Investigating Alternative Poultry Trade Policies in the Context of African Countries: Evidence from Ghana

by Omid Zamani, Craig Chibanda, and Janine Pelikan

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Abstract__

This paper analyses the potential effects of alternative trade policies and the 2020 partial ban on Ghanaian poultry trade and production. Due to the growing support for a total ban on poultry imports by various value chain actors, the paper also investigates the impact of a complete ban on Ghana's poultry imports. To account for the spillover effects, we apply a novel integrated method covering a modified General Equilibrium model and typical farm analysis and create a baseline according to the latest versions of the EU-Ghana Economic Partnership Agreement adopted in December 2020. Our findings show that the partial ban has a lower effect on trade, while it has larger negative effects on the whole economy compared with the total ban. The effect of expanding tariff escalation either through changing the tariff rates of the final product or abolishing the tariffs on feed products is small in our case. However, increasing the tariff rate of the final product to the maximum level of bound tariff, i.e. 99%, has a higher effect on the value chain compared with abolishing the tariff rate of feed products. The farm-level analysis reveals that mainly large-scale integrated farms in Ghana benefit from increases in domestic production due to tariff increases or a total ban.

Keywords: Import ban, tariff escalation, protection policies, poultry, Ghana.
JEL code: F14, Q18.

1 Introduction

Poultry meat is an important source of animal protein in Sub-Saharan Africa (SSA). Increasing urbanization and income combined with rapid population growth has led to a growing demand for animal products, including poultry meat in many African countries (Mottet and Tempio, 2017). Per capita consumption of poultry meat in SSA has substantially increased from 1.5 to 2.1 kg annually (equivalent to an increase of 40% of per capita consumption) between 2000 and 2017 (Asante-Addo and Weible, 2019). To meet growing demand, poultry imports by many African countries are rapidly increasing, and are much higher than the local production (FAOSTAT, 2020). Consequently, the self-sufficiency rates for many African states have been sharply dropping during the last decades. In response, several initiatives have been proposed to protect African agricultural producers characterized by low productivity (Benin 2016). Although the proposed protection policies may improve domestic production conditions, they can act as a double-edged sword that comes with adverse effects (Pretty et al., 2001; Chang, 2009; Anderson and Valenzuela, 2020). For instance, from a value chain perspective, not only the applied tariff of a specific product but also the tariff wedge between the output and input commodities, i.e. tariff escalation, is important in determining the final effects of tariff policy (Hwang et al., 2017). While increasing import tariff rates of final products may increase the domestic price, reduction in tariff rates of intermediate products allows producers to lessen production costs along the processing chains (Boysen et al., 2019).

The imposition of import bans on poultry products has become a famous policy instrument among African policymakers as they aim to protect domestic production and increase self-sufficiency in the long term (Akunzule et al., 2009; Johnson, 2011; Naggujja et al., 2020). For instance, in the last two decades, Cameroon, Nigeria, and Senegal have experienced partial or total bans on importing poultry products. Faced with the elevated international competition, in 2002, Nigeria was one of the first countries in West Africa to enact a ban on poultry imports to safeguard local products (Andam et al., 2017). Following a succession protectionist trade policy

beginning in the 90s, Cameroon restricted poultry imports in 2005, mainly due to producers' concerted lobbying (Johnson, 2011). In the same year, the Senegalese government implemented a ban on importing poultry products to prevent the Highly Pathogenic Avian Influenza (HPAI) from entering the country (Hollinger and Staatz, 2015). Although the Senegalese government initially imposed the ban as an official attempt to prevent an Avian Influenza outbreak, it continues to exist until today.

Ghana has been dependent on poultry imports for more than a decade (Asante-Addo and Weible, 2019). The European Union (EU) is the major supplier of poultry meat to Ghana, just ahead of the United States of America (USA) and Brazil (Zamani et al., 2021). However, the dominance of EU imports will most likely change as Ghana recently imposed an import ban on poultry product imports from the Netherlands, Germany, Russia, Denmark, and the United Kingdom from November 2020. According to an official letter written by the Ghanaian Ministry of Food and Agriculture on 10 November 2020, the ban was prompted by the recent outbreak of Avian Influenza subtype H5N8 in Europe. This is not the first time that Ghana has imposed a partial ban. During the 2006-2007 Avian Influenza outbreak, Ghana applied a partial ban on imports from less important trading partners (Akunzule et al., 2009; Johnson, 2011). Thus, the ban policy was not so prohibitive as poultry imports continued to increase. However, the recent imposition of a ban on one of the most important trade flows between Ghana and the EU combined with the implementation of the EPA (Economic Partnership Agreement) tariff reductions might affect relative prices of food in Ghana and thus may influence production patterns (Latka et al., 2021).

Trade is an essential component of the Ghanaian economic plans and policies. The guidelines for implementing Ghana’s trade agenda are aligned with ECOWAS regulation, its regional partnership agreement with the EU, and the long-term vision of Ghana (FAO, 2015). Within the context of ECOWAS protocols, the trade of Ghana with non-ECOWAS members is subject to the ECOWAS Common External Tariff (CET) adopted in 2015 (WTO, 2017). Moreover,

Ghana was the second country after Ivory Coast to sign a bilateral interim Economic Partnership Agreement (iEPA)[1] with the EU in 2016. According to the interim EPA, Ghana started to liberalize its market in 2020 and it will fully remove its import duties for 78% of EU exports by 2029[2]. In accordance with the content of Ghana's EPA, poultry meat and feed (i.e. maize) are excluded from liberalization and it is only subject to the 35% (poultry meat) and 5% (feed including maize) of ECOWAS CET. An important goal for the African policymakers is to simultaneously improve the productivity of local producers and shield them against cheap imported products. Agri-food processing chain often requires the incorporation of different imported or domestically produced inputs. Thus, changes in the import tax of intermediate inputs may be passed through to the price of final products and it should be considered in analyzing the tariff structure (Nassar et al., 2007; McCorriston and Sheldon, 2011). We assess this policy option in the context of tariff escalation. Tariff escalation occurs when an importing country protects its processing chain by applying a lower tariff rate on imports of intermediate products, and a higher rate on final products (Hwang et al., 2017). Under Doha's negotiation on agricultural trade policies, tariff escalation is identified as a form of protection which its true effect on the growth of developing countries is not still clear (Antimiano et al., 2011).

