What are the consumer welfare effects of tariff increases in South Africa?

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A dissertation submitted in fulfilment of the requirements for the degree of Master of Commerce in Applied Economics

Faculty of Commerce

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September 30, 2023

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Dedication

To my late brother Tapiwa Joel Mambara and late uncle Beaven Masvaure.

Acknowledgements

Firstly, I would like my supervisor, Professor Lawrence Edwards for his advice, support, and encouragement throughout my journey. He always had kind and inspirational words for me even when I could not see the light at the end of the tunnel. I come out of this with a dissertation and a life lesson from him: kindness.

Secondly, I would like to thank my co-supervisor, Dr Godfrey Kamutando. His insight and knowledge of the field were invaluable inputs in the crafting of this dissertation. As his slogan was, “it will be alright”, it has surely come that it is alright.

Thirdly, I would like to thank my friends who were support system as I went through my journey. Your support, care packages, words of encouragement and many other small acts fuelled me throughout the journey. I appreciate and love each one of you.

Lastly, to my parents, Joel and Jacqueline Mambara, my brother Dick Mambara, and daughter Joella Tapiwa Mambara I do not even know where to start. Your support picked me up on days when I wanted to quit, and you gave me everything you could to see me through this journey. I could not have done this without you.

Above all, I would like to give praise and thanks to the Lord, my God.

1. Introduction

Over the past decades, there has been a striking renewal of interest in the analysis of trade policy, driven by the increase in protectionist sentiment, notably with the use of trade measures such as tariffs, anti-dumping duties, safeguard duties and quotas (e.g., Davids, Meyer & Louw, 2015a; Amiti, Redding & Weinstein, 2019, 2020; Flaaen, Hortacsu & Tintelnot, 2020; Edwards et al., 2022). The bulk of the literature arrives at the same conclusion: an increase in protectionist policy is implemented at the expense of consumers through higher domestic prices. For example, increasing tariffs for staple foods can cause inflationary food pressure, resulting in overall consumer inflation (Makgetla, 2021). The inflationary pressure on food is in addition to the already rising food prices. South Africa, for example, has a 9.7% annual inflation of food which steadily rose in 2022 (Statistics South Africa [Statssa], 2022). Therefore, with high domestic food inflation, coupled with inflationary food pressure caused by international trade, it is crucial to understand the mechanism by which tariffs affect domestic prices. Consequently, this article aims to answer a single question, what are the consumer welfare effects of tariff increases in South Africa?

We have identified a poultry section, mainly chicken meat products, to answer this question. Our choice of chicken meat products is motivated by the increasingly protectionist stance South Africa has taken towards the product. For example, South Africa increased import tariffs on chicken products under HS-Code 0207 in 2013 and 2020 (International Trade Administration Commission of South Africa [ITAC], 2013). Additionally, between 2013 and 2020, South Africa applied a plethora of trade policy changes with the use of quotas against the United States, anti-dumping duties against European nations and safeguard duties against nations where there was an outbreak of avian flu (ITAC, 2013, 2015, 2019). These duties were placed on bone-in-portions (BIP) and boneless cuts (BLC).

In addition to issues of trade policy changes, the chicken industry is important in South Africa. With a gross value of R46.2 billion in 2019, the broiler chicken sector is the leading agricultural sub-sector, accounting for approximately 16% of agricultural GDP (Department of Agriculture, Land Reform and Rural Development [DALRRD], 2020). Furthermore, broiler meat comprises more than 70% of the poultry sector and more than one-third of all animal products (DALRRD, 2020). The commercial broiler sector is primarily in charge of broiler meat production. Also, the poultry sector employs over 110 000 individuals directly and indirectly (South African Poultry Association [SAPA], 2020). Accordingly, chicken presents itself as a cheap but rich source of protein (DALRRD, 2020; SAPA, 2020). On that account, we are particularly interested in chicken as ITAC notes several reasons for changes in trade instruments, including price disadvantages from cheap imports (ITAC, 2014, 2019). The price advantages that mainly benefit foreign producers are the most common reason for a change in trade instruments. Therefore, ITAC has shown little consideration for consumer costs through price increases. For these reasons, chicken is a good case study for our analysis.

Using chicken for our analysis, our paper extends the literature by investigating how tariffs affect prices and, through this, household consumption costs. More specifically, our paper

contributes to the literature[1] in three ways. Firstly, we look at regional pass-through, where we first analyse the provincial pass-through and then we analyse the rural-urban divide of each province. This allows us to analyse pass through at 27 distinct spatial units. Secondly, we use alternative household survey data[2]. We make use of the National Income Dynamics Study (NIDS), which is a panel of households that has rich consumption data for the spatial units we investigate. Thirdly, we calculate expenditure effects that explicitly consider differences in pass-through across regions. Therefore, given our focus, we have two key relationships to explore to identify the impact of tariff increases on household welfare: (a) How tariffs affect prices, and (b) how household welfare is affected by the composition of expenditure, particularly expenditure on chicken. The methodology used in the first stage, which focuses on price transmission, and the second stage, which focuses on welfare effects, builds on recent literature (Feenstra, 1989; Nicita, 2009; Marchand, 2012). Therefore, the welfare model will depend on factors of pass-through measure estimated in the first stage.

To summarise the impact on welfare in South Africa, the findings suggest that the nation suffered an increase in consumer prices for chicken meat products after 2010. Consequently, households faced a more expensive food basket, particularly with chicken meat. The results varied according to the expenditure distribution and spatially across South Africa's nine provinces and eighteen urban-rural splits. For example, the tariff pass-through for the Western Cape is 0.736, and its impact is an increased total expenditure of 2.17%. However, in the same province, the effect on the first decile of expenditure is an increase in total expenditure of 6.17%. The overall effect of chicken duties is quantified as a decrease in household purchasing power, with low-income households being disproportionally impacted. Additionally, provinces with ports (except for the Eastern Cape) and those close to them, experienced high pass-through of chicken duties to domestic prices. Consequently, higher prices will negatively affect consumption, thereby affecting welfare.

The paper is organised as follows: Section 2 provides a brief overview of the poultry sector and the evolution of tariffs in South Africa. Section 3 presents the theoretical framework, a basic welfare model that shows channels through which tariff changes affect household welfare through consumption and income linkages. Section 4 reviews the literature on the way trade policies affect prices and the implications of price changes on household welfare. Section 5 estimates the pass-through rates across geographical locations in South Africa. The section begins by presenting the empirical method applied and the estimation methodology. Then we introduce the data and some summary statistics covering the spatial element. Section 6 presents the estimates and discusses the findings. In this section, we estimate the welfare effect of tariffs on South African consumers. We also present the empirical method, data, and simulation estimates. Section 7 concludes the paper.

[1] This thesis builds on and extends work we conducted as part of a South Africa Reserve Bank project. The project is the working paper titled *The consumer price effects of specific trade policy restrictions in South Africa* (Edwards et al., 2022).

[2] We use the National Income Dynamics Study (NIDS) which is a panel study of households across South Africa. NIDS provides a rich source of expenditure data on various food items and updates the Income and Expenditure survey of 2010/11 used in Edwards et al., 2022.

2. Poultry and tariffs

This section presents an overview of the poultry industry, tariffs, and other trade policy changes. The vast poultry industry incorporates many industries, players, and products. The products include ostriches, turkeys, and chicken. The industry is vital in securing protein nutrition and food security in South Africa. We first discuss the poultry industry and its interaction with consumption and imports. After that, we discuss the revolving tariffs in this industry.

Within the poultry industry, chicken produce consists of three main activities: eggs, day-old chicks and broilers. The broiler chicken sector is the leading agricultural sub-sector, accounting for about 16% of the agricultural gross domestic product (GDP) with a gross value of R46.2 billion in 2019 (DALRRD, 2020). In addition, broiler meat accounts for more than 70% of the poultry sector and more than a third of all animal products (DALRRD, 2020). The production of broiler meat is overseen mainly by the commercial broiler sector. The commercial broiler sector is highly consolidated, with seven big producers controlling most of the market. Hundreds of small- or medium-scale producers constitute the remaining market share. The industry is classified as light industry, although depending on the scale of production, it becomes more capital intensive. Due to the evolution of the industry and its capital requirements, the poultry industry in South Africa has become mature over the decades. A sign of maturity is the ability to compete internationally in technical operations such as feed conversion ratio[3]. Despite the industry's maturity, it is still plagued with drawbacks, which we will discuss shortly.

The poultry industry interacts with other industries, such as the legal fraternity[4], abattoirs, contract growers, retailers, soya and maize farmers, feed manufacturers, and labour markets. Beginning with the labour market, the poultry sector employs over 110 000 individuals directly and indirectly (SAPA, 2020). The jobs created in the poultry sector make up about 13% of all jobs in agriculture (Bureau for Food and Agricultural Policy [BFAP], 2021), contributing significantly to the national base of jobs. Given the industry's size, the poultry sector is the second-largest consumer of maize and consumes a relatively large amount of soya (SAPA, 2020).

Despite the sector significantly impacting agricultural employment and output, it faces many challenges. One such challenge is feed costs rising over time. The increase in feed costs directly impacts the industry as feed is the primary input. High feed costs, therefore, translate to high chicken prices. One of the reasons this occurs is that retailer markups are much higher than producer prices. On aggregate, Stats SA (2022) find that all meat products make up 32% of food inflation. More specifically, for chicken, an increase in farm prices of ZAR1 results in a more than ZAR1 increase in retail prices (Mkhabela & Nyhodo, 2011). In addition to feed costs, rising electricity tariffs, droughts, Covid-19, and disease outbreaks are challenges that

[3] Feed conversion ratio is the standard measure of chicken production efficiency, which is calculated as the weight of feed intake divided by weight gained by the chicken.

[4] A good example in our case is the Meat Safety Act, Act No. 40 of 2000, and Agricultural Product Standards Act, Act 119 of 1990, which farmers, manufacturers, wholesalers, and retailers must abide by. The Acts cater for issues like the brine limit for individually quick frozen (IQF) and fresh chicken portions pegged at 15% and for whole chicken at 10%.

the sector faces (ITAC, 2013, 2015, 2019). However, the sector has managed, to a considerable extent, to meet domestic demand.

The increase in demand for chicken has outpaced production since 2009, indicating that imports have played a role in fulfilling domestic demand. The gap between production and consumption means South Africa's self-sufficiency[5] dropped from 92% in 2000 to 71% in 2018 (Mohapi, 2019). At the same time, South Africa also exported chicken to markets in neighbouring countries, namely, Botswana, Lesotho, Malawi, Mozambique, Namibia, Zambia, Swaziland and Zimbabwe (SAPA, 2020). Domestic demand for chicken is not surprisingly high as chicken provides a cheap source of protein for most households. In 2019, South Africans consumed a combined figure of 2.9 million tonnes of chicken compared to 1.5 million tonnes of beef, pork, mutton, and goat (SAPA, 2020). The per capita consumption of poultry is pegged at 38.93 kg as opposed to 16.8 kg, 5.2 kg, and 2.9kg for beef, pork, mutton, and goat, respectively. On the pricing side, chicken portions frozen non-IQF average ZAR 48.83/kg and IQF chicken portions average ZAR 68.95/kg (SAPA, 2020). Therefore, chicken is an important and cheap source of protein for households and their welfare.

The South African Poultry Association (SAPA) represents commercial and small-scale farmers within the broiler industry. In addition, the Department of Trade and Industry (DTI), and the Department of Agriculture, Land Reform and Rural Development (DALRRD) are interested in the broiler industry, its welfare, operations, and output. On the international front, ITAC investigates dumping and pricing disadvantages, among other related trade issues and recommends changing rates of various policy measures to the South African Revenue Service (SARS). SARS then implements the duty and reports to the public via its publications. We now move to a compilation of changes in different trade policy rates issued by SARS. See Table 1.

Table 1: Tariff changes and ITAC findings of fowls of species gallus domesticus (chicken)

HS8-Code & (Product Description)	Tariff Change	Date	Commission's findings									Other factors
			1	2	3	4	5	6	7	8	9	
0207.12.20 (Carcasses)	27% to 31%	30 September 2013	√	√	√		√	√				High input costs(feed electricity and various other cost items) Higher administered prices and wages Mortalities
0207.12.90 (Frozen whole birds)	27% to 82%		√	√	√		√	√				
0207.14.10 (Boneless cuts)	5% to 12%		√	√	√		√	√				
0207.14.20 (offal)	27% to 30%		√	√	√		√	√				
0207.14.90 (Bone-in-portions)	27% to 37%		√	√	√		√	√				
0207.14.11 (Breasts)	12% to 42%	13 March 2020		√	√	√						High input costs (feed electricity and various other cost items)
0207.14.13 (Thighs)				√	√	√				√		
0207.14.15 (Other)				√	√	√				√		
0207.14.91 (Whole bird cut in half)	37% to 62%			√	√	√				√		

[5] Calculated as Production/consumption*100.

0207.14.93 (Leg quarters)				√	√	√				√		
0207.14.95 (Wings)				√	√	√				√		
0207.14.96 (Breasts)				√	√	√				√		
0207.14.97 (Thighs)				√	√	√				√		
0207.14.98 (Drumsticks)				√	√	√				√		
0207.14.99 (Other)				√	√	√				√		

Source: BFAP (2021), ITAC (2013), South African Revenue Services, World Bank (World Integrated Trade Solution), World Trade Organisation

Notes: Ad Valorem Tariffs reported in percentages

The key for Commissions findings: 1= Low priced imports 2=Price disadvantages 3=Decline in Market Share 4= Decline in Sales 5= Decreasing profitability 6= Diminishing returns 7= Decline in production 8= Decline in capacity utilisation 9= tariff increase will improve the price-competitive position

Table 1 shows two changes in the tariffs of poultry products under HS-code heading 0207 that deal with gallus domesticus (chicken). The first change was on the 30th of September 2013, with five-line items experiencing an increase in tariffs. The most common reason ITAC states for the increase in tariffs is low-priced imports from nations like Brazil. The low-priced imports cause a price disadvantage which thereby causes a drop in the market share and profitability of domestic firms. Bone-in-portions (BIP) experienced a significant increase of 37% in tariffs, while boneless cuts (BLC) experienced a 14% increase in tariffs. The most significant increase was on frozen whole birds, which experienced a 203% increase in tariff, while offal increased by a modest 11%.

The first round of increase in tariffs is followed by anti-dumping duties (AD) and safeguard duties (SG) as reported in Appendix A, Table A1 and A2, respectively. In 2016, South Africa imposed provisional AD duties on European countries, namely Germany, the Netherlands, and the UK. These duties are essential as Europe enjoys preferential partner treatment, exporting duty-free to South Africa. The AD duties imposed cause a trade diversion, as will be discussed in depth in the literature review. In 2018, the AD duties were finalised with a phasedown period over three years from 2019 to 2021. Additionally, in 2016 and 2018, safeguard duties were imposed on Europe due to the avian flu outbreak in the region, thereby affecting the composition of imports by region.

The second change in tariffs came about on the 13th of March 2020. Between the first tariff change and the second in 2020, the HS Nomenclature 2017 entered into force, further disaggregating line items. However, the line items carried the duties from the main branch of disaggregation. Therefore, in Table 1, the second change in 2020 has more line items than the first change. The second change in tariffs was more aggressive than the first change, with BLC tariffs increasing by 250% while BIP increased by 68%. Cumulatively, all increases in trade policy present a more protectionist outlook by South Africa, especially towards chicken products. ITAC notes that the domestic industry faces many challenges beyond the low-priced imports: high input costs, higher administered prices and wages, and high mortality rates among chicks.

Further, ITAC and its investigations face limitations in analysing trade protection measures due to limited data and other operational hurdles. One such study backing the claim of ITAC's limitations is offered by Kwaramba and Tregenna (2014). They examine the role and

effectiveness of South Africa's ITAC, focusing on tariff investigation on poultry and paper tariff inquiries. Some of the issues they consider are the economic context, the parties' submissions and impressions of the tariff inquiry processes and conclusions, the duration of the investigation, the balancing of the numerous interests involved, and ITAC's recommendations in both cases. Based on these two cases, Kwaramba and Tregenna (2014) find that ITAC's attitude to tariffs appears to have shifted in response to South Africa's trade policy changes. The shift is towards a protectionist policy, protecting producers at the expense of consumers. To understand how the protectionist policy affects consumers and their welfare, we need to locate our study within theoretical territory to set a foundation for our analysis. Therefore, the following section presents our theoretical review.

3. Theory

We present the basic welfare model that shows channels through which tariff changes affect household welfare through consumption and income linkages. To deliver a robust foundation, we first present a model that identifies the channels in which tariffs are pass-through to domestic prices. Then we present a model that identifies how tariffs affect household welfare.

Therefore, to understand the implication of tariffs on retail prices, we draw on the well-established pricing framework of Engel and Rogers (1996). We present Eq. (1) as a simple Cobb-Douglas function.

$$P_{gr} = (P_r^N)^{\alpha_g}(P_{gr}^T)^{(1-\alpha_g)} \tag{1}$$

where P_{gr} is the price at the retail outlet of product g in region r that is a function of P_r^N, the non-traded input and P_{gr}^T the tradable product. The non-traded inputs include transport, communication, and advertisement costs, among others. In our case, the non-traded input includes and is not limited to chicken marketing and outlet workers' wages. At the same time, the traded product will be the actual chicken products from local farmers or foreign exporters such as Brazil. That being the case of tradable goods comprising domestic and imported products, we present Eq. (2) that looks at the price of tradable products.

$$(P_{gr}^T) = \left(eP_g^F(1+\tau) + L_r\right)^{1-\vartheta}(P_g^D)^{\vartheta} \tag{2}$$

where eP_g^F is the foreign price of the good in rands. In our case, the foreign price of chicken products would be denoted in rands. $1+\tau$ is the Ad valorem equivalent tariff rate, L_r is the transport costs of the imported goods to the outlet, and P_g^D is the price of the domestic good. ϑ measures the extent to which domestic goods dominate imported goods. For example, if $\vartheta = 0$, the tradable goods price will depend on the transmission of the import price to the retail price. On the other hand, if $\vartheta = 1$, the outlet sells only domestic sourced goods. We now take Eq. (2) and insert it into Eq. (1) to yield Eq. (3), which shows us the price for good g in region r at the retail outlet level.

$$P_{gr} = (P_r^N)^{\alpha_g}\left(\left(eP_g^F(1+\tau) + L_r\right)^{1-\vartheta}(P_g^D)^{\vartheta}\right)^{(1-\alpha_g)} \tag{3}$$

Eq. (3) has four critical takeaways: firstly, we are interested in how tariffs affect the landed price of the good. Foreign exporters may bear some tariffs by lowering prices depending on the tariff incident. In this instance, we have an incomplete pass-through of tariffs. However, if the foreign exporters do not change their prices, the tariff is fully passed through to the landed price of the imported good. Secondly, the lower the share of the non-traded input at the retail outlet level, the higher pass-through of the change in the price of the tradable product.

Similarly, the higher the share of the traded good at the outlet level price, the lower the pass-through of a change in the tradable's price. Third, the impact of tariffs on domestic prices will depend on substitutes, domestic supplier constraints and restrictions to imports that will raise or lower the pass-through. Lastly, regions closer to international markets experience a higher pass-through than regions further away. With multiple channels, we focus on the impact of tariffs on retail prices. Domestic consumers will face higher prices depending on the magnitude of pass-through to domestic products. However, we have only discussed the theory on tariff pass-through and will now introduce the welfare theory.

The most straightforward framework of Deaton (1989) for household welfare[6] effects of tariffs is presented in Eq. (4):

$$U_{hr} = \Phi_{hr}(x_{hr}, p) = \Phi_{hr}(m_{hr} + \pi_{hr}, p) \tag{4}$$

where Φ_{hr} is the indirect utility function, P is the vector of good prices, π_{hr} is the profit households realise from goods and m_{hr} is non-agricultural income from actives in the labour market or transfers such as remittances. Deaton (1989) notes that the household's utility is a function of profits from selling produce, income from non-farm activities and consumption, which are all a function of prices. A complete specification based on Deaton (1989) is given by Eq. (5)

$$dU_{hr} = \sum_{s} \theta_h dw_{sr}^{s} + \sum_{s} \theta_{hi}^{x} dp_{ir} - \sum_{s} \theta_{ir}^{hc} dp_{ir} \tag{5}$$

The first term on the right-hand side of Eq. (5) represents wages from selling skilled/unskilled labour to the markets. The second term on the right-hand side of Eq. (5) represents the profits from producing and selling goods. The last term on the right-hand side of Eq. (5) is similar to Marchand (2012) and Nicita (2009). It presents our primary analysis of the effect on household consumption cost, which is in homage to Deaton (1989).

