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THE CONCLUSION: VACCINE INEQUITY, AND ETHICALLY ANTI-FRAGILE COMPETITION LAWS

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Abstract: In wrapping up this timely discussion on post-COVID-19 trade facilitation-related issues in Africa, this chapter analyses the relationships between opacity and food authenticity, which concern African countries where the value chain is long and dependent on imported processed foods. A more equitable distribution of COVID-19 vaccines could have prevented significant deaths in selected African countries. In addition, we highlight some crucial trade challenges and policy recommendations based on the thesis presented in the previous chapters. Finally, this concluding chapter presents an appropriately anti-fragile competition framework that will be ethically desirable to the future of Africa's trade facilitation.

Key words: digitalisation; platonicity; fragility; opacity; authenticity; bleeding trade; COVID-19 pandemic; TRIPS; ethically anti-fragile competition laws; entrepreneurship

1 The context

As COVID-19 vaccination programmes were scaled in selected African countries, 2021 and 2022 increasingly recorded remarkable progress in vaccinating populations against the coronavirus. Consequently, African economies reopened by lifting quarantine requirements for people who have received vaccinations. Amidst African economies re-opening, and as a US-COVID-19 vaccinated traveller to a few West African countries in 2021, the free flow of passengers and goods across the airports could

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have been more a-platonic.¹ For instance, according to the United Nations (UN) Conference on Trade and Investment (UNCTAD) estimates, the world experienced an approximately 30 to 40 per cent decline in foreign direct investment inflows in 2020, while the OAG Aviation data showed a 70 per cent reduction in international air passenger capacity, thereby undermining the cross-border travel and tourism revenue and jobs generating capabilities of the global economy.

In Africa, trade agreements and legal frameworks have yet to keep pace with technological transformation and the pharmaceutical discovery of medical products. The systemic tension between competition law and the scientific revolution partly explains this ever-widening legal enforcement-market access gap. At the same time, the tumultuous nature of the COVID-19 pandemic has compounded the anti-competition behaviour and fragility of Africa's trade system. These imperfections relating to health, food, labour and trade market are evident in African countries' inequitable access to COVID-19 vaccines, reflecting unwanted societal biases that portend severe repercussions when unsupervised high-level socio-economic data are deployed.

Although the discriminatory consequences of vaccine inequity in Africa have been fairly researched, the broad aim of this chapter is to discuss vaccine inequities from Africa's trade facilitation standpoint. Taking policy lessons from health, food and trade sectors, it concludes with ethically anti-fragile policy interventions for overcoming the relationships between opacity and sectoral authenticity, undermining African countries 'characteristically long, untraceable, and uncertain commodities value chains'.

Structurally, this chapter is organised so that part 2 critically evaluates vaccine access and inequity within the context of Africa's vaccination status and the COVID-19 pandemic landscape. Part 3 articulates the challenges and solutions hidden in the oligopolistic nature of vaccines markets. Part 3.1 discusses the effectiveness of the current Common Market for Eastern and Southern Africa (COMESA) competition framework in addressing critical competition issues relating to new and emerging threats in vaccine access: trade, and food authenticity. Part 4 discusses the 'vaxxed' versus the 'unvaxxed' and the economics of factor and commodity markets. Part 5 analyses the nexus between fragility and food authenticity based on

1 G Odularu 'The introduction: Pandemic preparedness and a-platonic policies for transforming Africa's agri-food systems' in GOA Odularu (ed) *Agricultural transformation in Africa. Advances in African economic, social and political development* (Springer 2023).

research by Taleb and Douady.² Part 6 expatiates on bleeding trade and its African Continental Free Trade Area (AfCFTA) implications for micro, small and medium-scale enterprises (MSMEs), while part 7 presents digitalisation and entrepreneurship landscape for enhancing MSMEs trade facilitation capacities in this digital age. Finally, part 8 focuses on ethically anti-fragile towards shaping a desirable future for trade facilitation.

Both descriptive statistical techniques as well as doctrinal research methods are deployed in this study, while descriptive statistical methods analyse the growth in selected vaccine equity indicators and business facilitation measures in food, trade and health industries. The doctrinal research approach to this study focuses on a review of relevant literature on the oligopolistic nature of vaccines markets, as well as the economics of factor and commodity markets.

2 Lowest vaccination rate in the world. Cases of vaccine access and inequity

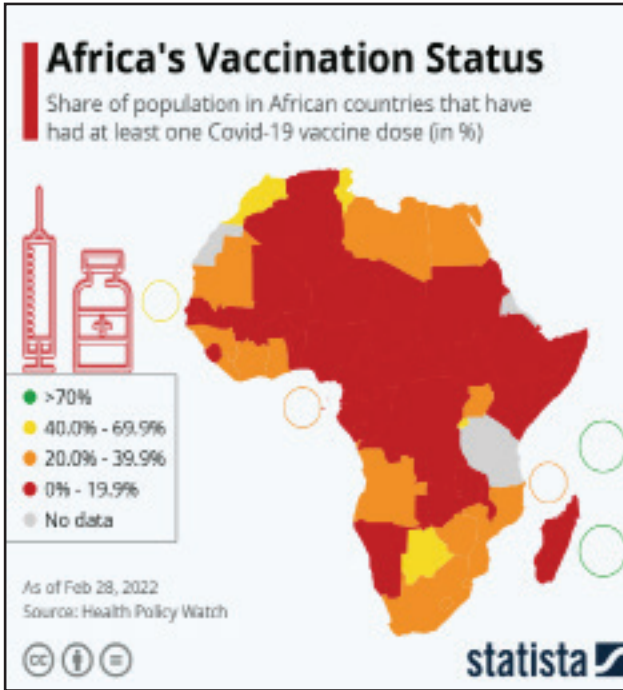
According to Statista,³ an excellent review of Africa's vaccination status shows that more than half of the African countries, predominantly in the centre of the continent, have vaccination rates of less than 20 per cent⁴ (see Figure 1). Approximately 19,8 per cent of Africa's population was fully vaccinated against the coronavirus as of 11 July 2022, making Africa's vaccination rate far lower than the global average. Although its share of population fully vaccinated against the COVID-19 pandemic has been rising over time, approximately 540 million vaccine doses have been administered in Africa since the beginning of the vaccination campaign in 2021 (see Figure 2 and Figure 3). More specifically, Figure 3 shows the population of fully-vaccinated Africans by country as of 13 April 2022. Seychelles presents the highest COVID-19 vaccinated rate at 81 per cent, followed by Mauritius at 76,2 per cent, while Zimbabwe barely records 23 per cent, and only 0,1 per cent of Burundians have been vaccinated against COVID-19.

