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EFFECTS OF MAIZE IMPORTATION ON THE ECONOMIC WELFARE OF MAIZE PRODUCERS AND CONSUMERS IN KENYA: A PARTIAL EQUILIBRIUM MODEL APPROACH

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SUMMARY

Maize imports bridge the maize supply-demand gap in Kenya. However, this does not automatically imply any positive or negative effects of such imports on the economic welfare of maize producers and consumers in the country. Nevertheless, there is a limited body of literature dealing with maize importation effects on the economic welfare of maize producers and consumers in Kenya. This paper provides the empirical evidence of maize importation effects on the economic welfare of Kenyan maize producers and consumers. For the purpose of determining such effects, time series secondary data for the period 1963–2016 (FAOSTAT, World Bank and Kenya National Bureau of Statistics) and the partial equilibrium model were used (which is suitable for measuring the effects of pricing policies on specific sectors, allowing for perfect substitutability between domestically produced and imported goods). The maize imports in Kenya were found to yield ambiguous effects on the economic welfare of both maize consumers and producers in the country. The consumer surplus calculated gained only the compensated loss in the producer surplus in 2 out of 11 points of analysis. Conversely, the producer surplus calculated gained only a compensated loss in the consumer surplus in 1 out of 11 points of analysis. The resultant net economic welfare effect of maize importation in Kenya was found negative, indicating adverse impacts on both the Kenyan maize sector and economy as a whole. To ensure the sustainability and development of the maize sector in Kenya, further maize imports are considered not feasible without compensating the losses in the country's maize sector. Therefore, complementary reforms should be introduced to forge a link between world and consumer prices, and encourage producers to respond to production incentives. This will not only benefit maize producers and consumers, but will also facilitate the efficient allocation of resources for the improvement of the maize sub-sector competitiveness.

Key words:
trade liberalisation, partial equilibrium model, economic welfare, maize imports, Kenya

Abbreviations:
FAOSTAT - Food and Agriculture Organisation Statistics; KALRO - Kenya Agriculture Livestock Research Organisation; KNBS - Kenya National Bureau of Statistics; NCPB - National Cereals and Produce Board; WTO - World Trade Organisation; PEM - Partial Equilibrium Model; EAC - East African Community; COMESA - Common Market for East and Southern Africa; URAA - Uruguay Round of Agreement on Agriculture

INTRODUCTION

The role of maize in the Kenyan food system and economy cannot be overstated. Maize is a staple food and the most grown crop in the country (Muyanga et al., 2005; Abate et al., 2015; KALRO, 2019). The average land area devoted

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to maize production in Kenya increased steadily between the 1960s and 2000s. For instance, approximately 1 million hectares of land were devoted to maize production in the first decade of the Kenyan independence (FAOSTAT, 2019). The average land area devoted to maize production increased to about 1.6 million hectares between 2000 and 2010. Recent FAOSTAT (2019) estimates indicate that approximately 2.1 million hectares of land were devoted to maize production in Kenya in the period 2011–2017. Despite the increases in land area devoted to maize production, maize yields have almost stagnated over the past decades. FAOSTAT (2019) estimates indicate that the average yield in the 1980s was about 1.7 tonnes per hectare. Nevertheless, the yields have stagnated at almost 1.6 tonnes per hectare since the 1990s (Olwande, 2012; FAOSTAT, 2019).

The stagnation in maize production has caused Kenya to devolve from a self-sufficient maize producer and exporter to a net maize importer over the past decades. For instance, the Kenyan maize exports averaged 85,000 tonnes in the 1960s compared to about 41,000 tonnes of imports in the same period (FAOSTAT, 2019). The average Kenyan maize exports approximated to 67,000 tonnes in the 1970s, whereas the average Kenyan maize imports were 4,000 tonnes in the same period. However, the average Kenyan maize exports approximated to 99,000 tonnes in the 1980s, whereas the average Kenyan maize imports increased to 100,000 tonnes in the same period. According to Abate et al. (2015), Kenya became a net maize importer in the 2000s, and the country's net maize imports were estimated at 292,000 tonnes in the period 2000–2011. On average, Kenya imported about 350,000 tonnes of maize in the period 2011–2015, whereas a total of about 5,500 tonnes of maize were exported in the same period (FAOSTAT, 2019). These statistics indicate that Kenya has devolved from a self-sufficient maize producer to a maize-deficit country over the past five decades.