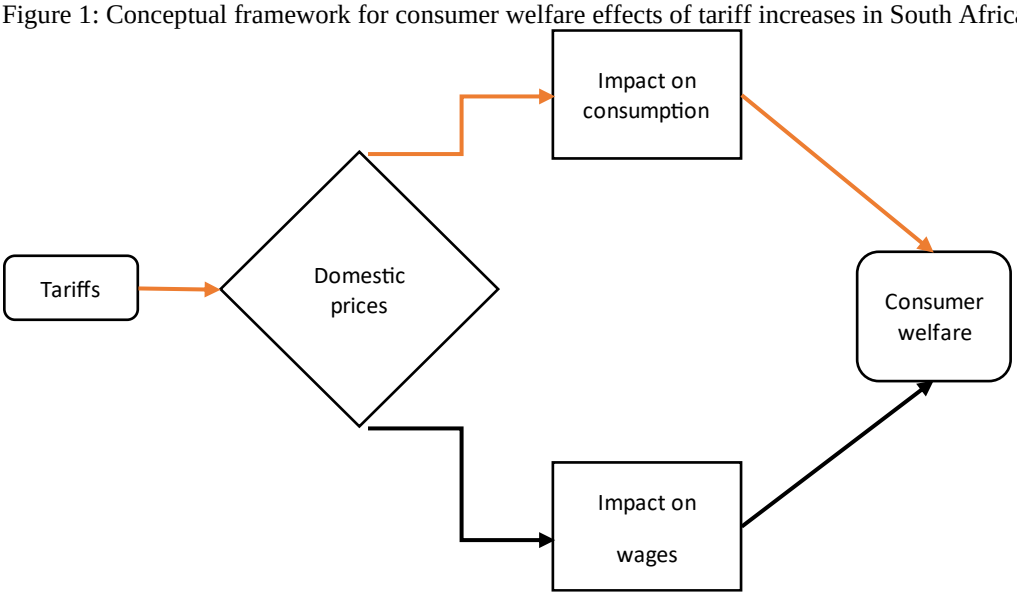
We note that the Deaton framework adopted in this paper has some limitations[7], which we will present in four parts. Firstly, according to our data, we note that consumption of chicken in lower deciles is rather low. Furthermore, most households in rural areas tend to consume less chicken given the subsistence farming nature of the rural environment in South Africa. Third,

[6] Singh, Squire & Strauss (1986) treat households as both producers and consumers of goods and then analyse the effects of tariffs on the household. They introduced agriculture household approach and argued that it is important to incorporate the duality of households in the model.

NIDS is a household panel, therefore data report omits chicken consumption from fast food outlets. Lastly, from Eq. (5), the first term of the right-hand side that accounts for wages from labour in the chicken industry is not accounted for. These limitations may dampen the effect of trade policy on households that consume chicken as well as selling chicken for profit.

We have presented the economic theory in two parts. We first focus on how tariffs affect domestic prices; secondly, how the impact on domestic prices affects consumption and, ultimately, the household's welfare. Guided by the theory, we present Figure 1, a conceptual framework for the consumer welfare effects of tariff increases in South Africa. We are primarily interested in the orange channels concerned with the degree of pass-through, varying from no pass-through to complete pass-through. Then, depending on the impact on prices, this will affect consumption, affecting thereby welfare.

Figure 1: Conceptual framework for consumer welfare effects of tariff increases in South Africa



Source: Author's compilation

The analysis is done in a two-stage setting, where the rest of the paper will look at pass-through and welfare effects separately. In the next section, we discuss the empirical literature, beginning with a subsection on tariff pass-through and ending with a subsection discussing welfare literature.

4. Literature review

The link between trade policies and prices is a complex phenomenon. The question guiding the discussion in this section is how trade policy affects prices and welfare. First, we present a review of the literature on how trade policies affect prices and, second, the implications of price changes on household welfare.

4.1.Pass-through Literature

This subsection discusses the extent to which domestic prices are affected by a change in trade policy. The bulk of empirical literature on tariff pass-through is presented in the context of trade liberalisation (Porto, 2006; Nicita, 2009; Han et al., 2016; Baek et al., 2021). Although,

some studies have focused on an increase in protectionist trade policy (Flaaen, Hortacsu & Tintelnot, 2020; Cavallo et al., 2021; Ma, Ning & Xu, 2021).

More specifically, we broadly categorise the literature into four strands as follows: firstly, imperfect competition in distribution and retail where demand, costs and institutional settings in each industry affect the pass-through (Pompelli & Pick, 1990; Feenstra, 1995; Rezitis & Brown, 1999; Taylor, 2000). Secondly, domestic factors such as infrastructure and spatial layout of countries constitute the way trade policy changes affect local markets (Porto, 2006; Nicita, 2009; Marchand, 2012; Atkin & Donaldson, 2015). Third, retail conditions focusing on indirect effects in downstream prices, non-traded goods prices, local producer markups, and retailer margins on local substitutes are presented as the leading cause of pass-through (Han et al., 2016; Cole & Eckel, 2018; Flaaen, Hortacsu & Tintelnot, 2020; Baek et al., 2021; Hayakawa, Ito & Mukunoki, 2022). Finally, pass-through depends on the incidence of tariffs. Therefore, if foreign firms have market power, especially on domestic imports of a country, the tariff pass-through is higher (Kreinin, 1961; Cavallo et al., 2021; Ma, Ning & Xu, 2021).

After that, we focus on the literature on pass-through in South Africa. Additionally, we close off the chapter with a focus on exchange rates. Despite exchange rates being beyond the scope of our analysis, we note that they play a crucial role in international trade. However, despite South Africa having one of the most volatile exchange rates in emerging markets, most authors agree that due to the monetary credibility and independence of the SARB, exchange rate pass-through has become much lower over the years (Parsley, 2012; Aron et al., 2014; Kabundi & Mbelu, 2018; Kabundi & Mlachila, 2019). We now delve into our four broad categories and expand the discussion.

Firstly, we focus on imperfect competition in distribution and retail. For example, Feenstra (1989) builds a pass-through framework by focusing on Japanese cars, trucks, and motorcycles. The study demonstrates the indistinguishable effects of both the exchange rate and tariffs on consumer prices in the domestic market. The analysis is set in an oligopolistic foreign market, i.e., the Japanese market, which had a few large manufacturers dominating the market at the time. Feenstra (1989) theorises the domestic price of imported goods to be a function of tariffs, exchange rates, foreign costs, domestic demand, and domestic costs. Therefore, we adopt a model like Feenstra's (1989) for the first stage, except for exchange rates. Feenstra (1989) obtained pricing data from the U.S. Bureau of the Census and the U.S. Department of Commerce to estimate the pass-through. They applied the data to an Event study specification with Difference-in-Difference (DiD) routes, finding that pass-through of both tariffs are symmetric and range from around 50 % to unity. While Feenstra (1989) found high tariff pass-through, the finding is explained by demand, cost and institutional settings in each industry being examined.

Additionally, Taylor (2000) expands the argument by incorporating inflation. He argues that low inflationary environments create friction that reduces pass-through to domestic prices. Additionally, Feenstra's (1989) framework can be expanded to include domestic inflation levels as he notes the importance of the domestic market conditions.

Rezitis and Brown (1999) also analyse the degree to which import tariffs and foreign exchange rates are passed on to consumers in the United States of America. They focus on oriental tobacco from Greece, while Pompelli and Pick (1990) focus on identical products from Brazil. Oriental tobacco is used to manufacture final products like cigarettes, where it is blended to

add flavour and aroma. Therefore, oriental tobacco constitutes a percentage of the cost. (Pompelli & Pick, 1990; Rezitis & Brown, 1999) examine the impact of tobacco tariffs under market imperfections, and Rezitis and Brown (1999) go further by testing the Law of One Price (LOP). They argue that tariffs and exchange rates affect the final price by increasing the cost of manufacturing raw materials, translating into the product's final cost. Both Pompelli and Pick (1990) and Rezitis and Brown (1999) build a pass-through model similar to Feenstra (1989), with Rezitis and Brown (1999) using annual data on US import prices of tobacco from the US Department of Agriculture Economic Research Service (USDA-ERS) and Pompelli and Pick (1990) using annual data on US import prices of tobacco from the US Bureau of the Census US imports for Consumption and General report and IMF. Pompelli and Pick (1990) find a tariff pass-through of about 0.549, and Rezitis and Brown (1999) also find a positive pass-through of 0.185.

Secondly, domestic factors such as infrastructure and spatial layout of countries influence the way trade policy changes affect local markets. For example, Porto (2006) introduces the most influential paper on the welfare effects of trade, focusing on trade and poverty by expanding on literature (Singh, Squire & Strauss, 1986; Deaton, 1989, 1997). Porto (2006) presents pioneering work by incorporating both impacts on consumption and wages and simultaneously analysing them. Additionally, Porto (2006) analyses the impacts of a change in trade policy between tradable sectors, such as agriculture, manufacturing, and mining, and non-tradable sectors, such as infrastructure and retail. The impacts happen in two stages: first, domestic goods' price change. Secondly, a change in domestic prices affects the households as both consumers and wage earners. Porto (2006) finds that middle-income and poor households in Argentina have benefited from Mercosur's liberalisation[8].

Nicita (2009) takes the framework further by estimating a spatial relationship between the rural-urban divide. Nicita (2009) analyses the distributive effects of tariff liberalisation in Mexico during 1990–2000. Tariff liberalisation affects households as consumers of products and services and income earners. Nicita (2009) introduces a new angle by focusing on how trade reform affects local markets. The analysis is conducted in three parts; firstly, the channel by which trade policies affect prices; secondly, how income changes when prices change, and finally, the relationship of prices and income to household welfare.

The first estimate is conducted using a pass-through model like Feenstra's (1989), then estimating the way wages respond to prices, and finally, evaluating household welfare. In the first stage, he finds a pass-through of over a third for agriculture and just under a third for manufacturers. However, he does not find regional differences in pass-throughs within Mexico, but as a national blanket pass-through. In the second stage, he finds a positive relationship between agricultural prices and wages and a negative correlation between manufacturers' prices and wages.

Similarly, Marchand (2012) calculates the welfare effects of trade liberalisation in India by considering the influence on commodities prices and wages. Marchand (2012) finds that in rural areas, the pass-through coefficient is estimated to be between 33% and 49%. In contrast,

[8] Mercosur is an economic and political bloc consisting of Argentina, Brazil, Paraguay, and Uruguay.

tariff reductions affect urban customers more than rural consumers, with a pass-through elasticity ranging from 64% to 68%. Extension considers the spatial trade costs affecting rural areas and their distance from international markets. Further on spatial pass-through, Atkin and Donaldson (2015) find that when pass-through rates are used to correct spatial price gaps for spatial variation in mark-ups, the impact on distance doubles. Notably, Nigeria and Ethiopia have about five times the intra-trade costs compared to the US. This means that the more remote rural areas are, the higher the pay for goods relative to those closer to the international markets.

Third, we discuss retail conditions with a focus on indirect effects in downstream prices, non-traded goods prices, local producer markups, and retailer margins on local substitutes. For example, Han et al. (2016) examine the channel through which tariffs are passed on to consumers and how trade liberalisation has affected income distribution in China's major cities. They model pass-through under our third condition, imperfect competition in distribution and retail. Han et al. (2016) claim tariffs are passed on to consumers through four transmissions, extending the empirical framework by allowing pass-through elasticity to vary among cities with different privatisation levels. They find that the transmission of tariff reduction depends significantly on the relative size of the private sector at the city level. Additionally, the pass-through tariff rate for import prices is higher than the pass-through tariff rate for consumer prices, indicating the potential importance of the domestic market structure. In contrast, the growing role of the private sector in distribution drives down retail markups and distribution costs for imported goods, allowing for more price flexibility. The size of the private sector heavily influences the transmission of tariff reductions at the city level. The pass-through tariff rate into import prices is more significant than consumer prices, indicating the importance of the domestic market structure. Expanding private sector distribution reduces retail markups and distribution costs for imported goods, allowing for more significant price flexibility. Low-income households benefit more from tariff reductions' consumption effect than high-income households.

Also, Cole and Eckel (2018) extend the theoretical framework by looking at domestic markets. They focus on the behaviour of retailers within the various market structures they engage in. They focus on indirect pass-through by analysing prices of goods that are not facing a trade policy change. They show that price changes due to trade policy shock can be mitigated through retailers changing the markups. Notably, retailers absorb the trade shock by lowering markups on the lowest-priced products while increasing the prices of better-selling products.

Flaaen, Hortacsu and Tintelnot (2020) investigate the impact of the 2018 US tariffs with an extension to 2012 and 2016 antidumping duties against China and South Korea. They focus on a single final manufacturer good, washing machines. Analysing washing machines introduces another spectrum, where tariff changes can indirectly raise consumer prices through their impact on the prices of other goods (Flaaen, Hortacsu and Tintelnot, 2020). They find that following 2018 safeguard tariffs, the US gained jobs at the expense of higher consumer prices and high tariff pass-through to retail prices for washing machines. Interestingly, the higher consumer prices were not just on the tariffed good, the washing machine. The higher prices were also caused by domestic retailers increasing the price of complementary dryers. Flaaen, Hortacsu and Tintelnot (2020) claim that this is because a pair of a washer and dryer were sold at similar prices to each other. Furthermore, with higher border prices and consumer prices, the

government collected revenue that offset the consumer costs by a small margin However, higher prices of washing machines and dryers may cause less spending on other goods, causing a contraction of jobs in the industries responsible for the goods.

Furthermore, Baek et al. (2021) extend the literature on imperfect competition in distribution and retail by analysing the extent of tariff pass-through to consumer goods, particularly how each value chain member reacts to a 1 % reduction in tariffs. More specifically, they are interested in the way wholesalers of the goods respond to a reduction in tariff change regarding their markup behaviour in Japan. Therefore, they are interested in how tariff reductions affect firm pricing behaviour. They argue that it is an important area to study as wholesalers are essential to the value chain. According to Ordinary Least Squares (OLS) results, wholesalers seem to have higher markups. However, the IV results indicate a margin increase due to a tariff decrease., Additionally, Hayakawa, Ito and Mukunoki (2022) investigate the pass-through of tariffs on prices of traded goods worldwide, focusing on the characteristics and their alterations on import prices. The adjustment of import prices is argued to follow a Metzler or Lerner paradox. However, most literature finds that tariff elimination results in a Lerner-like condition. They find that reducing tariffs reduces product quality and increases quality-adjusted prices. They argue that the firms' behaviour regarding markups and sorting products are the main reasons for the results. Conversely, they find that lower tariffs reduce the varieties of goods sold.

Finally, pass-through depends on the incidence of tariffs. The main interest is how foreign exporters change their pricing behaviour. The interest is in import competition amongst exporters with market power. For example, Kreinin (1961) assesses pass-through tariff rates that result from the General Agreement on Tariffs and Trade (GATT). This tariff reduction would not be fully passed to domestic consumers as foreign suppliers capture some of the rent through higher prices. Kreinin's (1961) framework indicates that foreign suppliers also find little room to hike prices given a tariff reduction. Furthermore, Irwin (2014) investigates the incidence of sugar duties by analysing the reaction of sugar's domestic and import prices to changes in tariffs, analogous to the way the public finance literature analyses the effects of sales taxes on consumer prices in the US. The results suggest a disproportionality between the domestic and international effects of tariff increases. While a rise in tariffs has two effects, higher domestic and lower import prices, a decrease in tariffs only lowers the domestic price.

Also, investigating the impact of tariffs during the trade war between the U.S. and China, Ma, Ning and Xu (2021) introduce another side of the spectrum by analysing the impact of the Chinese retaliatory tariffs on U.S. goods. They use the China customs data and China's MFN tariff schedule to analyse the trade and price effects of China's retaliatory tariffs. They adopt an event study specification with difference-in-difference roots and desirable properties such as capturing offsetting behaviours like hoarding goods before a tariff rise, similar to Feenstra (1989). They find that U.S. exporters do not change the prices before the tariffs despite changes in quantities and prices experienced by the importers. Secondly, they observe that different goods, consumer and capital goods experience a complete pass-through, and intermediate goods experience more than a complete pass-through of tariffs. Furthermore, trade diversion kicks in as China turns to various countries, including Brazil, South Africa, and Germany, for soybeans, metal and wood, respectively. Finally, taking the impact on domestic prices, they

compute deadweight loss. China realises a deadweight loss of about $ 15 billion compared to $82 billion of the US (Amiti, Redding & Weinstein, 2019, 2020; Ma, Ning & Xu, 2021).

Moreover, Cavallo et al. (2021) investigate the impact of tariffs during the trade war between the U.S. and China. They analyse the price impact of the US tariffs on US and Chinese importers and the impact on consumers. They also compute the tariff and real exchange rate pass-through to domestic retail prices. They find that Chinese exporters lower their prices by a small margin combined with a weaker Renminbi. However, the U.S. importer bores close to 94% of the tariff. On the exporter's side, Cavallo et al. (2021) find an opposing result to Ma, Ning and Xu (2021), who claim that US exporter did not lower their prices. Cavallo et al. (2021) find that US exporters significantly lowered their prices in response to retaliatory tariffs, implying that US exporters carry the burden of higher tariffs. They argue that homogeneous goods made up most exports, so they lowered their prices in response. Additionally, Cavallo et al. (2021) find a complete pass-through for some goods, such as washing machines. However, with other goods, they found pass-through incomplete and somewhat lagging in nature. Like Ma, Ning and Xu (2021), Cavallo et al. (2021) also find trade diversion in the case of the US and bulk stocking before the tariff increase.

Moving to literature on South Africa, empirical work on tariff pass-through is scarce. However, Edwards et al. (2022) provide a rich base on tariff pass-through. They investigate the consumer price effects of specific trade policy restrictions in South Africa in two steps. The first step is the response in the price of goods facing tariffs relative to similar goods under the same classification and the behaviour of the price of the same good from a country facing tariffs compared to a country without tariffs. Edwards et al. (2022) find that exporters from preferential trade partners not facing tariffs do not change their prices. This means that the tariff burden is entirely borne by South African importers and consumers in higher landed prices. Additionally, the entire burden of tariffs may not be entirely passed onto consumers as wholesaler and retailer markups and margins may alter. Moreover, transport costs and domestic producer behaviours may see the absorption of part of the tariff.

In the second step, Edwards et al. (2022) compute an aggregate pass-through of change in trade policy to domestic retail prices using controls such as pork and maize. Using the pork control, they find a pass-through tariff rate of 0.477, translating into a 4.8% increase in domestic retail prices. We build our paper upon Edwards et al. (2022) and expand the analysis to capture two broad spatial units, provincial and provincial-urban-rural.

Additionally, using partial equilibrium analysis, Davids, Meyer and Louw (2015) critically assess the potential impact of increased tariffs on South African broiler farmers and chicken meat consumers. They simulate three scenarios, and the results show the difference in outcomes when EU imports are included in the analysis. They find frozen chicken prices will increase by 2.6%, whereas producer prices will double. Moreover, Blignaut, Farrell and Rangasamy (2006) study the contribution of imports to the CPIX. They investigate how import volumes of final goods change with a change in economic conditions, such as the depreciation of the foreign exchange rate, and how the change in prices of input goods affects final goods and services. Using CPI data from Statssa , they find that in the CPI, which is of interest to this study, the

weight of imports is about 14%. Therefore, the CPI is largely influenced by domestic conditions.

We now take a detour and delve into exchange rate pass-through, focusing on South Africa. South Africa has one of the most volatile exchange rates in emerging markets (Parsley, 2012; Aron et al., 2014; Kabundi & Mbelu, 2018; Kabundi & Mlachila, 2019). It is worth exploring and presenting a summary of the literature. Parsley (2012) assesses the exchange rate pass-through to final consumer goods in South Africa by focusing on a group of individual final goods and services instead of price indices. He finds that pass-through to be around 27% for goods and a much higher pass-through for services. Aron et al. (2014) investigates the behaviour of import prices in response to movement in the exchange rates. The investigation is carried out by analysing indexes. He finds that after one year, the magnitude of pass-through is roughly 50%. Additionally, he finds that pass-through declines with volatility, which is primarily attributed to the change in monetary policy by the SARB. Overall, pass-through ranges between 20% and 33%, depending on the model. Kabundi and Mbelu (2018) investigate why the rand's depreciation has not translated to higher inflation. Interestingly they find that the pass-through dropped sharply around the Global Financial Crisis. Also, Kabundi & Mbelu (2018) argue that a lower pass-through may be due to a lack of competition in the domestic market, with foreign firms passing less pass-through and increasing markups. Kabundi and Mlachila (2019) investigate significant causes of the exchange rate pass-through in South Africa by dissecting the credibility of the SARB as it increased communication, independence, and transparency after a policy shift to inflation targeting. They find that the independence of the SARB is one of the most important factors that contributed to its credibility, making South Africa more resilient to exchange rate pass-through. Other factors such as transparency, communication and interest rate stability also yielded the resilience to exchange rate pass-through.

The literature can be summarised into four broad categories: imperfect competition in distribution and retail, organisation of the domestic market, retail conditions and import competition amongst exporters. Our focus is on imperfect competition in distribution and retail. We extend the empirical literature by focusing on a much more disaggregated[9] spatial pass-through. We will then use the pass-through to estimate impact on consumption, ultimately affecting welfare. In the following subsection, we focus on welfare literature.

