Inclusive industrialisation in agro-processing: the challenges for small enterprises in the South African maize processing industry

Innovation & Inclusion in Agro-processing

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Innovation & Inclusion
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1: Introduction

1.1: Introduction

This paper analyses the evolution of the South African maize processing industry since the liberalisation of the agricultural sector in the mid-1990s to explore the factors affecting participation by micro, small and medium size enterprises (MSMEs). The maize processing industry plays a pivotal role in the South African food system. Maize was South Africa's most important crop by gross value in 2017/18 (DALRD, 2020), and maize-meal[1] is the key staple carbohydrate, with 81kg average per-capita maize consumption compared to 21kg bread and 11kg rice (Euromonitor, 2019). Maize meal is particularly important for low-income consumers, comprising 10-15% of household food consumption expenditure among households in the lower income deciles,[2] and is supermarkets' single most significant product category by quantity purchased (Competition Commission, 2019). The cost of maize meal has a major bearing on the cost of living, wages and food security, making it, as Kirsten asserts (2014, 413), 'the most important food price in South Africa's food economy'. Besides maize meal, maize is also processed into a range of other items, from simple corn snacks, to beverages, to complex industrial starches. Grain milling accounts for around a fifth of food manufacturing output value, and employs 36,000 people – up from 20,000 in the late 1990s.[3] The maize processing industry also supplies the key input for poultry production and feedlots through a rapidly-growing specialised feed milling industry and through the by-products created by milling for human consumption, though this paper will focus primarily on processing for human consumption. Maize processing is therefore a critically important component of the South African economy, with a social and political importance which exceeds its economic footprint.

The post-harvest maize value chain is characterised by high levels of consolidation, with powerful large-scale enterprises at each segment. At the upstream farming segment, the maize industry is best understood as dualistic. Around 9,000 commercial farming units, mostly white-owned, supply approximately 95% of the commercial maize crop (Greyling & Pardey, 2019; DAFF, 2017). A process of consolidation has been underway for decades—there were 59,000 maize farmers in the late-1980s (Bernstein, 1996a)—continues as a result of commercial pressures such as rising input costs and increasing climatic stress. There is also a significant amount of small-scale maize production in the former 'homeland' areas, which plays an important role in food security in marginalised rural areas but is marginal to commercial value chains. Intermediating commercial farming and processing are a handful of internationalized agri-businesses in storage and trading, with the largest four firms controlling over 90% of grain silo capacity. In maize milling the largest four firms produce 40% of output, with the largest three being components of highly diversified food manufacturing

[1] Also referred to as mealie meal or pap. This paper will use the term maize meal for consistency.
[2] Author's calculations, StatsSA Household Survey Data.
[3] Author's calculations, Quantec data (2020).

conglomerates.[4] The retail segment is dominated by powerful chain supermarkets and wholesalers. Nonetheless, beyond the South African food system's prominent 'corporate core' there is a wide periphery of micro, small and medium-scale enterprises that remain poorly understood (Greenberg, 2017). In maize processing for human consumption, for example, there are almost 200 formally-registered enterprises, with many more small-scale millers uncounted in the informal economy.

The patterns of concentration exhibited by the maize industry are to be found throughout much of the South African food system, and indeed the wider South African economy. They have become an issue of significant concern for policymakers over the past decade. In the South African context of persistent high unemployment and inequality, agriculture and agro-processing activities have been identified by policymakers as key strategic priorities for job creation and widening participation in the economy. In particular, there has been significant emphasis on catalysing economic development in marginalised rural areas and making food value chains more inclusive through the incorporation of small-scale commercial farms and MSMEs, in particular black-owned enterprises. This was a key element of the National Development Plan (National Planning Commission, 2013), and multiple other policy initiatives from government agencies such as the Department of Trade Industry and Competition's (DTIC) Industrial Policy Action Plans. These concerns about widening participation in the agro-industries are also reflected in the Agriculture and Agro-Processing Masterplan process initiated in 2020 – highlighting the persistence of these challenges. Maize processing in particular has been targeted by a range of government agencies over the past decade through the financing of multiple small-scale milling operations with the aims of increasing black ownership in manufacturing, providing routes to market for small-scale commercial grain farmers, and increasing competition in the milling industry. These have been based on the assumption that maize processing is a relatively accessible entry-point to agro-processing for small firms, with small-scale mills believed to be 'viable with moderate assistance from government' (DAFF, 2018; DTI, 2017).

This emphasis on small firm participation in agro-processing derives from context specific concerns with inequality and exclusion in the South African economy but resonates with broader development policy agendas internationally. Though processing activities in the 'midstream' of food value chains have commonly been neglected within food systems research in favour of a focus on the farm level or consumers, agro-processing has recently become an increasingly prominent focus of multilateral development agencies, with small processing firms viewed as important actors in linking farmers to markets, generating rural employment and creating more inclusive food systems (e.g. AGRA, 2019; IFPRI, 2020; FAO, 2017; IFAD, 2016). Processes of urbanization, income growth and changing consumer habits in low and middle-income economies over recent decades have significantly increased the demand for more highly processed foods and have, alongside major institutional changes accompanying liberalisation and globalisation, spurred what the agricultural economist

[4] Figures for white maize processing from the South African Grain Information Service (SAGIS)

Thomas Reardon (2015) describes as a 'quiet revolution' in the midstream of food value chains. How these processes of change play out across differing contexts and with what consequences for structural transformation in the agro-industries, provides the motivation for the research project to which this paper contributes.

The participation of MSMEs in agro-processing can take multiple forms. While the popular imaginary of small firms is of dynamic, innovative, high-growth entrepreneurialism, research typically paints a more complex picture. Small firms are often precarious, with analysis of survey data showing high failure rates (McKenzie & Paffhausen, 2019; Page & Soderbaum, 2012). Indeed, in the South African context, Kerr et al (2014) show that large firms are more effective net job creators than small firms for this reason. Small firms often struggle to compete with larger and better-resourced rivals given the economies of scale attached to more advanced capital goods or services, which are increasingly required to produce food to competitive standards – it is increasingly unrealistic to view agro-processing as a 'low tech' industry. When small firms are 'included' in food value chains, their lower levels of bargaining power relative to large buyers can create conditions akin to 'adverse incorporation' (Hickey & Du Toit, 2007) that undermines long-term viability. Strategies pursuing rapid growth, 'high-road' upgrading involving leaps to higher value-added activities (Ponte & Ewert, 2009), and attempts to compete directly with larger rivals typically require large amounts of investment and risk. Many small enterprises prioritise stability and risk minimisation in support of a livelihood for owners and their family, over the growth and optimisation which is assumed in the neoclassical theory of the firm. As such, rather than seeking to participate in major markets and value chains, small firms may seek to occupy more sheltered market segments in which competitive imbalances with large firms are minimised (Penrose, 1995).

Research also highlights the heterogeneity of small firms, and much of the key research on small firms has sought to understand relationships between key firm-level attributes (e.g. age, managerial education, size) and key outcome variables (e.g. growth, survival, innovation, productivity) (McKenzie & Woodruff, 2015; Grimm et al, 2012; Fu, 2020). Differing firm performance also results from the differing combinations of intangible capabilities to effectively deploy resources in combination toward desired ends (Lall, 1992; Khan, 2019, Nelson et al, 2018). These capabilities can be technological or organisational in nature, but particularly important are 'dynamic capabilities' (Teece, 2018) – the capability to acquire new capabilities. Dynamic capabilities enable firms to adapt to a changing economic environment, and are the basis for long-term survival. For example, within agro-processing, rapid changes taking place in food production technology, consumer demands, hygiene standards etc necessitate dynamics capabilities. Many key capabilities are subject to economies of scale or scope—e.g. employment of specialist staff—and therefore may be more easily obtained by large enterprises. Additionally, many key capabilities—particularly organisational capabilities held collectively rather than by individuals—can only be acquired through a long period of learning-by-doing (Lall, 1992; Nelson et al, 2018).

Besides the character of internal resources available, firms' external environment may be more or less conducive to capability acquisition. This external environment comprises, among other things, the relationships with other firms—buyers of goods, suppliers of inputs, or competitors— in their markets and value chains; more broadly the relations with relevant state agencies, labour, consumers and civil society actors; access to the intangible ingredients of economic activity in credit, information and knowledge; and the institutional frameworks, historically-constituted norms, and distribution of organisational power which structures these relationships and flows. The firm's internal resources and its environment interact to shape outcomes, with differences in resources meaning the environment is different for each firm (Penrose, 1995, 217-220). Smaller firms differ by virtue of more limited internal resources, making consideration of the particularities of the immediate external environment generally more important than for larger firms (Ibid; Pietrobelli & Rabelotti, 2006). The paper therefore seeks to understand the position of small firms through their interactions with external actors in the wider food systems in which they are embedded, defined by Reardon et al (2020) as the dendritic clusters of value chains, founded on the input-output chains linking primary production to end-consumption, but enabled by 'feeder' chains including input supply, R&D, technology, information, logistics, public assets and finance. The paper pays particular attention to understanding the key vertical linkages between agro-processing MSMEs and their suppliers, buyers, and end-consumers, but also the horizontal relations with other firms, competitive or cooperative.

Recent literature on food system transformation recognizes the importance—but under-development—of political economy perspectives: questions of who gets what, how and why (De Schutter, 2019; IPES-Food, 2017; Howard, 2016; Leach et al, 2020; Dekeyser et al, 2020). Issues concerning how unequal distributions of power and resources determine pathways of change in the food system are particularly important in the study of the participation of MSMEs. Large firms frequently play powerful coordination or governance functions in food value chains, exerting bargaining power over smaller suppliers to increase their share of value created in the chain, enforce standards, and pass off risk to other actors. The large and highly consolidated supermarket retail sector makes this an important issue in South Africa. Beyond direct transactional relationships, large firms may also exert forms of 'constitutive' power to shape standards and norms (Dallas et al, 2019). For example, consumer preferences for the appearance, packaging and taste of food, can be shaped by firms that can spend significant amounts on advertising or R&D directed toward product innovation. This may create challenges for smaller firms left trailing behind key trends or seeking to catch-up with the frontier. Power in value chains can also, however, be exercised by collectives, and small firms that are weak individually may be powerful collectively when organised effectively. It is therefore important to examine the differing forms of business organisation and collective action (Puente & Schneider, 2020), including formal organisations like trade associations and cooperatives, alongside informal social networks. Collective action among firms can have benign manifestations, helping smaller firms counteract bargaining power imbalances, or achieve 'collective efficiencies' (Schmitz, 1995; Nadvi, 2015), for example in the dissemination

of useful information or the delivery services like R&D or specialist training that are beyond the capacity of all but the largest firms. It can also have more malign manifestations, for example in collusive behaviours.

Power in value chains is combinatory, with different forms of power overlapping or combining to reinforce or counteract one another (Dallas et al, 2019). For example, bargaining power imbalances in value chains are conditioned by the extent to which the government opts (or neglects) to place checks on large firms' treatment of suppliers—an issue which is reflected in the Competition Commission of South Africa's (CCSA) ongoing initiatives to create a code of conduct for grocery retail supply chains. This highlights that in the wider distribution of organisational power in the food system, the state is frequently a critical actor shaping the conditions encountered by firms. This is through the state's role regulating competition, food standards and hygiene, and labour relations, its role in provisioning infrastructure and key public services, its role in allocating resources and shaping markets through industrial policy decisions, and more besides. Intentionally or other-wise, policy choices made in these arenas—and the manner in which policies are carried out— usually benefit some actors more than others, and so commonly reflect wider political circumstances. This makes it critical to consider the nature of state-business relations. These can be highly complex given that the state is not a monolithic entity but a collection of disparate agencies that often function according to very different institutional logics, with differing aims and agendas.

With these concerns in mind, the paper analyses the evolution of the South African maize processing industry since market liberalisation in the mid-1990s to address the following interlinked objectives:

(i) How have the changing structures and dynamics of the maize value chain and its wider institutional context in the post-liberalisation period affected the participation of agro-processing MSMEs?

(ii) What factors have enabled or obstructed the upgrading of capabilities among agro-processing firms in the maize value chain?

(iii) How can industrial policy support the expansion of more inclusive agro-processing value chains?

1.2 Summary

The South African milling prior to liberalisation in the mid-1990s was highly concentrated, with four ultra-large scale urban firms accounting for around 80% of maize-meal output. Entry to milling was tightly controlled by the marketing board licensing system. Difficulties procuring grain outside the official marketing system further constrained the growth of informal small-scale processing, as did the constraints on black agriculture and manufacturing in the former 'homelands'. Liberalisation reforms radically reconfigured the grain industry, abolishing marketing boards and trade barriers, enabling privatisation of the cooperatives

that controlled storage infrastructure, and removing restrictions on entry by milling firms. Reformers had anticipated that liberalisation would create significant opportunities for small firms constrained by the previous regulatory system, and thereby contribute towards the creation of a more inclusive economy. In the ensuing decades, demand for processed grain products has grown significantly as a consequence of population and income growth in domestic markets, growth in the meat industry, and growth in regional exports. However, after a small increase of new entrants in the first decade after liberalisation there has been a steady decline in the number of formal industrial milling firms from over 300 in 2003/4 to less than 200 in 2019/20, as small firms have exited the market.

In general, the research suggests conditions have been highly adverse for small processing firms. The changing dynamics of food value chains and markets and the wider institutional and socio-economic environment in which these are embedded, creates a range of significant challenges for MSMEs, which are reflected in the numbers of firms exiting the market. Industrial policy initiatives to support small-scale black-owned milling firms have achieved limited results to date. However, the research also shows that small and micro-scale firms with particular types of capabilities and linkages can adapt, upgrade and achieve resilient positions in particular market segments and sales channels, typically orientated towards informal retail systems and independent wholesalers. In addition, while the ultra-large scale firms which have historically dominated maize processing in South Africa remain extremely powerful actors in supermarket retail channels, the post-liberalisation period has also seen significant growth among highly-competitive, dynamic medium-scale firms, typically operating in the major maize farming districts with close links to agriculture and advanced technological capabilities. This has driven a significant process of deconcentration at the top end of the size distribution of maize processing firms, with the share of the 'big-4' milling firms falling from 80% in the mid-1990s, to 60% in the mid-2000s, to around 40% in recent years. The explanations for these outcomes are explained below.

While commonly viewed as more amenable to small firm participation than other agro-processing activities, maize processing is in fact an extremely difficult industry for MSMEs. This is in part due to the basic structural features of the value chain, the characteristics of raw material supply and the nature of consumer demand. Processors face the challenge of an extremely volatile raw material input price and a high purchase/sales ratio, combined with the key market being highly price sensitive low-income consumers. Margins are typically slim and maize price increases absorbed by processors. Relatively slow demand growth, low barriers to entry and limited opportunities for product differentiation create an aggressive zero-sum style of competition. Large chain retail and wholesale firms play key coordination roles in the downstream segments of the chain. These firms have expanded significantly in the post-liberalisation period into township, peri-urban and rural markets, and the interstices in which small processing firms are more sheltered from competition with large firms have been shrinking as a result.

Large retailers and wholesalers enjoy considerable bargaining power as the gateway to the consumer, and this manifests in value extraction from suppliers through high rebates and various sundry charges, and long credit terms. They have also typically sought to streamline supply chains, and increasingly operate through centralised distribution hub models, favouring higher-volume suppliers. Increasingly exacting hygiene and quality standards required by major retailers have provided powerful inducements to upgrading among suppliers, but also create a significant barrier to entry for many firms. Large firms developed forms of countervailing power through economies of scope and investment in brands, and have engaged in radical process innovation to minimise costs and increase consistency through automation of production processes. They have also invested in increasingly sophisticated logistics operations to adapt to retailers' 'just-in-time' stocking systems. For this and other reasons discussed further below, there have been significant advances in the technological frontier which makes catch-up among follower-firms extremely challenging. In the upstream of the chain, access to consistent high quality maize suitable for the production of a commercially competitive project is—in the absence of arrangements with suitably capable grain farmers—secured through highly consolidated storage and trading segments. This creates significant intermediation costs, and a range of challenges for small firms needing to procure within a smaller radius, purchase grain in smaller quantities less frequently. Small processing firms are also less able to take advantage of the hedging services provided by storage and trading firms which large and medium-scale firms use to manage the severe price volatility which is a defining feature of the maize market—prices reflect global commodity market dynamics, macro-economic conditions and exchange rate, as well as domestic supply and demand.

Abstracting from in-depth interviews with 28 maize processing MSMEs, the paper identifies two broad categories, or ideal types, of successful adaptive outcomes to these conditions among firms. Given the small sample size and exploratory nature of the research, these should be understood as provisional categories as the basis for further research rather than fully representative of the population of firms. Firstly, we identify the category of *defensive adaptation*, where firm strategy has revolved around efforts to achieve resilience rather than rapid growth and upgrading. Firms achieving this were typically 'small' by formal statutory definitions based on employment or revenue, as opposed to micro or medium scale. A common feature among them was dense forward linkages in highly localised, and largely informal retail channels, in either rural or township markets. The high cost of logistics and last-mile distribution means that well-managed small firms can sell at competitive prices within a small radius. These sales channels are also typically more accommodating than chain retailer-wholesaler in terms of bargaining power imbalances, transactional conditions (e.g. rebates, credit terms) and product quality requirements, but require sophisticated marketing capabilities, local knowledge and 'relational assets', which take considerable time and skill to acquire (Whitfield & Staritz, 2021). This sales channel also involves major risks that accompany a large and complex debtors book consisting of precarious independent retailers. Relative to large firms at the technological frontier, such firms typically produce using highly

labour intensive business models and more basic machinery, which can provide great flexibility. However, to meet minimum product quality standards expected by consumers—products from large processors can be found even in some of the most marginal rural retail outlets—requires significant organisational capabilities. For example in quality control and hygiene routines. It also requires significant tacit knowledge relating to the production process, often acquired through long periods of learning-by-doing or social/family networks rather than formal training. Thus, the outcome of *defensive adaptation* is extremely difficult to achieve, contrary to assumptions which seem to have underpinned state industrial policy interventions targeting small-scale milling over the past decade.

A second successful adaptive outcome identified is *dynamic adaptation*, where the strategy pursued is one of aggressive growth and investment in technological capabilities, targeting either specialised niche products or, more commonly, low income consumer markets accessed through independent wholesalers. Both strategies relate to the avoidance of direct competition with ultra-large scale firms in the supermarket sales-channel. These were medium-scale firms by formal classifications, rather than small or micro. Expansion beyond the sheltered confines of localised markets entails high levels of capital investment in upgrading of technological capabilities to remain competitive on cost and quality. This in turn necessitates increased production volume, creating a treadmill effect. These were for the most part young firms, which had grown rapidly in the post liberalisation period with extensive capability upgrading including investment in advanced automation processes which enabled low-cost production. Most also exhibited dense backward linkages to farming, being situated in the major maize growing districts and with either full vertical integration with farming enterprises or with close relations with local maize farmers. This proximity to grain farming provided a range of advantages to both parties in terms of circumventing value chain intermediaries. Dense backward linkages were combined with diffuse forward linkages to distant, less-contested wholesale markets, in particular with independent wholesalers serving lower-income consumer markets where bargaining power is less imbalanced than with the major chains but in which there are opportunities to move large volumes. Importantly, many medium scale processing firms operate as subsidiaries of larger enterprises in other segments of the maize value chains. This includes agribusinesses involved in grain storage and farming services, commodity traders and, most significantly, commercial maize farmers. Indeed, farmers attempting to move up the value chain appears to be overwhelmingly the main entry point for maize processing. In all cases, while maize processing is typically a low margin activity, ownership of processing provides optionality for the profitable disposal of grain in conditions of extreme market volatility. Two important points are that the evolution of the agro-processing sector relates closely to the evolution of the broader agrarian structure and historical patterns of accumulation elsewhere in the maize value chain.

While successful adaptation is possible, it is clear that many small scale firms are highly precarious. This is reflected in the steady decline in the number of formally registered milling firms during the past decade and a half, and was powerfully conveyed in firm-level interviews.

A particular challenge relates to the process of rapid demand-induced innovation taking place over the post-liberalisation period, with consumer and retailer requirements for more highly-processed and consistent produce, delivered not imply at lower cost but with greater speed, precision and flexibility, and subject to more sophisticated packaging and hygiene requirements. A standout feature of this has been the market shift in maize milling to 'super' maize meal, a much more refined product which is more challenging to manufacture in terms of the capabilities and machinery required. Large firms have responded to these shifts in demand with significant process innovation – in particular in automated technology – in a manner which has significantly advanced the industry's technological frontier. They have also to an extent shaped demand through significant investment in product innovation and marketing which have shaped consumer expectations for the desirable attributes of the staple food. Keeping pace with customer requirements has necessitated significant investment in new equipment, which has been beyond the reach of many firms. It also long periods of learning-by-doing to home organisational routines around, for example, maintaining consistent product quality and maintenance of hygiene standards. For new entrants, the learning curve in maize processing is – contrary to prevalent assumptions – very steep, and the challenge is one of attaining these capabilities within a short enough period of time to remain viable.

The learning process for small firms is extremely challenging due to the characteristics of the sectoral innovation system. There is a limited amount of state support for firms' capital investment, R&D, skills training, information dissemination and other such services which support firm-level learning. What state support does exist for such functions is for the most part circumscribed by lack of funding and the centralised nature of key state agencies, and complex access criteria based on size and compliance with criteria in B-BBEE legislation. Trade associations have frequently been observed to fulfil key innovation system functions in support of firm-level learning in agri-food value chains. However, while the maize value chain is highly organised at farming and storage level, organisation is relatively limited at processing level. In particular, the milling trade association, the National Chamber of Milling (NCM), has a relatively low membership relative to the size of the industry. The NCM runs large training programmes which are centrally important to the supply of skills, but without state subsidy access is limited among smaller firms. The interviews found processing MSMEs to be in general atomized and isolated from the kinds of institutional enablers provided by the state and inter-firm collective action that are typically associated with upgrading among small firms. Successful upgrading processes were instead heavily dependent on commercial relations with specialist consultancies and capital goods suppliers, or by knowledge acquired by entrepreneurs through their own professional experience or social networks. This again advantages firms in commercial maize farming districts where there is easier access to specialist equipment and services suppliers, skilled staff, and complementary infrastructures associated with a clustering effect.

Though small-scale maize milling has, formally, been the target of a range of industrial policy interventions in the decade since 2010 seeking to deconcentrate markets and increase black participation in manufacturing, these were found to have been widely unsuccessful. From 22 firms funded by state agencies – a total established from interviews and publicly available documents – only a few were found to be formally registered and producing commercially. This reflects both the challenges outlined above, and shortcomings in the nature of industrial policy support. Milling appears to have been treated by government as a relatively simple industrial activity that could be quickly picked up by new entrants, rather than the technologically-sophisticated manufacturing process that it has become in the modern food system. Industrial policy support typically provided up-front subsidisation of capital expenditure but without subsequent subsidisation of skills development and learning processes (e.g. around marketing, hygiene) required to attain competitiveness. Alongside industrial policy, B-BBEE policies have become an increasingly important institutional feature of the maize value chain during the past decade. Manufacturing remains predominantly white-owned, and in an effort to address this government has made access to development finance and public procurement opportunities increasingly made contingent on higher levels of B-BBEE compliance. B-BBEE incentivises large firms and public sector agencies to procure more from small-scale and black-owned agro-processing firms as a means of widening participation in value chains. However, the interviews suggest more complex outcomes in practice, since procurement requirements appear to be circumvented by the use of black-owned trading intermediaries, which increase costs and complexity but do not diversify ownership of manufacturing. Additionally, the complexity of B-BBEE requirements is such that higher levels of compliance are more easily achieved by large firms able to devote resources to the task and hire specialist consultants, and this provides a further set of competitive advantages over white-owned SME rivals.

State-business relations around the maize processing industry have been complex and at times fractious over the post-liberalisation period, and this has also affected the character and effectiveness of industrial policy support. In the early post-liberalisation phase, some large and medium scale firms participated in collusive arrangements to control prices and manage the threat of destabilising competition. This was one manifestation of a broader post-liberalisation process in which extensive state governance of the food system was replaced by various forms of purposive coordination by powerful private sector actors. The fallout from the discovery and prosecution of the cartels had a bearing on the character of industrial policy, which in the 2010s emphasised supporting small-scale entrants as a means of increasing competition for the major players in the industry. Key industrial policy initiatives in this arena largely bypassed major established firms in the value chain and their respective organisations, with consequences for the ability to draw on key sources of expertise in the design and execution of interventions. Problems in the design and execution of effective industrial policy also appear to have been amplified by fragmentation of the South African state and poor coordination among the multiple agencies working on agro-processing.

A final point is that MSMEs face a wide range of severe challenges as a result of dysfunctionalities in key state functions relating to the provision of infrastructure and security. In particular, the unreliable supply of electricity and water, poor quality transport and telecommunications infrastructure, and the considerable impact of crime and social unrest on production and supply chains. These problems are widespread but also highly variable by location, and commonly relate to problems within municipal governments rather than the central state. Firms do not confront these problems in the wider business environment on a level playing field, with smaller firms suffering more acutely given their more limited ability to purchase alternative sources of energy, water, telecommunications and the like, the high costs associated with private security and the greater vulnerability of shorter, less diversified supply chains. Unresolved, these problems can be expected to undermine efforts to boost participation by small firms.

The paper is structured as follows. The first section discusses methods and data sources. The second section provides historical, economic and institutional context. The third section examines dynamics of the maize value chain and its bearing on MSME processors. The fourth section analyses processes of technological change and capability upgrading, and the fifth section analyses the political economy of industrial policy for the sub-sector.

2: Methods and data sources

The project followed a qualitative research design, with data collection involving a combination of semi-structured key informant interviews and firm-level interviews with managers of MSME maize processing firms. This was supplemented by analysis of official statistics and grey literature for triangulation and contextualisation. The semi-structured key informant interviews were carried out with a combination of 25 industry experts, state officials, representatives of industry associations, and specialist firms at other value chain segments. The researchers carried out 28 firm level interviews with a range of different firms in the attempt to better understand the diversity of firm level experiences. Interviewees are listed in Annex One. Firm-level interviews were carried out between August 2019 and December 2019, and key informant interviews between March 2019 and August 2020.

Names and other such identifying information have been removed from firms to prevent disclosure of any commercially sensitive information. Identifying information for key informant interviewees has been removed on request. The selection of 28 firm-level interviews followed a purposive, heterogeneous sampling approach where the aim was to explore the diversity of MSME experiences through a smaller number of in-depth interviews rather than to seek a representative random sample. These interviews used a structured questionnaire with a large number of open-ended questions to produce detailed qualitative data that provides an insight into the experiences of firms and the nature of the challenges they face in terms of growth, competition and upgrading of capabilities. The firm-level interviews took a ‘borehole’ approach (Liedholm, 2007), exploring firm histories and looking retrospectively at key changes in the firm and its value chain relations. Multiple questions

were open-ended and designed to elicit detailed qualitative data on firms' specific experiences.

A larger sample was constrained by project resources and the challenges of low response rates in a small, spatially-dispersed and extremely diverse population of firms. Because the sample is not statistically representative, we do not seek to make conclusive claims about the population of maize processors and are cautious with generalizations. Some identifiable regularities are indicative broader patterns, but these are treated as suggestive rather than conclusive. Nonetheless, we sought greater scope than narrower qualitative studies that are either hyper-local or anecdotally focused on single case-studies, or macro-level political economy analyses which pay little attention to the realities at firm-level. Purposive sampling for firm-level interviews sought to cover firms both inside and outside the major maize growing regions (where the majority of firms are situated), in both urban and rural locations, with a range of firm sizes across micro, small and medium scales. The researchers also sought to interview recipients of industrial policy support and black-owned firms. Given issues with survivor-bias in firm-level interviews, key informant interviews were also conducted with several owners of firms which had exited the industry. Firms were initially identified via the South African Grain Information Service (SAGIS) register,[5] organised by size and location and with the largest firms excluded. Desk research and consultations with industry experts helped identify further suitable interviewees. From 114 firms contacted for interview, 28 accepted and were interviewed between August 2019 and February 2020. Interviews were carried out in-person, typically on-premises to better understand the operating context. Qualitative interview data was subsequently analysed inductively and coded to identify emergent themes.

Firms were interviewed across seven provinces, with 15 within the 'maize triangle' of established commercial maize production districts (see below). Firm location by settlement-type is displayed in Table 1. Median firm age was 15 years, with the oldest founded in 1938 and the newest in 2017. Table 2 groups firms according to four age bands cross-tabulated with firm size. The sample included a range of firm sizes, classified below according to legal definitions.[6] Table 3 shows the distribution of firms according to the different measures of size. The median firm had 26 employees, and revenue of US$1.5m.

[5] A non-profit statutory body collecting grain industry data and with which all firms handling raw maize are legally required to register.
[6] Revised Schedule 1 of the National Definition of Small Enterprise in South Africa (manufacturing), 2019.

Table 1: Location of firms interviewed[7]

Settlement type	Definition	Number of firms
'City Region'	Large urban conurbations	7
'Regional Service Centre' (a) and 'Service Town' (b)	(a) Regional node with 'significant reach in its hinterland' and a 'significant social and economic service role in sparsely populated region', population < 100,000. (b) Providing an 'economic and social service anchor role in [a rural] hinterland, population 15,000-100,000	9
Small service towns	Population <20,000, playing a social and economic 'anchor' role with a radius of 30km from the town in densely populated rural areas, and 50km from the town in sparser areas. Serving the local population or niche economic activities.	12

Table 2: Firm age and size[8]

	Size of Firm = Micro	Size of Firm = Small	Size of Firm = Medium	Total
Pre-liberalization entrants (-1994)	3	2	2	7
Early reform period entrants (1995-2000)	0	2	4	6
Established entrants (2001-2010)	1	2	2	5
Recent entrants (2011-2020)	3	7	0	10
Total	7	13	8	28

[7] Settlement typology from: van Huyssteen, E. Green, C. Sogoni, Z., Maritz, J. and McKelly, D. South African Functional Town Typology (CSIR 2018 v2). Available at http://stepsa.org/socio_econ.html#Indicator, http://stepsa.org/typology_table.html

[8] Firm size in this table is by the employee number measure.

Table 3: Interviewees by firm size

Employment measure	
Micro (0-10 employees)	7
Small (11-50 employees)	13
Medium (51-250 employees)	8
Revenue measure	
Micro (≤R10m)	10
Small (≤R50m)	3
Medium (≤R170m)	6
Large (>R170m)	3
Refused	6
Output volumes	
≤100 tons per month	7
≤1000 tons per month	8
≤10,000 tons per month	9
Refused	2

All measures of size suffer drawbacks: output volume because firms are not selling identical products; employment because employee productivity differs dramatically between labour-intensive and mechanized operations, meaning some firms classified as 'medium' by the employment are 'large' by revenue. These are still of interest to our study of MSMEs since, relative to other firms in milling—rather than manufacturing as a whole—they are medium-scale, with output volumes 5–20% of the largest firms.

Most companies produced a relatively small range of products. Twenty-one firms interviewed had maize-meal as their main product. The seven that did not have maize-meal as their main product typically included it in their product mix but earned more income from other products including maize snacks, instant maize porridges, and samp, providing a useful window into these markets and avenues for diversification in maize processing. Some firms were either producing—or attempting/anticipating to produce—more sophisticated products such as corn snacks or instant porridge using extruders. All companies produced 'chop' as a by-product sold as animal feed to livestock producers. Malts for beer was also a seasonal opportunity for processed maize in some local markets.

3: Context

3.1: Historical and institutional context

Policy during colonialism and apartheid created highly concentrated and dualistic agro-industries in South Africa, with key productive assets owned by the white population. The

path dependencies of this period, and efforts to unmake them, continue to shape the political economy of agro-processing today. This section briefly discusses some specific aspects of the general patterns of agrarian development pertaining to maize. Maize has been a staple grain in South Africa since the late-19th Century, adopted to feed the rapidly-expanding mining industry (McCann, 2005). For a period there was competition between black peasant grain producers and white farmers (Bundy, 1979). However, land dispossession and poor farming conditions in the reserves stymied the commercial growth of black agriculture, while white farmers benefited from state subsidies for modernization (Ibid). The Marketing Act (1937) created a single-channel, fixed-price marketing system for maize, excluding black farmers while providing white farmers with cost-plus, pan-seasonal, pan-territorial prices, typically above world prices, alongside trade controls (Vink, 2012; Bayley, 2000). Powerful cooperatives and associations effectively represented commercial agrarian interests in the political arena, and Highveld maize-growing regions were a key source of National Party votes until the 1980s (Bernstein, 1996a).[9] Maize producers were the largest category of farmers and generous state agricultural support favoured field crops (Bernstein, 1996b; Makhaya & Roberts, 2013). The state invested heavily in mid-20th Century agricultural modernization, including extensive mechanization and large-scale concrete silo grain storage infrastructure. These silos were owned by regional grain co-ops, run as businesses by professional managers and organized as tessellated local monopsonies serving farmers in a 20km radius (Bernstein, 1996a). The co-ops served as the Marketing Board and Land Bank's agents, aggregating white farmers' grain and supplying inputs, assistance with farm modernization and cheap finance (Bernstein, 1996b).[10] This created a large-scale, capital-intensive white-owned commercial maize farming industry, juxtaposed with small-scale, low-productivity grain production orientated towards domestic consumption in the African 'homelands'. This dualism has proven persistent.