With this study, we contribute to the existing literature on agri-food trade policies in several ways. This analysis primarily aims to elaborate on the effects of possible protection policies on the poultry sector and the whole economy of Ghana and its major trading partners. In this line, we assess the potential impacts of tariff escalation and the recent partial ban. To our knowledge, this is the first empirical study investigating the potential implications of the recent partial import ban implemented in November 2020. The study further analyses the potential impact of a total ban as an alternative policy option. The first scenario is a 'partial ban' scenario that is based on the decision by Ghanaian policymakers while the second scenario is a 'total ban'

[1] To see different between Interim and full EPA please see Bartels (2009).
[2] For more detail please see: https://trade.ec.europa.eu/doclib/docs/2020/january/tradoc_158599.pdf

scenario that builds on qualitative research results (semi-structured interviews, focus groups, and Delphi study). Of which, the qualitative research was conducted in order to gather insights on the perceptions of poultry value chain actors regarding the option of banning poultry meat imports. Although the partial ban is implemented in response to the Avian Flu outbreak, the total ban policy majorly protects domestic producers against increasing imports of poultry meat. Moreover, the present paper is the first analysis using the latest version of the EU-Ghana EPA adopted in December 2020. So far, there have been several studies in the agricultural economics literature using Computable General Equilibrium (CGE) models to analyze tariff policies (e.g. Lee et al., 2014; Narayanan and Khorana, 2014; Freund et al., 2018) and import bans in different agri-food markets (e.g., McDonald and Roberts, 1998; Philippidis and Hubbard, 2001; Rodriguez et al., 2007; Chatterjee et al., 2016; Boulanger et al., 2016; Banse et al., 2019). We also use a CGE to analyze trade flows but combine this method with the results of semi-structured interviews, a Delphi study, focus groups, and farm-level analysis. This hybrid framework allows us to incorporate stakeholders' views regarding the policy and to have a comprehensive representation regarding the spillover effects of the protection policies on macroeconomics and farm-level variables simultaneously.

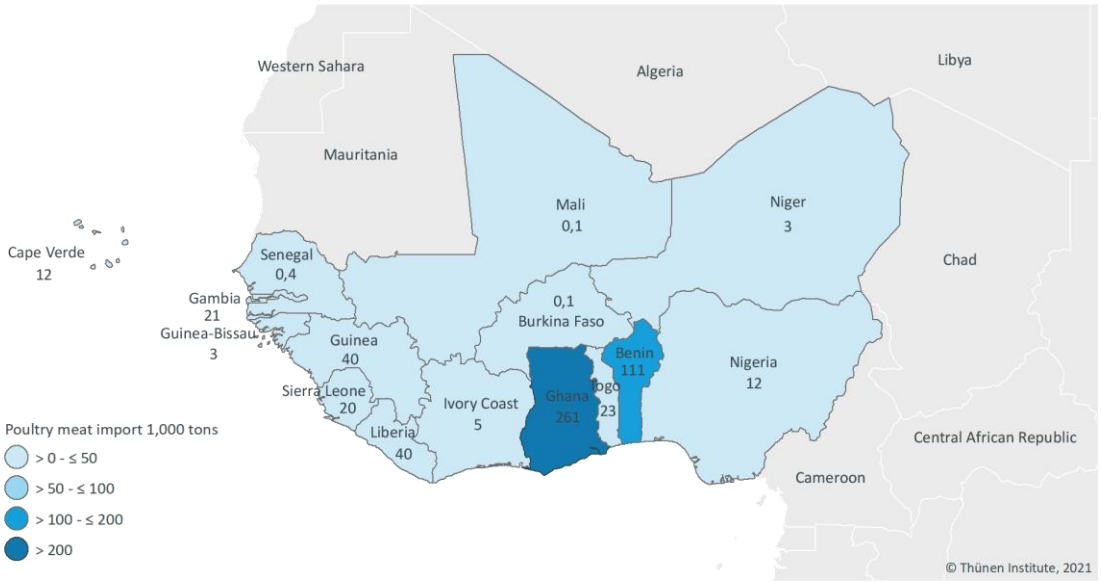
The rest of the paper is structured as follows: In Section 2, we review the existing literature on ban policies in the agri-food sector. In Section 3, the method framework of our analysis is presented. Finally, in Section 4, we summarize our results and drive the possible policy implications.

2 An overview of the Ghanaian poultry market and policy

With a significant difference, Ghana is the major importer of poultry meat in West Africa (Figure 1). As shown, Ghana imported 261 million tons of poultry meat in 2019. Additionally, it was the leading importer of poultry meat in terms of the quantity of poultry meat imports from the EU in 2019, by importing 185.5 thousand metric tons (UN Comtrade, 2019). Figure 2

highlights that over 70% of Ghana's poultry imports originate from the EU-28. According to the United Nations trade statistics (2019), the Netherlands (60%), and Belgium (18%) make up over half of all EU poultry exports to Ghana. As shown, although the EU, Brazil, and the US are the main exporters, Brazil and the US have decreased their poultry exports to Ghana since 2011 and 2013, respectively. Further, since 2014, the resulting gap has been compensated by the growing poultry exports from the EU. The decline in US poultry exports may be explained by the perceived quality of products from other exporters, existing non-tariff barriers, and the bureaucratic procedure of obtaining permits for poultry exports (Ashitey, 2017; Asante-Addo and Weible, 2019). Nevertheless, US poultry has continued to enjoy a price advantage over products from Brazil and the EU[3].

Figure 1: Main Importers of Poultry in West Africa (in 1000 tons)



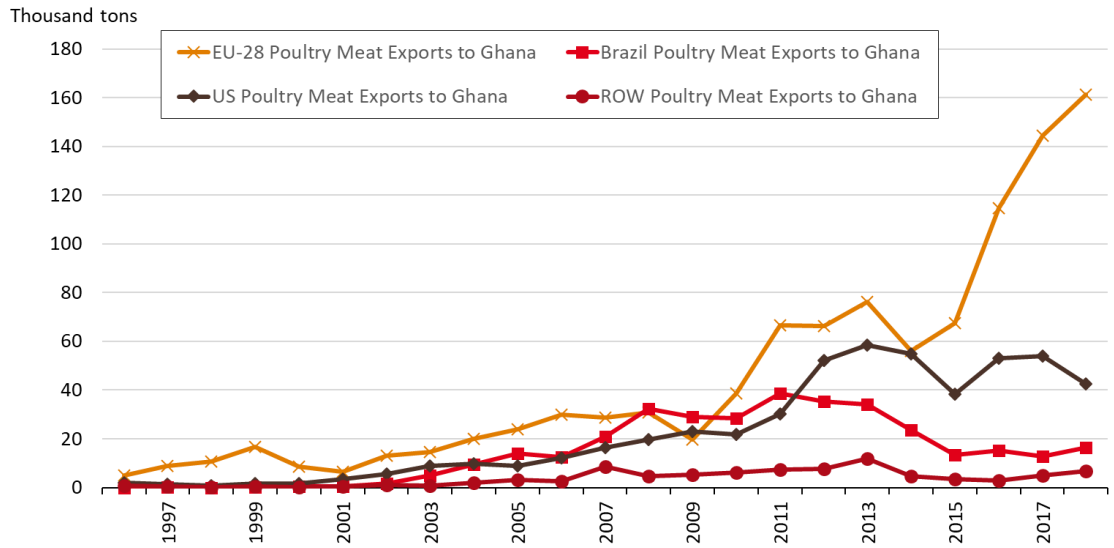
Source: UN Comtrade (2019). HS code: 0207. Maps, esri 2020.

