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Multinationals and competition in poultry value chains in South Africa, Zambia, and Malawi

Sumayya Goga and Simon Roberts

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Abstract

The geographic reach of multinational corporations in many industries means that mergers and cartel agreements in one jurisdiction such as in north America or Europe may impact on countries around the world, including in southern Africa. Our paper analyses the role of multinationals in shaping poultry value chains in three countries in Southern Africa - South Africa, Zambia, and Malawi - through impacts on the access to and price of breeding stock. It assesses the increased consolidation of breeding companies since the 1980s through a succession of mergers and the implications for smaller producers in African countries. Two multinationals, Tyson Foods of the USA, and the EW Group from Europe, now control more than 90% of commercial poultry breeding stock, a reduction from more than 20 companies in 1981. Control over poultry breeding is extended internationally by these two firms either through licencing/distribution agreements with large regional companies or by integrating directly into production.

Our paper analyses two main questions. First, how has concentration and vertical integration resulting from mergers shaped poultry value chains and outcomes in the three selected countries? Second, what do market outcomes and arrangements such as information exchange tell us about likely coordination internationally in light of the cartels uncovered in countries including the USA and Zambia in 2021 and 2018? These questions are addressed through assessing information on market structure and outcomes. The answers have far-reaching implications for the effectiveness of competition laws which are applied nationally and regionally, while the arrangements reach between continents. There are also important effects which extend back to animal feed and its main constituents of maize and soybean, as well as on food prices for what is among the cheapest sources of protein.

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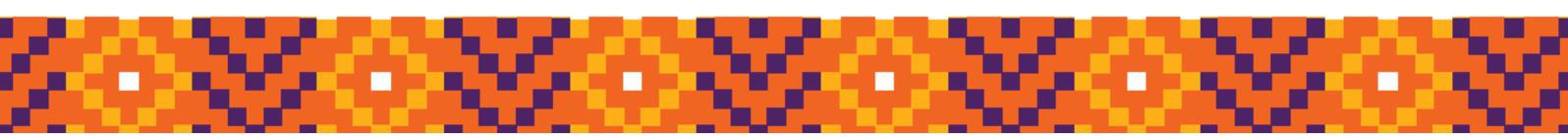
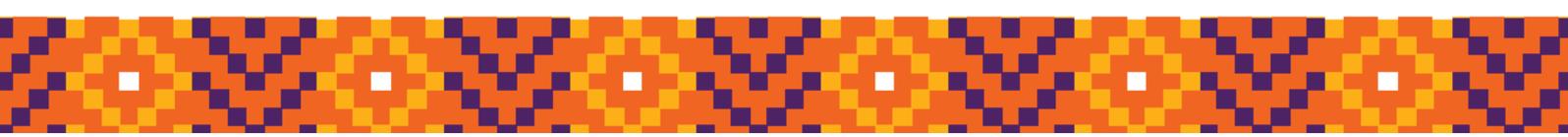


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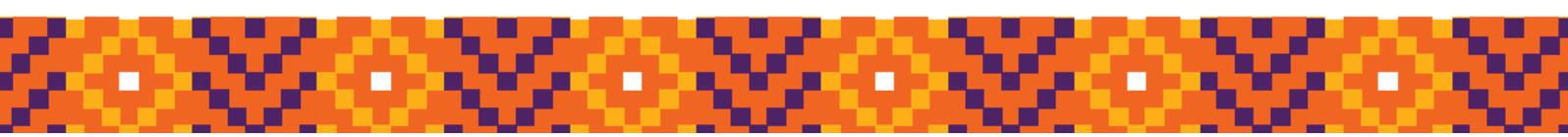


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1. Introduction

To assess the implications of international concentration and integration for southern Africa we map the reach of the main American and European multinational poultry companies across three African countries (South Africa, Zambia, and Malawi). We analyse the ways in which networks of arrangements and vertical integration between the multinational companies and lead poultry producers in these countries shape the poultry value chains, including the ability of smaller producers to compete. We collate and assess data on market outcomes, within and across these countries, drawing on in-country interviews with firms, poultry associations and researchers.¹

The way in which commercial poultry is produced has changed considerably in the last 70 years. From the holding of the ‘chicken of tomorrow’ competitions in the USA from 1946 to 1951, broiler breeds have been developed for mass-production of chicken meat.² These breeds have rapid growth and low mortality rates when kept under strict growing conditions. With diets to maximize the feed conversion ratio (weight of meat per kg of poultry feed) the leading breeds have feed conversion ratios of around 1.7kg of feed per 1kg of meat and growing times of just 35-45 days to reach target live weights of 2-2.5kg.³ The industry is therefore based on breeding stock, sourced as ‘day-old-chicks’ (DOCs), and feed production. Feed is the largest input cost, typically accounting for around 70% of costs. Maize and soybeans are the main feed constituents, along with vitamins, minerals, and pharmaceuticals. Growing global demand for animal feed also links global poultry consumption to the production of soybeans and maize which are a major cause of deforestation in countries such as Brazil.

The development of commercial poultry production has led to chicken becoming one of the cheapest sources of animal protein. Production has grown strongly around the world in the past half century. In sub-Saharan Africa poultry consumption is growing rapidly from relatively low levels and is projected to increase ninefold in per capita terms by 2050 with urbanization and rising incomes, and by much more in absolute terms given population growth (OECD-FAO, 2017; BFAP, 2021).⁴

The intellectual property embodied in the breeding stock is one factor driving internationalization of the industry and higher levels of concentration. Concentration has also increased through a large number of mergers and acquisitions which have, with a few exceptions, gone unchallenged by competition authorities. These factors mean that there are a small number of multinational firms which shape the development of the poultry industry and poultry markets in Africa. The global picture is essential to understanding concentration in southern Africa through the footprint of multinational companies along global value chains (Meagher and Roberts, 2021). Through examining market structure and market outcomes we analyse the effects of international concentration on southern Africa, with a focus on the three selected countries.

¹ See Appendix 1 for the list of interview participants. Given the confidential nature of licencing arrangements many firms were reluctant to be interviewed.

² <https://livestock.extension.wisc.edu/articles/the-chicken-of-tomorrow/>

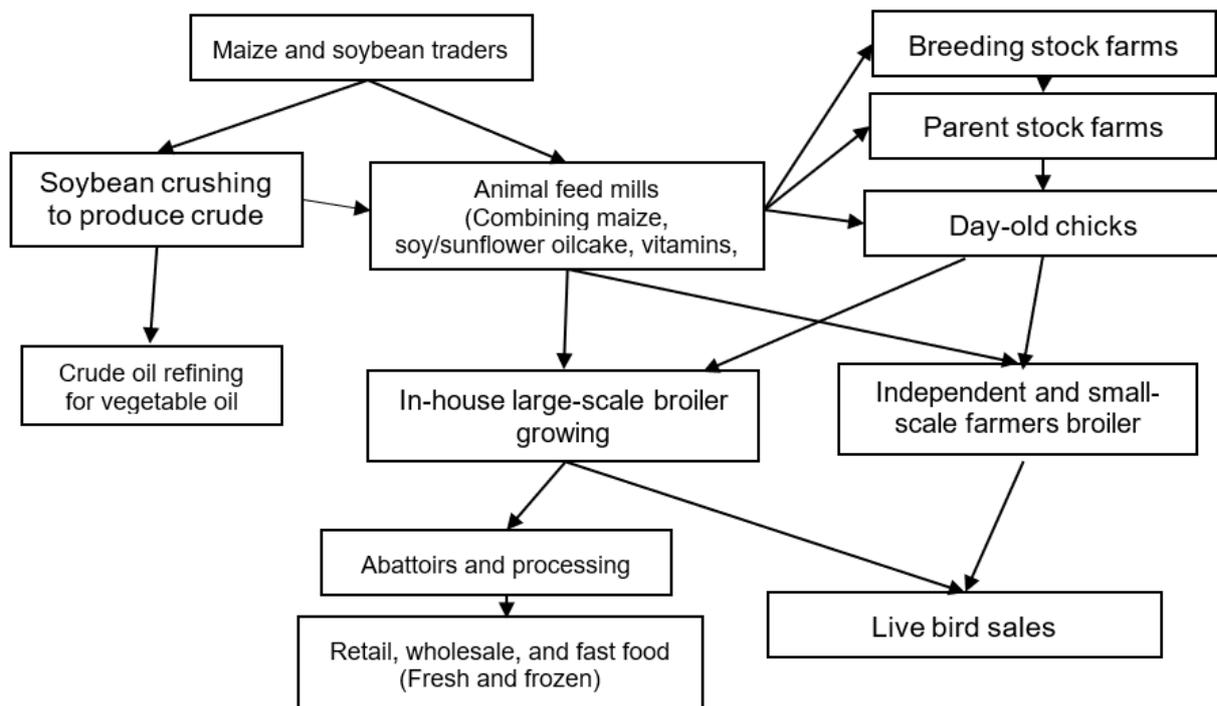
³ See OECD-FAO (2022)

⁴ Average consumption in Africa was just 2.1kg per capita in 2017, compared with 49.8kg per capita in the USA (OECD-FAO, 2017 and 2018a).

Value chain overview

The commercial poultry industry can be mapped as a 'value chain' which sets out the linkages between key stages in production and highlights the key levels at which companies may exercise power, for example, over essential inputs (Figure 1). Commercial poultry production is based on fast growing breeds which are continuously improved to meet country conditions and climate and the biosecurity regulations in place for growing poultry. The other major input is animal feed which relies on procuring the constituents at competitive prices. Production of broiler chickens happens in small and large-scale facilities with processing or live sales in some countries.

Figure 1: Poultry value chain



Source: Adapted from Bagopi et al. (2014)

Notes: The proportion of live bird sales versus retail sales differs by developing countries

Concentration at the breeding stock level is very high with two multinationals – Tyson Foods of the USA and EW Group GmbH, a family-owned company emanating from Germany, dominating commercial breeding stock for broilers. These companies have acquired almost all the main commercial breeds while just the two main breeds – Ross from EWG and Cobb from Tyson – account for around 90% of broiler production in most countries (Tak et al., 2022).⁵ Poultry breeding stock is the most concentrated major sector in all of industrial

⁵ Other breeds owned by these two companies include Arbor Acres, Hubbard and Lohmann. The USA complaints identify that Tyson, Aviagen and Hubbard (now merged with Aviagen) account for 98% of broilers in the USA and over 80% globally (see End-User Consumer Plaintiff's Fifth Consolidated Amended Class Action Complaint [Redacted Version], filed, 7 August 2020, United States District Court, Northern District of Illinois Eastern Division). Tyson has 50% of the USA market, meaning Aviagen has almost the same share. In Mexico, these breeding companies are identified as accounting for the whole market, albeit with Aviagen having had a majority share at 79% in 2016 (OECD, 2018b).

foods (ETC, 2022).⁶ The two multinationals provide access to their breeds either through licencing/distribution agreements, or by integrating into production in countries.

Within broiler production from the breeding stock there are typically a large number of broiler farmers who rear the chickens. The farmers may be contract out-growers as in the USA, or somewhat more independent as in European countries. Nevertheless, there are scale economies in processing poultry which, along with the importance of breeding stock and feed for performance, mean that a very few large companies typically control the majority of poultry meat production (ETC, 2022; HB, Meat Atlas, 2021).⁷ These companies are typically integrated into breeding and/or into feed and commodity trading.

There have been many cartel cases around the world (Roberts, 2023). Most recently, the USA uncovered collusion which ran from 2007 to 2019 and involved sophisticated information exchange and arrangements along the value chain. The cartel is estimated to have increased prices of chicken by as much as 50% (Li and Weisman, 2023).

In the east and southern African region on which we focus, the breeding stock producers hold rights from the global breeding companies (Ncube, 2018; Nsomba et al. 2022). In animal feed there are a few major with important linkages to major international grain traders and processors of soybeans and maize. The industry development is thus influenced by large multinationals and their conduct meaning that market and industry outcomes need to be understood within the international picture. This poses major questions about concentration, mergers and conduct for the competition enforcement which is undertaken at the national level (and regional level in the Common Market of Eastern and Southern Africa, COMESA).

2. Market structure in poultry breeding, and poultry market outcomes in southern Africa

2.1. International concentration at the breeding level

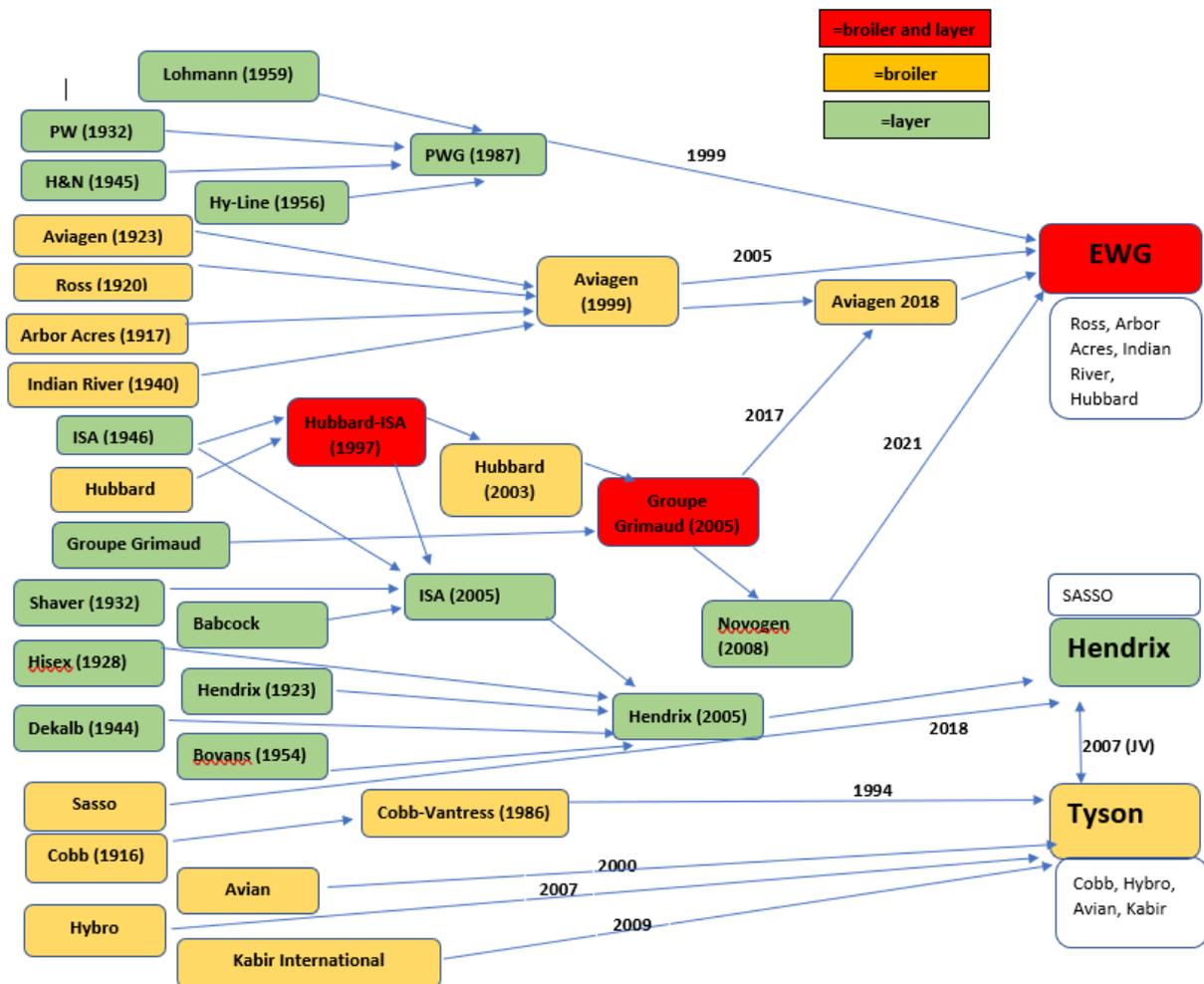
There has been a very substantial increase in concentration globally in poultry breeding. In 1981, there were 26 substantial commercial broiler genetics companies worldwide;⁸ by 2022 consolidation and mergers in the industry had led to two companies dominating broiler genetics – Tyson Foods and the EW Group (Figure 2, and Boxes 1 and 2). This includes acquisitions of the slow growing ('free range') breeds. The slow-growing Hubbard breed was acquired by the EW group (with Groupe Grimaud in 2017/18). Hendrix which acquired the slow-growing SASSO breed has a research collaboration, and a series of joint ventures and joint products with Tyson.