Downstream of farming, grain milling was licensed by the marketing board, with entry tightly controlled. The milling industry became highly concentrated and capital intensive (Bayley, 2000; Vink, 2012; FPMC, 2003). Fixed prices removed the competitive advantage small rural millers typically have in locating close to grain supply and incentivized urban mill location (Vink, 2012).[11] Difficulties procuring grain outside the official marketing system further constrained the growth of informal small-scale milling. Major milling firms were predominantly not Afrikaner-owned[12] and lacked the political capital of farmers; pricing favoured the latter. Maize products were controlled with exacting specifications and regular state inspections.[13] With squeezed margins and limited product differentiation, competition

[9] This changed in the 1980s for reasons discussed in (Bernstein, 2004).
[10] They hereby played a particularly important role in propelling mechanization and the adoption of chemical fertilizers and improved seed varieties (Bernstein, 1996b).
[11] Interview SAMB12, SAKI02, SAKI15.
[12] With the exception of SASKO, which derived from a grain farming cooperative, the major grain milling companies, Premier, Ruto, and Tiger Oats, were founded by Jewish industrialists, see Kaplan (1986) Frankel (1988).
[13] Interview, SAMB12, SAMB03.

centred on lowering costs through scale economies and acquisitions of competitors.[14] Four major grain milling firms emerged, Tiger Oats, Premier, SASKO, and Foodcorp, linked to the handful of conglomerates which controlled much of South African industry. These firms remain among the largest in the industry today (see section 5.1).[15] From the 1970s, farmer co-ops began diversifying into downstream activities, becoming significant players in rural milling and retail (Bernstein, 1996a). In particular OTK, the cooperative for the north-east Transvaal that is today Afgri, developed significant milling capacity; its assets were subsequently acquired by Pride Milling, which is the fourth largest maize-meal producer today. Reflecting broader patterns of concentration (Chabane et al, 2006; Joffe et al, 1995), at the time of the transition to democracy in 1994, four firms accounted for around 80% of maize-meal output.

For reasons discussed elsewhere (see Padayachee & Van Niekerk, 2020), the incoming ANC government adopted a sweeping liberalization programme with market-friendly redistributive adjuncts as the means to address the interlinked problems of industrial concentration, agrarian dualism, and racialised inequality. Proponents argued this would generate both equity and efficiency, lowering entry barriers, subjecting big business to competition and enabling increased black economic participation (Bayley, 2000; Bernstein, 1996a; Makhaya & Roberts, 2013). In milling specifically, liberalization was expected to create a rush of small-scale entrants, increasing competition for incumbents, and thereby lowering consumer prices, as had occurred elsewhere in Africa following liberalisation of formal grain processing sectors that had typically been dominated by large-scale parastatals (Traub & Jayne, 2008; Abu & Kirsten, 2009).

Gradual marketization of the maize industry had been underway since the 1980s (Bernstein, 1996b; Vink, 2012). Notably, 1993 reforms enabled the aforementioned co-ops to convert to companies, precipitating a wave of consolidation and transforming co-ops into diversified agribusinesses (hereafter, they will be referred to as 'agribusinesses'), with former members as client-shareholders (Bernstein, 1996b; Ducastel & Anseeuw, 2018).[16] Marketing boards were abolished and trade liberalized following the Marketing of Agricultural Products Act (1996), with maize prices thereafter determined by international market forces (Bayley, 2000). There followed an institutional shift to private governance of many key industry functions. Liberalisation exposed all maize industry actors to severe price risk, and the formation of the Agricultural Markets Division of the Johannesburg Stock Exchange's South African Futures Exchange (SAFEX) (now the Commodity Derivatives Market, CDM) was the key

[14] This included advanced imported machinery, overseas training of milling staff at the Swiss School of Milling in St Gallen, and employment of skilled British and Irish millers following mechanisation of the milling industry in the British Isles. Interview, SAMB03.

[15] Tiger Oats (today Tiger Brands) was part-owned by Barlow Rand, Premier by Liberty Life and Anglo American (Bartlett, 1993) and Foodcorp (today RCL), controlled by Sanlam (Joffe et al, 1995). SASKO became Pioneer in the 1990s and only entered maize milling in this period.

[16] Twenty five amalgamations involving 60 cooperatives took place between 1990 and 1994, backed with funding from the Department of Agriculture (Bernstein, 1996b).

institutional response, facilitating hedging and transparent price formation (Bayley, 2000) via a self-regulated[17] private platform. Use quickly became widespread, with maize futures becoming among the most extensively traded derivatives on the exchange and providing the benchmark price for the maize industry as a whole. Other quasi-private regulated organisations replacing Maize Board functions include SAGIS, a non-profit responsible for gathering and disseminating data on maize flows (SAGIS, 2020); The Maize Trust, using remaining Marketing Board funds to support key industry activities; and the Southern African Grain Laboratory (SAGL) which monitors maize quality on behalf of the industry. Alongside withdrawal from marketing, direct state support for agro-industries diminished and farm subsidies were withdrawn. Remaining state regulation of the maize introduced was minimalist and market enabling, restricted principally to setting minimum standards for maize grading, processed product categories, packaging and hygiene, which collectively enable arms-length trade in maize and associated products as a uniform commodity.[18]

This market-orientated regulatory framework has remained in place throughout the post-apartheid period. However, there have been some significant shifts in wider government policy orientation with a bearing on maize processing. In the early-2010s, the government adopted interventionist industrial policy schemes to support the entry of small-scale black-owned milling firms and introduced mechanisms through the Agri-BEE charter to incentivise white-owned firms to increase black participation in ownership and management. These shifts reflected broader changes in the approach to economic policy in the ANC from the mid-2000s and particularly under the leadership of former-President Jacob Zuma, with a more assertive approach to transformation and a partial re-engagement with more state-led development strategies. But the measures were also responses to sector-specific concerns held by government about sustained high levels of concentration in the agro-industries, limited black ownership, and, most notably, anticompetitive conduct among large firms following the discovery of cartel arrangements in the mid-2000s. These issues are discussed in-depth in subsequent sections. The following section discusses key sub-sectoral-level economic trends in the post-liberalisation period.

3.2 Economic context

This section provides key economic context on the maize processing industry, examining first key trends in demand, before examining the changing structural features of the industry and concentration levels. During 2019/20, 5.2mt of raw maize, ~90% white,[19] was processed for

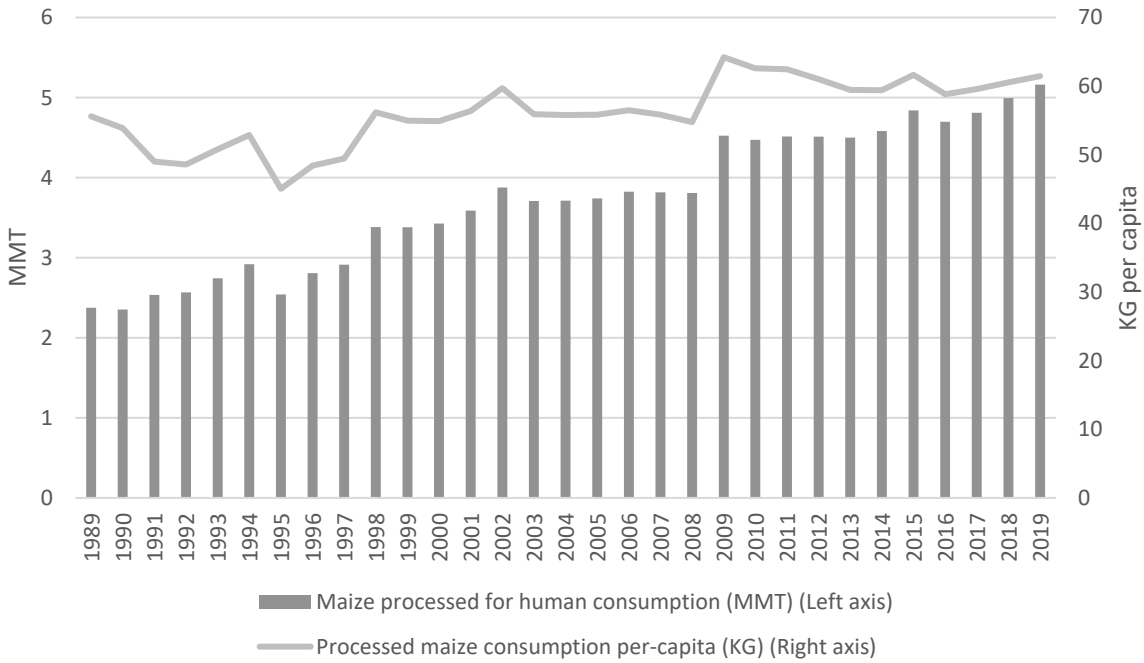
[17] Under supervision by the Financial Services Board and under the Financial Markets Control Act.

[18] DALRD's Agricultural Product Standards Act provides standardized categories for raw and processed maize. Under the 2009 regulations, raw maize is classified as either white or yellow, with three standards for each relating to quality specifications. The highest Grade 1 maize has lower levels of foreign matter (0.3% vs 0.5% and 0.75%), defective kernels (shrivelled, sprouted, immature, discoloured, soiled, damaged by pests – 7% vs 30%), and colour consistency. For processed products, in the latest 2016 regulations, there are 19 categories of maize products for sale, each subject to specifications.

[19] As with much of Southern Africa, most maize used for human consumption is white maize, rather than yellow maize. The former accounts for around 85%–90% of the raw material in this channel over recent years

human consumption. This figure has been growing steadily over recent decades, though more due to population growth—averaging just under 1m per-year during the past decade[20]—than per-capita consumption increases (Figure 1).

Figure 1: Maize processed for human consumption (Source: SAGIS)

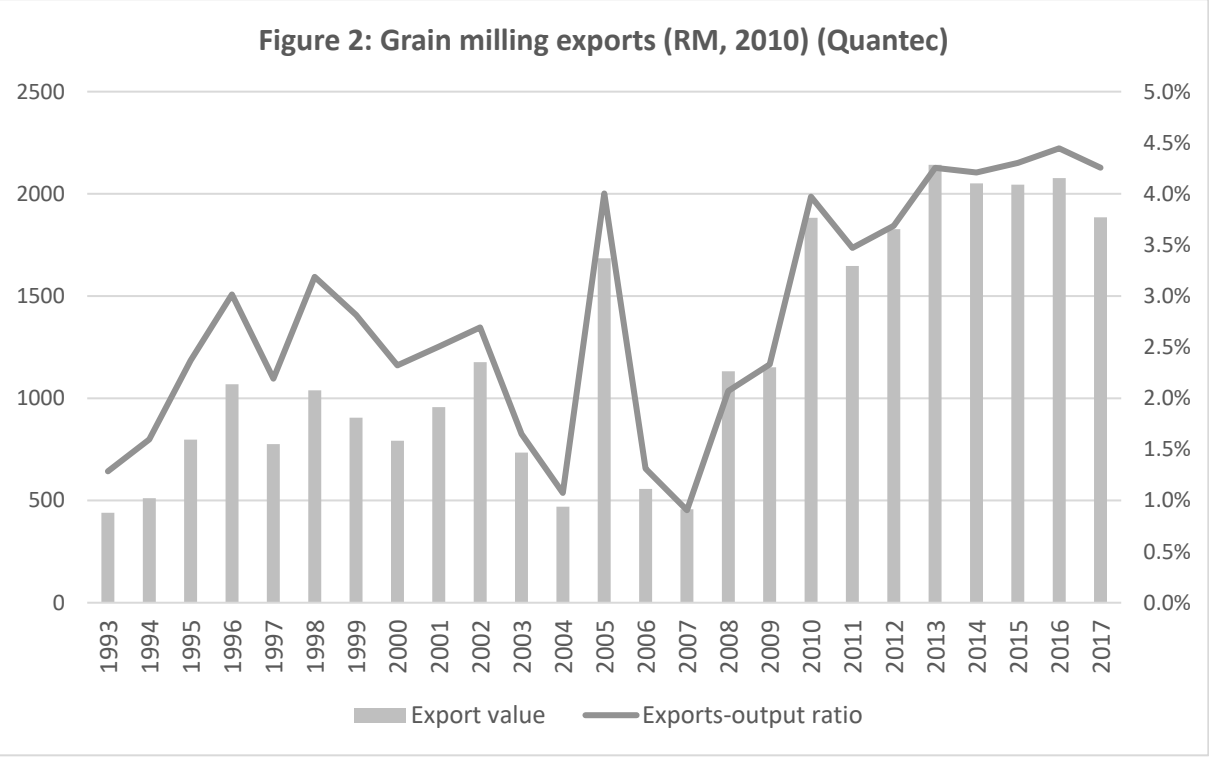


White maize consumption per-capita is expected to continue growing slowly at 0.5%/pa during 2020–2029 (BFAP, 2020, 43-58). Most output is for domestic consumption with only 4% exported, almost entirely to elsewhere in southern Africa. Exports have nonetheless grown significantly and official statistics may understate true volumes due to informal exports (Figure 2) (BFAP, 2014).[21]

(author's calculations, SAGIS data). Processed yellow maize for human consumption is predominantly for snacks and beverages.

[20] Author's calculations from StatsSA data.

[21] Interview SAMKI03.



Underneath this trend are important changes in the characteristics of demand. Maize is processed into multiple foodstuffs, the relative importance of which in 2018/19 is displayed in table 4. 'Super' maize-meal is most significant, at ~50% of processed volume. Other maize-meal categories, 'special' and 'sifted', are considerably smaller. 'Grits' are used to manufacture other products, like corn snacks and beer. Samp is dried and chopped maize kernels. Other products include traditional beers and maize drinks (magheu), sweet porridges, and starches/fines used as food manufacturing inputs. 'Chop' is by-product, used for animal feed.

Table 4: Processed maize food products, 2018/19 (Source: SAGIS)

	Maize Chop	Maize Rice	Maize Grits	Samp	Sifted Maize-meal	Special Maize-meal	Super Maize-meal	Un-sifted Maize-meal	Other
MT	1,667,338	8,228	62,964	118,545	50,691	382,035	2,524,824	8,574	198,102
%	31.5%	0.2%	1.2%	2.2%	1.0%	7.2%	47.7%	0.2%	3.7%

Relative to 'special' and 'sifted' maize-meal, super is a much more refined product, with more consistent granulation/texture and whiter coloration. Super's benchmark extraction rate is

62.5%, [22] though more expensive branded products may have higher rates. Alongside extraction rates, maize-meal categories are differentiated according to fat and fibre content and fineness (Table 5).[23] Production of super involves removing more of the fibrous pericarp (bran) and oily, protein-rich germ, such that the product is composed more from the starchy endosperm, increasing the calorific value and shelf-life, and decreasing cooking time, but removing some of the nutritional value. The product is considerably more expensive than sifted and special at retail.

Table 5: Categories of maize-meal (Source: Agricultural Product Standards Act, 2016)

	Extraction rates	Fineness	Fat	Fibre
Super	62.5	≥ 90% through 1.4mm sieve, <90% through a 0.3mm sieve	<2%	0.8%
Special	78.7	≥ 90% through 1.4mm sieve	<3%	1.2%
Sifted	88.7	≥ 90% through 1.4mm sieve	<4%	1.2%

The most important change in consumer demand in the post-liberalisation period has been the shift away from special, sifted and samp, to super maize-meal. The former three categories remain significant in regional and low-income rural markets, but have declined significantly with changing consumer preferences accompanying income growth and urbanization (Table 6). The drivers and implications of this shift towards more highly-processed products are significant to the challenges faced by small firms and discussed further in subsequent sections.

Table 6: Changes in maize-meal consumption, 1996/97–2018/19, T000s (Source: SAGIS)

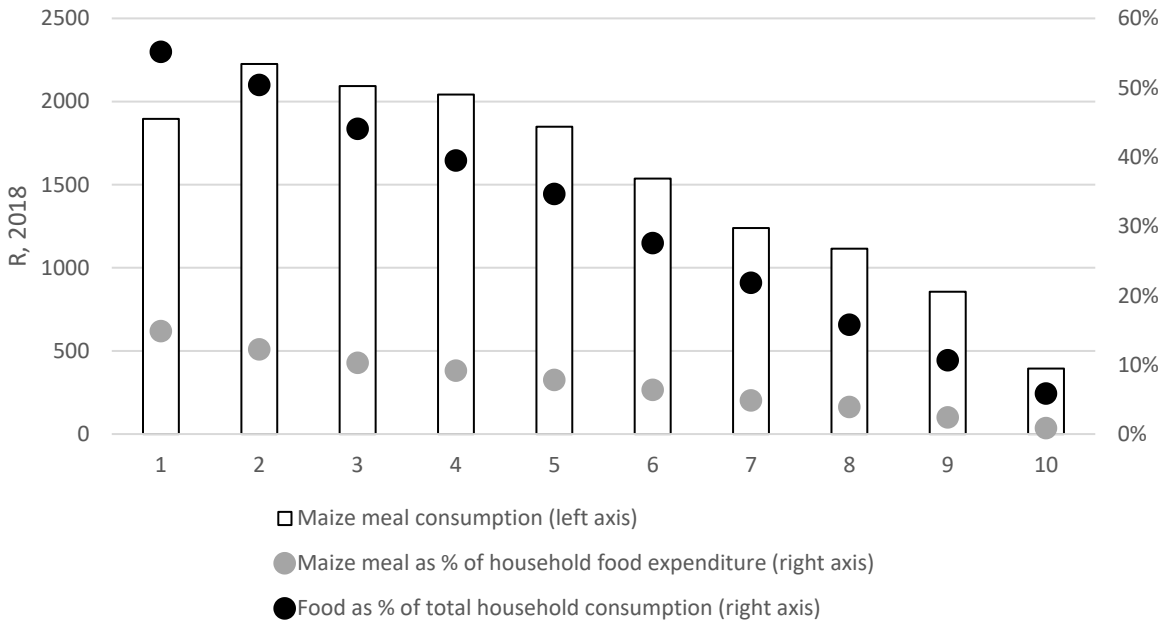
	Maize rice, grits and samp	Sifted maize meal	Special maize meal	Super maize meal	Total
1996/97	226	461	968	623	2,278
2018/19	190	28	371	2,495	3,084
Change	-16%	-94%	-62%	300%	35%

It is also important to note that maize-meal, while the main source of carbohydrates in the South African food system, is primarily sold to low-income consumers and has qualities of an

[22] Meaning that of the raw material fed into the mill, just under four-tenths of the mass becomes by-product.
[23] This is under the Agricultural Products Standards Act. Fineness is measured by the percentage passing through sieves of specified sizes. Similarly exacting regulations apply to other maize products like grits.

inferior good with consumption falling as income rises and consumers typically substituting to other carbohydrates (Figure 3) (Kirsten, 2014).

Figure 3: Total consumption per household consumption decile (Rm, 2018) (Source: StatsSA)



Grain processing[24] output value grew rapidly during the 2000s, a period of high growth for the South African economy as a whole, but has stagnated during the past decade alongside a more general deterioration of the South African economy and grown more slowly than other major categories of processed food such as dairy, meat and horticulture-based products (Figure 4). Similarly, after rising steeply in the first decade and a half post-liberalisation, investment levels have dropped during the past decade, to a much greater extent in grain milling than other key agro-processing categories (Figure 5).

[24] Figures in the following section are for the grain milling industry, which includes wheat and starches, since more disaggregated data is not available. It nonetheless provides a reasonable indication of broad trends given the importance of maize processing to this category.

Figure 4: Growth in output value, grain mill products and other food products (2010 prices) (Source: Quantec)

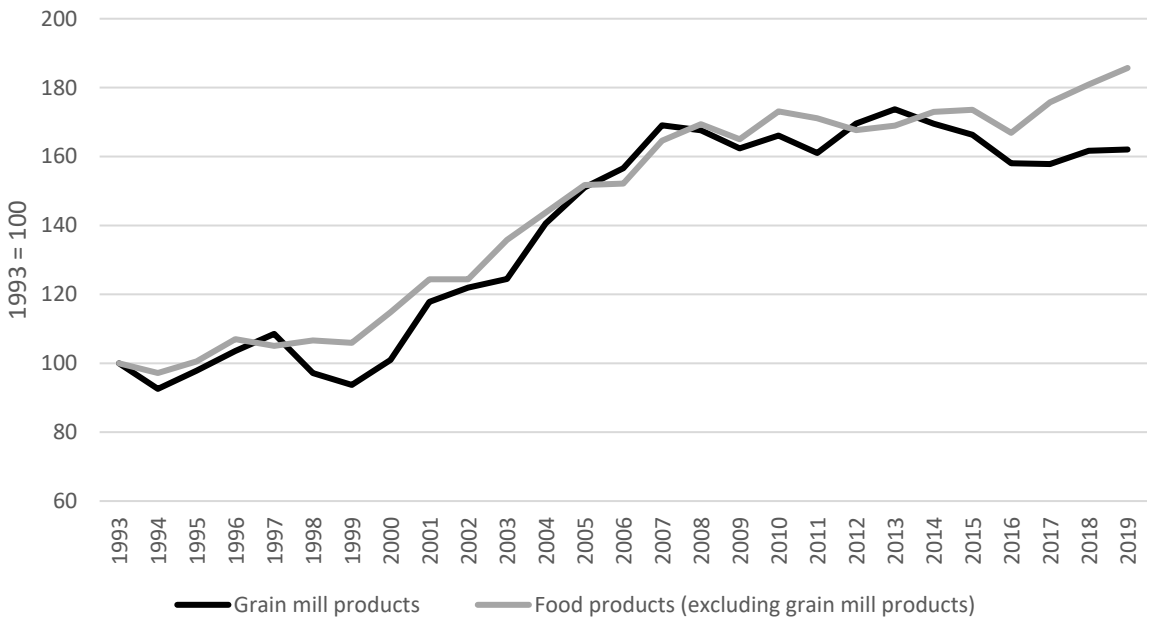
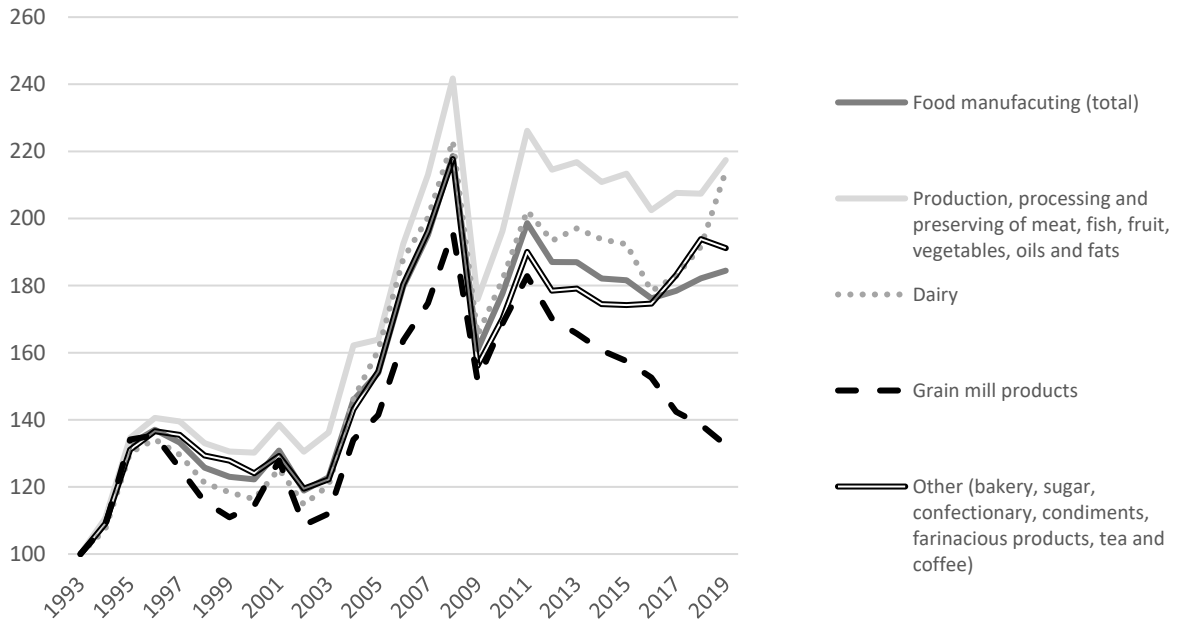


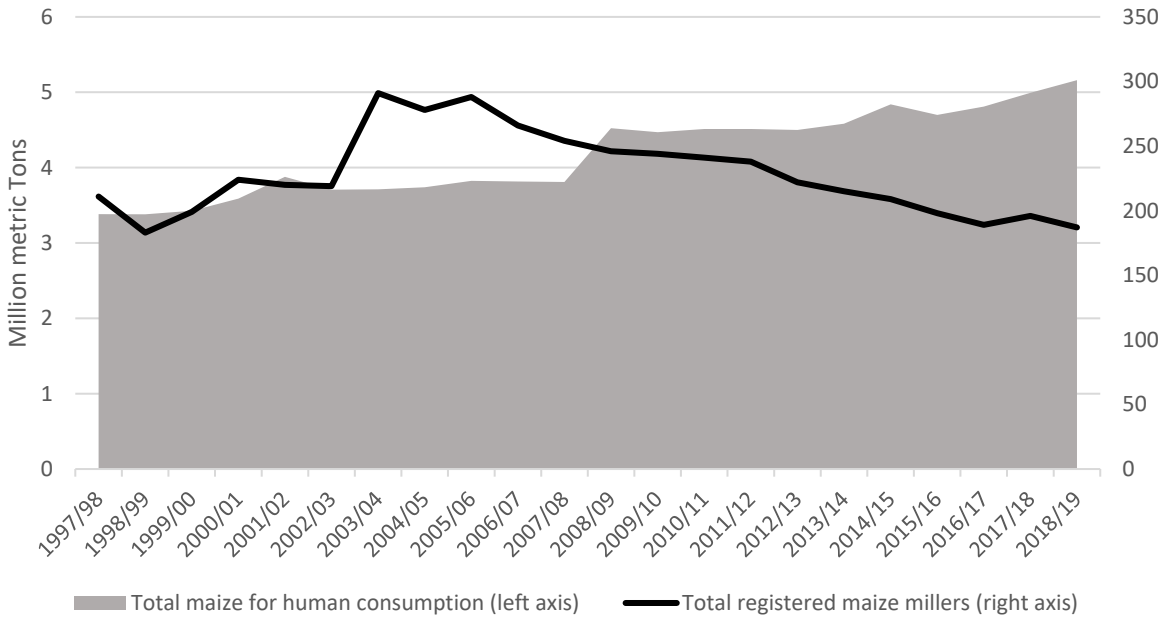
Figure 5: Index of gross domestic fixed investment (constant 2010 prices) (1993=100) (Source: Quantec)



Nonetheless, grain milling remains a major component of the agro-processing industry. It accounted for 20% of total food manufacturing output value in 2020 (R48bn) and 14% of employment (36,000 people, up from 20,000 in the 1990s), reflecting relatively high levels of capital intensity.

Changes in the structure of the industry are complex. As anticipated, there was a rush of new entrants to the grain processing industry in the post-liberalisation period, with formally-registered processors of white maize increasing from 211 in 1997/98 to a 2003/04 peak of around 300. After this, however, has been a sustained decline, even while output has increased (Figure 6).

Figure 6: Processed maize consumption and registered white maize processors (Source: SAGIS)



However, rather than this simply reflecting exit from the industry, there is considerable churn created by acquisitions of competitors and a stream of new entrants. Indeed, 10 of the firms interviewed had been founded in the past decade. Analysis of company registers for the five years to 2020 suggests churn rates as high as 25%.[25]

All firms purchasing maize are required by law to register with SAGIS, and experts interviewed for the project suggested that there are few commercial informal millers for this reason. The small informal milling sector is comprised of seasonal, on-farm mills, these being either hammer mills in deeper rural areas, purchasing maize produced by households and small-scale farmers that comprises around 5% of total maize output (around 600,000–800,000 tons according to the Crop Estimate Committee) or large-scale commercial maize farmers which opportunistically mill maize in seasons when they struggle to sell their maize for sufficiently high prices in the market.

Describing the size distribution of processing firms is complicated by a lack of publicly available data, though available information and experts interviewed suggest a concentration

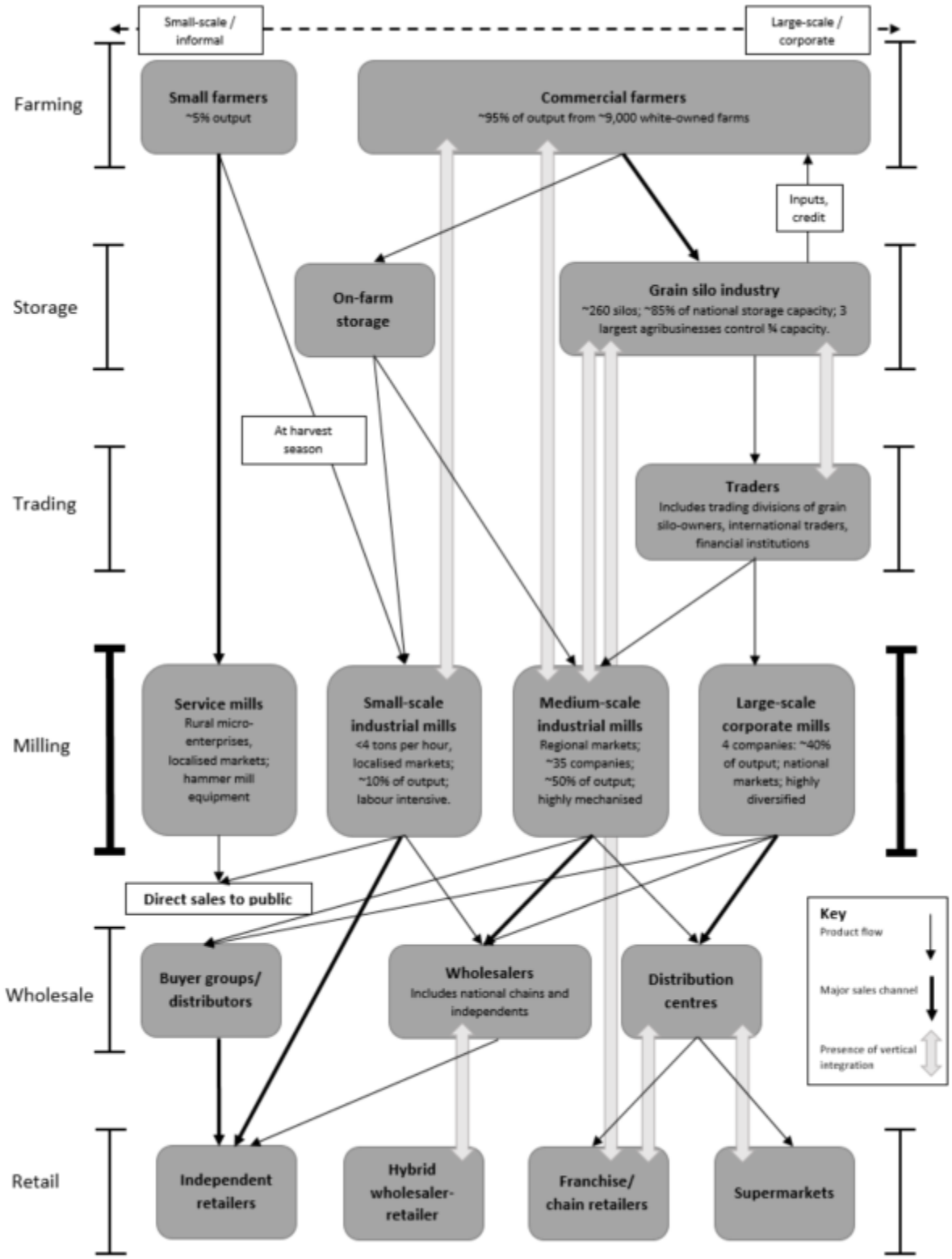
[25] Calculated by counting discrepancies between SAGIS registers in terms of firms which leave the register and new firms which join the register within this time period.

of large-scale firms and a long tail of small-scale enterprises. In 2016, the NCM classified ~50% of registered mills as small-scale with 0-4t/day capacity, 25% as medium-scale with 4.1-20t/day capacity and a further 25% as large-scale with >20t/day (NCM, 2016). Many firms classified as large by this output measure, our firm-level interviews suggest, would be medium-sized firms under legislative definitions for manufacturing based on revenue and employment. SAGIS data shows that the largest 20 firms account for 80% of processed white maize output, but that among the medium and large-scale firms there has been a significant process of deconcentration whereby in the mid-1990s, the four largest firms accounted for ~80% of output, but by 2010 this had reduced to ~60%, and in 2019 to 40%. The reasons for this are explored further in subsequent sections.

4: Value chain relations

This section analyses the structure and dynamics of the maize value chain and its bearing on the participation of processing MSMEs. The chain is bifurcated between, firstly, a formal/large-scale channel from large-scale commercial maize production, through the commercial silo system, large/medium-scale processors and finally chain retailers, and, secondly, a more complex peripheral channel composed of MSMEs, involving a more complex range of processor business models and ultimately targeting wholesale-informal retailers. The latter intersects with the former at various points, particularly around grain storage. This is summarised in Figure 7 and will be elaborated in subsequent sub-sections, beginning with a general overview of chain structure and key prices, before examining in more detail the nature of relations between processing and, firstly, upstream firms in farming, storage and trading then, secondly, downstream actors in retail and wholesale.