2 NN Taleb & R Douady 'Mathematical definition, mapping, and detection of (anti) fragility' (2013) 13 *Quant Finance*1677-1689.

3 Statista (2022), Coronavirus cases by country in Africa 2022 | Statista (accessed 28 July 2022).

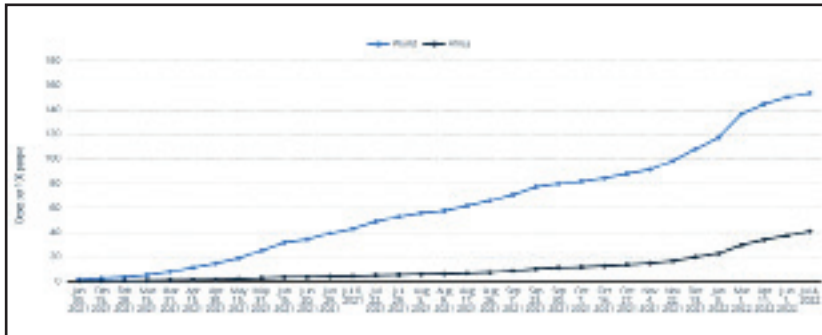
4 M Armstrong 'Africa's vaccination status' (2022), <https://www-statista-com.vmiezproxy.vmi.edu/chart/26956/africa-covid-vaccination-share> (accessed 28 July 2022).

Figure 1: Africa's vaccination status



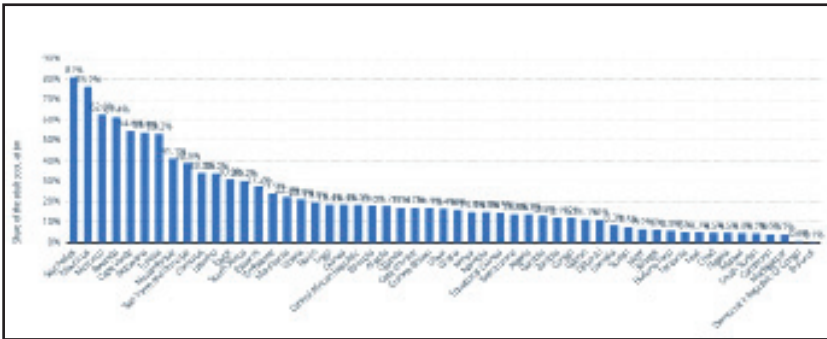
Source: Statista

Figure 2: Coronavirus (COVID-19) vaccination rate in Africa compared to the world from 30 January 2021 to 4 July 2022 (in doses per 100 people)



Source: OWID

Figure 3: Share of population fully vaccinated against the coronavirus (COVID-19) in Africa as of 13 April 2022, by country



Sources: Various sources, OWID

More specifically, while Seychelles boasts of 208 doses per 100 people as of 24 July 2022, South Africa, the most affected country in Africa, records a vaccination rate of approximately 62 per 100 population. The question about Africa’s access to vaccines relates to how Africa obtains vaccines. African countries are both purchasing new doses, and receiving vaccine donations from China, the United Arab Emirates, India and Russia; intra-African solidarity instances where Senegal donated vaccines to The Gambia, and Algeria shared some vaccines with Tunisia. The G7 leaders pledged one billion vaccine doses for poorer countries; the affluent nations have benefited the most from vaccine access and distribution. The UN-led Vaccines Global Access (COVAX) provided Oxford/AstraZeneca and Pfizer/BioNTech doses to some African countries, such that Africa received nearly 270 million doses as of January 2022.⁵ For instance, the COVID-19 vaccines saved 7,4 million lives in Africa and other low to middle-income countries participating in COVAX,⁶ resulting in vaccine inequity due to a disproportionately higher number of deaths prevented by vaccination in high-income nations compared to African countries.

As Africa’s trade, food and health systems evolved during the coronavirus pandemic, the continental economy also grappled with its pre-COVID-19 challenges, such as poor health infrastructure, high user fees, high rates of comorbidity indicators, poor sanitation, large

5 Statista (n 3).

6 COVAS is the global initiative that provides people around the world equitable access to COVID-19 vaccines. See R Goldberg ‘Vaccine damage schemes in the US and UK reappraised: Making them fit for purpose in the light of COVID-19’ (2022) *Legal Studies* 1-24.

refugee population, poor governance, and corruption, to name but a few constraints. Two French doctors expressed how vaccine trials should occur in Africa because there are ‘no masks, no treatments, no ICUs’ and ‘they are highly exposed, and they do not protect themselves’. However, the reality strayed far from the science and expert opinion, such that the number of COVID-19 cases on the continent remained low in absolute and proportional terms. For some West African countries that the Ebola virus has impacted, there were still experienced personnel to respond to COVID, thus minimising the spread. Rwanda and Senegal responded innovatively to treat and perform contact tracing. In addition, the African Union (AU) coordinated with other regional partners to establish the African Medical Supplies Platform – a virtual marketplace where governments can directly purchase essential medical supplies. The People’s Vaccine Alliance – a coalition of governments and actors from the Global South – demanded that the publicly-funded COVID vaccine be considered a public good because wealthier countries, which comprise only 14 per cent of the global population, have purchased 53 per cent of the promising coronavirus vaccine. In response, the Global South countries have requested that the World Trade Organisation (WTO) suspend trade-related aspects of intellectual property rights (TRIPS) to ensure that all countries have access to the requisite health resources for controlling the virus. This is even more important for the availability of medicines for chronic diseases and necessary vaccines as we interact as a global village in this century.

Moreover, the COVID-19 COVAX, an initiative managed by the Coalition for Epidemic Preparedness Innovations (CEPI), the vaccine alliance (Gavi), the World Health Organisation (WHO), and the delivery partner, the United Nations Children’s Fund (UNICEF), performed below expectations. Some policy makers alluded to the presence of vaccine apartheid in the global inoculation against COVID-19. Moreover, the strict implementation of intellectual property rights has transformed the knowledge associated with the development of vaccines and the patented ingredients – biologics, active ingredients, and chemicals – from non-rival and non-excludable goods to non-rival but excludable goods (see the second chapter on the economics of IPRs). This leads to highly-concentrated markets, as observed in oligopolies.