Due to the tremendous contributions of the poultry sector in job creation and food security, the Ghanaian government has placed several policy interventions in this market (Sumberg et al., 2017). However, this sector does not still feature significantly in the Ghanaian agricultural

[3] The price of poultry meat per 10 kg box for Brazilian, EU and the US types are $34, $32 and $22 respectively in 2013 (Ashitey, 2013).

policies compared to cocoa, maize, or rice (Acheampong et al., 2018). Aligned with the liberalization scheme of Structural Adjustment Program (SAP) reform, the government withdrew support and reduced import tariffs in the poultry market from 1980 to 1990. Ghana's parliament again raised the poultry tariff due to the growing level of imports in the 1990s (Hailu, 2011). Import tariffs on poultry meat were initially implemented at a rate of 20% in 1999 with the proposal that "all veterinary drugs and ingredients for the manufacture of poultry feed be exempt from import duty" (Ministry of Finance, 2000; Aning, 2006). In 2003, the poultry tariff was elevated from 20 to 40 percent. However, the tariff change was not approved by International Monetary Fund (Hailu, 2011). Tariff policy was lifted temporally in 2002 prior to adopting 35% ECOWAS CET in 2015. The government funds a program in 2003 to support the poultry industry that facilitates the capitalization and marketing of broiler birds (Aning, 2006). The Ghana Broiler Revitalization Project (GHABROP) was launched in 2014 to regulate imports of meat products aimed at protecting domestic broiler production in a ten-year period (FAO, 2015). Under this program, the Ministry of Food and Agriculture is supposed to produce 20 million day-old chicks in a five-year collaboration with the Ghana National Association of Poultry Farmers (Acheampong, 2019).

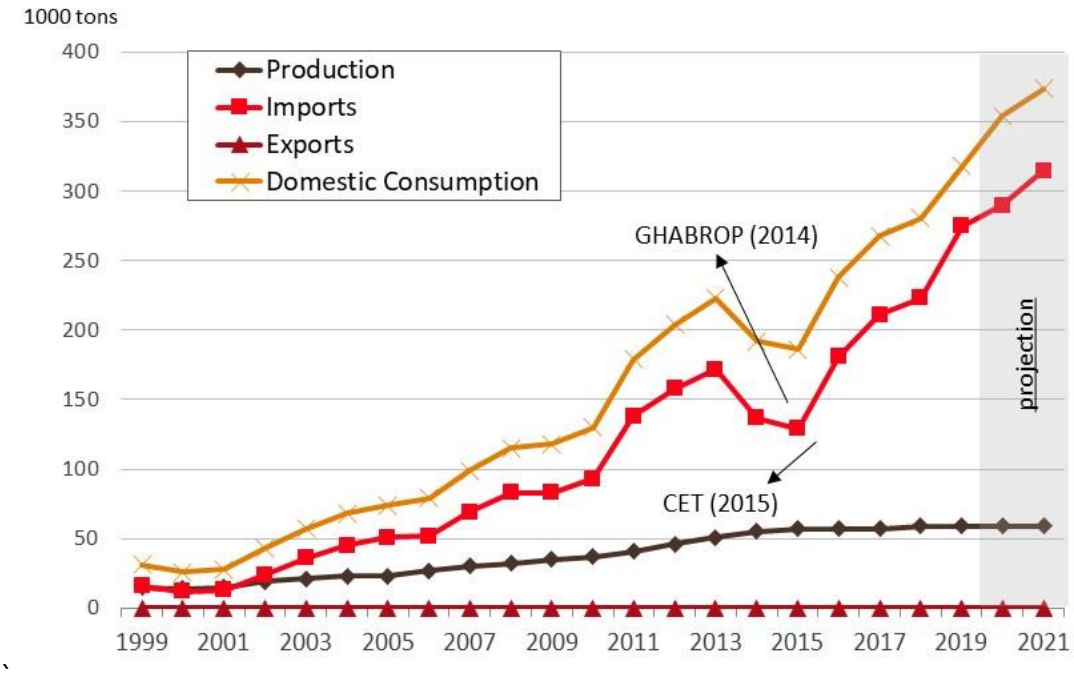
Figure 2: Main Exporters of Poultry Meat to Ghana from 1996 to 2019 (in 1000 tons)



Source: UN Comtrade (2019). HS code: 0207. ROW stands for “rest of the world”.

Figure 3 presents the development of total supply (domestic production and imports) and total demand (domestic consumption and export) of poultry meat in Ghana. As shown, the estimated per capita consumption has significantly increased from 1.6 kg in 1999 to 9.6 kg in 2018. The sharp increase in poultry meat demand has led to rising Ghanaian poultry imports (Figure 3). As shown, the share of imports in domestic consumption of poultry meat in Ghana has increased enormously during the last decades, whereas domestic production shows only a slight increase. The deficiency in domestic production is basically due to the high production costs (including energy price, feed, vaccines), inefficient production technologies, lack of processing facilities, and limited knowledge of modern poultry management (Ashitey, 2013). In this way, the self-sufficiency rate has fallen from 54% in 2000 to 23% in 2011. However, the public sector has continued to support domestic production by reducing customs duties on production inputs and facilitating access to veterinary services (Ashitey, 2013). After 2010, the self-sufficiency rate remained relatively stable. In 2018, it was still at 21%.

Figure 3: Development of the Poultry Meat Sector in Ghana from 1999 to 2021 (in 1000 metric tons)



Source: Dataset and projection based on USDA (2021).

2 Literature review: Tariff escalation and agri-food trade bans

Agricultural protection and market access strategies remain controversial topics in international trade negotiations and agreements. Using empirical literature, this section attempts to elaborate on the potential effects of two protection policies namely tariff policies in the value chain and trade bans on the agri-food sector. As laid out above, increasing applied tariff with the stage of processing is known as tariff escalation in the policy literature (Hwang et al., 2017). Since the agricultural value chains encompass products with different levels of processing, many empirical studies have focused on the potential effects of tariff escalation in this sector (see e.g. Rae and Josling, 2003; Bouët et al., 2014; Narayanan and Khorana, 2014; Boysen et al., 2019). For example, in Corden's (1966) discussion of effective protection, it is indeed true that reducing tariffs at the upstream stage will increase effective protection.

As Corden (1966), decreasing import tax at the upstream stage of the processing chain, i.e. tariff escalation, can improve effective protection. This policy setting has been systematically practiced in the agri-food value chains of both developed and developing countries (Regmi et

al. 2005; Boysen et al. 2019). For instance, the EU applies a 21.6% import duty for milled rice (HS code 100630), which is higher than the tariff rate of paddy rice (HS code 100610) i.e. 7.70% (International Trade Center, 2020). There is a similar pattern in the tariff wedge between maize (the main ingredient of livestock feed) and frozen chicken meat in the EU. Tariff escalation practiced by large exporting countries may depress world prices for the processed commodities and impede the developing counties from processing intermediate inputs and creating value-added along the value chain (Aksoy and Beghin, 2004). Using the ad-valorem equivalent of applied and bound specific tariff, Aziz et al. (2017) estimate effective protection in the form of tariff escalation in the major importing countries of the Ghanaian cocoa. This analysis shows that the relationship between implementing tariff escalation by importing countries and the exports of Ghanaian cocoa is inconclusive generally.