Kenya has witnessed a rapid population growth rate over the last five decades, resulting in an increasing demand for food. A growing demand for maize as a staple food commodity has also been recorded. The per capita maize consumption was estimated at 98 kg per annum by 2004 (Nyoro et al., 2004). However, recent estimates indicate that the per capita maize consumption stands at 108 kg annually (Kariuki et al., 2016). The Kenyan demand for maize exceeds its production, forcing the country to rely on imports to meet the increasing domestic demand for maize. Therefore, it can be concluded that trade plays an instrumental role in enabling the availability of the staple food in Kenya.

The practice of trade in Kenya precedes the country's independence, when tea and coffee were the main exports. However, the Kenyan participation in international trade has increased since the 1960s due to the continued wave of global economic integration. The trade liberalization in the Kenyan agricultural sector, comparable to a majority of other countries in Sub-Saharan Africa, can be traced back to the 1980s (Nyairo, 2011). The introduction of agricultural reforms in the 1980s was supported by international development organizations and agencies. The reforms introduced were aimed at eliminating production bottlenecks in the agricultural sector and exposing the sector to market forces (Sheahan et al., 2016). The reforms involved reducing the government involvement in the agricultural sector and creating incentives for farmers (Nyairo, 2011; Nagarajan et al., 2019).

Prior to the structural adjustment programs in the 1980s, the government controlled the maize sub-sector (Nzuma, 2007). The government controlled territorial and pan-territorial price, and monopolized maize marketing through the NCPB (Nzuma & Sarker, 2010). The intensification of the structural adjustment programs limited the government control over maize marketing and pricing. Prices were also deregulated, and subsidies to maize millers were cancelled. In 1993, NPCB ceased to be the sole buyer and seller of maize in the country. Territorial and pan-territorial pricing were also deregulated (Kirimi, 2012). However, these policies did not adequately limit the government control in the Kenyan maize sub-sector.

The accession of Kenya to the World Trade Organization (WTO) and the ratification of several bilateral and multilateral trade agreements opened the Kenyan borders to international trade. The endorsement of the Uruguay Round of Agreement on Agriculture (URAA) saw Kenya commit to market access requirements, including tariffs (David, 2018). Additionally, Kenya is also committed to the East African Community (EAC) and Common Market for East and Southern Africa (COMESA) trade agreements. According to Vitale et al. (2013), Kenya applies the EAC's common external tariff (CET) on cereals, with temporary adjustments depending on the level of deficit. Maize imports from countries that are non-EAC or non-COMESA member states are subjected to a tariff of about 50%. However, the tariff is either waived, reviewed or re-imposed from time to time (d'Hôtel et al., 2013). Maize imports from COMESA and EAC are tariff-free. According to Mulinge et al. (2014), Kenya imports mostly from Zambia, Malawi, and Tanzania. However, d'Hôtel et al. (2013) noted that tariff inconsistencies may result in undesired results caused by policy changes.

The number of studies investigating the effects of international trade on the economic welfare of citizens is increasing. This underscores the importance of trade liberalisation to the welfare of both consumers and producers in a country. Biswas & Sengupta (2015) used the partial equilibrium model to compare the effects of tariff changes on the welfare of producers and consumers in developing countries. Additionally, they analysed the welfare effects of

quantitative restrictions. The study established that import tariffs and quotas resulted in a reduction of import volumes and a decrease in both producer and importer profits. However, the domestic production considered did not completely offset fall in imports, which resulted in price hikes that impacted the consumer welfare. Overall, the trade policy effects led to welfare losses that defeated the original purpose of the policy change. However, Biswas & Sengupta (2015) noted that impacts depended on the currency devaluation and exchange regimes implemented by the developing countries considered.

Schmitz & Lewis (2015) investigated the effects of the North American Free Trade Agreement on the producer and consumer welfare using time series data for the period 2008-2013. The estimates obtained using the partial equilibrium trade model showed that the trade agreement between Mexico, Canada, and the United States had a disproportionate ex-post impact on the sugar economic welfare in these countries. As Mexican producers gained an average of $405 million to $833 annually, sugar producers in the United States recorded significant losses according to the trade agreement. Mexican consumers suffered between $376 million and $766 million loss in their welfare. Nevertheless, the total welfare loss for Mexico averaged between $29 million and $67 million per annum. In contrast, the United States producer surplus reduced by between $654 million and $1.6 billion per annum, but increased the consumer welfare by between $612 million and $1.7 billion in the same period. In the same period, the US total welfare increased by $405–833 million.

