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ORIGINAL PAPER



Cheap chicken in Africa: Would import restrictions be pro-poor?

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Abstract

Europe's chicken exports to Africa have long been criticised for their negative effects on local producers. However, while cheap chicken imports may hurt African poultry farmers, the same cheap imports benefit African consumers and improve their access to affordable nutrients. A few African countries have established import restrictions, but it is unclear how such policies affect different population groups and whether the potential benefits for farmers outweigh the broader social costs. We use nationally representative household data from Ghana and a partial-equilibrium framework to simulate domestic household supply, consumption, and overall welfare effects of two hypothetical policies, namely a 50% import tariff on chicken and a complete import ban. Our results suggest that both policies would lead to increased domestic chicken prices with negative consumption effects that are much larger than the positive supply effects. Average poor and non-poor households in rural and urban areas would suffer welfare losses from these import restrictions. While many households purchase and consume chicken, relatively few produce chicken and only very few sell any chicken in the market. The findings imply that chicken import restrictions are not a pro-poor and welfare-enhancing policy. To compensate the few households particularly hurt by cheap chicken imports, targeted support measures would make more sense economically and socially than general import restrictions.

Keywords Trade policy · Armington assumption · Poverty · Welfare analysis · Chicken · Ghana

1 Introduction

In many African countries, imports of chicken have increased rapidly over the last 20 years (FAOSTAT, 2021a, b; Zhou & Staatz, 2016). This is especially true in West Africa, where domestic chicken production has not kept pace with the rapidly rising demand (FAO, 2014; FAOSTAT, 2021c). The cheap imports of chicken – mainly coming from the European Union (EU) and to a lesser extent from the USA and Brazil – have received a lot of attention in public debates about trade liberalisation, food security, and poverty (Chibanda et al., 2022; Rudloff & Schmieg, 2016, 2017). On the one hand,

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developing countries may benefit from cheap imports, as these help to keep domestic prices low and thus improve poor people's access to nutritious foods (Cornelsen et al., 2015; Green et al., 2013; Ivanic et al., 2012; Zachary, 2004). On the other hand, cheap imports of chicken have long been criticized for hurting the local poultry production sector, including smallholder farmers (Rudloff & Schmieg, 2017). Agriculture is an important source of income for many poor households in Africa (ILOSTAT, 2019; Shimeles et al., 2018).

In the past, a few African countries, such as Nigeria and Senegal, have imposed protectionist trade policies, either by raising import tariffs or by banning chicken imports altogether (Boihmah & Weible, 2021; Kornher & von Braun, 2020; WTO, 2014). Raising import tariffs is not always a legal option under the Economic Partnership Agreements (EPA) that several African countries have signed with the EU, but for some countries tariffs on poultry are excluded from the EPA. Import bans are usually not allowed and would also violate World Trade Organisation (WTO) regulations in general, even though exceptions exist under specific conditions. For instance, Ghana recently imposed a partial import ban on poultry products from five European

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countries following an avian influenza outbreak (Zamani et al., 2022). Hence, the question how a possible increase in tariffs for chicken imports or even a complete import ban would affect domestic households in African countries remains interesting and policy-relevant. This question is addressed in this article.

In particular, for the case of Ghana, we analyse the effects of two hypothetical policies – a 50% import tariff for chicken and a complete import ban – on domestic household's chicken sales, consumption, and overall welfare, also differentiating between poor and non-poor households. We use household-level data and a partial equilibrium modeling framework. Ghana is an interesting example because the country has been importing cheap chicken for many years (Chibanda et al., 2022). Hence, we can compare the status quo of large quantities of cheap chicken imports with hypothetical scenarios in which we assume more protectionist policies.

It should be mentioned that since 2015 Ghana has imposed the Economic Community of West African States' (ECO-WAS) Common External Tariff (CET) of 35% on poultry imports. Nevertheless, import quantities remain high. As ECOWAS member, further raising the import tariff would have to be negotiated but seems possible in general. For instance, Senegal uses higher tariffs on a number of food items, whereas Senegal and Nigeria both have banned imports of poultry and/or poultry products (FAO & African Development Bank Group, 2015; International Trade Administration, 2020; Nigeria Customs Service, 2022).

Our study builds on the broader literature about the impacts of trade and price policies on poverty, inequality, and food security (Banse et al., 2019; Boulanger et al., 2016; Bureau et al., 2006; Chen & Ravallion, 2003; Litchfield et al., 2003; Mahadevan et al., 2017; Panagariya, 2005; Soumahoro, 2017; Swinnen & Squicciarini, 2012; Winters & Martuscelli, 2014). This existing literature suggests that trade liberalization – meaning the reduction or abolition of trade protectionist policies - has mostly positive effects on incomes and reduces poverty in general (Winters & Martuscelli, 2014). Protectionist policies can lead to higher prices and higher profits for domestic producers, but are also associated with higher prices for consumers. In the case of food, higher prices hurt poor consumers over-proportionally, as poor people spend a larger share of their income on food than rich people (Dorward, 2012; Ivanic et al., 2012; Minot & Goletti, 2000). The total welfare effects typically depend on whether a country or household is a net producer or consumer (Kornher & von Braun, 2020; Magrini et al., 2017; Mahadevan et al., 2017; Chauvin & Ramos, 2013; Swinnen & Squicciarini, 2012). While in the African context smallholder farmers often make up a large fraction of the poor, many of them are net consumers of food, meaning that they buy more food than they sell (Ivanic & Martin, 2014). In such situations, higher tariffs on food imports or other protectionist policies are not expected to be pro-poor.

