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The Distortions to Incentives in South African Agriculture: A Case Study of the Wheat Industry

Day M[1], Vink N[1]

[1]Stellenbosch Unversity

Corresponding author email: mikerossday@gmail.com

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This study is the second comprehensive analysis of the distortions to agricultural producers' incentives in South Africa. The core analysis of this study reapplies the Anderson et al. (2006) empirical framework for the time period 2005 to 2014, as applied by Kirsten et al. (2009), in order to estimate the distortions faced by agricultural producers. In addition to the aggregate application, the disaggregated approach to measuring distortions to individual agents' incentives in a vertical value chain is seminally applied in the South African context. The methodology developed by Briones, Alonso and Swinnen (2015) is applied to the South African wheat value chain for the marketing years starting in October 2000 and ending in September 2014. The results highlight the opposing incentives faced by primary agricultural producers depending on the trade status of their commodity. It is recommended that policy makers and market regulators thus consider the implicit impact of the long-term depreciation of the South African rand on agricultural producers' incentives, while also focusing on the phasing out of inter-industry distortion differences in order to realise potential efficiency gains.

Keywords: Tariff Policy; Wheat; South Africa; Policy Distortions; Value Chain

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1. Introduction

1.1 The Political Economy of Agriculture

The economic benefits of specialisation and trade are well known, yet governments persist in introducing measures that restrict international trade, including trade in agricultural products. While these restrictions differ from country to country, they contribute to volatility in global agricultural markets, consequently altering countries' terms of trade. As Williamson (2008) notes, this volatility in the long-run terms of trade has a growth-retarding effect.

Although the policy stances in developed and developing countries differ, both by their nature and the degree to which they distort agricultural incentives, the gradual policy developments within individual countries over time have had, and continue to have, a pronounced effect on the long-run growth and distribution of global welfare (Anderson 2009). Furthermore, in addition to the economic growth implications, distortions to agricultural incentives have knock-on effects on consumers through the price of food. Consequently, policy stances not only influence economic growth, but also influence poverty and income inequality due to the importance of food prices in these parameters.

While policy intervention in agricultural markets has been reduced drastically over the past 25 to 30 years, the reduction of this intervention was only prioritised once agricultural commodities were duly included in the framework of international negotiations, specifically in the General Agreement on Tariffs and Trade (GATT). Prior to the inclusion of agricultural commodities in international negotiations during the Uruguay Round Agreement on Agriculture (URAA), signed in 1994, individual countries had been left free to determine their respective agricultural policies, even when these policies have had a disruptive effect on world markets (Butault 2011). Preceding the URAA, the Haberler (1958) Report to the GATT highlighted the presence of policy-induced distortions and cautioned that they could worsen, which they did, as shown by Anderson and Hayami (1986). The signing of the URAA agreement in 1994, together with the concurrent establishment of the World Trade Organization, paved the way for the majority of signatory countries to shift their policy stances towards reducing agricultural support and progressively decoupling this support from the level of production (Butault 2011).

1.2 Background to the Study

Given the extent to which policy had distorted global agricultural markets, empirical studies were forthcoming that focused on measuring the government-imposed distortions that had created gaps between the domestic prices of agricultural products and the would-be free market prices. However, these studies were often limited to specific countries, with tailored methodologies aligned to the respective research objectives. This research stance made international comparisons of these country-specific studies nearly impossible, and consequently failed to contribute meaningfully to the body of literature on policy-induced price distortions.

Since the late 1980s, three key inter-country studies have applied respective uniform methodologies to empirically measure the policy-imposed distortions on commodity level that arise due to the complex web of agricultural policies. The seminal study conducted by Krueger, Schiff and Valdes (1988) covered a small range of developing countries (18 in total, and not including South Africa, which at the time remained sanctioned by the global community). The findings of this study proved ground-breaking in answering the age-old question about why agriculture had historically been supported in developed countries and taxed in developing countries, while also providing empirical estimates of the implicit taxation of agriculture in developing countries.

The OECD has provided estimates of policy support for its member countries and selected emerging economies, including South Africa, on an annual basis. The most notable and widely published measures from the OECD annual reports are the estimates of market price support, the nominal protection co-efficient and the producer support estimates. Furthermore, the OECD's estimates have empirically quantified the effects of specific policies within its focus countries. These empirical estimates are currently available for the past 30 years since 1986.

The most comprehensive study using a uniform methodology was conducted under the directorate of the World Bank and headed by Kym Anderson. Following on from the methodology derived by Anderson *et al*. (2006), a global study was conducted across 40 developing countries, together with the OECD countries and Europe's transition economies. At the time (2009), this group of countries accounted for around 90% of global agricultural production. The study was aggregated into key regions of the world where distortions to agricultural incentives were calculated from 1955 to 2007 and reviewed on a country basis. The initial study included a comprehensive investigation of the distortions to agricultural incentives in South Africa, conducted by Kirsten *et al*. (2009); however, the subsequent update of the empirical database to 2011 by Anderson and Nelgen (2013) did not incorporate an update of the South African estimates.

Kirsten *et al*.'s (2009) empirical findings for South Africa were largely aligned with the political environment in which policies were made in South Africa during the apartheid political regime, with high protection of the agricultural tradable sector throughout the 1960s and 1970s, peaking in the 1980s. Following the transition to democracy in the 1990s, distortions declined rapidly in the agricultural sector and, by the end of the period (2000 to 2004), the policy environment was such that resource allocation had shifted against the agricultural sector.

Since the Kirsten *et al*. (2009) distortion estimates up to and including the year 2005, no empirically aligned attempt has been undertaken to provide updated estimates for South African agriculture. Furthermore, with the exception of the Anderson and Nelgen (2013) empirical update, the application of the broad Anderson *et al*. (2006) methodology on a country level has significantly dried up internationally. An update of these distortion estimates is therefore due for the South African agricultural sector, as well as for the countries not covered in the Anderson and Nelgen (2013) update.

A common thread throughout the estimates published by the OECD, as well as those published as a result of the Krueger *et al*. (1988) and Anderson (2009) studies, is that policy stances are either seen as assisting or hindering producers or consumers of agricultural products. Consequently, the distortion estimates in these studies are generally aggregated into their net effect on each of these two economic groups at various levels of aggregation, including individual commodity level, commodity group level, industry level, as well as macro-economic level. Such aggregation enables the decomposition of results from the macro-economic level back down to the individual commodity level in order to analyse the contributions of the individual commodity or industry component to the greater aggregated measure. However, all three of the above frameworks of estimates fail to allow decomposition from the individual commodity level down to individual agents in the value chain. For example, if South African wheat producers as a collective are seen to receive assistance under the policy environment using the aggregate measure, it could still mean that certain agents within the broader producer group are being taxed under the current policy setting. Such a situation would logically prevail if the magnitude of the support to agents

within the broader producer category is larger than the magnitude of the taxation of agents within this category.

Consequently, and in essence, the distortion estimates published in their various forms in the documented studies hide how the policy assistance/hindrance incident on specific agricultural commodities or industries is distributed throughout the respective commodity value chains. Such an omission from inter-country studies is understandable, because of the detailed value chain data required to decompose commodity/industry-level distortion estimates. Although not necessarily internationally comparable, such a decomposition – as has been undertaken by Briones Alonso and Swinnen (2015) for the Pakistani wheat flour value chain – is indeed possible when limited to a specific country and commodity or group of commodities.

