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Price formation and competitiveness of the South African broiler industry in the global context

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ABSTRACT

In light of its recent classification by the Department of Trade and Industry as an industry in distress, this paper undertakes a comprehensive evaluation of the competitiveness of South African broiler production in the global context. A qualitative review of industry structure revealed a great deal of similarity to market leaders globally. Price formation within broiler production contracts in South Africa utilizes the same tournament pricing used successfully in the USA, resulting in high levels of technical efficiency, however economic efficiency is lacking. Univariate time series analysis confirmed that the domestic price of chicken is more elastic to changes in the import parity price than changes in feed costs. Feed remains crucial to economic efficiency and while declining protein meal prices in the future is plausible given recent investment into the industry, marketing strategies that optimize the returns from an entire carcass could aid effective competition with imported products.

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1. Introduction

According to the Department of Agriculture, Forestry and Fisheries (DAFF) the broiler industry represents the largest agricultural sub-sector in South Africa. Total value of production from fowl slaughters for the 2014–2015 season was R37.2 billion (DAFF, 2016: 76), representing 16.5 per cent of the gross value of agricultural production. In addition to dominating production, chicken meat also represents the cheapest and most consumed source of animal protein, contributing 59 per cent of meat consumption in 2015 (DAFF, 2016: 58–66). Further accentuating its value is the industry's consumption of other agricultural products – in 2015 it consumed more than 3.3 million tons of feed (including more than 2.1 million tons of maize).

Its dominance within the agricultural sector is apparent, yet the broiler industry finds itself under pressure from significant increases in relatively cheaper imports in the midst of rising domestic feed costs. As a net importer of chicken, South Africa is integrated into international markets and while nominal feed costs increased by 193 per cent from 2005 to 2015, the nominal chicken price increased by only 84 per cent. The share of imports in domestic consumption rose from 15 per cent in 2010 to 23 per cent in 2015, raising concern regarding the industry's ability to compete in the global market and hence its long-term sustainability. In response, the South African Poultry Association (SAPA) applied successfully for increased tariff protection in 2013, yet Davids *et al.* (2015: 6–7) indicate that the composition of imports, as well as the share of imports entering duty free from the European Union under the Trade, Development and Cooperation Agreement (TDCA) limits the impact of higher tariffs on domestic chicken prices. Recognising that the cost of increased producer support will be

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borne by lower income consumers, tariffs alone should not be the ultimate solution and the underlying factors that influence competitiveness should be identified.

Within this context, this study provides a comprehensive evaluation of the competitiveness of the South African broiler industry in the global context. A qualitative review of economic coordination and value chain structure is undertaken and compared to global standards to determine the fundamental factors underlying the industry's lack of competitiveness. In light of the integrated nature of the value chain and the reliance on contracting, a comprehensive review of contract characteristics and price formation within such contracts is undertaken, which includes the efficiency implications of price formation structures at different levels of the value chain. Given the concentrated nature of the industry, the qualitative evaluation of domestic broiler contracts is based on interviews with contract growers representing the five biggest broiler production firms, which together account for more than 70 per cent of the market. In addition to industry structure and value chain efficiency, the technical productivity of South African producers, as well as key cost drivers at primary producer level is related to global standards. Given that all companies do not make use of the contract growing model, it should be noted that technical efficiency on company farms is also important when evaluating efficiency at national level. Consequently the evaluation of technical productivity and cost drivers includes all producers, presenting a comprehensive review of the factors that affect competitiveness in the industry.

2. Global poultry value chains

Broiler markets worldwide exhibit similar structure. Technological advancement has altered the biological cycle of production, leading to varying levels of coordination through the value chain. Coordination facilitates exchange and manages the increasing risk of transaction failure associated with investment in improved technology (Dimitri *et al*., 2009: 30). Literature suggests that integrated supply chains are the norm, except for the broiler growing stage, which is generally contracted to specialist growers (MacDonald & Korb, 2011: 17). The choice of market structure reflects both the high levels of specific investment required to produce efficiently, as well as the risk of transaction failure associated with high numbers of broilers produced per cycle in order to capitalise on economies of scale benefits (Vukina & Leegomonchai, 2006: 589; Dorward and Omamo, 2009: 99).

2.1 Characteristics of broiler production contracts

Various types of contracts are used in broiler markets around the world, with key differences resting in the responsibility in providing inputs, as well as the determination of grower compensation (Leegomonchai & Vukina, 2005: 853). Integrated companies do not offer customised contracts to individual growers, as the cost of gathering information and implementing customised contracts would be excessive (Tsoulouhas & Vukina, 2001: 1065). Menard (1996: 170) states that most broiler contracts are purposefully incomplete, simply defining a general framework, with most technical provisions determined on a yearly basis.

In studying contracts used in the French poultry industry, Menard (1996: 170) identified three different types of contracts:

(1) "Fixed price contracts", used by only about 5 per cent of growers. Growers are fully independent and commit to delivering a certain number of chickens by a certain date. Contracts specify characteristics of the chicken to be delivered and a fixed amount of money to be paid.
(2) "Buy and sell" contracts, accounting for approximately one third of growers surveyed. Growers buy chicks and sell chickens, dealing with the same company as input supplier and buyer of chickens, while payments are made on a cost plus system. Growers usually remain in charge of intermediate products, though some had restrictive clauses allowing them to only purchase feed from a specific company. Buying prices in this type of contract were found to be per

chicken or per square meter, or alternatively based on a cost-plus system, with a margin added on cost of production.

(3) "Contracts of the putting out type", used by more than 50 per cent of growers in the French industry. Growers are provided with all inputs and equipment, while chicken is bought from them at a price determined on a yearly basis covering expenditures and a margin. The margin is usually flexible with built in incentives based on performance indicators like feed conversion and final weight.

In reviewing agricultural contracts in the USA, MacDonald and Korb (2011: 1–2) suggested that production contracts are typically used to govern exchange in livestock markets, while James *et al*. (2007: 4) indicates that these contracts have remained relatively similar in the last 50 years. The integrated processor typically provides crucial inputs while the grower supplies labour and chicken houses, getting paid per chicken produced. Due to the cost of shipping and the risk of mortality, contract growers are typically located within 100 miles of the integrators facilities, which normally includes hatcheries, abattoirs and processing plants (MacDonald & Korb, 2011: 17-18). The typical features of broiler contracts in the USA are summarised in Figure 1.