Figure 7: Maize to maize meal value chain



4.1: Overview of key segments

There are four main prices in the maize to maize-meal value chain: at the far upstream is (i) the farm-gate price received by farmers, which is determined by market forces and benchmarked to the CDM spot-price;[26] (ii) the mill door price paid by processors, which incorporates costs for transport, storage and trading; (iii) the mills' selling price taking into account production costs and the profit margin; and (iv) the retail selling price. There is reliable public data for (i) and (iv), but (ii) and (iii) are opaque, complicating efforts to analyse the distribution of value. Table 7 outlines general features for a typical medium-scale miller, estimated from interviews with firms and industry experts, official statistics and past studies.[27] This is a stylized example used for illustrative purposes due to the difficulties obtaining data, and the evident differences between firms in terms of production costs and retail prices. While not representative, it does convey a key financial challenge faced by processors: The high-purchase to sales ratio, in which maize accounts for a very large proportion of the production cost, means processing firms are squeezed between a volatile raw material price over which they have little control (since prices are set by the JSE CDM) on the input side, and retailer buyer power which constrains processor firms' pricing power on the output side, thereby limiting the ability to quickly pass maize prices on to consumers (price transmission is discussed further below).

[26] The farm-gate price is typically spot market price for maize adjusted for the location differential, and minus marketing, storage and handling costs incurred.

[27] In table 7, the calculations follow methods in NAMC (2012). (1) The estimates for (1) and (2) are based on GrainSA 2020 indicative farm budget for Eastern Highveld, using roundup-ready GM seeds with 5.5t/ha yield; (3) is the average 2019/20 marketing season JSE-CDM spot price (Randfontein base) with a four month lag, minus the simple average location differential, minus the handling, storage and transport costs incurred by the farmer; (4) follows GrainSA 2020 farm budget estimates for marketing costs; (5) Average daily JSE-CDM spot price (Randfontein base) for May 2019–April 2020, minus the simple average location differential for 2019/20; (6) Based on assumption of 120 days storage at the JSE's 2019/20 standard storage rate of 0.79c/day (JSE, 2019/20), and an outward handling fee of R47, the average of the five largest silo owners for 2019/20 (van der Vyver, 2019); (7) Rate for 26km-50km with 34 tonnes cargo and return load factor of 2, using JSE average transport costs for 2019/20; (8) Based on NAMC (2012); (9) Based on R2,600/t price for chop from interviews with millers, and extraction rate of 62.5% as NAMC benchmark for super maize-meal; (10) Calculated as market price plus silo-mill transport costs, trader commission, handling and storage costs, and minus income from chop; (11) calculated as (10)*1.6 given 62.5% extraction rate; (12) Based on interviews with processors; (13) Ibid; (14) Ibid; (15) Ibid; (16) Ibid; (17) Ibid; (18) manufacturing costs plus distribution; (19) based on ratio of capital costs to site costs in NAMC (2012) and FPMC (2003); (20) capital costs plus mill site costs; (21) the sum of conversion cost and the r/ton meal mill door cost; (22) The R8600 price is the May 2019–April 2020 average price for a 5kg bag of super maize-meal obtained by StatsSA surveys. Interviews with millers suggest this price is high and likely stems from StatsSA sampling more expensive brands from formal retailers. Interviews with millers suggest retail prices for maize-meal aimed at lower income consumers, sold in larger pack sizes of 10kg–25kg is considerably cheaper on a per-kg basis and a price of around R5.5-7kg at retail was frequently mentioned in interviews.

Table 7: Illustrative costs in the maize-to-maize-meal value chain, 2019/20

	Units	Cost
Farming		
Variable costs (1)	R/ton grain	1900
Fixed costs (2)	R/ton grain	400
Farm gate price (3)	R/ton grain	2390
Storage and transport		
Farmer handling, transport and storage costs (4)	R/ton grain	255
Market price (5)	R/ton grain	2640
Trader/processor handling and storage costs (6)	R/ton grain	140
Silo-mill transport costs (7)	R/ton grain	80
Trader commission (8)	R/ton grain	30
Processing		
Income from chop (9)	R/ton grain	1000
Mill door cost (10)	R/ton grain	1890
Mill door cost (11)	R/ton meal	3025
Manufacturing cost (12)	R/ton meal	**750**
of which, packaging (13)	R/ton meal	160
of which, fortification (14)	R/ton meal	50
of which, electricity (15)	R/ton meal	150
of which, labour (16)	R/ton meal	150
Distribution (17)	R/ton meal	200
Total mill site costs (18)	R/ton meal	**950**
Capital costs (19)	R/ton meal	280
Conversion cost (20)	R/ton meal	1230
Total super maize-meal cost (21)	R/ton meal	4255
Retail		
Final retail price (22)	R/ton meal	6000 - 8600
Margins		
Farm-gate % of retail	%	64% - 44%
Transport, handling and storage % of retail	%	11% - 8%
Manufacturing % of retail	%	13% - 9%
Conversion cost as % of retail	%	21% - 14%
Processor – retailer spread (R)	R/ton meal	1745-4355
Processor – retailer spread (%)	%	30% - 49%

Farm-gate prices comprise a large proportion of final retail value, estimated 44%–64% in 2019/20, depending on the retail price, which varies considerably between brands. The farm-retail price spread varies according to how changes in the raw maize prices transmit into retail prices. NAMC data for the past decade show figures ranging from 35%–80% (NAMC, 2019a). Maize prices are extremely volatile. Maize production is rain-fed in conditions of increasing climatic stress, and liberalisation means international commodity market and macroeconomic conditions influence the price.

It should be stressed that the often large farm-share does not necessarily mean significant value capture by farmers given high farm input costs. The storage/trading and logistics costs are ~10% of final retail value and are highly significant for farmers and processors. Intermediary agribusinesses earn fees for storage, handling and trading commissions. Because there is a high purchase/sales ratio, with raw maize costs as much as ~70% of total production costs in processing firms (again, varying with market conditions and according to products), small maize price changes can have large impacts on profitability. While the maize

spot price is determined by wider market conditions, different processors may face very different sourcing costs according to their specific circumstances. For example, the R80 transport cost in 3.1 assumes a 26–50km distance to the grain silo. However, vertically-integrated models with mill-site storage will have negligible transport costs (while assuming storage risks) and many large/medium-scale mills are built adjacent to silos and are conveyer fed. At the other extreme, mills in marginal maize production areas may transport grain hundreds of kilometres, with some interviewees reporting paying up to R700p/t for transport. Hedging services provided by trading firms or in-house specialist staff can help mitigate price risk, but as discussed further below these services are harder to access for small firms.

In the manufacturing process, major costs are labour, electricity, packaging and distribution, and different business models revolve around differing attempts to manage key costs. Interviews with firms, discussed below, show huge variation in processing business models. For example, labour-intensity varies between more manual/mechanical operations and automated/digital operations, with the latter producing up to eight times as much output per-employee, but facing high electricity and capital costs. The wide milling-retail spread is the most opaque part of the value chain, though interviews and company accounts from larger firms suggest millers operate on very slim profit margins, with larger firms targeting <5%.[28] Little is known about retail margins, but interviews and grey literature suggest retailers also make low margins on maize-meal because of low-income consumers' price-sensitivity, infrequent bulk-purchases, and maize-meal being a 'loss leader' product.[29] Retail prices have fluctuated considerably but remained, in real terms, within a narrow R40–R50 band for a 5kg bag and R10–R12 for a 1kg bag for the past decade, with the exception of the 2016–2017 drought period (Figure 8).[30]

[28] Though not all interviewees were willing to discuss their list/wholesale prices, those that did were broadly consistent, almost invariably giving a price which equated to R3,900/t to R4,800/t. Rebates will typically be added on to this. This seems in line with the estimate for total maize-meal production cost in table 3.1 of R4,25, and would suggest that processing firms are making slim profit margins. From interviews, competitive, high-volume medium-scale millers described net profit margins being around 2–3%, at best, and this is consistent with information provided by key informant interviews.

[29] A Competition Tribunal (2020c) investigation into one major retailer, the Massmart-owned Cambridge Foods, found that in 2019 it was achieving gross margins of 1.5%–6% on maize-meal, excluding the negative margins when the good was sold on special offer. This was for 25kg bags of Top White Maize-meal produced by GWK. Interview, SAMB01.

[30] Prices differ minimally between provinces and between urban and rural areas, with differences around 5% (NAMC, 2019b).

Figure 8: Real maize-meal prices (Source: StatsSA)

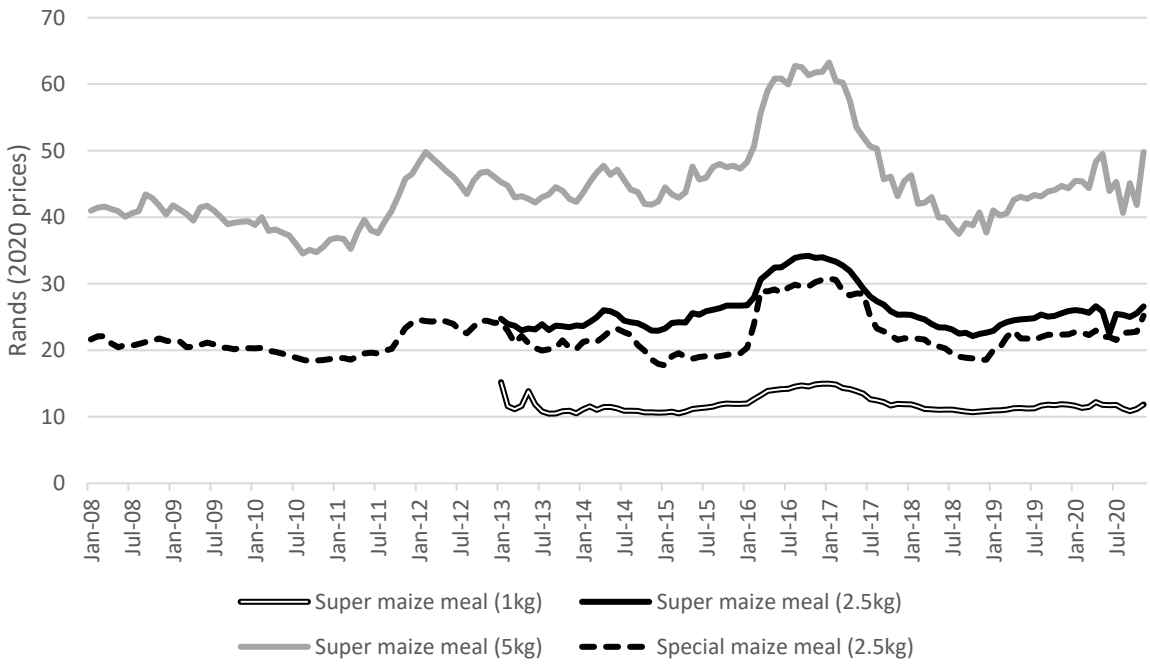
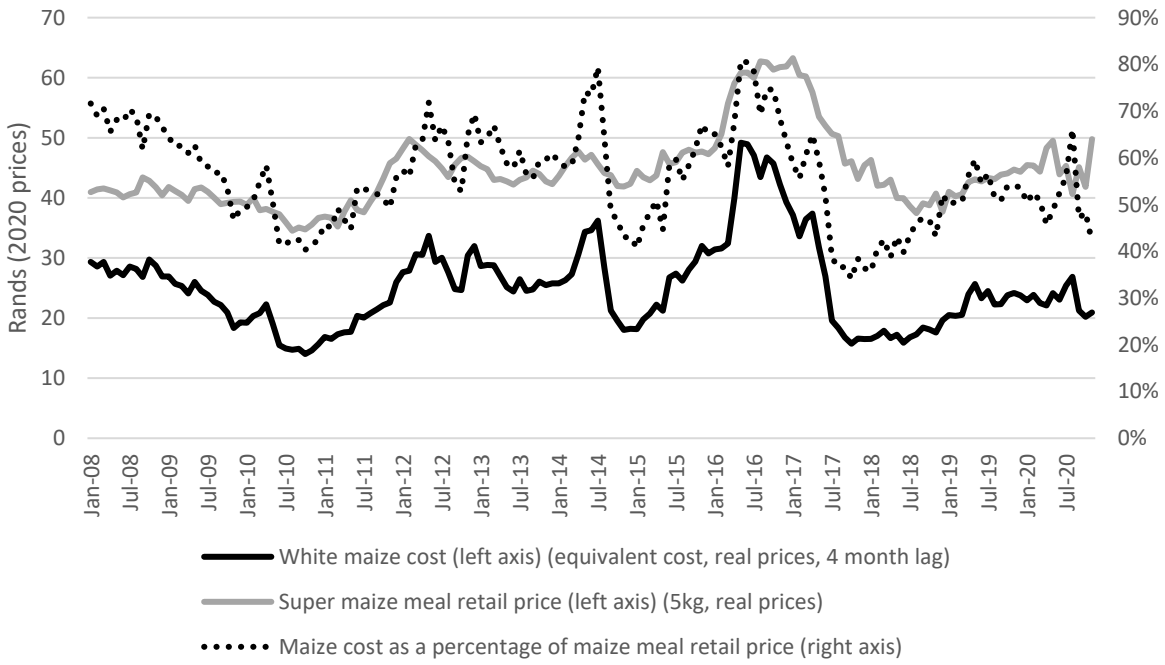


Figure 9 shows trends in maize-to-maize-meal margins,[31] In contrast to the first decade post-liberalization, which saw a sustained increase in this spread,[32] in the past decade there was no clear trend, with the margin fluctuating around a 54% average and a correlation coefficient of 0.8 between lagged maize and retail prices. At many points the margin is well above 60%, in particular during the 2016/17 drought, though after this point large harvests have depressed prices (BFAP, 2020).

[31] The maize price as a percentage of the retail price with a four-month lag to take account of how long it takes for raw material to arrive on shelves and be sold. This chart differs from the farm-to-retail price spread since it has not been adjusted for the location differential, handling and storage costs, but it nonetheless illustrates the key trend. The equivalent cost is obtained by multiplying the spot price by 1.6 on the assumption of a 62.5% extraction rate. The 4 month lag is supported by previous statistical analysis and our interviews with milling firms and industry experts (FPMC, 2003; NAMC, 2012).

[32] Research by Jayne and Traub (2004, 2008) found a rising milling/retail margin, with a steady increase in retail prices, in the years following deregulation, despite no major change in the milling cost structure, and falling real maize prices.

Figure 9: Maize to maize-meal margin (Source: JSE, StatsSA)



How cost increases are shared during the pinch points is critical to processor survival and highlights the heightened importance of bargaining power relations in the value chain. Indeed the 2016/17 period saw a number of milling firms experience severe financial distress. Difficulties in vertical price transmission were cited by larger firms as the reason why hedging was so important as a defensive measure, with large-scale firms with the means to do so buying significant volumes forward. A more systematic statistical study of price transmission by Louw and Kirsten (2017) finds “maize prices are determined at retail level and transmitted through the chain, to commodity level”, with retail prices the ‘master’ and producer prices the ‘slave’, “in that producer prices move to correct deviations from the equilibrium, whereas retail prices do not”. They attribute this to the saturated nature of the upstream chain, consumer price-sensitivity and retailers’ use of maize as a footfall-driver meaning they push the burden of adjustment back down the chain.

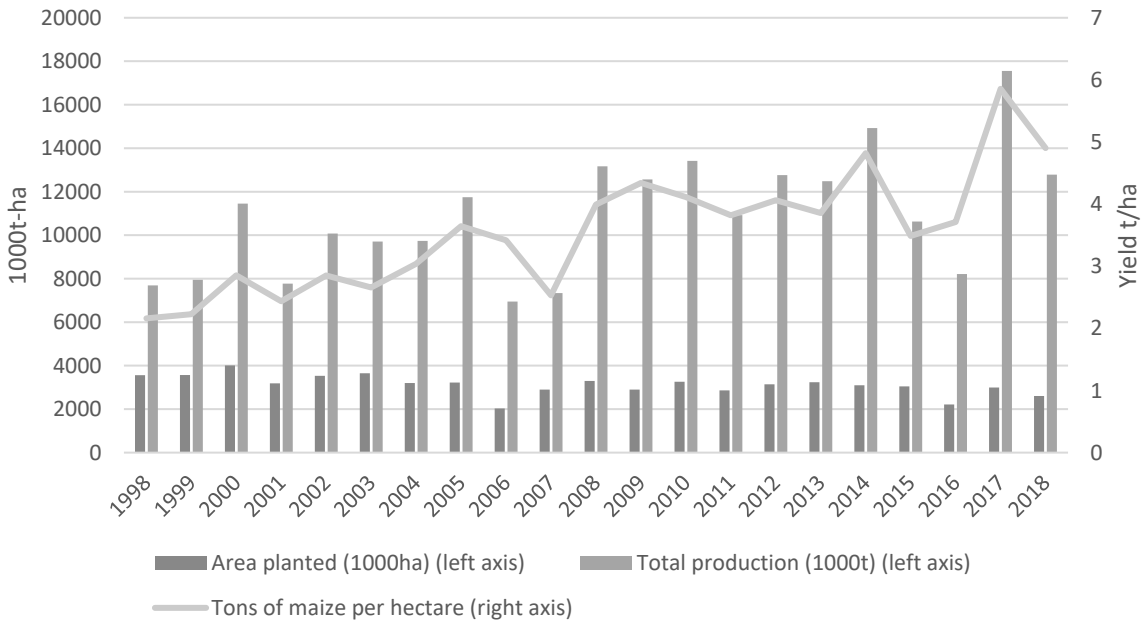
4.2 Upstream value chain linkages: maize production, storage and trading

As shown in the previous section, raw material input costs have a major bearing on the circumstances of processor firms. It is therefore important to understand the characteristics of the upstream segments of the value chain, both in grain production and the complex of actors and systems which intermediate farming and processing and the varying linkages between them.

Maize farming is dualistic, with ~95% of production coming from ~9,000 commercial farmers, most of which are large-scale, highly-mechanized, achieving high yields through advanced

inputs and techniques and situated in the 'maize triangle' spanning the Highveld areas of North West Province, Free State, Gauteng and Mpumalanga that benefitted from the agricultural modernization initiatives of the mid-20th Century (DAFF, 2017: Greyling & Pardey, 2019). The remaining ~5% comes from predominantly black smallholder producers in former 'homeland' areas, with yields around only 1–2t/ha and limited connection to commercial supply chains (DAFF, 2017: Greyling & Pardey, 2019).[33] Maize production has risen during the post-liberalisation period, from ~8mt in the late-1990s to an average of 11.5mmt over the past decade (Figure 10).[34] 2017s 17.5mmt harvest was the largest on record and 2020s 15.5mt the second largest (BFAP, 2020). Just over half of this is white maize, produced primarily for food, with yellow maize primarily for animal feed.[35] South Africa is the world's largest producer of the former, with prices tending to export parity, aside from the 2016/17 drought (BFAP, 2020). Production increases have been driven by higher yields, which more than doubled 1998–2018 to ~5-6t/ha while area planted fell from ~3.5mha to 2.6mha (Figure 10), alongside widespread adoption of GM seeds—~80% of production—mechanization and minimum-tillage techniques.[36] Commercial grain farmers are highly organized through farmers associations, the largest of which is GrainSA.

Figure 10: Maize (yellow and white) production trends, 1998–2018 (Source: DAFF)



[33] Figures estimated by the DALRD Crop Estimate Committee, Census of Commercial Agriculture, Abstract of Agricultural Statistics, author's calculations.
[34] DALRD Abstract of Agricultural Statistics.
[35] Author's calculation from SAGIS data. White maize has averaged 55% of total production over the past decade
[36] Author's calculations from DALRD data.

Consolidation at farm level has been underway for decades—~9,000 commercial grain farmers today compares to 59,000 in the late-1980s[37]—and continues today, accelerated by steep rises in key farm input costs and increasing climatic stresses. Farm employment has fallen significantly as farms have become more mechanized. Consolidation and intensification are expected to continue in the decade ahead (BFAP, 2020). There have also been significant shifts in the geography of maize farming, which are ongoing and have important implications for MSME processors. An effect of pan-territorial pricing during the control board era was to subsidize regions with agro-ecological conditions poorly suited to maize production. Since liberalisation, maize production has become increasingly concentrated in the Free State (Table 8) and an eastward drift is expected to continue in the coming decade as climate change impacts production in dryer western regions (BFAP, 2020).

Table 8: Maize production per-province (Source: DALRD)

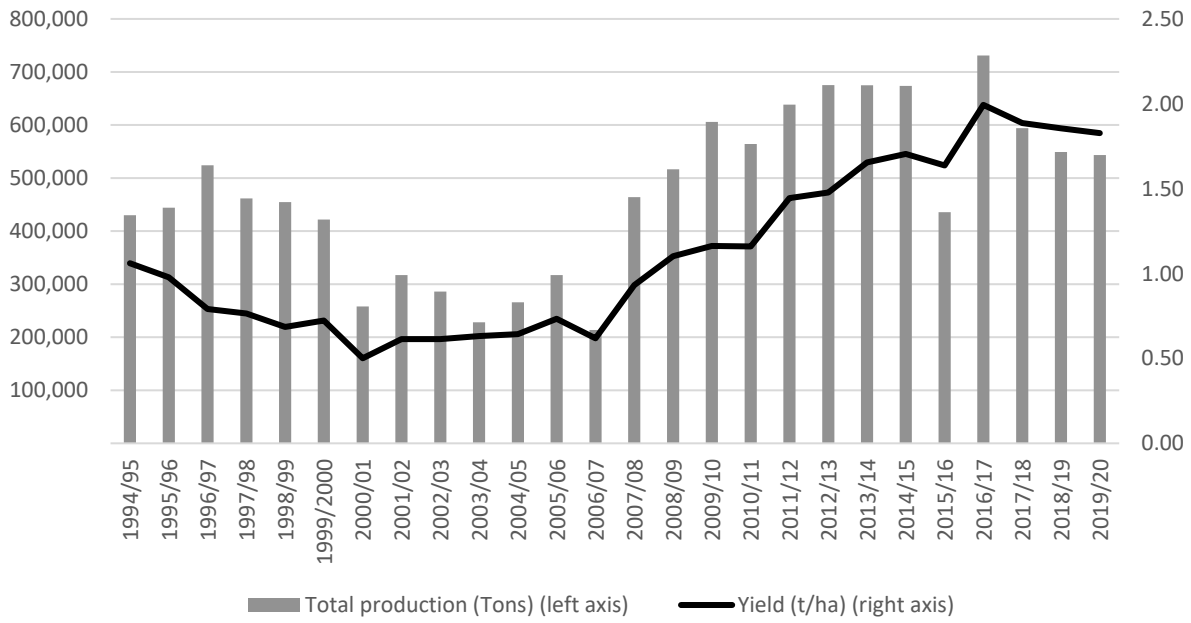
	1986/87 – 1990/91		1991/92 - 1995/96		1996/97 - 2000/01		2001/02 - 2005/06		2006/07 - 2010/11		2011/12 - 2015/16		2016/17 - 2019/20	
	T'000 ave.	%	T'000 ave.	%	T'000 ave.	%	T'000 ave.	%	T'000 ave.	%	T'000 ave.	%	T'000 ave.	%
Free State	2613	31%	2610	34%	3120	37%	3169	34%	4288	39%	4423	40%	5925	43%
Gauteng	429	5%	415	5%	383	4%	438	5%	517	5%	551	5%	676	5%
North West	2745	33%	2189	29%	2611	31%	2521	27%	2399	22%	1961	18%	2336	17%
KZN	330	4%	297	4%	280	3%	377	4%	469	4%	540	5%	698	5%
Mpumalanga	1879	23%	1820	24%	1794	21%	2118	23%	2434	22%	2613	23%	3052	22%
Limpopo	115	1%	84	1%	75	1%	112	1%	197	2%	293	3%	289	2%
Eastern Cape	70	1%	76	1%	41	0%	67	1%	82	1%	98	1%	109	1%
W. Cape	4	0%	12	0%	11	0%	19	0%	28	0%	36	0%	31	0%
N. Cape	120	1%	160	2%	229	3%	511	5%	597	5%	669	6%	677	5%

After falling in the late-1990s, smallholder production has grown considerably over the past decade, driven by increasing yield (Figure 11). There have been a range of support programmes by national and provincial governments and GrainSA to support emerging grain farmers. The Land Bank's role in the post-liberalisation period has also shifted increasingly to supporting this category of farmer. Land restitution, the state's main lever for agrarian transformation, has been of more limited consequence than in many other parts of the agricultural economy because major maize-growing areas are generally not subject to land claims in the way that, for example, Lowveld horticulture has been.

[37] Numbers were 104,000 in 1960, to around 70,000 in the early 1980s and around 59,000 in the late 1980s (Bernstein, 1996a).

Ecological conditions in parts of the former 'homeland' areas of Eastern Cape and KZN are hypothetically favourable to commercial maize production (BFAP, 2020), but farmers here are constrained by, among other things, legacies of severe underinvestment in infrastructure, notably storage.[38] Smallholder maize output does not typically enter mainstream commercial value chains, with quantity and quality required insufficient for the commercial silo and milling industry which, as discussed below, requires Grade 1 maize and safe storage arrangements. It is primarily for home consumption, local informal sales, or, in some rural areas, stored and processed through 'swap' mills, typically micro-scale and seasonal, with which farmers can store grain and withdraw the equivalent milled maize for a fee (Biénabe & Vermeulen, 2011). While marginal to the commercial food system, these activities are still important to food security in poorer rural areas.

Figure 11: Maize production and yield from 'non-commercial' farmers (Source: DALRD CEC)



Intermediating commercial maize production and processing is a highly-consolidated, advanced storage system. Most commercial maize passes through ultra-large-scale concrete silo complexes, of which there are 269 in total with an average capacity of 70,000 tons.[39] For historical reasons there is little on-farm storage capacity, and large-scale mill-site storage entails a range of significant risks, costs and technological challenges if the grain is to be prevented from contamination by pests and dangerous mycotoxins.[40] The silos were built

[38] Interview SAMKI04.

[39] Author's calculations from JSE data.

[40] The marketing board system diminished incentives for millers and farmers to invest in storage, which was carried out by the co-ops (Van der Vyver, 2019; Vink, 2012). Only 8-12% of unutilized maize stock in the commercial system is with processors at any one time (author's calculations, SAGIS data). Interviewees suggested that commercial millers typically only keep a couple of weeks of stock to free-up working capital, and

with state subsidy in the mid-20th Century (section 3.1) and are owned by a handful of large-scale, diversified agribusinesses with operations in other post-farm value chain segments. Control of these assets gives the agribusinesses a central role in chain coordination. Modern storage services are technologically sophisticated. More than simply smoothing seasonality in grain availability, storage providers' function is to turn the heterogeneous outputs of farming conducted in differing agro-ecological conditions, into a standardized, safe and rapidly-accessed inputs suitable for advanced industrial food manufacturing and a functioning futures market. Grain received from farmers is graded, screened, dried to set moisture levels and fumigated. Disputes over grading accuracy, blending of grades and excess moisture content—problems which have a worse effect on small firms, since they are less able to 'blend out' a bad batch—have reportedly been an occasionally a source of dispute and tension between agribusinesses and processors in the post-liberalisation period, but in general firm-level interviews showed there is confidence in the quality of grain accessed through the formal silo storage system (discussed further below).[41]

Of ~17mt commercial grain storage capacity registered with the CDM, 92% is owned by four agribusinesses: JSE-ZARX-listed Senwes (6.3m tons) and Afgri (~5m tons), owned by the Canadian private equity firm, Fairfax, JSE-listed NWK (2.4m tons) and VKB (1.1m tons) (VKB, 2019).[42] There are 33 registered storage companies in total.[43] Concentration increased following Senwes' 2020 acquisition of Suidwes, the fourth largest silo owner, a merger the Competition Commission advised be prohibited due to 'a substantial lessening of competition in the grain storage markets and associated grain trading markets' (Competition Tribunal, 2020a). The agribusinesses are organized through a trade association, AgbizGrain, whose 16 members include all major silo-owners.

All the major storage providers are privatised former co-ops and though expanding nationally and internationally, their storage infrastructure remains regionally concentrated, reflecting their former co-ops' footprint. This has two important implications. First, that storage infrastructure is almost entirely absent in black farming districts (Figure 13) but world class in white farming districts. Second, that given high (and rapidly rising) transport costs which compel processors to locate close to the raw material supply and farmers to store at their nearest silo, the agribusinesses have virtual local monopsony/monopoly conditions in many areas.[44] Senwes and Afgri report 70% and 80% market-shares for storage within their regions

because storage that meets DOH safety regulations is technologically challenging and expensive. Interviews: SAMKI02, SAMKI04, SAMKI06.

[41] Interviews, SAMB03, SAMB12.

[42] Senwes' figure includes 4.8m tons capacity plus Suidwes' 1.5m tons capacity, following their merger (Competition Tribunal, 2020a).

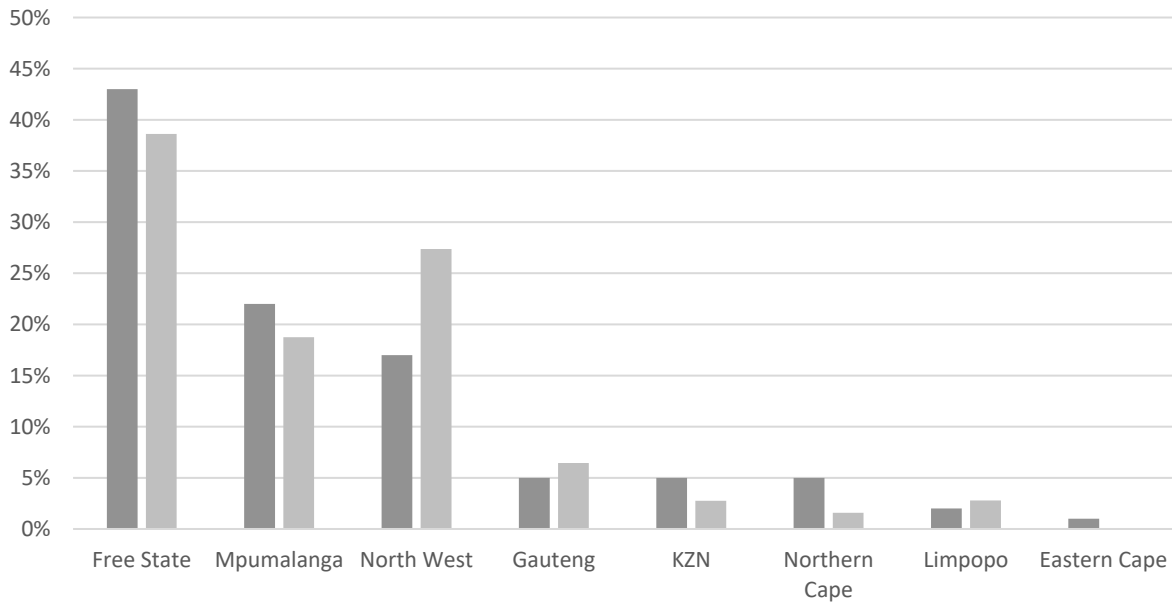
[43] Author's calculations from SAGIS data.

[44] On transport, four-fifths of grain transportation is by road, with rail declining in importance dramatically in recent decades with the deterioration of the state-owned rail network, from around 1/3rd of tonnage in 2006 to less than 10% in 2019. The estimated cost of transporting a ton of maize 25km in the 2019/20 season was R80, up >100% (nominal) from R39/t in 2012/13, R96/t to R161/t for 100km. Author's calculations, data submitted by hauliers to the JSE. These calculations use the assumptions employed by the JSE of a return load

(Fairfax, 2019; Senwes, 2017). Barriers to entry are high because concrete silo complexes are uneconomic to construct; only one has been built post-liberalisation (Senwes Scenario, 2019; van der Vyver, 2019).

This dominance is somewhat complicated by the changing geography of maize production and new storage technology emerging in recent decades: silo locations to a large extent reflect the distortions created by pan-territorial prices, creating the mismatches in Figure 12. Rapidly-assembled steel silos, silo bunkers and silo bags enable new entrants to target underserved high-demand areas or farmers to store themselves (Senwes, 2008/2010/2017; van der Vyver, 2019; Vink, 2012).[45] This potentially threatens agribusinesses capacity utilization (ibid). However, much new investment in 'alternative' storage comes from established agribusiness marginally augmenting capacity in high-demand areas and these firms have a range of competitive advantages in delivering accessible and reliable quality grain alongside a range of interlinked services.[46]

Figure 12: Maize silo storage capacity by province (Source: JSE)



factor of 2, a payload of 34 tons (JSE, 2019). 2012/13 is the earliest year for which comparable data is available.

[45] Interview SAMKI10.

[46] Interview SAMKI06. See also Senwes, 2019; Afgri, 2009; Afgri, 2006. Besides lacking the range of services offered by the agribusinesses, smaller storage providers also have difficulties registering on the JSE-CDM (van der Vyver, 2019). This is due to onerous guarantees required. As van der Vyver (2019) explains, this makes it harder to sell the grain, and means traders will demand higher margins. Agribusinesses have invested in securing HACCP hygiene certification required for entry to commercial retail sales channels, alongside digital stock management, and improved methods for handling, aeration and isolation of milling-quality grain (Afgri, 2009/2013; Senwes, 2008/2009/2018/2019), further raising entry barriers.