An extension of the base nominal rate of assistance framework used by Anderson (2009) allows for policy welfare impacts to be disaggregated within producer and consumer groups. The results of this extension provide estimates of the welfare impacts of policies per agent in a vertical value chain operating under the producer and consumer 'umbrellas'. Welfare estimates on a per-agent basis, rather than on an aggregate producer or consumer group basis, have important implications for the analysis of the economy and political economy. Furthermore, disaggregated estimates assist in the design of policies targeting the poorest groups along value chains (Briones Alonso & Swinnen 2015).

To date, no such disaggregated empirical approach has been published within a South African agricultural context. The South African wheat industry is ideally poised for such an investigation, given the constant hype around the market concentration of the industry at processing level and the perceived declining ability of producers to competitively produce wheat.

2. Theoretical Motivation

2.1 Value Chain Approach to Measuring Distortions to Agricultural Incentives

Motivation for a Disaggregated Model

The methodology developed by Anderson *et al*. (2006) is able to indicate the degree to which agricultural producers and product consumers are taxed or subsidised under various policy environments. The nominal rate of assistance (NRA) and consumer tax equivalent (CTE) measures are able to be calculated for specific commodities, as well as for aggregated groups such as exportable commodities or import-competing commodities. Furthermore, these indicators are able to be aggregated into sectoral indicators.

Briones Alonso and Swinnen (2015) dissect the NRA measure of Anderson *et al*. (2006), which represents the distortions to producers, and CTE, which represents the distortions faced by consumers and emphasise the fundamental point that, within each of the 'producer' and 'consumer' groups, there are a large number of agents throughout the value chain. Using the example of the NRA measured at the level of processed sugar, Briones Alonso and Swinnen (2015) highlight that there are both farmers of raw sugar cane as well as sugar-processing companies within the 'producers' category. Consequently, it is not clear from the broad NRA indicator developed by Anderson *et al*. (2006) how the specific policy environment affects specific groups, such as farmers and processors, throughout the value chain.

The difficulty of determining the policy impact of groups within the 'producers' and 'consumers' categories gives rise to the need for an indicator of the disaggregated nominal rate of assistance in order to disentangle the aggregate distortions faced by various groups throughout the value chain.

The South African Wheat Industry

Wheat cultivation and wheat milling are two of the oldest agricultural activities and industries in South Africa, and can be traced back to the first European settlers in the Western Cape (Mncube 2013). After maize, wheat is one of the most important grain crops in South Africa, with the wheat industry contributing significantly to agricultural GDP (Meyer & Kirsten 2005). Furthermore, milled wheat flour as an input for bread continues to grow in importance, with bread one of the main staple foods in South Africa.

The wheat value chain in South Africa was extensively regulated between 1937 and 1996, with the Wheat Board in place as the main intermediary between wheat grain producers and wheat grain processors. The centralised Wheat Board operated a single marketing channel for wheat, fixing wheat prices while also controlling imports and exports (Van der Merwe *et al*. 2016). This control enabled the manipulation of import and export prices by the Board, thus protecting the local supply chain from market forces. Shortly after the institution of the first democratic government in South Africa, the marketing of agricultural products changed dramatically with the introduction of the Marketing of Agricultural Products Act, No. 47 of 1996. These changes included the closure of numerous industry control boards, including the Wheat Board, together with commodity tariffication (Mncube 2013). Allowing international market forces to prevail enabled international competitors to enter the domestic market and to play a significant role in the wheat industry supply chain (Van der Merwe *et al*. 2016). One of the unintended consequences of the abolition of the Wheat Board is highlighted by Cock (2009) as being the concentration of ownership and regulation across the entire wheat-to-bread value chain. This concentration was driven primarily by the necessity for higher efficiency in an open market, as is evident from the decline in wheat buyers – from 137 mills in 1997 to 65 mills in 2011 (Van der Merwe et al. 2016). This market concentration is reflected in the four biggest milling companies accounting for more than 95% of all flour sales in the domestic market (Mncube 2013).

Although it has a competitive advantage in the wheat milling industry, wheat production in South Africa remains internationally uncompetitive (Van der Merwe *et al*. 2016). Van der Merwe *et al*. (2016) show, however, how the increased market concentration following the abolition of the Wheat Board coincided with the decreased competitiveness of wheat producers. Their findings conclude that the decline in competitiveness of wheat farmers is due to farmers' inability to adapt to the free market system without the significant protection provided during the Wheat Board era. They furthermore raise concerns about the policy environment in which wheat producers have to operate. Given the high level of concentration in the wheat milling industry, and the consequent regulatory and market control that this concentration yields, collusion between firms was inevitable. Mncube (2013) methodically evaluates these conditions that are conducive to collusion, while documenting the details of the wheat flour cartel that was active from 1999 to 2007. Neither Van der Merwe *et al*. (2016) nor Mncube (2013), however, seek explanations for possible policy drivers of the competitiveness of agents within the wheat value chain.

The motivation for the current study was primarily a concern to update the aggregate distortion estimates for primary agricultural production in South Africa, and then disaggregate these estimates per agent in the wheat value chain. However, with the recent history of the wheat industry being characterised by cartels at the processing level, together with declining competitiveness in wheat production, disaggregated policy distortion estimates will provide key insights into the policy environment under which the collusion and decline in competitiveness have been occurring.

3. Study Methodology

3.1 General Commodity Framework

In the situation of many firms producing a homogenous product using just primary factors, while operating in a small, open, perfectly competitive market, economic welfare would be maximised if the relationship shown in Equation (*1*) holds (Anderson *et al*. 2008):

$$DFP = CPP = (E \times P) \tag{1}$$

where DFP represents the domestic farmgate price for a product, CPP represents the consumer product price for the product, and E × P is the domestic currency price for foreign exchange multiplied by the foreign currency price for the specific product in the international market. Furthermore, the relationship in Equation (*1*) only holds in the absence of externalities, product-processing, marketing margins, exchange rate distortions and domestic and international trading costs. The result of any government-imposed diversion from the above equality in the absence of market failures or externalities would have a welfare-reducing impact on the small economy described. Consequently, the analytical framework developed by Anderson *et al*. (2006) sets out to measure any government-imposed diversion from the equality in Equation (*1*).

Nominal Rate of Assistance and Consumer Tax Equivalent

Considering a situation where an ad valorem import tariff (t_m) is the only distortion, its distorting effect on producer incentives is able to be determined by the nominal rate of assistance (NRA) to farm output as a result of border price support (NRA_{BS}). The NRA_{BS} is the unit value of production at the distorted price less the unit value of production at the undistorted price expressed as a fraction of the undistorted price. This relationship is depicted mathematically in Equation (2).

$$NRA_{BS} = \frac{E \times P(1 + t_m) - E \times P}{E \times P} = t_m \tag{2}$$

3.2 Disaggregated Value Chain Extension

Adaptation of NRA and CTE

Briones Alonso and Swinnen (2015) present Equation (*3*) as a means for calculating the nominal rate of assistance to a specific agent[i] in a vertical value chain.

$$NRA^i = \frac{p_o^i - p_o^{i^*}}{p_o^{i^*}} + \frac{\sum_j \left(p_j^{i^*} - p_j^i\right) \times {Q_j^i}/{Q_o^i}}{p_o^{i^*}} \tag{3}$$

$$= NRA_o^i + NRA_I^i$$

In Equation (*3*), P_o^i represents the actual domestic price of output 'o', $P_o^{i^*}$ is the undistorted domestic price, Q_o^i is the quantity of output sold, P_j^i is the actual domestic input price of input 'j', $P_j^{i^*}$ represents the undistorted price of input 'j' and Q_j^i is the quantity of input 'j' that is needed to produce output 'o'. The conversion rate from input 'j' to output 'o' is represented

by Q_j^i/Q_o^i. In the case of an agent such as a wheat miller, this conversion rate will be less than 1, whereas in the case of an agent such as a commodity trader it will be equal to 1.