4.2.Distribution Literature

Tariff pass-through to domestic prices has two effects. Firstly, it affects the wages of the goods sectors where the pass-through is experienced. Secondly, it affects consumers through higher

[9] South Africa has 9 provinces all with a rural-urban setting, thereby giving 18 different spatial elements. We firstly estimate regional pass-through, then merge the results with household data. Deaton (1997) warns that urban prices may be collected with greater frequency than rural areas, leaving few data points for estimation. Furthermore, later in the study, we analyse a change in price level, which Deaton (1997) argues captures both the choice of quantity and quality. This is opposed to unit prices, which are simply expenditures divided by quantities despite the difference in quality. For example, we combine total expenditure on chicken, which includes lower quality items such as offal and higher quality items such as breasts, thereby mixing the quality. Our pricing data does not suffer from this conundrum while our household survey data, NIDS does suffer from this conundrum as it aggregates expenditure on chicken.

prices in the domestic retail sector. This section aims to discuss literature that focuses on the consumption effect mainly. However, we also discuss literature that extends to include the effect on wages for completeness.

Firstly, we begin by looking at literature focusing on the household agricultural model where households are both consumers and wage earners. Taylor, Naude and Jesurun-Clements (2010) build an Accounting Matrix (SAM) for each rural household group to evaluate the consequences of abolishing the Dominican Republic-Central America Free Trade Agreement (CAFTA) agricultural tariffs on the four countries' rural economies. Consistent with the theory, they find that lower food costs which affect welfare through the consumption channel would moderate the negative effect of lower earnings on rural welfare. While their findings are crucial to our analysis, they focus only on agricultural and rural households. Faber (2014) extends the analysis by investigating how lower prices induced by lower tariffs affect product quality and the distributional effect on households across wages. The analysis departs from the traditional Stolper-Samuelson approach as they consider household indexes, intermediary goods, and investigation within the sector instead of across sectors. Faber (2014) uses several datasets such as ENIGH[10], used by Nicita (2009), and tariff data. He finds that access to lower-priced intermediate goods reduces the price of high-quality final goods. The finding introduces a new dimension of analysis of distributional effects where the choice of quality products differs across the income distribution and therefore affects purchasing choices, and the extent to which tariffs affect consumers. Since high-quality products will be cheaper, more affluent households purchase them, increasing income inequality.

Nicita, Olarreaga and Porto (2014) investigate whether the present protectionist trade policy of Sub-Saharan African (SSA) nations, including tariffs, reflects a pro-poor bias. They propose extending a simple framework for agricultural household production models (Artuc 2021, Artuc Porto and Rijkers, (2021). The extension of the agricultural household framework captures the change in real household income that will be decomposed into effects on consumption, production, and labour income. Furthermore, they assume that the pass-through rate for low-income rural families is 0.3, and for the poor, generally 0.4. However, they assume the pass-through for high-income urban households is 0.7 and for the rich, generally 0.6. They hypothesise that removing protectionist mechanisms transfers money from affluent to low-income families. Pro-poor bias indicators show that SSA's trade policies favour the poor. Protectionism raises agricultural prices for items supplied by African families, outweighing the impacts of higher consumer prices. When the consumption channel is considered, the pro-poor index shows inconsistencies. Burkina Faso and the Gambia gain from the consumption impact while in the rest of the countries, the wealthy, gain (Nicita, Olarreaga & Porto, 2014). Trade liberalisation and the absence of urban-rural inequalities are even more pro-rich due to the expected pass-through heterogeneity, which forecasts more modest consequences for low-income families than affluent households.

Focusing on measuring import shares across the income distribution, Jaravel and Borusyak (2021) link datasets on consumption and production. Specifically, they link expenditure microdata on consumer and motor vehicles merged with restricted access customs data. They set up their model like the agricultural household model. They employ a general equilibrium framework. Controversially, they show that the consumption channel of trade in the United

[10] National survey of household income and expenditure (ENIGH) in Mexico

States is close to distributionally impartial. At the same time, the wage effect is strong among income earners who start with like income. Additionally, they find the effect on overall inequality to be small.

In the most recent agriculture household model, Artuc (2021) presents the Household Impacts of Tariffs (HIT) data to analyse how tariff changes affect earnings throughout the income distribution. The Dataset harmonises representative household surveys with United Nations Conference on Trade and Development (UNCTAD) import tariff data for 54 developing countries. They follow Deaton (1989) in constructing a framework where income share from the sale of a good is subtracted from consumption to estimate net positions.

From the South African point of view, the net positions are as follows: On the one hand, lower food costs increase consumption, resulting in a 1.75 percentage point increase in real income, but tariff cuts cause income losses, amounting to 0.04 percentage points on average (Artuc, 2021). More specifically, in the case of poultry, they find that South Africa gains on consumption effect by a factor of about 0.09 while it loses on income effect by a factor of about 0.07. The same results hold in Artuc, Porto and Rijkers (2019). However, the gains from consumption are much larger and losses from income much smaller. Therefore, South Africa will gain on consumption from the liberalisation of tariffs. Drawing on the same conclusion they make for the developed world, gains from trade in South Africa result from lower prices and an increase in consumption, which exceeds the revenue losses caused by tariff cuts. The results represented by Artuc, Porto and Rijkers (2021) form a cornerstone for understanding household tariffs, specifically for South Africa as our country of interest, noting that South Africa is likely to have a more substantial consumption effect.

Secondly, some authors have primarily investigated the consumption channel effects on welfare. The reasons vary. However, the common denominator is data availability. Nevertheless, even without the availability of data to analyse wages, robust methodologies for analysing the consumption channel exist. For example, Fajgelbaum and Khandelwal (2016) devise a methodology to assess the dispersion of welfare shifts among diverse consumers via the spending channel for various nations and periods. A non-homothetic AIDS demand structure like Musyoka, Kavoi, and Omiti (2014) is used to solve a gravity equation to determine the influence of trade on the distribution of welfare. Changes may be identified through counterfactual changes in costs. They show that the poor are likely to benefit from trade as low-income people spend their money on goods and services that are more widely traded.

Returning to the US-China trade war, as discussed in the previous sub-section, we introduce several papers that primarily focus on the consumption effect. For example, Amiti, Redding and Weinstein (2019) compute deadweight loss associated with tariffs. They show that unit values typically increase by 10% to 30% due to the tariffs, which are equivalent in scale to the duties imposed, suggesting that tariffs are passed on almost immediately to US importers and consumers. Furthermore, a 10% tariff hike causes a 1% increase in domestic producer prices over the following 12 months in an industry where foreign businesses account for 25% of total domestic sales. Consumers and importers in America bore the total tariff incidence, showing evidence of foreign exporters not taking price cuts on goods sold. (Amiti, Redding & Weinstein, 2019, 2020). In a sequel to their study, Amiti, Redding and Weinstein (2020) find that the tariffs impact sectorial behaviour, with some exporters lowering the prices of goods.

They also find that import elasticity doubles over a year, showing that firms are less flexible in finding short-term alternative suppliers. This indicates that tariff pass-through over time is incomplete.

On the same topic of the US-China trade war, Waugh (2019) investigates the expenditure channel using auto sales data, an approach like Jaravel and Borusyak (2021), and employs a difference-in-difference analysis. Waugh (2019) finds that retaliatory tariffs cause a fall in consumption. Further, policy changes and jobs have a well-established relationship: a fall in consumption sees a fall in employment, further supporting Flaaen, Hortacsu and Tintelnot's (2020) findings. Additionally, changes in Chinese trade policy led to welfare losses, a finding that Fajgelbaum et al. (2020) also realise. The difference between Waugh (2019) and Fajgelbaum et al. (2020) is that Fajgelbaum et al. (2020) investigate the short-run impact of the 2018 tariffs on the US economy by focusing on quantity and price impacts. They find declines in imports in terms of varieties of targeted products and targeted sectors. In contrast, exports also decline due to retaliatory tariffs due to higher prices. The decline in imports causes an annual loss of about $51 billion. Regionally, the sectors protected politically are competitive, while the retaliatory tariffs impacted Republican counties.

Thirdly, we now turn our focus to the inequality impacts of trade. For example, Artuc, Porto and Rijkers (2019) use survey data on 54 developing countries to analyse the compromise of inequality for income gains. They find that in South Africa, manufacturing tariffs are about 17%, while in agriculture they are around 7%. Expenditure shares for staple agriculture goods in South Africa are about 32%, and manufactured goods have the same percentage. In terms of income, they find that wage income is the most important source of household income. At the same time, other income sources also provide an essential income. South Africa, therefore, exhibits concentrated income in wages as opposed to agriculture. However, this may mask the fact that some income earners in the agriculture sector report wages and therefore have an opposing effect. The main conclusion is that tariff liberalisation would explicitly contribute to social welfare.

Distributional effects can be extended to analysing impacts on household and individual characteristics such as gender. For example, Artuc, Porto, and Rijkers, (2021) consider the gendered effects of tariff liberalisation on inequality. They follow Artuc, Porto and Rijkers (2021) in empirical methodology with a distinction on income, adding profits from household enterprises to income from agricultural sales and introducing an anti-female bias index. In South Africa, protectionist tariffs result in a 0.5 % anti-female bias, implying that female-headed families lose more economically than male-headed households. Additionally, the intrinsic differences in the income sources and spending habits of male and female-led households also determine the degree to which tariffs affect them. Furthering their argument, Artuc, Porto, and Rijkers, (2021) note that income bias drives anti-female bias as fewer women work in agriculture and they therefore stand to benefit less from protectionist tariffs. Regarding consumption, the same intuition holds, as protectionist policies increase domestic prices and the cost of living for female-led households more than male households.

So far, we have discussed international literature on the distributional effects of tariffs, and we now turn to South African literature. Jooste, Van Schalkwyk and Von Lampe (2001) champion the analysis of the welfare consequences of liberalisation in South Africa's livestock industry, particularly in meat products, followed by Oyewumi et al. (2007). Jooste, Van Schalkwyk and

Von Lampe (2001) use a spatial partial equilibrium (SPE) model, while Oyewumi et al. (2007) use a partial equilibrium comparative static model and estimate four policy scenarios. Oyewumi et al. (2007) utilise data on domestic product pricing from the annual reports of the South African Poultry Association and the South African Meat Industry Company (SAMIC), while Jooste, Van Schalkwyk & Von Lampe (2001) use data on herd sizes that were obtained from the National Department of Agriculture (NDA). They both use the data and model, the producer's surplus (PS) and consumer surplus (CS). Also, Oyewumi et al. (2007) use the equivalent variation (EV) approach to quantify the income change required to maintain the same utility level at simulated prices as it did at original prices. Oyewumi et al. (2007) find an equivalent rise of 0.04% in real GDP or 0.06% in real disposable income in the first scenario, a 33% quota expansion. The welfare for farmers will be reduced by R77.6 million, with KwaZulu-Natal, the Eastern Cape, and the Free State impacted the most as they make up most of South Africa's livestock-producing provinces. A reduction in MFN tariffs of 33% in the second scenario would result in positive welfare effects for consumers and producers of 0.10% in real GDP or 0.16% in real disposable income (Oyewumi et al., 2007). On the other hand, in the earlier study, Jooste, Van Schalkwyk and Von Lampe (2001) find a reduction in tariffs will result in a 0.49% increase in the real gross national income at the expense of producer welfare amounts to 2.71% of real gross farm income, and 10.72% of real net farm income. A comparative static analysis, lack of regional disparities is ignored, a perfect pass-through is assumed, and only pricing data is used restricts the results.

Pauw, Edwards and Leibbrandt (2006) analyse the effects of trade liberalisation on individuals by addressing the impact on jobs and income. They also access the jobs created due to exports for a holistic analysis of the question. They used the Income and Expenditure Survey (IES) and the Labour Force Survey (LFS) of 2000. They find that the magnitude of liberalisation's impact on low-income households is mostly tied to the manufacturing sector. Thereby, the impact of trade liberalisation is small. Additionally, a lead cause of poor households' poverty is inadequate access to paying jobs due to distance and educational constraints.

Moreover, the agricultural sector makes up the bulk of the household income of poor households thereby highlighting the importance of the agricultural sector in poor households. Furthering the debate, Thurlow (2006b) finds that technological changes due to trade accelerate economic growth. However, Thurlow (2006b) notes that trade increases income inequality, mostly benefiting wealthier households. Daniels and Edwards (2007) also find wealthier households benefiting from trade liberalisation. However, they find an inverse relationship over time, where poor households benefited more from trade liberalisation. Also, Daniels & Edwards (2007) found that reduced prices arising from trade liberalisation benefited consumers.

Additionally, Thurlow (2006a) simulates the gendered effect of trade liberalisation on unemployment and poverty in South Africa. They use Customs and Excise data from Edwards (2005), the South African Reserve Bank (SARB), and Trade & Industrial Policy Strategies (TIPS). He finds that trade liberalisation on women resulted in job losses and migration to lower-paying sectors for unskilled women. This result implies that their consumption bundles were directly affected due to liberalisation (Thurlow, 2006; Artuc, Porto, and Rijkers, 2021). At the same time, the effects were favourable and similar at the upper end of the income distribution of male and female-headed families. Finally, Edwards et al. (2022) estimate tariff pass-through for South Africa to be 0.477 for frozen chicken and use the pass-through tariff

coefficient. Using the pass-through, they simulated households' average expenditure and found a disproportionate effect of chicken duties on poorer households.

In a nutshell, we have discussed literature on the welfare effects of tariffs that are transmitted via prices. The literature has demonstrated that both consumers and wage earners are affected by tariffs through prices. The degree to which they are affected will depend on the pass-through of tariffs to domestic prices. In the next section, we estimate the pass-through to domestic prices.

5. Estimating pass-through

Considering the theory and empirical literature, we estimate the pass-through rates across geographical locations in South Africa in this section. We begin by presenting our empirical method, specification and how we carry out the estimation. We then introduce the data and some summary statistics covering the spatial element. Finally, we present the estimates and discuss the findings.

5.1.Empirical approach

We begin by establishing a relationship between tariff shocks and domestic prices. The effect of tariffs on domestic prices may not be uniform as prices in different locations may respond differently to a change in trade policy. The literature has noted that border prices may be much more sensitive than retail prices to tariffs as the tariffs operate in markets that transfer trade policy changes to household welfare (Nicita, 2009 ; Marchand, 2012). Our approach is similar to Marchand (2012) and Feenstra (1989, 1995) as applied by Edwards et al. (2022), where we analyse a log-linear form of a pass-through model with DiD roots. We expand on Edwards et al. (2022) by introducing a spatial element to account for the differences in pass-through by provinces in South Africa. Our base specification is presented below.

$$p^{*}_{gktr} = \alpha_{gkt} + \beta_1 ln(1+\tau_{gt}) + \beta_2 \ln(p_{gt}) + \pi_{rt} + \omega_{kt} + \gamma ln(1+\tau_{gt}) * Prov + \varepsilon_{gktr} \quad (6)$$

where p^{*}_{gktr} is log price of good g in outlet k at time t and region r while p_{gt} is the price of good g on international markets. Introducing of price of good g on international markets is to capture a potential relationship of domestic prices and international price. Edwards et al. (2022) note a relationship of the domestic prices with international prices and highlight the volatility of international prices. Failure to include international prices would lead to a potential variable omission bias. . $1+\tau$ is the Ad valorem equivalent tariff rate which measures the percentage change in the import price of the product in response to a 1% change in Ad valorem equivalent tariff . We also include product-outlet α_{gkt}, region-by-time π_{rt}, and retail-time fixed effects ω_{kt} to control for product quality, inflation differentials and retail-specific trends, respectively. We are primarily interested in γ which captures the spatial effect of trade costs on the tariff pass-through. The pass-through is complete if $\beta_1 = 1$ and incomplete if $\beta_1 < 1$. If spatial trade costs have an identical effect across all provinces, then $\gamma = 0$. On the other hand, if local prices vary depending on provinces, then $\gamma \neq 0$. Additionally, we use contrrols products to address potential omit variable bias. The reference products include pork, fresh chicken, and maize.

The rationale behind the use of pork is that pork had no change in import duties. Additionally, pork price and chicken price trends did not vary greatly pre-2013. Fresh chicken presents itself as a valuable control as South Africa does not import fresh chicken. Additionally, fresh chicken is a perfect substitute for frozen chicken. However, in the case of maize, it is a key input in the poultry industry and maize prices are captured for both rural and urban for most of the period under study. We interact provinces with their respective spatial pass-through element γ to capture the impact the Ad valorem equivalent tariff on the 9 provinces. Our base variable in the interaction term is the Eastern Cape as it houses a port and receives about 3% of imports only. The characteristics of the Eastern Cape therefore make it desirable province to set as our base in the interaction term. We go a step further for completeness by including a more disaggregated analysis. Here, we further disaggregate the provincial analysis to each province's urban and rural landscape. Therefore, in this case, our base specification is given as follows:

$$p^*_{gktr} = \alpha_{gkt} + \varphi_1 ln(1+\tau_{gt}) + \varphi_2 \ln(p_{gt}) + \pi_{rt} + \omega_{kt} + \delta ln(1+\tau_{gt}) * Geo + \varepsilon_{gktr} \quad (7)$$

Here we introduce δ, which captures the urban-rural pass-through at the provincial level instead of the national level. We specifically use maize prices as a control as opposed to pork prices. This is because rural pork prices are collected from a much later date. Using our pass-through specifications, we compute an ordinary least square (OLS), analysing the price level and the impacts of trade policy and various controls. Like Han et al. (2016), we use Eq. 6 and limit our sample to focus on urban households and present the following specification :

$$p^*_{gktr} = \alpha_{gkt} + \varrho_1 ln(1+\tau_{gt}) + \varrho_2 \ln(p_{gt}) + \pi_{rt} + \omega_{kt} + \zeta ln(1+\tau_{gt}) * Prov_{urban} + \varepsilon_{gktr} \quad (8)$$

where ζ captures the provincial urban pass-through. We also use pork as control, as in Eq. (6).

We have presented three different specifications, the first focusing on provincial pass-through across all provinces in South Africa, the second focusing on the urban-rural divide across all provinces and the last, in which we limit our sample to urban areas across provinces. We use the specifications to analyse the data in the following subsection.

5.2.Data

This study uses SAFEX yellow maize price data from Grain SA, tariff data from SARS and consumer price indices (CPI) as used in Edwards et al. (2022). The CPI data tracks prices monthly from 2010:M1 to 2022:M4, giving 147 time periods. The prices are tracked at a retail level and from different retailer brands[11]. The data covers the nine provinces and three spatial elements (urban, other, and rural), giving 27 geographical areas. The spatial element and disaggregation to store level allow us to control for various effects, such as retail trends that may bias our results. Therefore, it allows us to shape the data into a panel set by tracking the same product in the exact location, sold by the same outlet over an extended period. Table 2 presents summary statistics of the median price of various poultry products by province. The

[11] For example, Spar, Woolworths, Checkers etc.

price variation is not just by province, but also depends on the type of products. For example, frozen non-IQF[12] chicken is the cheapest in the Western Cape and most expensive in Free State.

Table 2: Summary statistics of chicken prices by provinces

	Eastern Cape	Free State	Gauteng	KwaZulu-Natal	Limpopo	Mpumalanga	North West	Northern Cape	Western Cape
Chicken giblets	41.99	37.32	39.99	25.98	39.99	34.99	32.99		20
Fresh chicken portions	59.99	59.99	59.99	56.99	53.99	59.99	62.99	59.99	65.99
Fresh whole chicken	49.99	45.49	44.6	39.99	45.99	42.99	41.99	45.99	49.99
Frozen chicken non-IQF/kg	39.99	57.49	49.99	39.99	39.99	46.95	39.99	48.99	39.95
Frozen chicken IQF/2kg	64.99	67.99	65	63.99	65.99	66.99	67.99	65	66.99

Source: Own calculations using retail-level price data from CPI data
Note: We calculate the median prices for 2019.