Parajuli & Zhang (2016) used monthly imports of Canadian softwood into the United States to analyse the consumer and producer welfare. Similar to Schmitz & Lewis (2015), Parajuli & Zhang (2016) used the partial equilibrium trade model to estimate the welfare impacts of the softwood lumber agreement. The trade agreement restricted the volumes of Canadian softwood imports to the United States. The import restriction resulted in negative consumer surplus and positive producer surplus in the United States. The tax revenues for the United States were positive. Overall, the import restrictions resulted in a total economic loss. However, the trade policy led to the negative producer welfare in Canada, as well as the positive net economic welfare.

The onset of trade war between the United States and China has attracted the attention of international scholars. In retaliation to the United States' tariff on Chinese steel, China imposed a 25% tariff on the United States soybean. Sabala & Devadoss (2019) used the partial equilibrium trade model to estimate the impact of such decisions on the consumer and producer welfare in both countries. The study established that a 25% import tariff increased the consumer prices, resulting in a $3.03 billion decrease in the consumer surplus. In contrast, the producer welfare increased by $370 million. The net welfare loss was $2.66 billion. The United States responded to the Chinese tariff hikes by expanding its exports to Mexico, Canada, Brazil, Argentina, and Paraguay. Nevertheless, trade diversion did not offset the producer losses due to a decrease in consumer and producer prices. The Chinese tariff on the US soybean resulted in $5.52 billion and $2.80 billion in producer loss and consumer gain, respectively. The overall net economic loss was $2.72 billion.

The reviewed literature establishes a connection between trade and economic welfare. However, most of the literature focused on the welfare effects of trade in developed countries. There are no specific studies on the welfare effects of maize imports in Kenya. Moreover, the existing literature has mostly dealt with the effects of trade liberalisation on maize production, producer responsiveness to prices and food security (McCorriston et al., 2013; d'Hôtel et al., 2013; Kassim, 2015). Additionally, the reviewed literature generally has failed to recognize that trade gains and losses may be disproportionate, depending on the level of economic development of the trading nations. The current study focused on overcoming the abovementioned weakness by analysing the economic welfare effects of maize importation in Kenya. Moreover, the effects of maize imports on the maize producer and consumer welfare in Kenya in the period 1963–2016 were simulated using the partial equilibrium model.

MATERIAL AND METHODS

Data

Secondary source data were used in order to generate 54-year annual time series data on the consumer prices, producer prices, production, consumption, imports, import tariff rates, import prices, cropped areas and border prices of maize in Kenya in the period 1963–2016. The data were obtained from both international and domestic sources. The international sources included the FAOSTAT and World Bank online data sources. Conversely, the domestic sources consisted of publications obtained from the Kenya National Bureau of Statistics (Statistical Abstracts and Economic Survey), the Kenya Revenue Authority, and the Ministry of Agriculture.

Choice of explanatory variables

Variables affecting the economic welfare of maize producers and consumers in Kenya were selected according to the economic theory and empirical studies on trade liberalization effects on the economic welfare, and other policy

documents (e.g., Stockbridge et al., 2003; Nzuma, 2007; Nzuma & Sarker, 2010; Nuetah et al., 2011; Biswas & Sengupta, 2015; Schmitz & Lewis, 2015; Parajuli & Zhang, 2016; Mulenga et al., 2017). The following variables were considered: the quantity of maize produced and consumed, price elasticity of maize supply and demand, maize import tariff rate, maize import quantity, and border and domestic price of maize.

Modelling strategy

The partial equilibrium model (PEM) is commonly used to estimate the welfare effects of trade policies (Nzuma & Sarker, 2010; Biswas & Sengupta, 2015; Schmitz & Lewis, 2015; Parajuli & Zhang, 2016). The model focuses on estimating the effects of a policy change on a single sector as opposed to multi-sector effects that are analysed using the general equilibrium model. It has the capability of assessing indirect effects that result from trade policy changes such as import and export losses or welfare gains and losses. It also allows perfect substitutability between domestic and imported commodities (Lutz & Scandizzo, 2015). Therefore, PEM was employed herein to estimate the effects of maize importation on the economic welfare of maize consumer and producers in Kenya in the period 1963–2016.