In Equation (*3*), the NRA^i_o indicates the extent of distortions to output prices expressed as a percentage of the undistorted output price, in line with the base methodology of Anderson *et al*. (2006) (E × P in Equation (2)). Similarly, the NRA_I^i is representative of the extent of the total distortions to input prices for all inputs 'j' used to produce output 'o'. Consequently, the total nominal rate of assistance to agent^i (NRA^i) is the sum of NRA^i_o and NRA_I^i. Considering this, aggregating the NRAs of all agents under the 'producers' category yields the total nominal rate of assistance to commodity producers (NRA^P).

In terms of measuring the distortions that consumers face, Anderson *et al*. (2006) propose the use of CTEs. Briones Alonso and Swinnen (2015) draw on this methodology but utilise an NRA equivalent measure in which the nominal rate of assistance to commodity consumers (NRA^c) is obtained through Equation (*4*).

$$NRA^C = \frac{p_I^{c^*} - p_I^c}{p_I^{c^*}} \tag{4}$$

In Equation (*4*), p_I^c is the domestic price paid by consumers for the commodity, whereas $p_I^{c^*}$ represents the undistorted price that would have been paid by consumers of the specific commodity in a free market.

Value Chain Price Linkages

In a vertical value chain with multiple agents operating, the logical assumption is made in the methodology of Briones Alonso and Swinnen (2015) that the price paid by the subsequent agent (agent 'j') handling the traded commodity is equal to the price received by the previous agent (agent 'I') who handled and sold the commodity. Consequently, the market price of the output received by agent 'I' (p_o^i in Equation (3)) is equivalent to the price of the input paid by agent 'j' (p_I^j).

4. Study Results

4.1 Aggregate NRA to Primary Agriculture

Figure 1 presents the aggregate distortion estimates calculated in this study for the ten-year period leading up to and including 2014 in the context of the long-term trend from 1962 calculated by Kirsten *et al*. (2009).

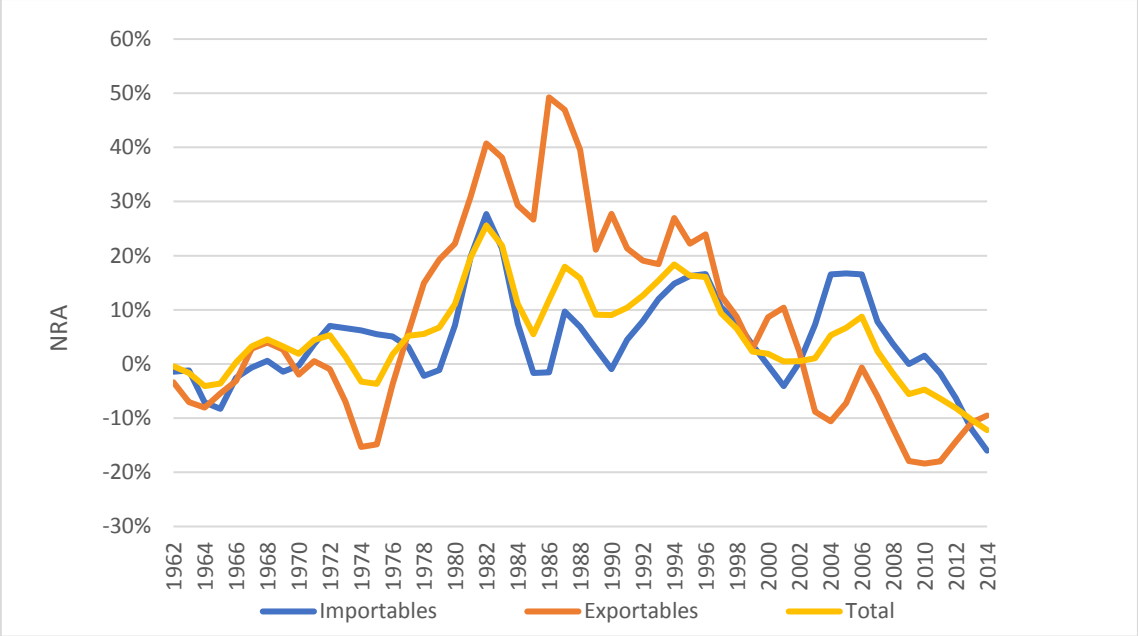

Figure 1. Aggregate NRAs for primary agricultural production – three-year moving average, South Africa, 1962 to 2014.
Source: 1962–2004: Kirsten et al. *(2009); 2005–2014: author's calculations*
Author's calculations data source: FAO (2017); ITC (2017a); ITC (2017b).

Following an initial increase in the total NRA to primary agricultural commodities in the beginning of the period, Figure 1 depicts a steady decline in NRA to primary agriculture over the most recent ten-year period. This decline reflects a complete reversal of the NRA to primary agriculture, from a positive average of close to 10% to a negative average value in 2014 in excess of 10%. Furthermore, with the exception of the negative NRA values experienced for a couple of years in the mid-1960s and 1970s, the years after 2008 mark the first sustained period of negative NRA values for aggregate primary agricultural production in over 50 years.

On average, the NRA for South African primary agriculture between 2005 and 2014 reflect a change in policy environment from one that incentivized primary agricultural production to one that disincentivized primary agricultural production. This shift coincided with the rapid depreciation of the rand against major trading partners' currencies, which in theory should have increased South Africa's competitiveness in the global market. Throughout this period, South Africa's real agricultural export value more than doubled, with this occurring at an increasing rate after 2012 (DAFF, 2016). Agricultural net exports remained extremely volatile throughout the period, however, reflecting erratic year-on-year agricultural imports. The acceleration of agricultural exports after 2012 reflected a positive shift in the policy environment in which agricultural exporters were operating. This shift is evident in Figure 1 where, after 2011, the NRA to primary agricultural exportables has been on an upward trend towards a zero-distorting environment.

Ironically, the policy environment shift facing the exportable sector has predominantly been a passive shift driven by the floating exchange rate depreciation and the consequent international competitiveness gain. This is in stark contrast to the governmental policies until 1995 to support exporters and shield against losses, as highlighted by Kirsten *et al*. (2009). Since the removal of these policies, the NRA to exportables has remained in a downward trend as markets liberalized. What the NRAs from this study reveal for the primary

agricultural exportable sector is that this downward NRA trend has possibly been reversed, with the 'saviour' being the widely negatively perceived depreciation of the rand.