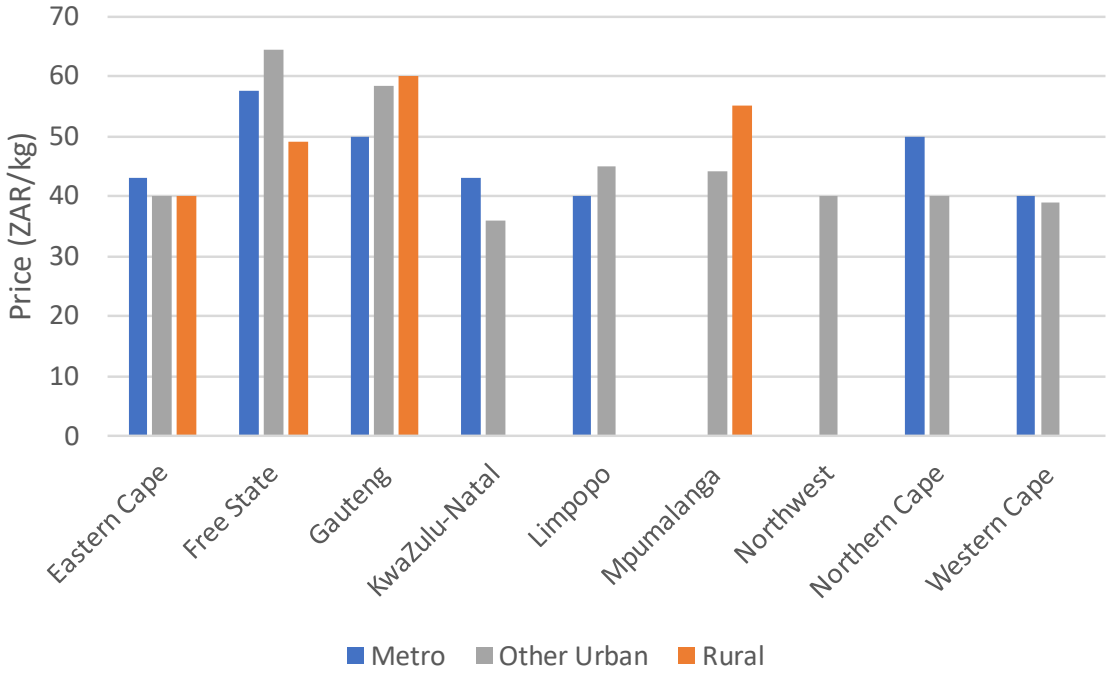
The median prices of chicken giblets have the most significant variance, with the Western Cape costing ZAR20/kg while the Eastern Cape costs ZAR41.99/kg. In addition to giblets, frozen non-IQF chicken, fresh portions and fresh whole chicken show a more significant variation by province. Frozen IQF chicken also shows variation in prices across provinces but to a lesser extent than those mentioned above. The summary statistics for the number of outlets by province are presented in the appendix Table A3. We also find trends like the pricing trends in Table 2 of the number of outlets selling each line item. For example, North West has the most (73) outlets reporting the sale of frozen chicken portions. In contrast, Western Cape only has a 14-reporting sale of frozen chicken pieces. We witness the same pattern with frozen IQF chicken, while non-IQF assumes a different pattern.

Moving on to Figures 2 and 3, we construct plots to show the price variation according to provinces and their respective subregions (metro, other urban and rural areas). Figure 2 shows the variation in prices of non-IQF chicken across provinces. The most expensive non-IQF chicken is sold in the Free State, with '*other urban'* areas in the province being the most expensive. Limpopo and North West have no data on rural prices. In Mpumalanga, rural prices exceed those of '*other urban'* areas. We expect this trend, as rural areas lie in remote geographic areas that are further away from processing plants. Therefore, costs such as transport (which must be refrigerated trucks) make up the price difference. Additionally, non-

[12] Individual Quick Freezing (IQF) is a food preservation technique in which individual pieces of chicken are rapidly frozen while retaining both quality and flavour. Non-IQF chicken is frozen using the cold store freezing method, in which the chicken is placed on trays inside a cold storage until completely frozen. The primary distinction between IQF and non-IQF frozen chicken is in size and quantity; cold store freezing is used for large quantities of larger sized items such as whole chicken. IQF, on the other hand, is best for freezing smaller items such as individual chicken wings. Additionally, IQF method is less expensive and labour intense than non-IQF.

IQF chicken processing is more expensive than IQF, making up for the price differences. This implies that the more remote an area, the higher the price of the non-tradable aspect of the retail price due to transport. In Mpumalanga, rural prices exceed those of '*other urban'* areas. The Eastern Cape and KwaZulu-Natal have higher prices in the metro areas compared to other urban and rural areas for frozen non IQF chicken. We did not expect rural areas to have prices higher than urban areas as urban areas are usually nearer to transport routes, and therefore have a much lower price for the non-tradable aspect of the retail price.

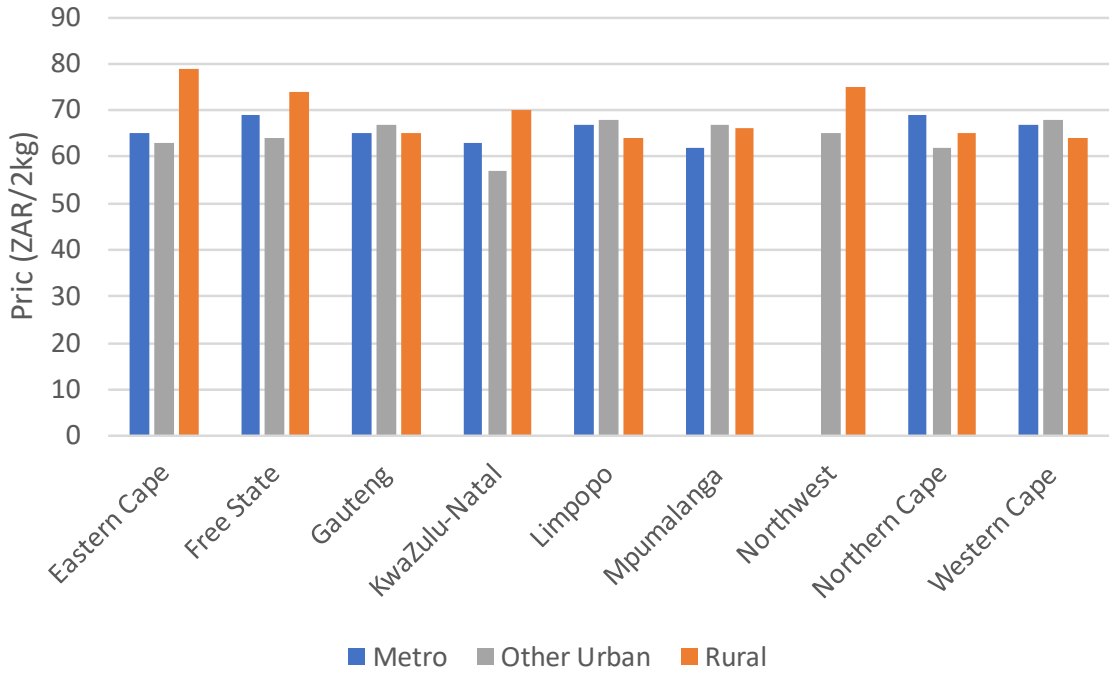
Figure 2: Summary statistics of frozen non-IQF chicken prices by provinces disaggregated at their urban-rural divide.



Source: Own calculations using CPI data.
Note: We calculate the median prices for 2019

Coinciding with Table 1, Figure 3 below presents a relatively more stable pattern on the pricing of frozen IQF chicken on average. An inverse relationship between Eastern Cape and KwaZulu-Natal is noted. The price of the tradable aspect of IQF chicken is expected to be lower in general. This is because IQF is a less expensive process than non-IQF. Therefore, except for the Eastern Cape and Free State, we see price differences where rural prices exceed urban prices. Therefore, as per our previous explanation, the price of the non-tradable aspect might be driving the price.

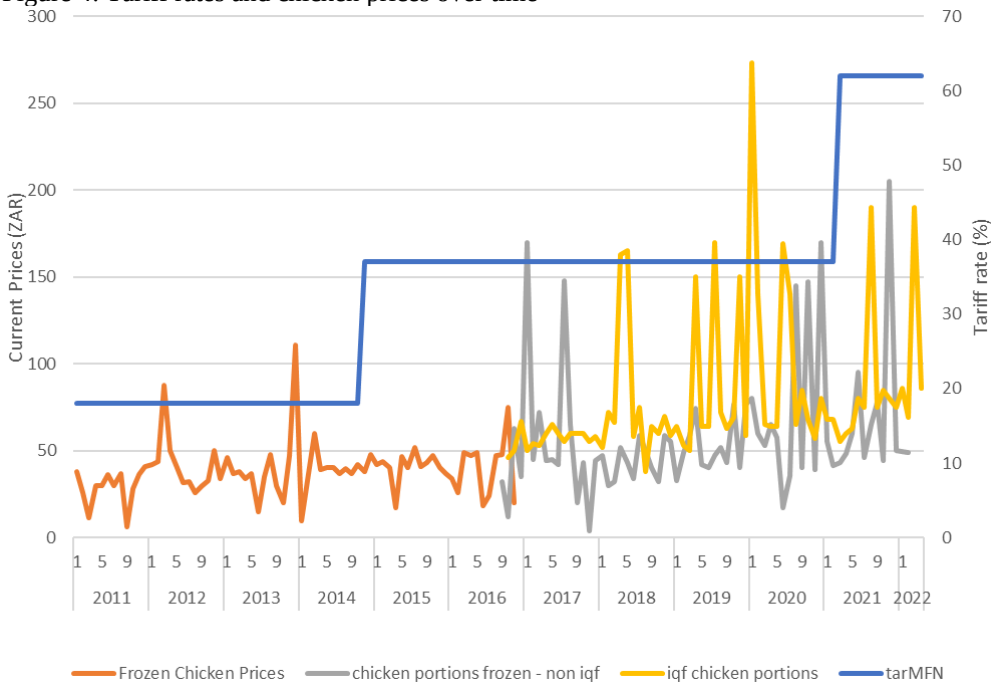
Figure 3: Summary statistics of frozen IQF chicken prices by provinces disaggregated at their urban-rural divide.



Source Own calculations using CPI data.
Note: We calculate the median prices for 2019

Finally, Figure 4 presents the way that tariff rates and chicken prices vary. We use current prices and track frozen chicken prices over time. Before late 2016, it was aggregated as frozen chicken and, after that, disaggregated into non-IQF and IQF frozen chicken. In this simple relationship, increased tariffs are more binding over time. The relationship is cemented by various trade policy measures that change the origin composition of the imported chicken.

Figure 4: Tariff rates and chicken prices over time



Source: Own calculations using CPI and Tariff data from SARS
Note: the frozen chicken was split into IQF and non-IQF in late 2016

To this end, we have presented background statistics showing a plethora of information on the spatial variation of chicken prices. The variation occurs at the provincial and district levels within each province. We therefore explore the spatial differences to understand the spatial pass-through. The following section presents the results estimated from the empirical models outlined above.

5.3.Results

Table 3 (page 26) presents the tariff pass-through results at the provincial level regardless of the urban-rural divide. The results in Table 2 are based on Eq. (6), where we interact the tariff with the provinces to get the respective provincial pass-throughs. Column (1) presents a single weighted applied duty[13] denoting the monthly bilateral import-weighted average duty inclusive of all duties and surcharges applied on frozen BIP and BLC imports from all origins. The applied duty, therefore, can capture imports from all countries. We have previously discussed how the other trade policy changes, i.e., AD and SD duties, make the trade restrictions more binding. With more trade restrictions, the applied tariff variable captures trade diversion and imports from all countries. We get a negative and insignificant coefficient on the applied duty variable representing our base province of the Eastern Cape. All other provinces have insignificant coefficients, with positive signs for the Western Cape, Gauteng, and the Free State. The insignificant coefficients in column 1 show us that the model without controls may suffer from omitted variable bias. This confounding behaviour indicates that capturing the tariff pass-through is complex, given the nature and scope of pricing models. However, this confounding effect changes when we add the omitted variable, pork/maize control, into the model. The insignificant provincial variables will no longer capture the partial effect of single-weighted import duty on tariffs. However, the omitted variable, our control, will now reflect the effect of duties on provincial prices.

Our main column of interest in Table 3 is column (2). In this column, we use pork[14] prices as a control. Using pork as a control improves our model by addressing the omitted variable bias. In addition, we control for region, outlet, and time-fixed effects. The idea is to control for product quality, inflation differentials and retail-specific trends. We find a pass-through ranging from 0.533 in the Northern Cape to 0.786 in the Western Cape. This means that a 1% increase in the single weighted applied duty would increase the price of chicken by 7.86% in the Western Cape and 5.33% in the Eastern Cape.

Further, we find the pass-through for the Eastern Cape and Limpopo to be insignificant, indicating that in both provinces, the change in trade policy may not affect domestic prices. The results for the Eastern Cape go against what we find in the conventional literature. However, that is not unusual. For example, Nicita (2009) finds no regional differences in Mexico. Therefore, traditional knowledge is that pass-through is higher in cities (provinces in

[13] Our single import-weighted average applied duty includes all customs duties, surcharges, and anti-dumping duties levied on frozen BIP and BLC chicken imports from all countries.

[14] We chose to use the price of pork as it is commonly utilised in analyses of chicken consumption trends. Additionally, tariffs on pork products did not change. Moreover, there is little variance on the trends of pricing of both pork and chicken.

our case) that are closer to the trade routes and ports (Marchand, 2012a; Atkin and Donaldson, 2015; Han et al., 2016). We used to import data[15] from SARS that showed that the Eastern Cape received 3% of total chicken imports in South Africa in 2013 and about 4% in 2014. Therefore, our single plausible explanation for no pass-through in the Eastern Cape was that a small number of imports enter the province via its port, Gqeberha. However, a more sophisticated explanation is needed to explain why the pass-through in Limpopo is insignificant. We came up with two hypotheses, and they are as follows: Firstly, it could be that Limpopo is the most northern province in the country and the furthest away from the port of Cape Town and a considerable distance from the port of Durban. The trade costs become too high so domestic importers find it hard to compete with domestic producers. This could result in domestic producers catering for all the demands in Limpopo and consequently supplying chicken, which does not face tariffs. Secondly, Limpopo could have a well-established domestic production system dominated by small-scale farmers who supply fresh chicken to consumers, lowering supermarket demand. Therefore, the consumed chicken is bought at prices that do not face the tariff, thus recording no pass-through effects.

In column (3), we depart from using pork as a control and substitute pork with the price of fresh chicken[16] as a control. We get a negative and insignificant coefficient on the applied duty variable, representing our Eastern Cape base province. We find a positive and significant coefficient in the Free State, Kwazulu-Natal, Mpumalanga, North West and the Western Cape. Here, a 1% increase in the weighted average duties will be associated with a 7.1% and 2.2% increase in consumer prices in the Western Cape and Free State, respectively.

We repeat the same exercise in column (4) but use maize as control this time. We find more positive coefficients and a higher pass-through across provinces, for example, 0.923 for the Western Cape. This result could be due to the similar trend between maize and chicken prices. Chicken and maize prices have a similar trend, as maize is the main input in chicken production (Edwards et al., 2022). Therefore, we could be capturing trends that drive up the coefficient. The pass-through coefficients for Free State, KwaZulu-Natal and Northern Cape are close to unity. We were expecting the results in columns (2), (3), and (4) to be different from each other. Firstly, we use a different control in each column, each with unique advantages and disadvantages. For example, we found that using pork as a control yields better results than the other controls. This is because pork prices do not have the same weakness as maize and fresh chicken prices. For example, using fresh chicken and maize, we find negative and insufficient pass-through for the Eastern Cape. However, using pork as a control, we find a positive pass-through as expected.

[15] We use unweighted important data of all imported chicken products from all countries. Our sample for this exercise is restricted to six months before the first tariff hike in 2013. That is, we analyse data from April 2013 to September 2013. On the other hand, we restrict the sample data to six months after the tariff hike, that is from October 2013 up to April 2014. We then compute the total kgs imported by South Africa, which is 179887280kgs and total imports in the Eastern Cape are 867440. Before the tariff hike, estimates are therefore calculated as 5477607/179887280* 100 = 1%. After the tariff hike estimates are 6838047/168916431*=4%. The data is available at https://www.sars.gov.za/customs-and-excise/trade-statistics/

[16] We use the prices of fresh chicken as a control as fresh chicken is not imported into South Africa. However, a caveat exists with using fresh chicken as a control. Prices of fresh chicken may increase due to an increase in demand that it driven by a fall in supply of IQF and non-IQF chicken.

Table 3: Tariff pass-through at a provincial level

	(1)	(2)	(3)	(4)
	Frozen chicken only	Pork control	Fresh Chicken control	Maize control
ln(1+applied duty)(gt)	-0.182	0.056	-0.237	-0.142
	(0.228)	(0.119)	(0.162)	(0.135)
ln(1+applied duty)(gt)*Free State	-0.042	0.708**	0.459+	0.920**
	(0.266)	(0.201)	(0.237)	(0.192)
ln(1+applied duty)(gt)*Gauteng	-0.055	0.475+	0.303	0.734**
	(0.308)	(0.279)	(0.313)	(0.179)
ln(1+applied duty)(gt)*KwaZulu-Natal	0.048	0.603**	0.444+	0.892**
	(0.258)	(0.202)	(0.228)	(0.166)
ln(1+applied duty)(gt)*Limpopo	0.103	0.210	0.332	0.660**
	(0.319)	(0.156)	(0.239)	(0.202)
ln(1+applied duty)(gt)*Mpumalanga	0.165	0.491**	0.489*	0.401*
	(0.275)	(0.182)	(0.223)	(0.173)
ln(1+applied duty)(gt)*North West	0.255	0.537**	0.469*	0.592**
	(0.276)	(0.184)	(0.206)	(0.147)
ln(1+applied duty)(gt)*Northern Cape	0.114	0.477**	0.580**	0.976**
	(0.276)	(0.164)	(0.217)	(0.159)
ln(1+applied duty)(gt)*Western Cape	-0.102	0.730**	0.947**	1.065**
	(0.251)	(0.165)	(0.200)	(0.149)
Constant	1.850**	3.695**	3.803**	3.155**
	(0.234)	(0.155)	(0.007)	(0.069)
Observations	73,878	91,527	145,377	104,400
Adj R-squared	0.706	0.786	0.710	0.892
Fixed effects	73,878	91,527	145,377	104,400
Region by time		√	√	√
Outlet by time		√	√	√
Commodity by unit	√	√	√	√

Note: Estimates are based on CPI data from 2010M1 to 2021M12. The frozen chicken was split into IQF and non-IQF in late 2016. Applied duty is the import-weighted average duty inclusive of all duties applied on imports of frozen bone-in and boneless chicken from all origins. Then applied tariff is interacted with provinces, and the first row reports the base province, which in our case is the Eastern Cape. We have only reported coefficients on pass-through of the ln(1+applied duty) variable and its interaction with the province spatial element and the constant. This is done as our primary interest is the spatial pass-through. Secondly, we omit reporting other variables such as international prices, the avian flu, MFN tariffs, and safeguards to minimise our table to our key variables of interest. For example, the variable capturing international prices is insignificant in our case. Robust standard errors clustered at the outlet level in parentheses. ** p<0.01, * p<0.05, + p<0.1

In addition to the provincial pass-through analysis, Table 4 estimates Eq. (7). Table 4 introduces a much more disaggregated spatial unit of analysis where we examine the pass-through at an urban-rural level by province. We use maize as a control as opposed to pork. This is because pork prices in the dataset are only recorded from later data, which is a shorter data span. We find higher pass-through in urban areas except for Limpopo and North West. Due to the proximity of urban areas to trade routes and the connectivity to ports via paved roads, rail, and air, we expected the pass-through to be higher in urban areas (Marchand, 2012; Atkin and Donaldson, 2015; Han et al., 2016). The remoteness of rural areas plus other factors such as availability of land and lack of electricity may drive rural preferences towards fresh chicken. A preference for fresh chicken means consuming little frozen chicken, including imports.

Interestingly, the Northern Cape has a pass-through that is greater unity. This is like the results realised by Mkhabela and Nyhodo (2011), that is, a ZAR1 increase in farm gate prices, results in a more than ZAR1 increase in retail prices,. An explanation for this result could be that the Northern Cape consumes more imported frozen chicken, within their consumption bundle. This means that an increase in tariff will cause an increase in prices by a magnitude more significant than the increase in tariffs. Alternatively, we could be capturing a trend of maize and chicken prices moving together, therefore, biasing the pass-through upwards.