This makes agribusiness' silo infrastructure a concentrated funnel-point in the chain and unless farmers or processors develop alternative arrangements to bypass the silos, they will have to use their nearest and incur the associated intermediation costs. These costs provide revenue to the agribusiness as part of a complex business model. The agribusiness' storage divisions do not purchase grain. Rather, producers delivering grain receive tradable ownership certificates enabling future withdrawal of same-quality grain. Grain in silos can be owned by multiple actors, including farmers, processors, and traders (including in some cases the agribusinesses' trading divisions). The certificate-holder pays a storage day-rate, handling fees on entry/exit and a range of miscellaneous charges.[47] A ton of maize can incur charges of several hundred Rands this way, with these charges estimated by the National Agricultural Marketing Council (NAMC) as typically 20% mill-door prices and 7% of maize-meal retail prices (NAMC, 2012). In areas with adequate capacity utilization, annual reports show this to be an attractive, cash-generative business, with reasonable operating margins (Table 9). This was underlined by Stanlib Infrastructure Yield Fund[48] recently purchasing negative control in AFGRI's storage assets (Fairfax, 2019; Competition Tribunal, 2020b).[49]

Table 9: Revenue and profits of major agribusinesses[50]

	Senwes	NWK	Afgri
	(2015-2019)	(2016-2020)	(2017-2019)
Compound annual revenue growth	3%	1%	5%
Average group operating profit margin	13%	11%	3%
Average grain storage/handling division operating profit margin	34%	56%	NA

The silos' importance to agribusinesses appears to reside partly in the complementarities with other divisions, enabling major economies of scope. Agribusinesses provide farm inputs, technical support, logistics and seasonal production credit, the latter with accompanying offtake agreements requiring farmers to store grain in their silos (Ducastel & Anseeuw, 2018). There is also significant downstream vertical integration of agribusinesses in trading and milling. Several own major regional processing firms. Further downstream, some agribusinesses have a significant rural retail presence. Afgri and Senwes have increased their

[47] These can include charges for weighing, administration, instruction amendments and certificate issuance. Charges differ between silos. In 2019/20, the average handling fee among the five largest silo-owners was R47/ton and average daily storage tariff R0.82/ton (van der Vyver, 2019).

[48] A private equity infrastructure investment fund focused on yield assets.

[49] Senwes' Grainlink division, the storage and handling operation from which the silos are housed, is capable of achieving return on capital up to 50% (Senwes, 2017). NWK's silo services achieved an average operating profit margin of 56% in the five years to 2019 (NWK, 2019).

[50] Afgri the profit measure is adjusted EBITDA from continuing operations (Source: Fairfax, 2019); Senwes annual reports, various years; NWK (2020)

lending operations in recent years and are major actors in the supply of credit. Afgri in 2011/12 moved its financial assets to the Land Bank's balance sheet while retaining responsibility for origination, credit and services (Fairfax, 2019). This made Afgri the Land Bank's intermediary for lending to both commercial and emerging farmers, giving it a key role in transformation (Ducastel and Anseeuw, 2018). In 2018, Afgri purchased the Bank of Athens in South Africa, giving it a full banking license (Afgri, 2018). Senwes has also seen steady increases lending over the past decade (Senwes, 2020). These credit linkages create close inter-relationships with farmers, which remain key shareholding blocks in some agribusinesses (Ibid).[51]

Large enterprises at this segment have co-evolved around one another. For storage operators, the attraction and retention of large-scale customers is essential as transaction costs are lower when dealing in large volumes, and there are smaller risks of default on sales.[52] Farmers storing ultra-large quantities of grain can receive volume discounts and repeat customers receive loyalty discounts.[53] Meanwhile, large and medium-scale millers are often situated next to silo complexes, enabling them to be conveyor-fed—~10% of maize is transported this way—thus saving transport costs and enabling use of consignment storage.

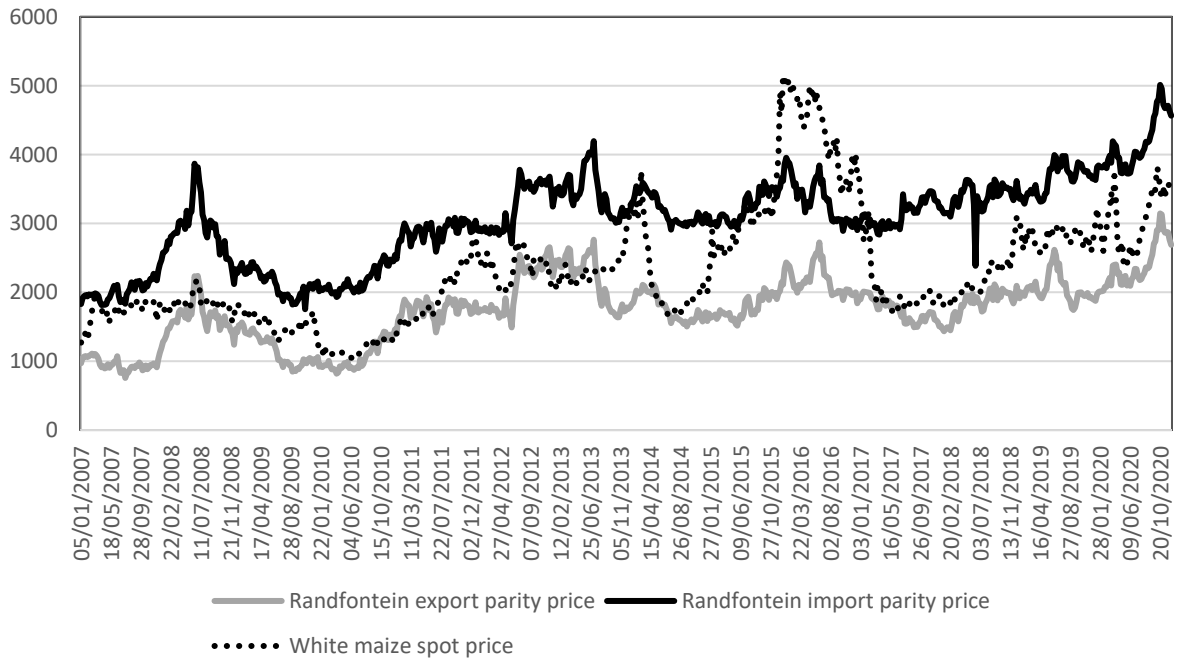
Wider concerns have been raised about agribusinesses' power. Government has raised concerns over silos accessibility for small farmers dealing in smaller grain quantities and critics view them as an obstacle to transformation (Bernstein, 2013; Ducastel and Anseeuw, 2018).[54] Additionally, in 2009 the Competition Commission discovered price-fixing through their trade association,[55] resulting in penalties (Competition Commission, 2011). Senwes, meanwhile, was reprimanded by the Tribunal for applying differential storage tariffs, with external traders charged more than those paid by Senwes' in-house trading division. As storage is a key input for trading services, this impeded competition (Constitutional Court, 2012). Senwes contested the ruling at the Competition Appeal Court, which ruled against the Tribunal (Competition Appeal Court, 2010), leading to the first ever competition hearing in the Constitutional Court, which ruled in the Commission's favour (Constitutional Court, 2012). More recently, the Commission has advised prohibiting two major agribusiness mergers over concerns they would limit competition: the 2020 merger of Senwes and Suidwes, the largest and fourth largest silo-owners and the 2018 purchase of two major medium-scale millers by Louis Dreyfus (see below). The Tribunal permitted both, based on concerns to preserve jobs (Competition Tribunal, 2020a; Competition Tribunal, 2018). The Commission investigations highlighted the important inter-relationships between storage and trading, which is the next key link in the chain.

[51] For example, producer shareholders still hold 12% of Senwes (Senwes, 2020).
[52] Interview SAMKI10.
[53] Interview SAMKI06.
[54] Interview SAG06.
[55] Then Grain Silo Industry (PTY).

The South African maize industry is deeply financialised in the definition of the concept proposed by Hardie (2012) as the ability to trade risk. Commercial maize trading centres around the JSE-CDM's standardized 100-ton derivative contracts, with the futures contracts providing the price discovery mechanism that sets the benchmark price used throughout the industry.[56] Adjusted by location differentials, this determines what most farmers receive for maize and what most processors pay. Trade on the CDM has grown steadily, with outstanding contracts multiple times the volume of physical grain. White maize futures are the most traded contract on the JSE CDM, with most cash-settled rather than delivered. The JSE wields enormous power in contract specification and regulating market participation. As of 2020, 46 firms were registered including agribusiness trading divisions, major international commodity traders like Louis Dreyfus and Cargill, and smaller local trading firms. While some participants are speculators and arbitrageurs, others compete for commissions through mill-door contracts and hedging services.[57] Some interviewees suggested brokers/traders and the agribusinesses favour larger customers which enable them to shift larger volumes, though there is no data available to assess such claims. Agribusiness annual reports suggest the apparent supply of sales credit for large processors, while all MSME processors interviewed purchasing from silos bought maize in cash.[58] Hedging is an important service for processors because the maize price is extremely volatile, driven by local and international supply/demand and the R/$ exchange rate. Climate change is making this worse.[59] When South Africa is a net importer—as is typically the case for yellow maize— prices tend toward import parity and where South Africa is a net exporter—as is typically the case for white maize—prices tend towards export parity price (Figure 13).

[56] A futures contract on the JSE's Commodity Derivative Market (CDM) for the following month delivering/accepting delivery in Randfontein, a municipality to the west of Johannesburg that has historically been a key location for maize storage and processing. In practice.
[57] Interview SAMKI06.
[58] Agribusinesses state in annual reports that they are major providers of credit to the milling industry. Indeed, Afgri in 2006 claimed to be the 'largest financier of the milling industry in South Africa' (Afgri, 2006; see also Senwes, 2008, 2012). This appears significant, because our interviews with MSME processors found that grain purchases were made in cash, suggesting that credit is offered preferentially to larger customers.
[59] Interview SAMKI01.

Figure 13: South Africa maize price, 2007–2020 (R/t) (Source: SAGIS, JSE)



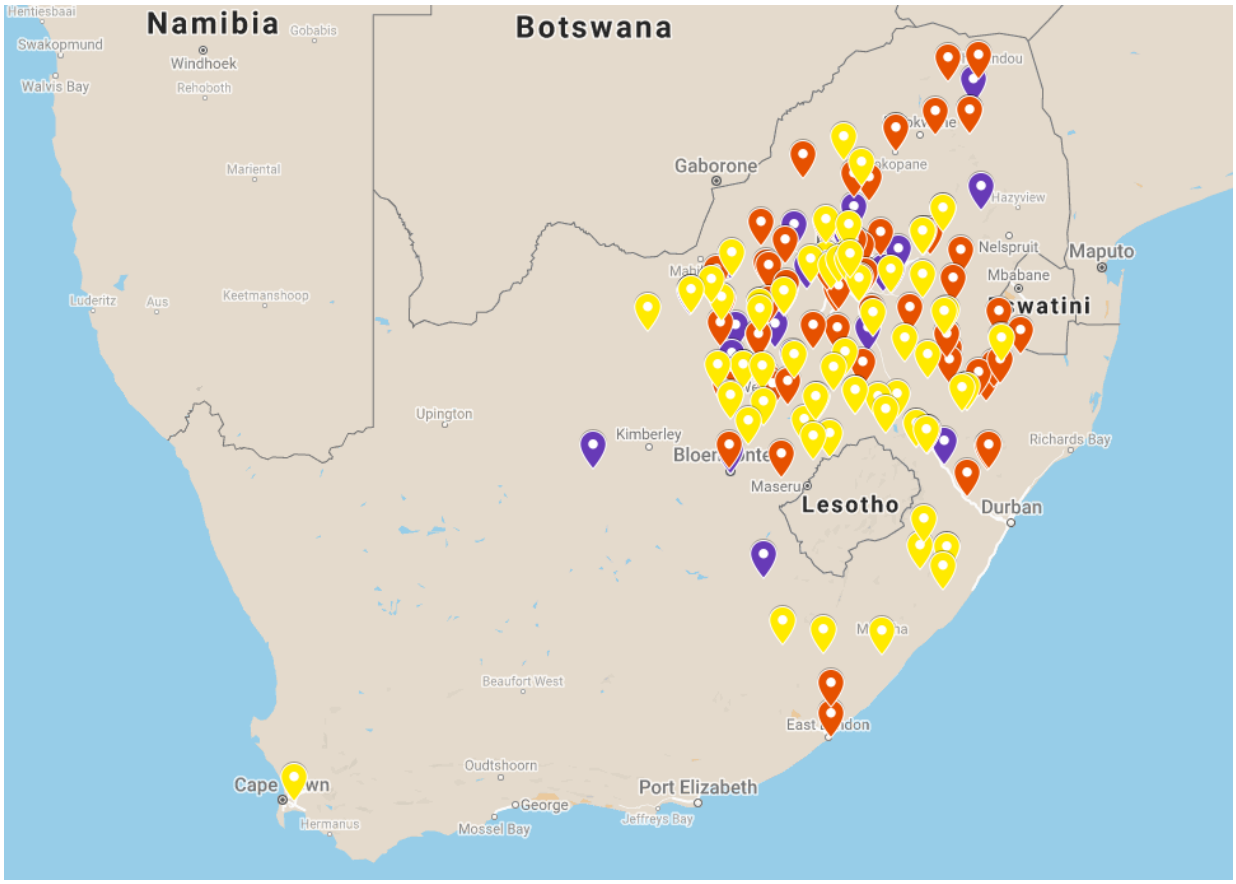
However, the ability to trade risk is not evenly shared. Large firms developed significant in-house procurement capability as a response to liberalisation and make extensive use of derivatives and forward contracts to control price risk.[60] However, interviews with processors found most MSMEs, aside from the more advanced medium-scale firms, not to use these contracts and—leaving aside instances where close relations with farmers enable forward-buying—purchase at the spot price. Reasons for not using derivatives included affordability of margin deposits and transaction costs, the inappropriate size of the 100-ton standardized contracts, financial knowledge and concerns around risk since misuse of derivatives can create major losses. As such, small firms buying from the formal system typically bought on a week-by-week basis, exposing them to price fluctuations. A key overarching challenge for MSMEs is, therefore, managing a raw material with a volatile price, funnelled through consolidated storage and trading nodes with high intermediation costs. Interviews with industry experts and firms show greater exposure to these risks to be a major source of disadvantage for small firms, but that close relational ties with grain farmers offer a potential source of respite.

Maize processing is clustered in the 'maize triangle' and typically within major maize farming districts. During the control board era the use of fixed pan-territorial prices meant large firms therefore located adjacent to major urban centres. Post-liberalisation however, proximity to raw maize is an important competitive advantage given the relative weight/value ratios of raw and processed products. Additionally, processors benefit from close relations with

[60] Interviews SAMKI13, SAMB01, SAMB03, SAMB12, S03, S04, S08, S21, S28.

livestock farmers to sell chop, which rots quickly. The processing industry's centre of gravity has shifted away from urban Gauteng and towards the Free State, which is now the most important province both by output and number of firms (Figure 14, Figure, 15, Table 8).[61] However, there are also a range of processing firms in more marginal maize growing areas.

Figure 14: Location of white maize milling firms[62]



[61] Given the lower weight/value ratio for the raw material as compared to the finished product, it makes more sense to locate near to major concentrations of maize silos. Free State is the home base for a number of new medium/large-scale milling firms, and the location of Premier's single milling facility, reportedly the largest mill in the southern hemisphere.

[62] Key: purple pins = top 20 largest firms by output; red pins = 21st-50th largest firms by output; yellow pins = small milling firms (51–187).

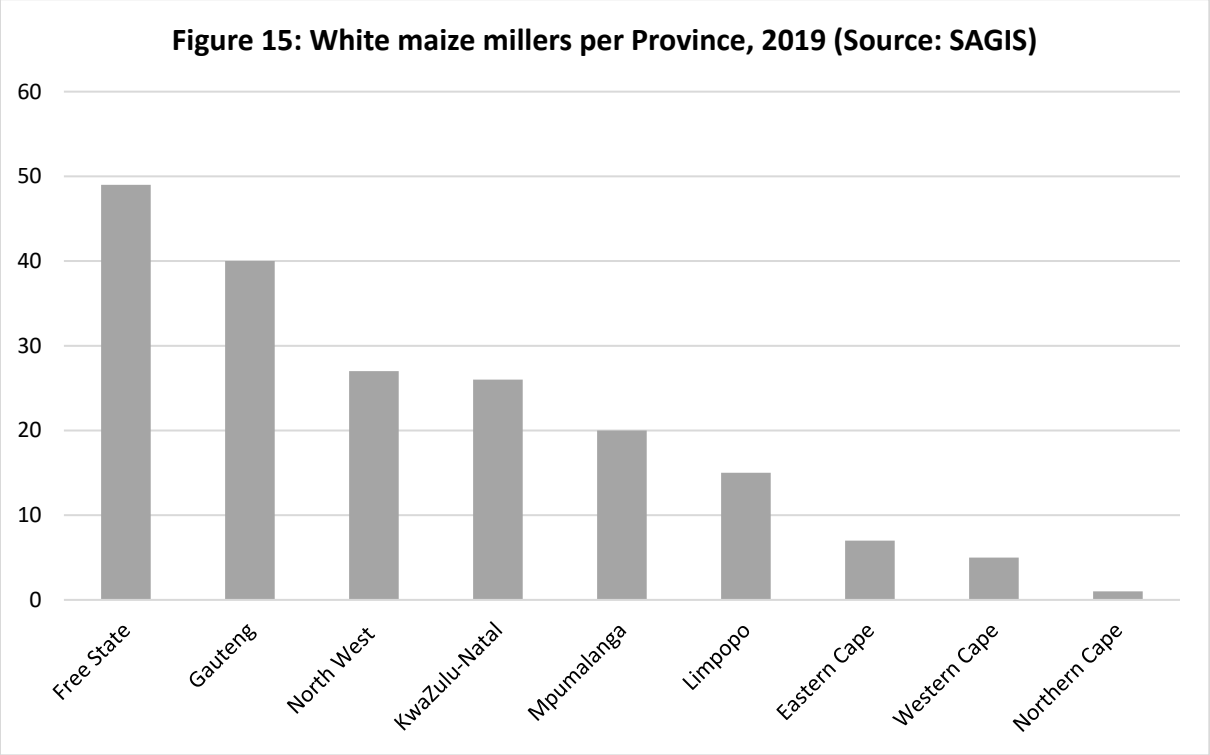


Table 10: Maize processing for human consumption and gristing, 2011–2020 (Source: SAGIS)

		E & W Cape	Free State	KZN	MP	Limpopo	Gauteng	Northwest	Total
2011/12	T	309,354	1,029,052	345,938	362,841	446,178	834,566	904,235	4,232,164
		7%	24%	8%	9%	11%	20%	21%	100%
2019/20	T	235,250	1,589,290	292,091	602,276	399,058	806,144	1,132,767	5,056,876
		5%	31%	6%	12%	8%	16%	22%	100%

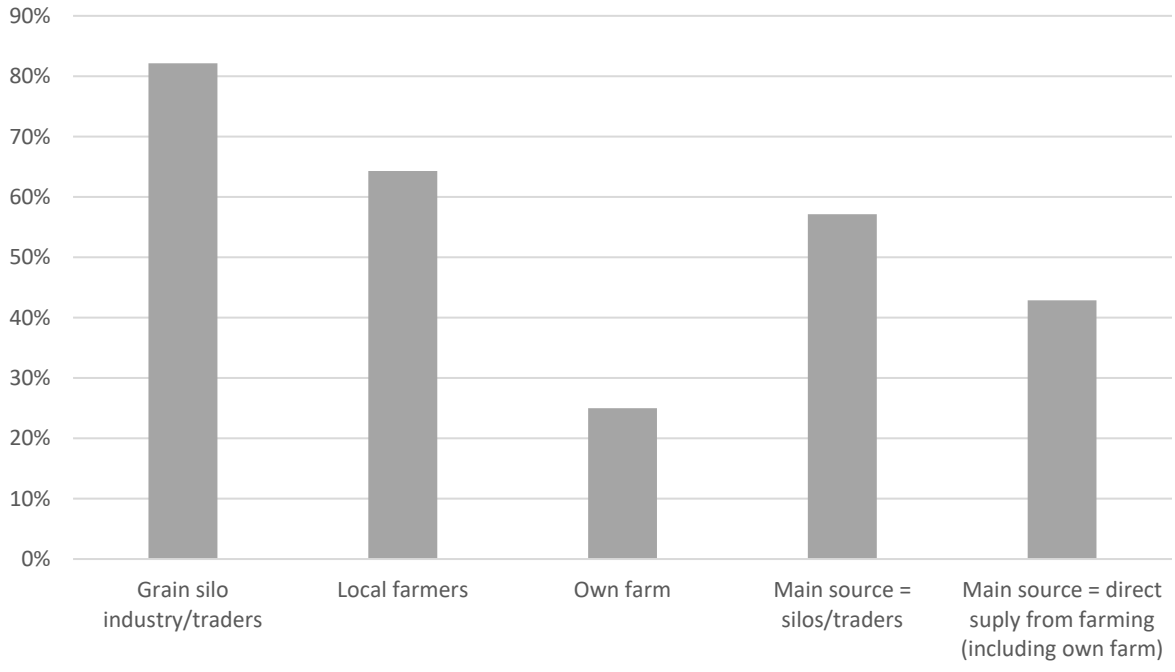
The spatial reconfiguration also reflects entry by grain farmers to the milling industry. Firm-level interviews explored the historical origins of firms, and while not a representative sample, a striking finding was the importance of farming—and to a lesser-extent other activities in the maize value chain—as an entry point to agro-processing. Eleven of 28 interviewees entered maize milling from commercial maize farming, using owners' capital accumulated in this activity; this included almost all the more dynamic medium-scale firms and resilient small-scale firms. A further seven entered processing from grain trading or related agribusiness, and in multiple instances mills were set up in cooperation with local farmers. Expert key-informant interviews and desk-research on the 20 largest processors confirmed many of the more

successful, fast-growing medium-scale firms to have entered the industry since liberalisation had done so from maize farming.

Knowledge derived from prior experience at a different stage in the value chain emerged as an important resource. But ties with maize farming, either through outright vertical integration or long-standing trust-based relationships, provided key advantages for both in terms of managing the maize sourcing challenges discussed above. Specifically, providing means of mitigating price risks and capturing value otherwise lost to intermediary enterprises.

Among the firms interviewed, the agribusinesses remained the most important source of grain supply, but 2/3rds sourced maize directly from farmers, and 40% as their main source; just under half of these included supply from small-scale farmers, highlighting an important role played by MSME processors in providing emerging farmers routes to market (Figure 16). Even if not accounting for the majority of the grain supply, interviewees described advantages deriving from this. These included, avoiding charges associated with storage, handling and trading from the intermediary firms discussed above (for both farmers and processors); use of forward contracts to mitigate price risk and gaining more options on how to profitably dispose of grain, particularly when prices are low. This optionality in means to dispose of grain in a volatile, unpredictable market has also been a key motivation for trading firms interviewed to move into processing; as discussed below, this trend has recently seen Louis Dreyfus, the multinational commodity trader, purchasing two large milling firms (see below).

Figure 16: Source of grain supply among firms interviewed (n=28)



Even in established maize producing areas in the maize triangle, where there is easy access to well-supplied silos, medium-sized firms reported difficulties with silo companies having an

effective local monopoly. As one explained "[t]hey [the founders] were looking to add value to own maize, because of the problem of the price differential with [agribusiness name removed], and what they pay farmer, the handling fees etc. The only option for farmers in the local area is [agribusiness name removed] so they wanted to, bypass the silos."[63] An individual case of vertical integration is described in Box 1.

Box 1: Vertical integration in milling

The farming family that owned S11, a small-scale milling firm in a marginal maize growing area, had entered both maize farming and milling in the 1990. They farmed over 1000ha of land, using large on-site storage silos which stored the annual harvest to be milled over the year, purchasing from local agribusinesses' silos when farm production was insufficient to run the mill efficiently. They explained that without this arrangement, they would have to store with the agribusinesses and in their local area [agribusiness name removed] had a monopoly in practical terms given the distance to rival silos. The agribusiness would charge handling fees, admin fees, sieve the maize to work out percentage deductions for waste product, and also adjust the weight of the grain to bring it to the acceptable moisture level of 12.5%. Their estimation was that they would be losing R300/t of maize if they were selling it to the silo. They explained, "Instead of losing that, it's better to bring into your own facility and store it. But to do this, you need to also have your own market for the maize" – in this case milling provides that market. Because of these challenges, they suggested—as did several other interviewees—that more commercial farmers were pursuing downstream vertical integration to bypass intermediaries, capture a larger share of the value, and gain greater control over marketing. "Also" they explained "this is nice as I do not have to trade in Safex [JSE-CDM], I don't have to worry about Safex." Meaning there is less concern about short term movements in the market price and the difficult decisions around timing that other farmers face.

Governance of the large-scale silo/trader channel is market-based, with arms-length transactions of a standardised commodity with standardised fee structures. Governance of chains with direct farm-mill supply was more 'relational', with the opportunity for bargaining, negotiating and modification of transactions. One medium-scale miller, whose business model was orientated to avoid using the agribusinesses, described the advantages of longstanding relations with local farmers as follows: "The local farmers, [buying from them] it suits us, you can speak directly with them, tell them the crop and cultivar we want, [and we] know we get a good quality of maize in ... some guys say "maize is maize" [but] then you get the soft maize, or poor quality maize from the silos where [agribusiness name removed] has mixed it."[64] Another described how longstanding relationships with local farmers meant advantageous payment terms, and the ability to use maize for several months before paying farmers.[65] Interviewees overwhelmingly said they had to purchase maize from silos with cash rather than credit, creating cash-flow problems given the reverse typically goes for retailers.

Industry experts interviewed widely suggested that the most effective way to support new small-scale processors was through vertical integration with maize farming enterprises or cooperative ownership by farmers and government schemes funding small-scale milling

[63] Interview S21.
[64] Interview S21
[65] Interview S24.

enterprises have frequently followed on this logic. However, while there are major benefits to these close ties to maize farmers, interviews also revealed major risks. Processing consistent, commercially competitive maize products, in particular 'super' maize-meal, relies on high-quality, Grade 1 maize. Accurate grading and quality control is potentially jeopardized when (a) there are lower levels of trust and (b) lower levels of farmer capability. Safe storage requires significant investment and expertise. Processors buying from small farmers had encountered serious problems with these issues. As one struggling micro-scale miller in a marginal maize growing area explained, buying from small farmers often involved problems with quality: "We were battling to get quality right. When it is fresh it is fine, but later they bring stale mealies, or they bring it mixed [with contaminants], they do not clean it, bad mealies are mixed with good mealies and the whole batch goes bad. The meal was going rotten quickly in 3–4 weeks" because the maize moisture content was too high.[66] Bad batches of maize-meal produced from this had lost them several key retail customers, a difficulty reported by other firms in similar circumstances. For processors in more marginal maize growing areas, direct purchases from farmers were made more from necessity than choice, given the distance to silos. This created major risks, since supply from smaller-scale farmers in the marginal maize growing is also less predictable. Making up a deficit from maize trucked to rural areas of the Eastern Cape or Kwa-Zulu Natal from the maize triangle could cost, interviewees reported, up to R700/t, making the product uncompetitive on price.[67] There are therefore important clustering effects or external economies for MSMEs with a maize triangle location, with the option to both buy reliable quality at a cost from agribusinesses and to develop mutually advantageous ties with large-scale commercial grain farmers.

4.3 Downstream value chain linkages: retail and wholesale

Retail channels through which maize meal and other major processed maize products are sold differ radically from one another, with major implications for MSME processor participation. Most analysts describe South African grocery retail as bifurcated with a 'modern' supermarket channel and a 'wholesale-informal' channel, sometimes misleadingly referred to as 'traditional', in which independent micro-scale retailers (often called spazas) are supplied by wholesalers (Euromonitor, 2020a; Das Nair & Chisoro, 2016; Greenberg, 2017, Competition Commission, 2019). Strict formal/informal distinctions are also hazardous, since the 'informal' sector is so tightly linked to the formal, with spazas sourcing goods produced by major corporate processors from formal wholesalers and supermarkets (Greenberg, 2017). While generally overlooked in policy discussions, the wholesaler-informal channel is critically important to the food system, with R223bn sales through 97,926 outlets comprising ~1/3rd of grocery retail (Euromonitor, 2020c).[68] Its 2014–19 compound annual growth rate (CAGR) of

[66] Interview S13
[67] Interviews S26, S18, S17.
[68] Estimates vary, with Ogando (2014 in Greenberg, 2017) suggesting these traditional retailers have 56% of the market.

7.8% was faster than overall grocery retail's CAGR of 6.9% and supermarkets' 6.4% (Euromonitor, 2020a,c,d). Small-scale retail outlets (spazas) increased in number by 31% 2014–2019 (Euromonitor, 2020c). The wholesale category includes a range of entities, including large chain operators under Massmart, [69] specialist buyer groups serving small retailer members [70] and independent wholesalers operating in local/regional markets. Although many run hybrid wholesale-retail business models, their main function is supplying spazas and hawkers, with Massmart estimating 90% of its products are re-sold this way (Euromonitor, 2020c; Competition Commission, 2019). Among small retailers surveyed by the Competition Commission, 86% bought maize-meal from a wholesaler, restocking once a week or less, with only 3% purchasing on credit (Competition Commission, 2019).

The most important change in the post-liberalisation period has been the growth of supermarkets and corporate chain retailer-wholesaler hybrids, which have expanded into new markets in rural and township economies. The supermarket channel is highly consolidated, with outlets owned by three firms comprising 80% of sales.[71] Maize-meal is their single most significant product category by quantity purchased (Competition Commission, 2019). Supermarkets dominate among middle-income urban consumers, but play a major provisioning role across all income groups and are increasingly prevalent in peri-urban/township and rural markets. Consumer surveys for the Competition Commission's Grocery Retail Market Inquiry (GRMI) suggest 80% of consumers purchase maize-meal from supermarkets, which are used for weekly/monthly bulk purchases of long-life products.[72] Spazas are more commonly used for convenience purchases and perishables (Competition Commission, 2019, 93). Supermarkets typically supply maize-meal at lower prices than spazas. The Competition Commission (2020b, 106) found a 40% (R15) difference for 1kg bags. The price differential between supermarkets and small independent retailers was corroborated by our interviews with processors, who relayed even higher selling price gaps for more rural spazas. Major retailers have also been expanding their private-label maize-meal offerings, typically sold for well below the prices of the branded products of the large-scale processors (Euromonitor, 2020d). This derives from fierce price competition among supermarkets using maize-meal as a loss-leader/footfall-driver and enabled by advanced logistics (e.g. centralized

[69] Currently, there are three main companies which operate within cash and carry/wholesaling in South Africa: Massmart Holdings through its Makro brand, which is operated partially under the cash and carry format; the CBW, Jumbo, Shield and Furnex brands under the retail buying group Independent Cash and Carry (ICC); and MetCash Trading Africa (Competition Commission, 2019).

[70] The main buyer groups are EST, ICC, IBC and UMS. Their function is chiefly to procure from food manufacturers on more favourable terms for their members, achieving economies of scale for their members. However, some also offer a range of other services such as skills training, credit and sales support (Bosiu et al, 2017; Euromonitor, 2020c).

[71] 2019 data from Euromonitor (2020d), with Shoprite 38.9%, Pick n Pay 22.3%, and Spar 18.9%.

[72] A similar proportion of respondents as for maize-meal reported purchasing sugar and cooking oil from supermarkets (Competition Commission, 2019, 93).

distribution centres, just-in-time stocking) and the exercise of buyer power over suppliers (Competition Commission, 2019; Bosiu et al, 2017).[73]

Getting listed as a supplier for major retailers provides access to huge markets and simplifies processor logistics, but entry barriers are high. Supermarkets have typically sought to streamline supply chains with a small number of trusted large-scale suppliers providing consistency and volume. They require exacting, costly private hygiene standards[74] that go well beyond legal minimums, and financially demanding trading terms with long repayment periods and a complex array of rebates, charges and discounts which can add up to 20% of the sale price.[75] Major chain retailers' bargaining power enables them to extract more favourable trading terms than other buyers –even the largest maize processors with leading brands struggle to walk away from negotiations (Competition Commission, 2019; Bosiu et al, 2017). Major processors have sales staff dedicated to managing relationships with major retailers to maintain relationships and manage contractual complexities.[76] Large rebates and charges increase retailer margins and enable them to lower costs for consumers in inter-retailer competition, but this is at the expense of suppliers as costs and risk are passed back up the chain (Competition Commission, 2019). Supermarkets' argument is that, besides benefitting consumers, the rebates enable the sophisticated centralised distribution centres that lower suppliers' logistics expenses, though there is little transparency on this issue (Ibid). Besides the costs, the major challenge for suppliers is around speed and frequency of deliveries, as supermarkets have increasingly moved to a 'just-in-time' model with much shorter stock cycle times.[77] Supermarkets also increasingly request B-BBEE certification, which creates hurdles for some white-owned firms (see section 7.3).