While the NRA to exportables remained negative throughout the period, the NRA to importables only turned negative after 2010, although it had been exhibiting a declining trend for all ten years of the study. However, while a depreciation of the rand would intuitively lead to implicit support for import-competing commodities on the output side due to the increased rand costs of imported commodities, the NRAs fail to reflect this implicit protection. Instead, the NRAs in the last four years exhibit a shift from a neutral policy-distorting environment to an environment strongly disincentivizing the production of import-competing commodities.

While the removal of tariff protection seems the logical explanation for such a decline in NRAs, the manner in which the depreciating exchange rate has affected the import-competing sector needs dual consideration. As highlighted, an exchange rate depreciation on the output side would lead to implicit support for the import-competing sector. On the input side, however, the same depreciation would increase the costs of imported inputs, thus raising the cost of production. Given this, and without sufficient productivity gains, if the relative rise in output prices is lower than the relative rate at which input costs are rising, the onset of a cost price squeeze is inevitable (Tweeten & Griffin 1976).

Consequently, while attempting to fulfil international trade agreement obligations in terms of the movement towards free trade, the removal of import-protection policies is justified from a welfare perspective (Anderson & Van Wincoop 2001). The results of the NRA to the importables sector in Figure 1, however, amplify an important aspect. Given the global trend of import tariff removal, the transformation of an import-competing sector from one that is protected by tariffs to a more open, zero-distorted sector needs to be conducted with caution. What the overshooting of the study's NRA to importables below zero suggests is an import-competing agricultural sector having lost import protection, on the one hand, while concurrently being faced with a cost price squeeze through the depreciation of the South African rand. This results in a sector fighting for survival, rather than being able to attempt productivity gains.

4.2 Disaggregated Wheat Value Chain Results

The disaggregated NRAs for each of the three covered agents in the South African wheat value chain are presented in Figure 2.

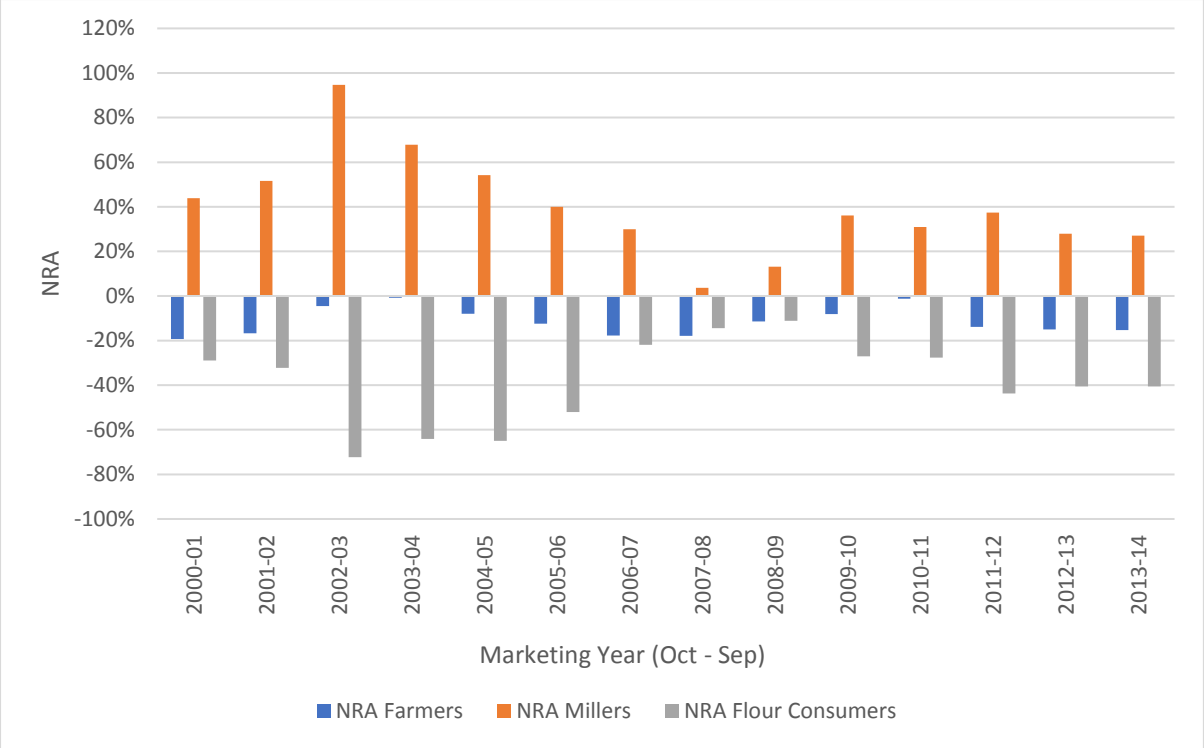

Figure 2. Disaggregated NRA per agent in the wheat value chain – marketing years, South Africa, 2000 to 2014.
Source: Author's calculations.
Author's calculations data source: DAFF (2016); SAGIS (2017); Grain SA (2017).

The South African wheat value chain was extensively regulated through a single marketing channel between 1937 and 1996. Following the transition to a free market, the wheat milling industry grew increasingly concentrated, with fewer firms controlling the market. This culminated in a wheat flour cartel being active from 1999 until 2007, through which wheat flour millers were able to extract excessive rents from the market at the expense of both wheat grain producers and wheat flour consumers.

In line with the objectives of this study, Figure 2 presents the distortion estimates for wheat farmers, wheat millers and wheat flour consumers, highlighting the large disparities between the incentives facing these three value chain agents between 2000 and 2014. The continued negative NRA for wheat farmers reflect the fact that all forms of tariff support were drastically reduced from 2001, along with an exchange rate-driven cost price squeeze. However, the trends seen in the NRAs to wheat millers and wheat flour consumers need to be considered together, and in the context of the competitive nature of the wheat milling industry.

Competitiveness and Market Structure

The market structure of the wheat milling industry has been and continues to be notoriously concentrated among four firms, namely Pioneer Foods, Tiger Brands, Premier Foods, and Foodcorp (Mncube 2013). Although the industry is highly concentrated, however, the only agent within the industry that was deemed to be competitive via the relative trade advantage (RTA) measure was wheat millers, as found by Van der Merwe *et al.* (2016) in their investigation of the industry's competitiveness. Their results, however, highlight a significant decline in the competitiveness of wheat millers from the early 2000s until 2007. Figure 3 depicts the RTA for wheat flour from 2000 until 2012, calculated by Van der Merwe *et al.* (2016). This is presented together with RTA measures for wheat flour, as calculated by

Boonzaaier (2017), in order to have a comparable time period to that being analysed. Positive RTA values indicate competitiveness compared to international peers, whereas negative values signify a lack of competitiveness. Zero RTA values indicate marginal competitiveness.