A few studies have also looked more specifically at actual or potential effects of import restrictions for poultry in Africa. Andam et al., (2017a, b) have modelled potential impacts of chicken import restrictions in Ghana, suggesting that higher domestic prices would increase domestic production but decrease consumption considerably. Based on results from their partial equilibrium model, Andam et al. (2017b) conclude that replacing chicken imports with domestic production would be almost impossible in the short term. Zamani et al. (2022) have simulated effects of import restrictions in Ghana's poultry sector with a general equilibrium model, finding large positive production effects in the commercial sector and much smaller effects among small- and medium-scale farms. Zamani et al. (2022) have not looked at effects for domestic consumers in more detail.

In addition to these modeling studies, some research with qualitative approaches also exists. Boimah and Weible (2021) have used focus group discussions with consumers in Senegal, suggesting that the import ban may have certain positive effects for the development of the domestic poultry production sector. However, protectionist policies implemented over longer periods of time may also have unintended side-effects. In Nigeria, after a long history of import restrictions (International Trade Administration, 2021; Oyejide et al., 2005) the complete ban on poultry imports is now leading to rising incidents of border smuggling, undermining domestic price targets as well as food safety and other policy objectives (Golub, 2012; Ogunleye et al., 2016; Rudloff & Schmieg, 2017).

Our analysis adds to the existing literature on poultry import restrictions in Africa by using a quantitative modeling approach and looking more specifically than previous studies at the production, consumption, and welfare effects for different types of households, including poor and nonpoor rural and urban households. To our knowledge, such distributional effects for different types of households have not been analysed previously. By focusing on households, we include small- and medium-sized poultry production activities, but exclude large commercial poultry enterprises not owned by individual households. For large poultry enterprises the effects of import restrictions may be different (Zamani et al., 2022).

The rest of this article is structured as follows. In section 2, we provide an overview of chicken consumption, production, and trade in Ghana. In section 3, we explain the methodological approaches and data used for the analysis. The results are presented in section 4, while section 5 discusses the findings and concludes.

2 Background

In Ghana, chicken meat is popular and consumption levels are rising steadily. Nevertheless, with an average annual consumption of 9 kg per capita in 2019, consumption levels still remain below the worldwide average (FAOSTAT, 2021b). One reason is the relatively high consumption of fish, which accounts for 60% of all animal protein consumed in Ghana (Komatsu & Kitanishi, 2015; Netherlands Enterprise Agency, 2020). Ghana imports most of the chicken and fish consumed domestically.

Ghana's growth in chicken consumption occurs in urban and rural areas alike (USDA Foreign Agricultural Service, 2017). Domestic production has not kept pace with this growth in demand, so the imported quantities have been rising over time. Figure 1 shows that imports now account for three-quarters of the total poultry meat supply in Ghana. Chicken is mostly imported from the EU, especially from the Netherlands, Poland, Belgium, and Germany (Observatory of Economic Complexity, 2021). The availability of cheap chicken imports is a major reason for the significant increase in poultry meat consumption in Ghana over time, also among poorer households (Osei-Asare & Eghan, 2014).

Table 1 provides an overview of domestically-produced and imported chicken quantities and consumer market prices in 2017, the reference year for our analysis (as explained below, the household survey data were collected in 2017). Prices paid for domestic chicken meat are almost 40% higher than for imported products. This means that both types of chicken are not perfect substitutes. Domestic and imported chicken differ in terms of freshness, taste, convenience, and other attributes (Kwakwa, 2013; Opoku & Akorli, 2009; Woolverton & Frimpong, 2013). Most of the imported chicken meat comes in the form of pre-cut, frozen pieces (Kornher & von Braun, 2020; USDA Foreign Agricultural Service, 2017), whereas local chickens are sold fresh and often live. Households choose their source of chicken based on preferences, affordability, and accessibility in the local context. A recent study suggests a higher mean willingnessto-pay for domestic chicken based on perceived quality differences (Asante-Addo & Weible, 2020).

Different types of producers are involved in domestic chicken sales in Ghana. Large and medium-sized commercial farms account for a significant share of the country's broader poultry sector, but these commercial poultry farms mainly focus on egg production (Netherlands Enterprise Agency, 2020). In other words, selling chicken meat is currently not their main business. This focus on eggs in the commercial poultry sector is partly a result of the cheap chicken meat imports that local producers can hardly compete with (Banson et al., 2015; Chibanda et al., 2022; FAO, 2014; USDA Foreign Agricultural Service, 2017). Most of the broilers in Ghana are kept by small- and medium-scale farms for home consumption and market sales. While market sales of live birds occur throughout the year, they often increase seasonally, especially around festivals and public holidays (Amanor-Boadu et al., 2016).