MSME processors rely heavily on the wholesaler-informal channel. Strikingly, among the sample of MSMEs interviewed, only 40% had supplied a major national chain retailer or wholesaler and in no case was supermarket retail the main sales channel by value. Those that had recounted negative experiences with the supply of major chain retailers, with widespread concerns about exploitative treatment and aggressive exercise of buyer power to extract value through rebates and credit terms. Where interviewees were willing to divulge, rebates for supermarkets/chain wholesalers were typically larger, ~12%–20%, compared to <10% for independent wholesalers that charged rebates. Besides the rebates interviewees described a miscellaneous range of additional charges, widely perceived as onerous and unfair, and demanding returns policies, amounting to up to 2% of stock in some outlets.[78] Interviewees with experience working for larger processing firms expressed similar concerns, noting how

[73] Interviews SAMB01, SAMKI13
[74] Typically, HACCP and FSSC22000, which can cost up to $10,000 per year to maintain (Bosiu et al, 2017), alongside requiring significant investment in modernization of facilities and staff training.
[75] Alongside conventional rebates and returns arrangements, this can include listing fees, advertising fees, distribution allowances (Competition Commission, 2019)
[76] Interview SAMB12.
[77] Interview SAMKI13.
[78] Interviews S03, S21, S04, S14, SAMKI11.

retailers would seek to rapidly recoup any margin gained by processors from a fall in the maize price.[79] As one former large firm employee explained, "The buyer from Checkers or Shoprite, they watch the maize price on Safex. If the maize price drops he will be on the phone immediately asking you to drop your price".[80] Requirements to sell on credit with long repayment periods was the other major difficulty, with repayment terms of 30–45 days, whereas, as mentioned above, maize was typically purchased in cash by MSMEs in the absence of vertical integration or forward contracts with farmers. As such, participation in chain retailer supply chains means being able to compete through balance sheet strength as well as in more conventional price and quality dimensions. Even with investment in brands, MSMEs were essentially price takers when selling to major chain retailers and wholesalers. Chain governance in this channel is best understood as 'modular' in character (see Gereffi et al, 2005) with formalized, codified specifications for generic products and multiple capable suppliers that bear full responsibility for the production process. Consequently, such suppliers faced the credible and constant threat of switching.

Supplying private labels offered a key pathway to enter major chains' supply systems, with major volume opportunities and the potential to build relations with major retailers in the hope of progressing to a branded product. However, alongside low margins and the high risk of switching, this route carries the additional potential risk of having no established brand to fall back on in the event of losing the private label contract.[81] Large firms with established brands reportedly avoided supplying housebrands for this reason, with one interviewee describing them as "totally cut throat".[82] Further perspectives from interviewees on the difficulties of dealing with major chains are in Box 2.

[79] Interviews SAMB01, SAMB12, SAMKI13.
[80] Interview SAMB01.
[81] Interview SAMKI11.
[82] Interviews SAMKI13.

Box 2: The challenges of supermarketisation

One former employee of a major milling firm described the changes in retail post-liberalisation: "Their [supermarkets'] offtake grew dramatically, the chain stores, because of the inward population growth. They started having a far bigger share of the sales to consumer, both in chain stores and wholesalers. So one spent a great deal of time with them, as they grew their importance, we spent a lot of time. I was at various head offices for each of them." Even for large-scale firms, the relationship with supermarkets was challenging, they said. "You are required to bend over backwards to accommodate the store, it is very difficult, not just giving the best prices, but the rebates on top, the promotional activity, a further incentive, being prepared to take back the product if they don't manage in-store hygiene – maize-meal is the first thing that goes off and gets infested. The same applies to negotiations around price. The first thing you would have to do is become listed as a supplier, and then enter into supply agreement, including trading terms, rebates, settlement discounts, promotion discounts, the list is endless … I don't remember a time during my employment where there was not pressure from retail and wholesale trade, but what happened [in the years following liberalisation] was the pressure got greater as the companies grew… The pressure only increased as they became larger and more powerful, and you as supplier realised you were either in there and providing the service, or out… You were negotiating with a much smaller number of people, and with no alternative either." MSMEs that had experience selling to major chains complained about the range and extent of charges, and the financial pressures this generated. As one medium-scale firm explained, "If you are not long in the game, they take chances. They call it [charges] a 'shelf fee', they want for every store R30,000. They just want them. If you are not big in the business or not a smooth talker, it is a lot of money to just list… The retailers are playing us off against one another."

The MSMEs interviewed instead were overwhelmingly orientated towards low-income retail channels, either indirectly through independent wholesalers, or, in the case of smaller firms, directly to small shopkeepers and members of the public purchasing directed from the mill. Independent wholesalers and spazas were the most important sales channels by value. Fifteen of the 28 MSMEs also made direct sales to customers from the mill site itself. While medium-scale processing firms typically target specific regional markets as their primary market—often distant from their manufacturing location—in which they establish strong relationships with wholesalers, micro/small firms were selling into highly localized markets, geared primarily towards the informal retail sector. Interviewees suggested transporting without bulk transport to be uneconomical beyond an 80–100km radius. Outside of this, it was more economical to outsource transport to specialized companies since trucks would need to be full on the return journey to be economical. Small/micro scale mills in such markets will typically own their own trucks and distribute within the local area, with the ability to distribute effectively a major source of competitive advantage in dealing with small retailers that don't keep lots of stock and require rapid-restocking at unpredictable intervals.

Table 11: Geographic markets accessed among MSME processing firms interviewed (n=28)

Sales only within home province	Sales mainly outside home province	Sales within home province	Sales outside home province	Nationwide	Exports
57%	21%	96%	36%	0%	29%

Rather than being viewed as a default option for firms unable to supply the major chains, interviewees explained that these channels had key advantages for smaller firms. Besides being less demanding in terms of standards, the more even bargaining power meant lower rebates and less stringent conditions. These channels put less pressure on cash-flows given typically shorter credit terms, or—in the case of sales at the mill-site or direct to spazas—spot-market cash-based transactions. Interviewees suggested independent wholesalers offering credit terms of 1–2 weeks, while for spazas the ability to offer any form of credit term is attractive.[83] Price pressure is less intense, with smaller retailers having less bargaining power and larger firms disadvantaged by long distances in rural markets and complex 'last mile' distribution in townships. Box 3 provides an example of this in an urban area. As one small firm described, "the more rural you are willing to go, the higher up into the mountains you are willing to go ... the less competition affects you. The bigger mills are not going to deliver to mud huts in the mountains ... the gross profit you can make there is larger. You are going to areas nobody wants to go, and so you up your price a bit".[84]

Buyer-supplier interactions described by interviewees operating in this wholesale-informal channel were more complex and transaction-specific. The smaller bargaining power imbalances and autonomy of owners presented opportunities akin to 'relational contracting', described by Hyami (1998, in Otsuka, 2007, 229-230) as "long-term, continuous contract relations, that are enforced and maintained by personal ties, mutual trust, [or] community obligations." An example is elaborated in Box 3.

[83] Interviews S09 , S10, S12.
[84] Interview S11.

Box 3: Relational contracting in the wholesaler-informal channel

The interviewee's firm had been in operation for 30 years, formed during the liberalisation period of the 1990s to operate in a densely populated township area. It had grown in phases, financed with retained earnings, to become a medium-sized firm. It ran a highly labour-intensive business model, opting not to automate packaging as with many other medium-scale firms due to costs. Their approach centred on serving the local market within 4–5 miles of the mill, and they specifically wanted to avoid playing in the national market, and opted never sell to supermarket retailers or major wholesalers. They instead sell to local spaza shops. They faced continual competition from larger milling firms that target urban areas, but sought competitive advantage through dense, relational ties with the local retail system. In particular, they ran their own distribution direct to spazas using a fleet of small vehicles – people coming to buy small volumes directly from the mill. The efficiencies of the model and the low distribution cost meant pricing R20 below the major brands for a 12.5kg bag. A brand built up over the decades was well-known among the local community, and the texture was adjusted to the tastes of the predominant ethnic group. Attempting to sell to supermarkets was, in the owner's view, somewhat fetishized. It is also an explanation for the failure of many small-scale millers, he believed. Instead of selling on credit, the mill ran as a strictly cash business, taking immediate payment from customers at point of delivery to minimise risk. Supermarkets, he said, could take months to pay. It also helped minimise the risk of spazas not paying back at all, which was a common issue given high failure rates and xenophobic attacks on ethnic minority shopkeepers.

While the wholesaler-informal channel was in many respects more accommodating or even advantageous to smaller firms than the major chains, it is nonetheless important not to romanticize the informal retail system or present it as somehow an 'easy' opportunity. Large firms also sell into the same markets, indirectly through major wholesalers which small shop owners purchase goods from. Given the price sensitivity of consumers and the presence of competitors, there is still fierce price competition. The more 'relational' contracting required to compete in-turn requires considerable organisational, marketing and distribution capabilities. Interviewees describe significant transaction costs in managing frequent, irregular resupply (smaller retailers keep little stock)—typically using the processors' own vehicles, sales agents, or WhatsApp groups.[85] Effectively managing credit relations with a large number of highly precarious buyers also required considerable skill, and carried major financial risks. Personal relations matter, with values like "trust" and "loyalty" raised as important, and strategic leniency or preference for favoured clients, but these take time to establish.[86]

Informal retail entry barriers are low and business failure rates high and small retailers are frequent victims of crime. In particular, multiple interviewees pointed to challenges relating to the extensive foreign ownership of informal retail outlets. Shop-owners lacking legal status made it hard to recover debts through formal channels. Xenophobic violence against small

[85] Interviews S05, S09, S10, S11, S12, S17.
[86] Interviews, S11, S12, S23, S24, S26, S27 , SAMB02.

shopkeepers was highlighted by interviewees in multiple parts of the country, including KZN, Gauteng, Mpumalanga, North West and Limpopo, in both major urban areas and smaller rural service towns.

Evidence from the GMRI suggests foreign-owned small retailers are typically more competitive than locally-owned shops, using vertical and horizontal cooperation strategies with other retailers and wholesalers within migrant communities to facilitate bulk purchasing and logistics (Competition Commission, 2019). These additional risks are on top of the transactional complexity of supplying large numbers of small buyers (Box 4).

Box 4: The challenges of informal retail channels

Firm S23, a medium-sized miller in a regional service centre, described changes in their local retail context during recent decades: "What happens is that a lot of small malls are opening, in all the areas. These malls, they do have a PicknPay, a ShopRite, a Spar ... In these areas, we had our old-fashioned customers. Because of competition with malls they could not survive, a lot of them, I would say 80% [of 400 retail customers] closed down, in the space of about 5 years ... all the black-owned retail businesses stopped". Instead, he says, the informal retail sector became dominated by migrant shopkeepers, who "are extremely dangerous for doing business with". He explained that "They [retailers] will fill in a credit application ... but today you are there at his shop, the next day, you ask where is the owner, they say he went [returned overseas] ... That happened every day, people just running away." The firm had incurred large losses in unsuccessful attempts to recover debts. Firm S24, a small-scale milling company in a rural area, explained that when selling on credit to multiple small retailers "You can set up a big debtors book that you never get rid of. The cash locked up there can destroy your business in 6 months". They had changed the way they operate to guard against this risk: "We start the relationship by paying cash and building relationships before extending credit. It's like a circle, you have over-extended to a client, because of the amount they owe you, [and] they leverage that to get more. My new rule is not to supply them at all until their account is settled. [otherwise] They amalgamate buying power… It's almost like micro lending!" They had established a trusted group of mostly female buyers, and were seeking to "micro-manage" their debtors book to secure repayment. Firm S11, a small- scale milling firm in a rural service town, explained: "The difficulty is selling on credit to new buyers. When we go into a new area, they do not have cash to buy up front. The granting of credit is a challenge, we have lost so much money ... in many cases, we are giving credit to a guy who does not have an ID book. most of the shop owners are foreign nationals, many [nationality removed], many are here illegally or on refugee status." The main model employed was 'one in one out'… "but that first delivery is always high risk. That holds us back. If I wanted to double production, I could do it next month" but the challenge is finding reliable customers. There is, they explained, a high risk selling in these low-income markets, but it has its advantages over wholesale. "Those guys [large wholesalers] they slaughter you on margins, they are always on you for cheaper stock, rebates, you end up making hardly any money. If you are willing to sell on credit to rural stores, you make far more profit, but you have high risk."

The wholesaler-informal channel is overlooked in terms of the importance to the food system and the productive opportunities offered to MSMEs. It is also increasingly threatened by the expansion of major chain retailer/wholesalers, whose buyer power is a competitive

advantage over smaller retailers (Competition Commission, 2019).[87] and who are seeking to expand further into rural and township markets. This is usually through specialist discounters (Shoprite's 'U-Save', PicknPay's 'Boxer') and malls with lease exclusivity agreements blocking other grocers (Competition Commission, 2019; Euromonitor, 2020b).[88] Such encroachments typically create a decline in the number of independent small retailers in the area (Ibid). Shoprite and PicknPay have also recently launched small-scale retail operations to further penetrate these markets.[89] For processors in the midstream, this effectively de-localizes food markets; the highly efficient distribution systems of the chain retailer/wholesalers can, even for bulky, low-value goods like maize-meal and corn snacks, bring the advanced, mass-produced wares of distant large-scale firms into more direct competition with the more rudimentary products of smaller rural and township firms.

5: Large/small firm relations

Having explored vertical linkages in the previous section, this section explores horizontal relations at the processing segment of the chain in terms of the varying forms of competitive strategy pursued by different types of firm and the relations between large and small firms. The latter is particularly important in the South African context given the consolidated nature of the industry resulting from historical processes discussed in section 3.1. Even if not competing directly, large firms shape the environment in which MSMEs operate in a variety of ways, not least in terms of shaping norms for product quality. However, as discussed in the previous section (4.3), the growth of chain retailers and wholesalers' distribution networks means that they do increasingly compete head-on. As is explained below, there are particular activity-specific competitive advantages deriving from scale and scope, and large processing firms can be seen to have 'co-evolved' (Reardon & Minten, 2021) around the other powerful large-firm actors at upstream and downstream segments described in 4.2–3, to develop key complementarities and forms of countervailing power.

5.1: Competitive strategies of large firms

Size is a relative concept and understandings of what constitutes 'large' or 'small' firms differs across contexts, not simply according to differing legal definitions but to industry specifics. As mentioned in 3.2, the white maize processing industry is mature and consolidated, with 20

[87] As the GMRI notes, "[t]hrough linking the rebate to these costs and activities, it effectively results in the wholesale channel (specifically Buyer Groups and wholesalers) being denied such rebates as they do not perform these functions. However, their customers, the small and independent retailers, and in particular spaza shops, do incur these costs and also do not benefit because there is no direct relationship with the suppliers or only a limited relationship. The net result is that these smaller stores are placed at a disadvantage relative to the national retail chains whose costs are reduced through additional rebates" (Competition Commission, 2019, 248).

[88] According to the Competition Commission's survey research, 80% of consumers access supermarkets through mall complexes, which typically have exclusivity clauses in the leases (Competition Commission, 2019). The aforementioned discounters added 100 new stores between 2014–19, with 387 outlets (Euromonitor, 2020b)

[89] This includes Shoprite's U-Save e-Kasi and PicknPay Spaza.

firms accounting for 80% of output. Within this the four largest, Pioneer, Premier, Tiger Brands and Pride, produce around 40% of output, from less than 10 ultra-large-scale mills. Premier, the largest, operates only one maize mill—down from a peak of 14—which is the world's largest.[90] This section focuses specifically on the first three of those firms, Pioneer, Premier and Tiger (hereafter, 'the big three'), which differ not only quantitatively in terms of size and (close to) national reach, but qualitatively by their position in highly-diversified, multinational food conglomerates.

Each originated in colonial South Africa, evolving through decades of complex M&As and restructurings, which continued post-liberalisation. Milling has been ever-present in the shifting group structures, and continues to play an important strategic role. JSE-listed Tiger Brands is the largest fast moving consumer goods (FMCG) company in South Africa, Premier is owned by Luxembourg-based holding company Brait, controlled by retail mogul Christo Wiese, and Pioneer, formed from cooperatives in the post-liberalisation period, is now owned by US multinational PepsiCo as its "springboard into Africa" (Pioneer, 2019, 11). Since liberalisation, they have pursued growth and diversification into more high-value branded/packaged groceries and (with varying success) internationally into faster-growing African markets (Brait, 2019, Tiger Brands, 2018, Pioneer, 2019). This has involved extensive M&A activity and significant capital expenditure.[91]

[90] Company website. orientated towards human consumption, there may be larger feed mills

[91] In which the firms collectively spent R15bn on 41 acquisitions. Tiger brands has spent around R10bn on acquisitions, conducting 18 purchases and 14 sales. Pioneer has spent around R3bn on acquisitions, and has conducted 15 purchases and 4 sales. Premier has completed 8 acquisitions since 2011, at a cost of around R2bn (Data from S&P CapitalIQ). These are predominantly bolt-on acquisitions of existing food companies with established capabilities and brands. Pioneer runs a 'ventures' division investing in promising small businesses which gain access to the company's operating platform (Pioneer, 2019).

Table 12: Key figures on the big-three[92]

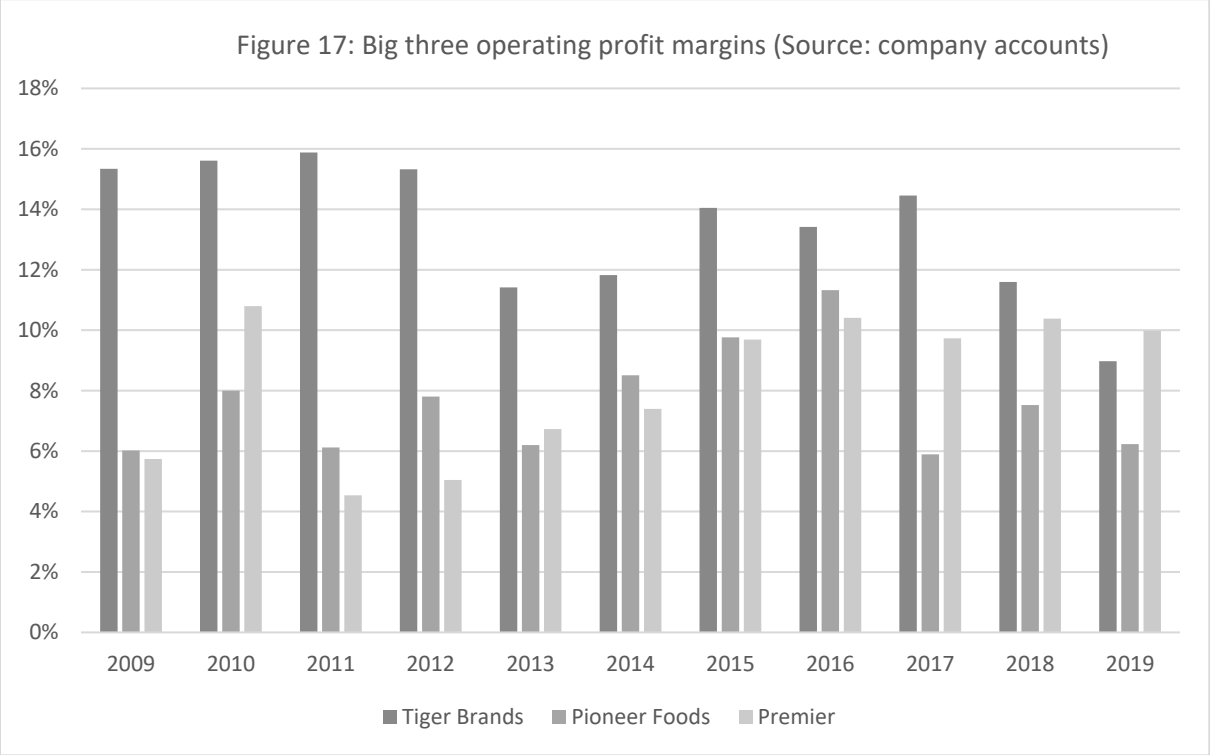
	Tiger Brands	Pioneer	Premier
Revenue (2019)	R29.2bn	R23.2	R9.7bn
Employees	10,543	9,504	9,700
Subsidiary companies	27	31	NA
Factories	41	43	19 (SA) plus 10 (Eswatini, Lesotho, Mozambique)
Grains contribution to revenue	44%	59%	81% (of which maize milling 13%)
International revenue	13%	15%	21%
Proportion of expansion capex on expansion (2010-2019)	39%	66%	61%

All are highly diversified. Pioneer, for example, operates >2,000 product lines across 43 factories. Their combined revenue is roughly equivalent to ~8% of South Africa's household food and beverage expenditure, albeit down from 10% a decade ago.[93] More than simply large, they play a coordination role in the food system, integrating thousands of separate supply chains and occupying dominant positions across a wide range of goods. While their nationally recognised brands dominate supermarket shelves, they also reach into informal markets through wholesalers and, as such compete with MSME processors too. Revenue growth among the big three has been relatively slow at 4%–7% (nominal) in the past decade, with rising competitive pressures in a low-growth home economy a major challenge, alongside underperforming international investments.[94] Nonetheless, they have remained consistently profitable with positive cash-flows, albeit on slim operating margins (Figure 17), high returns on equity, consistent dividend payments and low leverage.

[92] Notes: Premier does not report international revenue separately, and this figure is from CIM. Premier data on capex is 2012-2019.

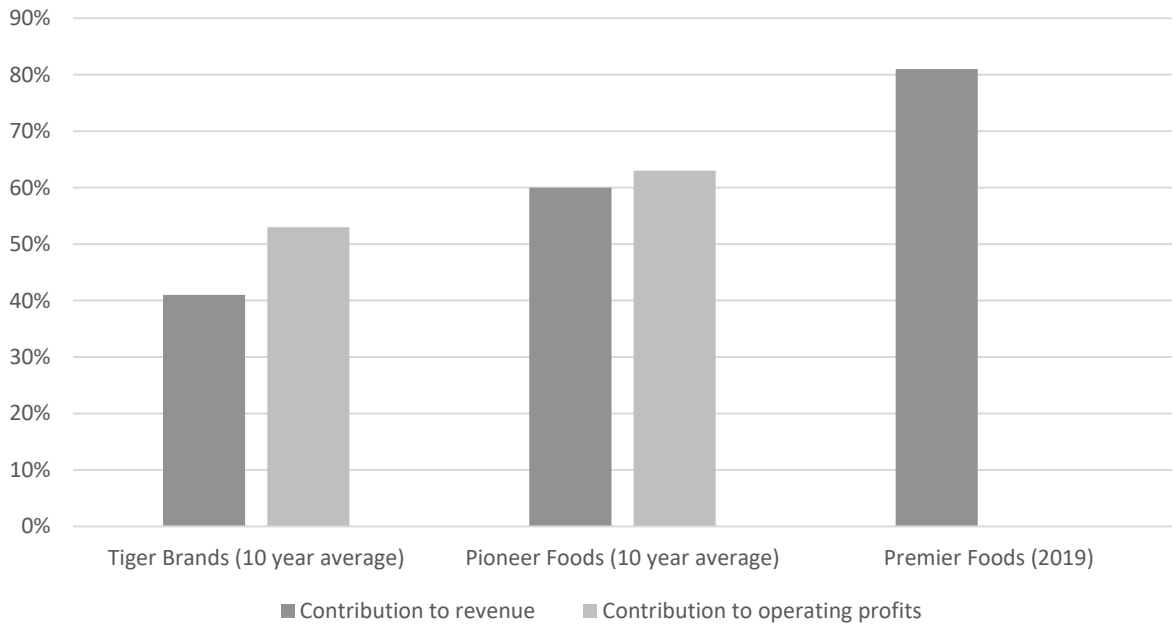
[93] Author's calculations from SARB data and company annual reports.

[94] According to Pioneer, African markets are now contested by a range of other food multinationals, who, in many instances, will choose to operate at a loss to establish early leads in key market segments, while local manufacturers now enjoy better access to finance than was previously the case (Pioneer, 2018, 68). Pioneer derives 8% of its revenue from overseas, down from a peak of 13% in 2014 but up from only 4% in 2010. Tiger Brands' high-profile acquisitions in Nigeria have fared badly. The company bought a majority stake in Dangote Flour Mills in 2012 for R1.5bn but sold this back after three years for $1. It has also recently closed its Nigerian biscuit making subsidiary Deli Foods after sustained losses. Tiger Brands derives 13% of its revenues from outside of SA, down from a peak of 26% in 2014 prior to the sale of some Nigerian and East African operations. Premier earns 21% of its revenue outside of South Africa, up from 1% in 2015. It has purchased companies in Mozambique, Eswatini and Lesotho, and also operates in the UK.



Despite their diversification, their grain processing divisions, comprising primarily maize and wheat milling and baking, remain centrally important as the largest contributors to group revenue. Interestingly, in the past decade these divisions have also contributed more to operating profits than they have in revenue (Figure 18). Interviews suggest even for large firms with valuable brands, maize milling is a low margin business. However, with high volume it can provide significant cash flows, which are more cyclically stable and predictable given maize meal is a staple food. This enables the grain processing divisions to serve as the base for expansion into other more high-risk FMCG activities.

Figure 18: Staple grains contribution to group revenue and operating profits
(Company annual reports, author's calculations)



There are major economies of scope from product diversification when compared to smaller food manufacturers. Wider product ranges augment bargaining power with retailers. As one former senior employee from a large firm explained, "[I]t gives power when you go to the retailer, [who] wants your whole basket [of goods]. The reason we diversify is that it strengthens bargaining power. The bigger your basket, the more you get your foot in the door".[95] This is complemented by owning widely recognised brands that consumers expect to find: intangible assets are 10% of Pioneer's asset value, 28% of Premier's and 15% of Tiger Brand's, with Pioneer owning 1,569 product patents (Pioneer, 2018). In maize-meal in particular, they sell through nationally recognized brands built through decades of marketing investment (Frankel, 1988) (Box 5).

The big-three also derive competitive advantage from technological leadership as the only actors capable of significant R&D, advertising and national-scale distribution.[96] This technological leadership is not simply about market share and innovation rents, but also indicative of what Dallas et al (2019) call 'demonstrative' or 'constitutive' power, in that the big-three shape conventions, norms and best-practices in a manner which smaller firms are compelled to follow. The creation of new consumer norms and expectations for 'super' maize-meal is the key important example. Super was first widely introduced by Tiger Brands in Soweto in the 1980s (Frankel, 1988), and in the 1990s Pioneer invested considerably in market research among urban consumers to create *White Star*, now the leading brand by sales, which

[95] Interview SAMB01.

[96] All companies claim to invest significant amounts in developing new product lines. There is inconsistent reporting of R&D expenditure, but Tiger Brands estimates it spends 4–5% of net sales on innovation and R&D activities, equating to R1.4bn in 2018.

now sets benchmarks for 'whiteness' and consistent granulation (Box 5). Mimicry requires investment in costly advanced production capabilities, as discussed in section 6. In recent years, the big-three have pursued product innovation in instant maize-meal and porridges using extruder technology, a small but rapidly growing category and medium-scale firms are beginning to follow.[97]

Box 5: White Star: product innovation and changing norms

The regulated maize industry constrained product differentiation, but in the post-liberalisation period major processors began pursuing product innovation in maize-meal, both responding to and ultimately also shaping consumer preferences for the texture and appearance of the staple food. Pioneer launched *White Star* as its lead super maize-meal brand in 1999 as the first vitamin fortified maize-meal brand. The product development process required R60m in investment—over R150m adjusted for inflation to 2019 prices—with a team of 12 people devoted to the task. Their assumption was that urbanization was changing consumer habits and that low-income consumers desired an increasingly refined, highly-packaged product and that they would be willing to pay more for higher quality maize-meal. They researched the black consumer market and concluded that people wanted a whiter, more consistently granulated meal. The more refined product would entail a much higher extraction rate, meaning more by-product from the raw material input. It also necessitated new capital goods (see section 6). Despite being a well-established wheat milling company dating back almost a century, it took Pioneer 10 years be the leading brand in maize-meal. Though the brand investment to revenue ratio is low for basic staples like maize-meal, the brand equity in *White Star* means Pioneer can now charge approximately R3 as a premium due to the brand and reports that the value/volume ratio of *White Star* is 1.19, that is, the share of market value is approximately 20% greater than the share of market volume (Pioneer, 2019). This claim is confirmed by interviews with small and medium-scale millers who almost invariably price lower than *White Star*—up to 40% lower in some instances—while still using it as a quality benchmark. The challenge of maintaining the brand equity is that the product must be of near identical quantity whenever and wherever it is bought, which is challenging given the variation in maize quality varies from crop to crop and region to region.

A final key area in which the big-three gain competitive advantage is logistics and distribution. Annual reports stress that a significant capital expenditure and organisational effort in recent years has been directed towards this. Distribution is a major cost for processing firms, which is reduced at any opportunity, but this investment also reflects changing major retailer demands in shortened stock cycle times and demand for 'just-in-time' delivery. The need is for flexibility, responsiveness and precision.[98] The investment required is in capabilities as well as simply hardware, with logistics increasingly resembling a "science", in the words of

[97] Premier estimates growth in hot cereals as 8% per annum in 2016, but in 2019 saw sales growth of 22% (Premier 2016, see also Pioneer 2019). This requires significant investment in extrusion machinery, pre-cooking maize-meal under high pressure and more exacting hygiene standards.
[98] Interview SAMKI13.

one manager of a large firm.[99] There are economies of scale in advanced distribution infrastructure and specialist staff and the increased sophistication of the activities is reflected in trends of centralization, in-sourcing and use of digital technology.

Premier operates a network of 18 distribution depos "strategically located around the country to optimize product availability and minimize unnecessary product handling which ultimately reduces costs" (Premier 2017, 29). Milling distribution was insourced from 2013 (Premier, 2015). Logistics network reach and the distribution platform is seen by Pioneer as a key competitive advantage and has, from 2016, been increasingly in-sourced to improve efficiency and coordination and is run through a separate division, 'Pioneer Foods Logistics Services' (Pioneer, 2018). The system uses real-time vehicle tracking technology and an automated sales administration system (Pioneer, 2018). Tiger Brands has 24 distribution centres and have also been centralising and applying advanced digital technology to improve management of stock availability, traceability and forecasting (Tiger Brands, 2019).

While the big-three have attributes which make them uniquely powerful actors there has been significant deconcentration at the top end of the size distribution of maize milling firms. The share of the top-four largest firms has dropped significantly since liberalisation. This is due to growth among highly-competitive, dynamic medium-scale processing firms. While these are discussed in sections 4 and 6, this sub-section briefly examines the 'next-17' of the top-20, sometimes referred to as 'regional' millers since they can be very important in particular regions without having a national reach. Less information is available about them since they are mostly private firms.[100] Companies and Intellectual Property Commission registration records show many are relatively young companies, with nine established post-1990 during the liberalisation period and several founded after 2000. All recent entrants are situated in the maize triangle and have emerged from commercial maize farming (for the reasons discussed in 4.2). Many are vertically integrated, and several are owned by major agribusinesses. Notably Louis Dreyfus, the world's third-largest commodities trader in 2018 purchased Noordfed and Progress, both next-17 millers, in a JV with Willowton Group (Competition Tribunal, 2017).[101] Former co-ops, Senwes, VKB, Afgri, TWK, BKB, GWK own sizeable maize processing operations.[102] As VKB explained it, their rationale is not only to provide services to farmers but also "create a market for the producer's products and add

[99] Interview SAMKI13.

[100] With the exception of Foodcorp, a subsidiary of RCL, which is the 9th largest white maize processor.

[101] The former was purchased from the third-largest agribusiness NWK where it was loss making. Notably, the Competition Commission recommended to the Competition Tribunal that the acquisition be prohibited due, in part, to fears it would facilitate collusion. The Tribunal allowed the transaction to proceed with conditions in order to save the 400 or so jobs at risk (Kilian, 2017)

[102] VKB is a major supplier of branded maize-meal in Limpopo, with three medium-scale mills, two acquired in recent years as part of an expansion through the 2010s, that have a combined capacity of 240,000 tons per year (VKB, 2019; VKB, 2020). Senwes owns a 35% stake in top-20 miller Botselo following its acquisition of Suidwes. It is disposing of Africum, another milling company owned by Suidwes; Afgri's Philafrica division comprises multiple processing operations including three yellow maize mills purchased from Pride Milling in 2011. GWK are a top-20 mill through GWK Farm Foods. OVK has owned the Tweespruit Mills, a top-40 firm, since 1974 (Competition Commission, 2019; company websites; JSE CDM; VKB, 2019).

value to the products [so] the agricultural producer is given the opportunity to share in the value generated downstream in the agricultural value chain" (VKB, 2019).

Though they all have brands, they compete primarily on price and typically price below the corporates. Business models focus on high volumes with thin margins, which they can better tolerate due to private ownership without the return on equity requirements of the publicly-listed big-three. Some interviewees suggested agribusiness-owned mills were willing (and able) to tolerate significant losses and annual reports, where data is available, appear to corroborate that some of these operations are loss-making.[103] Regional millers are diversified to a far more limited degree than the big-three, with owners' other activities being primarily within the grain value chain, particularly farming, grain storage and trading and animal feed milling. These firms are also key suppliers of supermarkets' private labels. None have emerged as fully-fledged national challengers to the big-three, but they have invested aggressively in expansion[104] and competition with regional millers is frequently raised in big-three annual reports to explain disappointing performance (Premier, 2018, Tiger Brands, 2016; Pioneer, 2018).

5.2: Competitive pressures on small firms

Price competition in markets for most processed maize products, in particular maize-meal, is particularly aggressive. This relates partly to the characteristics of demand. Demand growth is slow, particularly in the past five years as the South African economy has dipped in and out of recession. Consumption is predominantly among low-income households that are highly price-sensitive. Added to this, there are limited opportunities for product differentiation and the supply base is mature and has excess capacity.[105] This gives competition a fierce, zero-sum quality. Profit margins are therefore slim. From interviews, competitive, high-volume medium-scale millers described net profit margins being around 2–3%, at best and this is consistent with information provided by key informant interviews. Here, the business model revolves around achieving large volumes.

Across all sales channels, firms tended to perceive strong competitive pressures. Price competition was highlighted as the first or second most important category of five competitiveness factors by all but two of 28 firms interviewed, which while not a representative sample, is illustrative. This was confirmed in open-ended questions, where it was apparent that improvements in quality only become significant once competitive prices

[103] Noordfed under NWK's ownership prior to the sale to LDC, was loss making for many years (Competition Tribunal, 2018; NWK, 2020). Maulti Milling was loss making under TWK's ownership, but was sold in 2017. OVK's Tweespruit mill was loss making from 2017–20, the years for which annual reports were obtainable [ref]. VKB mills have struggled to achieve profitability in recent years (VKB, 2019). GWK's Farm Foods was loss-making in 2017, albeit in a drought year.