The simulation of maize importation effects on the economic welfare of maize producers and consumers in Kenya was made using the price elasticity estimates of Kenyan maize demand and domestic supply. The elasticity of Kenyan maize supply and demand, resulting from trade policy changes, was specified as follows:

$$Esd = \frac{\Delta \ln(Mqs)}{\Delta \ln(Ps)} \quad (1)$$

$$Edd = \frac{\Delta \ln(Mqd)}{\Delta \ln(Pd)} \quad (2)$$

where *Esd* and *Edd* denote the price elasticity of supply and demand respectively, *Mqs* is the maize quantity supplied to the market, *Mqd* is the maize quantity demanded in the market, *Ps* is the producer price, *Pd* is the maize domestic price, and Δ is the change operator.

The elasticities derived from Equations 1 and 2 were entered into the demand and supply sides of the PEM. Following Naanwaab & Yeboah (2014), the maize import demand function was specified as presented in Equation 3.

$$Q_m(P,Y) = Q_d(P,Y(P)) - Q_s(P) = Q_m(P,Y) \quad (3)$$

where $Q_m(.)$ denotes the quantity of imported maize, P is the domestic price, Y is the domestic income, $Q_d(.)$ is the quantity of domestic maize demand, and $Q_s(P)$ is the quantity of maize supplied to the domestic market at each price level P. Conversely, Naanwaab & Yeboah (2014) specified the import supply function as follows:

$$Q_x(P) = Q_s(P) - Q_d(P) \quad (4)$$

where $Q_x(P)$ denotes the quantity of maize import supplied to the market. The quantity supplied to the market is a function of the price of maize P, Q_s is the quantity supplied to the domestic market and Q_d is the quantity demanded in the market.

Empirically, Equations 3 and 4 were fitted using Specifications 5 and 6, respectively (Naanwaab & Yeboah, 2014).

$$M_t^* = f(Y_t P_{mt} / P_{dt}) \quad (5)$$

$$M_t^* = \alpha_0 + \alpha_1 Y_t + \alpha_2 P_t + e_t \quad (6)$$

Equation 5 is the empirical estimation equation for the import demand function, whereas Equation 6 is the empirical estimation of the import supply (Equation 4). M_t^* is the desired quantity of imports at time t, P_{mt} and P_{dt} denote the import price and domestic price at time t, respectively. Y_t is the income at time t, P_t is the relative price, P_{mt}/P_{dt} is a ratio of the import and domestic price at time t, and e_t is the stochastic error term.

Introducing a partial adjustment mechanism, the PEM equation was then specified as follows:

$$\Delta M_{ti} = M_{ti} - M_{ti-1} = \delta(M_{ti}^* - M_{ti-1}) \quad (7)$$

where M_t represents the actual quantity of maize imported at time t, M_{t-1} denotes the actual quantity of maize imported at time t - 1, wheras δ is the coefficient of adjustment.
A dynamic import equation derived from Equation 7 was given as presented in Equation 8.

$$M_t = \delta\alpha_0 + \delta\alpha_1 Y_t + \delta\alpha_1 P_t + (1-\delta)M_{t-1} + \delta e_t \quad (8)$$

The PEM focuses on establishing the effects of price changes resulting from imports, i.e. the impact of import tariffs or quotas on volumes of trade and welfare. As the focus of the model is placed on the consumer and producer responses to price, we excluded income from the import functions. Therefore, we postulated that a policy change will trigger changes in import volumes due to differences between the world and domestic prices of maize. This was represented by the import demand (9) and supply (10) equations as follows:

$$M_t = Q_d - Q_s = M(P/P_t^*, Edd_t, M_{t-1}) \quad (9)$$

$$S = Q_S - Q_d = S(P/P_t^*, Esd_t, S_{t-1,}) \quad (10)$$

where S_t is the actual quantity of maize import supply at time t, P/P_t^* is the relative price, and *Esd* and *Edd* are the elasticities of supply and demand, respectively. S_{t-1} is the actual quantity of maize imports supplied at time *t-1*.
Shehata & Mickaiel (2015) posit that welfare gains or losses from trade as specified in Equation 7 can be derived following the model variables and derivations in Tables 1–3. *Pd* and *Pw* are the domestic price and border price of maize, respectively. They are continuous variables measured in Kenya shillings (KES). In the period 1963–2016, the domestic maize prices in Kenya were strictly controlled by the government through the maize marketing and produce boards. After 1995, the Kenyan domestic maize policy dramatically changed and the role of the NCPB reduced to a buyer of the last resort (Nzuma, 2007). The border price of maize was used as a price at which maize was sold at the Kenyan international borders. *QPd* and *QCd* represent maize production and consumption quantity at domestic prices, respectively. *QPw* and *QCw* represent maize production and consumption quantities at border prices, respectively. *Esd* and *Edd* are the supply price elasticity and demand price elasticity at domestic prices, respectively. *Esw* and *Edw* are the supply price elasticity and demand price elasticity at border prices, respectively.