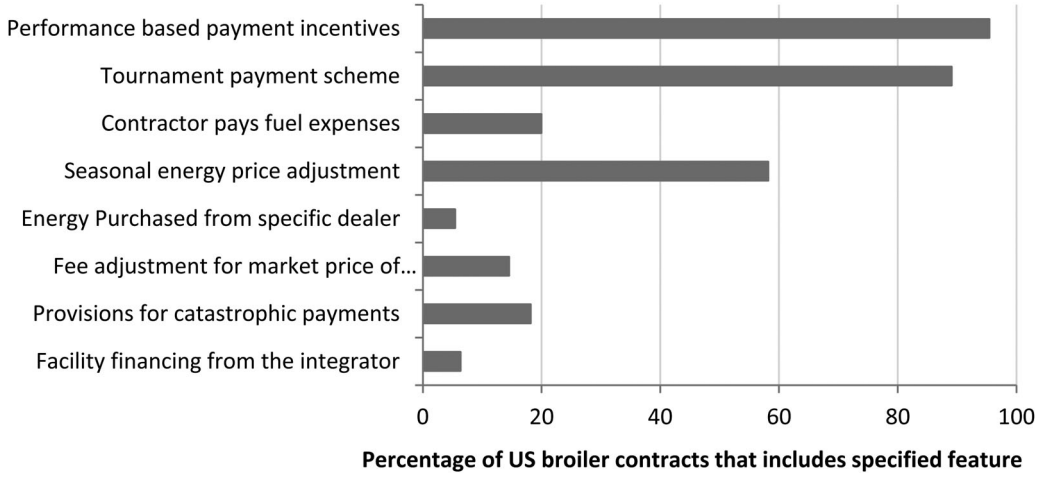

Figure 1. Typical features included in USA broiler contracts. Source: MacDonald and Korb (2011: 21).

Despite the long term investment required in highly specific assets, broiler contracts in the USA are generally short term, valid for one flock at a time and generally do not specify the number of flocks that a grower will receive per year (Leegomonchai & Vukina, 2005: 854). In most instances, however, the contract is tacitly renewed and it is not unusual for contract growers to grow for the same integrator for their entire career, as unilateral contract terminations are very rare. These dynamic contracts with a lack of long term commitment can also be seen as a source of implicit incentive (Leegomonchai & Vukina, 2005: 854).

2.2 Pricing methods in global broiler production contracts

Macdonald and Korb (2011: 18) suggests that contract growers in the USA receive a price consisting of a base payment, as well as additional variable payments based on efficiency and mortality performance. The most common form of pricing mechanism is that where producers are compensated in a two part tournament. Producers receive a basic fixed compensation, together with a variable incentive based on production efficiency relative to other producers. Flocks with lower mortality rates and higher feed conversion will therefore generate higher payments. In the USA, the strongest performers can be paid up to 50 per cent more than the weakest performers (MacDonald, 2008: 14–15).

By calculating the average performance of a group that has faced similar weather conditions, used the same feed and the same genetic strains and determining grower compensation based on relative performance, tournament pricing rewards growers for improved efficiency relative to competitors, while shifting common production risk onto the integrator (Goodhue 2000: 607; Tsoulouhas & Vukina, 2001: 1066). If the feed batch for instance was of inferior quality, results will be worse across the board, but individual growers will still receive the same payment based on their relative performance in the group. Thus the only remaining risk for the grower is the idiosyncratic risk.

Despite these benefits, growers have been opposed to a system where their compensation depends on the performance of others. Growers claim that tournament outcomes are potentially biased, as the quality of essential inputs like day-old chicks and feed are exclusively under the control of the integrator (Tsouhoulas & Vukina, 2001: 1062). Integrators are unable to monitor all individual growers constantly and so opportunistic behaviour by other growers to take advantage of the bonus system cannot be excluded. Leegomonchai and Vukina (2005: 850) were, however, unable to find any empirical evidence of strategic input allocation among growers of varying ability (Leegomonchai & Vukina, 2005: 874). An additional concern voiced by growers is that consecutive flocks facing similar input costs and performance could lead to different incomes due to the performance of other growers. Group composition changes continually as integrators place flocks with unequal rotation length in order to maintain control of output quantities. This changing group composition can lead to substantial differences in income from one term to the next and is defined by Tsoulouhas and Vukina (2001: 1063) as group composition risk.

An alternative pricing mechanism considered by Tsoulouhas and Vukina (2001: 1063) was for the portion of grower compensation that depends on a grower's performance to be calculated as relative performance compared to a fixed standard comparable with technology during the period of production. In evaluating the impact of replacing tournament pricing with pricing based on fixed performance standards on grower welfare and social surplus, Tsoulouhas and Vukina (2001: 1064) concluded that fixed performance standards shield growers from group composition risk, however insurance against common production shocks is reduced. Investigation of the same problem by Wu *et al*. (2004: 1–3) by means of an experiment to determine the effect of the two different incentive schemes on players with heterogeneous abilities found that high ability growers benefit from tournament pricing, while low ability growers lose under tournament pricing. The same study found no statistical difference in the effort implemented by the same growers under a tournament or fixed performance incentive scheme.

Tsoulouhas and Vukina (2001:1062) concluded that two part tournament schemes are a linear approximation of the optimal payment scheme and that they alleviate the moral hazard problem of the integrator. Though both payment mechanisms have strengths and weaknesses, tournament pricing schemes seem to be of superior efficiency from an integrators point of view, whilst the most efficient method from a grower's perspective would depend on the relative ability and risk appetite of the grower under consideration.