The COVID-19 pandemic raised African leadership’s awareness about the continental imperative to develop its vaccines against current and future outbreaks of emerging infectious diseases. Based on the fact that deploying a single economic theory is hard because privacy, oligopoly, vaccines, consumer protection and other competition policy issues of economic relevance arise in widely diverse contexts, this chapter analyses the relationship between opacity and food authenticity, the Trade-Related

Aspects of Intellectual Property (TRIPS) agreement and its role in vaccine manufacturing and distribution, as well as the ethically anti-fragile competition law framework for maximising Africa's trade facilitation innovation policy agenda with reference to vaccines and other related medical commodities.

With the government's limited resources to detect export market cartels' abuse, prosecution becomes ineffective. Empirical findings have revealed that competition regulations still lag technological development and Moreso in the management of digital platforms. As competition legislation at the national and regional levels in Africa is obsolete, spectacular artificial intelligence (AI) expansion remains a game changer for Africa's trade expansion and socio-economic transformation. However, AI misuse and unintended consequences from deploying AI raise several ethical implications. For instance, AI approaches to digital trade facilitation can expose markets to novel sources of risks, including increasingly complex and sophisticated forms of digital market manipulation. Whenever such market manipulation passes undetected, it ultimately jeopardises markets' safety and integrity, thus impairing trade facilitation, investors' protection, and confidence.

3 The economics and oligopolistic nature of vaccines market: Challenges and solutions

As vaccines continue to play a crucial role in preventing infectious diseases in the twenty-first century, they have further proven their effectiveness in protecting the public from one of the deadliest epidemics in the twenty-first century.⁷ Given the importance of trade in supplying necessary health resources for combating the pandemic, it is crucial to examine the oligopolistic nature of the trade market. Head and Spencer, in their extensive review of the use of the oligopolistic market in explaining trade, indicate that it was popular in the 1990s.⁸ Nevertheless, monopolistic competition became the desired model in the 2000s because it accommodates firm heterogeneity. Recent advances have made it clear that there is still a need to use oligopolies to explain trade. International trade is often highly concentrated with only a few large players even when

7 Goldberg (n 6).

8 K Head & BJ Spencer 'Oligopoly in international trade: Rise, fall, and resurgence' (2017) 50 *Canadian Journal of Economics* 1414-1444.

the market has the characteristics of monopolistic competition.⁹ ¹⁰ The assumption of an oligopolistic market will enhance the analysis of other aspects of trade apart from tariffs and subsidies.¹¹ These aspects include intellectual property and handling a pandemic such as COVID-19.

The understanding of the oligopolistic nature of international trade is visible in the aviation, telecommunication and banking sectors in Africa and globally. Adekunle, in his essay 'Iatrogenic: The dilemma of ingenuity', indicates that it is easy for companies that have cooperated through an alliance, for example, the SkyTeam Alliance, to reroute, move baggage and passengers through codeshare agreements, making international cargo delivery and travel seamless.¹² He further states that models such as the Sweezy model explain rigidity, while the Chamberlin model explains interdependency and tacit collusion in the aviation industry. Moreover, the reason why North American airlines do not provide food on flights – even those that are more than six hours long, charge \$25 for baggage check-in with no repercussions, and if you want in-flight entertainment, you better have the appropriate application on your device – is because there are few players, and the routes are not competitive.¹³ African countries need a good understanding of the oligopolistic market to make connectivity accessible and affordable. Much needs to be learned from the Middle East and Asian airlines.

Increasing international cooperation on vaccine access has resulted in reopening businesses, public freedom restoration, and a COVID-19 passport for international travel, especially as such proof is increasingly required during the early stage of curbing the spread of COVID-19. Digital proof of vaccination will expedite access to an event, being more trustworthy than mere verbal confirmation. COVID-19 is a natural disruptor that prompts beneficial innovations. Had the world not experienced COVID, it would not have embarked on the rapid development of biological tools such as messenger RNA (mRNA) platforms within a mere two years.

9 B Adekunle & G Filson 'Blockchain technology and asymmetric information in the food market' A selected paper presented at the IAABD 2019, 8-11 May 2019, Dar es Salaam, Tanzania.

10 J Clapp 'Mega-mergers on the menu: Corporate concentration and the politics of sustainability in the global food system' (2018) 18 *Glob Environmental Politics* 12-33.

11 Head & Spencer (n 8).

12 B Adekunle *Iatrogenic: The dilemma of ingenuity*. (2020).

13 As above.

3.1 COVID-19's status and regulatory responsiveness to exports cartels

COVID-19 adversely affected socio-economic transformation in Africa, with most specific impact on South Africa, which experienced the sharpest -7 per cent decline in gross domestic product (GDP), followed by Central Africa at -2,7 per cent. Since the pandemic occurred when the global oil prices drop, Nigeria, Africa's leading oil and gas exporter, witnessed a considerable decrease in crude oil export in 2020. Furthermore, Africa lost over 12 million jobs in its travel, tourism and creative sector, such that the number of Africans living in extreme poverty increased by approximately 30 million in 2020.

As digitalisation deepens in Africa, understanding the markets requires good attention to markets' structural conditions, number of firms, product homogeneity, and degree of concentration, multimarket contacts, entry barriers, and the likelihood of collusive behaviour. Its continental applicability and economic implications, since the economics of oligopolistic firms theorise that in a repeated interaction, explicit and binding agreements are not required to attain equilibrium outcomes in which firms gain supra-competitive profits. From an anti-competition perspective and in implementing AfCFTA, it is crucial to understand whether current antitrust laws could provide the legal framework to curb firms' capacity to cope and behave tacitly towards undermining competition and harming consumers. From digital platform and trade facilitation standpoints, Apple, Google, Samsung and Huawei smartphone operating systems are major players in oligopolistic industries. Thus, many antitrust cases and legal challenges are designed to curb the anti-competitive behaviour exhibited by oligopolistic firms. Digitalisation is rapidly changing the telecoms, airlines, broadcasting, health services, video games, entertainment, filmmaking, services, and e-commerce landscape as companies consolidate through mergers and acquisitions in Africa. Pro-competition policies have strategic roles to play in fuelling the future of digital experience as more African economies attract more clients by building a solid data foundation.