⁶ A third company, Hendrix Genetics, producing breeding stock for egg layers, however, for broiler breeding stock it has a series of joint ventures with Tyson.

⁷ The largest four firms accounted for 58% of the USA market in 2007 with subsequent mergers meaning this increased (Li and Weisman, 2023).

⁸ According to para 360 of End-User Consumer Plaintiff's Fifth Consolidated Amended Class Action Complaint [Redacted Version], filed, 7 August 2020, United States District Court, Northern District of Illinois Eastern Division.

Figure 2: Consolidation of poultry breeding companies through mergers



Source: Adapted from Tak et al., 2022, with additional information from company websites

Notes: i. This is not an exhaustive list of broiler breeding companies; ii. The years in the boxes signify the founding of the breeding company, while the years on the arrows signify the year of merging / consolidation.

Box 1. The EW Group

The family-owned EW Group GmbH owns the Ross, Arbor Acres, Rowan, Peterson and Hubbard breeds (among others).⁹ For the EW Group, the major increase in consolidation occurred when the EW Group acquired Aviagen in 2005, which itself was formed through a series of mergers and acquisitions. The main businesses in Aviagen are Ross Breeders, which had developed from the Ross family business in Grimsby, UK, in the 1920s. The Ross Poultry group with the Ross bird became part of the Aviagen holding company in 1998 which through acquisitions also held the Arbor Acres, Indian River and Nicholas Turkeys birds.¹⁰ The main bird has been the Ross 308 which

⁹ It is unlisted and formerly was Erich Wesjohann GmbH & Co KG. The EW Group reported profits of €332mn in 2018 (www.northdata.de with sales data not being available). Total sales of the wider corporate group in 2021 were \$3.25bn, according to Dun and Bradstreet https://www.dnb.com/business-directory/company-profiles/ew_group_gmbh.1417914a4698b55cc8399c61625c45b1.html

¹⁰ www.redcombgenetics.co.nz/ross-breeders-ltd/

became one of the dominant birds globally from the 1980s.¹¹ Under the EW Group, Aviagen then also acquired Hubbard in 2017.¹² Aviagen International Finance Ltd, registered in the UK and operating as a holding company within the EW Group, owns 52 companies.¹³ These include poultry breeding businesses in 20 countries around the world. It has expanded across Africa through companies including Aviagen East Africa, Aviagen South Africa, and Aviagen Central Africa.

Box 2. Tyson Foods

The Cobb-Vantress company with the Cobb breed is part of Tyson Foods. Cobb Pedigreed Chick was founded in 1916 in the US and claims to be the oldest poultry breeding company in the world. Tyson Foods grew as a vertically integrated family-owned poultry business from the 1950s including a hatchery and feed business working with farmers to raise broilers for processing and sale and industrializing the processing and supply of chicken while acquiring competitors through the 1960s and 1970s (Leonard, 2014). In 1994, Tyson Foods bought Cobb after it had formed a joint venture with Cobb in the 1980s. Tyson acquired breeding companies Avian in 2000 and Hybro in 2008. In 2008 Tyson and Hendrix set up a joint venture to share and promote expertise in the field of genomics, and they have further extended this agreement. The JV strengthens Cobb's position in broiler breeding and Hendrix's position in layer hen, turkey, pig and aquaculture genetics and enables the two companies to further explore JV business opportunities.¹⁴ Together with a research collaboration, Hendrix and Cobb have a product which combines Cobb and SASSO birds.¹⁵ Tyson is a global food company. It acquired the European operations of Brazil's BRF SA in February 2019 (with processing plants in the Netherlands and the UK) and has also diversified out of poultry into other meats. In the 2021 financial year it had total sales of \$47bn, up almost \$5bn in 2020. Of this, poultry accounted for \$13.7bn.

Links from breeding stock to broiler production

While both Tyson and EW Group have grown through mergers and acquisitions, they appear to have followed somewhat different business models. Tyson is integrated into poultry production in the USA and many other regions – it provides breeding stock and feed to contract farmers who then supply the broilers back to Tyson for processing. Tyson's business model in the USA is to use contract farmers to grow broilers while being vertically integrated from breeding through to processing, allowing it to control margins along the value chain.¹⁶ In contrast, the EW Group appears to be less integrated into poultry processing although it has been investing in poultry operations in Europe.¹⁷ Both companies provide breeding

¹¹ See Scaturro (2020).

¹² Approved by the UK's CMA on the basis that Hubbard's specialization on free range breeding stock does not substantially constrain Aviagen's broiler breeds. Hubbard was the third largest breeding company in Europe (EU, 2015) albeit far behind EW and Tyson and oriented to 'slow growing' breeding stock for free range and organic chicken.

¹³ According to the 2020 Annual Report.

¹⁴ <https://www.canadianpoultrymag.com/cobb-and-hendrix-extend-rd-partnership-12415/>

¹⁵ Email communication with Hendrix, 4 November 2022.

¹⁶ The farmer payments are calculated by Tyson through the 'tournament model' where farmer performance is measured against each other in a confidential process.

¹⁷ This is partly for historic reasons as the family business of the Lohmann-Wesjohann Group split in 1998 between the Wesjohann brothers, so that the EW Group (Erich Wesjohann) focused on the breeding stock while the PHW Group (Paul Heinz Weshohann) focused on the meat business and is the largest German poultry producer and fourth largest in Europe (and a leading supplier of animal feed, animal vaccines, vitamins and supplements). In 2014 EW Group also acquired one of the largest Dutch

stock to, and have networks of arrangements with, other major companies which are linked to feed, commodity trading and meat production. These include Cargill, the largest commodity trader, and a major poultry producer in countries such as the USA, UK, Colombia, China and Thailand, and Brazil's JBS, the world's largest meat producer and a major poultry producer in the USA, Brazil, Mexico, UK, Netherlands, and France.¹⁸

2.2. Footprint of concentration in southern Africa

The global picture is essential to understanding concentration and competition in southern Africa. Mergers approved in the USA and Europe have impacted on rivalry in breeding stock, such as Aviagen's acquisition of Hubbard in 2017/18 approved by the UK's Competition and Markets Authority. The two lead companies (Tyson and the EW Group) have subsidiaries all over the world and keep breeding stock on different continents. The rights to produce are then licenced to companies at the grandparent stock level. Grandparent stock cannot themselves be sold by licencees; these companies produce and can on-sell parent stock, depending on the distribution licence, or retain parent stock to themselves produce broiler DOCs. The broiler DOCs are reared by poultry farmers. From one female grandparent, 4 million broilers can be produced.

Setting up grandparent breeder facilities requires the breeding licence, significant capital investment, specialised knowledge in breeder technologies, and infrastructure to meet biosecurity and animal welfare standards. There are therefore significant barriers to entry into breeding operations. Setting up a grandparent operation in South Africa is estimated to cost around R50-R70 million (\$3 million-\$4million).¹⁹ In addition, it can take 15 to 24 months from receipt of grandparent stock to produce the first commercial-level day old chick (Bagopi et al., 2014). Poultry producers thus require up to two years of capital to sustain a breeding business before realizing revenue from the sale of commercial broilers. Since the investment costs are large, a company setting up a breeder operation would first need to be certain of a customer base, meaning having off-take agreements or being vertically integrated.

Being a breeder at the grandparent level means being able to sell both parent stock and broiler DOCs into the market (depending on how the companies' operations are set up). Firms with distribution licences have a significant cost advantage over downstream breeding firms who acquire parent stock to produce DOCs. For instance, one interviewee in South Africa cited the price of parent stock for own use at R68 (around \$4) versus parent stock being sold in the market at R95 (\$5.60), a 40% difference. Breeding firms acquiring parent stock have substantial set-up costs, but much less so than grandparent facilities, and have to satisfy government requirements in terms of breeding facilities.²⁰ Broiler DOCs can be sold to anyone in the market. Exports of broiler DOCs depend on countries' import rules for poultry.

slaughterhouse businesses Esbro and in 2015, with a consortium, it bought into Plukon, a processor and second largest poultry producer in Europe.

¹⁸ <https://www.cargill.com/sustainability/poultry/sustainable-poultry;>
<https://jbs.com.br/en/about/our-business/poultry/>

¹⁹ Interview with market participants in South Africa.

²⁰ They include environmentally controlled houses; biosecurity fences; security fences and generators. Technology required includes feed mixers, incubators, coal for brooding, thermometers, etc (Interviews with market participants in Malawi). In Malawi, houses are imported from France, while operating systems to control the temperature are imported from SA.

Main companies and distribution licences in the region

In recent years, the main global breeding companies have each integrated into the region more directly with regional partners. Under apartheid there were separate holders of the rights to the main breeds in South Africa, and in other countries in the region. Tyson Foods has long-established relationships with RCL Foods in South Africa and Irvine's in Zimbabwe. RCL (formerly Rainbow Chickens) within the Remgro conglomerate has long held the sole breeding rights to the Cobb breed.²¹ RCL is a fully integrated poultry-producing business that breeds and rears its own livestock, with its own feeds mills, processing and distribution for fresh, frozen, value-added and further-processed chicken.²² Following the formation of Cobb South Africa, a joint venture between Rainbow and Tyson-Cobb, a new grandparent breeding farm and hatchery complex was opened in Johannesburg in 2000.²³ Cobb SA became the fourth-largest customer of Cobb worldwide.²⁴ The distributor agreement allows Cobb SA to sell the breed to South Africa, Lesotho, Swaziland and Namibia.²⁵

Irvine's has the Cobb rights for much of southern and central Africa and owns Cobb Africa, incorporated in Mauritius (Figure 3). Irvine's is a family-run poultry business established in Zimbabwe in the 1950s²⁶ and a subsidiary of Inncor Africa Limited, a company that manufactures, distributes, and retails fast-moving and durable consumer goods (Inncor Africa Limited 2014). Cobb Africa holds the breeding rights to the Cobb breed in a number of countries in sub-Saharan African countries, excluding South Africa and in Zambia where the Cobb rights are held by Hybrid (Figure 3). Tyson Foods, via Buchan Ltd, has ownership in Irvine's and in Cobb Africa.²⁷

The investment costs of setting up a parent breeder farm in Malawi are estimated at around 100 million MKW (~\$100,000) depending on the size (Interview with market participant in Malawi).

²¹ Cobb broiler breeding stock first placed with Rainbow Farms in South Africa in 1992, when Rainbow Chicken purchased Bonny Bird Company who had the original grandparent facilities.

²² <https://rclfoods.com/brand/rainbow/>. Cobb South Africa has/had exclusive rights to the distribution of Cobb 500 genetic stock in South Africa. Pure line day old chicks are imported from Cobb Europe and raised on five different farms located in Carolina and East London. Cobb SA further has ten laying farms and two hatcheries that are used to produce parent stock for both Rainbow Farms and other independent hatcheries

²³ <https://www.thepoultrysite.com/news/2005/06/cobb-sa-gains-39valued-and-prestigious-partner39-award>

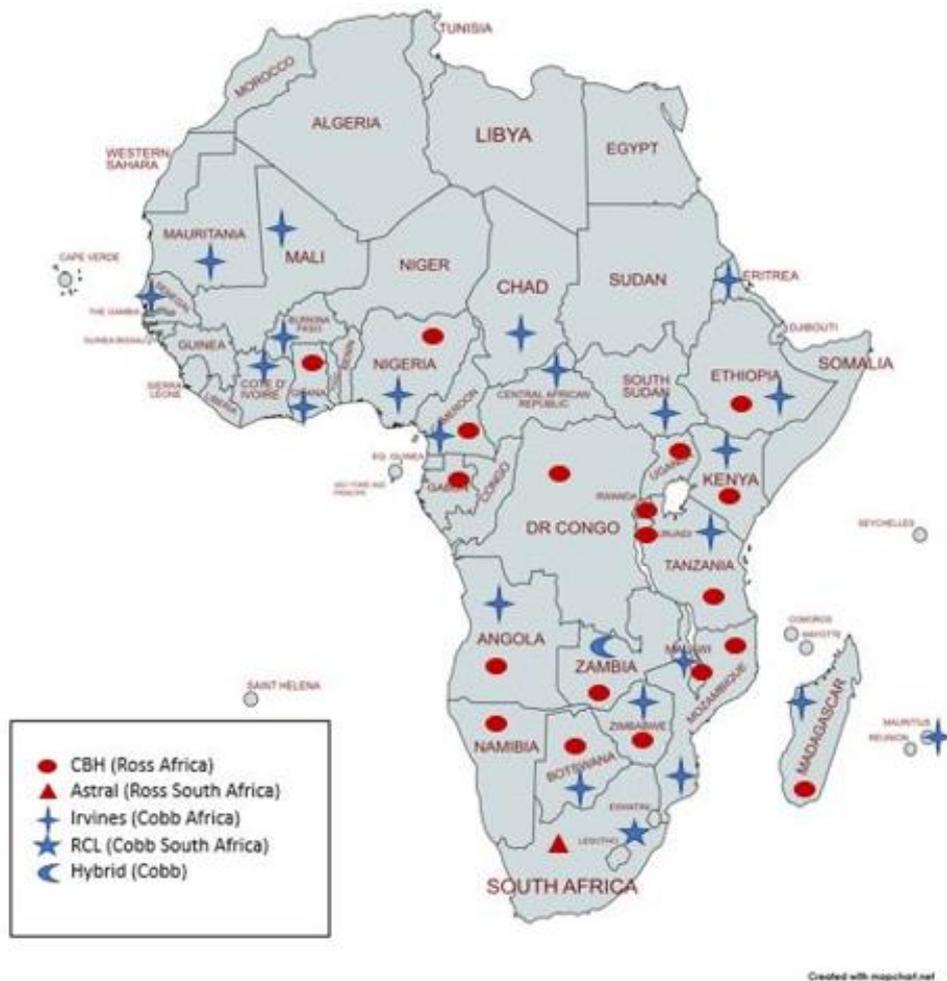
²⁴ <https://allafrica.com/stories/200011170270.html>

²⁵ RCL has a 33.5% shareholding in HMH in Uganda whose principal activities are the rearing and processing of chicken and the production of feed <https://rclfoods.com/expand-into-africa/>. RCL did also enter Zambia through a joint venture with Zambeef in broiler production (not breeding) but exited in 2016.

²⁶ <https://www.irvineschicken.co.zw/>

²⁷ <https://www.just-food.com/news/tyson-and-ex-ceo-donnie-smith-invests-in-african-poultry-business/>

Figure 3: Map of Ross and Cobb distribution rights in the region by major companies



Source: Authors construction using Cobb Africa (<https://www.cobbafrica.com/>) and Ross Africa websites (<https://rossafrica.com/>), as well as information on distribution rights in South Africa and Zambia

EW Group's Aviagen has long-term arrangements for the Ross bird with **Astral** in South Africa, and with **Country Bird Holdings (CBH)** for the rest of southern and east Africa (Figure 3). Astral's Ross South Africa accesses grandparent stock from Aviagen South Africa, which is a great grandparent operation set up in South Africa to supply Ross South Africa with grandparent stock.²⁸

CBH produces broilers, feed and breeding stock across the region, including through its subsidiary, Ross Breeders Zambia (RBZ).²⁹ In January 2022 Aviagen signed a joint venture agreement with RBZ to form **Ross Central Africa Ltd.**³⁰ CBH has also invested together with

²⁸ Interview with market participant in South Africa.

²⁹ Incorporated in Zambia in 1999 <https://www.competitionauthority.co.bw/sites/default/files/Merger%20Decision%20No%2028%20%202021%20-%20Aviagen%20European%20Holdings%20and%20Ross%20%20Central%20Africa%20%281%29.pdf>

³⁰ <https://www.competitionauthority.co.bw/cca-approves-acquisition-25-issued-shares-ross-central-africa-limited-aviagen-european-holdings>

Aviagen and African Poultry Development Limited (APDL, a regional poultry producer and owner of Hybrid in Zambia) in Aviagen East Africa which consists of new GP farms and a parent stock hatchery in Tanzania to supply breeding stock to the region.³¹

There are other smaller holders of breeding rights. In Zambia, *Hybrid*, owned by APDL, has the distribution licence for the Cobb breed at grand-parent level and sells parent stock to Zamhatch, as well as exporting to Tanzania and Kenya.