Table 4: Tariff pass-through at a rural-urban-provincial level

	(1)
VARIABLES	Maize control
ln(1+applied duty)(gt)	0.267+
	(0.141)
ln(1+applied duty)(gt)*Eastern Cape-rural	-0.129
	(0.225)
ln(1+applied duty)(gt)*Free State-urban	0.873**
	(0.217)
ln(1+applied duty)(gt)*Free State-rural	0.694**
	(0.241)
ln(1+applied duty)(gt)*Gauteng-urban	0.678**
	(0.202)
ln(1+applied duty)(gt)*Gauteng-rural	0.614*
	(0.248)
ln(1+applied duty)(gt)*KwaZulu-Natal-urban	0.895**
	(0.182)
ln(1+applied duty)(gt)*KwaZulu-Natal-rural	0.680*
	(0.324)
ln(1+applied duty)(gt)*Limpopo-urban	0.502*
	(0.221)
ln(1+applied duty)(gt)*-rural	0.897**
	(0.210)
ln(1+applied duty)(gt)*-urban	0.430*
	(0.176)
ln(1+applied duty)(gt)*Mpumalanga-rural	-0.413
	(0.493)
ln(1+applied duty)(gt)*North West-urban	0.594**
	(0.155)
ln(1+applied duty)(gt)*North West-rural	0.200
	(0.361)
ln(1+applied duty)(gt)*Northern Cape-urban	0.701**
	(0.157)
ln(1+applied duty)(gt)*Northern Cape-rural	1.448**
	(0.233)
ln(1+applied duty)(gt)*Western Cape-urban	0.899**
	(0.214)
ln(1+applied duty)(gt)*Western Cape-rural	0.990**
	(0.163)
Constant	3.165**
	(0.070)
Observations	104,629
Adj R-squared	0.892

Note: Estimates are based on CPI data from 2010M1 to 2021M12. The frozen chicken was split into IQF and non-IQF in late 2016. Applied duty is the import-weighted average duty inclusive of all duties applied on imports of frozen bone-in and boneless chicken from all origins. Metro and other urban areas are collapsed into a single urban category, and rural was taken as is. This was done to match the NIDS as the data has a rural-urban divide only. Then applied tariff is interacted with provinces, and the first row reports the base province, which in our case is the Eastern Cape-Urban Robust standard errors clustered at the outlet level in parentheses. ** p<0.01, * p<0.05, + p<0.1

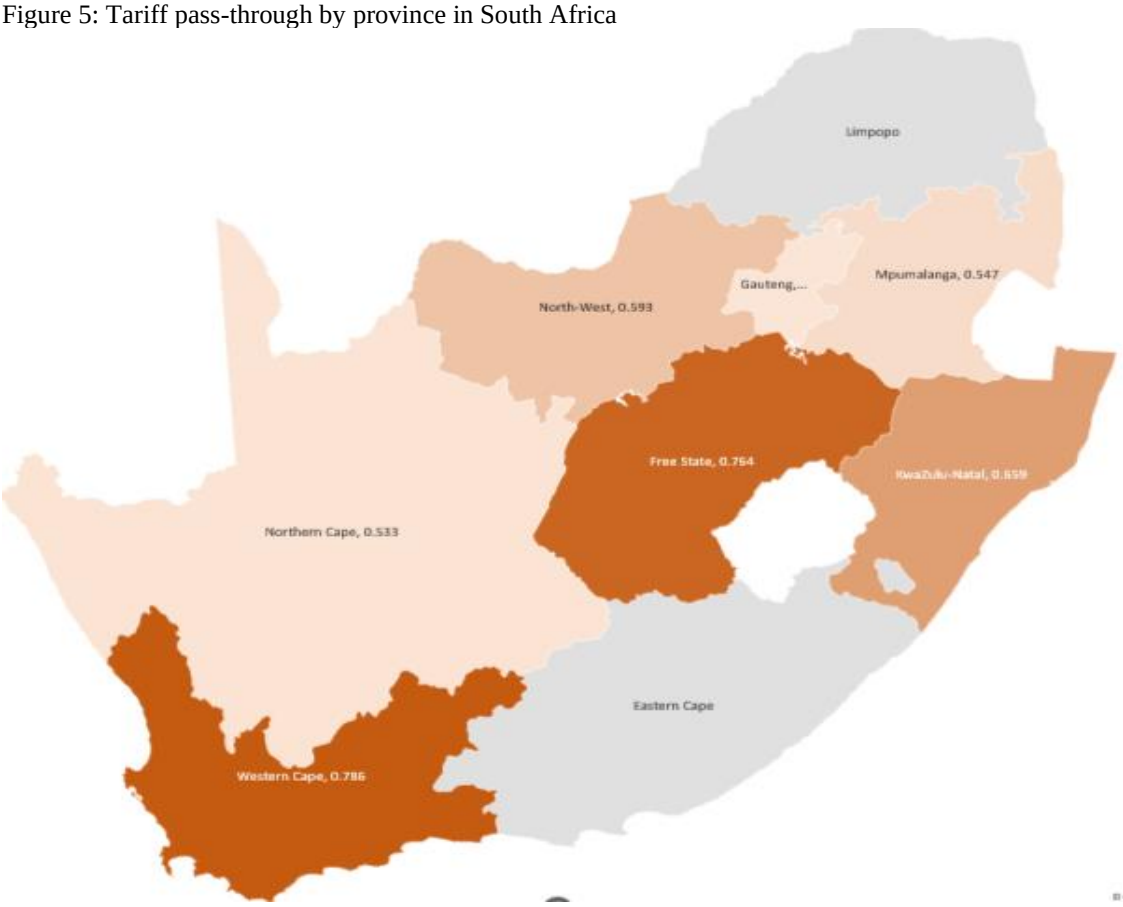
Lastly, Table B1 in Appendix B gives pass-through results at a provincial level with a sample restricted to urban areas only (metro and other urban), like Han et al. (2016). Column (1) shows the pass-through of import duties like Table 4. The similarity is in the significance of coefficients as we also find both Eastern Cape and Limpopo to have a pass-through that is not different from zero. However, by restricting our sample to urban areas only and controlling for pork prices, we realise a lower tariff pass-through across provinces.

This section has investigated the pass-through of tariffs to domestic retail prices. We find that tariff pass-through differs across provinces and their urban-rural divide. We also find that using pork prices as a control yields the best results. Also, restricting our sample to urban areas only lowers the provincial pass-through. Going forward, we use column (3) results in Table 3 with the pork control as our pass-through across provinces. We now proceed to estimate the welfare effect in the following subsection.

6. Estimating welfare effect

This section aims to estimate the welfare effect of tariffs on South African consumers. In the previous section, we discussed the first stage of welfare analysis. We identified pass-through across seven out of the nine provinces. A visual display is given in Figure 5. For example, the highest pass-through of tariffs is in the Western Cape, Free State and KwaZulu-Natal (Jooste, Van Schalkwyk & Von Lampe, 2001; Oyewumi et al., 2007). A high pass-through of around 0.7 is not uncommon in literature, with Nicita, Olarreaga and Porto (2014) using a similar pass-through for Sub-Saharan nations. The provinces in grey, Limpopo and Eastern Cape, experience no pass-through. In this section, we introduce our empirical approach to analysing the welfare effects of tariffs. Then we introduce the National Income Dynamics Study (NIDS) data and some important feature patterning to expenditure patterns. We close off by simulating the welfare effects.

Figure 5: Tariff pass-through by province in South Africa



Source: Author's own compilation using pass-through estimates given in Table 2

6.1.Empirical method

To analyse the welfare effects of chicken tariffs in South Africa, we adopt the framework of Deaton (1989)[17] where welfare is a function of consumption, income and other prices. Therefore, our specification, in this case, is given by Eq. (5):

$$CE_{hr} = -\theta_c^{hr} dp_{cr} \tag{8}$$

where θ_c^{hr} is the share of chicken in total expenditure of household h in region r, and dp is the percentage change in consumer prices calculated as the tariff hikes multiplied by the pass-

[17] We discuss the framework in chapter 2 over Eq. (4) and (5). We are interested in the consumption linkage to welfare. Modifying Eq. (4), P is the vector of chicken prices, π_{hr} is the profit households realise from the sale of chicken and m_{hr} is non-agricultural income from actives in the labour market or transfers such as remittances. The utility of a household h in region r depends on the changes in domestic prices of chicken and factors affecting the producing of chicken, for example pricing etc., and on the household's income from non-farm activities, chicken production, and consumption of chicken. where the first term on the right-hand side of Eq. (5) represents wages from selling skilled/unskilled labour to the markets. The second term on the right-hand side of Eq. (5) represents the profits from producing and selling chickens. The last term on the right-hand side of Eq. (5) is like Nicita (2009) and Marchand (2012), and presents our main analysis, the effect on the cost of household consumption, which is in homage to Deaton (1989). Our framework also suffers from lack of second-order effects such as consumption and production adjustments/dynamic effects as we do not have production data or wage data on the chicken industry.

through rate. In our context, Eq. (8) regarding r (region) will be altered in three ways. Firstly, we simulate the price impacts at a provincial level across the country, then at an urban-rural divide for each province. Finally, we limit the sample to urban areas across all provinces. Additionally, we will use the aggregate pass-through from Edwards et al. (2022) to simulate the consumption effect on the entire sample. In summary, our focus is on the consumption linkage to welfare. We have discussed, from a theoretical point of view, our specification based on Deaton (1989) and later modified by Nicita (2009) and Marchand (2012). In the following subsection, we present our data.

6.2.Data

This section uses the National Income Dynamics Study (NIDS). NIDS is South Africa's first national household panel study. It ran from 2008 up to 2017, covering five waves of data. The five waves encompass a nationally representative sample of approximately 28,000 people in 7,300 households across the country who participated in the study. NIDS tracks the livelihoods of people and families across time, changes in poverty and well-being, household composition and structure, fertility and mortality, migration, labour market involvement and economic activity, human capital production, health and education, vulnerability, and consumption, among the other themes. NIDS is ideal for our study as it provides expenditure data on various food items and, more importantly, household expenditure on chicken. We now present some summary statistics and an overview of the data.

Table 5 presents summary statistics on three shares of food expenditure items by province. The three food items of interest are chicken, which is the focus of this paper, mealie meal, which is widely consumed in South Africa, and vegetables. As a percentage of food expenditure, chicken ranges from 13.82% in the Eastern Cape to about 16.20% in Gauteng. The expenditure variation in chicken is narrow across the board, with an absolute variation of about 3%. The high expenditure shares on chicken indicate that chicken is an important consumer good in households. Additionally, we see what is masked in high food expenditure, with poorer households spending 50% of their income on food (Mhlongo & Daniels, 2013).

Table 5: Share of household total expenditure and food expenditure by province, 2010–2012

	Share of food expenditure			Share of total expenditure		
Province	Chicken	Mealie Meal	Vegetable	Chicken	Mealie Meal	Vegetable
Eastern Cape	13.82	12.10	6.73	5.10	4.93	2.57
Free State	14.93	10.91	3.97	4.36	3.31	1.07
Gauteng	16.20	12.34	6.18	4.27	3.45	1.60
KwaZulu-Natal	13.57	14.65	6.38	5.53	6.61	2.51
Limpopo	13.04	23.24	4.11	4.94	9.01	1.52
Mpumalanga	14.12	14.89	4.42	4.88	5.67	1.54
North West	14.66	13.43	6.79	4.86	4.48	2.17
Northern Cape	15.78	13.16	5.91	5.72	2.96	2.14
Western Cape	14.77	4.93	4.86	4.50	1.62	1.38
Total	14.37	13.67	5.70	4.98	5.14	1.95

Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: The simple average share consumption expenditure is presented using the unweighted data. Chicken consumption includes line items like BIP, BLC, whole chicken and offal. Vegetable consumption includes various items like spinach, broccoli, and other vegetables. Mealie meal expenditure includes all types of mealie meal like

instant mealie meal and super refined, among others. The top and bottom 1% of households by expenditure level are dropped from the sample.

The consumption pattern indicates that chicken is a staple meat, thereby presenting itself as an important source of protein across the country. Secondly, mealie meal shows more significant variation between provinces, with the Western Cape having the lowest consumption share at 4.93% compared to Limpopo, which has a consumption share of 23.24%. Lastly, vegetables, like chicken, have a narrow variation in shares of food expenditures. The Free State reports the lowest share of vegetables at 3.97% compared to the North West, which has a share of about 6.79%.

The last three columns of Table 5 present the same expenditure shares expressed as a percentage of total expenditure. The results were as we expected. Expenditure, for example: the share of mealie meal as a percentage of the total is about 5.14%. In comparison, chicken is approximately 4.98% and vegetables 1.95%. We note that in the Eastern Cape, food and total share of chicken expenditures make up approximately 13.82% and 5.1%, respectively. In comparison, in Gauteng, food and total share of chicken expenditures make up approximately 16.20% and 4.27%, respectively. An explanation for this could be that preference for chicken is higher in Gauteng than in the Eastern Cape. Adding to preferences, incomes in Gauteng could be higher than in Eastern Cape, so the share of chicken could be lower as a percentage of total expenditure. Alternatively, the basket of chicken products consumed could be more expensive in Gauteng than the Eastern Cape. Table 1 shows frozen non-IQF chicken is ZAR10/kg more in Gauteng than in the Eastern Cape. If we then combine this with higher incomes, the results still hold.

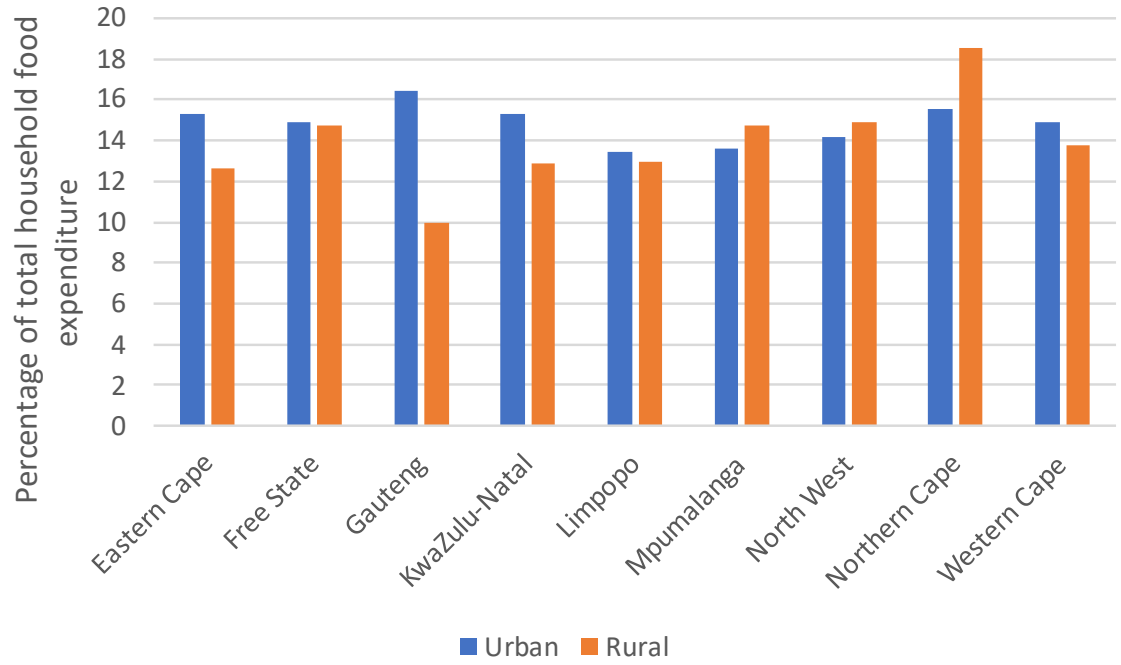
In addition to Table 5, we also computed Table A4 (See Appendix A). Table A4 presents the share of household total expenditure and food expenditure by consumption decile. Beginning with the share of food items as a percentage of total food expenditure, the data show that poorer households spend a disproportionate share of their income on food products. Firstly, in households in the first consumption decile, chicken makes up 23.23% of their total food expenditure, compared to the tenth decile at 9.36%. Secondly, in households in the first consumption decile, mealie meal makes up 25.49% of their total food expenditure, compared to the tenth decile at 3.83%. Finally, in households in the first consumption decile, vegetables make up 9.59% of their total food expenditure, compared to the tenth decile at 0.47%. This shows that poorer households spend a greater portion of their food expenditure on chicken and mealie meal.

Moving to the share of food items as a percentage of total household expenditure, the data show a similar pattern. A striking difference is noted in chicken, with the lowest consumption decile spending 10.10% of their total expenditure compared to the top decile of households, which spends a mere 0.99%. The pattern is more pronounced with vegetables than with chicken, with the least variance in vegetables. Going further, Table A5 shows the expenditure by decile and province. We see much more variation in expenditure regarding shares of chicken. For example, in the top decile, regarding food share, Western Cape share is the lowest at 7.65%; however, regarding the total expenditure share, Mpumalanga, is the lowest at 0.82%. Strikingly, at the bottom decile, the share of food chicken expenditure in the Western Cape is

52.58%. In comparison, a share of total expenditure is 14.37%. Given that the Western Cape has the highest provincial pass-through of change in trade policy, the bottom decile in the Western Cape is likely to be adversely affected.

Figure 6 presents the chicken expenditure share in household total food expenditure by provincial rural-urban divide. We further disaggregate the data to understand the driving factors of chicken share as a percentage of food expenditure. The data shows that in five (Eastern Cape, Free State, Gauteng, KwaZulu-Natal, and Limpopo) out of the nine provinces, chicken share as a percentage of food expenditure is higher in the urban areas than in rural areas. One explanation for this could be that those in urban areas need to purchase chicken. In contrast, those in rural areas rear chicken for their own consumption, leaving fewer households purchasing chicken. Supporting this claim, Table A7 reports income from selling chickens. Only 26 households answered the question and only one household was in the urban area. Mpumalanga, North West and Northern Cape show the opposite. Chicken share as a percentage of food expenditure is higher in rural areas than in urban areas.

Figure 6: Share of chicken expenditure in household total food expenditure by provincial rural-urban divide, 2010–2012



Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: The simple average share consumption expenditure is presented using the unweighted data. Chicken consumption includes line items like BIP, BLC, whole chicken and offal. The top and bottom 1% of households by expenditure level are dropped from the sample.

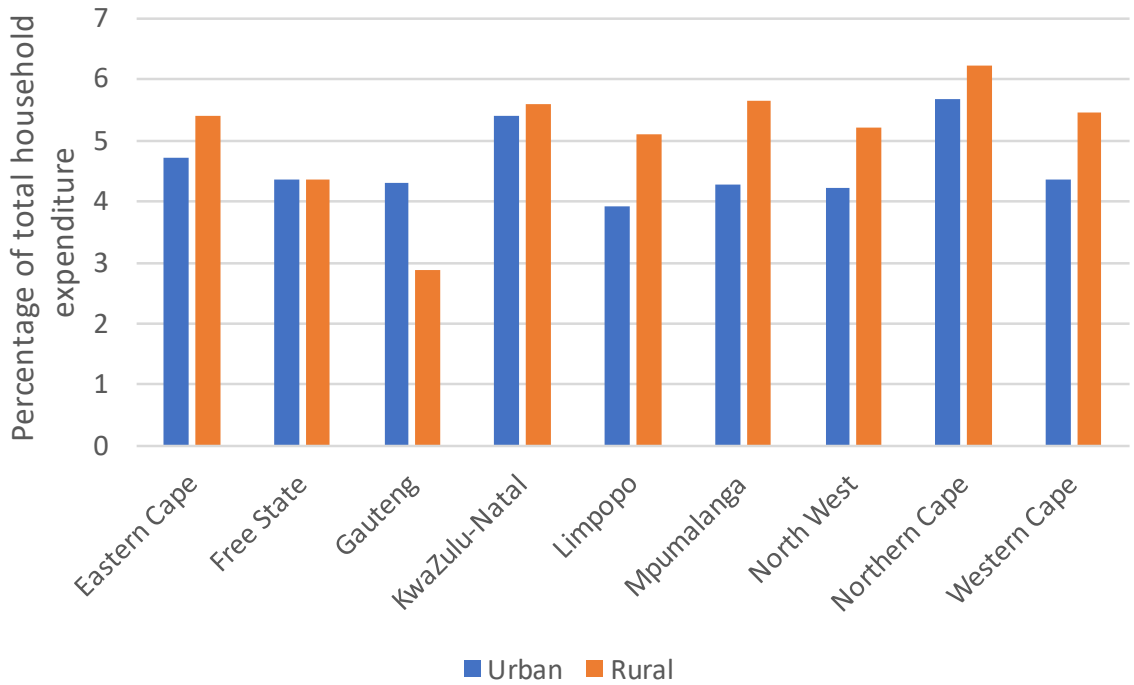
Figure 7 (p. 33) presents the share of chicken expenditure in household total expenditure by provincial rural-urban divide. As we expect, rural incomes are lower than urban incomes. Therefore, we expect the opposite relationship to Figure 6. We expect to see the share of chicken expenditure as a percentage of household total expenditure higher in the rural areas. Out of the nine provinces, we notice this same trend in seven provinces (Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, North West, Northern Cape, and Western Cape).

Interestingly, in the Free State, the shares are similar for both rural and urban areas; in Gauteng, the share is higher in urban than rural areas.

Additionally, we present a share of household total expenditure and food expenditure by household characteristics in Table A6. Africans have the highest share of chicken expenditure as a percentage of food and total household expenditure at 14.51% and 5.13%, respectively. White households' expenditure is 11.50% and 1.76%, respectively. The same pattern is noted for mealie meal. These results could reflect differences in preferences.

Regarding gender, the share of food items expenditure as a percentage of food and total household expenditure is similar across the board. However, regarding location, we see a higher share of chicken expenditure as a percentage of food expenditure in urban areas (15.25%) compared to rural areas (13.24%). We see the opposite regarding a share of total expenditure, with urban areas spending 4.65% and rural areas spending 5.37%. Finally, as the number of residents increases, the shares of the food items decrease – suggesting the possibility of a secondary income.