[104] In particular, Pride is seeking to reach national scale with an investment programme initiated in 2016 to double capacity, while Itau, the seventh largest milling firm, was only founded a decade ago and has grown rapidly to become a major supplier in the Eastern Cape.

[105] Interview SAMKI01.

have been achieved. Competition for MSME processors came from both above, in the form of large-scale firms with advanced capabilities and established brands, and from below in informal enterprises which, for reasons discussed below, could undercut formal firms on price while being less concerned about quality. In terms of the former, as discussed in the previous section, large firms' brand equity and quality gives them pricing power and MSMEs of all kinds interviewed, that were willing to divulge price information, priced up to a quarter cheaper than leading brands. Distribution costs were particularly important to this for smaller firms. For large-scale mills, transport is typically around 20–30% of the final selling price, depending on distances travelled.[106] The ability to sell in a localized, hard-to-reach market, rural or urban, therefore provided a pricing advantage (See 4.3). However, interviewees reported that large millers will also strategically drop prices to try and squeeze out new competitors or dump excess product in wholesale markets when producing above their breakeven targets or seeking to establish themselves in a new area. The major Free State medium-scale millers were also frequently cited as aggressively targeting low-income rural markets.

There is a competing requirement to maintain a level of quality not too far behind that set by the large firms, meaning the cost pressures of higher extraction rates, meaning more by-product and investment in machinery. All MSMEs interviewed had invested in developing a unique brand, but these were also easily damaged by a single batch of poor quality products. Additionally, as several interviewees stressed, low-income consumers will not simply seek the absolute cheapest food-stuffs.[107] In particular, when it comes to maize-meal, because low-income consumers were making large-volume, [108] infrequent purchases of a daily consumption item, a bad bag was disastrous for a household. Consumers would pay more for trusted items. As one micro-scale firm in a rural market in the Eastern Cape explained, "For the spazas [meaning targeting low-income consumers], people are very loyal to their brand… they won't buy your product just because you are producing locally. Regardless of its lower price, they might look down on it. We had to do a lot of promotions".[109] As another small-scale processor in rural Kwa-Zulu Natal explained, **"**The 40-50kg bag is the key product. The consumer buys one bag for the month, probably pays R200, on a pension of R1600/month, this is a big chunk, but can feed a family for a month ... if it is lousy quality and she is stuck with it for the month, she will not buy that same brand again. Poor quality has a lasting implication. It is unforgivable to give [an] inferior quality product".[110] MSME firms are thus arguably in a much more delicate price/quality trade-off than is the case for larger firms.

[106] Interview SAMB01.
[107] Interviews S27, S24, S12, S11.
[108] Though there is regional variation, lower income consumers in rural areas typically buy larger bags of maize-meal, including 25kg to 50kg, whereas urban consumers are more likely to purchase smaller quantities, with many retailers stocking 1–2kg bags.
[109] Interview S17.
[110] Interviews S11.

Box 6: The high costs of formality

As one interviewee from a struggling small-scale firm in one of the major maize farming districts explained, competition from informal mills operated by local farmers was a major competitive threat, and a source of grievance. The firm was trying hard to comply with regulations, with the interviewee showing meticulous paper-based record keeping systems for cleaning schedules and measures taken around the mill site to prevent pest infestations. This was for the benefit of periodic visits from the municipal. The workers at the mill were, they said, paid the minimum wage, which had added significantly to costs. "There are a lot of [informal] mills here. They come up like mushrooms when the maize is very cheap, mills jump up like mushrooms. Farmers use the mill to get a better income." The interviewee explained such mills would dump their product at ultra-low prices in the local market, explaining "These are small informal mills, lots of them are not registered, not legal. To make it legal it costs money," because you are subject to regular random checks by the department of health and the department of labour. This requires daily record keeping of key health and safety checks (e.g. hand and fingernail cleanliness, use of hair nets) and monthly checks on a huge range of items. Alongside reporting to SAGIS on tons of maize bought and sold, payments for micro-nutrients are another significant cost. It would be much cheaper, they suggested, to just not register at all.

MSME processors face the additional problem of competition from below from informal milling firms, cited as a threat by multiple MSMEs. These would typically operate only seasonally and some years not at all and would operate without compliance with regulations around hygiene, fortification, and the minimum wage etc., which are costly and time-consuming (Box 6). This enabled them to sell at ultra-low cost[111] sufficient to draw custom, but without a brand to defend, such that there was less risk in selling lower quality. Many such entrants would reportedly cease operating after a short period of time, but nonetheless could be extremely disruptive in the short term. Interestingly, multiple interviewees suggested that rather than being standalone micro-enterprises, these mills were frequently run by commercial maize farmers who would use the operation to add value to their crop when market prices were low.

6: Technological capabilities and upgrading

This section explores issues around technological capabilities and upgrading among firms. It starts by examining key product and process innovations at the industry's technological frontier, before then examining variation among MSMEs interviewed and then the wider sectoral innovation system pertaining to MSMEs.

6.1: Demand induced innovation

As discussed in previous sections, in the post-liberalisation period there have been major changes in consumer demand with the rise of more highly-processed 'super' maize-meal, with consistent granulation, a homogenous, white appearance, shorter cook-time and longer shelf-life (see also Khumalo et al, 2011). Crucially important, as discussed in previous sections,

[111] This enabled them to price considerably lower, with examples given of R25 for 10kg bags.

is consistency, with small deviations affecting the cooked product. Appearance is also critical, with consumer preferences for consistent whiteness necessitating removal of brown/black segments at the kernel's tip and any discoloured kernels. Removing more of the oily germ is also important for extending shelf life, since it accelerates rotting – a problem magnified with increased consumer/retailer preferences for more expensive polypropylene bags, which prevent dust escaping but accelerate decomposition. Corresponding to this have been major shifts in private standards for hygiene enforced by retailers.

Meeting this has required significant investment in technological and organisational capabilities, in a process of 'demand induced' innovation (Kaplinsky, 2011; Lee & Malerba, 2017). In some respects, product innovation has not been dramatic, in the sense that current maize-meal products would not shock a consumer teleported to the present day from several decades ago. However, achieving the increased quality levels, consistently, at scale, at competitive cost, means the same may not be said for the inside of a factory, where process innovation has been far reaching, with widespread automation and application of digital technology to shift processing towards more of a precision manufacturing process. Alongside this has been the increasing formal complexity of the knowledge base accompanying increased digitalization/automation and marketization, requiring a smaller but more skilled workforce at advanced firms. This has widened the technological gap MSMEs must bridge to participate in mainstream markets.

Following liberalisation, firms undertook a large-scale recapitalization process and gross domestic fixed investment in the grain milling industry increased over 80% in real terms in the decade to 2009 (Quantec, author's calculations).[112] One interviewee, a former head miller at one of the country's largest firms put it that, "[f]or many years [during the control board era] there was no innovation. However, increased sophistication came from the changing consumer demands over recent decades, and this has been dramatic", going as far as to say that "[t]here has been more technological change in last 30 years than the previous 100 years".[113] The 'technological regime', the dominant forms of technology employed by firms and the 'technological frontier' set by the most advanced firms (Lee & Malerba, 2018; Nelson et al, 2011) have shifted to meet changing demand conditions. Correspondingly, so has the underlying knowledge base and the capabilities and networks required by competitive firms.

In the production process, this has meant more effective machinery for maize intake/cleaning (removing impurities) and conditioning. The largest firms have introduced optical sorters, with individual kernels entering the mill scanned and digitally analysed for discolouration and removed automatically if necessary. High-compression degerminators, first introduced two decades ago based on rice industry technology following pressure on equipment manufacturers from processors,[114] have become an essential process technology that is widely diffused, including among many small firms. They are, however, costly – even small-

[112] Interviews SAMB01, SAMB03.
[113] Interviews SAMB03.
[114] Interviews SAMKI13, SAMB03, S12.

scale degerminators can cost up to R1m.[115] Improvements in de-hulling equipment reduced the need for water use, meaning a drier grain which facilitates greater automation, since fewer staff are required on the line to deal with blockages caused by wetter grain gumming up.[116] The more refined product has also required more advanced roller mills and sifters. Alongside moisture, fat content and granulation, the key variable in the production process is extraction rate. This determines the quantity of by-product and thus the amount that gets sold as chop at a loss. Producing super maize meal requires higher extraction rates and thus more chop. The challenge is therefore to reach the precise level where the maximum amount is obtained from the kernel while maintaining the quality.[117] The extraction rate is not fixed because—even when accurately graded—the raw material input is variable: season-to-season, region-to-region or even batch-to-batch. As one interviewee from a large firm described it, you must manage the milling process "in the decimals".[118]

Dealing with this requires both experienced, trained millers and, at the technological frontier, advanced automation. Interviewees emphasized the importance of tacit, embodied knowledge to adjust the production process, for example through visual inspection and assessing the feel of the product. However, large firms have shifted from being manual/electromechanical operations to become increasingly digitalized. Programmable Logic Controller (PLC) automation—computer systems programmed with specialist software to control industrial machines according to data collected by sensors on key production parameters such as moisture, weight, extraction rates—was introduced initially by large firms and has diffused among the more competitive medium-scale firms. This enables remote, real-time monitoring and control, without the need for manual inspections and tests, automatically halting the line or adjusting when a parameter shifts beyond required levels. This is costly and requires both in-house skills, and links to specialist capital goods and service providers, to adjust and maintain equipment and software. There has been a five-fold increase in the proportion of GFCF on computer equipment and software since the liberalisation period in grain milling, albeit levels remain well below those in most other forms of food manufacturing (Table 13).

[115] Interviews SAMB03, S12, S02.
[116] Interviews SAMB03.
[117] Interviews SAMKI03, SAMB03.
[118] Interview SAMKI13.

Table 13: Gross Fixed Capital Formation on computer and other related equipment and computer software, % total GFCF (Source: Quantec)

	Grain milling	Dairy	Food manufacturing	Manufacturing
1994	1.2	2.7	0.5	2.7
1999	1.4	3.1	2.7	3.1
2004	5.2	9.5	7.1	7.4
2009	3.5	7.2	5.5	5.6
2014	7.9	15.1	11.7	12
2019	6.9	21.3	13.4	12.4

Investment in new machinery creates large fixed costs, which requires large volumes to pay-off, creating a treadmill effect for fast follower medium-scale firms. However, adoption of these processes enables dramatic reductions in labour requirements. Large mills only have a few production line workers operating the machinery from computer terminals. The major remaining labour requirement is in packaging.

For the grain milling industry as a whole, there is a relatively high use of informal labour and low use of high-skilled/semi-skilled labour (Table 14). However, in absolute terms, the total number of skilled workers has increased from below 2,000 in the 1990s to 3,812 in 2019. Interviewees conveyed challenges with, on the one hand, a major undersupply of skilled labour in the industry, which creates particular challenges for small firms, alongside labour relations challenges stemming from the low-paid workers in manual packaging roles. This has made packaging a key target for automation in the past two decades. Packaging robots were first introduced in the early 2000s and have since widely diffused among large and medium-scale firms, with industry experts suggesting as many as around 50 firms now use packaging robots.[119] This technology enables dramatic labour reductions.[120]

[119] Interviews SAMB12, SAMB06.

[120] Modern mills are 'closed' and produce considerably less dust than older 'open' mills, further reducing labour requirements for cleaning staff.

Table 14: Employment by skill level (%), 2019 (Quantec)

	Grain milling		Dairy		Food manufacturing		Manufacturing	
Formal: skilled employees	10.7%		15.4%		10.5%		15.4%	
Formal: semi-skilled employees	40.4%		37.3%		44.4%		48.4%	
Formal: low skilled employees	26%		26.4%		30.6%		17.1%	
Informal labour	22.9%		20.9%		14.4%		19.2%	
Total	100%	35,696	100%	28,231	100%	259,288	100%	1,509,299

Traditionally, manual workers would fill maize-meal bags through a chute, weigh them, stitch them and stack them onto pallets, or directly onto trucks. There are multiple opportunities for mistakes to be made, requiring considerable labour discipline. In automated packaging systems, bags are filled and stitched by machinery, lifted and stacked by robotic arms on pallets and automatically wrapped in plastic film before forklift loading. Automated packaging is additionally important for small packages (1–5kg) that are increasingly demanded by urban consumers/retailers. Investment in this equipment is costly, with firms willing to disclose costs suggesting single packing robot arms to cost R3-7m.

A further significant area for costly process innovation is in hygiene, as firms selling to major retail/wholesale chains are required to produce certification for private hygiene standards that are well above the Department of Health minimums. Meeting these can require extensive re-design of plants, purchase of equipment, employment of specialist consultants or specialist staff and the adoption of exacting organisational routines such as record-keeping.

While process innovation has been widespread, this has involved little formal R&D within the grain milling industry, which is negligible compared to other food manufacturing sub-sectors, let alone manufacturing as a whole (Table 15). The R&D based innovation is instead taking place among other firms, principally the major international capital goods suppliers, which diffuse these through milling. The limited opportunities for product differentiation means little patentable activity beyond registration of brands. Nonetheless, at an aggregate level, these process innovations appear to have created significant increases in overall productivity, in terms of value added/revenue and fixed capital productivity (Table 16).

Table 15: Gross Fixed Capital Formation on R&D, % of total GFCF

	Grain milling	Dairy	Food manufacturing	Manufacturing
1994	0	2.6	1.5	6.8
1999	0	2.6	1.9	6
2004	0	3.4	2.1	6.9
2009	0	3.6	2.4	7.3
2014	0.1	4.1	2.7	7.9
2019	0.1	5.2	3.8	10.3

Table 16: fixed capital productivity and value added

	Grain mill products		Dairy products		Food manufacturing (total)	
	2000-2009	**2010-2019**	**2000-2009**	**2010-2019**	**2000-2009**	**2010-2019**
Fixed capital productivity growth (weighted annual average)	0.8%	2.0%	0.5%	1.5%	-0.1%	1.6%
Value added / revenue (annual average)	17%	22%	21%	26%	21%	25%

For MSMEs behind the technological frontier, this poses challenges of either pursuing a strategy of followership in the adoption of advanced process innovation, requiring significant dynamic capabilities for effective participation, or seeking to pursue alternative business models reliant either on a different kind of capability set and/or alternative markets with different competitive dynamics.

6.2: Upgrading

Interviews were carried out with a wide range of MSMEs to better understand the heterogeneity of forms of technological capabilities and upgrading processes. On key outcome measures around growth, capital/labour intensity and efficiency, there were high levels of dispersion, albeit with some patterns or 'clusters' of firms with key similarities across certain variables emerging from analysis of individual cases and cross-tabulations. In particular, we identify three main 'ideal-types' (Table 17) in terms of strategic responses to the changing 'environmental' conditions discussed in the previous sections: medium-sized firms pursuing 'dynamic adaptation' via conventional upgrading strategies of technological followership; 'defensive adaptation' among effective small-scale firms, where the aim was

resilience rather than growth, utilising labour-intensive business models with strong organisational/distribution capabilities to effectively target sheltered markets and 'precarious maladaptation' among struggling firms. These are outlined further below.

Table 17: A typology of maize processing firms

	Defensive adaptation	Dynamic adaptation	Precarious/maladapted survivors
Size	Small/Medium	Medium	Micro/small
Growth	Slow/stable	Rapid/stable (depending on age)	Rapid from a low base or decline
Strategy	Resilience / risk minimization	High-volume, low margin	Improvisation / drift
Markets	Highly localized (by design).	Regional, mass-market	Highly localized
Sales Channel	Independent wholesale; informal retail; direct sales	Regional wholesale for low-income consumers	Informal retail; direct sales/gristing
Production	High labour intensity; low-cost, local equipment; mechanical	High capital intensity, automated / international standard equipment / digital	High labour intensity; outmoded/incomplete equipment
Key capabilities / knowledge base	Relational contracting / distributional / organisational	Formal / technical / precision-based / techne	Limited / outmoded / struggle to achieve basic processes
Relation to technological/productivity frontier	Distant, but targeting different capabilities	Fast follower	Distant
Hygiene /regulatory compliance	Legal minimum	Private standards	Below legal minimum

Table 18 summarizes growth outcomes in revenue and output, cross-tabulated by firm size. There are important caveats about the data,[121] but the overall picture in the sample provided some interesting insights. Some micro-scale firms reported very rapid growth. These were young firms, and this was from a low base and in firms that were in key respects struggling and facing an uncertain future, thus the growth was precarious. The micro-scale firms in decline were, for the most part, older enterprises that had not successfully adapted products, production technology and marketing systems to a changing economic environment,

[121] Revenue and output do not move neatly in tandem because of changing raw material prices, changing product mixes and changing markets. There are also issues with the accuracy of the reported data with some firms unable to give exact figures. Among some micro-scale firms there are particular concerns around accuracy and high rates of growth come from a very low base. Using change in employment numbers is sometimes suggested as a more accurate way of gauging growth among small firms given the problems associated with accurately reporting revenue. However, this is problematic because it is clear in maize processing that firms can grow by becoming less labour intensive, relatively and absolutely, as they invest in automation.

alongside two struggling state-funded milling enterprises. Younger medium-scale firms were growing rapidly, while older ones were best described as stable or low-growth, having gone through rapid growth steps earlier in their existence. They had established competitive positions within their respective markets, in most cases through extensive 'high-road' process upgrading/innovation (described below), such as investment in automation or new product categories with significant growth opportunities. Among small firms, the stable and fast-growing firms we interviewed had achieved this not through 'high-road' process upgrading, but forms of 'defensive' adaptation involving exploitation of sheltered, localized markets, adaptable labour-intensive business models and relational contracting in the wholesale-informal retail channel (section 4.3).

Table 18: categorization of firms by growth levels and size[122]

	Decline	Low growth/stability	Rapid growth
Micro	**7**	**1**	**4**
Small		**4**	**2**
Medium	**1**	**6**	**3**

As interesting as the growth outcomes, are the intentions, attitudes and strategies regarding growth, collected through open-ended questions. These are summarized in table 17, which shows a range of attitudes and reasons for why or why not firms were seeking to expand. An important observation is that among many firms, growth is not in relation to perceived opportunities so much as compelled by the need to spread high fixed costs across a larger volume of production in order to reduce costs: indeed, the need for a high volume precisely because of the difficulties encountered with competition in saturated markets with little scope for product differentiation,[123] rather than pursuit of a growth opportunity. As one medium-scale firm, which had expanded rapidly in the decade and a half it had been in operation, explained, they were considering doubling their capacity because of the intensity of competition and the excess of cheap products: "There are big mills that can just boom [explode] the market" by dumping product and "a lot of jokers in the market [unprofitable mills … are making it difficult for us, they are just throwing low prices in the market and cutting our throats".[124] Millers, they explained, can only grow to a certain point and then face a

[122] Growth was assessed across revenue, output volume and employment across the cases, taking into account the effect that changing maize prices have on revenue and technological change may have on labour intensity.
[123] That said, an interesting feature of responses was the confidence many interviewees had in the resilience of future demand for processed maize products, including conventional maize-meal, as a result of continued urbanization, growth in demand from SADC and attendant export opportunities and substitution effects towards inferior goods as the South African economy continued to stagnate.
[124] Interview S03.

decision about increasing volume. “You must be able to pay the fixed costs. The fixed costs per-ton are lower as you grow. Labour in particular. I don't know where that point is, but there is a point where you either have to diversify or chase huge volume.”[125] This treadmill effect was noted by other firms, with another putting it that “if you are not expanding you are left behind.”[126]

Table 19: Coded responses to open ended question on expansion plans[127]

Not sure	Not planning to expand	Planning to expand
High competitive pressures	High competitive pressures (x3)	Higher anticipated demand (x5)
Risks accompanying new investment	Requirement for new investment	Need to lower fixed costs per-unit (x6)
Just completed new investments	Anticipating closure/considering exit (x3)	
Requirement for new investment	Risks accompanying new investment	
Anticipating closure/considering exit (x2)	Excess capacity	
Requirement for improved hygiene certification		

More than half the firms were either definitely not planning to expand, or not sure. There were a range of reasons for this. In multiple cases among small firms it was clear that further growth was not an aim in the first place given the risks associated with it or satisfaction with their current position. Attitudes to growth, and outcomes, appeared to depend significantly on perceptions of demand and competition within specific sales channels, but with firms operating within very different kinds of markets. Obstacles to growth in many instances also related to challenges with investment costs and capability deficits. Notably, five firms were considering exiting the industry or anticipating closure.

Interviews also sought to understand firm-level innovation processes during the previous five-year period, innovation broadly conceived as including ‘new-to-firm’ processes and products, given the importance of ‘mundane’ adaptation and modification of existing technology to processes of structural transformation (Rosenberg, 1976, Andreoni, 2011). Among innovation-active firms product innovation was limited; though some firms had opted to specialize in more novel products, most were producing well established items that were improved incrementally or by adding new product lines. Only one firm had introduced genuinely new-to-market product innovations in the form of maize-soya blend nutritional porridges. Otherwise, product innovation was new-to-firm efforts to match market standards, in particular the introduction of ‘super’. Process innovation was a much more complex

[125] Interview S03.
[126] Interview S08.
[127] Initial coding of interview data on attitudes to growth had to be re-done having read open-ended explanations and other sections of the questionnaire, where it was clear that some firms answering that they ‘planned to expand’ interpreted this more as a vague aspiration and were in fact on the brink of closure.

subject, with the requirements for product quality and consistency and aggressive competition discussed in the preceding sections compelling adaptation of processes and the introduction of new machinery. The analysis of forms of innovation and their significance among the firms interviewed revealed a split between, on the one hand, 'incremental' forms of resilience-orientated process innovation based around minor, low-investment cost improvements to linkage/organisational capabilities reliant on more practical, applied knowledge acquired through learning-by-doing; and on the other hand, more 'transformative' forms of innovation orientated towards chasing the technological frontier set by larger firms, based around the introduction of productivity-enhancing machinery, notably digital processes and automation that required significant financial investment and new types of formal skills and organizational reconfiguration. Around a third of firms interviewed were innovation inactive and were in all cases micro-scale enterprises with—for varying reasons—uncertain survival prospects given difficulties with demand for their product and routes to market and limited internal resources preventing major productivity or quality improvements.

Figure 19: Products and Processes Improvements among firms interviewed

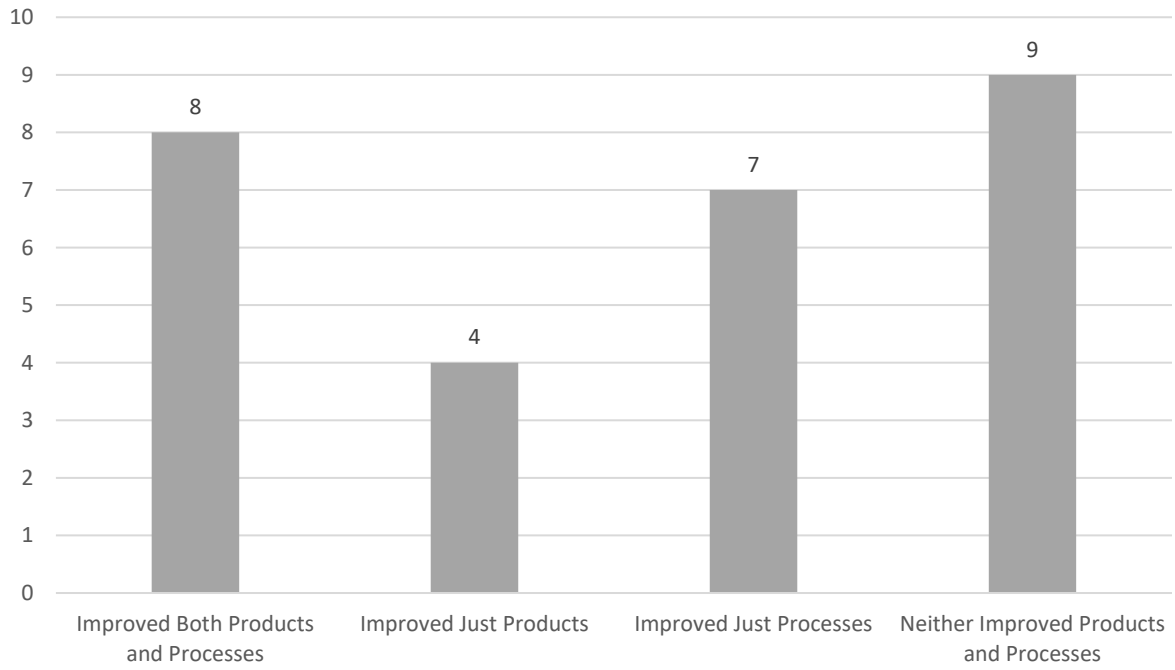


Table 20: Categorization of innovation type by firm size

	Innovation inactive	Incremental	Transformational
Micro	**8**	**3**	**1**
Small		**6**	
Medium		**3**	**6**

Firms pursuing transformative innovations, involving fundamental changes to the nature of key aspects of the production or distribution process, required a combination of both internal capabilities of skilled staff and linkages to advanced sectoral innovation system actors in the form of international capital goods suppliers and/or specialist consultancies. Though there was no formal R&D, medium-scale firms described in-house capacity to do design and engineering, adapting machinery to their needs and engaging with equipment suppliers to improve processes.

A core focus of these transformative innovation efforts was the automation and digitalization of processes, particularly packaging, as a means not just of lowering operating costs but addressing labour relations challenges. Internet use was almost pervasive among the firms interviewed, even the most traditional micro-scale firms using internet for basic tasks such as communications (86%), gaining market information (82%) and making purchases (79%), though less so for more complex functions like inventory management. Half of the firms interviewed had engaged in digital upgrading in the past five years, but among these there was a clear division between more rudimentary forms of back-office digitalization (e.g. record keeping, payments) and the advanced digitalisation of production processes pursued by dynamic medium-scale firms introducing PLC automation and automated packaging. Many, including smaller firms, expressed ambitions to further automate production processes, with wage pressures as the reason. In particular, firms cited the minimum wage introduced in January 2019 as a driver for automation, with wages among the lowest paid staff responsible for tasks like cleaning and packaging rising between 15%–48% following its introduction. Automated/digital operations interviewed produced up to eight times as much output per employee as even more successful small-scale manual/mechanical operations examples. Automation of packaging, according to firms adopting it, roughly trebles the speed or packing in terms of bags per minute and minimizes errors (e.g. because weighing is digitally controlled).[128] It also allows for digital stock management, as all product flowing through the system is logged digitally, replacing paper-based systems which are vulnerable to errors and harder to protect against theft by employees, which was widely viewed as a problem. As one medium-scale firm explained, being manual/mechanical rather than digital meant a lot of human error, for example staff entering the wrong numbers from scale readings: “Every day

[128] Interviews S03, S23.

I have to do stock reconciliation and there are a lot of errors. It is a major problem with staff misreading scales etc. We need a 'just in time' digital monitoring of the production process so we get measurements automatically and can get alerted automatically when there are any problems with the machinery. Currently we have to wait for faults to appear".[129]

However, alongside the obvious obstacle of high capital costs of equipment, was the challenge about the lack of necessary skills and the risks of reliance on external parties for maintenance and adjustment of equipment. As one rapidly-growing medium-scale firm in the maize triangle that had extensively automated explained, "[e]verything is becoming more electronic and computer-driven. The machines are digital. Your main issue becomes training and educating production managers. The issue is with training guys. Many of our production guys are not a tech or computer person". Automation required a more highly literate and educated workforce. Labour-intensive business models were in some cases explained as much in terms of minimizing risk and increasing flexibility. As one firm opting against automation explained, "We try and make it simpler for the workers, we don't really want to automate ... rather leave it the same so it is simple for them, so we can fix it".[130] Similarly, another explained, "The manual labour, the advantage is you can chop and change things very quickly".[131] More advanced machinery is complex to reset for different products. Adoption required support from capital goods suppliers or specialist local engineering consultancies for programming and maintenance.

A further key source of reluctance to further automate was concern about the potential impact on labour and community relations. Alongside those firms that had experienced labour relations problems during their upgrading processes, a surprising number of interviewees also raised concerns about the social impacts of automation and, regardless of cost, a reluctance to pursue it for fear of its impact on job losses and as an extension, community relations. It was apparent from interviews that many small-firms have extremely complex community relations, reflective of the reliance on relational contracting and small-scale retail discussed in 4.3. For small firms, key customers are typically their immediate community and negative sentiments among the people living in close proximity to the firm, the communities in which the workers live, is a more serious threat to sales in a way in which it would not be for a larger company with more extensive, diffuse sales channels. For example, one rapidly growing small-scale miller, said they would consider automating the packaging line, but they had concerns about this because it "comes with a price" in terms of damaged community relations. They said the provision of more employment meant "poorer communities will look after you more" and using people for packaging makes the product more 'acceptable' in the community. With output growing, they will have the challenge of making the packaging line more efficient, but the interviewee doubted they would fully automate. They explained: "they demand jobs, the local [political] leaders demand that their

[129] Interview S01.
[130] Interview S09.
[131] Interview S24.

people are employed. If you say no, they will burn your place down, stone it, and close your gates." They were placed under pressure by local councillors to employ "their people ... that is how local councillors get their vote".[132]

Box 8: Automation processes and transformative innovation

The vignettes describe two medium-scale firms who had invested large sums into transformative innovations in the form of automation to lower production costs. The first, a rapidly growing medium-scale firm, bought a new digitally operated [PLC] mill in 2015, which doubled output. Accompanying this, they invested in two packaging robots in recent years which lift bags and palletize. They had also the previous year installed small packaging machines, which automatically packs the 1kg, 2kg and 5kg bags, and pallets/wraps them. These smaller bags require precision but open new retail markets for convenience shopping. "The first big challenge after the upgrading of the mill, was a very big demand for checking and packing better. That pressured us to change and innovate on the packaging side. To keep up, as the manual packing was too slow" and prone to mistakes. The introduction of packing robots reduced the workforce by just over a quarter. The robots can pack ~15 bags per minute, compared to 6 "at best" for labourers. They also "don't come into work drunk". It is, however, complex and time-consuming to adjust them to different bag sizes and they create problems when they break. The incentive was not just to save labour, but also to enable higher production volume. The cost of the labour saving achieved was less than the robot itself, the advantage was more about the speed and volume it enabled. The machinery is produced by a North American equipment manufacturer and installed by a local consulting firm. All their technical knowledge came from other companies, they explained, though they have skilled, trained engineers in-house who could modify and adjust the machinery as needed. Another medium-scale firm, described their packaging automation process. From 2017 they had fully-automated packaging lines, enabling them to reduce their workforce by around 50%. The challenges were with labour relations. "The people complained, we had the union on us, we had lots of meetings with them. In the end the head union official came to see us" in an attempt to dissuade them. The change went ahead nonetheless. Besides the costs, the interviewee also suggests this solves labour relations challenges: "that robot doesn't ask for leave, it doesn't care if it is a Saturday". They explained competitive pressures compelled automation: "Most of the guys [competitors] run automated mills [that are] PLC [programmable logic controller] driven, so you have to have millers that are trained to run that system. This makes it difficult as you don't find good millers any more … Most of the [major] mills have moved to an automated system. If you are not able to move to PLC [programmable logic control], the time is wasted". Their introduction of PLC automation had meant that the mill could now be operated from a smart-phone, with the machinery's performance and any faults analysed remotely by internet connections expert technicians in Europe.

Incremental innovation processes were typically based on low-cost improvisation and changes to organisational routines in labour-intensive business models, for example in regular product quality or hygiene inspections and marketing procedures. Smaller firms lacking funds for investment and seeking to improve consistency require advanced organizational capabilities—in particular testing and record-keeping routines for fat, moisture content, granularity etc.—and skilled milling staff with tacit knowledge to improve product consistency. Similar to the marketing capabilities that are important to enable distribution in

[132] Interview S28.

complex informal retail channels, these are nonetheless difficult to acquire through lengthy learning-by-doing processes and relied heavily on staff experience.

Box 9: Incremental innovation

This small-scale milling firm had a labour intensive business model and were not able to invest in more advanced automated systems due to the capital costs and the extra scale this would necessitate. The interviewee described its most "game-changing" process innovation as new quality management routines. They hired a new head miller from a large firm and he brought expertise in grain testing and quality monitoring. Although the company does not have a proper lab, of a kind found in more commercially competitive medium-scale operations, they instituted a system of hourly checks of output, testing granularity, moisture, the speck count (for visual discoloration) and other items. This was done by milling factory staff, who fill out a paper form which the manager designed. These are then collated into monthly spreadsheet reports. If any of the hourly indicators are off target, they must be informed immediately. This is to try and ensure consistency of product quality. As they explained, "[c]ustomers buy R50–R80kg at a time, to last a whole month. So, if the quality is poor for one bag, you may lose the customer altogether". The upgrading was not costly, it just involved small hand-held sieves and containers, a simple moisture tester and some forms: the direct cost is negligible. The challenges for implementing the innovation were organisational change. "It is the employee culture issue, they [staff] were used to doing it the old way, where you just grab a handful [of maize-meal] and have a look [as a means of assessing quality]. It has been hard getting the staff to buy into it. I still think they don't see the need, as they did it for so many years." Sometimes they just skipped filling it in, he explained ("[i]t is a laborious thing and if you don't see the point...") and they had needed to take disciplinary action against some employees to compel adherence. Another small-scale firm, a recent entrant to the industry, described a similar struggle to implement new organisational routines around measurement and quality control in pursuit of consistency. They described this as "closing the feedback loop, seeing the effect of changes [in inputs, machinery settings]. Measuring everything, measuring the extraction rate every day, the amount of maize that is bagged, making sure overtime is controlled." They correspondingly introduced a new degerminator at a cost of R800,000 to improve the extraction rate, this reduced waste from 16% to 2%. Previously, the firm's extraction rate was not being measured or controlled… "People go on about the 4th industrial revolution," they said, "this is currently the second one!" Major improvements were derived from "measuring a lot better [e.g. costs, product quality], making sure we are not R20 under a competitor, getting systems into place to measure quickly. Make sure you get feedback from customers quickly to adjust the price".