In Malawi, *Central Poultry (CP)* has the largest breeding operation, with the Cobb breed obtained at parent stock level from Irvine's. In South Africa, *Quantum* had a licence for its own use of the Cobb bird, however, it struggled to compete with RCL and subsequently moved to a parent breeder farm (accessing Ross parents from Astral).³² It has a feed business (Nova Feeds), an egg business (Nu-laid), and layer and broiler farms in South Africa which it supplies to abattoirs.³³ Quantum has operations in other countries including broiler and layer breeder, eggs and feed businesses in Zambia and Uganda.³⁴

Irvines/Cobb Africa and CBH/Ross Africa therefore have the greatest geographic reach (see Appendix A1). Each grouping has breeding rights held through companies registered in low-tax Mauritius, in which Tyson and Aviagen have shareholdings (including through intermediate shareholding layers and in joint ventures).

We now assess how the networks of arrangements - from global to regional - impact on concentration, integration, and value chain governance in southern Africa through focusing on our three selected countries.

2.3. Concentration in South Africa, Zambia, and Malawi

2.3.1 South Africa

South Africa has a substantial poultry industry with production dominated by a few large, integrated firms (Davids and Meyer, 2017; Appendix Table A2). The global duopoly is effectively replicated in South Africa at the breeding level, with both RCL (Cobb SA) and Astral (Ross SA) claiming to have over half the breeding stock.³⁵ CBH with the Arbor Acres bird is a relative fringe producer with 5-10%.³⁶ The arrangements between RCL and Astral with the global breeding companies are consistent with the trade data with most imports from the United Kingdom where Tyson Foods has great grandparent production facility and Aviagen also has breeding facilities, with some imports from the United States (Appendix Table A6). South Africa is a net exporter of DOCs to the region (including to Mozambique, eSwatini, Nigeria, Malawi, Zambia, and Botswana) although exports declined after 2016 (Appendix Figure A1).

³¹ <https://www.thepoultrysite.com/news/2021/03/aviagen-secures-local-supply-through-a-greenfield-investment-in-east-africa-with-the-establishment-of-aviagen-east-africa-limited>

³² Interview with market participants in South Africa.

³³ <https://quantumfoods.co.za/>

³⁴ <https://quantumfoods.co.za/african-operations/>

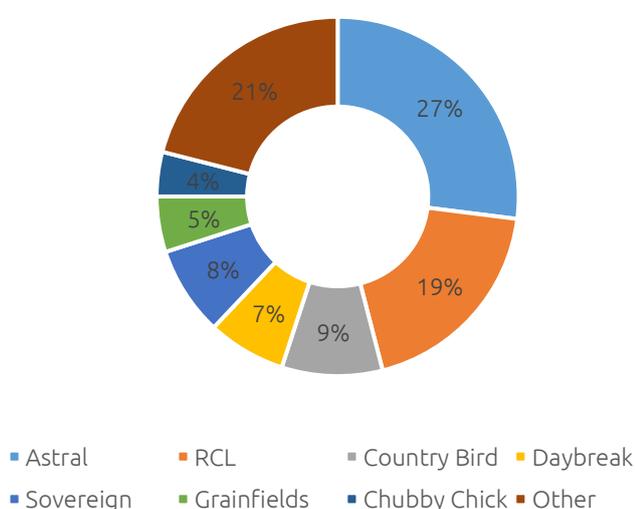
³⁵ Interviews with companies and online sources (<https://rclfoods.com/brand/cobb/>.)

³⁶ Estimated at 5-10% based on the share of broiler production.

RCL has mainly just produced DOCs for its own operations.³⁷ RCL has also tested an Aviagen breed (Indian River). Both Astral and CBH supply DOCs to third parties in addition to their own operations. In terms of hatcheries for broiler DOCs, where fertilized eggs from parent stock are transferred to be hatched as broiler DOC, the biggest is the independent Eagles Pride with an estimated market share of 46% of non-integrated supplies.

The rearing of broilers is contracted out for a large proportion of the production; however, contract growers' birds are slaughtered in the abattoirs of one of the main producers who then supply into the market. In terms of broiler poultry production, Astral and RCL are the largest producers, followed by a second tier of around five significant producers who typically have links to feed businesses (Figure 4).³⁸

Figure 4: Market Share of Main Poultry Producers, South Africa, 2021



Source: Astral Annual Results Presentation, 30 September 2021

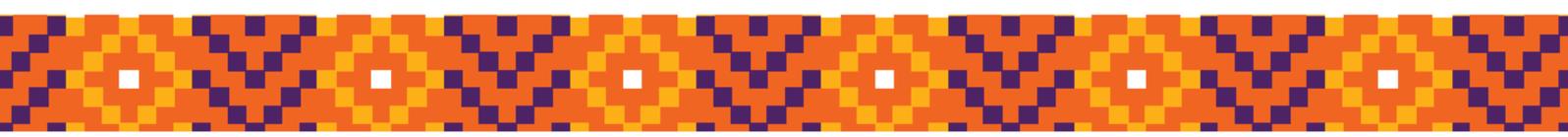
Notes: Local broiler production = 20.6 million birds per week (July YTD)

The concentration in breeding in South Africa reflects global concentration given the rights required and restrictions which have been applied. The breeding level impacts on the volume of parent and broiler DOCs in the market, and therefore on the ability of smaller players to participate in poultry value chains. Smallholder producers have reported a shortage of DOCs in 2022.³⁹ For independent producers wanting to scale up and compete in the formal market, the lack of availability of parent stock and DOCs has been cited as problematic, with independent producers “being locked out of corporate supply chains for breeding inputs” (Garcia-Dorado et al., 2021). Concentration also raises resilience risks given the lack of diversity (Mottet and Tempio, 2017).

³⁷ Although it has at times supplied small quantities of broiler DOCs into the market. Interview with ex-CEO of SAPA, 8 September 2022.

³⁸ For example, Grainfields entered by integrating from grain production into milling and feed (Nkhonjera, 2020).

³⁹ Interviews with smallholder producers in South Africa, September, and October 2022.



2.3.2 Zambia

Global concentration in breeding is mirrored in Zambia, as across the region. The grandparent breeding licence for the Ross bird is with the regional CBH (Ross Breeders Zambia, RBZ, in which Aviagen has a stake) for the Ross 308 breed. For the Cobb bird (the Cobb 500 breed) the licence is with Hybrid Poultry owned by APDL (Appendix Table A3). Each of these companies exports within the region as Zambia is somewhat of a regional hub. Hybrid exports Cobb to Tanzania and Kenya, to where Irvine's (Cobb Africa) have parent breeding operations.⁴⁰ RBZ exports parent DOCs (via Ross Africa) to a number of countries including Malawi, Botswana, Senegal, Zimbabwe, Mozambique, DRC, Angola, Ghana and Uganda by road and air. It also exports broiler day-old chicks to the DRC by road, and hatching eggs to Zimbabwe, Malawi, Botswana and the DRC by road and air.⁴¹

Quantum, Zamharvest and Zamhatch/Zambeef produce Ross DOCs in Zambia from parents sourced from RBZ, adding to the total Ross volumes in the market. Zamhatch also produces Cobb DOCs from Hybrid parent stock (see Appendix Table A3). These three companies breeding supplies are therefore dependent on parent stock sourced from CBH/RBZ and Hybrid. The costs of setting-up breeding operations are substantial, with economies of scale, however, not to the same extent as grandparent breeders.⁴²

Tiger Feeds (Astral) accesses parent stock and holds a distribution licence from Aviagen for DOC for Indian River in Zambia. Tiger pursued the distribution rights for Indian River rather than sourcing Ross parent stock from RBZ, as they wanted a unique identity in the market and did not want to be dependent on their competitors for parent stock.⁴³

It appears as if the market shares of the Cobb and Ross breeds in Zambia are broadly similar at around 45% (after accounting for the broiler DOCs produced by other companies from parent stock from RBZ and Hybrid), while Indian River is around 10% (see Nsomba et al., 2022).⁴⁴ In addition, there is a small niche market for the slow growing breeds which are more resilient and dual purpose (also laying eggs) but require more feed to reach the optimal weight. Zamharvest has the distribution rights for the slow-growing SASSO breed (from Hendrix, partnered with Cobb). It estimates that it has about 30% of the slow-growing market in Zambia. While Hybrid has the Cobb broiler breed, in the slow-growing segment it has the Hubbard breed sourced from Aviagen.⁴⁵

The import data for breeding stock are consistent with Zambia sourcing great-grandparent stock from Tyson and Aviagen, with imports mainly from the United Kingdom, the United States, France and South Africa (Appendix Table A7). While it is not possible to distinguish

⁴⁰ Interview with market participant and, <https://issuu.com/outlookpublishing/docs/hybrid-poultry-farm>

⁴¹ <http://rossafrica.com/index.php/zambia/>

⁴² Interview with market participants in Zambia.

⁴³ Interview with Tiger Feeds. While Tiger exports fertilized eggs, the majority of production is consumed locally. Tiger have not integrated down to processing but operate in the feed and DOC businesses – this has been a strategic decision made by Astral (South African parent company), but they are exploring the possibility of integrating into the processing space in the future. (Interview with Tiger Feeds, 16 August 2022).

⁴⁴ There were some reports of concerns about the Cobb bird's performance, impacting on market shares (Interviews with market participants in Zambia).

⁴⁵ Interview with Zamharvest. The SASSO breed is indicated here: <https://issuu.com/outlookpublishing/docs/hybrid-poultry-farm>

between types of DOCs/fertilized eggs in the data (grandparent, parent, broiler), the data appears to reflect the importation of grandparent stock by CBH (Ross) and Hybrid (Cobb), as well as Indian River parent stock by Tiger (Astral), and SASSO and Hubbard from the UK, US and France. For example, Hybrid imports grandparent stock three times a year from Cobb Europe.

The big poultry companies are integrated into broiler production and into animal feed, as well as processing. These links include Nutrifeds owned by CBH, Tiger Animal Feeds (owned by Tiger Chicks) and Novatek (owned by Zambeef). Hybrid is reported to source feed from Zambeef / Novatek (Bogapi et al, 2016). Tiger and Quantum, however, are not involved in processing.

At the broiler production level, small and medium-scale producers account for an estimated 70% of the volumes.⁴⁶ These smaller producers operate as outgrowers and as independent producers. However, they generally slaughter in abattoirs of the major poultry companies.

The importance of Zambia is underscored in the further integration of Aviagen in the region with Aviagen entering into a joint venture with RBZ/CBH through the creation of **Ross Central Africa Ltd in 2021**.⁴⁷ In 2022, Ross Africa announced that it is doubling its grandparent hatchery capacity in Zambia, just seven years after opening it to meet growth in the southern and central African poultry sector.⁴⁸ The purpose of the Ross Central Africa JV is to promote the breeding of grandparent stock in Zambia and increase the availability of the supply of parent stock to various customers in Zambia. The Zambian Competition and Consumer Protection Commission (CCPC) granted conditional authorization to the proposed transaction because preliminary investigations and assessments had revealed that the transaction was likely to raise competition concerns that could lead to substantial lessening of competition and abuse of dominant position of market power. One of the conditions was that Aviagen undertook not to restrict companies from Zambia from importing other breeds under the Aviagen group.

The substantial capacity in Zambia, with production estimated at around 3 million chicks per week in mid-2022, is sufficient for local and export.⁴⁹ Exports grew strongly from 2016 to 2021. However, smallholder participants reported widespread shortages,⁵⁰ with waiting times during Covid-19 reported to be up to 6 months.⁵¹ Interviewees noted that exports may be given preference over the local market possibly due to: i) contractual obligations; and ii) a perception that breeders earn more on the export market than on the local market.⁵² We reflect further on price and trade dynamics in light of the reported shortages in the Zambian in section 2.4 below.

⁴⁶ Interview with the Poultry Association of Zambia.

⁴⁷ RBZ and Aviagen opened integrated operations in Zambia on the 1st of March 2022 (interview with market participant in Zambia).

⁴⁸ <https://issuu.com/pasreform/docs/pas-reform-times-2022>

⁴⁹ Interview with market participants in Zambia.

⁵⁰ One NGO noted a waiting time of 2-4 months; another smallholder producer noted a 1-2 month waiting period; one smallholder producer noted that people with cash on hand place orders a year in advance and are therefore given preference (Interviews with market participants in Zambia).

⁵¹ Interview with smallholder producer in Zambia.

⁵² Interviews with market participants in Zambia.

2.3.3 Malawi

Malawi is the most concentrated of the three countries, however, there are no breeders at the grandparent level. One company, Central Poultry (CP), produces over 85% of the broiler DOCs in the country, sourcing its Cobb breeding stock from Irvine's (Nsomba et al. 2022). It is vertically integrated into feed and broiler production, supplying more than 80% of the broiler chicken. The second largest company, Kelfoods, and some other fringe breeders supply Ross DOCs, from parents sourced from RBZ in Zambia. This implies that CBH via RBZ and Irvine's control the supply of breeding stock in Malawi through supplying the parents.⁵³ This is consistent with the data on imports being mainly from South Africa, Zambia, and Zimbabwe (Appendix Table A8). Imports from South Africa suggest DOCs are also being sourced from Astral or RCL.

In Malawi contract farming to rear broilers has not been implemented widely, with large scale activities for contract farming having only begun within the last 3 years.⁵⁴ As a result, large commercial producers own the majority of the farms for broiler production, as well as all abattoirs and processing facilities. Both large-scale producers and small and medium-sized producers sell much of their broiler production as live chickens in Malawi.

A number of mergers have contributed to the high levels of concentration, reinforcing the dominance of CP, and leaving few alternative sources of inputs for small and medium-sized independent downstream producers (Nsomba et al., 2022). Medium- and small-scale producers have reported substantial barriers to their entry and growth including the availability, quality and the cost of DOCs and feeds, along with other obstacles such as access to finance (CASA, 2020).⁵⁵

3. Competition concerns

Global concentration is replicated at the regional level in southern Africa. The consolidation of breeding companies means that poultry producers effectively face a global duopoly from which to access breeding stock, whether the main breeds, Ross and Cobb, or smaller breeds like Arbor Acres, Indian River, and the slower growing free-range breeds. The global breeding companies have become integrated with a few very large African poultry and feed producers. Smaller and independent poultry producers are dependent on the large poultry producers for access to the breeding stock which, together with feed, are the key inputs to broiler production.

There are five main companies (CBH, Irvine's, Hybrid, Astral and RCL) which hold distribution rights for the Tyson and Aviagen breeds, with apparently restricted regional supply (Table 1). The global breeding companies together with these partners are able to monitor the volume and production capacity of parent breeders and thus of the overall supply of DOCs. As a result, they are also able to control the prices of DOCs. They are suppliers to, and competitors of, the independent companies.

⁵³ Accessing parent stock from a company that does have distribution rights involves an agreement covering quantities, standards for breeder farms and charts of performance (interviews with market participants in Malawi).

⁵⁴ Small and Medium Poultry Farmers Association, 4 March 2022.

⁵⁵ See Nkhonjera (2020) for a broader assessment of barriers to entry in poultry.

We evaluate merger review internationally and in African countries and assess the implications in terms of conduct by the large firms. Competition investigations would be required to assess whether arrangements and conduct are anti-competitive. We further consider the implications for independent poultry producers in southern Africa.