The COMESA Competition Commission cooperates with member states' national competition authorities to enforce the codified set of COMESA Competition Regulations and the COMESA Competition Rules, particularly in investigating competition cases. The cooperation is guided by the Commission's signed cooperation framework agreements with national competition authorities, which also articulates areas of common interests, including information exchange facilitation relating to investigation of competition cases and national competition laws

harmonisation engagements as well as effective enforcement of the Regulations in the Common Market.

South Africa's Competition Tribunal describes export cartels as a 'cynical policy which allows firms to do in someone else's backyard what they could not do at home'. Its competition policy provides possible grounds for granting exemptions on any restrictive business practices. Section 3(b)(i) of the 1998 Competition Act provides that maintenance or promotional exports as one of the possible grounds for granting an exemption for a restrictive agreement or practice. Although the US antitrust policy exempts hard core export cartels from law enforcement due to its harm to foreign consumers, and not domestic consumers, export cartels increase export costs and limit the quantity of imports, forcing consumers to pay artificially higher and non-competitive prices. Most African countries except South Africa are characterised by MSMEs and infant industries that are more likely to suffer harm from export cartels than larger firms with highly diverse industrial bases. Furthermore, most sub-Saharan African firms are price takers with little or no control over prices set by export cartels. For instance, Jenny found that export cartels originate and operate in an exporting nation and exert negative externalities, creating deadweight loss.

The objectives of article II of the Draft AfCFTA Protocol on Competition Policy aim to enhance competitive processes, consumer welfare and efficiency when fully implemented. Within the COMESA competition regulatory framework, the COMESA Competition Commission enforces competition regulation among its member states, the East African Community (EAC) operates the EAC Competition Authority for its territory, and the Southern African Development Community (SADC) implements a cooperation framework for dealing with competition matters, although a fully-fledged authority to deal with anti-competitive business practices such as cartels is highly needed. Like the WTO, the Tripartite Free Trade Area (TFTA) does not operate a competition policy framework. However, its member states invoke their respective regional economic blocks to deal with cross-border competition issues such as export cartels.

Perceiving cartels as non-trade barriers that influence who trade what and by how much, most cartels are dominated by the same group of multinationals operating in different countries. Within the SADC sub-region of the COMESA region, the enforcement of anti-cartel regulations and competition policies is crucial at the national and regional levels to undermine cross-border cartels, especially among regional multi-national corporations (RMNCs), which operate throughout Southern Africa. In

other words, South African RMNCs cartels pose significant challenges for trade facilitation in the SADC region. Despite the enactment of national and regional competition laws, cross-border cartels continue to undermine Africa's trade facilitation efforts and adversely impact labour productivity, regional integration, free movement of goods in the CFTA, barriers to market entry, and gains from trade. Cartels in Malawi, South Africa and other SADC countries raised consumer prices by an estimated average of 49 per cent.

Export cartels in Southern Africa have evolved and are complex to regulate, detect and prosecute. AI agencies further exacerbate these well-known competition law enforcement issues of market conduct rules. As digital platforms and technological advancement interact more broadly, their unregulated growth should be checked with appropriate regulations on data privacy while supporting smaller competitors and checking CEOs' unnecessary ambitions. COMESA and AfCFTA competition authorities¹⁴ are undermined due to the absence of coordinated competition law frameworks, statutory exemptions regarding certain anti-competitive conduct, weak enforcement mechanisms, and government policies that encourage cartels unintentionally.¹⁵¹⁶ In view of this, the COMESA competition regulator should leverage the African Competition Forum (ACF), International Competition Network (ICH); Organisation for Economic Co-operation and Development (OECD) and UNCTAD competition enforcement experiences.

4 Economics of factor market and commodity market: Face masks and the '(un)vaxxed'

The production or use of a product can benefit or harm another group of entities.¹⁷ A typical example of a beneficial or positive externality is the Salk and Sabine polio inoculations.¹⁸ Furthermore, mass vaccination benefits both vaccinated and unvaccinated because of the implications of positive externalities. There is an indirect beneficial effect for the unvaccinated because the vaccinated will reduce the transmission of the

14 WW Nkosi & WH Boshoff 'Characteristics of prosecuted cartels and cartel enforcement in South Africa' (2022) *Review of Industrial Organisation*.

15 As above.

16 T Ndhlovu 'Regulation of export cartels in South African competition law and Southern African Development Community' dissertation, University of Pretoria, 2019.

17 M Connolly 'Public goods, externalities, and international relations' (1970) 78 *Journal of Political Economy* 279-290.

18 As above.

disease even when infected. Oligopoly, the cost of producing vaccines, and an unwillingness to share knowledge and technology for the development of vaccines may delay the provision of vaccines globally and reduce global trade because both movements across borders and production will continue to be restricted by COVID-prevention protocols. Protective trade policy should also be discouraged, such as the export ban implemented by the European Union (EU) to curtail the export of COVID-19 vaccines to certain countries.

The development of vaccines can curtail the spread of the COVID-19 pandemic and other diseases. The few players involved in this process include a Pfizer and BioNTech collaboration, an AstraZeneca and Oxford alliance, and Moderna, among others. This indicates that the market for vaccines is oligopolistic. The demand for vaccines can be explained using oligopolistic models – Stackelberg, Chamberlin, Sweezy, or Price leadership. These companies can also form a cartel concerning market sharing and production if it is desirable for their profit margin or enforced by government to positively favour the international beneficiaries who, in the case of COVID-19, cannot wait to witness the end of the pandemic that has stifled international trade.