3. The South African broiler value chain

Considered within the context of large broiler markets around the world, the South African industry is small (1.8 per cent of global production), but similar in structure. It is characterised by the same hybrid structure found in the most significant global producers. Production is dominated by a few large, integrated firms that account for most of the supply chain; except for the crucial broiler grow out stage, which is controlled through relational contracting. Significant capital requirements and economies of scale benefits act as barriers to entry for new, small scale producers, leading to high levels of concentration within the industry (Louw *et al*., 2011: 262). Investigations by the competition commission, such as those initiated in 2009 against Rainbow Chicken Ltd., Astral Foods, Pioneer Foods, Country Bird Holdings and Afgri Poultry have raised concern regarding possible uncompetitive behaviour

Table 1. Market Share of large commercial chicken producers in South Africa

Producer	Market share, %
Rainbow Chicken Ltd.	25.04
Astral Foods	22.45
Country Bird Holdings	7.99
Tydstroom Poultry (Pioneer Foods)	6.39
Afgri Poultry	5.97
Chubby Chick	5.86
Sovereign Foods	4.53
Others	21.77

Source: Davids (2013).

under these high levels of market concentration. In 2011, the two largest producers, Rainbow Chicken Ltd. and Astral Foods produced just below 50 per cent of total production (Table 1).

The South African broiler value chain is part of the global food system and can be described as a complex integrated structure of different chains interacting with each other. The efficiency and competitiveness of the value chain therefore depends on the efficient operation of other value chains like maize and soybeans, while the global broiler value chains affects the South African system through trade. Its integration in the global system offers local producers access to the best genetic material and production technology in the world, improving technical efficiency. Figure 2 represents the generic structure of the South African broiler value chain.

3.1 Broiler production contracts in South Africa

Broiler contracts in South Africa are similar in structure to international contracts, with the two major components being the responsibility in providing inputs as well as the method of determining grower compensation. Though small differences are evident, the major components of the contracts used by the different integrated companies are of similar nature, with the responsibility for providing major inputs resting with the integrator. The variable input costs per production cycle, as stipulated in the contracts are summarised in Table 2.

Table 2: Variable production cost breakdown of South African broiler producers

Variable cost component	Average share of variable production cost
Feed	71.3%
Day old chicks	20.0%
Labour	1.3%
Heating and electricity	3.3%
Bedding, waste removal and cleaning	1.7%
Vitamins and vaccinations	0.6%
Maintenance	0.7%
Catching	0.4%
Other	0.7%

Source: Compiled from confidential interviews.

On average, feed and day old chicks account for 91 per cent of variable costs and are always supplied by the integrated company. Thus growers have no say in terms of quality and price of inputs that account for more than 90 per cent of variable production costs per cycle. The integrator further provides bedding, vaccinations and catches the mature birds, while the grower provides housing, labour and other infrastructure to grow the broilers to marketing weight. Electricity, heating and cleaning costs are the responsibility of the grower; while some integrators provide these services, the grower may source them from independent providers if the price or quality is preferred.

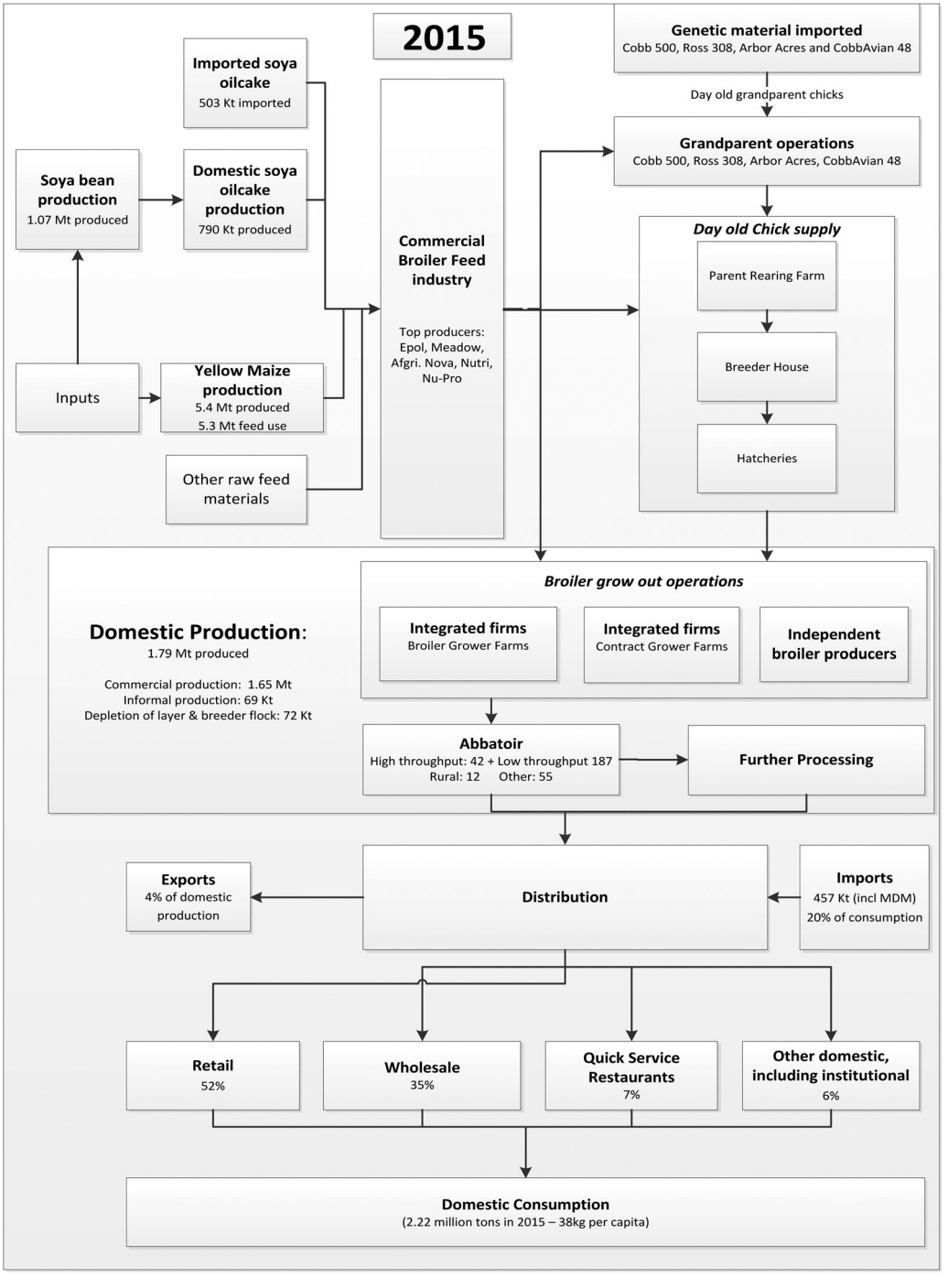

Figure 2. Structure of the South African broiler value chain in 2015. Sources: BFAP (2016), SAPA (2013) and NAMC (2007).