Assuming cost pass-through, tariff differential over products of the value chain may promote producers to import unprocessed (primary or intermediate) products and thus, reduces the production cost of the final commodity (McCorriston and Sheldon, 2011). Boysen et al. (2019) report that an increase in the tariff wedge between processed and less processed foods may affect dietary-related problems through changing the retail price of highly processed, energy-dense foods in Sub-Saharan Africa. However, the final effect on consumers varies over genders and income groups. Using the tariff escalation framework, Antimiani et al. (2011) compare the trading partners of nine African countries in terms of their preferential trade agreements. This analysis identifies the EU as the most liberal partner while China applies the highest tariff escalation in the bilateral trade with the selected African countries. Additionally, Narayanan & Khorana (2011) focus on tariff escalation effects on the export share of developing countries in the coffee and cotton value chains. The findings do not show a strong effect of tariff escalation on the export shares of developing countries; however, the elimination of tariff wedge can improve export shares globally.

According to the World Trade Organization (WTO), an import ban is prohibited for member countries. Exceptions are considered under defined conditions such as safeguarding mechanisms, developing countries exemption, human, livestock, and plant health-related issues (see GATT 1994 article XI). Several papers in the literature discuss the potential consequences of trade bans in various contexts. For instance, the effects of an import ban on Genetically Modified Organism (GMOs) products (e.g., Anderson et al., 2005; Philippidis, 2010; Henseler et al., 2013), a ban to prevent livestock disease outbreaks (e.g., McDonald and Roberts, 1998; Philippidis and Hubbard, 2001; Rodriguez et al., 2007; Chatterjee et al., 2016; Kutlina-Dimitrova, 2017), and the political-induced import bans, like the Russian import ban on EU products (e.g., Boulanger et al., 2016; Banse et al., 2019) are analyzed. Although the existing literature on import bans varies in terms of case studies and potential consequences, mainly CGE-based models are applied.

Chatterjee et al. (2016) report the economy-wide evidence on the EU's import ban on several GM foods produced by India using a modified GTAP (Global Trade Analysis Project) model. Following the EU's ban, the simulation shows that the domestic supply of GM food in India rises, which changes the trade balance. Due to reductions in the domestic price, the extra GM product supplies are majorly absorbed by domestic consumers. In another work by Henseler et al. (2013), the potential impact of a trade ban on soybean exports from Argentina, Brazil, and the USA to the EU are simulated. Using an integrated approach of general and partial equilibrium models, the interaction between agricultural and biofuel sectors to the trade ban is considered. The findings predicted a high feed cost in response to the trade restriction scenario, which affects poultry and pork sectors the most. To conserve forest resources and reduce environmental degradation, Bosello et al. (2013) analyze the possible consequences of pending EU legislation to ban illegally harvested wood and wood products trade in the EU market. Using a modified CGE model, the author points out that the unilateral EU trade ban may effectively remove illegal timber from the international market. Additionally, this policy may promote

illegal logging countries to increase secondary wood production as their products become more competitive (due to price increases) after implementing the ban.

The 2014 Russian agri-food imports ban is one of the recent cases in the literature. In response to the Ukraine conflict and to "protect the national security of the Russian Federation", Russia imposed a temporary ban on agri-food imports from the EU, the USA, Norway, Canada, and Australia (Banse et al., 2019). In this regard, Boulanger et al. (2016) apply a modified CGE model to analyze the short-run consequences of the Russian imports ban. As the findings of the study show, the EU compensates for the ban-related negative shock majorly by intra-EU trade, while Russia ensures the highest income loss due to the ban (approximately €3.4 billion). Using the GTAP model, Kutlina-Dimitrova (2017) reports that the impact of the Russian agri-food ban is negligible on total EU exports. This limited effect may be evidence of a strong "cushioning" effect through redirecting the banned product to the EU internal market. In a recent paper, Banse et al. (2019) also show that removing the Russian food import ban may result in a minor change in the agricultural sectors of both Russia and the EU.

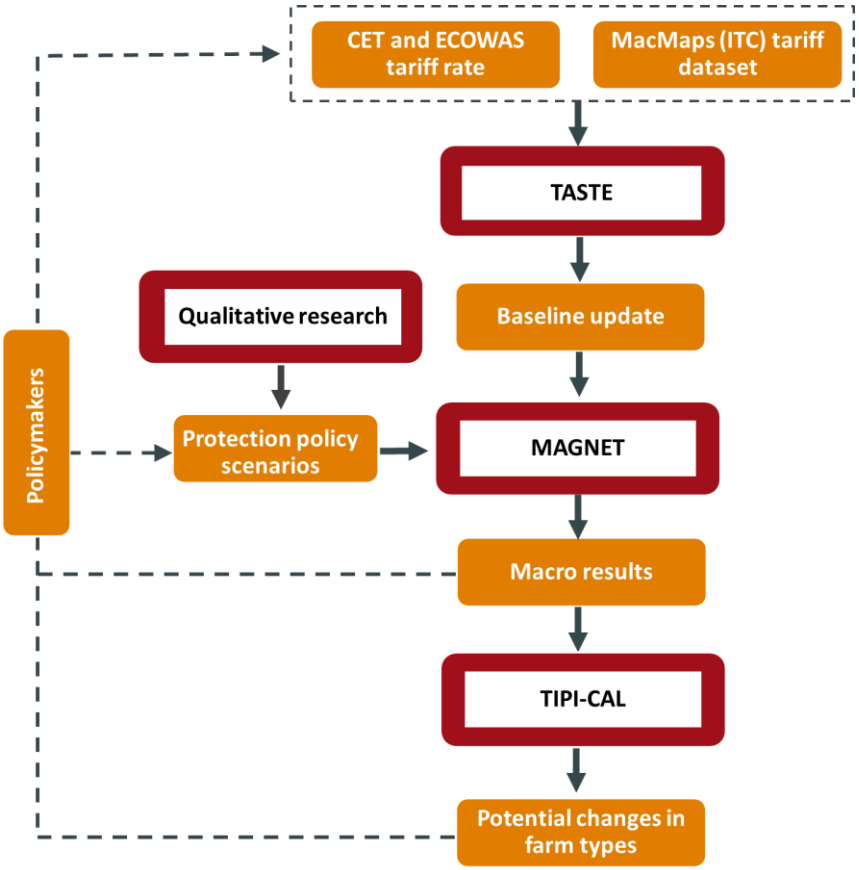
According to the existing literature, the final effects of a partial ban depend on various factors. From a trade perspective, the partial trade ban may affect bilateral trade flows by reallocating market shares in favor of non-banned countries (Nicita, 2008). Thus, the total effects on the domestic market are highly influenced by the share of new competitors and changes in total imports following the partial ban implementation. Although poultry import bans have some common effects in the context of some Western African countries, existing literature shows that the policy effects vary from country to country. In Senegal, the imposition of a poultry import ban has resulted in increased domestic production and consumption (FAO, 2014). According to Arnoldus et al. (2020), the per capita consumption of chicken meat increased from 3.1 kg/person in 2007 to around 5 kg/person in 2019. In contrast, although there has been an increase in domestic production in Nigeria after the ban, Andam et al. (2017) report that the per capita consumption of chicken meat in Nigeria decreased from an annual average of 1.32

kg/person in 1995-1999 to an annual average of 0.85kg/person in 2011–2015. Furthermore, Andriamananjara et al. (2009) and Golub (2012) suggest that the poultry import ban in Nigeria has also led to the significant illegal trade (smuggling) of frozen chicken products from Benin to Nigeria. Additionally, a ban on inputs into poultry production leads to an increase in maize prices. Maize prices tripled from 2007 to 2008 and left many poultry producers unable to provide sufficient feed quantities (Killebrew et al., 2010). According to the above explanations, the difference in the impact of poultry import bans imposed by Nigeria and Senegal shows that the policy implications of a ban policy in Ghana cannot be generalized based on the effects on other countries but should instead be investigated based on the specific local context.