Figure 7: Share of chicken expenditure in household total expenditure by provincial rural-urban divide, 2010–2012



Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: The simple average share consumption expenditure is presented using the unweighted data. Chicken consumption includes line items like BIP, BLC, whole chicken and offal. The top and bottom 1% of households by expenditure level are dropped from the sample.

To develop our understanding of how household characteristics affect expenditure on various food items, we regress food expenditure items on household characteristics. The results are presented in Table 6. Column (1) focuses on chicken products. The results in column (1) indicate that a 1% increase in household expenditure is expected to increase the chicken expenditure of the household by ZAR0.32%, ceteris paribus. The positive coefficient on

expenditure shows that chicken is a normal good. Moving onto gender, we do not see much difference in expenditure between male and female-led households, as shown by a negative and insignificant variable of the gender dummy.

Interestingly despite African households having a higher share of chicken expenditure as a percentage of total household and food expenditure, all races consume more than them. For example, Indian/Asian households, on average, consume ZAR102 more than African households, ceteris paribus. The same applies for coloured and white households. Each of them consumes ZAR19 and ZAR27 more, respectively. A household in the rural area consumes ZAR13 less than those in the urban areas, ceteris paribus. Finally, an additional resident in the household is accompanied by a ZAR2.6 increase in expenditure on chicken. This variable captures the number of people who live in a household. It is important because we expect that the more people in a household, the higher the expenditure on chicken.

Column (2) and column (3) present the same regressions except that the focus is on mealie meal and vegetables, respectively. In column (2), we find a negative and insignificant coefficient on household expenditure, suggesting that as household expenditure increases, households do not spend more on mealie meal. Interestingly we find that all races spend less than Africans on mealie meal, suggesting a preference for other starch. The coloured population spends ZAR41 less on mealie meal than black households. Additionally, expenditure for rural households is ZAR23 more than for urban households. Again, this suggests preferences for mealie meal differ by location. Column (3) has two exciting takes, namely, coloured people's expenditure on vegetables is not different from that of Africans. At the same time, both white and Asian households consume more than Africans respectively. Secondly, vegetable consumption is insignificantly different from zero for rural households.

Table 6: Regression of food expenditure items on household characteristics

	(1)	(2)	(3)
VARIABLES	Chicken	Mealie Meal	Vegetable
ln(Household Expenditure)	31.915**	-0.065	12.774**
	(1.669)	(1.529)	(0.996)
Male	-1.932	-4.360	-1.581
	(4.085)	(3.345)	(1.359)
Coloured	19.477**	-40.805**	1.734
	(5.303)	(5.144)	(2.042)
Asian/Indian	101.931**	-29.240*	66.525**
	(26.456)	(12.212)	(17.436)
White	26.958*	-19.665	30.917**
	(10.997)	(16.407)	(6.887)
Rural	-12.968**	23.196**	2.288
	(4.485)	(3.421)	(1.395)
Residents	2.606**	6.725**	1.092**
	(0.475)	(0.587)	(0.259)
Constant	-149.048**	54.152**	-63.722**
	(11.779)	(10.589)	(7.603)
Observations	6,279	6,138	4,218
R-squared	0.0438	0.0455	0.142

Note: For each column, our depended variable is the food item expenditure of the household. So, for example, column (1), the dependent variable is therefore the household expenditure on chicken. Male is a dummy for male = 1, female =0, rural =1, and urban =0. The base category for race is African, and residents is the number of people residing in a household at a given time. We also take the log expenditure of total expenditure by the household. Chicken consumption includes line items like BIP, BLC, whole chicken and offal. Vegetable consumption includes various items like spinach and broccoli, among other vegetables. Mealie meal expenditure includes all types of mealie meal like instant mealie meal and super refined, among others. We use Wave 3 of NIDS and top up missing expenditure values from Wave 2. We focus on 2012, the year before the first tariff change during our analysis period. Robust standard errors clustered at the outlet level in parentheses. ** p<0.01, * p<0.05, + p<0.1

In summary, we have presented statistics showing the difference in expenditure by province and provincial locations, aggregate of the whole country, consumption deciles, and household characteristics. There are differences in spending, highlighting a differential behaviour across spatial elements and household characteristics. We now delve into the final set of estimates. The estimates are a simulation of the impact of consumption that is induced by trade policy and how it affects different consumers. In the following sub-section, we present the simulation results.

6.3. Simulation results

This sub-section introduces our simulation results. We first calculate the change in price due to a change in trade policy as follows:

$$\Delta P = (e^{(Prov\ Pass-through\ *0.52}\text{)-1} \quad (6)$$

where we compute the price change by taking the provincial pass-through for each province and multiplying the log change in tariff (0.52[18]). Equation (6) is computed for all provinces except for Limpopo and the Eastern Cape, for which we found an insignificant pass-through. We then manipulate Eq. (6) by replacing the provincial pass-through with provincial pass-through urban areas only. Furthermore, we compute the pass-through for the urban-rural divide by province for further disaggregation.

The first of our estimates is presented in Table 7 (p.36). The Table gives the percentage change in chicken expenditure from trade measures as a percentage of food expenditure and total household expenditure by province. In other words, Table 7 shows how much households would need to increase expenditure to maintain their current consumption. The first column of Table 6 shows the household's food expenditure by province. In the seven provinces where we find a significant pass-through, we observe a relatively large increase in food expenditure. The Western Cape is adversely affected compared to all other provinces, with a 7.46% increase in food expenditure due to chicken duties. This increase is much more than observed in the literature (Davids, Meyer & Louw, 2015; Amiti, Redding & Weinstein, 2019; Edwards et al., 2022). One explanation for observing an increase in expenditure that is higher than the literature lies in the methodology. In the literature, the spatial unit does not have much coverage, therefore trade policy is observed at an aggregate level. While in our paper, we observe the increase in expenditure at spatial levels, therefore observing disaggregate patterns that could give rise to higher figures. Another explanation is the data used. This paper uses

[18] The log change in tariff is calculated as the log of (tariff from 2012 to end of time period). We use the tariff data obtained from SARS to calculate the log change in tariff.

NIDS data, which is a household panel that has much more data on consumption and focuses on income and health among others. NIDS also has spatial elements in the data that allow for the paper to observe the expenditure increases at micro level. Given that, the efficiency of results is highly dependent on the response rates in the different spatial units. For example, if Gauteng rural has a low response rate which skewed to the high side, we may see a larger impact of a trade policy change on expenditure. In contrast, Mpumalanga has the lowest increase in expenditure at a 4.65% increase in food expenditure due to chicken duties. Generally, the results follow a data pattern with provinces with higher pass-through experiencing higher expenditure increases. Higher chicken costs reduce consumption, and, therefore, real income (Artuc, Porto & Rijkers, 2021). Our estimates show that the chicken duties are highly regressive, impacting food expenditure greatly across provinces (Makgetla, 2021).

Shifting to the second column of Table 7, it gives us the rise in the household's total expenditure by province. Households in the Free State experience a 2.13% increase in total household expenditure due to the chicken duties. However, we witness a pattern that has become a theme throughout our paper. When it comes to total household expenditure, the impacts differ by province. For example, Gauteng experiences a 5.15% increase in food expenditure, resulting in only a 1.36% increase in total expenditure. In comparison, KwaZulu-Natal experiences a 5.55% increase in food expenditure, translating to a 2.26% increase in total household expenditure. This shows that although food expenditures are affected similarly, depending on the household expenditures and incomes in different provinces, the impact is either cushioned or amplified, as shown in our Gauteng-KwaZulu-Natal example.

Table 7: Percentage change in chicken expenditure from trade measures as a percentage of food expenditure and total household expenditure by province, 2012

	Share of food expenditure	Share of total expenditure
Province		
Eastern Cape		
Free State	7.28	2.13
Gauteng	5.15	1.36
KwaZulu-Natal	5.55	2.26
Limpopo		
Mpumalanga	4.65	1.61
North West	5.30	1.76
Northern Cape	5.04	1.83
Western Cape	7.46	2.27
Total	5.6	1.88

Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: We work out the impact of trade policy as the Chicken share * ΔP (which is computed as (e^(Prov Pass-through *0.52))-1. Using the Western Cape as an example, chicken share regarding food expenditure is 14.77, while the pass-through is 0.786. The impact of trade policy is therefore 14.77*((e^ (0.786*0.52)-1) =7.46. The rest are calculated in a similar manner. We use the pass-through obtained from Table 2, column (2), which uses pork as a control. Chicken consumption includes line items like BIP, BLC, whole chicken and offal. We use Wave 3 of NIDS and top up missing expenditure values from Wave 2. That is, we focus on 2012, the year before the first change in tariffs during our analysis period. The values reflect the increased expenditure required to retain their existing consumption bundle.

In addition to Table 7, we present Table A8 (in the Appendix), which shows the percentage change of trade measures in household total expenditure and food expenditure by consumption

decile. The first column in Table A8 shows the impact of chicken duties on consumption. It shows the amount of expenditure increase needed by households to maintain their current consumption of chicken. Regarding food expenditure, the bottom decile is negatively affected, with a 3.25% increase compared to the top decile, which experiences a 1.31% increase (Edwards et al., 2022). Additionally, as a share of total expenditure, the bottom decile chicken duties raise the household's average expenditure by 1.4% compared to 0.14% for households in the top decile. Table A9 gives us a percentage change in chicken expenditure from trade measures as a percentage of food expenditure and total household expenditure by decile and province. Again, we witness that those in the lower deciles need to increase food expenditure by 25.48% for the Western Cape to 6.22% for North West. At the same time, the bottom decile of expenditure in both provinces increased by about 3.69% and 4.03%, respectively. Regarding an increase in total expenditure, we see the top decile increasing by 0.5% at most and the bottom decile increasing by 6.39% at most. Therefore, we see low-income households negatively affected by a rise in chicken tariffs (Davids, Meyer & Louw, 2015; Artuc, Porto & Rijkers, 2021; Makgetla, 2021; Edwards et al., 2022).

Table 8 (p.38) presents the percentage change of trade measures in food expenditure and total household expenditure by province, urban areas only, and by province, rural and urban areas. We repeat this exercise to understand how the pass-through affects expenditure at disaggregated spatial locations. The first two columns under provincial urban areas are calculated using pass-through given in Table B1 in the appendix. We notice a similar pattern to Table 7, where provinces with higher pass-through coefficients impact expenditures more. Interestingly, restricting our sample to urban areas in provinces is accompanied by a reduction in the pass-through and its impact on an increase in food expenditure. Looking at total household expenditure, Gauteng experiences a 3.78% increase in food expenditure, resulting in only a 0.99% increase in total expenditure.

In comparison, Northern Cape experiences a 3.57% increase in food expenditure, translating to a 1.31% increase in total household expenditure.

We now focus on the last four columns in Table 8 under the 'Provincial Urban-Rural' title. These columns are calculated using pass-through coefficients from column (1) of Table 3, which uses maize prices as a control. For urban areas, we can see for the first time the impact of chicken duties on the Eastern Cape and Limpopo. Despite the food expenditure increase of 2.14% in the Eastern Cape Urban areas, it is only accompanied by a 0.14% increase in total expenditure.

In comparison, in Limpopo urban areas, a 1.6% increase in food expenditure is accompanied by a 0.47% increase in total expenditure. We also witness lower food expenditure shares in Free State, Mpumalanga, North West and Western Cape compared to the results in the first column. However, the estimates for Gauteng remain the same. Moving to the rural areas, we find no tariff pass-through for Eastern Cape, Mpumalanga, and North West. We note that the Northern Cape rural areas have the highest impact on food expenditure, with an increase of about 14.80% and 4.98% in total household expenditure.

Table 8: Percentage change in chicken expenditure from trade measures in food expenditure and total household expenditure by province, urban areas only, and by province, rural and urban areas, 2012

	Provincial Urban only		Provincial Urban-Rural			
	Urban		Urban		Rural	
Province/Share	Share of food expenditure	Share of total expenditure	Share of food expenditure	Share of total expenditure	Share of food expenditure	Share of total expenditure
Eastern Cape			2.14	0.14		
Free State	5.68	1.66	5.23	1.53	3.55	1.05
Gauteng	3.78	0.99	3.78	0.99	1.90	0.55
KwaZulu-Natal	4.76	1.67	5.68	2.00	2.95	1.29
Limpopo			1.61	0.47	4.80	1.89
Mpumalanga	3.27	1.03	1.09	0.34		
North West	3.83	1.14	2.56	0.76		
Northern Cape	3.57	1.31	3.73	1.36	14.80	4.98
Western Cape	5.96	1.75	5.52	1.61	6.06	2.41
Total	4.53	1.38	4.00	1.14	3.81	1.55

Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: We work out the impact of trade policy as Chicken share * ΔP (which is computed as (e^(Prov Urban Pass-through *0.52))-1. Using Eastern Cape as example, 14.4*((e^0.267*0.52)-1) =2.14. The rest are calculated similarly. We use pass-through coefficients obtained in column (1) of Table B1 in the appendix for the first two columns. We use the pass-through obtained from Table 3, column (1), which uses maize prices as a control for the last four columns, showing Provincial Urban-Rural impacts. In Table B1 we use pork as a control and limit our analysis to urban areas only. Chicken consumption includes line items like BIP, BLC, whole chicken and offal. We use Wave 3 of NIDS and top up missing expenditure values from Wave 2. That is, we focus on 2012, the year before the first change in tariffs during our analysis period. The top and bottom 1% of households by expenditure level are dropped from the sample.

Tables 7 and 8 fully exhaust the simulation of a change policy's effects on food expenditure and total household expenditure. The effects of a change in trade policy are analysed at spatial locations. Table 9 presents estimates of an increase in chicken expenditure from trade measures by household characteristics. A 1% increase in household expenditure will cause a ZAR0.01 decrease in chicken expenditure. We find insignificant effects on gender and coloured. At the same time, Asian/Indian households spend about ZAR0.56 and white households spend ZAR 0.451 more than African households following a price change induced by trade policy. Rural households spend less than urban households, and larger households spend more than smaller households. At a provincial level, all provinces spend less than the Western Cape, with Gauteng spending the least on chicken compared to the Western Cape.

Table 9: Estimates of increased chicken expenditure from trade measure by household characteristics and location

	(1)
VARIABLES	Chicken
ln(household expenditure)	-1.118**
	(0.037)
Male	-0.010
	(0.049)
Coloured	0.125
	(0.103)
Asian/Indian	0.565**
	(0.125)
White	0.451**

	(0.085)
Rural	-0.138*
	(0.063)
ln(residents)	0.109**
	(0.036)
Northern Cape	-0.764**
	(0.106)
Free State	-0.297*
	(0.150)
KwaZulu-Natal	-0.476**
	(0.131)
North West	-0.779**
	(0.132)
Gauteng	-0.861**
	(0.120)
Mpumalanga	-0.802**
	(0.131)
Constant	11.032**
	(0.350)
Observations	4,780
Adj R-squared	0.251

Note: Our depended variable is the household expenditure on chicken. Male is a dummy for male = 1, female =0, rural =1 and urban =0. The base category for race is African, the base for provinces is Western Cape, and residents refers to the number of people residing in a household at a given time. We also take the log expenditure of total expenditure by the household and the log of residents in the household. Chicken consumption includes line items like BIP, BLC, whole chicken and offal. We work out the impact of trade policy as Chicken share * ΔP (which is computed as (e^(Prov Pass-through *0.52))-1. We use the pass-through obtained from Table 2, column (2), which uses pork as a control. We use Wave 3 of NIDS and top up missing expenditure values from Wave 2. That is, we focus on 2012, the year before the first change in tariffs during our analysis period. Robust standard errors clustered at the outlet level in parentheses. ** p<0.01, * p<0.05, + p<0.1

In addition to Table 9, we present Table B2 (in the appendix). Table B2: presents by household characteristics, the estimates of increased chicken expenditure from trade measures. We find results like Edwards et al. (2022) with an exception to races where we find, instead, all races increasing their expenditure on chicken relative to Africans. Also, we present Table B3, which shows the percentage increase in total expenditure from trade increases on household characteristics by province, urban areas only, and province, rural-urban divide. We find similar results to Table 9.

The conclusion we draw from our simulation results is that, on average, a change in trade policy is highly regressive. We argue that most consumers would benefit from decreased living costs if trade barriers were removed, since they could consume more due to lower prices (Artuc, 2021). Figures C1 to C9, for example, provide a scatter plot of the overall spending shift from higher chicken tariffs vs household expenditure levels for all provinces. Starting with Figure C1 for the Eastern Cape, we see that spending in urban areas is slightly higher than in rural areas. Additionally, households in the upper decile have a very low impact compared to those in the lower deciles. The pattern of a low increase in expenditure impact for high-consumption households is the same across the board. However, for some provinces, Free State (C2), KwaZulu-Natal (C4), Northern Cape (C8), and the Western Cape (C9), we see a much more pronounced effect on households, with low consumption in comparison to the other provinces. This result corroborates our findings in this section and the provincial pass-through we realised from Section 5. In addition, some households do poultry farming and sell chicken, which aids

the household income. Therefore, since not all houses are net consumers, it is important to understand the impacts on households that sell chicken. We perform a simple simulation exercise in Table A7 that shows a change in income (ZAR) from selling chicken due to a change in trade measures. On average, households selling chicken benefit from around ZAR0.42 to about ZAR28 due to increased chicken prices. Although data on sales has an extremely low response rate, we can already see that some houses stand to win, whilst others stand to lose. In summary, we note that trade policy changes affect households with different characteristics, expenditures, and spatial locations. The implication of trade policy and conclusions will be given in the following subsection.

7. Conclusion

This paper examines the effects of South Africa's tariff increases over the past decade on consumer welfare. In particular, the paper is interested in tariffs, anti-dumping and safeguard duties applied to chicken products. The choice of chicken products is attractive because chicken presents itself as a cheap source of protein, and it has endured substantive trade policy changes over the years. In addition to being an important consumer good, the poultry industry contributes the largest to agricultural GDP. It makes up the largest share of meat production in South Africa. Therefore, it is not surprising that SAPA, through ITAC, applied protectionist measures based on price disadvantages that affected profitability and employment in the industry. SARS implemented one such increase in 2013. SARS increased tariffs on five-line items of chicken. For example, BIP tariffs increased by 37%, while BLC tariffs rose by 14%. The tariff increase for frozen whole birds was 203%, and for offal, it was 11%. Therefore, capturing the effect of tariff increases on welfare is not straightforward, given that trade policy changes are not always fully transmitted to domestic retail pricing.

The process involves two steps generally. Firstly, the interest is on the channels and extent to which a change in trade policy is transmitted to domestic prices; therefore, we estimate the tariff-pass-through to domestic prices at three[19] spatial levels. Secondly, we can capture the consumption effects, depending on how prices change due to trade policy. Consequently, we utilise our estimates of tariff pass-through and simulate the impact of tariffs on consumption across the entire expenditure distribution and on a spatial scale.

In the first step, our price transmission analysis builds on the channel concerned with the impact of tariffs on retail prices. We analyse these transmission mechanisms between trade policy change and domestic prices at the provincial level and provincial urban-rural split using detailed pricing data. We estimate these relationships independently to understand better how trade may affect local prices. We find that in the Eastern Cape, tariffs do not impact on tariffs. We hypothesise that this is due to the share of imports landing at Gqeberha. Also, Limpopo experiences no price impacts. We hypothesise that the province's trade costs, and market structures make it less viable for imports to compete. However, we find high pass-throughs for the Western Cape and KwaZulu-Natal at about 0.736 and 0.659, respectively. These results are unsurprising as the literature indicates that areas closer to trade routes may transmit prices more

[19] Provincial level, urban-rural across all provinces and only urban areas of provinces.

flexibly than those farther away. The trend continues as most urban pass-throughs are greater than rural pass-throughs.

Noting the spatial nature of the pass-through of trade policy to domestic prices, we simulate welfare effects in the second step. To simulate the welfare effects, we use the pass-through coefficients obtained in step 1. We use survey data that shows poorer households spending more on chicken and narrow provincial differentials on chicken expenditure. For example, for a household to keep the same level of consumption in KwaZulu-Natal, they had to increase their total expenditure by 2.14%. In the same instance, a household in the bottom consumption decile had to increase total expenditure by 1.41%, as opposed to households in the top decile that only had to increase expenditure by 0.14%. At a much more disaggregated level, households in the first expenditure decile in the Western Cape had to increase expenditure by 6.93%. Therefore, we witness a nexus between provinces and the position on the expenditure distribution.

Ultimately, we find that tariff pass-through differs between geographical locations. The impacts on consumption depend on space, household income and expenditure patterns. Considering all these facts, we find that duties on chicken products are highly regressive and affect the poorer and those in rural areas. We recommend that ITAC consider the injurious effect chicken duties have on consumers in South Africa when constructing policy. Additionally, we recommend an interplay of trade and fiscal policy, where SARS lowers the duties on chickens.

At the same time, the state should increase support for chicken farmers. An important instrument of such support is the Poultry Sector Master Plan adopted in 2019. We recommend that the state reduce red tape and act on it more aggressively. Both an interplay of trade and fiscal policy, where SARS lowers the duties on chickens and Poultry Sector Master Plan measures will support the domestic industry and protect consumers from higher prices.