The trade landscape has also changed due to the need to produce protective gear in massive quantities that were not required before the pandemic. A typical example is the use of face masks. Face mask guidelines and safety restrictions have increased without significant economic growth. As a result, there is an increase in the demand for complements and a decrease in the demand for substitutes. This translates to a movement of the factors of production to the production of face masks, thus affecting the distribution of the factors of production in the input or factor market.¹⁹ On the externality issue, the face mask also has a positive externality. It contributes to public health because it reduces the spread of COVID-19 and any other airborne diseases. If inoculation is well implemented and people use face masks during an epidemic or pandemic, it will protect the populace, contribute to public health, guarantee economic activity, and ensure international trade. To strengthen the positive impact of inoculation and the use of face masks, the hampered accessibility to vaccines created by TRIPS coupled with the monopoly exhibited by Big Pharma should be addressed. Otherwise, international trade may be stifled. Moreover, the littering of the environment with face masks should be discouraged by policies that create incentives for better environmental management while using the masks and related goods. In addition, as of August 2021, the global community is being confronted by

19 Adekunle (n 12).

a fourth wave of rapidly-spreading coronavirus infections, primarily due to the highly-contagious Delta variant.²⁰ In this context, understanding the relational dynamics between faith-belief system, trust, inequity, and vaccine hesitancy can enhance the effectiveness of policy making in stemming the spread of the virus and reducing socio-economic hardships and unrest being experienced in Africa's large economies, such as South Africa and Nigeria.²¹

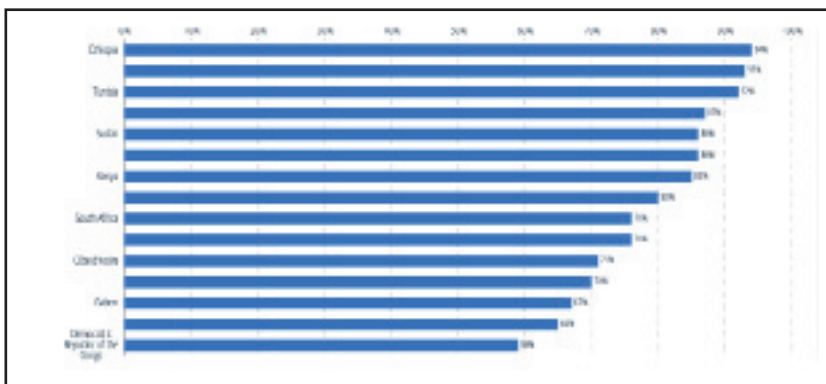
Fear and vaccine hesitancy are usually high among vulnerable communities. Despite a full-scale vaccination push as well as widespread evidence that the 'unvaxxed' make up an overwhelming majority of the hospitalised, a few outliers could exist in a COVID-19 hot spot. For instance, the Missouriian Lake of the Ozarks region is made up of hundreds of educated and mask-less people with one of the lowest vaccination rates, despite the overstretched capacity of its hospitals, as the Delta variant took hold in 2021. Despite having recorded 600 000 coronavirus-related deaths in the US in 2021, there are still cases of people not only fundamentally forgoing masks but recklessly forgoing vaccinations in the face of the deadly Delta variant.

According to the December 2020 Statista survey on the willingness of Africans to take a COVID-19 vaccine, Ethiopia ranked first in terms of the share of population – 94 per cent – willing to accept a COVID-18 vaccine, compared to the Democratic Republic of the Congo (DRC), where only 59 per cent of the population would have taken a COVID-19 vaccine (see Figure 4). By implication, most of the 'vaxxed' are very important and high-level government officials, as well as their associates and family members. In a global effort to bring cross-border travel and tourism back better, the global systems require an approach for identifying and monitoring the 'vaxxed' and 'unvaxxed' towards tourism and travel sectors' recovery. Thus, the EU deployed an electronic sanitary pass system that will enable swift verification of the vaccination status of citizens across all EU member countries, thereby enabling safe and seamless movement of people across borders. As of September 2021, lessons from the EU digital COVID certificate are being discussed to explore innovative, comprehensive, cloud web-based, decentralised, and mutually-recognisable certification systems across different countries worldwide.

20 The Delta variant spreads quicker and more efficiently than the first COVID-19 variant and can infect fully-vaccinated people although their symptoms appear milder.

21 The 31 July *Economist* special edition on coronavirus coverage discusses middle-income countries' experiences where the rich, government leaders, and well-connected receive medical treatments, and vaccinations, while the poor continue to suffer from the socio-economic challenges that smoldered long before COVID-19 arrived.

Figure 4: Share of people willing to accept a coronavirus (COVID-19) vaccine in Africa as of December 2020, by country



Source: Africa CDC

On the other hand, there is an alarmingly increasing number of ‘unvaxxed’ among Africa’s vulnerable, educated, and highly religious communities. A 2022 published *Nature* article on ‘Limited cross-variant immunity from SARS-CoV-2 Omicron without vaccination’ notes that ‘in unvaccinated people, infection with the Omicron variant of SARS-CoV-2 provides little long-term immunity against other variants’. In other words, the Omicron variant induces only a weak immune response, and this response is weak in the vaccinated individuals, but helps strengthen overall protection against a variety of COVID-19 strains. However, in those without prior vaccination, the immune response fails to confer broad, robust protection against other strains.

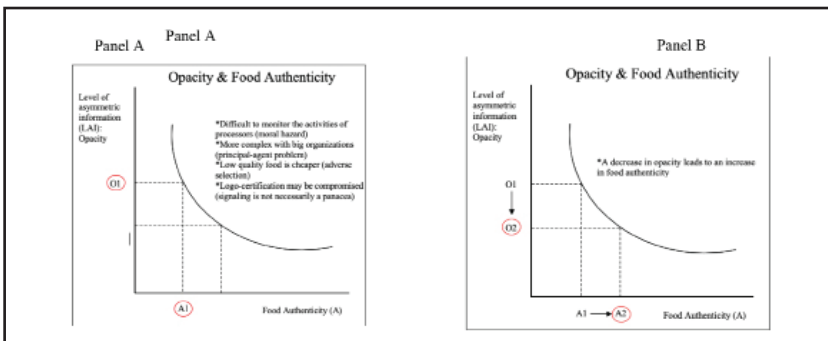
A decentralised and publicly-democratised blockchain ledger could restore and enhance trust among the ‘unvaxxed’ and, given its priceless characteristics, maintain trust in the event of professional indemnity litigation and insurance claims negotiation. Despite blockchain’s promising future to offer solutions, a few challenges remain before Africa’s industries and sectors can efficiently deploy blockchain technologies. Some of these challenges include (i) *technical challenges*: 90 per cent of blockchain-based supply chain projects will stall by 2023 due to technological concerns, poor cost efficiency, and high energy consumption; (ii) *regulatory challenges*: from a legislative standpoint, merging the current complex legal frameworks with across-the-borders rights of ownership and possession governance will pose challenges; and (iii) *building digital capacity challenges*: blockchain systems capacity building is complex, difficult to track, and costly to investigate. For instance, blockchain applications for responsible business conduct in the mineral value chains of Burkina Faso, the Republic of the

Congo, Mali, and Niger suggest that blockchain technologies can only complement and not substitute for an in-person verification.