3 Model Framework

Figure 4 presents the process by which our methods are applied. It is based on connecting the qualitative and quantitative analyses for identifying the most important challenges in the poultry value chain and simulating the potential effects of policy decisions on macro and micro levels. Firstly, the tariff dataset is adjusted according to our research question. Secondly, five protection policies are defined according to the implemented government policy and our qualitative research results (semi-structured interviews, focus groups, and Delphi study) in Ghana. The scenarios are identified in the next section. Thirdly, the effects of the scenarios are simulated by using the MAGNET (Modular Applied General Equilibrium Tool) model. Based on the simulation results for production, the potential changes in different farm types are estimated. Continuing the loop, the simulation results provide policymakers with a basis to readjust or modify the trade policies. The scenarios used in this analysis and different parts of the following flowchart are described in detail in the section below

Figure 4: Policy assessment flowchart



Source: Own presentation.

3.1. Qualitative research

In line with Akunzule et al. (2009), semi-structured interviews were used to collect data from key informants knowledgeable of the poultry value chain in Ghana. Semi-structured interviews were used because they enabled key informants to freely express their points of view, allowing the researchers to gain an in-depth understanding of the various issues related to the poultry value chain. The interviews were conducted in Accra, Kumasi, and the Eastern region. A total of 17 key informants were interviewed. The key informants included input suppliers (hatcheries, feed manufacturers, and veterinary product suppliers), poultry producers, processors (slaughterhouses), and distributors (retailers, wholesalers).

Additionally, the Delphi method was used to identify and rank the challenges facing the value chain identified through an in-depth literature review. According to Grime and Wright (2014), the Delphi method is used to gather a consensus of expert opinions through structured and

anonymous group communication. In our study, the method was used to understand the extent to which poultry meat imports are perceived as a challenge. The Delphi study was composed of a heterogeneous group of experts, including researchers, poultry producers, policymakers, input suppliers, feed millers, hatcheries, and slaughterhouses. The Delphi study was conducted from November to December 2020 in two rounds of emails. In the first round, the questionnaire, which was composed of two questions, was sent to the experts. The first question requested the experts to judge the importance of 14 challenges facing the value chain through a five-point Likert scale. The second question was an open-ended question that requested the experts to identify and judge the importance of other challenges not included in the initial list. The first-round responses were then analyzed using the mean, standard deviation, and Kendall's coefficient of concordance and fed back to the experts in Round 2. The responses from the first and second rounds were then compared and a decision to end the study after two rounds was made because the results showed minor changes.

3.2. MAGNET model

A CGE model of the world economy known as MAGNET was used to estimate the potential impacts of changes in Ghana's border protection on imports and domestic production. MAGNET is based on the GTAP model and the GTAP database with a particular focus on the global agricultural sectors (Woltjer et al., 2014). MAGNET has been extensively applied by researchers and public institutes to assess the economic implications of agri-food trade policy scenarios (e.g. Banse et al., 2008; Boulanger and Philippidis, 2015; Helming and Tabeau, 2018). Woltjer and Kuiper (2014) provide a detailed description of MAGNET. For this analysis, the latest version of MAGNET is applied that disaggregates poultry products from other livestock products.

In a first step, a baseline is created that includes the phasing in of EU trade agreement between the year 2020 and 2030. The underlying trade policy and macroeconomic assumptions are

documented by Hass et al. (2020) in more detail and updated for this analysis. In order to consider Ghana's trade policies, the Common External Tariff (CET) is implemented, and the most recent version of EPA trade agreement between the EU and the ECOWAS (Economic Community of West African States) is included in the baseline. As a result, the model approach includes tariff protection for all countries worldwide based on the 2017 protection structure, and by 2030, the data for the EU and ECOWAS countries have been adjusted according to the gradual implementation of trade agreements. For the update of the protection structure, we apply the Tariff Aggregation and Simulation Tool for Economists (TASTE) developed by Horridge and Laborde (2008) and updated by Pelikan et al. (2020). Building on the baseline, five scenarios regarding protection policies are created (see Figure 5):

a) Decreasing import tariff rate of maize (Maize Tariff_0%): expanding tariff escalation through abolishing 5% import tariff rates of maize (i.e. livestock feeds);

b) Increasing import tariff rate of poultry (Poultry Tariff_40%): expanding tariff escalation through increasing import tariff rates of poultry meat (i.e. final product) from 35% to 40%;

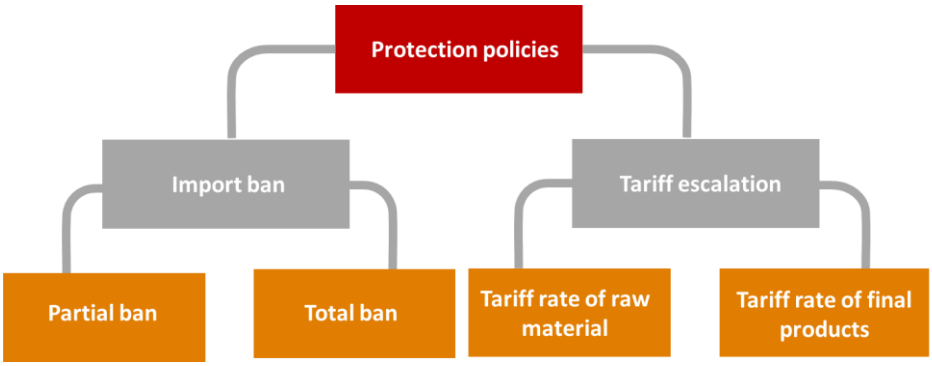
c) Increasing import tariff rate of poultry (Poultry Tariff_99%): expanding tariff escalation through increasing import tariff rates of poultry meat (i.e. final product) from 35% to 99% (the maximum bound rate);

d) Partial ban: an import ban for poultry products from the Netherlands, Germany, Russia, Denmark,[4] and the United Kingdom.

e) Total ban: an import ban for different poultry products from all trading partners.

[4] Since Denmark is not disaggregated in our baseline, we remove it. According to the UN Comtrade, exports from Denmark to Ghana are minor.

Figure 5: Scenario structure



Source: Own presentation.