Broiler contracts in South Africa tend to be for a longer term than found in the rest of the world. Section 2.1 indicated that broiler contracts in the USA are generally valid only for one cycle at a time. In South Africa, however, contract terms were found to be fixed for between five and 15 years, in line

with the time required to finance the broiler houses. After expiry of the initial contract length, it becomes indefinite, but both the integrator and the grower have the option of ending the agreement with a stipulated notice period which ranges from 60 days to three production cycles. International contracts are generally also renewed and most growers produce for the same integrator for years, yet the South African contracts are more "grower friendly" in that they are fixed for the period required to pay off the initial investment. This provides greater incentive for producers to make the necessary investment in order to enter the industry and produce competitively.

3.1.1 Compensation within broiler contracts in South Africa

The second important component is the method used to compensate growers. Louw *et al*. (2011: 233) stated that the price paid to contract farmers is determined by the contractor, after which the cost of supplied inputs like feed is deducted. While all integrators use the same basic system, minor differences in compensation methods between integrators relate mainly to the system used for payment of bonuses.

Compensation consists of three components; a fixed margin per kg, a cost recovery component based on the tournament pricing structure illustrated in Section 2.2 and an optional bonus payment based on a fixed performance standard. While the margin and cost component is used by all integrators, with small differences in the size of the margin as well as the formula used to adjust the margin over time, the bonus payment is not available to all producers, as some integrators base compensation only on the fixed margin and cost recovery component. The price determination process is illustrated diagrammatically by Figure 3.

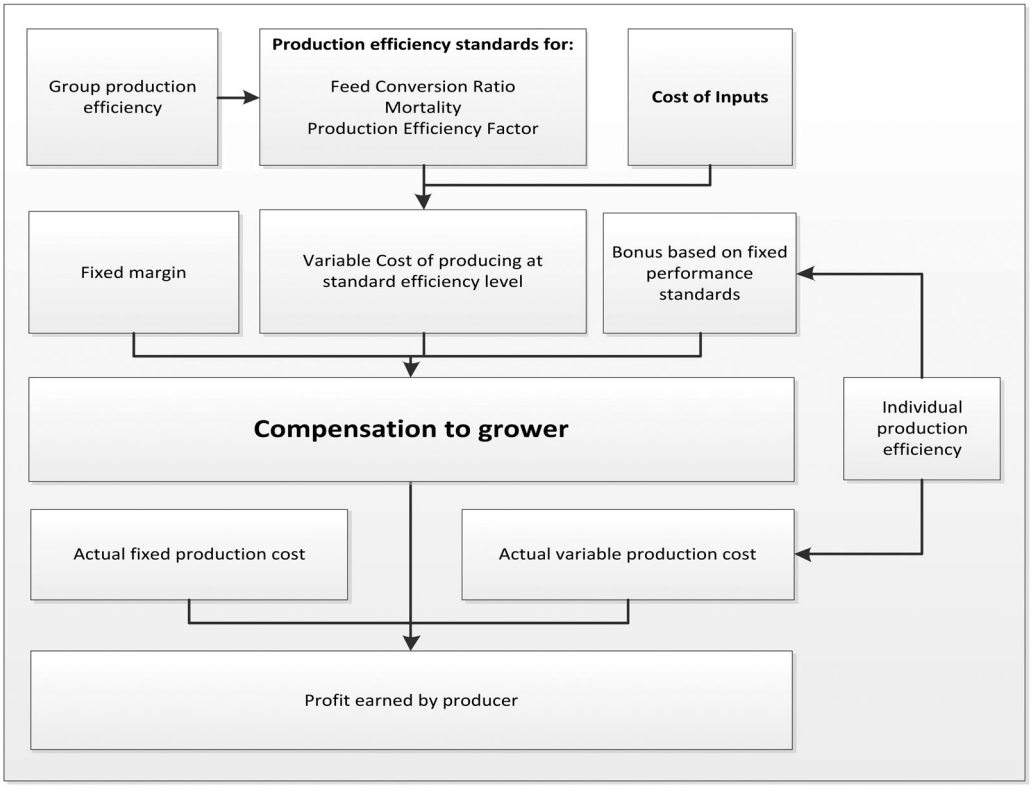

Figure 3. Price determination process in South African broiler production contracts. Source: Compiled from confidential interviews.

The cost recovery component is comparable with the tournament pricing schemes used in the USA, as each producer's compensation for production costs depends not only on his own performance, but also on the performance of other contract growers and the integrator's own farms. While small differences are found amongst integrators in the calculation of the cost component, the basic structure is unchanged. The integrator makes use of pre-stated formulae to calculate the average costs that a producer should entail given a set of performance standards relating to production efficiency.

Standard performance indicators are calculated based on the average performance of all producers for a stated time period preceding the cycle in question. These standard indicators in turn are used to calculate the amount of inputs that the grower should have used in the production process. The grower is compensated based on these quantities, regardless of the actual amount of inputs used. The key differences in this system as applied by different integrators are the length of time that the average performance standard is based on, as well as different inclusions within the group creating the standard.

The time period considered in determining performance standards ranges from a moving average of three to six months, or one to five cycles. The use of a moving average performance standard as opposed to comparing performance in the cycle in question or a fixed standard has advantages for both integrators and growers. The use of historic data enables growers to have better information with regards to expected payment than would be the case if only the current cycle was used, decreasing the group composition risk, without losing the protection against common production risk provided by the use of a tournament scheme. The integrator also benefits in that performance standards are automatically adjusted over time as technology and performance improves and so producer compensation does not increase indefinitely as technology improves.

In addition to refunding the producer for the variable costs that should have been incurred in the production process if the standard performance indicators were to be achieved, the integrator also pays the producer a pre-determined margin per kilogram. The purpose of the margin is for the producer to be able to cover fixed costs, such as the financing of broiler houses, while at the same time allowing the producer to earn a profit.