Table 1: Summary of licences and dynamics in South Africa, Zambia and Malawi

South Africa	Zambia	Malawi
Licences		
3 Licences <ul style="list-style-type: none"> • Ross (Astral) • Cobb (RCL) – unclear what the status of the licence is, RCL is testing Indian River in the SA market • Arbor Acres (CBH) • A number of parent breeders / hatcheries • Cobb (Quantum) – now divested 	3 Licences <ul style="list-style-type: none"> • Ross (CBH) • Cobb (Hybrid) • Indian River (Tiger/Astral) • 3 other significant parent breeders (all Ross except for Zambef/Zamhatch which breeds both Ross and Cobb (Nsomba et al., 2022)) 	Parent breeders: <ul style="list-style-type: none"> • Cobb (CP Feeds, parent) • A number of Ross parent breeders
Dynamics in the market		
<ul style="list-style-type: none"> • RCL utilizing licence for production of DOCs for own use mostly • Quantum’s licence barred it from selling in the market • Shortages of DOCs • High prices of DOCs compared to international comparators 	<ul style="list-style-type: none"> • Shortages of DOCs in local market • Zambia become production hub for region with significant and growing DOC exports • Very high prices of DOCs • Aviagen 25% stake in Ross Central Africa (CBH) • Aviagen invest with CBH and APDL (Hybrid owner) in Aviagen East Africa 	<ul style="list-style-type: none"> • One dominant producer (CP) dominating the breeding and broiler market • Lack of Ross presence in the market • Shortages of DOCs • Very high prices of DOCs

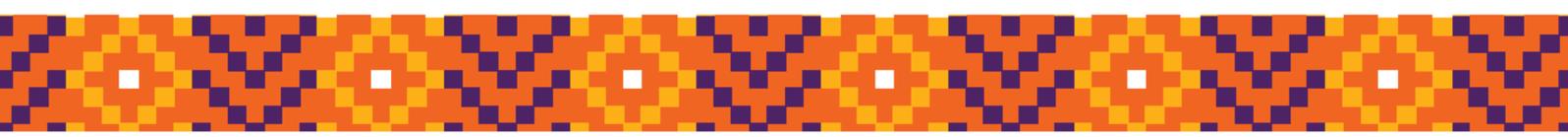
Source: Authors compilation

3.1. Mergers and concentration

The regional and global concentration results from a succession of mergers (see Figure 2 above) which do not appear to have been challenged in Europe and North America. These directly led to a lessening of competition in southern Africa as, in general, alternative actual and potential breeding stock suppliers were removed from the market. In particular, we highlight two recent international deals which have prevented slower growing breeds suited for rearing as free-range birds from competing with conventional broiler chickens. We then consider regional merger activity and its implications for competition.

Aviagen – Hubbard merger

The acquisition by Aviagen Group Holding Inc of Hubbard Holding SAS in 2018 was assessed by the UK’s Competition and Markets Authority (CMA, 2018). The review was only undertaken at a phase 1 stage which is the initial assessment in which a determination is made whether to require further information from the merging parties for a more in-depth phase 2 review. The assessment did not find it necessary to refer the merger for an in-depth



review. It does not appear to have been assessed in terms of its substantive effects in any other country.

Despite very high market shares on the part of each of the firms in their respective segments in closely related markets, the CMA judged the firms not to be competing as conventional and slow-growing breeding stock were found to be in different markets. The CMA in effect found the transaction to be a merger of two quasi-monopolists in the UK, in adjacent markets. The transaction was approved because the markets were separately defined *and* because it was judged that each company was not an effective competitor in the others' core market segment despite being the only alternative, apart from the Cobb bird. This market definition differed from that in earlier cases of the European Commission and the Spanish Competition Authority (see CMA, 2018, footnotes 10 and 11). The market shares in the UK were as follows, as stated in the decision:

- In value terms, Aviagen estimated its share of all types of chicken parent stock as being 80-90% in the UK with an increment from the merger of 5-10%.⁵⁶
- Aviagen estimated its share on conventional parent stock in the UK was 70-80% in 2016, with Cobb accounting for the remainder. While Hubbard had a conventional bird, it was not considered competitive by customers, and the slow-growing bird was found to be in a different relevant product market.
- Hubbard's share in slow growing parent stock was estimated at 80-90%, with Sasso (Cobb/Hendrix) holding 5-10%. Aviagen had marketed its Rowan Ranger birds previously and attained a 20-30% share but it indicated it had not performed well, and customers had stopped purchasing it. Aviagen's evidence that it was not going to continue developing its Rowan Ranger slow-growing bird was accepted. However, the Rowan Ranger bird was still being marketed by Aviagen as an attractive breed in early 2022.⁵⁷

The merger was not assessed in terms of dynamic competition, that is, how markets and products are evolving over time (even while a section in merger review purported to consider dynamic competition), nor in terms of cross-border changes. At a European level, the third largest competitor was acquired by one of the top two firms. While the Hubbard businesses acquired included the French, Poland and Brazil businesses, it is not clear that reviews of the merger were made in these countries.⁵⁸ Slower growing, free range and organic broilers are *more significant* in France and the Netherlands, for example, with share estimates of 24-35% of the French broilers and nearly 40% of Dutch broiler production, compared with 11% of UK production in 2019.⁵⁹

⁵⁶ See para 14 of CMA (2018). It is not clear why the value estimate is so much higher than the estimates for conventional chicken parent stock (where Aviagen is focused), para 44 of CMA (2018).

⁵⁷ <http://en.aviagen.com/brands/rowan-range/>

⁵⁸ For example, a search of all merger control decisions of the French Autorite de la Concurrence does not indicate a decision.

⁵⁹ Slower growing breeding parent stock has been around 35% of the French market (<https://www.poultryworld.net/Genetics/Articles/2015/11/Breeding-for-alternative-markets-2709620W/>), see also EU (2019). Davies (2019) expresses the numbers as proportions of broiler production with 24% in France and almost 40% in the Netherlands (this is consistent with the higher French parent stock if France exports some of this). In addition, the CMA did not appear to consider information on market outcomes such as the price of day-old chicks. Day-old chicks in the UK in 2017

The merger also does not appear to have been evaluated in African countries. This is likely as Hubbard was not a significant presence. However, it was an important potential alternative to the dominant breeding companies, especially given the slow-growing bird characteristics making it suitable for free range operations, and available to customers.

Tyson (Cobb) and Hendrix Genetics (Sasso)

Hendrix Genetics is a family-owned company founded in 2005, headquartered in the Netherlands.⁶⁰ It has grown rapidly, with leading breeds across a number of species, and at the end of 2022 had operations in 25 countries. In 2008 Hendrix and Tyson agreed a joint venture to share and promote expertise in the field of genomics, which has been extended through successive Joint Development Agreements (JDAs) and include a jointly developed breed. The 2008 agreement included Tyson's Cobb-Vantress acquiring the Hybro breed in exchange for preferred stock.⁶¹ In 2012, the JDA was extended for a further three years and claimed to strengthen Cobb's leading position in broiler breeding.⁶² In November 2015 the companies signed their third consecutive JDA to collaborate on fast-growing poultry genomics.⁶³

Hendrix acquired the SASSO bird (based in the south of France) in 2017.⁶⁴ Cobb had already started cross breeding with SASSO by 2008, with the launch of the Cobb-Sasso 150 bird, around the same time as the Hendrix – Tyson joint venture.⁶⁵ By 2015 Tyson's Cobb-Vantress had further developed its 'mid-market' bird with SASSO, as the Cobb-Sasso 200 bird, situated between slow and fast-growing breeds. The breed's development was stimulated by animal welfare concerns and pushes to reduce antibiotics, as slow growing birds are more robust and less prone to stress and diseases (therefore not requiring antibiotics).⁶⁶ Hendrix continued to develop the SASSO bird as a traditional slower growing broiler after acquiring it in 2017, and continued the collaboration with Cobb-Vantress to produce the CobbSASSO

were €0.405 per chick, very substantially higher than in most EU countries at between €0.31-0.33 per chick (van Horne, 2018: 21). Reference is made to buyers in the UK requiring a 'high quality bird' (CMA, para 36), however, the breeding stock supplied in the UK and exported across Europe appeared to be the same. Just two customers were noted as raising concerns which is not surprising given the concentrated nature of the industry and the reliance customers would have on Aviagen going forwards. In addition, while Hubbard sold conventional chicken stock in other European countries, the definition of the market as UK wide meant that the minimal sales of Hubbard in the UK were taken as indicating negligible overlap. This is even while there are high levels of trade within Europe and Aviagen had indicated it viewed the market as being Europe (EEA) wide.

⁶⁰ Private equity company Paine Schwartz Partners acquired 50% of Hendrix in November 2021.

⁶¹ <https://www.canadianpoultrymag.com/cobb-vantress-and-hendrix-genetics-alliance-1252/> accessed 7 February 2023

⁶² <https://www.canadianpoultrymag.com/cobb-and-hendrix-extend-rd-partnership-12415/>

⁶³ <https://www.wattagnet.com/articles/24863-cobb-vantress-and-hendrix-genetics-sign-joint-development-agreement> accessed 7 February 2023

⁶⁴ <https://www.hendrix-genetics.com/en/animalbreeding/traditional-poultry-breeding/> accessed 7 February 2023.

⁶⁵ <https://www.poultryworld.net/poultry/uk-two-new-chicken-breeds-launched/>

⁶⁶ <https://www.poultryworld.net/poultry/breeding-for-alternative-markets/>. Aviagen was developing its Rowan Ranger for this market, as was Hubbard's bird, and there was a wider initiative to develop the 'chicken of tomorrow'.

range of birds from 2021 for slow-growing coloured chicken suited to traditional, free-range and organic farming as well as less intensive indoor production.⁶⁷

In Africa SASSO is marketed as a dual-purpose chicken which can be raised for both egg production and for meat.⁶⁸ Hendrix has partnered with Solidaridad which works with small-holder farmers in Africa, including in Mozambique and Zambia, and has a five-year grant from the Bill and Melinda Gates Foundation for the Sustainable Access to Poultry Parental Stock to Africa (SAPPSA) project to supply improved breeds to local poultry value chains.

As with Aviagen's acquisition of Hubbard, the agreements between Tyson (through Cobb-Vantress) and Hendrix, reduced competition. This occurred through the acquisition of the Hybro broiler breed by Tyson, and then the SASSO slow-growing broiler being part of joint development (and not an independent rival).⁶⁹ In the latter case, this built on the earlier collaboration of Cobb-Vantress and SASSO in the crossbreed. The development may mean a better performing bird for African countries albeit not as an independent competitor.

Regional mergers in southern Africa in poultry breeding

There has been a succession of mergers and acquisitions which have extended ownership links by the multinational corporations into the regional and national producers. We organize these by the major groupings, starting with Aviagen together with entities associated with CBH and Ross Breeders Zambia (RBZ) and then Tyson, with Irvine's Cobb Africa, and RCL Foods. We note just one merger appears to have been blocked (abandoned), which was due to concerns raised by the CFTC in Malawi.

Aviagen, CBH and APDL in Aviagen East Africa

Aviagen, African Poultry Development Limited (APDL) and Country Bird Holdings Limited (CBH) invested in Aviagen East Africa in March 2021.⁷⁰ Aviagen East Africa consists of new GP farms and a parent stock hatchery in Tanzania to supply breeding stock to the region. It was motivated by the rationale of being closer to parent stock customers enabling delivery of chicks by truck, significantly reducing logistics times. The new GP farms were opened in October 2022.

APDL is the holding company of Hybrid, the Zambia producer of Cobb breeding stock, and has been incorporated in Mauritius since 2007, owned by Seaboard Corporation of the USA. It is linked to Tanbreed Poultry which has been incorporated in Tanzania (since 2007) and is also owned by Seaboard.⁷¹ We note that one of the parent stock customers in Tanzania is Silverlands which produces Ross DOCs, as well as SASSO DOCs (the Hendrix breed

⁶⁷ https://www.cobb-vantress.com/assets/Cobb-Files/product-guides/6c1436d72b/CobbSasso_Breeder_Management_Supplement_v1_EN.pdf ; Email communication with Hendrix, 4 November 2022.

⁶⁸ <https://africa.sasso-poultry.com/en/> accessed 7 February 2023.

⁶⁹ The Hybro breed had been marketed to African countries in around 2006 <https://www.thepoultrysite.com/news/2006/08/hybro-poultry-college-breeds-international-collaboration>

⁷⁰ <https://www.thepoultrysite.com/news/2021/03/aviagen-secures-local-supply-through-a-greenfield-investment-in-east-africa-with-the-establishment-of-aviagen-east-africa-limited>

⁷¹ Tanbreed is reported as importing Hubbard parent stock from France in 2020, and Arbor Acres parent stock from the UK <https://www.exportgenius.in/tanbreed-poultry-limited-importer-in-tanzania>

developed closely with Cobb).⁷² The merger means there are ownership relationships between suppliers of competing breeds.

Ross Breeders Central Africa JV (of RBZ and Aviagen)

In March 2021, the Zambian CCPC approved a merger application involving Aviagen European Holdings Limited and Ross Breeders Zambia Limited. The merger transaction involved Aviagen and Ross Breeders Zambia Limited establishing a joint venture for the purposes of promoting the breeding of grandparent stock in Zambia and increasing the availability of the supply of parent stock to various customers in Zambia (through Ross Breeders Central Africa). The Zambian CCPC granted conditional authorization due to competition concerns and imposed conditions including that Aviagen undertook not to restrict companies from Zambia from importing other breeds under the Aviagen group.

In August 2021, the Competition Authority of Botswana approved the same transaction, indicating that Aviagen European Holdings Limited acquired 25% of Ross Breeders Central Africa, incorporated in Zambia and a wholly-owned subsidiary of RBZ (itself a subsidiary of Ross Africa Ltd, in turn a wholly owned subsidiary of CBH).⁷³ The merger was notified in Botswana as parent stock is sold by RBZ to its sister company Master Farmers Feeds in Botswana, which is also ultimately controlled by CBH.

What does not appear to have been considered in these mergers is that the owner of Hybrid in Zambia (APDL / Seaboard), a competitor to CBH/RBZ in Zambia and in exports to the region, was a joint venture partner of Aviagen and CBH in East Africa including Tanzania, sharing a border with Zambia, and with Kenya which is in the Common Market of East and Southern Africa (COMESA) with Zambia. We return to these relationships in section 3.2 below.

Cobb Africa and Tyson/Buchan

Cobb Africa owned by Irvine's (originally of Zimbabwe) has the rights to the Cobb breed in most countries in the region, aside from Zambia, South Africa, and Namibia (Figure 3). It boasts of being the oldest Cobb distributor, going back over 50 years. Tyson Foods acquired a stake in Buchan Ltd in 2017, which is an owner in Irvine's, and in Mauritius-registered Cobb Africa.⁷⁴ The Buchan holding company is also indicated as having control of Irvine's operations in Botswana, Mozambique and Tanzania. The 2017 acquisition was focused on day-old chicks and feed according to Irvine's CEO Craig Irvine, quoted as saying "[t]his transaction is primarily about day-old chicks. We're going into the day-old chick and feed markets, not so much in processing. We sell to tens of thousands of small-scale farmers in each of these countries, who in turn have their own small businesses, buy the feed, buy the chicks, grow them, and sell them into the live-bird markets. At this stage, we are not into

⁷² <https://www.silverlandstanzania.net/>

Silverlands was established in 2013 by the then CDC, now British International Investment (wholly owned by the UK government), it is now owned by SilverStreet Capital, and has operations also in Kenya and Uganda. SilverStreet is also invested in Quantum. Silverlands Tanzania was the second largest producer of DOCs in Tanzania in 2021 (with 14 million sales). It also has a feed business.

⁷³ <https://www.competitionauthority.co.bw/cca-approves-acquisition-25-issued-shares-ross-central-africa-limited-aviagen-european-holdings> The Directors of RBZ are Anthony Collet (British), Kevin James (Zimbabwean) and Colin Lindsay (Zimbabwean).

⁷⁴ <https://www.just-food.com/news/tyson-and-ex-ceo-donnie-smith-invests-in-african-poultry-business/>

processing in these ventures.” It does not appear that this merger was assessed by any competition authority.⁷⁵

CP Malawi and Kelfoods

The Competition and Fair-Trading Commission of Malawi did evaluate the proposed acquisition by CP Feeds (the Cobb distributor, obtaining parent stock from Cobb Africa) of Kelfoods, the largest Ross breeding stock supplier in the country. After competition concerns were raised by market participants in Malawi given the direct anti-competitive nature of the merger, it was abandoned in 2022.⁷⁶ However, it is likely that substantial information was exchanged in the merger process and market participants in Malawi indicated the companies appeared to be working together.