The main reason why broiler farms in Ghana can hardly compete with imports from Europe are high feed costs (Andam et al., 2017b). Maize and to a lesser extent soy are the main feed ingredients for market-oriented producers. In addition, the locally used breeds have a lower productivity, and energy and transport costs are relatively high as well, especially for farmers in remote locations (Al-Hassan Noah et al., 2014). For comparison, farmers in the EU benefit from subsidies, which are not directed at chicken but lead to higher farm incomes anyway. Moreover, European consumers have a strong preference only for certain chicken parts, such as breasts, meaning that other parts are often exported at low prices (Kornher & von Braun, 2020; Rudloff & Schmieg, 2016).



meat in Ghana, domestic production, and imports (Data from FAOSTAT, 2021b, c)

 Table 1 Domestic supply and imports of chicken meat in Ghana (2017)

Variables	Supply (tonnes)	Market price (GHS per kg)
Domestic supply	57,099	15.206 (2.107)
Imported supply	147,538	9.503 (5.131)
Total supply (domestic and imported) Average consumer market price	204,637	11.092 (3.752)

Supply and import measures taken from FAOSTAT (2021c). Market prices in Ghanaian cedi (GHS) per kg estimated from GLSS7 community survey data, showing means across regions with standard deviations in parentheses. Prices for domestic supply based on mean market prices for live or fresh chicken, with a 2 kg conversion factor for live chicken, as suggested in recent studies for Ghana (Netherlands Enterprise Agency, 2020; USDA Foreign Agricultural Service, 2017). Prices for imported supply based on mean market prices for frozen chicken items. Market prices taken from the GLSS7 complementary market price survey

The government of Ghana has tried to increase productivity and competitiveness in the local poultry sector through various support programs, including input subsidies and trade restrictions (MoFA, 2020, 2021; Republic of Ghana, 2019). Between the 1990s and around 2010, tariffs changed frequently. In 2007, a partial poultry import ban was implemented, following an outbreak of avian influenza (Banson et al., 2015; FAO, 2014; Johnson, 2011; WTO, 2014). In 2015, import tariffs for chicken and most other types of meat were raised to 35%, following to the ECOWAS CET regulations (ECOTIS, 2021; WTO, 2021). However, while chicken imports were falling between 2013 and 2015, they have increased again since 2016 (Fig. 1). Obviously, the different policy measures have not changed the competitiveness of local producers significantly; the rapid growth in demand can hardly be met by the growth in domestic supply (Andam et al., 2017b; USDA Foreign Agricultural Service, 2017). Potential effects of higher import tariffs are analysed in the following.

3 Materials and methods

We want to evaluate effects of higher import tariffs for chicken on household consumption, chicken sales, and the overall welfare of households in Ghana. As explained, Ghana currently has an import tariff of 35% for chicken meat in place. This is the status quo in our analysis. As counterfactuals, we use two hypothetical tariff scenarios, namely (i) an import tariff of 50% and (ii) a prohibitive tariff that would lead to zero imports, equivalent to an import ban. Using a prohibitive tariff is the traditional way of implementing an import ban in modeling studies. Alternative approaches to characterize an import ban exist, such as a reduction in the import demand (Boulanger et al., 2016). However, since the demand for imported chicken in Ghana has grown steadily over time, reduced import demand does not appear to be a realistic characterization in our case.

We use a partial-equilibrium framework to model the tariff effects on the markets for imported and domesticallyproduced chicken. As imported and domestic chicken are not perfect substitutes, we use the Armington (1969) assumption. A higher tariff on imported chicken meat will lead to higher prices and lower demand for imported chicken. This will lead to an upward shift in the demand for domestically-produced chicken, whereby the magnitude of the shift depends on the tariff and the Armington elasticity. The shift leads to higher prices for domestic chicken and higher profits for local producers. We calculate the resulting changes in prices using an equilibrium displacement model (Alston et al., 1995; Wohlgenant, 2011). The price changes for imported and domestic chicken are then employed to simulate changes in consumption and production at the individual household level, using constant values for the price elasticities of demand and supply. The new consumption and production levels are also used to evaluate welfare effects in monetary terms. Additional details of the data, the modeling framework, and the assumptions used are explained in the following.

3.1 Data

We use data from the 7th round of the Ghana Living Standards Survey (GLSS7), a nationally representative household survey with about 14,000 household observations (Ghana Statistical Service, 2019).¹ The survey was conducted in 2016/2017 and includes a wide range of data on household agricultural and other economic activities, as well as food and non-food expenditures. Food consumption quantities and expenditures were collected over the course of 12 months through multiple household visits. During each visit, households were asked to report on quantities of various food items consumed over a five-day recall period. The survey data differentiate between the consumption of fresh and frozen chicken meat. It is fair to assume that the frozen chicken meat is imported, while the fresh meat is domestically produced. Mean quantities consumed by different types of households are shown below in section 4.

We calculate changes in chicken quantities consumed and produced as well as welfare effects for each household in the sample and present results for all households together and for different types of households, including households in rural and urban areas as classified in the GLSS7 survey

¹ As some of the regions in Ghana were over-sampled in the GLSS7, we use sampling weights for all households as provided in the data set (Ghana Statistical Service, 2019) for the presentation of results.

data. For the welfare analysis, we additionally differentiate between poor and non-poor households. We use the official poverty line, as defined by the Ghana Statistical Service (2018) for the GLSS7 data, to identify poor households. A household is defined as poor if its consumption expenditures are below GHS 1,761 per adult equivalent (AE) and year.