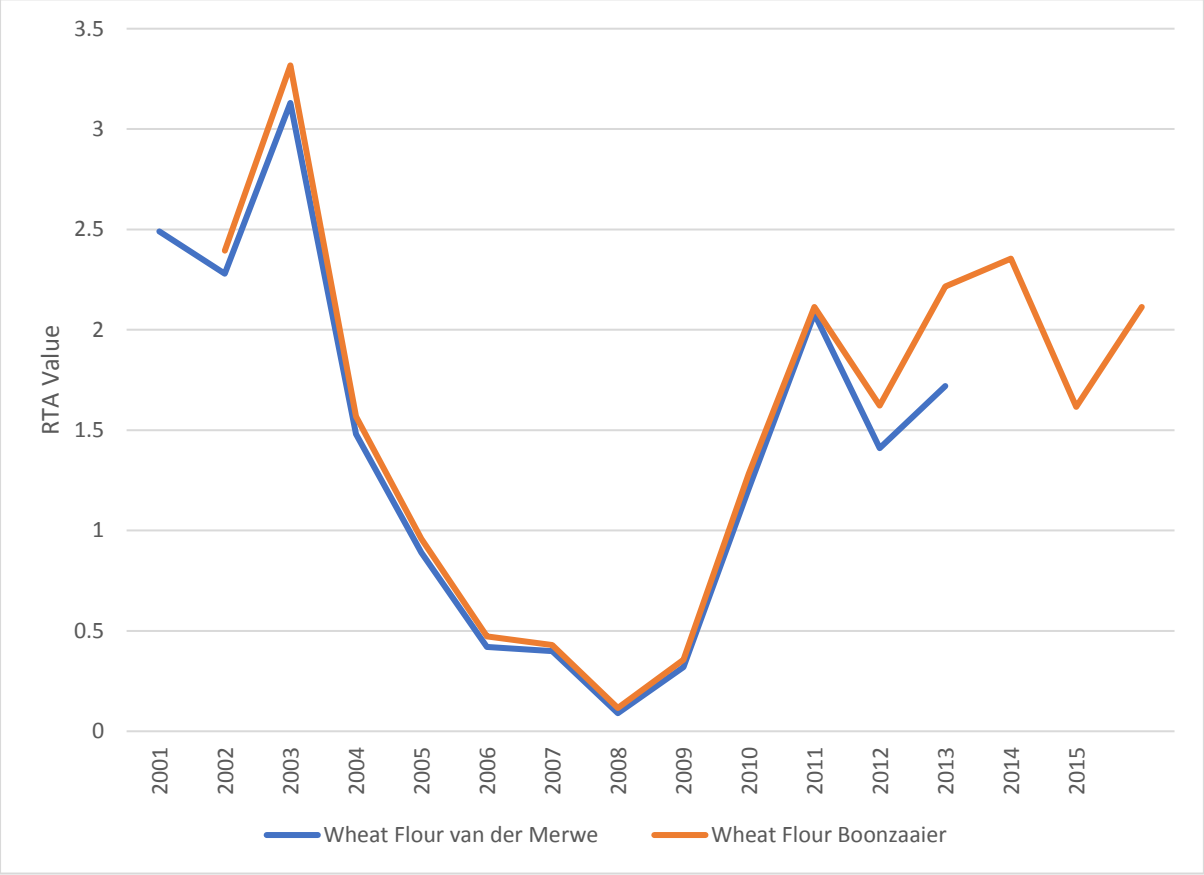

Figure 3. RTA competitiveness measure of wheat flour, South Africa, 2000 to 2015. Boonzaaier and Van der Merwe data comparison.
Source of data: Van der Merwe et al. *(2016) and Boonzaaier (2017)*

The RTA trend depicted in Figure 3 highlights a clear decline in the international competitiveness of wheat millers during the last four years that the wheat cartel was active (2003 to 2007). When competitiveness is viewed in relation to the NRA measures of wheat millers, however, a striking relationship is revealed. Figure 4 combines the NRAs for wheat millers calculated in this study with the competitiveness RTA measures calculated by Van der Merwe *et al*. (2016) and Boonzaaier (2017) respectively.

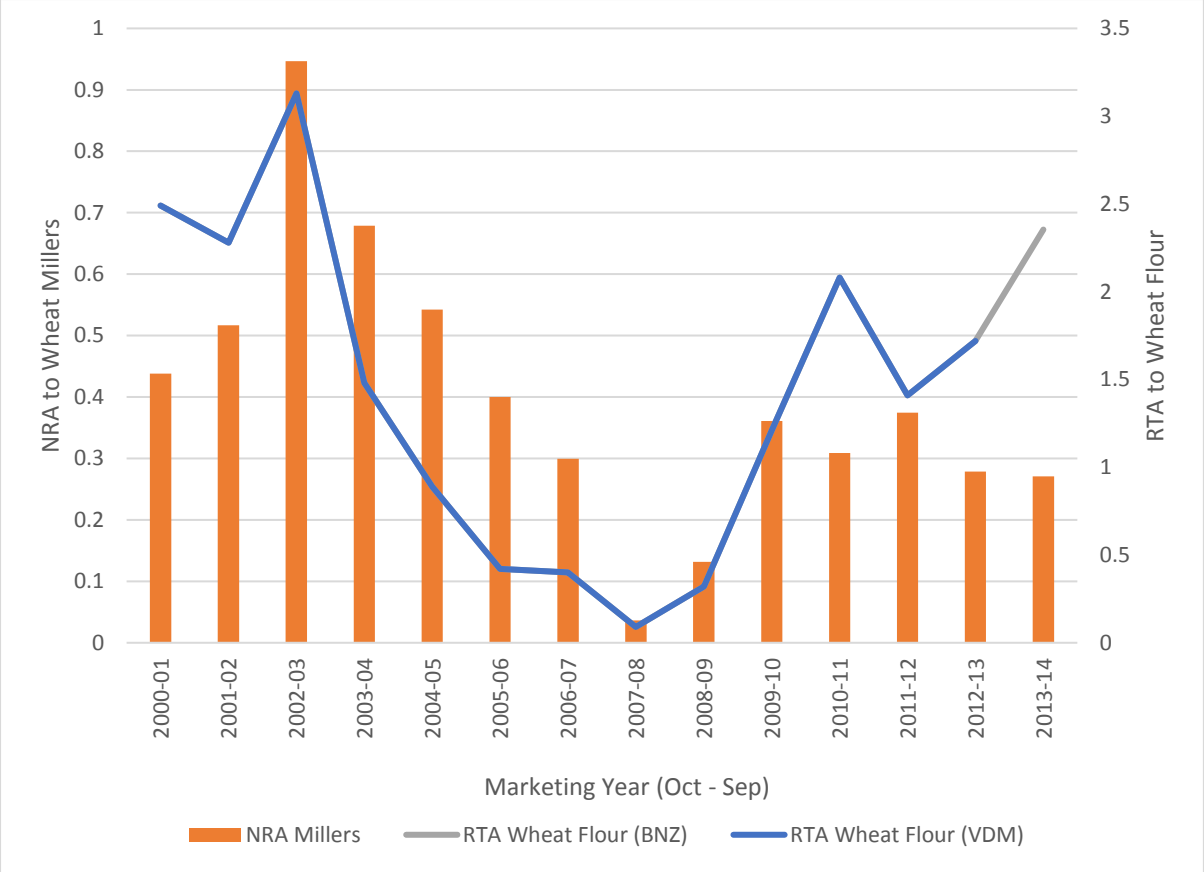

Figure 4. NRA to wheat millers and RTA of wheat flour, South Africa, marketing years 2000/2001 to 2013/2014.
Source of RTA data: Van der Merwe et al. *(2016) and Boonzaaier (2017)*
Source of NRA data: Author's own calculations

Figure 4 shows the peak of the NRA to wheat millers as well as the competitiveness peak of these agents during the 2002/2003 marketing year. The NRA value of close to 0.95 in this year reflects the fact that wheat millers were receiving close to double the price for their wheat flour than they would have been receiving in a free market. Unsurprisingly, the competitiveness of South African wheat millers was at its highest point of the 14-year study period during this marketing year. In line with this, Mncube (2013) found that cartel members' profits were approximately double during the collusion years than they were in the post-collusion years.