Zamchick and Rainbow Chicken

In February 2013, Rainbow Chicken Ltd (subsequently RCL Foods) the holder of the Cobb licence in South Africa acquired 49% of Zamchick from Zambeef for US\$14.25mn.⁷⁷ In May 2013 it also launched Zamhatch a parent stock operation in which Rainbow had 51% and Zambeef 49%. In March 2016 RCL Foods exercised a put option to sell the shares (including Zamhatch) back to Zambeef for approximately US\$22.5mn.⁷⁸ While RCL sold-out of Zamchick there had been a deep exchange of understanding about the markets and the industry with one of the other major producers in the region.

Common shareholding?

Hybrid’s holding company is African Poultry Development Ltd (APDL) incorporated in Mauritius.⁷⁹ APDL is reported to represent the largest group of integrated poultry companies in East and Central Africa.⁸⁰ Even though Aviagen and Tyson are competitors in the breeding market, APDL, through a joint venture with Aviagen and CBH, is the part owner of Aviagen East Africa which consists of grandparent farms and parent stock hatcheries of Aviagen breeds, which include Ross 308. APDL is also a shareholder in the largest poultry company in Kenya, Kenchic, which sources Cobb parent stock from Hybrid and Ross parent stock (from Ross Africa).⁸¹

Considerations of ownership relationships are relevant for coordination, which we now consider.

3.2. Coordination and collusion

There have been many cartels in the poultry industry around the world (Roberts, 2023). This includes cartel conduct in breeding stock in Zambia uncovered in 1999 and again in 2018,

⁷⁵ It should have been notified to the COMESA Competition Commission.

⁷⁶ Interviews with market participants in Malawi.

⁷⁷ <https://zambeefplc.com/zam-chick-market-announcement/>

⁷⁸ <https://zambeefplc.com/zambeef-exercise-put-options-granted-rcl-foods-respect-zam-chick-zamhatch-aim/> The amount was the sum of US\$16.25mn, ZMW24.8mn and Euro3.3mn.

⁷⁹ Incorporated in 2007, parent company Seaboard Corp https://opencorporates.com/companies/mu/C073845/statements/subsidiary_relationship_object

⁸⁰ <https://tmea.aviagen.com/news-room/press-releases/aviagen-secures-local-supply-through-a-greenfield-investment-in-east-africa-with-the-establishment-of-aviagen-east-africa-limited/>

⁸¹ <https://tmea.aviagen.com/news-room/press-releases/aviagen-secures-local-supply-through-a-greenfield-investment-in-east-africa-with-the-establishment-of-aviagen-east-africa-limited/>

and in South Africa in 2009. Most recently there has been extensive apparent collusion from 2008 through to 2019 identified in a series of complaints lodged in the USA. These involve the largest poultry producer in the world, Tyson Foods, along with Cargill (the largest global agro-commodity trader) and Pilgrim's Pride (subsidiary of the world's largest meat producer, JBS). Tyson is also identified in alleged collusion in beef, pork and turkey in the USA, Cargill in beef and turkey, while Seaboard is a party to cases in pork (Alderman and Blair 2023; Li and Weisman, 2023).

The cases are useful as they indicate how cartels are likely to occur in the poultry sector and point to market conditions which increase the likelihood of collusion. The main industry characteristics which increase the likelihood of collusion are as follows (Motta, 2004; Harrington, 2007; Kovacic et al. 2011; Marshall and Marx, 2012):

- High levels of concentration
- Relatively homogenous product
- Standard production methods (and similar cost structures)
- Facilitating means of communication, cooperation and sharing of information
- Ability to monitor sales and effectiveness of output restrictions in increasing prices
- High barriers to entry
- The ability to detect and expeditiously punish cartel defectors, including through vertical integration

The poultry industry in southern Africa is much more concentrated than in the USA, has similar production methods (and has run joint workshops on this⁸²), good means of sharing information between producers and monitoring of sales given the close-knit industry relationships, cross-shareholdings, and vertical integration, while barriers to entry are high.

We first review the recent cartel cases and then draw implications for our assessment.

Poultry cartels in USA

There are criminal cases which have been brought by the US Department of Justice and civil litigation being pursued which set out arrangements across the industry. The broiler antitrust civil litigation brought by poultry buyers charges that the producers conspired and combined to fix, raise, maintain, and stabilize the price of broiler chickens, including through manipulating a key price index and through sharing information over a period from 2008 to 2019. Settlements of these cases have been reached by the main producers, including Tyson having reached a settlement of \$221.5mn⁸³ and making provisions for further settlements, while Pilgrim's Pride has admitted conduct and paid a fine of \$110mn.⁸⁴ The publicly available complaints filed provide insight into the conduct notwithstanding the redaction of confidential information (Li and Weisman, 2023; Sappington and Turner, 2023).⁸⁵

⁸² See <https://www.poultryproducer.com/cobb-europe-drives-innovation-in-southern-africa/> accessed 13 December 2022.

⁸³ Tyson Annual Report 2021 on Form 10-K SEC filing, pages 78-80. <https://www.wsj.com/articles/tyson-foods-to-settle-price-fixing-claims-11611167192>

⁸⁴ <https://news.bloomberglaw.com/antitrust/pilgrims-to-pay-110-5-million-fine-over-chicken-price-fixing>

⁸⁵ See End-User Consumer Plaintiff's Fifth Consolidated Amended Class Action Complaint [Redacted Version], filed, 7 August 2020, United States District Court, Northern District of Illinois Eastern Division.

The collusion is alleged to have worked through a number of mechanisms, with information exchange and links to breeding stock being central in the arrangements.

First, the concentration at the breeding level and the vertical linkages from breeding into broiler production meant that production could be reduced in 2008 and 2009 by reducing breeder flocks, and constrained thereafter, to support higher prices than would otherwise have been the case.⁸⁶ At the time there were three providers of breeds (Tyson/Cobb-Vantress, Aviagen and Hubbard, with the latter two merging in 2018). Second, concentration and vertical integration through to processing meant that supply could be collectively controlled, and price increases sustained. Third, price expectations were shared through public announcements, meetings with investors, industry gatherings and through commissioned market studies by industry bodies. Fourth, information was shared through Agri Stats on breeding stock, hatcheries, feed, broiler flocks, slaughtering and processing, wages for plant workers, inventories, sales. While the data for the companies is anonymous the detail provided allowed the identification of companies, and it appears actual competitor data was also shared. Companies also met in the International Poultry Council, as well as in national bodies.

The US Department of Justice criminal cases against individual managers involved in the cartel conduct had to meet the higher standard of ‘beyond reasonable doubt’ in a jury trial. In this case, Tyson Foods has received corporate leniency implying that it admits the conduct and co-operates with the prosecution in exchange for not being charged. The indictment spelled out the communications between managers regarding pricing and bids to supply chicken to buyers from 2012 to 2019.⁸⁷ The defendants argued that the communications could not be proved to be an agreement to raise prices and that a key witness could not be trusted and in December 2021 a mistrial was declared after the jury failed to reach a decision.⁸⁸ Juries also failed to reach findings in subsequent retrials.

In the broiler chicken grower litigation, farmers brought a case against Tyson Foods and others alleging that the companies colluded ‘with the purpose and effect of fixing, maintaining, and/or stabilizing grower compensation below competitive levels’.⁸⁹ This included sharing detailed data on grower compensation through Agri Stats.⁹⁰ Tyson Foods settled these cases in August 2021.

The case relating to collusion regarding workers’ pay filed in August 2019 alleged that from 2009 Tyson Foods, Pilgrim’s Price, Perdue Farms and others conspired to depress wages in

⁸⁶ As observed in Sappington and Turner (2023) from *Action Meat Distributors, Inc. v. Norman W. Fries, Inc.*, Complaint for Violations of Federal Antitrust Laws, Case No. 1:18-cv-03471 at ¶123: “Because breeder flocks are created from a limited pool of so-called “grandparent” chickens from one of only three genetics companies (Aviagen, Hubbard, and Tyson’s Cobb-Vantress), it takes substantial time – anywhere from six to eighteen months or more – to re-populate a breeder flock.”

⁸⁷ See Superseding Indictment in *U.S. v. Penn*, 20-cr-00152, U.S. District Court, District of Colorado (Denver).

⁸⁸ <https://www.bloomberg.com/news/articles/2021-12-17/chicken-price-fixing-case-ends-in-mistrial-as-jurors-deadlocked>

⁸⁹ Tyson Annual Report 2021 on Form 10-K SEC filing, page 79.

⁹⁰ Consolidated Amended Class Action Complaint, Broiler Chicken Grower Litigation filed in United States District Court for the Eastern District of Oklahoma, 10 July 2017.

their processing plants.⁹¹ It was the first class-action case of its kind in the USA.⁹² The complaint refers to in person meetings between companies as well as information exchanged through Agri Stats and surveys conducted by WMS. The case noted that while worker compensation was fixed below fair market levels, the processing plants also relied heavily on workers in vulnerable situations including migrant workers, refugees, asylum-seekers, prison laborers, and participants in court-ordered substance abuse programs. According to the case brought, a 'three-prong strategy was used by the companies: (1) they conducted "off the books" in-person meetings where they discussed and ultimately set the wages and benefits paid to chicken processing plant workers; (2) they exchanged detailed, timely and competitively sensitive wage data through two survey companies, Agri Stats and WMS; and (3) they engaged in bilateral and regional plant-to-plant exchanges of current and projected compensation data.'⁹³ Settlements have been reached with a number of the companies including Pilgrim's Pride.⁹⁴

Coordination in breeding stock in Zambia, 1998-99 and 2018

The Zambian Competition and Consumer Protection Commission (CCPC) found cartel conduct by the poultry breeders in 1998-99. In 2018 the CCPC again found cartel conduct, namely that Hybrid Poultry Farm Zambia Limited, Ross Breeders Zambia Limited, Quantum Foods Zambia Limited and Tiger Chicks were involved in collusive practices in breeding stock to restrict supply and raise prices. The companies were fined after an investigation found that the four companies had together created a common 'Chick Order Policy', forcing customers of all four companies to comply with the same conditions when ordering DOCs from the four companies. The CCPC found that there was no justification for all four hatcheries to have a common policy as each hatchery had different production capacities, customer base, number of agents and employees and would therefore not all take the same time to sort out orders from poultry growers, neither did each hatchery need four weeks to supply day old chicks to farmers.

The investigation revealed that the four weeks' time requirement agreed by the hatcheries was in fact a trading condition in violation of the Competition and Consumer Protection Act. Furthermore, it was noted that the four hatcheries through the chick order policy intended to limit the production of DOCs on the market and consequently the price of DOCs. In this regard, the four hatcheries were indirectly setting production quotas and thus violated section 9(1)(d) of the Act.⁹⁵

Close company relationships and information exchange

The arrangements in Zambia appear similar to the coordination uncovered in the USA in that control over supply can be exerted by the small number of firms which govern breeding

⁹¹ Second Amended Consolidated Complaint in Civil Action No. 1:19-CV-2521-SAG, in US District Courts for the District of Maryland, filed 2 November 2020

⁹² The case brought made reference to a 2015 report by Oxfam America observing that "the rates of injuries and illness" in chicken processing plants "are shockingly high." see <https://www.cohenmilstein.com/case-study/jien-et-al-v-perdue-farms-inc-et-al>

⁹³ <https://www.cohenmilstein.com/case-study/jien-et-al-v-perdue-farms-inc-et-al>

⁹⁴ *Judy Jien, et al. v. Perdue Farms, Inc., et al.*, Case No. 1:19-cv002521-ELH, U.S. District Court for the District of Maryland

⁹⁵ <https://diggers.news/business/2018/03/28/ccpc-fines-hybrid-ross-quantum-and-tiger-chicks-for-bad-business-practices/>

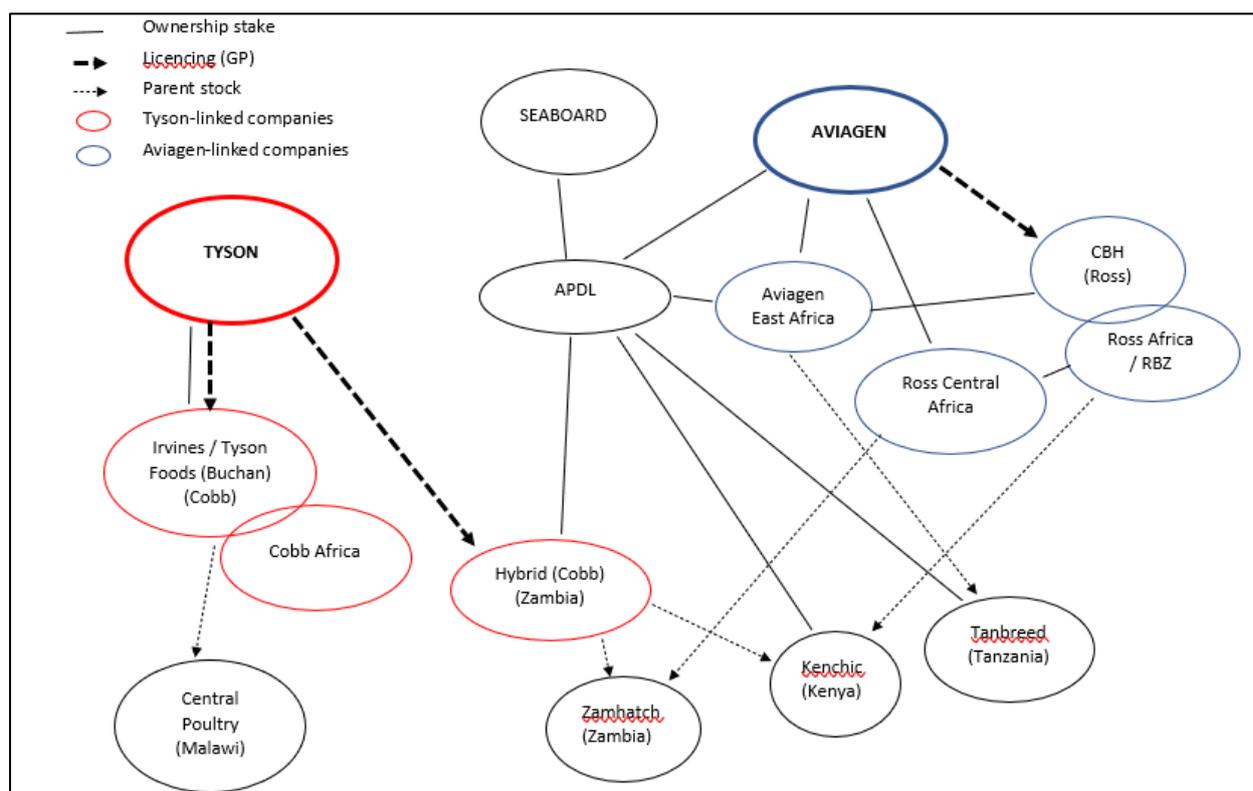
stock. Jointly restricting and monitoring supply means higher prices can be charged and independent downstream producers are not effective competitors, being rationed in the volumes that they can produce.

Following the reductions in output agreed by competitors in the USA in 2008, information sharing between producers through a third-party company (Agri Stats) was a central part of ongoing monitoring of the understanding reached not to compete (Sappington and Turner, 2023). It is notable that Aviagen does not appear to be identified as a party to the main cartel arrangements but that it is identified as one of the three main breeding suppliers in which reductions in the breeding stock were made and volumes were monitored thereafter. After the acquisition of Hubbard, Aviagen was one of just two of the suppliers, again raising questions about the approval of the Aviagen Hubbard merger by the CMA.

At least three of the companies in the USA cartels are present in southern Africa. Tyson has shares in Irvine's and Cobb Africa, which operate across many countries. Seaboard is identified as a party in the USA pork cartel (though not poultry) and in Africa owns stakes in APDL and through it in Hybrid in Zambia, Aviagen East Africa in Tanzania, and Kenchic in Kenya and Uganda. It also owns companies in oilseed processing and trading. Cargill is a major party in three of the USA cartels (poultry, beef and turkey) and operates across Africa in commodity trading and processing, although it does not appear to have ownership in poultry businesses.