In addition to the household-level data, local market price data were also collected in 2016/2017 as part of the GLSS7 (Ghana Statistical Service, 2019). Having price and quantity data referring to the same time period is important for the modeling exercise. We use regional-level average market price data for chicken to represent the status quo of consumer prices in our analysis. These average consumer prices are calculated by weighting prices for fresh and frozen chicken with regional quantity shares. Producer sales prices are calculated as unit values based on the household-level data by dividing the monetary revenues from chicken sales by the quantities sold. Hence, chicken sales prices are available only for those households that actually sold chicken during the survey year.

3.2 Modeling framework and elasticities

We use partial-equilibrium models of imported and domestic chicken supply and demand in Ghana, assuming that other sectors of the economy would be unaffected. Zero effects on other markets and sectors are obviously not a very realistic assumption, especially not for markets that are vertically linked to chicken production, such as the markets for chicken feed. Increased domestic chicken production would increase the demand for chicken feed, especially cereal grains and soy (Andam et al., 2017a; Zamani et al., 2022). Ghana currently imports some of its maize and almost all of its wheat, rice, and soy from abroad (USDA Foreign Agricultural Service, 2020). These imports would likely rise with increased domestic chicken production. Such effects should not be neglected when analysing broader sectoral developments for food and agriculture in Ghana. However, as explained, here we are particularly interested in the welfare and distributional effects at the household level, where the main effects of chicken import restrictions will occur through changes in chicken prices and quantities consumed and supplied. Hence, the simplified assumptions of the partial-equilibrium framework seem acceptable for our purpose.

Higher import tariffs increase the price of imported chicken and decrease the imported quantities. In the case of a prohibitive import tariff, chicken imports will stop completely. Given substitution effects, the demand for domestic chicken will increase, depending on the tariff, the resulting import price and quantity changes, and the Armington elasticity. Based on Hertel et al. (2007), we use an Armington elasticity of 8.8 to characterize the substitution between imported and domestic chicken.² We then characterize the

effects on the market for domestic chicken through a shift in demand and compute price changes using an equilibrium displacement model (Wohlgenant, 2011). These effects depend on the own-price elasticities of demand and supply.

For the own-price elasticity of chicken demand (PED), several estimates are available for Ghana (Ansah et al., 2020; Osei-Asare & Eghan, 2014). The most recent study by Ansah et al. (2020) used household-level data from the 6th round of the GLSS survey for estimating various demand elasticities. We use their mean PED estimate of -0.86 for chicken in Ghana. Note that this value only applies to chicken purchased in the market. The consumption of own-produced foods is typically much less price-responsive than market demand. In modeling studies, a consumption price elasticity of zero is often assumed for own-produced foods, meaning that the quantity of subsistence consumption is not affected by market prices (Alston et al., 1995). This is a simplified assumption, as production and consumption decisions are typically non-separable in semi-subsistence farming households (Key et al., 2000). However, using a non-separable household model would require primary data collection, which would be beyond the scope of this study. Hence, in the absence of available estimates of the price responsiveness of subsistence consumption and lack of data for related own calculations, we follow the assumption of a zero PED for own-produced chicken meat.

For the own-price elasticity of chicken supply (PES), we did not find any studies that have estimated values in the context of Africa. Studies from other regions report PES values for chicken between 0.3 and 0.9 (Revell, 2015; Rezitis & Stavropoulos, 2011; Dagdemir et al., 2004; Shiptsova et al., 2002; Bhati, 1987). In general, the PES is higher in commercial systems than in the semi-subsistence small farm sector (Alston et al., 1995). In a recent study on Ghana's poultry sector, Andam et al. (2017b) assumed a PES of 0.5 for poultry meat, which seems a reasonable value in our context as well. As mentioned, we concentrate on farm households with small- and medium-scale chicken production, not on large-scale enterprises where the supply responsiveness may be stronger (Zamani et al., 2022).

We calculate market supply and consumption changes for chicken in the two hypothetical tariff scenarios, using the status quo with observed consumer market prices and producer sales prices as the reference. These calculations are carried out for each individual household. Chicken consumption is measured in kilograms per AE and year. Consumption expenditures are expressed in Ghanaian cedi (GHS) per

 $^{^2}$ An Armington elasticity of 8.8. implies a relatively high substitutability between imported and domestic chicken. In a sensitivity analysis, we reduced the value of the elasticity by 50%. While the numerical results change to some extent, the general findings and conclusions do not.

AE and year. Domestically-produced sales are measured in terms of kilograms of chicken sold per household and year and in terms of annual chicken income expressed in GHS.

Based on the estimated changes in household consumption and sales of chicken, we also calculate the resulting welfare effects for each household in the two tariff scenarios, using the equivalent variation (EV). The EV was originally proposed and defined by Hicks (1942) and is a frequentlyused measure to evaluate the welfare effects of price policies (Feltenstein & Plassmann, 2008; Nikodinoska & Schröder, 2016). The EV is a measure of the amount of money transfer that would be needed to lift the household to the new level of utility at the initial price levels. It can be expressed as:

$$EV = e(p_0, u_1) - e(p_0, u_0)$$

where p_0 is the initial price without the policy, and u_1 and u_0 are the utility levels with and without the policy, respectively. We calculate the EV for each household, first looking at consumption and production effects in monetary terms separately, and then adding up to obtain the overall welfare effect. Since import tariffs lead to higher prices, we expect welfare losses on the consumption side and welfare gains on the production side. Welfare gains and losses are expressed in GHS per AE and year.