Finally, we have not considered the impact of chicken duties on wage linkages. An important extension of our paper is to look at consumption and wages to calculate a net effect. Additionally, depending on the availability of farm gate prices, incorporating such data into price transmission would aid the model's strength by controlling for local prices.

Appendix A- Additional Tables

Table A1: Motivations of anti-dumping duties of fowls of species gallus domesticus, pasta, tomatoes & potato chips

HS8-Code & (Product Description)	Country of origin	Anti-dumping Duty	Date	Commission's findings															Other factors
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
0207.14	USA	940c/kg	27 December 2001 Continued 5 April 2012	√															√	Developments in technology
0207.12.90 (Frozen whole birds)	Brazil	62,93%	10 February 2011 (up to and including 10 August 2012)	√	√		√							√					√	Contraction in demand or changes in the patterns of consumption
0207.14.10 (Boneless cuts)		6,26%		√	√	√	√	√			√			√	√				√	
		46,59%		√	√	√	√	√			√			√	√				√	
0207.14.90(Bone in portions)	Germany	31,30%	4 July 2014 up to and including 2 January 2015	√	√	√			√	√	√		√			√	√		√	High feed costs
	Germany	73,33%		√	√	√			√	√	√		√			√	√		√	
	Netherlands	22,81%		√	√	√			√	√	√		√			√	√		√	
	UK	22,03%		√	√	√			√	√	√		√			√	√		√	
0207.14.9(Bone in portions)	Germany	31,30%	27 February 2015	√	√	√			√		√		√			√			√	Foreign technology superior Bringing in foreign markets
	Germany	73,33%		√	√	√			√		√		√				√		√	
	Netherlands	3,86%		√	√	√			√		√		√				√		√	
	Netherlands	22,81%		√	√	√			√		√		√				√		√	
	UK	12,07%		√	√	√			√		√		√				√		√	
	UK	12,07%		√	√	√			√		√		√				√		√	
	UK	30,99%		√	√	√			√		√		√				√		√	
	Netherlands	16,42%		√	√	√			√		√		√			√			√	
0207.14.9(Bone in portions)	Germany	73,33%	23 August 2021	√	√	√			√		√		√				√		√	
	Netherlands	22,81%		√	√	√			√		√		√				√		√	

	UK	30,99%		√	√	√			√		√		√				√		√	
0207.14.97(Thighs)	Brazil	30,5%	17 December 2021 up to and including 14 June 2022	√	√	√	√		√	√			√			√		√	√	Impacts of Covid-19 Avian Influenza in Poland
	Brazil	13%		√	√	√	√		√	√			√			√		√	√	
	Brazil	22%		√	√	√	√		√	√			√			√		√	√	
	Brazil	48%		√	√	√	√		√	√			√			√		√	√	
	Brazil	10%		√	√	√	√		√	√			√			√		√	√	
	Brazil	6%		√	√	√	√		√	√			√			√		√	√	
	Brazil	265.1%		√	√	√	√		√	√			√			√		√	√	
0207.14.98(Drumsticks)	Brazil	30.5%		√	√	√	√		√	√			√			√		√	√	
	Brazil	13%		√	√	√	√		√	√			√			√		√	√	
	Brazil	22%		√	√	√	√		√	√			√			√		√	√	
	Brazil	48%		√	√	√	√		√	√			√			√		√	√	
	Brazil	10%		√	√	√	√		√	√			√			√		√	√	
	Brazil	6%		√	√	√	√		√	√			√			√		√	√	
	Brazil	265.1%		√	√	√	√		√	√			√			√		√	√	
	Brazil	30.5%		√	√	√	√		√	√			√			√		√	√	
0207.14.99(other)	Ireland	158.42%		√	√	√	√		√	√			√			√		√	√	
	Poland	5%		√	√	√	√		√	√			√			√		√	√	
	Poland	9%		√	√	√	√		√	√			√			√		√	√	
	Poland	96.9%		√	√	√	√		√	√			√			√		√	√	
0207.14.93(Leg quarters)	Spain	16%		√	√	√	√		√	√			√			√		√	√	
	Spain	3%		√	√	√	√		√	√			√			√		√	√	
	Spain	4%		√	√	√	√		√	√			√			√		√	√	
	Spain	26%		√	√	√	√		√	√			√			√		√	√	
	Spain			√	√	√	√		√	√			√			√		√	√	

Source: ITAC (2014; 2014;2015;2019) South African Revenue Services, World Bank (World Integrated Trade Solution), World Trade Organization

Notes: 1 All Ad Valorem Tariffs reported in % while non-Ad Valorem reported in ZAR/kg

The key for Commissions findings: 1= Dumped prices 2=Price undercutting 3=Price Suppression 4=Decline in Market Share 5= Decline in Sales 6= Decreasing profitability 7= Decrease in employment 7= Decline in production 8= Decline in Capacity utilization 9= Negative impact on the ability to raise capital 10= negative ROI 11=growth 12= decline in output 13= negative effects on net cash flow 14= negative effects on the ability to raise capital 15=increase in inventory 16=causal link

Table A2: Motivations of safeguard duties of fowls of species gallus domesticus, pasta, tomatoes & potato chips

HS8-Code & (Product Description)	Country of origin	Safeguard duty	Date	Commission's findings									Other
				1	2	3	4	5	6	7	8	9	
0207.14.9(Bone in portions)	European Union	13,90%	15 December 2016						√				
0207	Zimbabwe	Full ban	June 2017						√				
0207.14.9(Bone in portions)	European Union	0%	3 July 2017						√				
0207.14.9(Bone in portions)	European Union	35,3%	28 September 2018						√				
0207.14.9(Bone in portions)	European Union	30%	12 March 2019						√				
0207.14.9(Bone in portions)	European Union	25%	12 March 2020						√				
0207.14.9(Bone in portions)	European Union	15%	12 March 2021						√				

Source: South African Revenue Services, World Bank (World Integrated Trade Solution), World Trade Organisation

Notes: 1 All Ad Valorem Tariffs reported in % while non-Ad Valorem reported in ZAR/kg

Key for Commissions findings: 1= Unforeseen developments 2= significant increase in import volumes 3=Decline in Market Share 4= Decline in Sales 5= loss situation 6=Highly Pathogenic Avian Influenza (HPAI) outbreak H5N8 7=Decline in Capacity utilisation 8= causal link 9=critical circumstances

Table A3: Summary statistics of retail outlets by province

				Number of outlets by province								
	start date	End date	Observations									
				Eastern Cape	Free State	Gauteng	KwaZulu-Natal	Limpopo	Mpumalanga	North West	Northern Cape	Western Cape
Chicken giblets	2016m10	2022m4	5292	10	11	8	7	12	8	22	11	5
Fresh chicken portions	2010m1	2022m4	6749	44	36	18	25	45	27	74	24	16
Fresh whole chicken	2010m1	2022m4	52595	48	40	25	35	58	34	90	39	21

Frozen chicken	2010m2	2022m5	43822	38	21	16	27	31	21	73	24	14
Frozen chicken non-IQF	2016m11	2022m4	4768	5	12	11	13	9	7	16	11	6
Frozen chicken IQF	2016m10	2022m4	23087	30	22	18	17	45	24	70	28	18

Source: Own calculations using CPI data

Table A4: Share of household total expenditure and food expenditure by consumption decile, 2010–2012

	Share of food expenditure			Share of total expenditure		
decile	Chicken	Mealie Meal	Vegetable	Chicken	Mealie Meal	Vegetable
1	23.23	25.49	9.59	10.10	11.68	4.17
2	16.00	18.52	6.93	7.29	8.56	3.11
3	15.42	16.52	6.53	6.32	6.51	2.61
4	14.16	13.82	5.46	5.28	5.56	2.17
5	13.43	14.87	4.81	4.64	4.43	1.78
6	12.85	11.03	5.18	3.97	3.42	1.57
7	12.69	8.79	4.85	3.18	2.27	1.23
8	12.69	8.16	4.89	2.50	1.58	0.94
9	11.96	5.28	4.76	1.59	0.67	0.60
10	9.36	3.83	3.94	0.99	0.32	0.47
Total	14.62	14.01	5.80	5.03	5.23	1.98

Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: The simple average share consumption expenditure is presented using the unweighted data. Chicken consumption includes line items like BIP, BLC, whole chicken and offal. Vegetable consumption includes various items like spinach and broccoli, among other vegetables. Mealie meal expenditure includes all types of mealie meal like instant mealie meal and super refined, among others. The top and bottom 1% of households by expenditure level are dropped from the sample.

Table A5: Chicken expenditure as a share of household total expenditure and food expenditure by province and consumption decile, 2010–2012

	Eastern Cape		Free State		Gauteng		KwaZulu-Natal		Limpopo		Mpumalanga			North West		Northern Cape		Western Cape	
Decile	Food	Total	Food	Total	Food	Total	Food	Total	Food	Total	Food	Total		Food	Total	Food	Total	Food	Total
1	21.84	8.92	29.63	10.80	23.67	10.56	29.63	10.80	16.83	8.32	23.23	10.14		17.93	8.84	26.83	12.22	52.87	14.37
2	14.97	6.80	17.36	7.06	19.09	8.07	17.36	7.06	14.44	6.78	14.93	7.00		17.00	7.28	17.32	8.68	18.17	7.74
3	16.39	6.67	13.53	5.17	21.08	6.40	13.53	5.17	16.08	5.97	14.78	6.94		15.58	6.11	17.27	7.52	15.65	6.28
4	12.83	4.58	15.98	5.25	20.46	5.81	15.98	5.25	11.19	4.34	17.15	6.50		14.54	5.10	14.44	6.28	15.74	6.28
5	11.16	4.10	12.77	4.51	15.04	4.54	12.77	4.51	12.19	4.33	15.38	4.93		13.68	4.69	21.27	5.91	15.61	5.30
6	11.41	3.68	14.65	3.71	12.74	3.33	14.65	3.71	9.45	2.84	13.19	4.17		13.72	3.40	17.45	5.47	14.25	4.72
7	12.43	2.75	15.25	3.13	12.98	2.81	15.25	3.13	10.69	2.66	12.08	2.98		14.04	2.95	13.07	4.41	14.30	3.83
8	9.03	1.84	10.16	1.90	18.49	2.82	10.16	1.90	9.73	1.95	12.24	2.49		12.55	2.25	12.56	2.63	11.35	2.87
9	9.67	1.46	11.75	1.41	16.66	1.75	11.75	1.41	11.24	1.62	11.44	1.56		11.87	1.66	7.67	1.28	11.31	1.72
10	12.89	1.00	8.45	0.92	8.20	0.99	8.45	0.92	11.84	0.92	7.95	0.82		11.60	0.95	9.75	1.08	7.65	1.04
Total	14.15	5.11	15.08	4.38	16.76	4.39	15.08	4.38	13.06	4.94	14.50	5.00		14.70	4.85	16.10	5.86	15.09	4.49

Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First

Note: The simple average share consumption expenditure is presented using the unweighted data. Chicken consumption includes various line items like BIP, BLC, whole chicken and offal. The top and bottom 1% of households by expenditure level are dropped from the sample.

Table A6: Share of total household expenditure and food expenditure by household characteristics, 2010–2012

	Share of food expenditure			Share of total expenditure		
Household Characteristics/ Food item	Chicken	Mealie Meal	Vegetable	Chicken	Mealie Meal	Vegetable
Race						
African	14.51	14.59	5.88	5.13	2.09	5.60
Coloured	14.36	8.37	4.72	4.89	1.54	2.04
Asian/Indian	12.99	3.42	7.13	2.58	1.36	0.77
White	11.50	3.83	5.48	1.76	0.81	0.75
Gender						
Female	14.47	13.84	5.81	5.08	2.04	5.41
Male	14.04	13.21	5.45	4.86	1.83	4.72
Location						
Urban	15.25	10.24	5.68	4.65	1.69	3.31
Rural	13.24	17.00	5.65	5.37	2.29	6.98
Number of residents						
1	17.01	14.11	6.99	5.36	2.11	4.74
2	15.84	12.87	6.03	5.38	2.01	4.77
3	14.09	12.95	5.44	4.88	1.81	4.67
4	13.65	13.37	5.26	4.71	1.78	4.36
5	13.23	12.67	5.43	4.63	4.94	1.88

Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: The simple average share consumption expenditure is presented using the unweighted data. Chicken consumption includes line items like BIP, BLC, whole chicken and offal. Vegetable consumption includes various items like spinach and broccoli, among other vegetables. Mealie meal expenditure includes all types of meal, like instant mealie meal, and super refined, among others. The top and bottom 1% of households by expenditure level are dropped from the sample. Households with five or fewer residents are presented as they make up 75% of households.

Table A7: Change in income (ZAR) from selling chicken due to a change in trade measures.

	ZAR income from sales before Tariff	ZAR income from sales after Tariff	Difference
	0	0	0
	3	3.42	0.42
	50	57	7
	60	68.4	8.4
	80	91.2	11.2
	100	114	14
	120	136.8	16.8
	125	142.5	17.5
	150	171	21
	160	182.4	22.4
	190	216.6	26.6
	200	228	28
	250	285	35
	300	342	42
	400	456	56
	420	478.8	58.8
	450	513	63

	2040	2325.6	285.6
	2300	2622	322
Total	26	26	

Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: Only 26 households report income from the sale of chicken. We then take the unweighted incomes and work out the impact of trade policy as the Chicken share * ΔP (which is computed as (e^((Pass-through *0.52))-1). We use the pass-through obtained from Edwards et al. (2022), which is 0.477. All figures are reported in ZAR.

Table A8: Percentage change from trade measures in household total expenditure and food expenditure by consumption decile, 2012

	Share of food expenditure	Share of total expenditure
decile		
1	3.25	1.41
2	2.24	1.02
3	2.16	0.89
4	1.98	0.74
5	1.88	0.65
6	1.80	0.56
7	1.78	0.44
8	1.78	0.35
9	1.67	0.22
10	1.31	0.14
Total	2.05	0.70

Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: We work out the impact of trade policy as the Chicken share * ΔP (which is computed as (e^((Prov Pass-through *0.52))-1). We use the pass-through obtained from Edwards et al. (2022), which is 0.477. The values reflect the increased expenditure required to retain their existing consumption bundle. Chicken consumption includes line items like BIP, BLC, whole chicken, and offal. We use Wave 3 of NIDS and top up missing expenditure values from Wave 2. That is, we focus on 2012, the year before the first tariff change, during our analysis period. The top and bottom 1% of households by expenditure level are dropped from the sample.

Table A9: Percentage change in chicken expenditure from trade measures as a percentage of food expenditure and household total expenditure by decile and province, 2012

	Free State		Gauteng		KwaZulu-Natal		Mpumalanga		North West		Northern Cape		Western Cape	
Decile	Food	Total	Food	Total	Food	Total	Food	Total	Food	Total	Food	Total	Food	Total
1	13.75	5.01	7.34	3.27	8.80	4.15	7.43	3.24	6.22	3.07	8.24	3.75	25.48	6.93
2	8.05	3.27	5.92	2.50	6.03	2.85	4.78	2.24	5.90	2.53	5.32	2.67	8.76	3.73
3	6.28	2.40	6.54	1.98	5.16	2.41	4.73	2.22	5.41	2.12	5.30	2.31	7.54	3.03
4	7.42	2.43	6.34	1.80	4.67	1.98	5.49	2.08	5.05	1.77	4.43	1.93	7.59	3.02
5	5.92	2.09	4.66	1.41	4.41	1.74	4.92	1.58	4.75	1.63	6.53	1.82	7.52	2.55
6	6.80	1.72	3.95	1.03	4.64	1.67	4.22	1.33	4.76	1.18	5.36	1.68	6.87	2.28
7	7.07	1.45	4.02	0.87	4.14	1.21	3.86	0.95	4.87	1.02	4.01	1.35	6.89	1.84
8	4.72	0.88	5.73	0.87	4.64	1.05	3.92	0.80	4.36	0.78	3.86	0.81	5.47	1.38
9	5.45	0.66	5.17	0.54	4.47	0.61	3.66	0.50	4.12	0.57	2.36	0.39	5.45	0.83
10	3.92	0.42	2.54	0.31	4.23	0.42	2.54	0.26	4.03	0.33	2.99	0.33	3.69	0.50
Total	7.00	2.03	5.19	1.36	5.38	2.17	4.64	1.60	5.10	1.68	4.94	1.80	7.27	2.16

Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: please see Table 6 for calculations

Appendix B- Regressions

B1 Import tariff pass-through.

Table B1 presents tariff pass-through at a provincial level, where we restrict our sample to urban areas only, i.e., metro, and other urban areas. We use pork as a control. The intuition behind this is that pork prices and chicken prices are well-recorded in urban areas. Using urban areas only reduces the bias that rural areas could cause and their recording of prices over time. We find an insignificant pass-through for the Eastern Cape and Limpopo. The pass-through per province is as follows: Free State 0.642. Gauteng 0.417. KwaZulu-Natal 0.538. Mpumalanga0.432. North West 0.476. Northern Cape 0.415. Western Cape 0.667.

Table B1: Tariff pass-through at a provincial level (urban areas only)

	(1)
	Pork control
ln(1+applied duty)(gt)	0.060
	(0.118)
ln(1+applied duty)(gt)*Free State	0.702**
	(0.200)
ln(1+applied duty)(gt)*Gauteng	0.477+
	(0.279)
ln(1+applied duty)(gt)*KwaZulu-Natal	0.598**
	(0.201)
ln(1+applied duty)(gt)*Limpopo	0.206
	(0.154)
ln(1+applied duty)(gt)*Mpumalanga	0.492**
	(0.182)
ln(1+applied duty)(gt)*North West	0.536**
	(0.183)
ln(1+applied duty)(gt)*Northern Cape	0.475**
	(0.163)
ln(1+applied duty)(gt)*Western Cape	0.727**
	(0.165)
Constant	3.677**
	(0.154)
Observations	89.651
R-squared	0.784
Region by time	√
Outlet by time	√
Commodity by unit	√

Note: Estimates are based on CPI data from 2010M1 to 2021M12. The frozen chicken was split into IQF and non-IQF in late 2016. Applied duty is the import-weighted average duty inclusive of all duties applied on imports of frozen bone-in and boneless chicken from all origins. We restrict our sample to urban areas only, i.e., metro

and other urban areas Robust standard errors clustered at the outlet level in parentheses. ** p<0.01. * p<0.05. + p<0.1

B2 Estimates of percentage increase

We compute estimates of percentage increase in total expenditure from trade increases on household characteristics. Aggregated for South Africa, like Edwards et al. (2022). We find similar results. An increase in household expenditure causes a decrease in expenditure on chicken in rand value. Additionally, we also find no impact of gender. Concerning race, we found that coloured, white and Indian/Asian in rand terms consume more than Africans, given a rise in prices cause by a change in trade policy. This contrasts with Edwards et al. (2022). Finally, we also find that an increase in household size would increase the expenditure on chicken.

Table B2: Estimates of an increase in chicken expenditure from trade measure by household characteristics for the whole of South Africa

	(1)
VARIABLES	Chicken
ln(household expenditure)	-0.409**
	(0.011)
Male	-0.005
	(0.015)
Coloured	0.092**
	(0.021)
Asian/Indian	0.229**
	(0.042)
White	0.201**
	(0.024)
Rural	-0.064**
	(0.017)
ln(residents)	0.038**
	(0.011)
Constant	3.831**
	(0.090)
Observations	6.277
Adj R-squared	0.244

Note: Our dependent variable is chicken expenditure. Male is a dummy for male = 1, Female = 0, rural =1, and urban =0. The base category for race is African. Residents refers to the number of people residing in a household at a given time. We also take the log expenditure of total expenditure by the household and the log of residents in the household. Chicken consumption includes line items like BIP, BLC, whole chicken, and offal. We work out the impact of trade policy as Chicken share * ΔP (which is computed as (e^((Prov Pass-through *0.52))-1). We use the pass-through obtained from Edwards et al. (2022), which is 0.477. Chicken consumption includes various line items like BIP, BLC, whole chicken and offal. We use Wave 3 of NIDS and top up missing expenditure values from Wave 2. That is, we focus on 2012, the year before the first change in tariffs during our analysis period. Robust standard errors clustered at the outlet level in parentheses. ** p<0.01. * p<0.05. + p<0.1

B3 Estimates of percentage increase by province urban areas and provincial rural-urban divide

Table B3 estimates the percentage increase in total expenditure from trade increases on household characteristics by provincial urban areas only and provincial rural-urban divide. Table 3 is like Table 8 but uses different locations and controls for pass-through coefficients. For example. Column (1) uses only urban areas and pork as a control compared to columns (2) and (3) which use maize as a control over the rural-urban divide.