The network of holding companies and joint ventures across Southern Africa, described above, mean Tyson, Seaboard and Aviagen have direct influence over poultry production in the region. The relationships also make it easy to share information and monitor sales, along with all of the other factors being clearly met relating to a high likelihood of coordination. Moreover, Seaboard is an important connection *between* companies - through APDL it has stakes in Hybrid with Cobb Africa (along with Tysons and Irvine's), and in Aviagen breeding businesses with CBH (Figure 5). As parent breeding stock is supplied from regional hubs including Zambia, this means that the firms are actual and potential competitors (globally in the case of Aviagen and Tyson), while there are cross-ownerships between them. In addition, Kenchic, owned by Seaboard/APDL obtains both Cobb and Ross breeding stock, while in Zambia the same is true for Zamhatch, within the Zambeef group, enabling balancing of shares if there would be an understanding on market shares, as has characterized the Zambian and USA coordinated arrangements. Indeed, some of the ownership changes have been made since the Zambian cartel was uncovered which could assist with the coordination at a regional level through information flows.

Figure 5: Networks of relationships for Cobb and Ross breeds, outside of South Africa



Source: Authors' compilation

Moreover, there is evidence of close communication about breeding operations in the region. Cobb Europe has held workshops in 2019 with the Cobb breeding companies RCL Foods in South Africa and Hybrid in Zambia, on behalf of APDL Group (the holding company of Hybrid and the JV partner in Aviagen East Africa).⁹⁶ The director of Hybrid is quoted as saying "We always enjoy bringing the teams together *across* the ADPL Group," said Richard Keeley. It is also noted in the article that 'senior poultry leadership from customers across Africa will be invited to the Europe, Middle East and Africa technical school in Harderwijk, Netherlands, in July'.⁹⁷ While the APDL group became shareholders in the rival Aviagen's businesses only two years later in 2021, Seaboard owned a stake in Kenchic which has a dominant position in breeding stock in Kenya (with both Ross and Cobb breeds), and in Tanbreed in Tanzania since 2007. APDL's partners in East Africa, Aviagen and CBH are also directly invested in Ross Breeders Zambia which is a competitor to APDL's Hybrid business. The two competitors at the breeding level (Tyson and Aviagen) could cooperate at the production level as far as DOCs are concerned.

3.3. Abuse of dominance and exclusion of rivals

Within the networks of oligopolistic producers there are individual companies with substantial market power in some countries. This may be viewed as unilateral market power although it is important to recognize that it could be due to joint dominance or coordinated

⁹⁶ See <https://www.poultryproducer.com/cobb-europe-drives-innovation-in-southern-africa/> accessed 13 December 2022.

⁹⁷ See <https://www.poultryproducer.com/cobb-europe-drives-innovation-in-southern-africa/> accessed 13 December 2022.

arrangements which mean that markets are divided in geographic terms. For example, an understanding not to export breeding stock to a given country means that the local dominant supplier in this country may have monopoly power to set prices and impose other requirements such as tying the purchase of feed to breeding stock, as seems to have been the case in Malawi. In addition, exclusionary conduct in one country can undermine a smaller rival at an early stage to prevent it from growing to be a competitive challenge to anti-competitive arrangements across the region. Competition cases which have been pursued in southern Africa reflect these concerns.

Exclusionary conduct related to breeding stock in South Africa

In South Africa RCL Foods has been vertically integrated from breeding and animal feed through to processing and supply of chicken. It did not supply breeding stock on a reliable basis to third party poultry producers. As a result, the Elite joint venture was formed by other poultry producers to introduce breeding of the Ross bird under licence. Following Astral's acquisition of another JV partner National Chicks in 2002, Elite came under Astral's the sole control.

After gaining control of Elite in 2002, Astral restricted independents from sourcing from other breeds, refused to supply day-old chicks to a competitor, and tied in purchases of feed from its own operations (Meadow Feeds).⁹⁸ Country Bird Holdings (CBH) lodged a complaint of exclusionary abuse with the Competition Commission in 2007. Following the investigation Astral admitted to exclusionary conduct in a settlement around 2010. CBH was able to obtain the rights to Arbor Acres bird from Aviagen for South Africa to challenge the Astral/RCL duopoly. In the following years, competition intensified with growth in local production, a reduction in margins and a redistribution of surplus to consumers (Ncube et al., 2016, Grimbeek and Lekezwa, 2013; Goga and Bosiu, 2019).

Competition Cases related to breeding stock in Malawi

In 2013, the Competition and Fair-Trading Commission (CFTC) initiated investigations against Central Poultry (CP) and Alpha Milling (now Kelfoods) following allegations of abuse of market power, unfair trading practices and product tying. The two entities were alleged to have sold day-old chicks to third party producers on condition that their feed was also purchased. It was found that those who were not regular buyers of Alpha Milling feed were refused supply of day-old chicks.⁹⁹ The CFTC found that the conduct on the part of Alpha Milling was unjustified, which distorted competition. There was, however, insufficient evidence against CP. The board of commissioners thus dismissed the case against CP and ordered a cease and desist against Alpha Milling to immediately stop engaging in tying practices.

In 2022 the CFTC found Central Poultry had engaged in exploitative conduct (unconscionable conduct and misuse of market power) in the supply of DOCs when it increased prices on breeding stock already ordered at set prices. The penalty was, however,

⁹⁸ See Competition Commission South Africa press release 'Competition Commission settles poultry case with Astral Operations', 22 November 2012.

⁹⁹ CFTC Case No. ABP/14/02 "The Foods Company Limited vs Alpha Milling Company Limited and Central Poultry (2000) Limited", August, 2014.

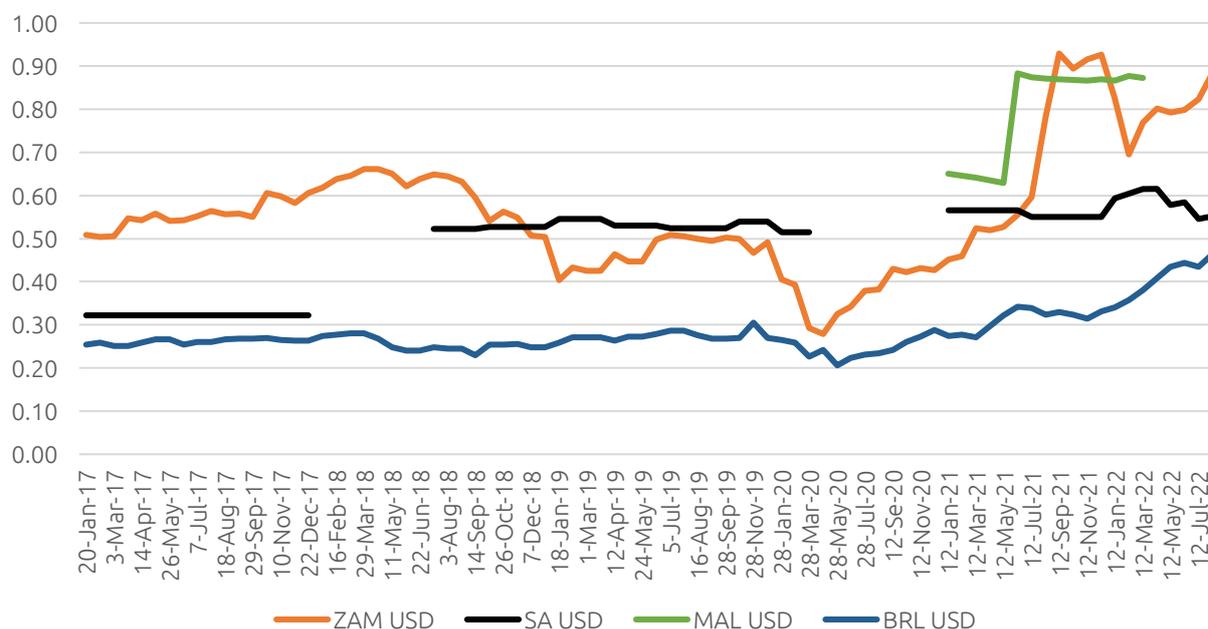
just a token amount of MK500,000 (US\$500) and other complaints about pricing were dropped by the CFTC.

3.4. Prices of DOCs and trade flows

Anti-competitive mergers and collusion mean prices are set above competitive levels. This may go along with market allocation on geographic lines, removing competition through trade. Assessing actual arms-length prices relative to benchmarks of competitive prices requires data on transactions which can often only be obtained through market investigations. We review the data on day-old chick prices which are available, noting challenges which the data pose for drawing inferences.

The comparison of DOC prices in Zambia with Brazil where there are also publicly available data over time indicate prices in Zambia which are double those in Brazil. We also note that Zambian price in US dollar terms fluctuate sharply at times due to exchange rate changes of the local Zambian Kwacha against the dollar. There was a major exchange rate depreciation in February 2020 which explain the sharp reduction in dollar prices. From June to September 2021 there was around a 30% increase in prices in local currency terms which the appreciation of the Kwacha meant translated into an increase of close to 67% in US dollar terms. Malawian prices for 2021 and 2022 for which we have data have been similar to Zambia, including a sharp increase in 2021 (in local currency and US dollar terms).

Figure 6: DOC prices in Brazil, Malawi, South Africa, and Zambia (US \$)



Source: i) Zambian DOC price data was obtained from Poultry Association of Zambia website; ii) Brazil DOC price data was obtained from Conab via Brazilian researchers; iii) data for South Africa from 2018 to 2021 was obtained from SAPA reports that collects data from smallholder farmers while data for 2022 was collected from smallholder farmers; iv) data for South Africa for 2017 was obtained from Van Horne (2017).

Notes: We have averaged prices for Parana, Santa Catarina and Rio Grande Do Sul for Brazil. All prices have been converted from local prices to US\$.

The prices in Zambia and Malawi in 2021 and 2022 after the increase were more than 50% higher than in South Africa. A possible reason for the difference is that costs may be higher in Zambia and Malawi than in South Africa. This requires firm level data to assess. However, we note that this does not appear consistent with Zambia being selected as a poultry breeding hub with grandparent breeding licences and substantial and growing exports to the region (see Appendix Figures A1 to A3). The main producers are also integrated into animal feed production, with low maize and soybean prices (the main feed components) in Zambia (Nsomba et al. 2022).

The prices of DOCs in South Africa are themselves substantially above levels in Brazil. Brazil has a very large-scale poultry industry which has developed with substantial government support and is the largest poultry exporter in the world (Goga and Bosiu, 2019). However, Brazil sources the same breeding stock under licence and comparisons in 2017 found similar prices in the EU, South Africa as in Brazil for DOCs (Van Horne, 2017).

Interviews with participants pointed to a range of prices in the South African market depending on where broiler producers are purchasing DOCs,¹⁰⁰ which have been averaged in the prices from 2018 onwards sourced from the South African Poultry Association. It is also not clear whether the prices in our data to independent producers differ from the prices for sales to related companies.

The likelihood that competition considerations play a role in prices is reinforced by the fact that DOC prices reduced in Zambia in 2018 (in local currency and dollar terms) following the finding by the Competition and Consumer Protection Commission of Zambia of collusive practices for breeding stock. The Zambian and Malawi prices subsequently increased following the increased concentration – internationally and locally – and cross-shareholdings facilitating information exchange and coordination. The status of Zambia as a breeding hub and exporter means that coordination would likely be on a regional basis.¹⁰¹ While some interviewees suggested that the increases in DOC prices were due on shortages in breeding stock due to COVID effects, this is not consistent with increased DOC exports and low feed prices in Zambia, and instead indicates the exercise of market power.

In Malawi the DOC price increase in 2021, in combination with increased feed prices and stable prices in the downstream market for broilers, appear to constitute a margin squeeze on independent poultry producers (Gondwe et al., 2022). The dominant producer, CP has more than 80% of the DOC and broiler markets (with the Cobb breed) and acts as a price-setter for inputs and outputs.

¹⁰⁰ Interviews with market participants in South Africa.

¹⁰¹ Zambian exports were to Zimbabwe, Botswana, Mozambique, Kenya, Namibia, Tanzania and Malawi (see Appendix Table A7). The increase in grandparent capacity, as well as the joint venture between CBH's RBZ and Aviagen in Zambia in December 2021 in Ross Central Africa Ltd underscores the importance of Zambia for production of DOCs for the region. This JV followed the creation of Aviagen East Africa Ltd as a joint venture between Aviagen, APDL and CBH in March 2021.

4. The implications of international concentration for competition enforcement

The study of poultry breeding stock demonstrates the challenges international concentration poses to competition enforcement in a number of ways, especially with regard to addressing conditions for coordination between firms.

First, mergers approved without proper scrutiny in Europe have undermined competition in African countries (as well as in Europe and North America), removing actual and potential competitors and increasing the likelihood of coordination. Second, the duopolistic global market structure poses concerns about international coordination, at the breeding level and, given the vertical integration, at the level of poultry production. Third, the conduct identified in the USA and Zambia points to constraints on breeding stock as a mechanism for coordination while at the same time excluding independent smaller producers. Fourth, there are relationships between the two main breeding companies in terms of cross-shareholdings, joint venture arrangements and licencing of breeding stock to common companies which would assist in monitoring market division. Fifth, there are links between breeding companies and feed suppliers which point to concentration in breeding raising concerns in feed supply. Sixth, prices in southern Africa of breeding stock are high by international comparison, contributing to high food prices for an important source of protein.

We consider the implications for enforcement under the main headings of merger review, collusion, and abuse of dominance.

Merger review

Merger review has failed to identify the likely substantial lessening of competition, within and across jurisdictions through a succession of mergers. Most recently, in the case of the UK decision in Aviagen – Hubbard (Groupe Grimaud) merger this appears due to a failure to consider how competition is evolving between fast and slow-growing breeds, the importance of slow-growing breeds in other markets (in the EU and the USA the Hubbard breed was identified as a rival) and the potential competition from Aviagen in developing its own slow-growing Rowan Ranger breed. The joint venture of Tyson and Hendrix has similarly meant that the SASSO bird is not an independent competing breed. Breeds like kuroiler and SASSO provide a good alternative to indigenous breeds with improved productivity but in an extensive system, since they are suited to scavenging with some supplementary feeding but with improved productivity from indigenous breeds (BFAP, 2021).

These mergers were not evaluated in African countries as they do not appear to have been notifiable due to the relatively small size of the target companies.

There has been a range of mergers through which Tyson, Aviagen and their regional partners have cemented their integration and cross-shareholdings across southern and east Africa. In themselves these mergers do not appear to have raised concerns (with the exception of the conditions imposed by the Zambian CCPC in the Ross Central Africa JV), however, our assessment points to possible coordinated effects, especially when cross-border competition is considered.

National merger review has proved woefully inadequate given the internationalized nature of poultry breeding. The merger reviews have also failed to properly consider coordinated effects and potential competition concerns. The issues identified with regard to poultry have much wider implications for the inadequacy of merger review. We propose that the (lack of) coordination by authorities on international mergers be urgently addressed in forums such as the ICN, OECD and UNCTAD.

Collusion

The conditions in the markets for breeding stock are highly conducive to coordination, with high levels of concentration, relative homogeneity of products and barriers to entry, and multi-market contacts. In addition, this is reinforced by cross-shareholding and licencing arrangements. In particular, APDL has shareholding in one of the main regional Cobb breeders, Hybrid, which exports parent stock, as well as in Aviagen-related businesses across the region. There have been joint workshops organized in South Africa, Zambia, and the Netherlands of breeders in competing companies. There are also breeding operations held for both Cobb and Ross birds by Kenchic and Zamhatch enabling them to be points of contact. These provide the basis for possible hub-and-spoke type arrangements to manage coordination.

The network of relationships provide a strong basis for the apparently preferred mechanism for coordinating on breeding stock to divide poultry markets that have been evident in the cases in the USA and Zambia. The international reach of the companies involved suggest that such arrangements would also be international and through information exchange, requiring effective coordination by competition authorities for these to be addressed. Constraints on breeding stock supplies have been reported across the countries studied consistent with such practices, while prices have increased to very high levels. Coordinated inquiries and investigations by authorities could assess the extent of the arrangements.