3.3 Limitations

The analysis uses a few simplified assumptions, which should be kept in mind to avoid over-interpretation. First, by looking at demand and supply effects separately, we implicitly assume that markets and household decisions are fully separable, which may not be the case. As mentioned, in semi-subsistence settings consumption and production decisions are often non-separable, which is especially true with widespread market imperfections (Key et al., 2000). Not accounting for consumption and production links within households may mean that we possibly underestimate own-consumption effects and overestimate market supply effects of price changes in semi-subsistence farm households. Second, price elasticities of demand and supply are point estimates that usually work well for predicting the quantity effects of relatively small price changes. The predictions are less reliable when modeling larger changes in prices, as we do here especially in the scenario with a complete import ban.

A third limitation that also relates to the elasticity assumptions involves the question how variable the inputs used in domestic chicken production are in the short, medium, and long term. Our results can probably best be interpreted as medium-term effects of higher import tariffs, whereas the short-term effects (in the first few weeks and months after the new policy) and long-term effects (after several years) may possibly differ. In the given situation, where over 70% of all chicken consumed in Ghana comes from imports, a sudden import ban would likely lead to severe short-term market disruptions, because domestic supply cannot be increased so much instantaneously (shortages of feed etc.). In the long term, new types of domestic producers and technologies may emerge, and current net buyers of chicken may turn into net market suppliers, possibly leading to larger supply responses than those assumed here. Finally, our study looks at household production only. Price effects also affect commercial poultry enterprises, which, in turn, could affect household welfare through labour markets and wages.

Against the background of these limitations, this study only provides tentative estimates of the household consumption, sales, and welfare effects that can be expected from import restrictions for chicken in Ghana. The results should not be over-interpreted as precise measurements. Further research using multi-market approaches and non-separable household models could be useful to address more specific questions in the future.

4 Results

We start this section by presenting descriptive statistics of households in the GLSS7 sample and their chicken consumption and sales patterns. This is important to better understand the consumption and supply effects resulting from the tariff and price changes, which we present subsequently, before analysing the overall welfare effects.

4.1 Consumption and sales of chicken

Table 2 shows descriptive statistics for the total sample of households in Ghana, as well as differentiated for poor and non-poor households in rural and urban areas. Around 43% of all households consumed any chicken in 2017. The consumption of frozen chicken is much more common than the consumption of fresh chicken. About 5% of the households consumed chicken from own production; 6% consumed fresh chicken purchased from the market. Around 15% of all households owned chicken for meat or egg production, but only 4% sold any chicken during the 12-month survey period. Hence, the proportion of households hurt directly by cheap chicken imports is small. Tables A1 and A2 in the Online Appendix show consumption and sales including only those households that consumed or sold any chicken in 2017.

The disaggregation by household type in Table 2 shows that rural households are more likely to own chicken and to sell any chicken than urban households. Also, the quantities sold and the incomes earned from chicken are larger in rural areas, as one would expect. Nevertheless, also in urban areas around 7% of the households own chicken. This is consistent with Chibanda et al. (2022) who found that an important part of Ghana's broiler production takes place

		Total		Urban		Rural	
Variables	Total sample	Poor	Non-poor	Poor	Non-poor	Poor	Non-poor
Household size (AE)	2.919	4.514	2.641	4.275	2.587	4.566	2.732
	(1.985)	(2.399)	(1.761)	(2.045)	(1.679)	(2.467)	(1.888)
Total expenditure	5318.031	1122.795	6050.258	1317.819	6886.646	1080.168	4646.387
	(5466.672)	(402.733)	(5609.338)	(319.413)	(6396.209)	(406.536)	(3531.276)
Food expenditure	2548.662	647.640	2880.462	678.507	3072.896	640.893	2557.462
	(2098.842)	(298.072)	(2101.833)	(235.713)	(2267.143)	(309.679)	(1743.553)
Chicken consumption							
Any chicken (1/0)	0.426	0.335	0.442	0.356	0.435	0.330	0.455
	(0.495)	(0.472)	(0.497)	(0.480)	(0.496)	(0.470)	(0.498)
Frozen chicken (1/0)	0.364	0.234	0.387	0.339	0.391	0.211	0.381
	(0.481)	(0.423)	(0.487)	(0.474)	(0.488)	(0.408)	(0.486)
Consumption quantity of frozen chicken	4.703	1.140	5.325	1.603	5.489	1.039	5.049
	(11.783)	(3.134)	(12.601)	(3.702)	(12.794)	(2.987)	(12.266)
Expenditures for frozen chicken	41.224	11.536	46.406	17.671	43.988	10.195	50.464
	(127.912)	(43.100)	(136.795)	(62.354)	(121.251)	(37.496)	(159.449)
Fresh/live chicken (1/0)	0.058	0.029	0.063	0.010	0.066	0.033	0.059
	(0.234)	(0.168)	(0.244)	(0.098)	(0.248)	(0.180)	(0.236)
Quantity of fresh/live chicken	1.041	0.224	1.184	0.099	1.192	0.251	1.169
	(6.143)	(1.979)	(6.595)	(2.716)	(6.366)	(1.777)	(6.964)
Expenditures for fresh/live chicken	16.604	3.011	18.976	1.288	19.599	3.387	17.930
	(96.645)	(25.302)	(104.025)	(33.499)	(104.346)	(23.123)	(103.489)
Own-produced chicken (1/0)	0.049	0.110	0.038	0.024	0.013	0.129	0.080
	(0.215)	(0.313)	(0.191)	(0.152)	(0.113)	(0.335)	(0.271)
Quantity of own- produced chicken	0.202	0.315	0.183	0.082	0.084	0.366	0.348
	(1.669)	(1.317)	(1.722)	(0.778)	(1.770)	(1.403)	(1.624)
Value of own-produced chicken	9.922	13.015	9.383	3.712	4.287	15.048	17.935
	(88.701)	(93.140)	(87.895)	(30.263)	(84.463)	(101.729)	(92.756)
Chicken production							
Household owns chicken (1/0)	0.152	0.351	0.117	0.132	0.051	0.399	0.229
	(0.359)	(0.477)	(0.322)	(0.339)	(0.220)	(0.490)	(0.420)
Chicken sold (1/0)	0.041	0.113	0.028	0.026	0.008	0.132	0.062
	(0.198)	(0.317)	(0.166)	(0.160)	(0.090)	(0.338)	(0.241)
Quantity of chicken sold	0.587	1.309	0.461	0.311	0.236	1.527	0.838
	(11.283)	(5.617)	(11.996)	(2.088)	(11.752)	(6.101)	(12.388)
Value of chicken sold	4.799	11.320	3.660	9.551	1.482	11.707	7.317
	(52.102)	(70.018)	(48.210)	(133.888)	(50.654)	(45.440)	(43.566)
Observations	14,009	3582	10,427	371	5647	3211	4780