Table B3: Estimates of percentage increase in total expenditure from trade increases on household characteristics by province, urban areas only, and province, rural-urban divide

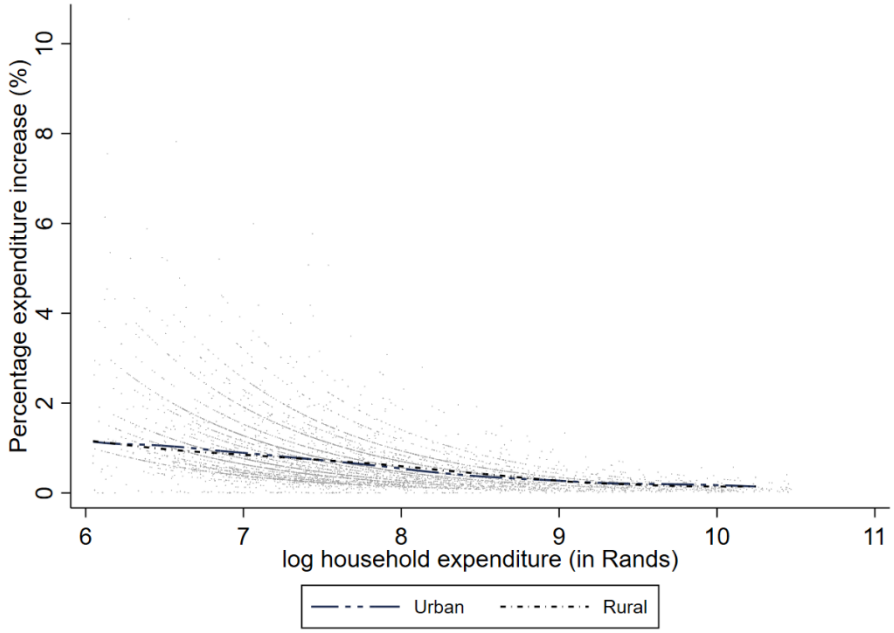
	(1)	(2)	(3)
VARIABLES	Chicken x Urban Prov	Chicken x Urban Prov (Urban-Rural)	Chicken x Rural Prov (Urban-Rural)
ln(chicken expenditure)	-0.846**	-0.684**	-0.969**
	(0.035)	(0.031)	(0.056)
Male	-0.008	-0.014	-0.095
	(0.047)	(0.041)	(0.067)
Coloured	0.060	0.079	0.215
	(0.084)	(0.067)	(0.769)
Asian/Indian	0.486**	0.131	0.626**
	(0.130)	(0.134)	(0.146)
White	0.269**	0.211**	0.834**
	(0.073)	(0.066)	(0.276)
ln(residents)	0.104**	0.072*	0.081+
	(0.034)	(0.029)	(0.046)
Eastern Cape		-1.718**	
		(0.086)	
Northern Cape	-0.710**	-0.469**	2.287**
	(0.088)	(0.085)	(0.773)
Free State	-0.243+	-0.194+	-1.267+
	(0.129)	(0.116)	(0.731)
KwaZulu-Natal	-0.384**	0.157	-1.331+
	(0.119)	(0.117)	(0.751)
North West	-0.787**	-0.976**	
	(0.118)	(0.097)	
Gauteng	-0.794**	-0.638**	-1.700*
	(0.101)	(0.089)	(0.740)
Mpumalanga	-0.753**	-1.279**	
	(0.109)	(0.090)	
Limpopo		-1.243**	-0.768
		(0.113)	(0.754)
Constant	8.467**	7.052**	9.775**
	(0.337)	(0.289)	(0.871)
Observations	2.931	3.443	1.819
Adj R-squared	0.284	0.336	0.308

Note: The dependent variable is total expenditure. Male is a dummy for male = 1, Female =0, rural =1, and urban =0. The base category for race is African. The base for provinces is Western Cape. Moreover, residents refers to the number of people residing in a household at a given time. We also take the log expenditure of total expenditure by the household and the log of residents in the household. Chicken consumption includes line items like BIP, BLC, whole chicken, and offal. We use the pass-through obtained from Table 3 column (1), which uses maize

prices as a control for the last four columns showing Provincial Urban-Rural impacts. We use pass-through coefficients obtained in column (1) of Table B1 in the appendix for the first two columns. In Table B1 we use pork as a control and limit our analysis to urban areas only. Chicken consumption includes various line items like BIP, BLC, whole chicken and offal. We use Wave 3 of NIDS and top up missing expenditure values from Wave 2. That is, we focus on 2012, the year before the first tariff change, during our analysis period. Robust standard errors clustered at the outlet level in parentheses. ** p<0.01. * p<0.05. + p<0.1

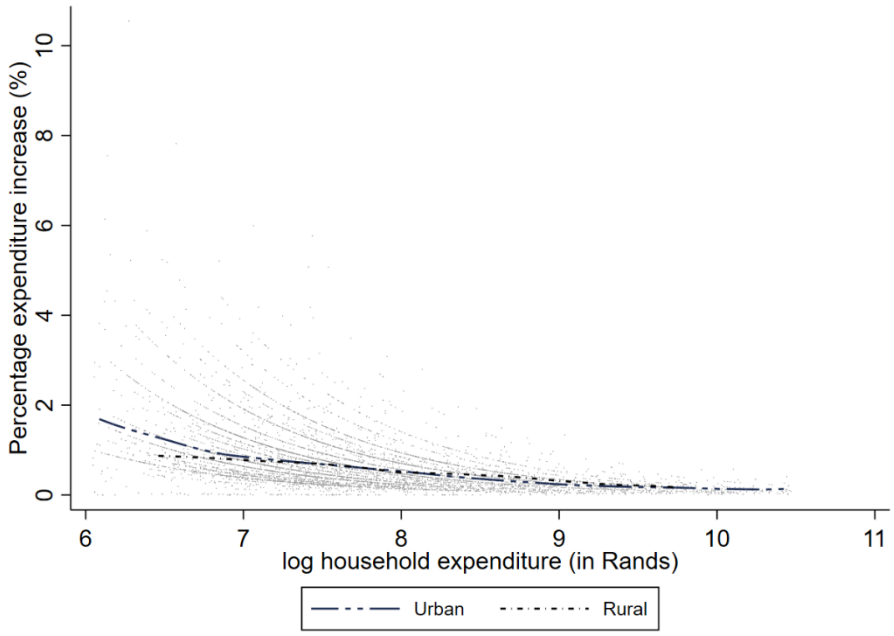
Appendix C – Additional figures

Figure C1: Eastern Cape scatter plot and local polynomial estimates of percentage total expenditure changes from increased chicken duties against household expenditure level



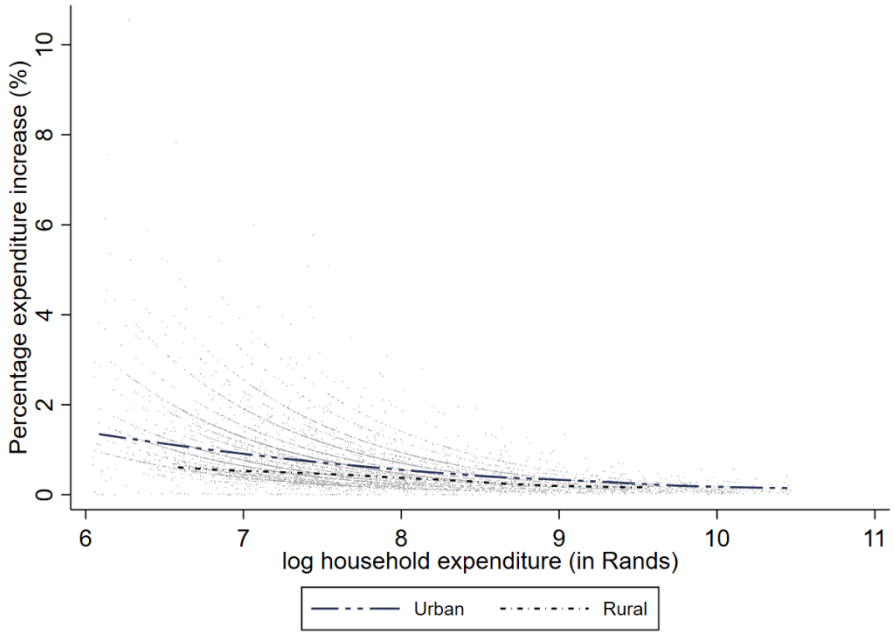
Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: We work out the impact of trade policy as the Chicken share * ΔP (which is computed as (e^((Prov Pass-through *0.52))-1). We use the pass-through obtained from Edwards et al. (2022) which is 0.477. The values reflect the increased expenditure that would be required to retain their existing consumption bundle. Chicken consumption includes various line items like BIP, BLC, whole chicken and offal. We use Wave 3 of NIDS and top up missing expenditure values from Wave 2. That is, we focus on 2012, which is the year before the first change in tariffs during our period of analysis. Smoothed local polynomial estimates for urban and rural areas are included. The top and bottom 1% of households by expenditure level are dropped from the sample.

Figure C2: Free State scatter plot and local polynomial estimates of percentage total expenditure changes from increased chicken duties against household expenditure level



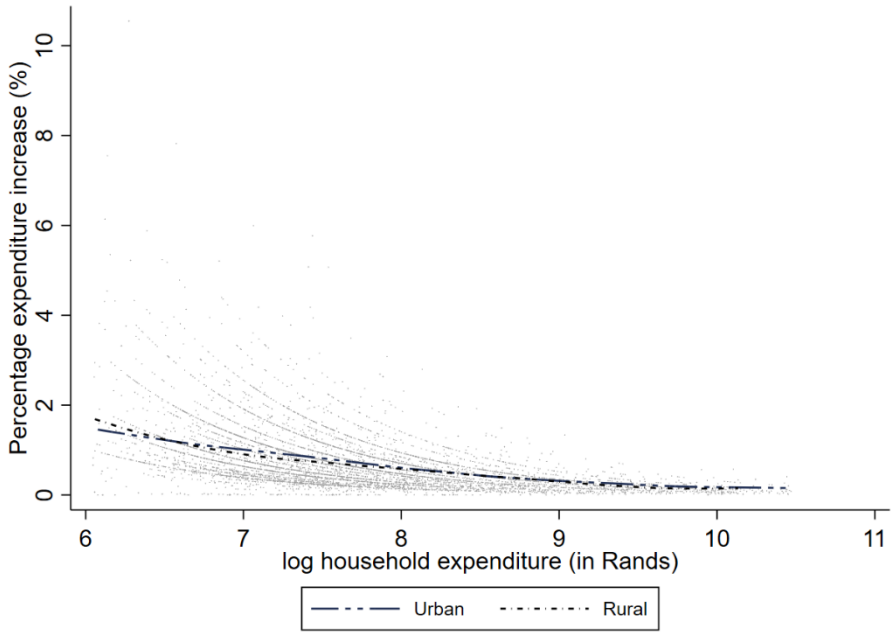
Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: please see Figure C1 for notes.

Figure C3: Gauteng scatter plot and local polynomial estimates of percentage total expenditure changes from increased chicken duties against household expenditure level



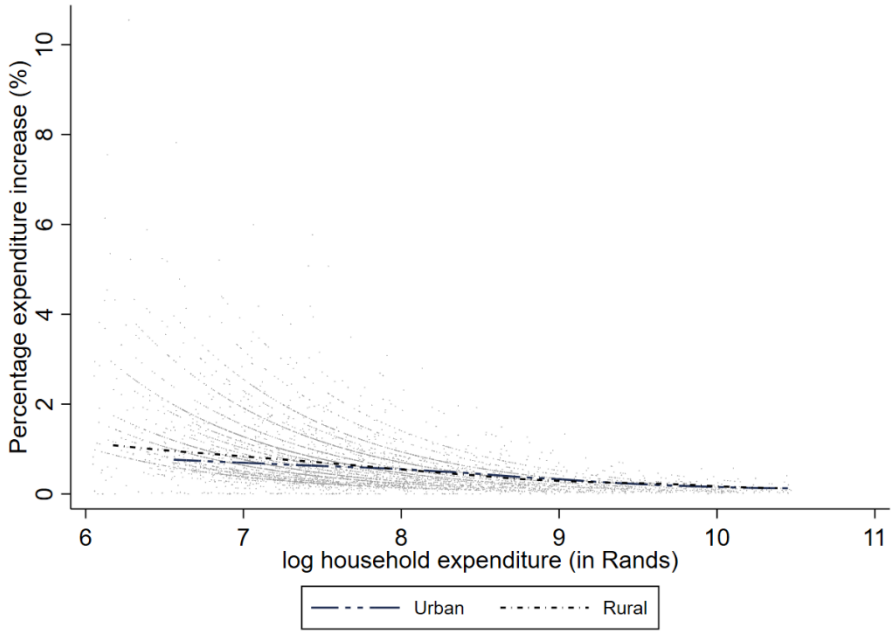
Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: please see Figure C1 for notes.

Figure C4: KwaZulu-Natal scatter plot and local polynomial estimates of percentage total expenditure changes from increased chicken duties against household expenditure level



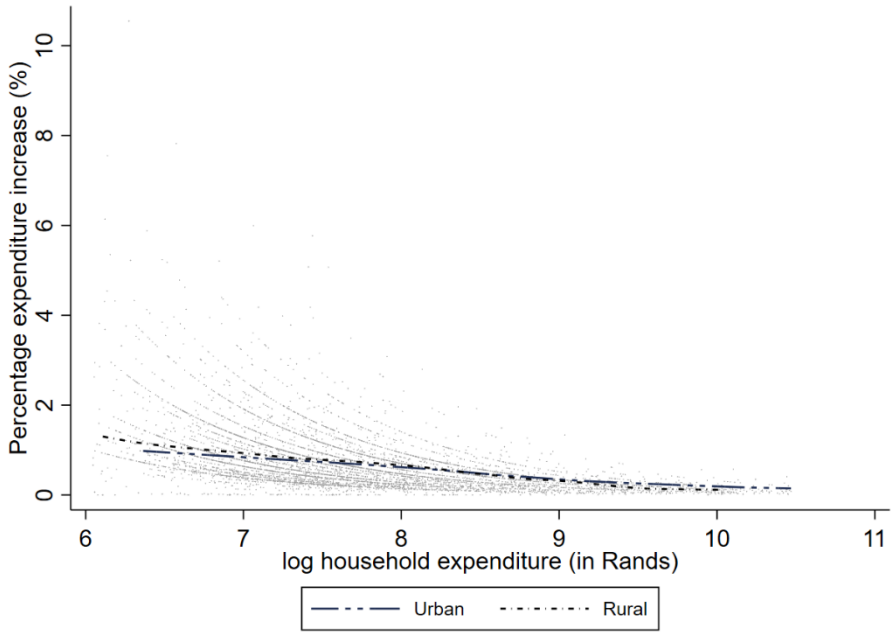
Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: please see Figure C1 for notes.

Figure C5: Limpopo scatter plot and local polynomial estimates of percentage total expenditure changes from increased chicken duties against household expenditure level



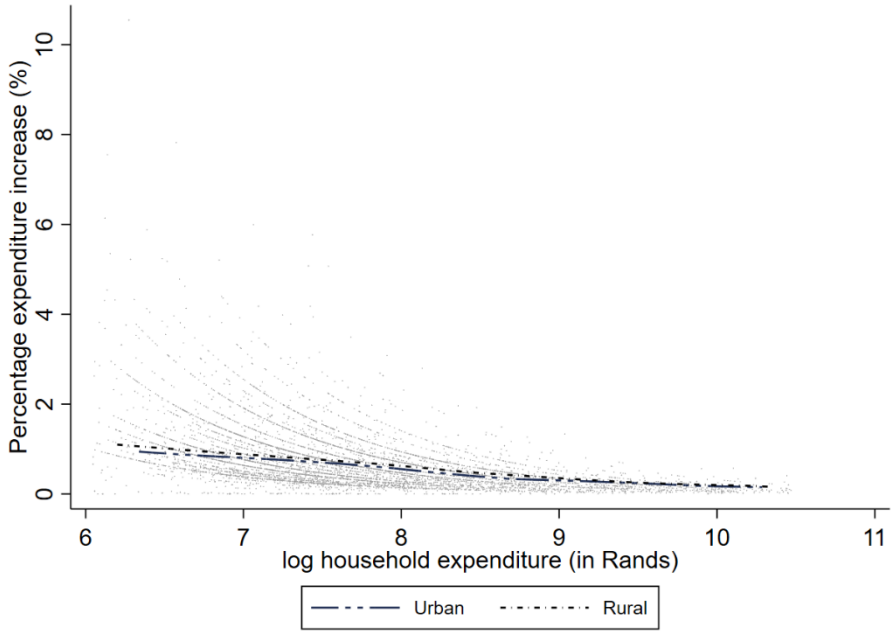
Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: please see Figure C1 for notes.

Figure C6: Mpumalanga scatter plot and local polynomial estimates of percentage total expenditure changes from increased chicken duties against household expenditure level



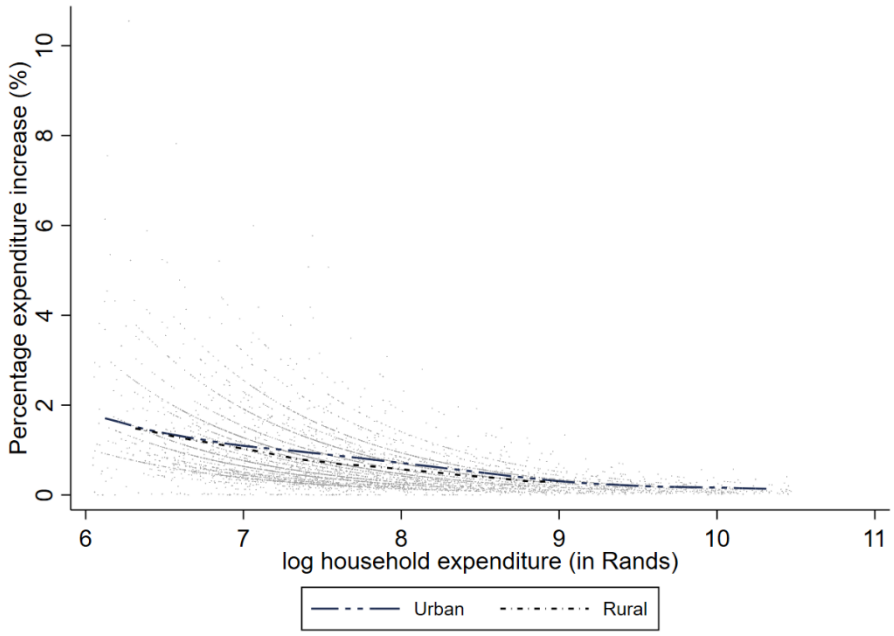
Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: please see Figure C1 for notes.

Figure C7: North West scatter plot and local polynomial estimates of percentage total expenditure changes from increased chicken duties against household expenditure level



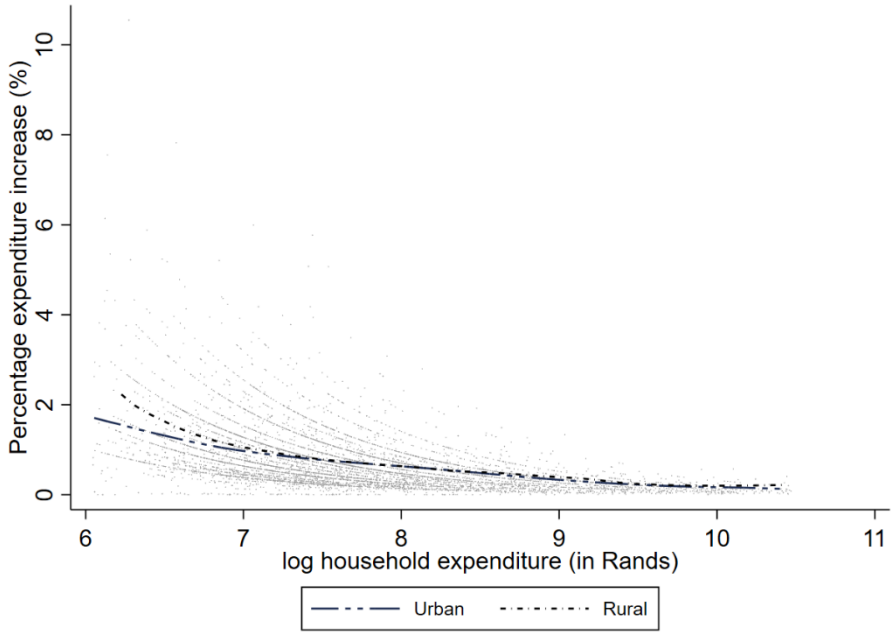
Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: please see Figure C1 for notes.

Figure C8: Northern Cape scatter plot and local polynomial estimates of percentage total expenditure changes from increased chicken duties against household expenditure level



Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: please see Figure C1 for notes.

Figure C9: Western Cape scatter plot and local polynomial estimates of percentage total expenditure changes from increased chicken duties against household expenditure level



Source: Own calculations using National Income Dynamics Study Wave 1 and Wave 2 obtained from Data First
Note: please see Figure C1 for notes.

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