The third component of grower compensation is the performance bonus, based on fixed performance standards. The greatest variation in compensation across integrators is found in the structure of the performance bonus payment. While some integrators choose not to use a bonus system at all since better performance is already rewarded through the tournament pricing scheme, others supplement the basic compensation with bonus payments based on fixed standards related to efficiency of production or size and quality of the final product relative to a set requirement.

Compensation to broiler producers in South Africa can be described as a 'best of both' compensation system, based on a system of cost plus margin and including an optional bonus. All components used in international markets have been integrated to allow for a system that incorporates the tournament pricing scheme used so successfully in the USA, combined with a bonus based on fixed performance standards, as requested by growers in the USA. Differences between integrators are apparent, but these differences are minor calculation adjustments, with the basic structure remaining the same. Essentially, any producer that exceeds the standard performance indicators will be over compensated for costs incurred, while producers that do not achieve the standard performance indicators will be under compensated for costs incurred.

3.2 Pricing at integrator level

The result of the coordinated nature of the chain and pricing within this contractual framework is that the price paid by integrators for live birds is confidential in nature and not reported or published. MacDonald (2008: 3) suggests that the broiler market at primary producer level is no longer a market for live birds, but rather a market for growing services rendered, with the tournament pricing system being used due to its greater success in improving production efficiency over time.

The producer price quoted by SAPA is the price at first point of sale, in other words the price received by the integrator for slaughtered birds. The broiler producer price is negotiated between integrated producers and retailers, where concentration levels are high on both sides. The negotiation process between a few large producers and retailers, as opposed to an open market system with large numbers of buyers and sellers suggests that the price levels of key inputs like feed will be significant factors in the price negotiation process, yet other factors such as the price of substitutes must also be considered (Demir *et al*., 2010: 225).

At wholesale level, competition is provided by imported products that essentially caps the price received by domestic producers at import parity levels. As a result, import parity prices, as well as the price of substitute meats like beef influences the price that integrators receive for chicken products. Factors such as the level of brining, value adding and specific product mix ultimately also impacts the level of product differentiation and therefore the price relative to imported products.

3.3 Empirical estimation of the South African broiler producer price

In order to compare the elasticity of the response in domestic chicken prices resulting from changes in the price of imported chicken, as well as feed costs, a time series approach is used to quantify the long run co-integrating relationship between the wholesale price of chicken as dependant variable and the price of imported chicken, feed and beef as independent variables. The proposed analysis of price transmission has been the preferred approach when analysing long term relationships between different markets, as it allows for quantification of long run relationships in time series that contain a unit root. The approach has been adopted by multiple authors in recent years including Baquedano and Liefert (2014) and Minot (2011), who applied it in African grain markets. The South African broiler producer price equation can be conceptualised as follows:

$$RBPPSA = fn(RBFPSA, RWAFOBT, RBEEFPSA)$$

where *RBPPSA* is the real broiler producer price; *RBFPSA* is the real broiler feed price; *RWAFOBT* is the real weighted average FOB price plus tariff; *RBEEFPSA* is the real beef price.

Prior to being used for empirical estimation, the time series properties of the data is evaluated for stationarity, as the presence of a unit root could render a normal Ordinary Least Squares (OLS) regression spurious. The Augmented Dickey-Fuller (ADF) test for stationarity was used for this purpose, with all variables found to be integrated by an order of one.

Use of variables containing a unit root in an OLS regression could potentially yield spurious results, yet use of variables in differenced form results in some of the long run theory and goodness of fit being lost (Ferris, 2005: 311). As all variables are integrated by an order of one, an error correction model (ECM) is estimated in order to account for the long run relationship between the broiler producer price and the explanatory variables, as well as the short run variations around this long run relationship. Following the estimation of a long run co-integration equation and error correction model, long run parameters are adjusted for initial bias through the Engle-Yoo third step, yielding the long run elasticities summarised in Table 3.

While all variables were significant in explaining the variation in the wholesale price of chicken in South Africa, the elasticity of 0.2 remains low, indicating that a 10 per cent increase in feed prices will result in an increase of only 2 per cent in the price of chicken. Domestic chicken prices respond far more elastically to changes in the price of imported products; an increase of

Table 3. Long run elasticities and *t*-statistics following Engle-Yoo adjustment

Variable	Elasticity	*t*-statistics
$RBFPSA_t$	0.194	1.61*
$RWAFOBT_t$	0.575	5.11***
$RBEEFPSA_t$	0.271	1.59*

Note: Significance level: ***1%, **5% and *10%.

10 per cent in the price of imported chicken yields an increase of 5.8 per cent in the domestic price of chicken.

3.4 Implications of the price formation process in the South African broiler market

The price formation mechanism described has implications that are beneficial both to the producer and the integrator. It provides great incentive for individual producers to improve efficiency, as improved individual efficiency in relation to the group's performance allows the individual producer to increase his profit. At the same time, continued improvement by each individual improves the group average and thereby decreases the cost for the integrator.

Contract growers benefit from shifting of price risk onto the integrator. The producer is essentially protected from increasing input costs by the formula used to calculate the price and the only factor that concerns the producer is his individual performance compared to the performance of the group. Provided he maintains or betters the standard performance indicators achieved by the entire group, he is ensured of recovering production costs, regardless of the price received by the integrator at wholesale level. Critically for the integrator, imported products provide competition at wholesale level, meaning that the wholesale price of chicken will not increase above the import parity price for extended periods, regardless of the price of inputs.

By implication, when feed price increases are not accompanied by increased chicken prices at wholesale level, the integrated companies must absorb the cost, squeezing margins. Commodity cycles are common in agriculture and large, diversified companies are much better equipped than smaller individual producers absorb the bulk of the cost squeeze. While primary producers are affected indirectly in that margin increases may be limited and placements may be reduced in severe circumstances, they are not required to bear the entire impact as is often the case in an open market environment. Diversified companies ability to absorb the costs reduces the effect on the entire industry, while the certainty regarding both the market and price implied for the producer encourages investment in technology that optimises production efficiency. Integrators in turn are assured of the required level of throughput at abattoir and processor level. While their size and diverse structure renders integrators better equipped than producers to absorb the cost squeeze through difficult cycles, the fact remains that integrators cannot record losses indefinitely, as they are required to perform in order to maintain shareholder confidence. When the costs escalate to the extent that an integrator exits the business, contract growers will be left with no income and significant capital expenditure.