Own calculations based on GLSS7. Mean values are shown with standard deviations in parentheses. The survey data include live chicken as whole animals. We used a conversion factor of 2 kg per chicken, as suggested in recent studies for Ghana (Netherlands Enterprise Agency, 2020; USDA Foreign Agricultural Service, 2017). Dummy variables are indicated with (0/1), where 1 stands for a "yes" response. Quantities consumed are expressed in kg per adult equivalent (AE) and year. Expenditures are expressed in GHS per AE and year. Quantities produced are expressed in kg per household and year.

in urban and peri-urban areas. Poor households are more likely to sell chicken than non-poor households, which is true in both rural and urban areas. This means that the poor population segments deserve particular attention when analysing potential welfare losses from cheap chicken imports. On the consumption side, urban households are more likely than rural households to purchase chicken from the market (frozen or fresh). In both rural and urban areas, nonpoor households consume more purchased chicken than poor households, whereas poor households consume more chicken from own production.

4.2 Effects of higher import tariffs on prices, consumption, and household sales

Table 3 shows current mean market prices for chicken in Ghana and the price changes we calculated for the two hypothetical import tariff scenarios. With a 50% import tariff (up from the current 35% tariff), prices for chicken meat would increase by about 11% and 6% for imported and domestic chicken, respectively. With a prohibitive tariff, prices would increase by 60% and 34%, respectively. With the 60% price increase for imported chicken, this market segment would cease to exist, as imports would drop to zero.

Table 4 shows the effects of these higher prices on the consumption of chicken meat. Only households who purchased any chicken from the market (imported or domestic) are included here, as these are the only ones affected by changing market prices on the consumption side. It is unlikely that more households would start purchasing chicken at significantly higher prices. With a 50% import tariff, the consumption of imported chicken would decrease by 6%, whereas the consumption of domestic chicken would increase by 3%. With a prohibitive import tariff, no imported chicken would be consumed anymore (decrease by 100%), whereas the consumption of domestic chicken would increase by 17%.(163.985)41.831

Table 5 shows the effects of the higher prices on market supply levels among those households that sold any chicken. With a 50% import tariff, domestic chicken sales quantities would increase by 3%. With a prohibitive import tariff, sales quantities would increase by 17%. Average incomes from chicken sales would increase by 22% and 74% in the two scenarios, respectively. While these are large effects, it should be stressed that only 4% of all households are currently involved in any chicken sales. Hence, the proportion of households that would gain from additional import restrictions is much smaller than the proportion of households that would lose as consumers. As mentioned before,

the proportion of households selling chicken might potentially increase in the long run with consistently higher market prices.

4.3 Welfare effects

Figure 2 presents the welfare effects of higher import tariffs for the average household in Ghana (total sample) and for different types of households, namely poor and non-poor households in rural and urban areas. For these calculations, we assume an equal marginal utility of money for all households. However, as the role of food prices is not the same for poor and non-poor households, we also express the welfare effects relative to households' total food expenditures in Table A3 in the Online Appendix. As expected, higher import tariffs would lead to welfare losses on the consumption side and to welfare gains on the supply side. The average consumption losses are much bigger than the average gains from additional sales, meaning that the overall welfare effects of higher import tariffs would be negative. The total negative welfare effects would be much larger with a prohibitive import tariff (Fig. 2, panel b) than with a 50% tariff (Fig. 2, panel a), as with a prohibitive tariff the market for imported chicken would cease to exist.

The finding that the losses through higher import tariffs on the consumption side are much larger than the gains from additional sales is true for all household types in Fig. 2, including poor and non-poor households in rural and urban areas. Non-poor households would suffer more from chicken import restrictions than poor households, as non-poor households in all groups tend to purchase more chicken from the market. However, this does not mean that import restrictions would be pro-poor; all households would face welfare losses.