In addition, in at least two cases, the multinational breeders have restrained competition in southern Africa through alternative breeds. First, Tiger (Astral) has not had access to Indian River grandparent stock in the Zambian market which means that the company is reliant on regular imports of parent stock rather than establishing a larger-scale breeding operation.¹⁰² Second, in the South African market, RCL does not use its Cobb breeding licence to supply to the market (as it is focused on its own use). When Tyson/Cobb granted an additional licence to Quantum it blocked Quantum from selling breeding stock in the open market. This contrasts with the much earlier experience when the Arbor Acres breed was introduced into the South African market by CBH and competition in the breeding market increased resulting in growth in production, reduction in margins, and reductions in prices to consumers. However, CBH is now the main partner of Aviagen for the Ross bird in southern and east Africa outside South Africa. Thus, even when market participants feel that the market can support additional volumes, including through access to grandparent stock to produce at scale, they may still not be able to access these rights.

Abuse of dominance, harm to competition and consumers

The high levels of concentration, likely coordination, and barriers to entry, imply that the main producers have substantial market power. In some countries such as Malawi and Kenya

¹⁰² The conditions imposed by the CCPC in Ross Central Africa merger may impact on this.

a single firm is likely to be dominant with shares of 70-80% in both DOCs and commercial broiler production.

Smaller producers appear to be subject to exploitative and exclusionary abuses of dominance. The very high prices of breeding stock in Malawi and Zambia, even while input costs such as animal feed components and labour are relatively low, harms independent poultry producers and means chicken is more expensive to consumers. In the Malawian market CP dominates and can control the price and production of DOCs as well as feed inputs. In 2021 the increases in DOC and feed costs in 2021 subjected independent producers competing with CP in the downstream markets to a margin squeeze, excluding them from being effective competitors (Gondwe, Nsomba and Roberts, 2022).

In the Zambian market, the increase in DOC prices and constraints in supply of the input, while exports increased, reflects an exertion of market power by breeders to undermine competition by independents in downstream poultry production. The higher DOC prices mean production costs are increased and consumer prices are also higher than they would otherwise be.

In addressing the arrangements which have caused harm to competition and to consumers, we must keep in mind the wider picture of the international duopoly. This poses the central challenge to enforcement – to take actions at the level of national jurisdictions (and regional in the case of COMESA) while working to make international markets more open and competitive.

5. References

- Alderman, B. and Blair, R. (2023). Antitrust Litigation in the Protein Markets, *The Antitrust Bulletin*, 68(1), 3-9.
- Bagopi, E., Chokwe, P., Halse, J., Hausiku, M., Humavindu, Kalapula, W. and Roberts, S. (2016). Competition, Agro-Processing and Regional Development: The Case of the Poultry Sector in South Africa, Botswana, Namibia, and Zambia. In *Competition in Africa*, ed. S. Roberts, 66–101. Pretoria: HSRC Press.
- BFAP (2021). Modelling poultry markets in Eastern and Southern Africa. A technical report by Bureau for Food and Agricultural Policy (BFAP) in collaboration with members of the Regional Network of Agricultural Policy Research Institutes (ReNAPRI) and Wageningen University and Research.
- CASA (2020). Poultry sector strategy – Malawi. CASA Malawi Country Team.
- Cobb. (2013). Cobb Focus Worldwide. Two 2013. Available at: <https://www.yumpu.com/en/document/read/31472396/cobb-focus-two-2013-english>
- Davies J. (2019) Slow-growing birds are fast becoming mainstream. <https://www.poultryworld.net/Meat/Articles/2019/7/Slow-growing-birds-are-fast-becoming-mainstream-454287E/>.
- Dauids, T. and Meyer, F.H. (2017). Price Formation and Competitiveness of the South African Broiler Industry in the Global Context, *Agrekon*, Vol 56 (2), pp 123-138.
- ETC Group. (2022). Food Barons 2022. Crisis Profiteering, Digitalization and Shifting Power. Available at: https://www.etcgroup.org/files/files/food-barons-2022-full_sectors-final_16_sept.pdf.

- Garcia-Dorado, S.C., Queenan, K., Shankar, B., Hasler, B. Mabhaudi, T., Cooper, G., and Slotow, R. (2021). Using Qualitative System Dynamics Analysis to Promote Inclusive Livestock Value Chains: A Case Study of the South African Broiler Value Chain, *Frontiers in Sustainable Food Systems*, 5:670756. doi: 10.3389/fsufs.2021.670756.
- Gondwe, T., Nsomba, G., and Roberts, S. (2022). Competition and the challenges of inclusive development: An apparent margin squeeze in poultry farming in Malawi. CCRED African Market Observatory Working Paper 2022/10.
- Grimbeek, S., and Lekezwa, S. (2013). The emergence of more vigorous competition and the importance of entry – comparative insights from flour and poultry. Centre for Competition and Economics, Working Paper 1/2013.
- Goga, S. and Bosiu, T. (2019). Governance of poultry value chains - A comparative perspective on developing capabilities in South Africa and Brazil. CCRED Working Paper 10/2019
- Harrington, J. (2007) Behavioural screening and the detection of cartels, in Ehlermann and atansiu (eds) *European Competition Law Annual 2006: Enforcement of Prohibition of Cartels*. Oxford: Hart.
- Heinrich Boll Stiftung (HB). (2021). Meat Atlas. Facts and figures about the meat we eat. 2021.
- Horne, P.L.M. van, 2017. Competitiveness of the EU poultry meat sector, base year 2015; International comparison of production costs. Wageningen, Wageningen Economic Research, Report 2017-005. 36 pp.; 14 fig.; 11 tab.; 16 ref.
- Horne, P.L.M. van, 2018. Competitiveness of the EU poultry meat sector, base year 2017; International comparison of production costs. Wageningen, Wageningen Economic Research, Report 2018-116. 40pp.; 14 fig.; 16 tab.; 19 ref.
- IBF. (2013). Study of the impact of genetic selection on the welfare of chickens bred and kept for meat production. Report prepared by Spike Jooste Hiemstra and Jan Ten Napel.
- Kovacic, W., Marshall, R., Marx, L., White, H. (2011) Plus Factors and Agreement in Antitrust Law. *Michigan Law Review*, 110(3).
- Leonard, C. (2014) *The Meat Racket*. New York, Simon & Schuster.
- Li, D. and Weisman. D. (2023). Ruffled Feathers: The Chicken Cartel in the United States, *The Antitrust Bulletin*, 68(1), 47-72.
- Marshall, R. and Marx, L. (2012). *The Economics of Collusion*. MIT Press.
- Meagher, M. and Roberts, S. (2021). The Footprint of Competition: Power, Value Distribution and Exploitation in the Food Supply Chain, in Holmes, S., D. Middelschulte, M. Snoep eds. (2021) *Competition Law, Climate Change & Environmental Sustainability*, Concurrences. <https://www.concurrences.com/en/all-books/competition-law-climate-change-environmental-sustainability>
- Motta, M. (2004) *Competition Policy: Theory and Practice*. CUP.
- Mottet, A. and Tempio, G. (2017). *Global poultry production: current state and future outlook and challenges*, *World's Poultry Science Journal*, 73, June 2017.
- Ncube, P., Roberts, S., Zengeni, T. (2016). Development of the animal feed to poultry value chain across Botswana, South Africa, and Zimbabwe. WIDER Working Paper 2016/2.
- Ncube, P., Roberts, S., Samboko, P. and Zengeni, T. (2017). Identifying growth opportunities in the Southern African Development Community through regional value chains - The case of the animal feed to poultry value chain, WIDER Working Paper 2017/4.
- Ncube, P. (2018). *The southern African poultry value chain: Corporate strategies, investments and agro-industrial policies*, Development Southern Africa, DOI: 10.1080/0376835X.2018.1426446
- Nkhonjera, M. (2020). Entry challenges in vertically integrated industries: Insights from three agro-processing value chains in South Africa. In Vilakazi, T., Goga, S. and Roberts, S.

- (eds) *Opening the South African Economy: Barriers to entry, regulation, and competition*. HSRC Press.
- Nsomba, G., Kachipapa, A., Mulozi, I., and Oiro, R. and Roberts, S. (2022). Competition issues and regional integration in soybean and animal feed to poultry markets within and across Kenya, Malawi, Zambia. CCRED African Market Observatory Working Paper 2022/09.
- OECD-FAO (Organization for Economic Cooperation and Development and the Food and Agriculture Organization of the United Nations) (2017). OECD agriculture statistics (database): OECD-FAO agricultural outlook (edition 2017.). Paris:OECD Publishing. <https://doi.org/10.1787/d9e81f72-en> (cited in Asante-Addo, C. and D. Weible. 2019)
- OECD/FAO (2018a), *OECD-FAO Agricultural Outlook 2018-2027*, OECD Publishing, Paris/FAO, Rome, https://doi.org/10.1787/agr_outlook-2018-en.
- OECD (2018b) Market examinations in Mexico: Case study of the chicken meat market
- OECD/FAO (2022), *OECD-FAO Agricultural Outlook 2022-2031*, OECD Publishing, Paris, <https://doi.org/10.1787/f1b0b29c-en>
- Roberts, S. (2023). *Competition, trade, and sustainability in agriculture and food markets in Africa*, Oxford Review of Economic Policy, 39(1), Spring 2023, 147–161.
- Sappington, D. and Turner, D. (2023). Information Sharing and Collusion: General Principles and the AgriStats Experience, *The Antitrust Bulletin*, 68(1), 10-23.
- Scaturro, M. (2020). How chickens became like apple and android phones, Heated Medium. Available at: <https://heated.medium.com/how-chickens-became-like-apple-and-android-phones-85378e97799e>
- Singh M, Lim, A.J., Muir, W.I., Groves ,P.J. (2021). *Comparison of performance and carcass composition of a novel slow-growing crossbred broiler with fast-growing broiler for chicken meat in Australia*, *Poult Sci*, 2021 Mar;100(3):100966. doi: 10.1016/j.psj.2020.12.063. Epub 2020 Dec 26. PMID: 33652532; PMCID: PMC7936175.
- Tak, M., Karamchedu, A., and Syndicus, I. (2022). Identifying Economic and Financial Drivers of Industrial Livestock Production – The Case of the Global Chicken Industry. Guidance Memo Prepared for Tiny Beam Fund.

6. Appendix

Appendix 1: Interview Participants

Malawi

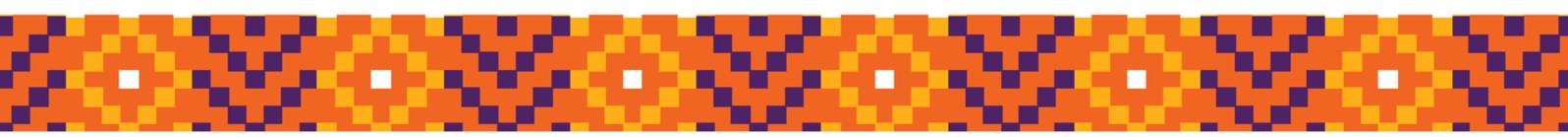
- | | |
|---|---------------------------|
| 1. Small and Medium Poultry Farmers Association (SMPFA) | 30 June 2022 |
| 2. Prof Timothy Gondwe - Animal Sciences, Lilongwe University of Agriculture and Natural Resources, Bunda | 1 st July 2022 |
| 3. Department of Animal Health & Livestock Dev, Ministry of Agriculture | 4 th July 2022 |
| 4. Thanzi Chicks | 5 th July 2022 |
| 5. Conforzi / Glenae | 7 th July 2022 |
| 6. Small poultry producer | 6 th July 2022 |

Zambia

- | | |
|----------------------------------|------------------------------|
| 1. Poultry Association of Zambia | 15 th August 2022 |
| 2. Tiger Chicks | 16 th August 2022 |
| 3. Zamharvest | 16 th August 2022 |
| 4. Small poultry producer 1 | 17 th August 2022 |
| 5. Quantum | 18 th August 2022 |
| 6. Selfhelp Africa / AGCO | 18 th August 2022 |
| 7. Small Poultry Producer 2 | 19 th August 2022 |
| 8. Small Poultry Producer 3 | 19 th August 2022 |
| 9. Hendrix Genetics | 7 th September |
| 2022 | |

South Africa

- | | |
|---|------------------|
| 1. South African Poultry Association (SAPA) | 5 August 2022 |
| 2. Quantum | 2 September 2022 |
| 3. Astral | 6 September 2022 |
| 4. Ex-CEO of SAPA | 8 September 2022 |
| 5. Small poultry producers | Sep/Oct 2022 |



Appendix Table A1: Summary of Cobb Africa and Ross Africa Operations

Cobb Africa / Irvines	
Operations	Cobb Africa supplies most of the sub-Saharan countries directly from its operations in Zimbabwe or from Europe (Cobb, 2013) ¹⁰³
Supplies (parent stock)	Cobb Africa is supplier of Cobb parent stock for sub-saharan Africa, including Nigeria, Cameroon, Ghana, Uganda, Ivory Coast, Senegal, Kenya, Tanzania and Malawi. ¹⁰⁴
Ownership	Irvine's and Tyson (through Buchan Ltd)
Ross Africa / CBH	
Operations	Ross Africa Ltd is a wholly owned subsidiary of the CBH Ltd Group and has facilities in Botswana ¹⁰⁵ and Zambia (grandparent hatchery in Zambia ¹⁰⁶). It has sole rights to distribute breeding stock for CBH and other independent producers in Southern Africa.
Supplies (parent stock)	Ross Breeders Zambia ¹⁰⁷ (via Ross Africa Ltd) exports ¹⁰⁸ : <ul style="list-style-type: none"> parent day old chicks to countries including Malawi, Botswana, Senegal, Zimbabwe, Mozambique, DRC, Angola, Ghana, Uganda via road and air. hatching eggs to Zimbabwe, Malawi, Botswana, DRC (via road and air) broiler day-old chicks to the DRC via road
Ownership	CBH; Aviagen shareholding in partnership with CBH and APDL in Aviagen East Africa

Source: Authors compilation

Appendix Table A2: Distribution Licences, South Africa

Country	Operations	Notes / recent developments	Exports of parent stock
Astral (fully integrated)	Ross 308, GP and parent operations	Distribution rights to Ross 308 parent in SA for own use and other hatcheries, who ultimately supply DOCs to independent broiler growers. Chick breeding facility & hatchery in Eswatini ¹⁰⁹	South Africa, Lesotho and Swaziland ¹¹⁰
RCL (fully integrated)	Cobb 500, GP and parent operations	Held / hold the distribution rights to Cobb 500 parent in SA for own use and other hatcheries. Have been testing the Indian River (Aviagen) breed in the market; unclear if will continue will the Cobb 500 distribution rights. Reports are that Cobb hatch rates have increased ¹¹¹	South Africa, Lesotho, Swaziland, Namibia ¹¹²
CBH (fully integrated)	Arbor Acres, GP and parent operations	Distribution rights to Arbor Acres parent in SA for own use and other hatcheries.	

¹⁰³ Also see <https://www.cobbafrica.com/>

¹⁰⁴ <https://www.cobbafrica.com/>

¹⁰⁵ Ross Botswana was formed early in 2005 via the acquisition of a 60% shareholding in a hatchery, and is the leading supplier of day-old-chicks to the market in Botswana <http://cbh.co.za/our-brands/ross-africa/>

¹⁰⁶ <https://www.thepoultrysite.com/news/2022/03/ross-africa-to-double-grandparent-hatchery-capacity-in-zambia>

¹⁰⁷ RBZ was incorporated in Zambia in 1999.