Hygiene compliance was a particularly important example of incremental process innovation of most importance to small firms. As experts noted, this is a pervasive challenge for MSMEs, and small firms in the sample frequently highlighted this as among the most significant process innovation challenges, with customers being lost to those that could not produce required certification.[133] Compliance with more advanced private hygiene standards required by major retailers—HACCP, ISO22000, FSCC – has become a condition of entry to mainstream markets.[134] Compliance frequently requires significant investment to redesign production facilities to minimise contamination risks, though firm-level interviews suggested that a more

[133] Interviews SAG05, SAG08
[134] Interview SAG08.

fundamental challenge was in the development of organisational routines and procedures for cleaning and record keeping and maintaining compliance among the workforce. This was also the case for basic legal compliance with the DOH's Food Safety Legislative Framework[135] and the municipal health inspections accompanying them. Private standards such as HACCP compliance require audits twice a year and can take as much as two years to obtain. Less than a third (29%) had gone beyond the legal minimum. Those who had were all medium-scale.

6.3 The sectoral innovation system and business environment

Particularly for smaller firms given their more limited resources, innovation processes dependent on external actors in a wider sectoral innovation system, which shapes the conditions for firm-level learning (Malerba, 2002). This section examines the external relations pertaining to the upgrading processes discussed in the previous section. A first key point was that, with the exception of a small number of firms that had been initiated through industrial policy programmes (discussed in section 7), the state played little, if any direct role in supporting upgrading processes. There are, formally, a range of state agencies which could do so, particularly given the ostensible policy emphasis on agro-processing and small enterprise development over the past decade. These agencies include development finance institutions including the Land Bank and the Industrial Development Corporation (IDC), public R&D institutions the ARC and CSIR and government departments such as the DTIC or Department for Small Business Development. However, with the exception of five firms started by the state, all of which were struggling micro-enterprises, none of the firms interviewed had accessed any forms of direct state support—financial or in-kind—within the past five years. Most interviewees were unaware of government's stated aims for agro-processing industrial policy, with only 7/28 having clearly articulated or accurate knowledge of industrial policy support mechanisms relevant to their sector. This can of course be read as much in terms of shortcomings in government communication as in terms of the knowledge of interviewees.

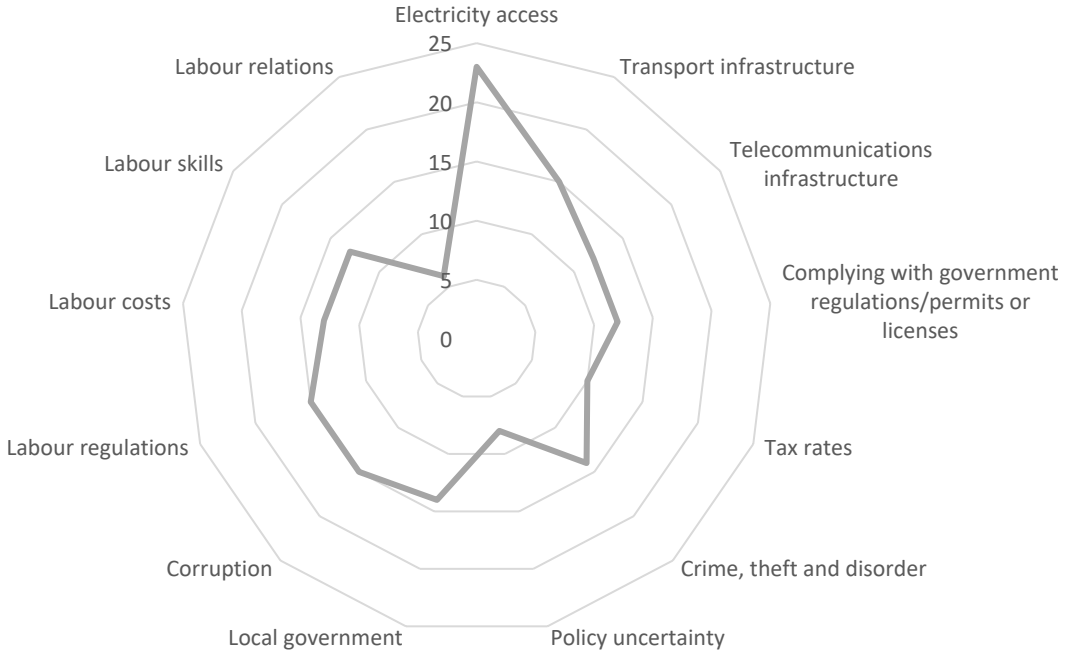
The handful who had investigated or previously secured state support for upgrading—all dynamic medium-scale firms—through the DTIC or IDC had negative experiences and were no longer interested in pursuing this support. In one case a successful, rapidly growing medium-scale firm had DTIC support removed when revenue dropped below projections, as a result of a fall in the maize price rather than a reduction in volume.[136] Other reasons included the complexity of application procedures and long waiting times for processing, changes in B-BBEE legislation reducing eligibility for white-owned firms with low scorecard levels, or perceptions that applicants required political connections to succeed.[137]

Negative attitudes towards state industrial policy programmes seemed, in part, conflated with widespread concern about the challenging business environment and state-provisioned

[135] The National Health Act, 61 of 2003, which regulates the hygiene of foodstuffs. The Health Act, 63 of 1977 regulates the hygiene of food premises and transport.
[136] Interview S03.
[137] Interviews, S14, S03, S04, S17, S22, SAMKI11.

infrastructure. These mattered to upgrading processes since upgrades were dependent on the functioning of complementary infrastructures and because challenging social conditions introduced new forms of risk. Most important among these was electricity (Figure 20)

Figure 20: Factors harming the competitiveness of the firm



Difficulties with energy costs and load-shedding at the state electricity utility, Eskom, are well known and affect all firms, but what is also apparent from the interviews is the variability across municipal contexts in reliability of supply and tariffs. Given the high costs of off-grid energy for energy intensive milling equipment, firms were largely beholden to municipal providers.[138] Load shedding and localized brown-outs were causing severe disruption to many firms interviewed, in particular since outages damaged equipment and more electricity is consumed when starting up machinery. In several areas firms reported severe challenges with water access, with water cutting out for periods of days or weeks. A large number of firms discussed problems with telecommunications, either in terms of absence of fixed line/mobile communications or poor internet connections and this is a major obstacle to the kinds of advanced automation processes discussed in section 6.4, which rely on internet connections, as well as to marketing. Roads were an additional problem for many firms due to prevalence of potholes damaging trucks. Again, such problems were also frequently linked by interviewees to problems with municipal service delivery and perceptions of municipal corruption. More than half the interviewees encountered severe difficulties with crime and social unrest, which included violent protests leading to closure or evacuation of plants, or threats thereof, disruption to distribution from protests, which included blocking roads, or

[138] A 100t per day mill requires 140 kwh – 280 kwh to run, which is too much for solar or a generator, interview SAMKI03.

even the hijacking and burning of trucks and theft from the plant, alongside the aforementioned problems with xenophobic violence against customers.

In open-ended responses, it was apparent that firms would, wherever possible, develop private solutions to the shortcomings of public infrastructure and services. These included, electrical generators to keep minimum functions operating during load-shedding, use of private security guards, satellite telecommunications connections to circumnavigate the shortcomings of telecommunications infrastructure (even, in one case, in a densely populated area of Gauteng), private boreholes for water supply and even, in the case of two medium-scale firms, attempting to re-surface public roads. These of course dramatically increase overheads in a manner which is easier to bear for larger firms that can afford to enclave themselves from their local context and reduce reliance on state services.

The private sector was the source of information, capital, skills and other forms of support for upgrading and because of this there were very uneven levels of access according to financial capacities. Private sector lenders—including commercial banks and vendor finance—were therefore the key source of credit for investment in upgrading, though were not widely used among firms interviewed. Only two of 28 had used commercial bank finance as a source of start-up capital. Of the 18 'innovation active' firms, 10 had funded upgrades through retained earnings and a further four through a combination including retained earnings and loans. Most growing firms were funding themselves primarily through retained earnings and owners' capital without going to banks. Only 13 of 28 had applied for any form of commercial credit and only 7/28 had used credit for a major purchase, as opposed to overdrafts or vehicle finance. The major capital goods suppliers were key sources of information technical support and are the key sources of innovation and R&D for the industry. Large international processing equipment manufacturers, predominantly from Europe and Asia conduct R&D into the improvement of grain processing as a source of competitive advantage,[139] but also provide assistance with specialist aftersales support, training and technical advice—involving exchanges of personnel—to support customers' efficient use of their equipment. The more advanced manufacturers also offer support on process automation.[140] Besides processing technologies, suppliers of packaging equipment and automation services are also increasingly important actors in the innovation system.[141] These are complemented by a small number of specialist private consultancies, which assist with system integration and provide advice on specialist functions, including hygiene. Large firms typically develop close, mutually-supportive relations with key equipment suppliers built up over long periods of time, involving exchange of knowledge and information, which, informants suggest, is often bidirectional.

[139] Grain processing is a major international industry, and firms such as Satake (Japan), Buhler (Germany/Switzerland), Ocrim (Italy), ANA (Turkey) have significant R&D capacity.
[140] The more advanced manufacturers include Buhler (Switzerland), ANA (Turkey), Imas (Turkey) Henry Simon, Roff also offers support on PLC automation.
[141] Netpek, Italpak and Chronos Premiertek are important suppliers of these equipment and services to the milling industry in South Africa (Source: company websites, interviews).

There were also a small number of domestic equipment manufacturers, notably Maizemaster and Roff, that specialised in providing machinery for smaller maize processing enterprises. Both these firms and international suppliers had responded to demands from small-firms—not simply in South Africa but, interviewees informed us, faster-growing markets in the rest of southern and eastern Africa—for robust, modular, small-scale (<5t/h) mills, capable of achieving extraction rates required to make super. These were designed to operate in more difficult conditions and could be transported in shipping containers for greenfield projects. Innovation for this segment of the capital goods market had been driven by competition among capital goods manufacturers and, including the entry to African markets of cheaper Chinese equipment during the past decade.[142] This competition necessitated, in the words of one equipment supplier "never ending improvement".[143] Smaller firms frequently use older or second-hand equipment. Those located in more marginal agricultural areas, distant from the denser clusters of processing firms in the maize belt, could face challenges with access to support services, spares and repairs, and so relied heavily on internal skills and resources. Medium/large-scale firms chasing the technological frontier typically relied on imported equipment from major international capital goods manufacturers and the support of specialist local consultancies.

The supply of skills and training opportunities for staff is another key dimension of the innovation system. While most interviewees stressed the importance of experience-based 'on-the-job' tacit knowledge, the increased technological complexity of the industry had increased demand for formally trained staff. Among firm-level interviews, 16 of 28 said that they encountered difficulties finding skilled staff. While not a representative sample, this is suggestive of wider challenges. Indeed, some experts put this as the most serious problem facing MSMEs in maize processing.[144] These challenges can be especially severe for firms in more marginal rural areas. The NCM sought to address shortcomings in the provision of skills and the state technical college system through establishing the Grain Milling Academy in 2016. This offered courses at NQF levels 4–5, with discounted rates for Chamber members and has an intake of 300–500 students per year, which is a significant amount in an industry employing around 36,000 people. Nonetheless, according to interviewees with knowledge of the programme, numbers registering had somewhat undershot expectations. Most registrations have been from medium and large-scale millers, which interviewees said were making greater use of the opportunity. The fewer registrations from small processors, was attributed not simply because of the absolute cost of the training, but because of the higher opportunity costs faced by smaller firms in allowing staff away from the factory to train and concerns about losing skilled staff. Though registered and accredited by the SETA, this programme received no support from government to subsidise small-firm participation.[145]

[142] Interview SAMKI03.
[143] Interview SAMKI03.
[144] Interview SAMKI01, SAMKI02, SAMKI15.
[145] Interviews SAMKI01, SAMB12, SAKI15.

As is common across middle-income contexts (Lundvall et al, 2011), the sectoral innovation system for maize processing is best characterised as dualistic: comprising an advanced range of private services available to medium and large-scale firms, connected to the wider international circuits of knowledge and technology. Small firms, in contrast, rely more on local or internal human resources, forms of improvised repair and adaptation and time-consuming learning-by-doing, since support from specialist consultancies and equipment suppliers is limited by costs and the infrequency of purchases. Government agencies to help bridge this gap for agro-processing MSMEs have limited reach. In maize processing in particular, small firms face the challenges of being relatively isolated from forms of institutional support and therefore heavily reliant on the quality of internal resources. This challenge is particularly acute for firms outside of the maize triangle, which, while not a densely-packed industrial cluster in the conventional sense, still provides firms within it some of the 'collective efficiencies' associated with relative spatial proximity, such as easier access to specialist services, skilled labour and suppliers (Kaplinsky & Morris, 2019).

7: The political economy of industrial policy

This section analyses the political economy of industrial policy in the maize processing industry. It explores the features of state-business relations, changing forms of private sector collective action and state policy measures seeking to support small maize processing firms.

7.1: Private sector collective action

As discussed in section 3, private sector collective action has an important history in South Africa's agro-industrial development, with commercial farming during the apartheid era being highly organised and effective at representing its interests with the state. In the post liberalisation period, 'organized agriculture', as it is sometimes referred, re-branded[146] and reconfigured as a series of membership-based trade associations representing the interests of commercial agriculture and agribusiness. These organisations function at both sectoral and commodity level, and in many cases have come to provide increasingly sophisticated services conventionally provided by state agencies, like R&D and extension services. Many of these associations have also come to play a major role in transformation initiatives in their respective commodities through farmer development programmes.

However, private sector collective action in the agro-industries in the post-liberalisation period has also taken more malign manifestations, in particular in the form of collusive behaviours among large firms uncovered by the Competition Commission. As discussed above, liberalisation of the grain industry meant processing firms faced new difficulties with price volatility, retailer buyer power, and the threat of destabilizing, unconstrained competition following entry by competitors. This induced a range of strategic coordination

[146] The Co-operative Council as the Agricultural Cooperative Business Chamber, later the Agricultural Business Chamber, the South African Agricultural Union as AgriSA, with GrainSA for grain farmers.

initiatives by big business (Makhaya & Roberts, 2013; Roberts, 2009). Concerns about the potential presence of collusive behaviour in the grain industry emerged in the early-2000s. Contrary to expectations that increased competition would depress consumer prices, maize-meal prices instead climbed steadily, reaching almost 40% above 1991 levels by the early 2000s (Traub & Jayne, 2008). This entailed a substantial transfer from consumers to maize millers and retailers, estimated as up to 5% of annual income for the households in the lowest income quartile (Traub & Jayne, 2008). Miller-retailer margins were observed by analysts to widen even during periods of falling maize prices (Chabane et al, 2003). However, investigations by the Competition Commission and Food Price Monitoring Committee (2003) concluded there was insufficient evidence of opportunism at work and that while concentration may enable large milling firms to move the market in the short-term, 'fundamentals in the maize market will force the market to fluctuate around an equilibrium, which is established by demand and supply forces' (FPMC, 2003, 157).

However, a bread cartel was discovered in 2006 following a complaint to the Competition Commission by an independent distributor. This involved the three largest bakers, Premier, Pioneer and Tiger Brands—the aforementioned 'big three' of section 5.1—that were and still are also the three largest maize millers. Premier received conditional immunity after informing the Commission of additional wheat and maize milling cartels and pledging cooperation (Mncube, 2014a). Tiger Brands followed, but Pioneer opted to fight its case (Mncube, 2014a, 31).[147] In 2010 the Commission referred its investigation to the Competition Tribunal,[148] revealing a complex multi-tier cartel, lasting between 1999–2007 and involving 17 firms (Competition Commission, 2010). Price-fixing agreements were coordinated by the big-three, though the cartel included a range of regionally significant medium and large-scale firms. Besides price increases, the meetings were also used to discuss means to resist the power of major customers (Competition Commission, 2010, 74.3). The Competition Commission argued that the arrangements extended the 'culture of co-operation and discussion … entrenched in the industry over many years' from control board-era (Competition Commission, 2010, p.32).[149] However, low entry barriers and regional market segmentation limited the maize cartel's effectiveness (Grimbeek, 2012; Bonakele & Mncube, 2012), with 'periods of co-operation that occasionally break down and usher in periods of price competition which then give rise to renewed agreements to avoid the commercial attrition of unbridled rivalry' (Competition Commission, 2010, 53). Further instances of anti-competitive behaviour were around the same time discovered downstream in maize storage, discussed in section 4.2 above.

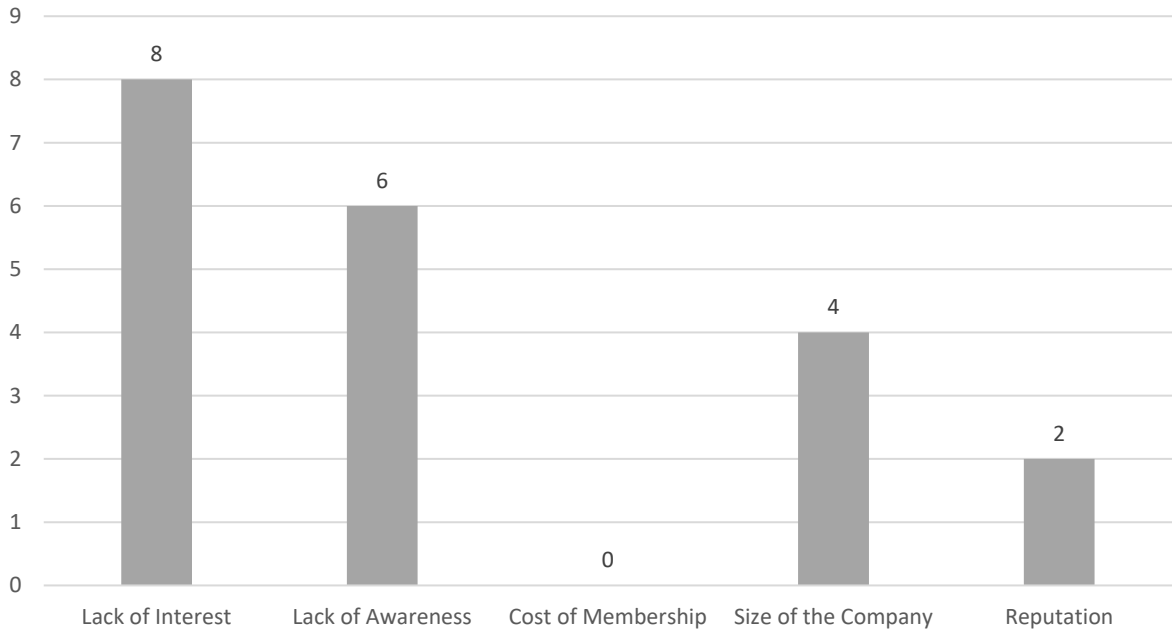
[147] Tiger Brands received a R98m fine for the bread cartel, but subsequently had immunity from prosecution in the maize and wheat cartels.
[148] The body responsible for adjudication on Commission investigations
[149] Millers had regularly convened to deliberate on matters of shared interest through the Chamber and the Maize Board

Participating firms subsequently received large fines,[150] but the impacts were more widely felt. The cartels created tensions between key state industrial policy agencies and the industry, and informed subsequent efforts by the DTIC to increase competition for established firms by supporting the entry of small-scale milling firms (discussed further below). Apparently fearing the risks of further collusion allegations, many firms, including the big-three, left the NCM, reducing membership by around 60% (Planting, 2010). With the NCM being the only formal industry association for maize processors, this impacted the capacity for communication and information sharing in the industry. Though it to some extent recovered some of its lost membership—notably, Tiger and Premier re-joined—it remains a relatively small organisation relative to the number of firms in the sector and to the scale and resources of associations found in other value chains. As of 2019, it has 14 maize milling members, less than 1/10th of registered firms.[151] Notably, this does not include Pioneer or many of the key regional millers. The NCM does still play a number of important roles as the industry representative with government, with a technical committee engaging government on matters such as food labelling and fortification, and through the Grain Milling Academy (discussed above) which is the main source of specialist skills training for the industry. However, its reach among small firms is limited. Strikingly, many MSME processors interviewed have no contact or awareness of the NCM. Only 2 of 28 firms interviewed were NCM members at the time of interview. Among the 20 non-member firms responding to the question about reasons for not joining the industry association, there were a variety of reasons given, which were coded into categories of response (Figure 21). Multiple firms were under the impression that it was only for large firms, though membership of the Chamber is based on a per-ton levy, rather than any size threshold. The most common response was a lack of interest deriving from a perception that there were insufficient benefits to be gained from membership. This was not the view of the two firms who were interviewed that were members, who highlighted the Chamber as a valuable source of information and training.

[150] The Tribunal levied a range of penalties on cartel members, with the Commission initially seeking 10% of 2009 revenue – a large fine, particularly for an industry with margins as slim as in milling, which was intended to reflect the impact on low-income consumers and act as a deterrent (Competition Commission, 2010). Pioneer's treatment was the most consequential, with an R500m fine combined with a commitment not to lower its capex and a discount remedy—the first of its kind—from which Premier would lower the price of bread and flour (Mncube, 2014: 31–32). A R250m portion of the fine was set aside to create the Agro-Processing Competitiveness Fund, administered by the Industrial Development Corporation, a state-development bank, as an industrial policy instrument to provide credit to qualifying small firms in agro-processing (Mandiriza et al, 2016).

[151] Although a larger proportion of output since it includes Tiger Brands, Premier and a number of medium-scale operations (6 of the top-20 largest)

Figure 21: Reasons given for not joining trade association among firms interviewed



The relatively limited levels of organisation among processing firms creates a range of potential challenges in terms of information sharing, communication, standard setting, coordination, and access to services. This also contrasts with higher levels of organisation and effective collective action at other segments of the value chain. Notably, in grain farming main industry association, GrainSA,[152] is a voluntary membership organisation funded by levies and its own commercial income with local branches/regional divisions and a democratic organisational structure (GrainSA, 2020). With 6,000 members it represents the majority of commercial maize farmers, and provides a range of member services ranging from market information, to technical support, to study groups and employs over 50 staff, including economists, extension workers, researchers working on issues such as climate adaptation and crop improvement, and a significant transformation unit assisting small farmers (GrainSA, 2019). Indeed, the association replicates many functions which would conventionally be fulfilled by government. The provision of collective services such as scientific research and farmer development is also supported through the Maize Trust, funded by the Maize Board's surplus funds. Besides these collective services, the association also plays an important lobbying role, working with the umbrella AgriSA. In the far upstream of the chain at wholesale retail levels it is interesting to note significant and highly effective formal and informal collective action among small retail firms employed to address bargaining power imbalances with large firms and provide services subject to economies of scale. These include both the

[152] Formed in the immediate post-liberalisation period in 1999 from NAMPO and other grain associations for sorghum, soybeans, sunflowers, wheat and groundnuts

large buyer-groups that provide bulk procurement, distribution/logistics and training, and the informal associations of immigrant retailers/wholesalers (Competition Commission, 2019).

7.2 Industrial policy for small firms

The milling industry has been the subject of a range of industrial policy interventions from a variety of state agencies, seeking to deconcentrate the industry and transform racial inequalities in ownership by supporting the entry of small-scale black-owned milling firms. These efforts have taken place within a broader engagement with activist industrial policy and more assertive measures to acceleration transformation over the past decade, in which agro-processing has been a key target. Key industrial policy frameworks identified agro-processing as a priority sector for intervention due to job-creation potential, but noted obstacles of concentrated ownership and anti-competitive practices from incumbents (NPC, 2013, 144-45, 219; EDD, 2011). Having been relatively neglected compared to the scale and range of initiatives for supporting small-scale farming (DTIC, 2019), support for agro-processing MSMEs was made a high-level policy priority (NPC, 2013) and adopted by the DTIC's Industrial Policy Action Plans (2007-), the DAFF (now DALRD) (e.g. DAFF, 2015), the IDC, and provincial governments.

Small-scale milling was identified as a priority target for intervention in the DTIC's 2010/11 Industrial Policy Action Plan (DTI, 2010), the coordinating mechanism for industrial policy. It remained as such in 2017/18 (DTI, 2017), though the focus of policy has since shifted increasingly to high-value export orientated horticulture. The aims in supporting small-scale milling were to increase competitive pressures on existing firms and reduce basic food costs, while increasing social inclusion (Ibid; DTI, 2013; PMG, 2015). Small milling enterprises, the DTI surmised, would be 'viable with moderate assistance from Government' and particularly competitive in rural areas given transport costs (DTI, 2010, 47-52; DTI, 2013, 88). This logic has underpinned motivations for and characteristics of interventions by the DTIC and other agencies. The DTI funded two high-profile enterprise development initiatives. The first was carried out through African Micro Mills, an advisory service for small-scale millers which has since ceased to exist, to which the DTI provided grant funding through the DTI's Manufacturing Investment Programme under IPAP for new milling equipment in its Kuvusa project, a small-scale milling facility in Durban. The expectation was that this could achieve 20% lower maize-meal prices than established large-scale firms (Bizcommuity, 2012; African Micro Mills, 2011). The project was opened with a ministerial visit and plans to expand through KZN (Ncube, 2016). However, the Kuvusa plant never entered production. The reasons why remain unclear, with it not proving possible to trace any interviewees associated with the project.

This was followed by a larger initiative carried out through the Foundation for African Business and Consumer Services from 2014 (FABCOS). Established in 1988 to serve the township entrepreneurs and in the post-apartheid period was refashioned as a trade association for

small black-owned business to promote township and informal businesses entry to the mainstream economy (PMG, 2015). FABCOS had previously been a sizeable organisation and for a short period in the mid-2000s was majority owner of Premier Milling, before selling its stake to Brait in 2007/08 and refocusing on promoting small business (Ncube, 2016, 55–56). FABCOS' sought to establish a network of 24 small-scale mills, operating as a franchise directed by Homegrown, providing management services, a common brand and retail supply agreements (Fabcos, 2015).[153] The DTI provided grant funding for six mills in Gauteng, which were registered in 2015 and equipped with new milling machinery.[154] The initiative involved technological innovation in partnership with Swiss equipment manufacturer, Buhler, in the form of the Isigayo, a compact, transportable mill pre-engineered as a complete plant (DTI, 2013b). In 2017, the DTI highlighted the project as a success case study, with R160m of investment[155] and 24 more mills in the pipeline (DTI, 2017). However, the mills never entered full commercial production. As of 2020, none of the six was fully operational, with five in the process of liquidation and FABCOS embroiled in legal disputes over the matter with the DTI and milling entrepreneurs involved in the project.[156] There is no clear explanation for the failure of the project and Fabcos were unwilling to discuss the matter. Box 10, an interview with a senior staff members from one of the mills, provides some insight into the problems afflicting the project. A further two milling firms separate to Fabcos were listed as recipients of DTI incentives, though neither is operating formally as a registered firm with SAGIS.[157]

[153] The ultimate aims were even more ambitious, with the intention to source grain from the commercial system initially and to then source from black small-scale farmer co-ops it was incubating (PMG, 2015)

[154] The funding was delayed due to changes in the DTIs support facilities (Ncube, 2016, 60).

[155] Subsequent media reports cite a lower figure of R60m (Malope, 2019). The DTI in 2018 reported funding R10.9m to each of the 6 mills (DTI, 2018).

[156] One interviewee reported that brand new mills purchased for the project were being auctioned for R1m, having been purchased for around 10 times this amount. On the legal disputes, see (Malope, 2019).

[157] The DTIC 2017/18 annual incentive report shows funding for Rietfontein Agri Partners (Pty) Ltd t/a Sebata Super Maize-meal. Nciba Grain Group-Maize Milling was funded through the Black Industrialists Scheme according to the DTIC 2018/19 annual incentive report, with the DTI funding about 30% and the Land Bank the remaining 70%; http://nsacc.org.ng/black-industrialists-funded-by-the-dti-to-create-jobs-grow-ec-economy/

Box 10: FABCOS and a failed industrial policy experiment

The last operational Fabcos mill was not fully operational at the time of interview, having only produced intermittently since its commission a few years previously. The initial staff complement of 15 had been reduced to two. This was not due to lack of demand, interviewees claimed. The mill had attracted considerable interest from retailers, both local spazas and supermarket chains seeking to improve their B-BBEE scorecard points. However, they had not been able to mill, primarily due to inability to buy grain because of lack of working capital provided by the owners. Homegrown controlled company financial arrangements and there was confusion as to whether this remained a going concern. The mill building had been well equipped, with new machinery capable of producing super maize-meal with an eight ton per hour throughput, but the premises were poorly laid out. The company was provided with no truck or logistics arrangements, so relied on customers coming to pick up from the site. Most were reluctant to do so. The interviewee said that those planning the project did not understand basic milling principles. In their view, this was a common problem. “So far I have never seen any mill owned by anyone that received government funding that is up and running and running smoothly. When I check them out, most of the people have zero experience of milling, but they get funding. It [the mill] is just standing there doing nothing ... [but] this is a money spinner providing you run it properly." He suggests that a lack of industry-specific knowledge in government had led them to both underestimate the difficulty involved in commercial milling: “They just think it's [a mill] a grinder, you put it [maize] in here, and it comes out there … "They need somebody within the DTI who knows what this industry is all about, so when they come and fund it and come and inspect, they know what to look for.” The perspective was echoed by other industry experts with knowledge of the FABCOS programme. Their view was that government projects typically provided upfront for expensive machinery equipment but not support for the wider range of skills to enable the firm to operate competitively.

Alongside the DTI, a range of other government agencies sought to support the entry of small-scale milling enterprises, or at least expressed plans to do so, most notably for DALRD and provincial governments. DALRD’s milling proposals relate to the Agri-parks and Fetsa Tlala schemes, which approach small-scale milling investments as a means to provide small-scale grain farmers with a route to market. These have yet to come to fruition, with the Agri-Parks scheme being drastically scaled back.[158] More recent DALRD planning documents identify small-scale milling as a key element of value chain development strategies, though there were no projects underway (DAFF, 2018). The DFIs the Land Bank and the IDC had both also been involved in lending to small-scale milling projects to a limited degree. The IDC identified agro-processing as a priority activity (2018, 30), and administered the APCF established from Pioneer’s fine for its milling cartel activities, funding two milling companies at expansion

[158] The Agri-Parks scheme, launched within DAFF’s Revitalization of the Agriculture and Agro-Processing Value Chain programme in 2015, was to involve 44 district municipality clusters of trading, processing, marketing, extension, inputs, linked to small-scale farmers. Many of the plans mentioned milling. At a parliamentary hearing in 2019 (PMG, 2019), DALRD staff said the scheme had not gotten off the ground, with resources having been spread too thin. The programme was now scaling back and focusing on Farmer Production Support Units (FPSU).[158] Fetsa Tlala is a cross-department initiative to support subsistence farmers in former homeland areas, that included proposals to establish storage and milling capacity, while arranging for local marketing of the maize-meal (DAFF, 2014; PMG, 2019).

phase.[159] Provincial governments are required to develop their own customized industrial policy strategies to support agro-processing according to the specific needs of their key provincial agro-industries (DTIC, 2019) and a range of provincial governments have supported small-scale milling enterprises, or produced plans to do so, including Gauteng, North West, Limpopo, KZN and Eastern Cape.[160] The most significant of these has been coordinated by the Eastern Cape Rural Development Agency (ECRDA) through its Rural Enterprise Development hub (REDhub) programme, which received support from national government and the Development Bank of Southern Africa and was launched through a visit by then-President Jacob Zuma, but at the time of writing was struggling and faced an uncertain future (Box 11).[161]

[159] The APCF was administered by the IDC on behalf of the EDD to provide credit to qualifying small enterprises, with a focus on boosting competition and facilitating entry in sectors cartelized by Pioneer (Mandiriza et al, 2016). By 2016, 87% of this funding had been approved to 34 firms, with 92% of this disbursed, with business-plan based estimates of 2,401 jobs created and a CC assessment that the fund had "achieved its objectives in terms of facilitating the expansion of non-dominant firms" (Mandiriza et al, 2016). Among these were two milling firms at expansion phase.

[160] Limpopo provincial government planned to support ten community milling projects during the 2014–19 period (Limpopo DAFF, 2016). North West Provincial Government Department of Rural, Environment & Agricultural Development has four maize milling projects listed in provincial documents. These are Tswaing Milling Project, Khunwana Milling Project, Sehloho Agricultural Milling Project, (Bakoena Milling), Petsitsammidi milling (PMG, 2018). The KZN provincial government planned a small-scale mill in Impendle mill as part of agri-parks programme (Impendle, 2018; DRDLR, 2016). The Gauteng provincial government funded the establishment of two milling companies, Super Brand Milling and Randfontein Milling (Gauteng Province Agriculture and Rural Development, 2019). The Free State provincial government funded a new milling in Lejwelda (National Council of the Provinces, 2019).

[161] Alongside ECRDA funds, the projects benefitted from equipment and inputs from DAFF and DRDLR and the Treasury Jobs Fund. The SETA provided funding for student interns from Walter Sisulu University. Interview SAMKI07, SAMKI08.