4. Efficiency of South African production in the global context

Production efficiency represents two factors, technical productivity as well as economic efficiency. The price formation mechanism described in Section 3 has driven improved technical productivity and measured against top broiler producing countries globally, South African growers compete well on a technical basis. Upon the introduction of costs, however, they are generally found wanting in terms of world standards. Universal measures of technical efficiency include feed conversion ratios (FCR), mortality rates and the production efficiency factor (PEF). FCR refers to the amount of feed required to produce a kilogram of meat, whereas the PEF is calculated using the FCR achieved, days fed and mortality rate of each producer (Joubert, 2007; Louw *et al*., 2011: 237). The PEF is calculated as follows:

$$\frac{Percentage\ survivors\ x\ Average\ live\ mass}{FCR\ x\ Age\ in\ days} x \frac{100}{1}$$

South African broiler producers have become increasingly productive over time, as indicated by a decline in FCR and constant increases in the PEF (Figure 4). Following a period of favourable

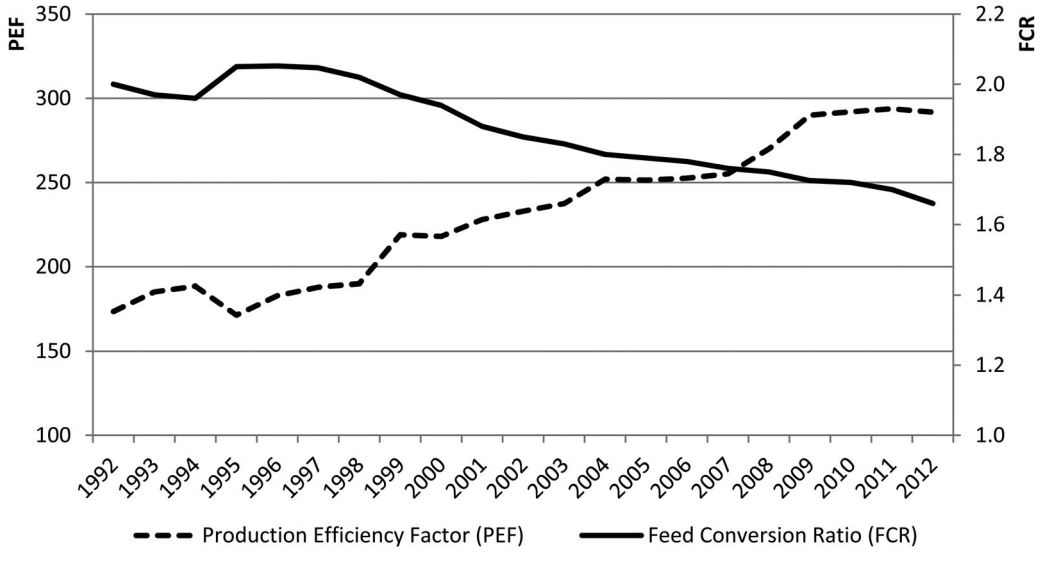

Figure 4. Improved efficiency indicators over time. Source: SAPA (2013: 21).

chicken to feed price ratios from 2004 to 2006, significant investment into broiler production resulted in a substantial improvement in the PEF from 2007 to 2009.

South Africa's relative performance against key broiler producing countries is presented in terms of slaughter weights and FCR in Figure 5. At 1.67, the FCRs achieved in South Africa in 2013 compares well to international counterparts. However, differences in FCR should be interpreted within the context of differences in slaughter weights. South African slaughter weights were the lowest of any country in the sample and given that the efficiency of converting feed to meat declines as chickens grow older, the shorter production cycles utilised reduces the FCR achieved.

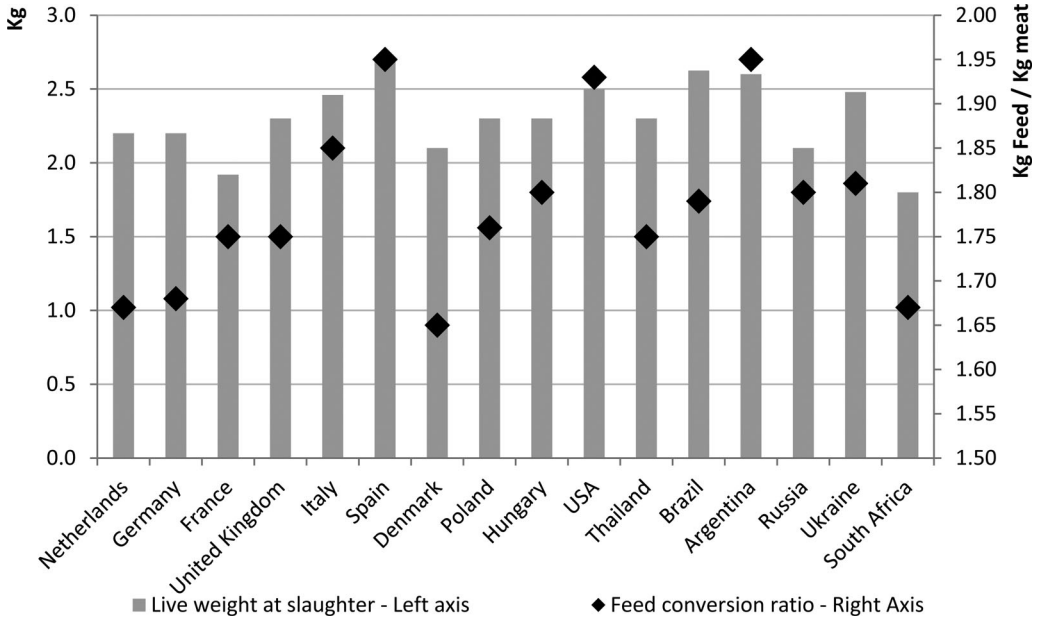

Figure 5. Technical efficiency of selected broiler producing countries. Source: Van Horne, 2014.