5 Fragility and food authenticity

On the one hand, global food market fraud is expected to represent approximately \$30 to \$40 billion in 2021.²² On the other hand, globalised trade is characterised by uncertainties, randomness, volatility, and risk because of continuous change and its ability to create disturbances that ensure that the market is always in a state of equilibrating tendencies but not in a state of equilibrium.²³ Based on this premise, trade is always fragile, and a typical example of this is manifested in the disruption created since 2020 by the COVID-19 pandemic. Taleb and Douady²⁴ state that ‘*fragility* is related to how a system *suffers* from the variability of its environment beyond a certain preset threshold (when the threshold is *K*, it is called *K-fragility*), while *antifragility* refers to when it *benefits* from this variability’. To be antifragile is to be more than resilient and to thrive under challenges. This is possible when redundancy, with its optionality attribute, is emphasised instead of efficiency. One of the ways to make trade antifragile is the creation of symmetry in trade by reducing opacity. See Figure 5 for further explanation.

Figure 5: The relationship between opacity and food authenticity



Source: Adekunle and Filson (2019)

22 ‘The real costs of food fraud’ – The Real Cost of Food Fraud (tracegains.com), 2021.
 23 I Kirzner ‘Entrepreneurial discovery and the competitive market process: An Austrian approach’ (1997) 35 *Journal of Economic Literature* 60-85.
 24 Taleb & Douady (n 2).

As presented in the figure above,²⁵ opacity and food authenticity are inversely related. The higher the level of asymmetric information in the market, the opaquer the products in the market are and the less authentic they are. This relationship implies a need to ensure information symmetry in the production of goods and their movement across borders. Otherwise, it will lead to adverse selection, moral hazard, principal-agent problems, and a compromised labelling system that translates to a situation where signaling is not necessarily a panacea. Some of these challenges can be resolved by technologically backed traceability and crypto labelling. Furthermore, major food players may be forced to adopt blockchain technology to meet consumers' traceability and accountability needs and reduce the increasingly alarming cases of food-related illnesses and allergic reactions.

6 Bleeding trade, AfCFTA, and implications for micro, small and medium enterprises

Bleeding²⁶ is generated by non-linear amplification of random socio-economic activities such that its outcomes depend on the derivative, where the relationship between the variables is convex rather than linear. This convexity is the primary mechanism that generates either negative or positive bleeding across diverse spheres. Furthermore, convexities result in fundamental socio-economic fragilities, which justify the need to understand bleeding within the 'epistemic' context of leveraging it to predict selected variables and human behaviour based on the four forecasting quadrants posited by Taleb.^{27,28,29}

The pertinent question at this juncture is: How could the current state policies and AfCFTA be made less bleeding by building effective trade institutions and making trade expenditure more impactful? As many African businesses, especially MSMEs, struggle to navigate the increasing complexities of the international trade landscape, bleeding trade undermines sustainable development trajectories.³⁰ Africa could overcome its trade bleedingness by strengthening its trade-related institutions and

25 Adekunle & Filson (n 9).

26 See ch 5 for a detailed discussion on 'bleeding'.

27 NN Taleb 'Bleed or blowup? Why do we prefer asymmetric payoffs?' (2004) 5 *Journal of Behavioural Finance* 2-7.

28 NN Taleb *Black swan: The impact of the highly improbable* (2007).

29 NN Taleb 'The fourth quadrant: A map of the limits of statistics' unpublished manuscript (2008), http://www.edge.org/3rd_culture/taleb08/taleb08_index.html (accessed 28 July 2022).

30 Taleb (n 27).

making them more inclusive, thereby innovatively implementing a set of trade policies that foster the welfare of its citizens. In other words, bleeding trade is an endemic trap that is difficult to escape, especially in a post pandemic era, where the International Monetary Fund (IMF) predicted that Africa would be unable to catch up with its pre-pandemic growth rates. Escaping extreme trade bleedingness requires inclusive trade institutions, political will, and preparation for the new challenges of bleeding trade.

Inclusive trade, digital trade and market access policies are effective ‘anti-bleeding interventions that AfCFTA needs to implement. Strong trade institutions reduce socio-economic and political uncertainties and bleedingness that engenders optimal allocation of innovations, thereby fostering economic cooperation, growth, and trade expansion.^{31,32} In the absence of a ‘bleeding trade’ perspective on the role of African governments to leverage AfCFTA for realising sustainable development in Africa, for instance, a wide range of currently-implemented policies result in market failures or positive bleeding that need to be encouraged. However, leakages in positive bleeding are prevalent, and more innovative research efforts are required to articulate appropriate anti-bleeding policy tools to effectively enhance trade facilitation institutions and foster trade efficiencies.

As an author who is interested in enhancing Africa’s preparedness for AfCFTA’s post-pandemic future, proposing positive bleeding trade strategies is one strategic pathway forward. Thus, there is an increasing need to support clients in responding to strategic challenges and opportunities around the rapidly unpredictable global trade policy arena. According to EY, trade strategy helps clients – corporate organisations, investors, governments – identify and mitigate disruption to international trade, whether arising from Brexit, the US-China trade wars, emerging trade tech issues such as data management, privacy, and sustainability. Markey-Towler develops the idea of antifragile knowledge and the psychological attributes necessary to benefit from radical uncertainty.³³

31 D Acemoglu, S Johnson & JA Robinson ‘The colonial origins of comparative development: An empirical investigation’ (2001) 91 *American Economic Review* 1369-1401.

32 D Acemoglu, S Johnson & JA Robinson ‘Institutions as a fundamental cause of long-run growth’ in P Aghion & S Durlauf (eds) *Handbook of economic growth* (2005) 385-472.

33 B Markey-Towler ‘Antifragility, the black swan and psychology: A psychological theory of adaptability in evolutionary socio-economic systems’ (2018), <https://ssrn.com/abstract=3130038> or <http://dx.doi.org/10.2139/ssrn.3130038> (accessed 28 July 2022).