Box 11: ECRDA REDhubs

The rural districts of the Eastern Cape which used to comprise the Transkei 'homeland' are widely considered to be an area of considerable agricultural potential, including for small-scale maize farming. There have been a range of interventions supporting maize production on communal land, though it is commonly understood these have suffered in part from a lack of storage capacity and processors to provide a route to market. Four 'REDhubs' were created to this end by the provincial government's Eastern Cape Rural Development Agency in 2015, with a cost of around R360m investment, supported by the Treasury DRDLR, DAFF, Provincial Treasury and the SETAs. The hubs were run as secondary co-ops serving primary cooperatives composed of local maize farmers on ~1,000ha land in each area with storage infrastructure, farm inputs and mechanization services, and a commercial milling enterprise. A consultancy developed a shared brand and established supply agreements with Spar and Boxer, who agreed to forgo rebates. During a 2019 visit the mills were largely operational, but with a range of challenges. Two were utilizing only a small fraction of their capacity and were loss-making, dependent on state-subsidy to operate. Another was closed following community conflict over control of the cooperative and land ownership disputes, with protests preventing production and marketing such that maize stayed in the silos unsold. Prior to that, it operated at a tenth of its capacity. One among the four had established a foothold in local markets and developed a distribution strategy with local retailers, though was still subsidy-dependent and processing only a few hundred tons per week. Unfortunately, it had the worst machinery of the group, putting a constraint on expansion. The difficulties they faced are illuminating and speak to the challenges of establishing commercially viable agro-processing enterprises in marginal maize growing areas.

The ECRDA said a problem had been that there was limited business know-how in the co-op memberships initially. A manager with professional experience in agro-processing was subsequently hired to oversee the four mills to address the problems, but most staff lacked relevant experience and skills. Indeed, many of the managers were interns from a local university. This meant a steep learning curve for the businesses, which were unprepared for the challenges of commercial production. In particular, retailers required Department of Health hygiene certification. This required extensive work taking over a year and costing R140,000, involving re-laying the factories and adding new hygiene facilities. Processes such as testing maize quality and fumigating stores also had to be learnt. Even with such problems resolved, the mills were unable to access sufficient quantity and quality of maize from the co-ops as farmers undershot targeted volumes. Interviewees attributed this to late planting due to late delivery of inputs, animal grazing on under-fenced communal land, harsh drought conditions in some areas, and locations having been chosen more for political than agricultural reasons. In some areas, only half the maize planted was bought to the hub because farmers viewed the price offered, based on the JSE benchmark, as being too low and instead opted to sell maize locally by the bucket-load for higher prices. The little maize that was supplied was typically too low quality to produce competitive super maize-meal. Producing meal from low-quality maize meant product not cooking properly and rotting quickly. One of the mill managers found local spazas refusing to stock their product following complaints.

Given the lack of Grade 1 white maize available to purchase within Eastern Cape, mills relied on purchasing maize from as far afield as Mpumalanga and North West, with distances up to 700km and struggled to find available material for their small volumes during high-demand period. This added enormous transport costs. Distance from the major centres of agro-processing activity, with their ecosystem of equipment suppliers and service providers, also created major difficulties accessing spares, repairs and skills the co-ops lacked in-house. This meant long waits and high costs for travel and accommodation costs for technical support staff had to be brought in from other provinces, entailing accommodation and travel costs. Skilled staff were hard to find and harder to retain as educated youngsters preferred working in urban areas. Some interviewees suggested political problems were a major factor in the challenges, with control of the co-ops contested, disruptive involvement of local political elites in the running of the businesses, and timing and location of projects in some cases being more politically than commercially determined. These problems combined to mean that the REDhubs were unable to fulfil offtake agreements with Spar and Boxer secured at the start of the project. Major Free State millers were omnipresent on retailer shelves where the mills operated and were fiercely competitive price-wise despite being between 300–700km away. With 70% of the operational mills' maize being purchased from outside the province, transport costs were R700 per-ton. One manager suggested that the agro-processing enterprises could not compete until the local maize supply was improved. The mill had sought public procurement opportunities as an alternative to the competition in retail markets, but had been unable to find significant opportunities, finding the processes too time consuming and cumbersome and suggesting they required better political connections. Government subsidy was being progressively reduced with the REDhubs expected to be self-sufficient after five years, from 100% state funded in their first year. As one manager explained, "They [government] are setting their time frame without doing enough research, because some of those challenges emerged as we were doing it [running the mill]. We got in this business without getting enough information. Some of this information we got while we were already in, like food safety, marketing, the [supermarket] offtake agreement. If at all we knew before we got into business, we could have had a bit longer." However, time is running out and interviewees were unsure if the mills would be able to remain open if subsidies were withdrawn.

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In the decade since 2010, state agencies have funded the establishment of a total of 22 separate small-scale milling operations, that we could establish from interviews and publicly available documents. At the time of the research, only three of these were formerly registered with SAGIS, and only one was producing commercially, albeit still at a micro-scale and dependent on state support. None were providing significant competition to the established milling industry.

Milling appears to have been treated by government as a simple activity rather than the technologically advanced precision manufacturing process that it has become in the modern food system, requiring not just production capabilities but a range of complex organisational routines for maintenance of hygiene standards and marketing. As some interviewees noted, government's approach had typically been 'input focused', providing financing for the purchase of capital goods to enter maize processing, but not the ongoing enterprise development support required to develop the operational/organizational capabilities required to effectively compete within it.[163] It is also notable that the flagship milling schemes sought to leapfrog recipients immediately into the more demanding retail sales channels of chain retailers. As discussed in previous sections, even in rural markets geography provides only very limited shelter from the aggressive competitive strategies of large firms. As discussed in Box 11, proximity to grain production is also of no help if the grain produced is not consistently Grade 1.

A more fundamental problem underlying these missteps appears to have been that industrial policy worked 'against and around' the established processing industry, rather than in collaboration with it to draw on the key sources of expertise about the industry. This contrasts to some other agro-industrial sub-sectors where established firms and industry associations have played key role in assisting smaller enterprise development initiatives (for example, citrus or wool). Additionally, among state agencies there appears to have been a problem with an apparent lack of cross-departmental communication and coordination. By way of illustration, despite the problems encountered with Fabcos and other such interventions, DAFF in 2018, copied word-for-word into an agro-processing strategy document the DTI's 2010/11 assertion that '[t]he small-scale milling sector appears to be viable with moderate assistance from government' (DAFF, 2018), though of course the experience has been quite different. The multiple milling support initiatives appear to have been carried out largely in isolation, without attempts to transfer lessons, coordinate activities or learn from experiences. Key informant interviews affirmed challenges around duplication of effort, limited cross-agency coordination and limited learning from past industrial policy experiences in this area. Different agencies pursued different approaches with different underlying logics.[164] This situation for maize processing is a manifestation of a wider issue with lack of

[162] Interviews SAMKI07, SAMKI08.
[163] Interviews S17, SAMKI11, SAMKI02, SAG03, SAG05.
[164] Interviews SAG01, SAG04, SAG05, SAG06, SAG08.

coordination among government agencies around industrial policy that has been highlighted in the recent Agriculture and Agro-processing Masterplan.

7.3 Transformation and B-BBEE

Alongside measures to support new MSME entrants discussed in the previous section, a key feature of agro-industrial policy in South Africa has been the range of measures to address racial inequalities in ownership of productive assets, in particular the land reform process and B-BBEE legislation. Land reform is less significant an issue in maize processing than other sub-sectors given there are less large-scale restitution cases in the major maize growing areas than is the case for horticulture. The key policy lever of transformation in the processing segment of the value chain has been the Agri-BEE Sector Codes. These incentivise white-owned agro-processors to diversify ownership through equity transfer and support black economic participation through preferential procurement, management and skills development. Companies receive a weighted score from 1 (highest) to 8 (lowest) according to their performance on five key measures: (a) Ownership (Equity & Land Ownership), (b) Management control, (c) Skills development, (d) Enterprise and Supplier Development, and (e) Socio-Economic Development. Most contentious for white-owned firms, particularly from the perspective of MSMEs, which are often family owned with small management structures is ownership, where the minimum compliance target is 25%+1 black ownership measured by exercisable voting rights (AgriBEE, 2017). There are forms of partial exemption to this legislation for micro-enterprises and slightly looser conditions for 'qualifying small enterprises'. Exempted micro enterprises (with revenue <R10m) have automatic level 4 status. Majority black-owned micro enterprises get automatic level 1 status. Qualifying small enterprises (Revenue R10m-R50m) have a different scorecard rating, with slightly higher weightings for skills development and lower weightings for management control. There is a formal verification process for which companies must be assessed and scored by an accredited Verification Agency, which are private consultancy companies. Measured entities (companies) then receive a certificate. Higher levels of scorecard compliance have become increasingly important for maize processing firms, in order to access public procurement

opportunities [165] and state industrial policy support. [166] It is also, interviewees suggest, increasingly sought by major retailers seeking to improve their own scorecard performance on the supplier development measure.

Reports from the B-BBEE Commission show that transformation levels achieved on B-BBEE scorecards in the agro-industries—grain milling included—have lagged other sectors of the economy (Table 21-22).[167] For firms submitting certificates under the Agri-BEE charter, a level of only 12% black ownership was achieved in 2019, against the 25% target (B-BBEE Commission, 2020b, 11).

Table 21: B-BBEE Levels by sector (Source: B-BBEE Commission, 2020b)

		Level 1-4	Level 5-8	Non-Compliant	Average black ownership	>51% black ownership	Management control
Agri-BEE	Large	23	43	34	12	1	29
	Small	14	40	46	4	0	
Construction	Large	63	25	12	44	24	37
	Small	68	11	21	48	31	
Finance	Large	63	15	22	25	15	45
	Small	8	25	67	15	13	
ICT	Large	63	27	10	36	37	46
	Small	31	29	40	13	2	
Transport	Large	55	34	11	31	16	29
	Small	79	16	5	33	8	
Generic	Large	40	29	31	29	19	40
	Small	25	29	46	13	4	

[165] Following the amendment of the Preferential Procurement Policy Framework Act to incorporate B-BBEE in 2011 and 2017. With the introduction of the B-BBEE codes in 2007, the Treasury amended the PPPFA such that it would advance the objectives of the codes. See http://www.thedtic.gov.za/financial-and-non-financial-support/b-bbee/b-bbee-procurement-transformation-verification/. After 2011, the regulations applied an 80/20 principle to procurement over R1m, such that 20% of the points allocated to bidders for public procurement contracts relate to their B-BBEE status rather than just conventional value for money concerns. These were updated in 2017 such that the 80/20 system applied for procurement of R30,000 to R50m. State bodies can also set higher pre-qualifying B-BBEE criteria to advance BEE. Overall, the intension of this, the DTIC says, is that B-BBEE compliant procurement by state-entities "has a trickle-down effect which applies pressure on all suppliers and service providers to meet these standards. The impact that this cascading implementation has on procurement in general is the increase in market access for black companies." http://www.thedtic.gov.za/financial-and-non-financial-support/b-bbee/b-bbee-procurement-transformation-verification/

[166] It is frequently a condition for IDC lending and DTIC incentives.

[167] B-BBEE Com data is from certificates uploaded on their portal by accreditation agencies. The tables use data from reporting entities and so many firms will simply not be measured. The levels of transformation in the industry as a whole will be significantly lower. Note only 5,818 certificates were uploaded on the portal in 2019, of which 411 were EMEs, 2057 QSE and 3350 large entities – thus only a small number of firms seek accreditation (verify with SARS data) (BCom, 2020b). Indeed, only 323 were uploaded under the entire agro-BEE code, 156 of which were large enterprises. Under section 13G of the act all JSE firms must report on compliance.

Table 20: Comparison of BEE Scorecards (Source: who owns whom)					
	Flour and grain mill products	**Dairy products**	**Preserving and processing of fruit**	**All industries (average)**	**Maximum**
Ownership	59	17	56	77	100
Management and control	31	30	37	53	100
Skills development	59	45	53	68	100
Enterprise and supplier development	65	61	58	82	100
Socio-economic development	97	91	91	94	100
Black ownership	22	5	23	32	100
Black female ownership	9	2	7	13	100

White owned enterprises made up the majority of the firms interviewed (22/28), and, interviews suggest, the majority of formal agro-processing MSMEs. Concerns about the impacts of B-BBEE legislation emerged as a major theme from interviews, with many firms viewing it as a major problem in accessing markets or state support. B-BBEE was the most common reason cited by firms who were aware of industrial policy support available but had not accessed it, though this sometimes appeared to be based on misapprehensions about the levels of compliance required. A significant concern related to the complexities of compliance for smaller firms. Firms frequently hire consultants to advise them on navigating the complexity of the codes and how to meet scorecard criteria, which require action in staff training/promotions, the composition of management, procurement practices, community development and diversification of ownership. Many of the code requirements for minimum compliance in these areas are more easily achieved in large firms due to the ability to spread overhead expenses, the presence of specialist staff and other advantages of scale. For example, skills development activities[168] benefit from scale simply by virtue of a larger workforce making it easier to spare workers from the factory floor for training. The enterprise and supplier development element of the scorecard[169] is particularly complicated for MSMEs with shorter, less diversified supply chains than large firms. In particular, the lack of transformation in grain farming makes it difficult for focused maize processors to address

[168] Measured by levels of skills development expenditure and numbers participating in training programmes.
[169] Whereby entities are scored on the percentage of total procurement from B-BBEE-compliant firms, majority black-owned firms, black women-owned firms, Exempt Micro-Enterprises, Qualifying Small Enterprises, and contribution to enterprise and supplier development schemes

procurement dimensions of the scorecard. Large firms, in particular the ultra-large-scale FMCG firms, are more diversified in their supplier base, and can also and take proactive measures to build their own black-owned suppliers through supplier development programmes. These supplier development programmes are now widespread among large-scale food manufacturers, which have devoted considerable resources and in-house expertise to the activity.

Among MSMEs interviewed attempting to gain verification or raise their B-BBEE scorecard levels, the ownership dimension was particularly challenging. In particular, dilution of existing owners' control may be more complicated for family businesses. The challenges of equity transfer are less severe for large firms with more complex management and ownership structures, particularly listed firms with publicly traded share capital, where disposal of a minority equity stake to an empowerment partner are less consequential in terms of how the firm operates than would be the case for small firms. Larger firms are also able to engineer their own bespoke empowerment funds, with many of the large, listed companies using employee or community share ownership vehicles to meet their empowerment targets. In general, B-BBEE transactions are still heavily reliant on vendor financing (33%), with only 3% of transactions being cash in 2018/19 (11% 2017/18), meaning companies with stronger balance sheets may find it easier to complete transactions (B-BBEE Commission, 2020a). There have indeed been some significant transactions and initiatives among the very largest maize processing firms over recent years (Box 12). While more granular data is not available, there appears to be a broader pattern where large firms perform significantly better than small firms on B-BBEE scorecard levels (Table 23). For the reasons outlined above, an inadvertent effect of B-BBEE codes appears to be that large firms gain an additional source of competitive advantage over their white-owned MSME rivals.

Table 23: B-BBEE Levels Achieved, 2019 (B-BEE Commission, 2020)

	JSE Listed entities	Large entities	Qualifying small enterprises
Level 1-4	49%	45%	36%
Level 5-8	34%	29%	26%
Non-compliant	25%	26%	39%

Box 12: Large firms and BEE

The three major listed milling firms have, like much of corporate South Africa, sought to address BEE ownership requirements through disposals of minority equity shares, primarily through employee share ownership programmes. Workers own the equivalent of 13% in Pioneer Foods via Pepsi's shares on the Nasdaq, with an Agri-BEE scorecard rating of 6. Tiger Brands' ESOP and community trust own equivalent to 14.8% in the company, which has a scorecard rating of 4. Premier has a B-BBEE scorecard rating of 4. RCL meanwhile has 20% BEE ownership. More significant in terms of transformation have been two recent acquisitions in milling by large black-owned firms, in both cases strategic partnerships with major white-owned firms in the maize value chain. The 2018 acquisition of two major medium-scale milling firms, Noordfed and Progress, by the multinational commodity trader Louis Dreyfus (LDCA) was carried out in conjunction with the domestic, black-owned agro-processing firm Willowton, which is one of the largest edible oil producers in Africa. The latter holds 51% of the new firm created from the joint venture (marketing under the brand Noko). The Competition Commission recommended prohibition of the merger given the potential impact on competition in the maize value chain. A key justification for approving the merger given by the tribunal was, alongside saving jobs at two struggling millers, that "In our view, the industrial policy of the government which encourages the creation of historically black-owned businesses to compete with established enterprises warrants serious consideration in these instances. Holdco will, post-merger become a black-owned white maize miller which with the financial support and expertise of Willowton and LDCA will compete effectively with the 4 big milling companies" (Competition Tribunal, 2017). In 2019, the Tribunal approved the purchase of a 30% stake in Pride Milling, the fourth largest milling firm in the country, by Thebe Investment Corporation (Competition Tribunal, 2019), a large cross-sectoral holding company with interests in petrochemicals, energy, food processing and telecoms and tourism, including as empowerment partner for Shell. The major agribusinesses have also carried out BEE deals, with Senwes conducting a landmark deal in the mid-2000s with the Royal Bafokeng Holdings, a large cross-sectoral holding company controlled by the Bafokeng royal family. Afgri's holding company AgriGroupe is 20% owned by Bafepi, a special purpose vehicle created as an employee's share ownership and community trust.

In addition to this, interviews with black-owned processing firms suggested that public procurement policies were not functioning effectively to support transformation. Public procurement is hypothetically a major alternative sales channel for small firms given the millions of meals required to be provided each day through school feeding schemes, prisons, hospitals and other public institutions. It is also widely recognised, in South Africa and internationally, as an important potential industrial policy instrument for providing stable, long-term revenue streams to small enterprises. However, among firms interviewed with experience of the public procurement system opinions were negative, with contracts viewed as difficult to obtain for small firms, poorly managed or subject to forms of corruption.[170] Forms of fronting and intermediation by trading enterprises which raised costs substantially but did not to support genuine transformation in manufacturing were viewed to be widespread. Two firms gave an example of their products being bought by middlemen holding public procurement tenders. While the manufacturer covered all practical aspects of the

[170] Interviews S02, S04, S17, S26, S22, SAMKI11, S20.

contract, the middleman would sell the produce on for around double the purchase price.[171] Other interviewees claimed fronting was taking place to circumnavigate demand from supermarkets and public procurement bodies for B-BBEE certificates, in which 'briefcase businessmen' intermediated sales. Black-owned manufacturing firms interviewed also had difficulty accessing public procurement, or found wider dysfunctionalities in the public procurement system to be a challenge. One small-scale black-owned firm, which had only recently entered the milling industry had developed public procurement contacts as a key sales channel. However, accessing these contracts meant selling through a series of precarious trading enterprises holding public tenders. These trading enterprises would frequently fail or default, they explained. "They don't have any guarantor, they don't even have a formal office or a factory, they are running it [the contracting business] out of their houses. They don't have offices. The government just gives them [tenders] ... if you liquidate them you won't get anything" because they will vanish and be almost impossible to trace. In the past four years, such contractors had made away with R6m from the business in money owed for produce delivered to them. The owner paid a law firm R200,000 to try and trace them, but nothing came of it. Because of the big risk, he says "as time goes on I want to leave the [department name removed] and go to the open market" because "contractors run away with the money". His view was that public procurement was serving to create trading enterprises rather than manufacturers. The difficulty was, he said, that commercial opportunities were much easier to access in food distribution than manufacturing, since the financial requirements for entry were much lower.[172]

8. Conclusions

The paper analysed the evolution of the maize-processing value chain in South Africa and the challenges faced by MSMEs in the decades following the liberalisation reforms of the 1990s. Despite rising demand for processed grain products and the lowering of regulatory barriers to entry, after an increase of new entrants in the first decade after liberalisation there has been a steady decline in the number of formal industrial milling firms from over 300 in 2003/4 to less than 200 in 2019/20. The research suggests conditions have been highly adverse for small processing firms. The changing dynamics of food value chains and markets and the wider institutional and socio-economic environment in which these are embedded, creates a range of significant difficulties for MSMEs. Industrial policy initiatives to support small-scale black-owned milling firms have achieved limited results to date. However, the research also shows that small and micro-scale firms with particular types of capabilities and linkages can adapt, upgrade and achieve resilient positions in particular market segments and sales channels, typically orientated towards informal retail systems and independent wholesalers. In addition, while the ultra-large scale firms which have historically dominated maize

[171] Interviews S4, S21.
[172] Interviews S22.

processing in South Africa remain extremely powerful actors in supermarket retail channels, the post-liberalisation period has also seen significant growth among highly-competitive, dynamic medium-scale firms, typically operating in the major maize farming districts with close links to agriculture and advanced technological capabilities. This has driven a significant process of deconcentration at the top end of the size distribution of maize processing firms, with the share of the 'big-4' milling firms falling from 80% in the mid-1990s, to 60% in the mid-2000s, to around 40% in recent years.

While often viewed by policymakers as more favourable for small firm participation than other agro-processing activities, as the paper has shown maize processing is in fact an extremely difficult industry for MSMEs due to the structural features of the value chain, the characteristics of raw material supply and the nature of consumer demand. In particular, large retailers and wholesalers wield considerable bargaining power over small firms, and have sought to streamline supply chains. Increasingly exacting hygiene and quality standards required by major retailers have provided powerful inducements to upgrading among suppliers, but also create a significant barrier to entry for many firms. Large firms developed forms of countervailing power through economies of scope and investment in brands, and have engaged in radical process innovation to minimise costs and increase consistency through automation of production processes. This has led to significant advances in the technological frontier, which makes catch-up among follower-firms extremely challenging. In the upstream of the chain, access to consistent high quality maize suitable for the production of a commercially competitive project is—in the absence of arrangements with commercial grain farmers—secured through highly consolidated storage and trading segments. This creates significant intermediation costs, and a range of challenges for small firms needing to procure within a smaller radius, and purchase grain in smaller quantities less frequently. Small processing firms are also less able to take advantage of the hedging services provided by storage and trading firms which large and medium-scale firms use to manage price volatility.

Abstracting from in-depth interviews with 28 maize processing MSMEs, the paper identifies two broad categories, or ideal types, of successful adaptive outcomes to these conditions among firms. Firstly, defensive adaptation, where firm strategy has revolved around efforts to achieve resilience rather than rapid growth and upgrading, with dense forward linkages in highly localised, and largely informal retail channels, in either rural or township markets. Small firms could enjoy price advantages in these markets due to last-mile logistics costs, and bargaining power imbalances, transactional conditions (e.g. rebates, credit terms) and product quality requirements. Success in these markets nonetheless required sophisticated marketing capabilities and local knowledge. There are also major risks given the precarity of small-scale independent retailers. While business models are labour intensive, meeting minimum product quality standards expected by consumers requires significant organisational and technological capabilities.

A second successful adaptive outcome identified is dynamic adaptation, involving aggressive growth and investment in technological capabilities by medium scale firms, targeting either

specialised niche products or, more commonly, low income consumer markets accessed through independent wholesalers. Expansion beyond the sheltered confines of localised markets entails high levels of capital investment in upgrading of technological capabilities to remain competitive on cost and quality. This in turn necessitates increased production volume, creating a treadmill effect. These were for the most part young firms, which had grown rapidly in the post liberalisation period with extensive capability upgrading including investment in advanced automation processes. Most also exhibited dense backward linkages to farming, being situated in the major maize growing districts and with either full vertical integration with farming enterprises or with close relations with local maize farmers. Farmers attempting to move up the value chain appears to be the main entry point for maize processing. In all cases, while maize processing is typically a low margin activity, ownership of processing provides optionality for the profitable disposal of grain in conditions of extreme market volatility. Two important points are that the evolution of the agro-processing sector relates closely to the evolution of the broader agrarian structure and historical patterns of accumulation elsewhere in the maize value chain.

While successful adaptation is possible along these lines, it is clear that many small scale firms are highly precarious. This is reflected in the steady decline in the number of formally registered milling firms during the past decade and a half, and was powerfully conveyed in firm-level interviews. A particular challenge relates to the process of rapid demand-induced innovation taking place over the post-liberalisation period, with consumer and retailer requirements for more highly-processed and consistent produce, delivered not imply at lower cost but with greater speed, precision and flexibility, and subject to more sophisticated packaging and hygiene requirements. Large firms have responded to these shifts in demand with significant process innovation – in particular in automated technology – in a manner which has significantly advanced the industry's technological frontier. They have also to an extent shaped demand through significant investment in product innovation and marketing. For new entrants, the learning curve in maize processing is – contrary to prevalent assumptions – very steep, and the challenge is one of attaining these capabilities within a short enough period of time to remain viable.

The learning process for small firms is extremely challenging due to the characteristics of the sectoral innovation system. There is a limited amount of state support for firms' capital investment, R&D, skills training, information dissemination and other such services which support firm-level learning. What state support does exist for such functions is for the most part circumscribed by lack of funding, the centralised nature of key state agencies, and complex access criteria. Additionally, while the maize value chain is highly organised at farming and storage level, organisation is relatively limited at processing level with low membership in the formal milling association. The interviews found processing MSMEs to be in general atomized and isolated from the kinds of institutional enablers provided by the state and inter-firm collective action that are typically associated with upgrading among small firms. Successful upgrading processes were instead heavily dependent on commercial

relations with specialist consultancies and capital goods suppliers, or by knowledge acquired by entrepreneurs through their own professional experience or social networks. This again advantages firms in commercial maize farming districts where there is easier access to specialist equipment and services suppliers, skilled staff, and complementary infrastructures associated with a clustering effect.

Though small-scale maize milling has, formally, been the target of a range of industrial policy interventions in the decade since 2010 seeking to deconcentrate markets and increase black participation in manufacturing, these were found to have been widely unsuccessful. From 22 firms funded by state agencies – a total established from interviews and publicly available documents – only a few were found to be formally registered and producing commercially. This reflects both the challenges outlined above, and shortcomings in the nature of industrial policy support. Milling appears to have been treated by government as a relatively simple industrial activity that could be quickly picked up by new entrants, rather than the technologically-sophisticated manufacturing process that it has become in the modern food system. Industrial policy support typically provided up-front subsidisation of capital expenditure but without subsequent subsidisation of skills development and learning processes.

State-business relations around the maize processing industry have been complex and at times fractious over the post-liberalisation period, and this has also affected the character and effectiveness of industrial policy support. In the early post-liberalisation phase, some large and medium scale firms participated in collusive arrangements to control prices and manage the threat of destabilising competition. This was one manifestation of a broader post-liberalisation process in which extensive state governance of the food system was replaced by various forms of purposive coordination by powerful private sector actors. The fallout from the discovery and prosecution of the cartels had a bearing on the character of industrial policy, which in the 2010s emphasised supporting small-scale entrants as a means of increasing competition for the major players in the industry. Key industrial policy initiatives in this arena largely bypassed major established firms in the value chain and their respective organisations, with consequences for the ability to draw on key sources of expertise in the design and execution of interventions. Problems in the design and execution of effective industrial policy also appear to have been amplified by fragmentation of the South African state and poor coordination among the multiple agencies working on agro-processing.

A final point is that MSMEs face a wide range of severe challenges as a result of dysfunctionalities in key state functions relating to the provision of infrastructure and security. In particular, the unreliable supply of electricity and water, poor quality transport and telecommunications infrastructure, and the considerable impact of crime and social unrest on production and supply chains. These problems are widespread but also highly variable by location, and commonly relate to problems within municipal governments rather than the central state. Firms do not confront these problems in the wider business environment on a level playing field, with smaller firms suffering more acutely given their

more limited ability to purchase alternative sources of energy, water, telecommunications and the like, the high costs associated with private security and the greater vulnerability of shorter, less diversified supply chains. Unresolved, these problems can be expected to undermine efforts to boost participation by small firms.

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Annex One

Code	Interviewee	Organisation	Location	Date
SAG01	Dharmarai Naicker, Competency Area Manager	Council for Scientific and Industrial Research	Pretoria	05/09/2019
SAG03	Joseph Kau, Agricultural Economist	Agricultural Research Council	Pretoria	12/08/2019
SAG04	State agro-industrial policy officials (de-identified)	De-identified	Pretoria	10/09/2019
SAG05	State small-business policy official (de-identified)	De-identified	Pretoria	02/09/2019
SAG06	State economic policy officials	De-identified	Written responses to questions	27/09/2019
SAG08	Dumisani Mngadi	South African Bureau of Standards	Pretoria	17/10/2019
SAMB01	Former large processing firm manager (de-identified)	De-identified	Johannesburg	17/07/2019
SAMB02	Manager, medium scale processing firm	De-identified	Gauteng	04/2020
SAMB03	Former large processing firm manager (de-identified)	De-identified	Gauteng	26/06/2019
SAMB06	Former mill owner (de-identified)	De-identified	North West Province	06/2019
SAMB12	Former large processing firm manager (de-identified)	De-identified	Via Zoom	31/08/2020
SAMKI01	Trade association representative (de-identified)	De-identified	Johannesburg	12/08/2019
SAMKI02	Mariana Purnell, Ishmael Tshiame	Agricultural Business Chamber (Grain)	Pretoria	26/08/2019
SAMKI03	Processing equipment supplier (de-identified)	De-identified	Free State	04/09/2019
SAMKI04	Wiana Louw & Jolanda Nortje	Southern Africa Grain Laboratory	Pretoria	05/09/2019
SAMKI06	Grain storage company	De-identified	Gauteng	11/09/2019

	representative (de-identified)			
SAMKI07	Navy Simukonde and Luvo Qongqo	Eastern Cape Rural Development Agency	East London	30/09/2019
SAMKI08	Tim White	First Business South Africa	East London	01/10/2019
SAMKI10	Lukas Van Zyl	Silostrat (Pty) Ltd	Gauteng	04/02/2020
SAMKI11	Xolani Ndzaba	Golden Dice Food (previous owner of Lethabo Milling)	Gauteng	26/02/2020
SAMKI13	Manager of large processing firm (de-identified)	De-identified	Via Zoom	01/09/2020
S01	Manager of MSME processing firm (de-identified)	Small-scale processing firm (de-identified)	Free State	26/08/2019
S02	Manager of MSME processing firm (de-identified)	Micro-scale processing firm (de-identified)	Free State	27/08/2019
S03	Manager of MSME processing firm (de-identified)	Medium-scale processing firm (de-identified)	Free State	28/08/2019
S04	Manager of MSME processing firm (de-identified)	Medium-scale processing firm (de-identified)	Free State	29/08/2019
S05	Manager of MSME processing firm (de-identified))	Micro-scale processing firm (de-identified)	Free State	30/08/2019
S06	Manager of MSME processing firm (de-identified))	Medium-scale processing firm (de-identified)	Free State	03/09/2019
S07	Manager of MSME processing firm (de-identified)	Medium-scale processing firm (de-identified)	Free State	05/09/2019
S08	Manager of MSME processing firm (de-identified)	Medium-scale processing firm (de-identified)	Gauteng	13/09/2019
S09	Manager of MSME processing firm (de-identified)	Small-scale processing firm (de-identified)	Gauteng	17/09/2019
S10	Manager of MSME processing firm (de-identified)	Micro-scale processing firm (de-identified)	Free State	20/09/2019
S11	Manager of MSME processing firm (de-identified)	Small-scale processing firm (de-identified)	Kwa-Zulu Natal	26/09/2019
S12	Manager of MSME processing firm (de-identified)	Small-scale processing firm (de-identified)	Kwa-Zulu Natal	26/09/2019
S13	Manager of MSME processing firm (de-identified)	Micro-scale processing firm (de-identified)	Kwa-Zulu Natal	27/09/2019

S14	Manager of MSME processing firm (de-identified)	Medium-scale processing firm (de-identified)	Eastern Cape	30/09/2019
S15	Manager of MSME processing firm (de-identified)	Small-scale processing firm (de-identified)	Eastern Cape	01/10/2019
S16	Manager of MSME processing firm (de-identified)	Small-scale processing firm (de-identified)	Eastern Cape	02/10/2019
S17	Manager of MSME processing firm (de-identified)	Small-scale processing firm (de-identified)	Eastern Cape	03/10/2019
S18	Manager of MSME processing firm (de-identified)	Micro-scale processing firm (de-identified)	Eastern Cape	04/10/2019
S19	Manager of MSME processing firm (de-identified)	Micro-scale processing firm (de-identified)	Gauteng	08/10/2019
S20	Manager of MSME processing firm (de-identified)	Micro-scale processing firm (de-identified)	Gauteng	10/10/2019
S21	Manager of MSME processing firm (de-identified)	Medium-scale processing firm (de-identified)	Free State	14/10/2019
S22	Manager of MSME processing firm (de-identified)	Small-scale processing firm (de-identified)	Gauteng	17/10/2019
S23	Manager of MSME processing firm (de-identified)	Small-scale processing firm (de-identified)	Mpumalanga	18/10/2019
S24	Manager of MSME processing firm (de-identified)	Small-scale processing firm (de-identified)	Limpopo	21/10/2019
S25	Manager of MSME processing firm (de-identified)	Medium-scale processing firm (de-identified)	Gauteng	08/11/2019
S26	Manager of MSME processing firm (de-identified)	Small-scale processing firm (de-identified)	Kwa-Zulu Natal	11/11/2019
S27	Manager of MSME processing firm (de-identified)	Small-scale processing firm (de-identified)	Gauteng	05/02/2020
S28	Manager of MSME processing firm (de-identified)	Small-scale processing firm (de-identified)	North West	19/02/2019

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