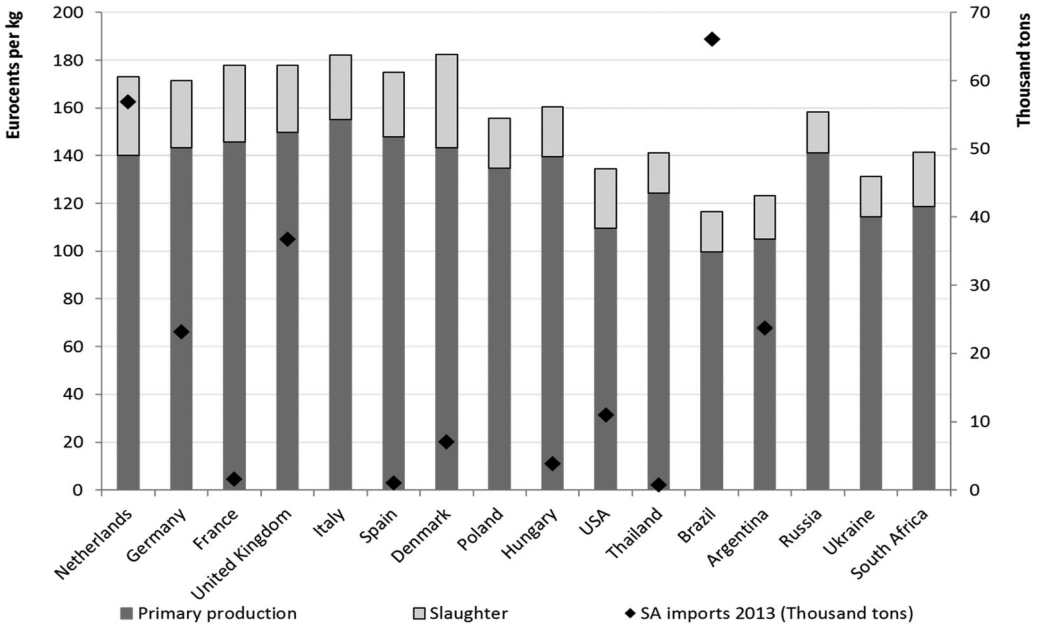

Figure 6. Average production cost per kg in selected countries. Source: Van Horne (2014).

In light of comparable technical efficiency, South African producers should be able to hold their own against competition from abroad, yet the import parity price calculated by Davids *et al.* (2015: 74) is significantly below the domestic price, suggesting that upon introduction of production costs, South African producers no longer compete that effectively. The United States International Trade Commission (USITC) (2012: 8.9) in fact state that: "Despite rising feed costs, Brazil and the United States are the most efficient and lowest-cost broiler producers in the world, giving both countries a competitive advantage against producers in third-country markets." Figure 6 indicates that the cost of producing a live bird in Brazil (117 EUc/kg) and Argentina (123 EUc/kg) is lower than in South Africa (141 EUc/kg).

Despite higher production cost, South Africa still imports significant volumes from countries in the EU, such as the UK, Germany and the Netherlands. These imports consists mainly of bone-in portions, which would indicate that South Africa's competitiveness relative to these countries does not lie in the cost of production, but rather in the valuation of the carcass. The premium obtained for high value breast meat in the EU allows bone-in portions, for which domestic demand is significantly less than breast meat, to be exported at very competitive prices. Furthermore, producer support estimates from the Organisation for Economic Cooperation and Development (OECD) (2014) indicate that producer support to poultry producers is significantly higher in the EU than in South Africa.

Feed represents 70 per cent of total variable production cost in South Africa and as a result, it remains the most important driver of economic efficiency, a fact confirmed by Louw *et al.* (2011: 9) who identified the quality, consistency and cost of feed as one of the major challenges facing producers. In addition, contract producers are provided with feed and day old chicks and therefore have no control or choice regarding the quality or price of these essential inputs. While feed costs are higher than key exporting countries such as the USA, Brazil and Argentina, Table 4 also indicates that this is compounded in the cost of day old chicks, which is higher than any other country included in the sample. Within additional costs such as labour, housing and other overheads, South Africa competes well in the global context (Table 4).

Table 4. Primary production cost comparison in selected countries

	Feed	Day old chicks	Labour	Housing	Other	Overheads
Netherlands	63.1	14.5	4.4	5.4	9.5	1.1
Germany	65.2	14.7	4.5	5.8	9.0	1.1
France	64.4	17.0	4.9	6.5	8.2	1.1
United Kingdom	69.1	17.4	3.1	7.0	7.5	1.1
Italy	76.1	15.1	2.6	6.2	7.5	1.0
Spain	75.7	12.3	2.9	5.9	5.8	0.9
Denmark	62.2	16.7	4.6	6.5	9.3	1.1
Poland	64.6	14.4	1.4	5.9	7.3	0.8
Hungary	62.8	14.5	2.3	8.0	9.2	0.8
USA	54.9	9.2	2.7	3.5	5.5	0.9
Thailand	60.9	13.7	1.2	4.9	5.7	0.6
Brazil	49.4	10.6	2.7	3.7	2.7	0.5
Argentina	51.9	9.8	2.2	5.2	4.0	0.6
Russia	68.4	16.3	0.7	4.9	8.0	0.6
Ukraine	56.8	11.0	0.5	5.9	5.2	0.5
South Africa	57.3	16.8	0.9	3.9	5.9	0.7

Source: Van Horne (2014).

4.1 Broiler feed

Maize and soya oilcake contribute the bulk of raw materials for broiler feed and as a result, prices of maize and soya have the greatest influence on the cost of broiler feed. Brazil, Argentina and USA are net exporters of both these products (Trade map, 2013a), ensuring ample supply at competitive prices. South Africa on the other hand deals with extreme volatility in yields, with the maize price fluctuating between import and export parity levels. In a normal production year, South Africa would be a net exporter of maize, but protein meal remains expensive.

Despite increased production over the past decade, South Africa remains a net importer of soya oilcake and prices are affected by a volatile exchange rate, as well as South American trade policies, such as the export taxes of 32 per cent imposed on Argentinean oilcake. This tariff affects the relative prices of oilcake exported from Argentina and that sold in the domestic market. Over the past 5 years, 99 per cent of oilcake imports originated from Argentina (Trade map, 2013b) and as a result the FOB price for South African buyers of Argentinean soya meal will be higher than the domestic price in Argentina.