For instance, over the last ten decades,³⁴ major national and regional economic, trade, and market access programs have transformed into regional integration blocs in Africa. Although there are still free trade agreements (FTAs) silos and huge gaps between major trade and market systems across African national borders, low-resourced countries look to establish regional trade programmes for resources, assistance, education, support, and cap-and-trade replacement. Trade-related, historical data may serve as a poor guide to the future magnitude of AfCFTA-related risks.³⁵ However, quickly deploying continental free trade agreements (CFTAs) as a socio-economic recovery instrument comes with a plethora of ubiquitous risks. That said, rethinking the AfCFTA's vision, mission, programmes, and assumptions is crucial within the concept of a 'bleeding trade'. By implication, African trade policy stakeholders often struggle with the randomness of the practice and workability of free trade agreements and policies, ignoring what would have happened had those free trade agreements not been made. First, AfCFTA in the public interest should emerge from a broad range of community and stakeholder groups. In other words, it should be easily understandable to every African in the supply chain and in the remotest community. Otherwise, the implementation of AfCFTA might appear superficially beneficial to all. More importantly, AfCFTA and its legal parameters should cast a wider net to overcome challenges via community development interventions, organisational structures, and technological innovations. Could CFTA be the solution to reducing poverty, accelerating post-COVID-19 socio-economic transformation, and facilitating cross-border paperless trade? There seem to be multiple layers of uncertainty and a significant 'bleeding trade' phenomenon in Africa's post pandemic socio-economic trajectory!

7 Digital technology, entrepreneurship and small businesses

The use of technology has transformed our day-to-day activities, and the future belongs to the people who can explore new frontiers enabled through advances in digital technology. To remain relevant in the global trade landscape, there is a need for proactive behaviour where a technology that is new today may become old tomorrow, where a digital health model can

34 The Southern African Customs Union (SACU), an African regional economic organisation, is the world's oldest customs union, founded in 1910, and comprises Botswana, Eswatini, Lesotho, Namibia and South Africa.

35 The AfCFTA Secretariat Chief of Staff, Silver Ojakol, noted that economic integration is not an event but a process being established as the world's largest free trade area since the World Trade Organisation (WTO)'s launch. In view of this, AfCFTA will not happen overnight, because most of its success depends on what is implemented next, and where efforts should be focused.

show that an unpreventable virus today can become preventable tomorrow, or where ‘unvaxxed’ today transitions to become ‘vaxxed’ tomorrow.³⁶ Furthermore, it is crucial to understand the role of social media in digital entrepreneurship because the global economy is now knowledge-based. To explain the role of social media in economic development, scholars³⁷ proposed that collaboration through shared ideas with Instagram users is positively related to the successful initiation of digital entrepreneurship, that market analysis through the use of Instagram’s unique followers is positively related to the successful pursuit of digital entrepreneurship, and that advertisement, promotion, and marketing using Instagram is positively associated with the successful pursuit of digital entrepreneurship. Business implementation through Instagram’s loyal customers and influencers is positively related to a successful pursuit of digital entrepreneurship. Since social media such as Instagram enhances entrepreneurship, it is essential to strengthen this structure because entrepreneurship is about the discovery of new opportunities,³⁸ about creation and destruction,³⁹ about a function of personal characteristics such as perceived self-efficacy, locus of control and personal agency beliefs⁴⁰ and about other strategic, innovative tendencies. If the nexus between digitalisation and entrepreneurship is well established, inclusive socio-political participation, regional integration, and economic development visions are promoted.⁴¹ Entrepreneurs can produce efficiently, provide access to digital markets, and avoid weak transportation and logistics infrastructure with appropriate digital tools, social media platforms, and skill sets. In addition, entrepreneurial and digitally savvy Africans are deploying digital technologies and fast-growing business models to establish digitally innovative solutions to meet the booming consumer demand.^{42 43 44} For some examples, Kenya’s Lori

36 GOA Odularu & B Adekunle ‘Digitalisation in the African context’ (2020) 21 *Journal of African Development*, <https://scholarlypublishingcollective.org/psup/african-development/article-abstract/21/1/1/262414/Understanding-Digitalization-in-the-African?redirectedFrom=fulltext> (accessed 28 July 2022).

37 B Adekunle & C Kajumba ‘The nexus between Instagram and digital entrepreneurship’ (2020) 21 *Journal of African Development*.

38 Kirzner (n 23).

39 J Schumpeter *The theory of economic development* (1934).

40 DA Harper *Foundations of entrepreneurship and economic development* (2003).

41 Adekunle & Kajumba (n 37).

42 AUC/OECD ‘Africa’s development dynamics digital transformation for quality jobs’ (2021) AUC, Addis Ababa/OECD Publishing, Paris, <https://doi.org/10.1787/0a5c9314-en>. (accessed 28 July 2022).

43 International Trade Centre (ITC) ‘COVID-19: The great lockdown and its impact on small businesses’ (2020) SME Competitiveness Outlook Report, 2020, <https://www.intracen.org/SMEOutlook/> (accessed 28 July 2022).

44 McKinsey & Company ‘How the COVID-19 crisis may affect electronic payments

Systems, an all-in-all logistics platform; Ghana's AgroCenta, a supply chain and financial inclusion platform; Nigeria's OPay,⁴⁵ an agent banking that provides individuals with a point-of-sale machine and underlying software, so they act as banks and ATMs, is the fastest African start-up to cross \$1 billion in value; and Nigeria's Kobo360, a start-up founded in 2017 that raised US \$30 million to link Nigerian farmers to the global market, as well as to transform the domestic transport and logistics sector.

The COVID-19 crisis considerably crippled cross-border trade, with wide-ranging and long-lasting effects on all WTO member states. In addition to the obstacles that a global pandemic creates, markets were also confronted by the volatile geopolitical environment of Brexit and the 2016-2020 US President Trump administration. However, the pandemic has underscored the increasing need for trade technology and trade finance system interoperability, which facilitate the exchange of commodities electronically, a reduction in physical contact, and digital trade across all sectors, as well as more critically, across all supply chains of essential commodities, such as food, medicine, and vaccines, in Africa and the entire world. Digitalisation of trade across borders will enhance the development of a single window, a one-stop border, automation, and publication and harmonisation of processes and procedures, thereby ushering in a new era of efficiency and sustainability in the comprehensiveness and depth of innovations in African trade facilitation. It is pertinent for Africa to leverage China's Belt and Road Initiatives as one of the effective pathways for improving internal trade infrastructure in several African countries.