¹⁰⁸ <http://rossafrica.com/index.php/zambia/>

¹⁰⁹ https://repository.up.ac.za/bitstream/handle/2263/41069/Davids_Playing_2013.pdf;sequence=1

¹¹⁰ <https://tmea.aviagen.com/news-room/press-releases/astral-celebrates-50-years-as-a-ross-customer/>

¹¹¹ <https://www.wattagnet.com/articles/43987-tyson-foods-hatch-rate-has-improved>

¹¹² <https://www.thepoultrysite.com/news/2017/11/rcl-foods-celebrates-25-years-with-cobb-in-south-africa>

Quantum (fully integrated)	GP and parent operations / Since August 2022 only parent operations	Held the distribution rights to Cobb parent in SA for own use / Have divested of the distribution rights as of August 2022, and now access Ross parent stock from Astral	
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Source: Authors compilation

Appendix Table A3: Distribution Licences, Zambia

Country	Operations	Countries exporting parent stock to
Hybrid Breeding, hatchery and breeding of day-old chicks, live and dressed broilers, layers and village chicken	Grandparent and parent operations Cobb 500 grandparent breeding farm– rights for Zambia	East African market – exports to sister operations in Kenya (Kenchic) and Tanzania (Tanbreed) ¹¹³
CBH (RBZ via Ross Africa) Breeding, hatchery and breeding of day-old chicks, processed chicken	Grandparent and parent operations Ross 308 grandparent breeding farm– rights for the region	Ross Breeders Zambia ¹¹⁴ (via Ross Africa Ltd) exports ¹¹⁵ : <ul style="list-style-type: none"> parent DOCs to a number of countries including Malawi, Botswana, Senegal, Zimbabwe, Mozambique, DRC, Angola, Ghana, Uganda via road and air.¹¹⁶
Zambeef/Zamhatch Integrated	Parent Operations Ross 308 Cobb 500	
Tiger Chicks Feed and breeder ¹¹⁷	Parent Operations Indian River – parent breeding farm; rights for Zambia	
Quantum Feed and breeder ¹¹⁸	Parent Operations Ross 308 – parent breeder farm (get parent stock from RBZ)	
Zamharvest / Heartland Hatchery and breeding of day-old chicks, processed chicken	Parent Operations Ross 308 – parent breeder farm SASSO – parent breeder farm; rights for Zambia	

Source: Authors compilation

¹¹³ <https://issuu.com/outlookpublishing/docs/hybrid-poultry-farm>

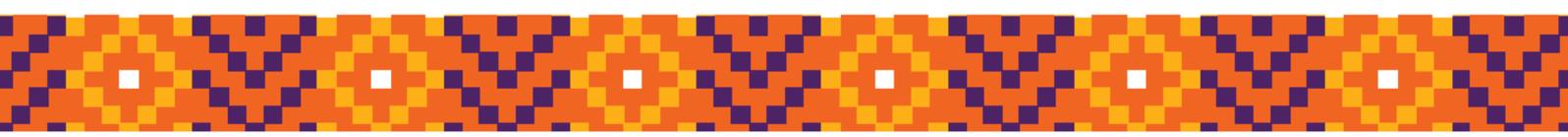
¹¹⁴ Ross Breeders Zambia (RBZ) (via Ross African Ltd) is a fully owned subsidiary of CBH and has been Aviagen’s partner for over 25 years. RBZ was incorporated in Zambia in 1999.

¹¹⁵ It also exports broiler day-old chicks to the DRC by road, and hatching eggs to Zimbabwe, Malawi, Botswana and the DRC via road and air <http://rossafrica.com/index.php/zambia/>

¹¹⁶ It also exports broiler day-old chicks to the DRC by road, and hatching eggs to Zimbabwe, Malawi, Botswana and the DRC via road and air <http://rossafrica.com/index.php/zambia/>

¹¹⁷ Interview with Poultry Association of Zambia.

¹¹⁸ Interview with Poultry Association of Zambia.



Appendix Table A4: Distribution Licences, Malawi

Country	Operations
CP Feeds	<ul style="list-style-type: none"> • Parent operations • obtain parent DOC from Irvines (Cobb) (interview with SPFMA)
Kelfoods	<ul style="list-style-type: none"> • Parent Operations • obtain parent DOC from RBZ (Ross)
Conforzi / Glenae	<ul style="list-style-type: none"> • Parent operations • obtain parent DOC from RBZ (Ross)
Charles Stewart	<ul style="list-style-type: none"> • Parent Operations • obtain parent DOC from RBZ (Ross)
Thanzi	<ul style="list-style-type: none"> • Parent Operations • obtain parent DOC from RBZ (Ross)

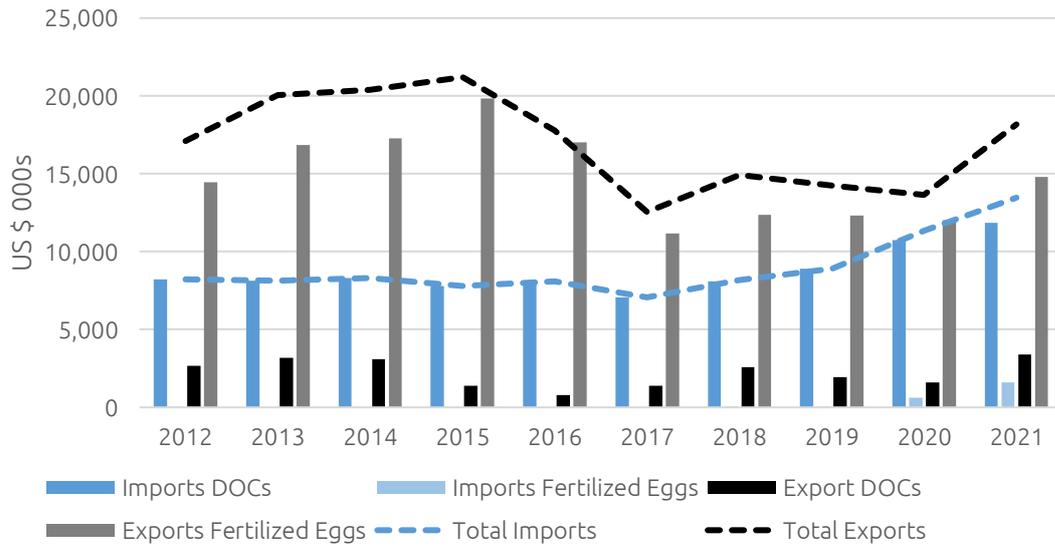
Source: Authors compilation

Appendix Table A5: South African Breeding Operations and Estimated Market Shares

Company	Market Share, total Parent Stock	Non-integrated broiler DOC sales, market share
RCL	~40-50%	
Astral / National Chicks (hatchery)	40-50%	~21%
Quantum	~5%	~8%
CBH	~5-10%	~13%
Independent Hatcheries		
Eagles Pride (independent)		~46%
Keystone (independent)		~4%

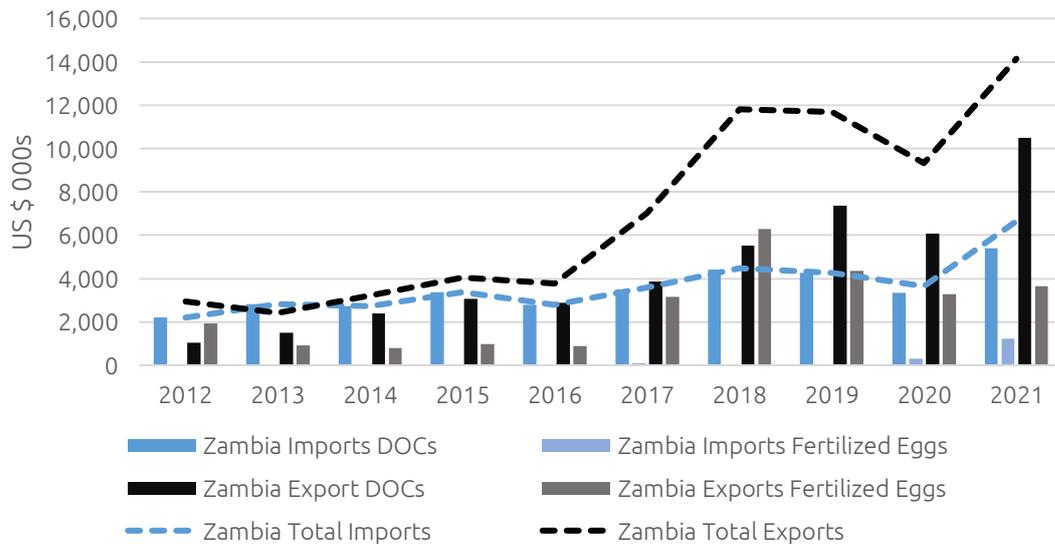
Source: Estimated market shares from interview participants

Appendix Figure A1: Trade in DOCs and fertilized eggs in South Africa



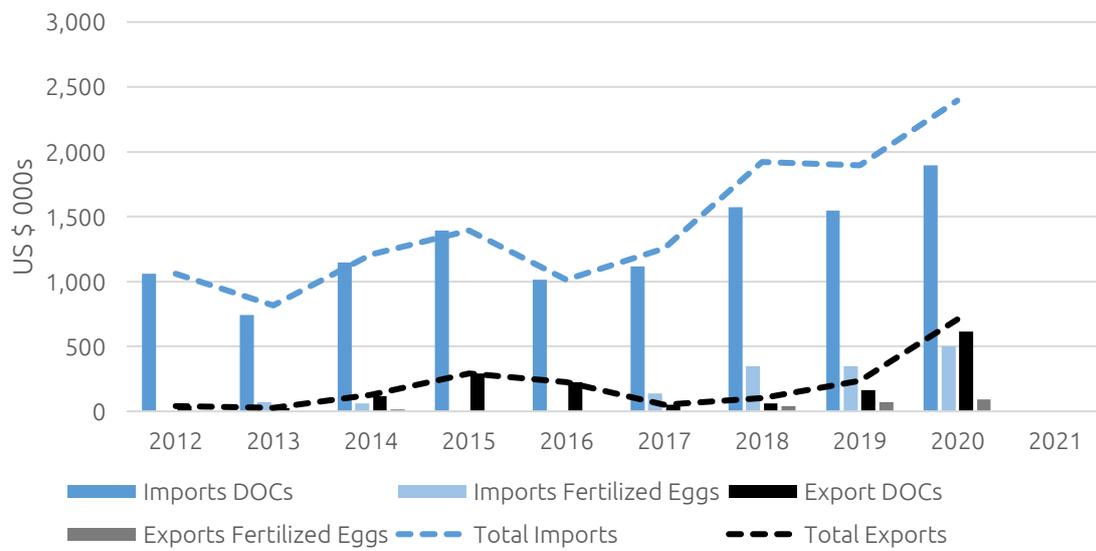
Source: Trademap

Appendix Figure A2: Trade in DOCs and fertilized eggs in Zambia



Source: Trademap

Appendix Figure A3: Trade in DOCs and fertilized eggs in Malawi



Source: Trademap

Appendix Table A6: Trade in DOCs and fertilized eggs by importing and destination country for South Africa

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Imports DOCs										
United Kingdom	3,703	3,037	3,433	4,575	7,473	6,229	7,095	6,715	8,473	11,150
United States of America	2,784	2,481	3,114	0	201	197	232	1,893	1,920	377
Canada	0	0	0	0	0	350	342	6	5	339
Brazil	0	0	0	2,882	0	0	438	287	324	
Germany	988	601	379	0	419	0	0	0	0	
Netherlands	757	2,012	1,402	0	6	0	0	0	0	
Spain	0	0	0	321	0	290	0	0	0	
World	8,232	8,131	8,328	7,778	8,099	7,065	8,109	8,901	10,722	11,867
Imports Fertilized Eggs										
United States of America	0	0	0	0	0	0	0	25	594	1,536
Brazil	0	0	0	0	0	0	32	0	0	65
World	6	0	0	0	0	0	49	25	598	1,601
Exports DOCs										
Malawi	22	0	29	0	0	197	95	426	655	1,193
Zambia	161	119	11	0	0	1	0	3	0	877
Tanzania, United Republic of	0	0	0	0	0	102	0	0	0	458
Mozambique	250	565	1,157	439	68	381	1,076	402	120	327
Lesotho	1,030	1,338	845	523	489	432	653	728	504	312
Botswana	278	336	0	22	0	161	649	344	315	114
Namibia	140	155	154	79	84	7	20	0	0	64
Eswatini	634	393	184	74	57	65	84	16	6	
World	2,649	3,171	3,095	1,369	783	1,385	2,581	1,922	1,600	3,378
Exports Fertilized Eggs										
Mozambique	5668	9841	9498	10754	10023	5304	6809	5929	5865	8242
Eswatini	4630	4184	3520	5039	4095	4467	4978	5113	4602	4822

Nigeria	23	265	914	23	3	34	0	630	878	1042
Botswana	2161	486	122	270	350	70	450	578	672	624
Tanzania, United Republic of	8	387	404	130	112	0	72	7	2	46
Angola	613	461	290	2	33	36	0	0	0	
Côte d'Ivoire	0	0	0	34	316	162	0	0	0	
Namibia	205	80	150	92	9	34	1	1	0	
Zimbabwe	941	967	1975	3394	1979	815	0	0	0	
World	1444 0	1686 3	1728 2	1983 4	1701 9	1116 5	1236 4	1230 5	12041	14814

Appendix Table A7: Trade in DOCs and fertilized eggs by importing and destination country for Zambia

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Imports DOCs										
United Kingdom	1,009	1,692	1,416	2,622	2,001	1,714	2,338	2,231	2,308	3,315
France	97	0	13	248	14	46	100	187	115	754
South Africa	176	114	210	231	187	116	257	35	0	592
Netherlands	733	846	1,010	268	548	1,465	1,503	1,345	650	329
Spain	0	0	0	0	0	0	0	188	184	281
Germany	0	93	43	0	0	120	208	116	86	
World	2,201	2,831	2,743	3,388	2,778	3,484	4,421	4,260	3,348	5,409
Imports Fertilized Eggs										
United States of America	0	0	0	0	0	95	0	0	49	1,011
France	0	0	0	0	0	0	36	0	60	130
United Kingdom	0	0	0	0	0	0	0	0	126	12
World	0	0	0	0	0	101	42	0	296	1,240
Exports DOCs										
Zimbabwe	565	524	1,014	1,182	1,289	1,892	2,120	2,885	1,895	5,646
Botswana	182	371	627	901	876	895	670	858	1,161	1,135

Kenya	54	21	0	0	16	43	529	419	369	887
Namibia	0	0	0	0	0	0	747	784	706	822
Tanzania, United Republic of	0	17	0	0	0	43	712	872	762	618
Malawi	109	142	366	378	299	349	298	321	493	613
Mozambique	36	217	136	0	200	372	195	171	213	343
Uganda	0	0	0	0	8	0	9	18	4	275
Angola	50	55	149	125	123	121	55	115	176	101
Congo	36	0	0	88	0	0	0	772	68	48
Congo, Democratic Republic of the	0	88	107	380	76	82	0	0	0	
Rwanda	0	0	0	0	0	22	38	30	217	
South Africa	0	0	0	0	0	0	0	102	0	
World	1,032	1,490	2,399	3,076	2,887	3,877	5,513	7,349	6,064	10,489
Exports Fertilized Eggs										
Zimbabwe	621	0	81	448	323	1,834	4,271	1,627	1,319	1,793
Mozambique	0	0	0	120	11	70	62	27	333	1,268
Malawi	1	136	231	0	0	131	389	144	398	288
Botswana	0	44	38	256	96	427	395	248	572	110
Kenya	0	35	0	0	116	630	692	2,031	467	84
Tanzania, United Republic of	1,183	711	409	130	290	58	218	0	3	49
Nigeria	0	0	0	0	0	0	0	193	140	39
Namibia	0	0	0	0	0	0	208	0	0	
World	1,921	925	810	977	877	3,149	6,290	4,346	3,274	3,655

Appendix Table A8: Trade in DOCs and fertilized eggs by importing and destination country for Malawi

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Imports DOCs									
South Africa	120	0	0	406	50	271	263	641	834
Zambia	127	169	377	359	379	398	413	387	606
Zimbabwe	515	435	636	628	456	106	0	440	453
Netherlands	0	0	0	0	0	289	452	0	0
United Kingdom	90	0	41	0	0	0	294	69	0
United States of America	108	0	0	0	63	0	0	0	0
World	1,063	744	1,147	1,393	1,013	1,118	1,572	1,547	1,894
Imports Fertilized Eggs									
Zambia	0	72	0	0	0	139	347	153	454
Zimbabwe	0	0	60	0	0	0	0	197	19
World	0	72	60	0	0	139	347	350	501
Exports DOCs									
Mozambique	0	1	93	110	7	32	61	166	617
Tanzania, United Republic of	33	1	7	126	136	19	0	0	0
World	42	27	115	293	225	51	61	166	617
Exports Fertilized Eggs									
Mozambique	0	0	0	0	0	0	32	70	91
World	0	0	15	0	0	0	40	70	91