In the context of CGE models, the import ban scenarios have been implemented in different ways. In the traditional approach, the ban is defined by increasing tariff rates to prohibitively high levels which in turn causes the reduction in imports (Anderson et al., 2005; Henseler et al., 2013; Antimiani et al., 2014). However, it may not provide a precise representation of the poultry ban in Ghana. Alternatively, Philippidis (2010) and Boulanger et al. (2016) formulate the self-imposed ban on the utility function by reducing the domestic demand for imports. As an advantage of our analysis, we implement the import ban with the help of the import-augmenting technical change variable "ams_{irs}" which can be used to lower effective prices of imported products. captures the rate of decay on imports of commodity or service i from country r imported by country s. Equation 1 presents the effect mechanism of ams_{irs} on trade flows (Corong et al., 2017),

$$qxs_{irs} = -ams_{irs} + qim_{irs} - \varepsilon_i[pms_{irs} - ams_{irs} - pim_{is}] \quad (1)$$

Where qxs_{irs}, qim_{irs}, and pms_{irs} respectively denote the percentage change in the exports (qxs) and imports (qim) of commodity i from country r (source) to country s (destination) and domestic price (pim) in country s of imports from country r. pim_{is} presents a market price of import i in the country of destination. ε_i is the elasticity of substitution among imports in the Armington structure. To implement the ban, we change the closure of the model. *qxs* is changed to an exogenous variable and *ams* to an endogenous variable. In this way, we can reduce exports to Ghana by 100% by implementing a shock on *qxs*. To compare different ways of

implementing ban scenario, we present the import effects of ban using both approach in Appendix I. As shown, the import-augmenting technical change variable provides more accurate results compared with highly prohibitive tariff rate. Additionally, the prohibitive tariff rate approach aggravates the computational complexity of general equilibrium models.

3.3. Typical farm approach

The typical farm approach was used to construct empirically grounded farm data sets by applying several qualitative research methods that include farm observations, semi-structured interviews, and focus groups. The constructed "typical farms" were then used to analyse the economic perform of broiler chicken farms in Ghana. We applied this approach to link the results of the MAGNET model to the farm-level variables. Thus, it allowed us to better interpret the results of MAGNET. As stipulated by Chibanda et al. (2020), we applied the approach in a series of the following steps:

Step 1. Identified the most important broiler production regions and broiler production systems through an in-depth literature review and consultation of local experts.

Step 2. Selected broiler farms with characteristics that represent the identified typical broiler production systems. Farm data was then collected from the farms through semi-structured interviews.

Step 3. Focus groups were used to typify the individual farm data collected in Step 2 and to construct typical farms through recalibrating the farm data. A total of three focus groups were held, one for each production system. Each focus group was composed of ten participants who included five poultry producers, three local experts (extension or veterinary officers), and two local researchers. Chibanda et al. (2020) define the typical farms we constructed in Step 3 as 'virtual' farms representing the most common farm types within specific production systems and regions. A total of three focus groups were held, one for each identified production system.

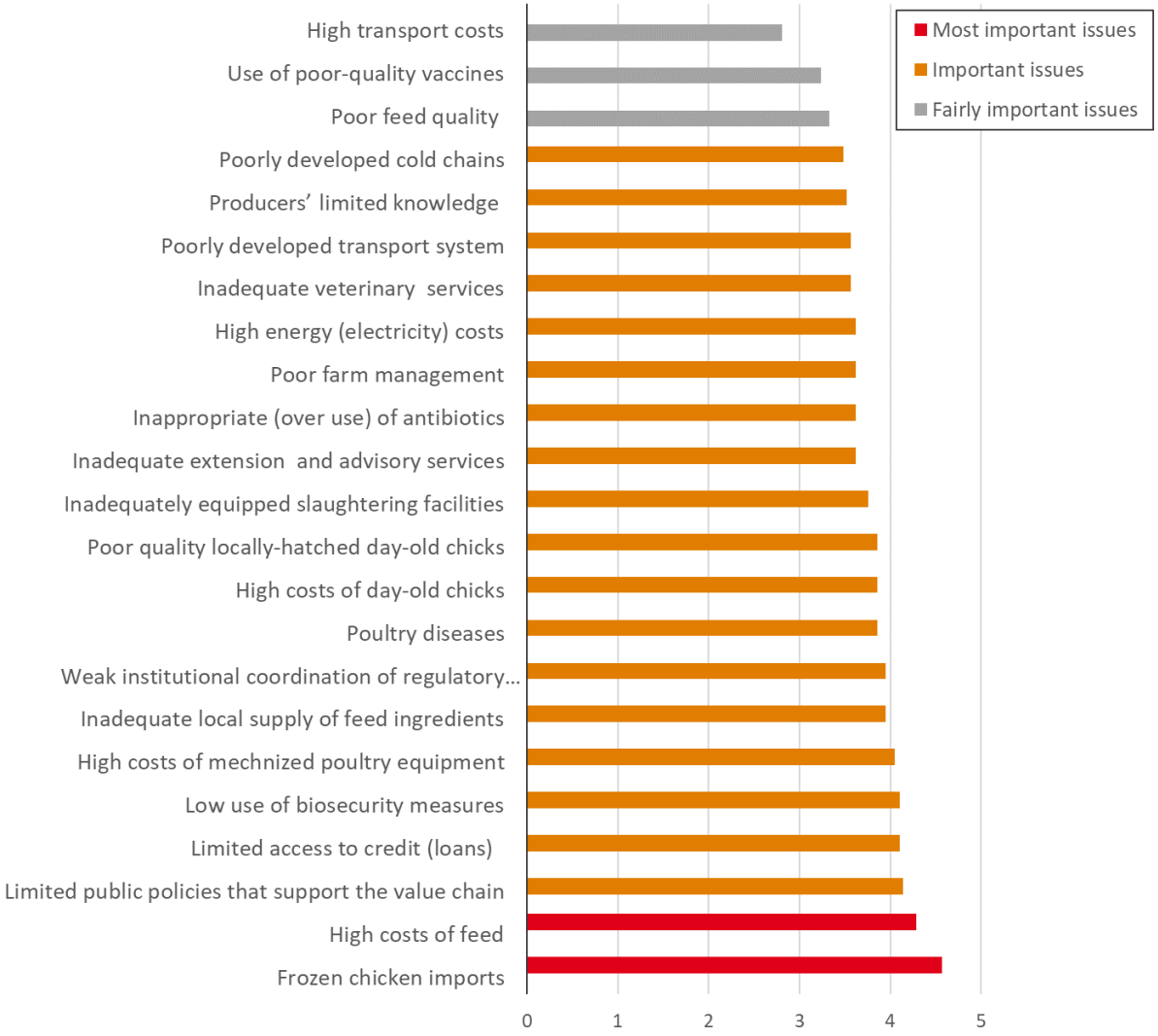
Each focus group was composed of ten participants who included five producers, three extension officers, and two local researchers.

Step 4: The Technology Impact Policy Impact Calculations (TIPI-CAL) model was used to analyze the typical farm data. TIPI-CAL is a computer-based policy impact assessment tool used in farm economic analysis as it allows a detailed analysis of farm-level variables (Kress and Verhaagh, 2019). Chibanda et al. (2020) provide an in-depth explanation of how the typical farm approach is applied.

4. Results

Figure 6 presents the key challenges facing the poultry sector that were identified and ranked through the Delphi study. The results show that frozen chicken imports and high feed costs are perceived to be the most important challenge facing the poultry sector. Furthermore, most of the poultry industry experts interviewed indicated that poultry imports are hindering the development of the sector. The experts suggested that a total ban on imports would be beneficial for the sector and the wider economy. Therefore, these findings were the basis for us to run the total ban scenario in the next step. Alternatively, we analyze the effects of increasing tariff rate of poultry meat and decreasing tariff rate of feed products, as an instrument to reduce feed costs, respectively.