In this increasingly digital-enabled trade environment, the government should provide effective legislation support to entrepreneurs (especially youth, women and the vulnerable) to register, defend and protect their copyrights, brands, patents, industrial designs, trade secrets, and trademarks (see chapter 7 on women's digital entrepreneurship). Evidence-based regulatory interventions will make it easier for start-ups and firms to obtain financing, drive job growth, spur innovation, and accelerate sustainable development.⁴⁶

in Africa' (2020), https://www.mckinsey.com/~/_media/McKinsey/Industries/Financial%20Services/Our%20Insights/How%20the%20COVID%2019%20crisis%20may%20affect%20electronic%20payments%20in%20Africa/How-the-COVID-19-crisis-may-affect-electronic%20payments-in-Africa.pdf (accessed 28 July 2022).

45 OPay aims to dominate African fintech by providing a super app for peer-to-peer payments, transportation, food, asset management, and even instant messaging.

46 G Odularu & P Alege 'Trade facilitation capacity needs' (2019), Palgrave Pivot, Cham. <https://link.springer.com/book/10.1007/978-3-030-05946-0> (accessed 28 July 2022).

8 Ethically anti-fragile competition laws for shaping trade facilitation innovation: Futurity, desirability and workability

Regulatory struggle to manage the increasing role of digital platforms for trade facilitation is a phenomenon that has always been present in the African economy. In other words, as technology innovations increase at geometric progression, competition regulatory reforms and lawmakers' capabilities to safely regulate digitally disruptive platforms become crucial.

While the pandemic has considerably disrupted governments and businesses in the face of data consumption trends and endemic digital divides, it is also an opportunity to successfully transform enterprises in the new normal. This requires intelligent and agile automation and digitalisation that empowers a remote workforce and other virtual frontiers both productively and securely. Cybersecurity capacity for intellectual property protection is critical to realise both an AfCFTA vision and a future of innovation in African trade facilitation and bio-economy. Artificial intelligence (AI) is a crucial part of modern trade facilitation given its trade and diplomacy, game-changing capacity for handling large volumes of trade data and for making collaborative, complex decisions that support continental-wide, regulated, and regionally transformative trade systems. There is a need for a simulation-based framework for identifying, assessing, and mitigating systemic cyber insecurity. Furthermore, there is a need for a center for cybersecurity education and research focused on securing trade facilitation systems that will serve as a holistic framework that utilises multimodal sensor data to detect and mitigate trade systems failures using deep learning technologies and emerging wireless communication techniques. In addition to driving a quantum shift in digitalisation and cybersecurity, COVID-19 reflects the fundamental relationship between education, health, and other assets, such as skills acquisition, because all are amenable to market failures, such as moral hazard or imperfect and asymmetric information. The rolling out of online learning from primary to tertiary levels has become the new normal, especially with increasing demand for micro-credential courses and online learning mixed with traditional face-to-face teaching.

As more sectors of the African economy need to digitally facilitate trade, artificial intelligence remains a game changer for delivering several efficiency gains in an unprecedentedly risky landscape.

Sustainable competitive advantage by African countries can be achieved only when trade is facilitated in an organised business environment with

legal instruments that are ethically developed. Despite the complexity of its realisation, which requires political decisions, practical actions, science, and implementation capacities, the pursuit of a sustainable AfCFTA is of great interest to Africans and their region-wide nations. However, most of its ongoing trade strategies are seemingly unsustainable, intrinsically fragile, environmentally unsound, economically inadequate, socially incorrect, and ethically unacceptable, thereby assuming a bleeding characteristic. By implication, future research should focus on deploying ethically developed legal instruments and trade facilitation innovations to enhance Africa's future preparedness. Such a research proposal requires one to systemically measure and understand the amount of 'bleeding' in its national and regional trade, as well as its socio-economic programmes. This research will address the FTA-related challenges confronting Africa by (i) leveraging more nimble adaptation of existing data to build evidence on what works; (ii) promoting a culture of open data and reproducible analytics for designing and implementing better and faster analytics; and (iii) focusing on data for goals and on systematic country diagnostics with good analytical work based on excellent judgment and statistical advisory capacities. This will contribute to supporting the African global vision to build up its digital economy for every African while contending with the scourges of cross-border landlockedness, fragility, and conflict.^{47 48 49 50 51} Moreover, the government should provide ethically antifragile competition policies and legislative tools that are appropriately responsible for 'data' market regulations. In this regard, selected African national and continental organisations could deploy the OECD Competition Assessment Toolkit to eliminate anti-competitive barriers in a digitally dynamic ecosystem.

- 47 G Odularu, B Adetunji & A Odularu 'Conclusion and policy recommendations: Creating an enabling business ecosystem for fostering trade opportunities in the digital age' in G Odularu, M Hassan & M Babatunde (eds) *Fostering trade in Africa. Advances in African economic, social and political development* (2020) https://doi-org-443.webvpn.jnu.edu.cn/10.1007/978-3-030-36632-2_10 (accessed 28 July 2022).
- 48 G Odularu 'The primer: Bracing Nigerian trading ecosystem for the future' in G Odularu (ed) *Strategic policy options for bracing Nigeria for the future of trade* (2020) https://doi.org/10.1007/978-3-030-34552-5_1 (accessed 28 July 2022).
- 49 G Odularu 'Conclusion and policy recommendations' in Odularu (n 28).
- 50 G Odularu 'Digital pathways for fostering post-COVID-19' (2020), <https://www.afronomicslaw.org/2020/07/18/digital-pathways-for-fostering-post-covid-19-trade-outcomes/?fbclid=IwAR2FOS9d9U6epp8ItvrqhRIJkfmvHPbITuPmdaXRqt0ed9X120YEH6U5Fk> (accessed 28 July 2022).
- 51 G Odularu 'Building businesses back better amid COVID-19 pandemic in Africa' in 'Crisis and fragility: Economic impact of COVID-19 and policy responses' KIEP Visiting Scholars' Opinion Paper (2020) | Visiting Scholars' Research Activities | KIEP Visiting Scholars (accessed 28 July 2022).

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