Arising from this is the intuitive question about how the large positive disparity arose for wheat flour in an open market system. Mncube (2013) highlights the fact that, due to the concentration in the wheat milling industry, the four major firms also had substantial control over imports of wheat grain and ensured they paid the lowest possible import price for this wheat grain. This contributed to supressing the domestic producer price for wheat grain and thus ensured a lucrative processing margin potential. Furthermore, the cartel (in place up until 2007) ensured both fixed selling prices and market allocation of wheat flour. This further increased margins on the output side of the processing level and thus enabled excessive rents to be extracted.

It should therefore come as no surprise that the logical deduction from Figure 4 is that the presence of an over-enabling market and policy environment for wheat millers is what drove their international competitiveness. The decline of this incentivizing policy support for wheat millers leading up to the cartel bust in 2007 corresponds nearly perfectly to the decline in the

measured competitiveness levels over the same period. This raises questions about the real competitiveness of South Africa's wheat milling industry if it were to be operating in an open, zero-distorted policy environment free of collusion. The results suggest that, during the 'bust' year of the cartel, the measured NRA to wheat millers was just under 4%, while the RTA was 0.09, which indicates near-marginal competitiveness.

For the last six years of the period, however, NRAs were once again substantial and indicate that, in some years, wheat millers were receiving close to 40% more for their flour than would have been the case under a free market. In addition to this, the competitiveness of wheat millers was once again strongly positive, in line with the incentivizing policy environment. Although on a significantly smaller scale, these recent trends after the cartel investigation reflect the same environment that was evident during the cartel years, viz. positive NRAs and positive RTAs. This gives rise to the question whether the reforms and regulations initiated post-2007 have been successful in ensuring that there cannot be collusion between millers.

Intra-industry NRA Comparisons

The NRA trends presented in Figure 2 display three key trends. Firstly, the NRA for millers remained positive for all marketing years studied, although it declined up to the cartel 'bust' year in 2007/2008 before increasing again thereafter. Secondly, the NRAs to both wheat farmers and wheat flour consumers remained consistently negative throughout the period, with wheat consumers exhibiting substantially greater negative NRAs than wheat farmers. Lastly, the estimated NRAs between wheat millers and wheat consumers exhibited a strong negative correlation (-0.84), while the estimated NRAs between millers and farmers displayed a moderately positive correlation (0.51).

When considering the impacts of the nominal exchange rate on individual value chain agents, as in other importable industries, wheat farmers would be implicitly supported on the output side by a rand depreciation due to higher rand domestic prices for wheat grain. On the input side, however, the production costs of imported inputs would rise following a currency depreciation. A similar intuition would hold for millers, as imported flour costs would increase, which would implicitly protect millers. Consumers, on the other hand, would face decreased support from a rand depreciation, as domestic flour prices would tend to increase, leading to higher retail prices for consumers.

The only explicit border policy change that occurred during the period was the lowering of the import tariff on wheat grain from 16% (% of CIF) in 2001 to less than 1% in 2004. Between 2004 and 2014, the import tariff saw no significant adjustments and remained between 0% and 3% (SAGIS 2017). Isolating this tariff reduction shows that, although the removal of the tariff should technically lower the NRA to farmers, as a positive price wedge is being removed, the NRA to farmers in fact increased from 2000/2001 to 2003/2004. Theoretically, if the NRA to farmers was negative in the presence of an import tariff, as it was in 2000/2001 (-17%), the removal of a tariff should lead to a further decrease in the NRA, as the domestic producer price would decrease.

This anomaly in the movement of the NRA to farmers in response to the tariff removal gives rise to the question what the real impact of the tariff was on farmers. This is highlighted particularly when considering the exchange rate appreciation that occurred between 2001 and 2004, which would have implicitly decreased output support for farmers while implicitly increasing input support for farmers. Given the trends in the previously discussed importable commodities, the exchange rate tends to influence support estimates far greater on the input side than on the output side.

The overriding exchange rate effects on farmers' NRAs are exhibited throughout the rest of the period, as tariff protection was largely negligible. It is evident from the exchange rate series (see Figure A.1) and the NRA to farmers estimates in Figure 2 that, during time periods of exchange rate depreciation, the estimated NRA to farmers declined, whereas the NRA to farmers increased during times of appreciation. Thus, it is clear that the implicit impacts on wheat farmers' price incentives were driven primarily by the exchange rate and not necessarily by the import tariff in place. This questions the effectiveness of the protection provided to farmers by the wheat tariff.

The NRAs for wheat millers, on the other hand, exhibited an increase in NRA following the removal of the wheat grain import tariff and the appreciation of the rand over the same period. The appreciation of the rand, while resulting in decreased implicit output protection for millers, would furthermore increase input support through the decreased costs of imported inputs. Given that the major input into the milling industry is wheat grain, the removal of the import tariff leading up to 2004, together with the exchange rate appreciation, would have significantly decreased the input costs of millers and thus enabled greater processing margins to be realised.

However, the NRA for millers post-2003/2004 exhibits a rapid decline to close to zero in 2007/2008, signalling the breakup of the cartel. It is noteworthy, however, that this decline occurred over a period (2003 to 2008) when the South African exchange rate did not depreciate nearly as much as in more recent years (2011 to 2014). Furthermore, it occurred during a time when the removal of the wheat grain import tariff would have explicitly assisted wheat millers. Therefore, given the cartel's price-fixing agenda, the NRAs 'conscious' decline suggests that there was perhaps anticipation of investigation from within the cartel, and thus an impetus to align prices increasingly with those in the free market. This tendency contributed to reducing the disincentives facing consumers, as is evident from the opposite directions in which the NRA to millers and NRA to consumers moved over the period.

There is, therefore, evidence from these results to suggest that, while it was in place, the wheat cartel's presence absorbed the wheat import tariff benefits and thus blocked its incidence on wheat grain farmers. Furthermore, wheat grain farmers were increasingly faced with implicit exchange rate incentive distortions, which predominantly affected production inputs, as the output impacts were governed by farmers' price-taking position at the liberty of the cartel and the lower quality of wheat grain imports. In addition to this, consumers were made to pay heavily for the anti-competitive behaviour of wheat millers through increased retail prices.

Conclusion on Disaggregated Estimates

Despite it often being praised as a processing sector of high international competitiveness, the disaggregated results from this study highlight the substantial policy and market assistance afforded to wheat milling in South Africa. On the other hand, having had output price tariff protection all but removed over the period, together with input cost inflation via a depreciating exchange rate, wheat producers are often criticised for their inefficiency compared to their global peers. While this criticism is not unfounded on the basis of the competitiveness measures in the literature, the industry structure, together with the intra-industry distortion estimates from this study, provides possible reasons for this perceived inefficiency.