Figure 6: Ranking of key challenges facing the poultry sector



Source: Own calculations based on the Delphi study.

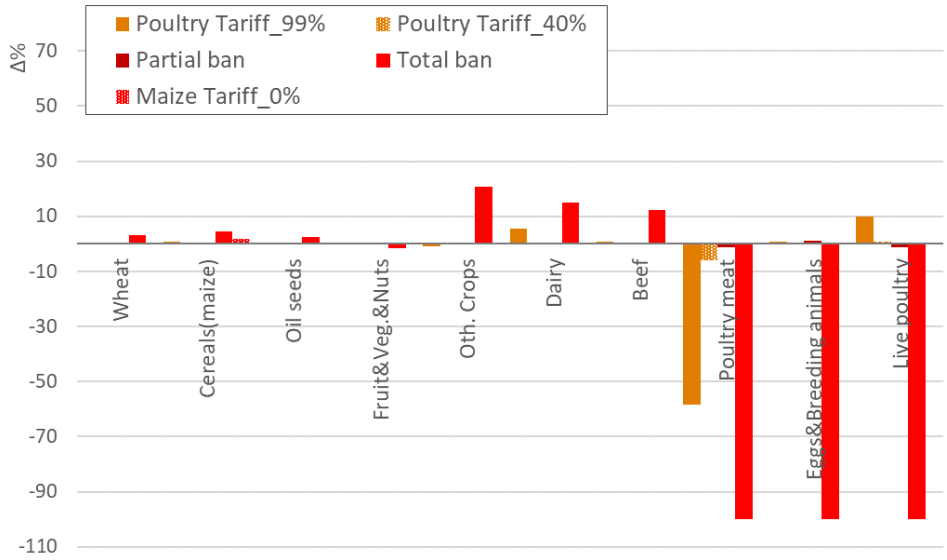
In the CGE model framework, we implemented the ban scenarios on imports of poultry meat, live poultry, and eggs & breeding animals subsectors. According to the UN Comtrade dataset (2019), the imports of breeding animals to Ghana are minor. Thus, the egg & breeding animals subsector mainly shows the changes in the egg imports. Of which, according to industry experts, the majority of the imported eggs are hatching eggs.

The effects on Ghanaian imports resulting from the partial and total bans as well as tariff policy scenarios are displayed in Figure 7. While the partial ban only results in small changes in total imports, the total ban scenario will also affect other sectors. Here crops (containing seeds for fodder plants) and maize imports increase when a total ban on poultry products is enforced.

These products are used as inputs into poultry production. Through the typical farm approach, we estimated the proportions of key poultry feed ingredients used by typical broiler farms in Ghana. The feed used by these farms is composed of maize (57%-60%), soy meal (20%-24%), wheat bran (7%-12%), fishmeal (2-5%), broiler concentrate (5%), and palm kernel cake (2,5%). Additionally, the imports of beef and dairy subsectors increase after the total ban, which is explained by lower domestic production of these products due to higher feed costs (i.e. maize and fodder plants).

As expected, the poultry meat imports decrease substantially in response to the higher tariff rate. However, increasing the tariff rate from 35% to 40% has a significantly less-pronounced protection effect compared with the maximum bound rate of poultry meat in Ghana, i.e. 99%. This policy intervention results in an increase in live poultry (day-old chicks) imports, which in turn can be used in the domestic production process. As the current import duty of maize is already low (i.e. 5%), we may not expect a significant change due to the import liberalization of maize. Additionally, Figure 7 reveals that import demand shifts to other animal products like dairy and beef. Since the initial value of these imports is low, the additional quantities that cross the borders are also not high.

Figure 7: Change in Import Values relative to the Baseline in the year 2030



Source: Own calculations with MAGNET.

Why is the effect of a partial ban so small? Although the imports from the Netherlands, Germany, United Kingdom, and Russia to Ghana become zero, the total imports remain relatively constant. As shown in Figure 8, the market shortage in the Ghanaian poultry market due to the partial ban is majorly compensated by the imports from Brazil and the US. Thus, the shares of these countries increase after the partial ban, while total imports remain relatively constant. Additionally, our findings display a similar pattern for the egg market. However, the partial ban causes the share of African, Asian, and other European countries to rise significantly in the total imports of egg products. Although the imports of maize do not change significantly in total, this policy causes the share of the US and other African countries to increase in the Ghanaian maize market. The results from the model are consistent with the findings from the semi-structured interviews. According to hatchery managers that were interviewed, the partial ban will most likely increase the number of imports of hatching eggs from non-banned countries like Belgium, Turkey, Egypt, Cote de Ivoire, South Africa, and Brazil.

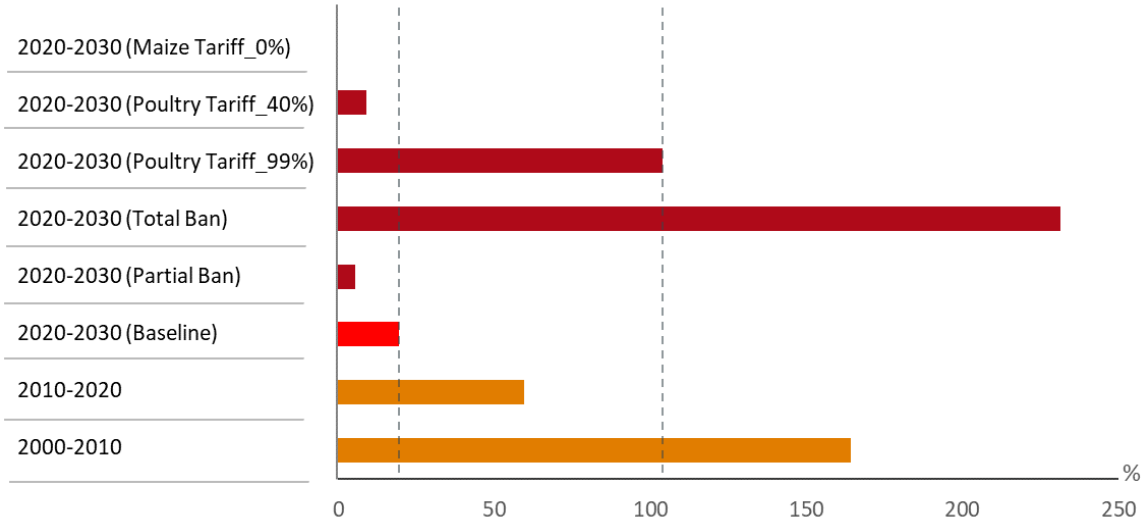
Figure 8: Import shares to Ghana from different countries/regions in %

Source: Own calculations with MAGNET.