In both import tariff scenarios and for all groups of households, the total welfare losses would account for less than 2.3% of total food expenditures (Table A3), meaning that the

Variables	Imported chicken	Domestic chicken	Household producer prices
Mean price at current 35% tariff (status quo)	9.503	15.202	9.695
	(5.131)	(2.109)	(7.919)
Mean percentage price change at 50% tariff	11.111	6.231	6.231
Mean price at 50% tariff	10.559	16.149	10.299
	(5.701)	(2.239)	(8.413)
Mean percentage price change at prohibitive tariff	60.000	33.649	33.649
Mean price at prohibitive tariff	15.204	20.312	12.957
	(8.209)	(2.817)	(10.584)

Mean values are shown with standard deviations in parentheses. Prices are shown in GHS per kg. Mean prices in status quo are calculated using prices per kilogram of chicken as reported by the GLSS7 market survey data. Producer prices are shown for households that sold chicken (n=955) and are based on revenues from chicken per kg sold, as reported in the GLSS7 household survey

Table 3 Chicken meat pricesin status quo and hypotheticalimport tariff scenarios

Table 4	Change in chicken consum	ption through higher in	port tariffs among household	s that purchased any chicker

	(1)	(2)	(3)	(4)	(5)	(6)
	Imported chicken			Domestic chicken		
Variables	Total sample	Urban	Rural	Total sample	Urban	Rural
Consumption (status quo)	11.809	12.474	10.819	2.614	2.682	2.512
	(16.272)	(16.745)	(15.492)	(9.521)	(9.360)	(9.757)
Expenditures (status quo)	103.514	100.513	107.980	41.691	44.046	38.187
	(186.119)	(166.249)	(212.234)	(149.701)	(153.104)	(144.459)
Consumption at 50% tariff	11.094	11.718	10.164	2.695	2.766	2.591
	(15.286)	(15.731)	(14.554)	(9.817)	(9.651)	(10.061)
Expenditures at 50% tariff	108.050	104.917	112.712	45.669	48.249	41.831
	(194.275)	(173.534)	(221.535)	(163.985)	(167.712)	(158.243)
Consumption at prohibitive tariff	0.000	0.000	0.000	3.054	3.133	2.935
	(0.000)	(0.000)	(0.000)	(11.122)	(10.935)	(11.398)
Expenditures at prohibitive tariff	0.000	0.000	0.000	65.095	68.772	59.624
	(0.000)	(0.000)	(0.000)	(233.739)	(239.051)	(225.554)
Observations	4732	2394	2338	4732	2394	2338

Mean values are shown with standard deviations in parentheses. Consumption is expressed in kilogram per adult equivalent (AE) and year. Expenditures are expressed in GHS per AE and year

effect sizes are small. The main reason for the small effect sizes is that chicken consumption, production, and sales quantities are small for the average household in Ghana. As explained, much of the animal protein in Ghana comes from fish. Less than 43% of all households in Ghana consume any chicken meat at all, and only 15% produce any chicken. When we confine the analysis to those households that consumed or produced any chicken, the welfare effects increase in magnitude, but the direction of the effects remains unchanged (Table A4 in the Online Appendix). The overall welfare effects of higher import tariffs remain negative for poor and non-poor households in rural and urban areas. This means

that at least in qualitative terms our results may also hold if chicken consumption in Ghana continues to rise.

In Table A5 in the Online Appendix, we further disaggregate the group of poor households. In particular, we differentiate between poor and extremely poor households, using Ghana's extreme poverty line, which in 2017 was GHS 982 per AE and year, which is 45% lower than the regular poverty line (Ghana Statistical Service, 2018). While the share of extremely poor households in urban areas is low, in rural areas more than 40% of all the poor fall into this extreme poverty category. Around 42% of these extremely poor households owned chicken, and 14% sold any chicken. On

Table 5Change in householdchicken sales and incomethrough higher import tariffsamong households that sold anychicken

	(1)	(2)	(3)	
Variables	Total sample	Urban	Rural	
Quantity of chicken sold (status quo)	14.370	26.622	12.643	
	(54.063)	(118.729)	(36.682)	
Income from chicken sales (status quo)	117.536	207.230	104.894	
	(230.845)	(572.307)	(117.668)	
Quantity of chicken sold at 50% tariff	14.818	27.451	13.037	
	(55.747)	(122.429)	(37.825)	
Income from chicken sales at 50% tariff	143.482	227.003	131.711	
	(505.713)	(626.913)	(485.697)	
Quantity of chicken sold at prohibitive tariff	16.788	31.101	14.770	
	(63.159)	(138.706)	(42.853)	
Income from chicken sales at prohibitive tariff	204.514	323.562	187.736	
	(720.826)	(893.580)	(692.295)	
Observations	955	84	871	

Mean values are shown with standard deviations in parentheses. Quantities are expressed in kilogram per household and year. Incomes are expressed in GHS per household and year



(b) Prohibitive import tariff



Fig. 2 Welfare effects of higher import tariffs for chicken in Ghana (GHS per household). Note: Average results are shown for the total sample and for different household types. The analysis includes all households

regardless of whether or not they consumed or produced and sold any chicken. Hence, welfare effects can be interpreted as gains and losses for average households in Ghana

average, extremely poor households sold 1.7 kg of chicken and earned 11.16 GHS during the 12-month survey period. The results in Table A5 suggest that in both, the 50% and the prohibitive import tariff scenarios, the overall welfare effects are negative for all types of households, including the extremely poor in rural areas.