The evident 'bulge' of market power between the few firms at the processing level in the wheat value chain remains a toxic situation for all stakeholders in the industry, including the millers themselves. This market structure, in which a large number of wheat producers

service a small number of millers who supply a large number of wheat flour consumers, concentrates market power and lobbying power at the processing level. As this study suggests, this situation enables millers to essentially self-regulate their market and, in doing so, force wheat producers to remain price-takers, while they are able to dictate wheat flour prices through their control of supply. This market situation thus empowers millers to essentially extract all market and policy assistance out of the industry at the processing level, thereby blocking the majority of positive benefits from reaching wheat farmers and wheat flour consumers.

The intra-industry distortion estimates for the wheat industry reinforce this proposition, especially due to the fact that the period included NRAs for years either side of a cartel bust. If the years leading up to the cartel bust are interpreted as years during which wheat millers limited their self-regulating ability, up to the point where market regulation was instituted due to the Competition Commission's investigation, the negative impact of this self-regulation is evident. Where market regulation was enforced through the Competition Commission's investigation into the wheat cartel, millers' incentive distortions were largely negligible, while those facing consumers were at an all-time absolute low. Thus, the manner in which self-regulation by millers, due to conducive market conditions, distorted the incentives of consumers is evident. Furthermore, the means by which millers were able to utilise the favourable policy environment in order to gain international competitiveness is highlighted by their loss of international competitiveness as a direct result of the decrease in market and policy support leading up to the year in which the cartel was bust.

Therefore, when considering the impact of explicit policy changes, such as the removal or implementation of a tariff, it is important to consider the market structure of the specific industry, together with distortions facing the respective value chain agents within the industry. This is in contrast to the conventional approach of evaluating policy success or failure using measures that often culminate in a competitiveness index. What the disaggregated results of this study have highlighted is the need to consider quantitative support indicators when evaluating the performance of value chain agents. Although the wheat millers remain internationally competitive, a clear driver of this competitiveness is their position in the market and their ability to 'absorb' market and policy support. This is highlighted through the persistently large positive nominal rates of assistance estimated in this study. Therefore, their core industry competitiveness without substantial NRAs needs to be questioned.

On the other hand, wheat producers – a large number of farmers – are perceived to be uncompetitive and are often criticised for inefficient resource use. However, their position in the wheat value chain means they have minimal lobbying power, while remaining price-takers. Furthermore, farmers remain exposed to exchange rate-driven input cost price squeezes, while not necessarily receiving the implicit positive output price benefits accompanying exchange rate depreciation. They persist with wheat production, however, albeit within a market and policy environment which disincentivizes this activity. In addition to this, the study's results highlight how, over the 14-year period covered in the disaggregated approach, wheat farmers all but lost tariff protection within the first three years and were then faced with a sustained period of exchange rate depreciation, all while being price takers to a wheat-processing cartel.

It is clear from this study two situations characterized the wheat value chain for the duration of the study period. Although being perceived to be uncompetitive internationally, wheat farmers, on the one hand, persisted with production under a forever challenging market and policy environment that persistently disincentivized wheat production. On the other hand,

millers, who had been perceived to be exceptionally competitive internationally, had been left to self-regulate their market and collude while receiving substantial market and policy incentives to do so. These two situations are thus a conundrum for the wheat industry in South Africa and require further research in order to ensure better-directed support policies for agents. A review of the current means used to evaluate the success or failure of the core competence of an industry is needed to choose which of the two situations is the better evil.

5. Conclusion

5.1 Implications for Policy Makers and Industry Players

Aggregate Results

Given the major findings of this study being as a result, firstly, of the long-term depreciation of the South African rand (aggregate results) and a lack of efficient market regulation (disaggregated results), the implications for both policy makers and industry players are several. The results do not oppose the zero-approaching trends in explicit border protection for the respective primary agricultural commodities, but rather call for consideration of both this tariff-reducing approach and broader macroeconomic occurrences.

Although incentive distortions as a result of exchange rate policy are provided for, both within the literature and in the applied methodology of this study, these provisions focus on a dual exchange rate system where importers and exporters face different exchange rates. The results of this study highlight, however, how even in a floating exchange rate system, as is the case in South Africa, the sustained depreciation of the rand had a significant effect on the incentives of production facing primary agricultural producers.

Given the South African situation, therefore, the transition towards zero explicit trade barriers needs to be considered in combination with the macroeconomic and political environment of the domestic economy. The impact of tariff removal on the domestic agricultural sector was, unsurprisingly, found to have reduced output protection, particularly for agricultural importable commodities. This was coupled with the overarching impact of the weakened exchange rate, namely a significant rise in the cost of production. This left producers of agricultural importables having to try to make significant productivity gains in order to compete internationally despite reduced import protection, while experiencing rising input costs driven by the depreciation of the rand. This toxic situation tremendously limits the abilities of the producers of importables to adapt to global competition in the domestic market, and highlights the need for policy makers to not overlook the macroeconomic challenges reflected in the exchange rate facing producers.

When determining border protection rates, it is thus imperative for policy makers to consider the relative distortion impacts of the exchange rate on the producers of agricultural commodities. Furthermore, following changes to the macroeconomic environment as a result of the political or global economy, an adequate review is needed from the government's perspective in order to determine the policy incentives facing the producers of individual commodities. Failure by government to eliminate the traditionally isolated approach to border protection will compound the challenges facing producers.

Disaggregated Results

On aggregate, the situation described above was found to be no different in the wheat industry, with wheat production strongly disincentivized. The disaggregated results furthermore highlight the need to efficiently regulate markets and to include the market structure and its implications when constructing policies. The results of this study paint a bleak picture for the wheat industry and the manner in which policy incentives have been distorted throughout the value chain.

While the competitiveness of value chain agents often underpins their presumed efficiency, the distortions facing individual agents needs adequate parallel consideration. Although shown to be non-competitive in various studies, wheat production in South Africa continued throughout the period. This happened in the face of decreased output protection through the removal of tariff protection, as well as sustained input price pressure as a result of the depreciation of the rand. The culmination of this situation was reflected in the negative distortion estimates to wheat farmers, thus reinforcing the challenging market and policy environment under which farmers had to produce. This challenging environment in which farmers found themselves was furthermore compounded by their price-taking position in the market. Yet, although being faced by a policy environment exerting downward pressure on their production margins, non-competitiveness was concluded through isolated competitiveness indicators and used as an argument against the primary activity and the support thereof.

On the other hand, wheat processing took pride as the lone activity in the wheat value chain that was perceived to be globally competitive and assumed to be highly efficient. This perception of high competitiveness and efficiency prevailed for an activity operating in a market and policy environment that highly incentivized wheat processing. Furthermore, the market structure and the lack of efficient regulation enabled collusion between processors, empowering them to exert market dominance and tailor the market and policy environment in their favour. Concurrent with the high positive distortion estimates are high measured competitiveness indicators for processors over the period. These competitiveness measures shaped policy makers' stance towards industry value chain agents.