Domestic soya crushing capacity has expanded rapidly over the past five years, but despite growth in area under production, the domestic soybean crop remains insufficient to fill this capacity. Consequently, soya bean prices have shifted closer to import parity, reducing crushing margins. Low utilisation rates resulting from technical challenges and the domestic bean shortage further increased the fixed cost of production and soya oilcake prices continue to trade in line with import parity levels. A longer term shift away from import parity levels will be dependent on sufficient soya bean production to induce a shift back to export parity for soya beans and increased crusher utilisation rates.

4.2 Marketing

While feed remains the major contributing factor to increased cost of production in South Africa, the supply of high quality feed is not a factor that the industry is able to control or change. Other factors, such as the marketing strategy currently employed affect the potential returns from a chicken carcass, regardless of the costs of producing it. Individually quick frozen (IQF) chicken portions currently accounts for just over 60 per cent of domestically produced chicken entering the market (Figure 7). In contrast, imported chicken products are packed by individual cuts, allowing optimisation of the returns from a carcass by increasing the price of higher value cuts.

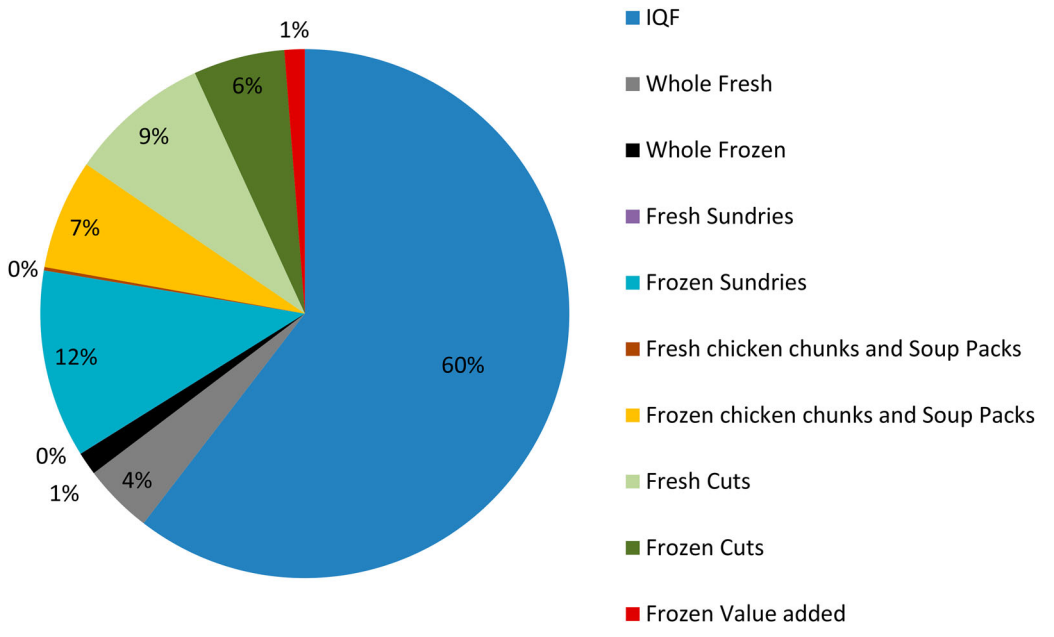

Figure 7. Market composition of chicken products in South Africa: Quarter 4 2013. Source: SAPA (2014: 7).

Demand for various cuts differs across regions; the EU for example imports high value cuts like deboned chicken breasts, while exporting lower value cuts to areas with increased demand for these cuts. A marketing strategy that allows for pieces packed by individual cuts will allow South African producers to optimise returns in the same manner, allowing higher returns from high value cuts, which enables a reduced price for lower value cuts that are forced to compete with imported products.

5. Conclusions

The South African broiler industry finds itself in a troubled position, due in large to significant increases in feed prices since 2010 that have not been accompanied by similar increases in the broiler producer price. In light of its classification by the DTI as an industry in distress, the fact that domestic producers are unable to compete at the price levels dictated by the price of imported products raises concern regarding the long run sustainability of the South African industry and led to a critical evaluation of the underlying factors that drive competitiveness within the industry.

The coordinated structure of the market, where the majority of production is governed by production contracts that incorporate compensation based on broiler production tournaments is similar to international markets and encourages investment in order to improve production efficiency on a continuous basis. It was therefore not surprising that the technical efficiency of South African producers is on par with international standards. Consideration of economic efficiency, which also accounts for the cost of production, presents a different picture however. It was found that the cost of raw feed materials, particularly the cost of soya oilcake as the main source of protein in broiler feed is the most significant driver of South African producers' lack of competitiveness. As a net importer of Soya oilcake, the price trades at import parity levels, while the price of Soya oilcake in Brazil, the USA and Argentina trades at export parity levels. Export tariffs in Argentina, the origin of South African imports, further increases the cost to South African producers.

Despite their contractual commitment to pay contract growers based on cost of production, the price received by integrated broiler producers is negotiated in a concentrated market between

integrated producers and retailers. The competition provided by imported products limits the extent to which increased costs like feed can be recovered, leading to a significant decline in profitability levels after significant increases in feed prices following the drought in the USA. Empirically, the domestic broiler producer price was found to be more elastic to changes in international prices than changes in feed prices. From the estimated elasticities, it was clear that the price of imported products remains the biggest driver of domestic prices, regardless of the cost of producing chicken in South Africa.

The sharp depreciation in the value of the Rand against major international currencies illustrated the impact of a volatile macroeconomic environment on prices of imported products. In providing the cheapest source of protein to South African consumers, the South African broiler value chain makes a substantial contribution to food security and hence the long run sustainability of the industry must be prioritised. Nevertheless, Davids *et al.* (2015) indicated that the impact of increased tariff protection is unlikely to be sufficient to ensure sustainable production in the long run. High feed costs remain a concern and while significant investment into oilcake processing in South Africa could potentially reduce the cost of feed products, much uncertainty remains and the long run sustainability of chicken production in South Africa cannot be reliant on the possible decline in the cost of protein meal. Hence the industry will be forced to reconsider key elements of its business model, such as marketing strategy, where structural changes such packaging based on individual cuts as opposed to mixed portions will allow optimal returns from the entire carcass. Compliance with sanitary and phytosanitary regulations will provide access to the export market, where high value cuts could be marketed at a premium, allowing for a cost reduction in lower value cuts that compete with imported products.

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