5 Discussion and conclusion

Cheap imports of chicken meat coming from Europe and other regions are often perceived as hurting African countries in general, and rural smallholder farmers in particular. A few African countries have established import restrictions to protect their farmers, but whether such protectionist measures are really welfare-enhancing and, if so, for what type of population groups has not been analyzed previously with household-level data. In this article, we address this research gap by using nationally representative household-level data from Ghana. Ghana has moderate import tariffs for chicken meat in place. Nevertheless, over 70% of the total chicken supply in Ghana comes from imports, mostly in the form of frozen chicken pieces from Europe. Imported quantities have grown significantly over the last 20 years. In our analysis, we use a partial-equilibrium approach to simulate the effects of tightened import restrictions for chicken in two scenarios: (i) a higher import tariff of 50% and (ii) a prohibitive import tariff that would be equivalent to an import ban.

In the status quo, less than 43% of all households in Ghana consumed any chicken. For those households that consumed chicken, frozen imported products were the main source, making up close to 80% of total consumption. Only 6% of all households consumed domestically-produced chicken purchased from the market. Around 15% of the households produced chicken, but only 4% of the households sold any chicken during the 12-month survey period.

As expected, higher import tariffs would lead to higher domestic chicken prices. Our analysis reveals that a complete import ban would raise domestic chicken prices by 34%. Higher prices would decrease chicken consumption. In the 50% tariff scenario, average consumption of imported chicken would decrease by 6%, while consumption of domestic chicken would increase by only 3%. In the prohibitive tariff scenario, no imported chicken would be consumed, whereas domestic chicken consumption would increase by 17%. Average chicken sales of producing households would increase by 3% and 17% in the two scenarios, respectively. Accordingly, incomes from chicken sales would rise.

We also calculate the resulting welfare effects. The welfare losses from higher chicken import tariffs on the consumption side would be much larger than the welfare gains through additional chicken sales, meaning that the overall welfare effects of higher import tariffs would be negative. While the overall welfare losses are larger in the prohibitive tariff scenario, the direction of the results is the same in both scenarios. We also disaggregate the analysis for different types of households, including poor and non-poor households in rural and urban areas. Interestingly, higher import tariffs would lead to negative welfare effects for all these household types, including extremely poor households. The reason is that most households that produce and/or consume any chicken are net consumers.

Given these results, additional import restrictions for chicken cannot be considered a pro-poor policy in general. In other words - unlike a few other countries in Africa - Ghana has rightly not increased its tariffs to keep cheap chicken imports out of the country. One may consider policy measures to compensate the small proportion of chickenproducing households that suffer income losses through the cheap imports, but higher tariffs would not be an efficient way to do so. Targeted support - for instance through technical assistance or direct income transfers - could be much more cost-effective. Overall, the cheap chicken imports do not seem to be as harmful for Ghana as often claimed. Chicken meat is an easily available source of protein and micronutrients, so increasing consumption, which is facilitated by cheap imports, contributes to improved nutrition of income-restrained households.

The absolute magnitude of the welfare effects of chicken import restrictions in Ghana is relatively small, because the average quantities of chicken consumed and sold per household in Ghana are small. Around 60% of all the animal protein consumed in Ghana comes from fish. For illustration, we also calculate effects for only those households that consume or produce chicken. These additional results suggest that the negative welfare effects from higher import tariffs increase with higher chicken consumption levels. This may be important also for other African countries, where the consumption of chicken meat plays a larger role than in Ghana. In qualitative terms, we expect our results to be similar also in other countries and regions of Africa.

We stress that our analysis builds on a few simplified assumptions, so that the exact magnitude of the effects should not be over-interpreted. In the partial-equilibrium framework we use, we only focus on the market for imported and domestically-produced chicken and ignore potential spillovers to other markets and sectors. Higher domestic chicken production would lead to additional demand for feed, affecting the markets for maize, wheat, and soy in particular. If all chicken were to be produced domestically, demand for grain as feed would increase significantly, possibly leading to higher grain prices and negative effects for food consumers. Another limitation relates to the price elasticities of demand and supply. Elasticity estimates typically describe how the quantity changes with small changes in price. When using constant elasticities for simulations with larger price changes, as is true in our prohibitive tariff scenario, the results need to be interpreted with caution. Large price increases could possibly lead to a larger proportion of households selling chicken and also to the rise of large-scale broiler enterprises, which is not fully reflected in our analysis. We focus on households and their farming activities and do not include commercial enterprises. This may also be the reason why our calculated supply response is smaller than that projected by Zamani et al. (2022) in their recent study on import restrictions and poultry production in Ghana. We feel that our analysis provides reasonable estimates of the medium-term effects of tightened import restrictions for households in Ghana. In the long term, high import tariffs may possibly lead to effects that are not fully captured here.

Apart from our finding that higher import tariffs would hurt most domestic households, a relevant question is also whether it would really make economic sense for countries in Africa to foster a commercial broiler sector for which developing international comparative advantage will be very difficult under current conditions. Probably, fostering other agricultural sub-sectors, for which African countries have stronger comparative advantages, would make more sense economically and socially. More generally, policies to strengthen local infrastructure, technology, and institutions are much better suited to promote sustainable development than import restrictions.

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Declarations

Competing interests The authors have no conflicts of interest to declare that are relevant to the content of this article.

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