Figure 9 presents the change in production based on historical data and supplements this with the results of the simulations. According to UN Comtrade data, poultry production in Ghana increases by 264% from 2000 to 2010. In the next decade, the increase is 159%. In our simulation, we focus on the period between 2020 and 2030. Although we consider GDP-growth rates and population growth in our baseline, we project an increase until 2030 by only 20%. Growing demand in Ghana is mainly met by additional imports. Increasing the tariff rate to a high prohibitive level of 99% has a significant effect on domestic production of poultry meat,

however, the reduced cost of poultry production due to the maize market liberalization is not significant to be passed through to the final product. The current rate of maize import is only 5% which may not change the price of the final product significantly. Moreover, a partial ban resulting from Avian Influenza would increase production by 5.4% by 2030 relative to the baseline. However, if the total import bans as suggested by the experts were implemented, then production could increase by 231% relative to the baseline. Is a production increase of this magnitude possible? Which producers will benefit the most from this? An answer to these questions is provided by the analysis of typical farms. According to Amanor-Boadu et al., (2016), broiler farms that are fully operational in Ghana can run up to 6.5 production cycles per year. However, Table 1 shows that all three typical broiler farms run only around three production cycles per year. Producers who participated in the typical farm focus groups revealed that due to the low-priced frozen chicken imports, locally produced broiler meat is only readily marketable during peak demand periods (i.e., Christmas, Easter, and Eid Al-Fitr). These findings are in line with the studies conducted by Amanor-Boadu (2016) and RVO (2020), which conclude that the Ghanaian broiler market is seasonal as production is done mainly for the festive holidays. Therefore, a total ban on imports would result in current producers easily increasing their production by 117% by running 6.5 cycles per year. The rest of the increase could be accounted for by new producers attracted to poultry production or an increase in the number of birds per cycle by current producers.

Figure 9: Percentage changes in the production of poultry meat in Ghana



Source: Dataset 2000-2020, USDA (2019); Baseline and Scenarios, own calculations with MAGNET.

According to Asante-Addo and Weible (2019), besides the poultry meat imports being more affordable than local chickens, consumers in Ghana buy more chicken imports than local chickens because the imports are available in cut pieces or as dressed chickens that make preparation more convenient. Table 1 presents the characteristics of typical broiler production systems that we identified. The results show that large-scale integrated broiler farms are the only farm type currently slaughtering their chickens. Therefore, they are better positioned to take advantage of the total ban and satisfy the demand for processed chickens. Hence, similar to Senegal (Arnoldus et al. 2020), the Ghanaian poultry sector will most likely be dominated by a few large-scale integrated farms after a total ban.

Table 1: Characteristics of typical broiler production systems in Ghana

	Small-scale commercial	Medium-scale commercial	Large-scale integrated
Farm size	< 5.000 birds per year	5.000- 20.000 birds per year	> 20 000 birds per year
Feed source	Commercial feed-mills		Operate their own feed-mills
Day-old chicks	Exotic breeds that are often imported	Exotic breeds that are often imported	Farms often own a hatchery and produce their own exotic breeds.
Marketing	Live birds sold in local communities, live markets, and to small restaurants	Live chickens are sold in live markets and to traders.	Chickens are often slaughtered on the farm, and sold to retailers and restaurants.
Number of cycles per year	3.72	3.00	3.00

Source: Own calculations based on Typical Farm Analysis.

Finally, it should be noted here that the focus of this analysis is on producers. In the overall economy, import bans are often associated with welfare losses. The decline in GDP as a result of the partial ban would be 26 million USD. But, GDP would fall only by 1 million USD as a result of a total ban. This is mainly due to the considerable increases in domestic production, which compensate for the major reductions in the GDP. We have not quantified the benefits of preventing Avian Influenza. However, it can be assumed that an outbreak can be prevented at relatively low costs if imports are banned only from specific countries. When interpreting the results of a total ban, it should be borne in mind that, in reality, illegal imports are often recorded when a country imposes a ban. This would reduce the positive effects on producers and would have an additional negative effect on consumers, as cold chains are more frequently not adhered to in the illegal trade. Although increasing the import duty of poultry meat results in a negative effect on the GDP, the reductions in the GDP increase at a diminishing growth as the tariff rates rise. Liberalization of the maize market has the same negative effect of increasing 5% tariff rate of poultry meat on GDP. As shown, both scenarios lead to 0.01% reduction in GDP.

Table 2: Changes in the Ghanaian GDP under different scenarios

	GDP (Mio. USD) in 2030	Percentage change
Baseline	76357	--
Scenarios:		
Partial ban	76331	-0.03%
Total ban	76356	-0.00%
Poultry Tariff_40%	76351	-0.01%
Poultry Tariff_99%	76273	-0.11%
Maize Tariff_0%	76351	-0.01%

Source: Own calculations with MAGNET.

5. Conclusion

This study analyses the potential effects of alternative poultry trade policies, including the recent ban on poultry imports from some European countries and Russia by Ghana. To capture the spillover effects of the policies on different stakeholders, we apply a hybrid method integrating Computable General Equilibrium (CGE) and typical farm analysis. This method allows us to estimate the results of implementing protection policies for different farm types.

According to semi-structured interviews from key stakeholders of the poultry value chain in Ghana, five specific scenarios associated with tariff escalation and import ban policies are identified. Our findings imply that increasing the current tariff rate of poultry meat to the 99% bound rate, i.e. tariff escalation, causes domestic production to rise by 104%. Due to the low tariff rate of maize, production cost reduction driven by market liberalization is not large enough to change the final product price through the cost pass-through process. Comparably, tariff escalation through increasing the duty rate of poultry meat by 5% does not have a significant effect on the whole value chain.

The effects of the recent partial ban are compared with a total ban policy. In contrast with the total ban policy, imports of corresponding products do not change significantly due to the partial ban. This pattern is driven by a “cushioning” effect through trade diversion by increasing the

import shares of other competitors to the food market of Ghana. The partial ban causes the export shares of US and eastern European countries to increase in the sectors of "poultry meat" and "eggs & breeding animals" of Ghana, respectively. Our simulation suggests that the total ban comes with a relatively low cost (1 million USD) for protecting the domestic market. This is mainly driven by increasing domestic production due to the total ban. As Amanor-Boadu (2016) and RVO (2020), the Ghanaian broiler market is seasonal with peaks in the festive holidays. Considering the potential capacity of the domestic producers, a total ban on imports would result in current producers increasing their production substantially. The rest Although the total ban leads to a more significant increase in production by domestic producers than the partial ban, the negative externalities due to the potential informal trade triggered by the total ban need to be considered.

Additionally, our typical farm analysis shows that the large-scale integrated broiler farms are better positioned to receive the positive effects of increasing import tariff rates or imposing a total ban and meet the demand for processed chickens. Considering the significant level of cross-border trade in West Africa, the ban policy may increase the risk of illegal trade. However, we have no information on illegal trade to estimate the potential effects of the ban. Another limitation of our analysis goes back to the long-term structural effects of the protection initiatives. It might be difficult to relax a ban again after a long-term implementation, as the producers may not be competitive on the world market anymore. This might be a venue for future analysis to consider the long-run effects of protection policies on domestic producers.

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Appendix I Comparing different approaches of implementing ban scenarios

Ban implementation approach	Import effects of the partial ban					
	World	EU12	DEU	NLD	GBR	RUS
Technical change variable	286.2	72.7	0	0	0	0
Prohibitive tariff	286	72.6	0	0.2	0	0
	Import effects of the total ban					
Technical change variable	11.02	0	0	0	0	0
Prohibitive tariff	42.62	8.86	1.27	6.17	0.12	0.02