This study shows, however, that, leading up to the year in which the cartel was bust, the ability of the cartel to tailor the market and policy environment in its favour and thus incentivize processing rapidly diminished. This coincided with a rapid decline in the estimated competitiveness of wheat processors – to a level of marginal competitiveness during the year in which the cartel was bust. Thus, it is not unfounded to assert that the driving reason behind the wheat processors' high competitiveness was the lack of market regulation and the ensuing market and policy incentives provided to processors. Simply stated, the only reason why wheat processors were competitive is because they were receiving high levels of support. This perceived competitiveness only further increased their lobbying power and resulted in their ability to further tailor market and policy incentives for themselves, predominantly at the expense of wheat flour consumers. What should be of concern for market regulators from the results after the year in which the cartel was bust is that distortion estimates are once again highly positive for wheat millers, as are competitiveness indicators. This is indicative that the situation currently prevailing is similar to that which prevailed during the known cartel years.

The disaggregated results provide, therefore, more questions than answers. The first is, obviously, whether the wheat processing sector is being adequately regulated after the cartel bust. The second challenges many literature studies on the South African wheat industry that have concluded that wheat should essentially not be produced in South Africa. While the conclusions of this study are by no means sufficient to refute the findings of these studies, the results introduce a new dynamic into the argument pertaining to the core competitiveness of value chain agents in a zero-distorting environment. From a policy maker standpoint, it is, rather, core competitiveness that should be considered when designing and implementing policies, as this measure duly excludes distorting 'noise' as a result of aspects such as market power. In order to measure this core competitiveness, however, extensive empirical research will be needed in order to develop a distortion-free competitiveness indicator.

Appendix A

A.1 South African Rand Exchange Rate

Figure A.1 Nominal monthly average exchange rate, United States dollar per South African rand, January 2000 to July 2017.
Data source: SARB (2017a)

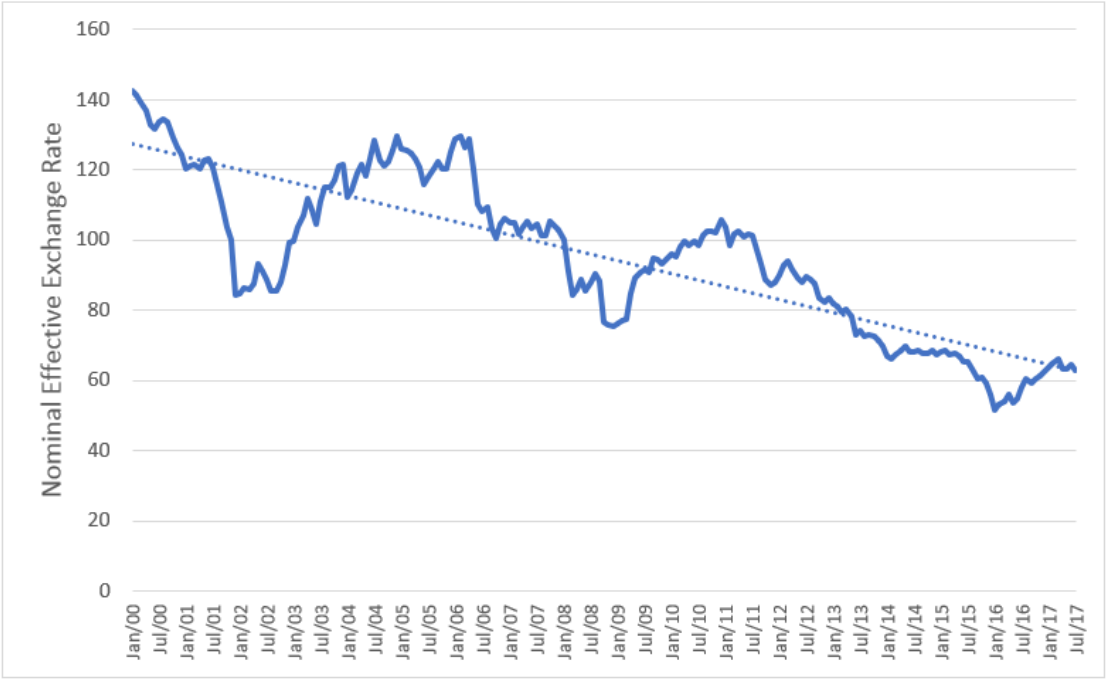

Figure A.2. Nominal monthly average effective exchange rate, South African rand against 20 most important trading partners, January 2000 to July 2017.
Data source: SARB (2017b)

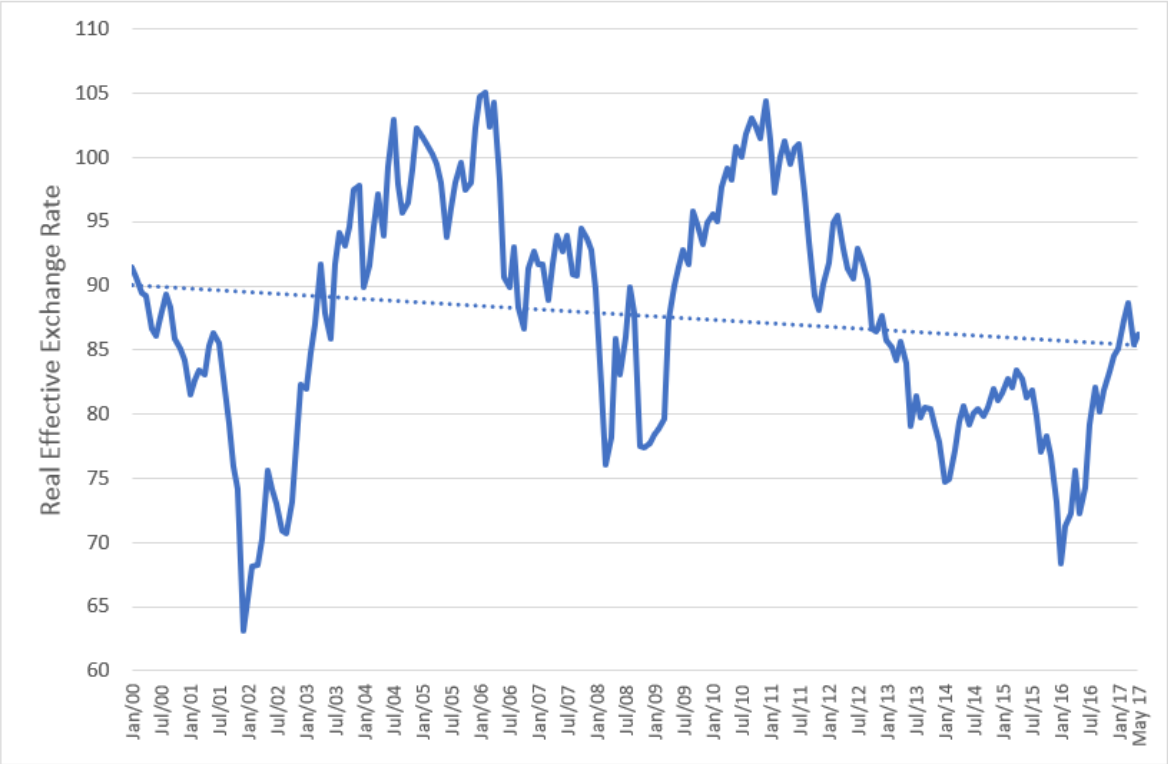

Figure A.3. Real monthly average effective exchange rate, South African rand against 20 most important trading partners, January 2000 to July 2017.
Data source: SARB (2017c)

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