Table 1. Private Price

Variable	Description	Measurement	Derivation
Pd	Domestic Price	KES	
Tmd	Import Tariff Rate	Percentage	*(NPC-1)/NPC*
Esd	Supply Price Elasticity	Percentage	
Edd	Demand Price Elasticity	Percentage	
QPd	Production Quantity	Tonne	
QCd	Consumption Quantity	Tonne	

Table 2. Social price

Variable	Description	Measurement	Derivation
Pw	Border Price	KES	
NPC	Nominal Protection Coefficient	Ratio	*Pd/Pw*
Tmw	No Import Tariff Rate	Percentage	*NPC-1*
Esw	Supply Price Elasticity	Percentage	*Esd*(Pw*QPd)/(Pd*QPw)*
Edw	Demand Price Elasticity	Percentage	*Edd*(Pw*QCd)/(Pd*QCw)*
QPw	Production Quantity	Tonne	*QPd-(Esd*(Pd-Pw)*QPd/Pd)*
QCw	Consumption Quantity	Tonne	*QCd-(Edd*(Pd-Pw)*QCd/Pd)*

Table 3. Derivation of economic welfare

Variable	Description	Measurement	Derivation
NELp	Net Economic Loss in Production	KES	*0.5*(QPw-QPd)*(PwPd)*
NELc	Net Economic Loss in Consumption	KES	*0.5*(QCw-QCd)*(PdPw)*
PS	Change in Producer Surplus	KES	*QPd*(Pd-Pw)-NELp*
CS	Change in Consumer Surplus	KES	*QCd*(Pw-Pd)-NELc*
GR	Change in Government Revenue	KES	*-NELp-NELc-PS-CS*
NET	Net Economic Loss in Export/Import	KES	*PS+CS+GR = -(NELp+NELc)*

RESULTS AND DISCUSSION

Table 4 presents the average price elasticity of maize supply and demand in Kenya in the period 1963–2016. The private price elasticity of maize supply was 1.53%. This result is consistent with the findings of Huong & Yorobe (2017), who established that maize supply is highly responsive to maize price changes. Conversely, the private price elasticity of demand was -1.05%. According to the social price elasticities, the supply elasticity averaged 0.24%, whereas the demand price elasticity was -0.02%.

Table 1. Supply and demand price elasticities in the period 1963–2016

Elasticity	Private	Social
Supply	1.53	0.24
Demand	-1.05	-0.02

Table 5 presents the results of the PEM analysis of the effects of maize imports on the economic welfare of maize producers and consumers in Kenya in the period 1963–2016. The welfare effects are a five-year impact of maize imports, except for the period 2013–2016.

Table 2. Maize import effects on the economic welfare of maize producers and consumers in Kenya

Period	PS (million KES)	CS (million KES)	Net effect (million KES)
1963–1967	-40.48	-9.08	-49.6
1968–1972	-430.5	-63.03	-493.5
1973–1977	-901.8	46.11	-855.7
1978–1982	-6,934	1,562	-5,372
1983–1987	773.9	-144.8	629.1
1988–1992	-5,962	-104,100	-110,062
1993–1997	-3,505	3,613	108
1998–2002	1,019	-7,012	-5,993
2003–2007	-2,910	5,627	2,717
2008–2012	29,550	-58,540	-28,990
2013–2016	88,180	-492,800	-404,620

In 7 out of the 11 periods considered, maize producers and consumers suffered economic losses due to maize importation. The simulation results obtained show that the Kenyan producers lost about KES 40 million between 1963 and 1967, i.e. their welfare decreased by virtue of a negative producer surplus of KES 8 million per annum. This could be attributed to a decline in the marketed surplus during this period, which was caused by the land transfers and resettlement programs initiated by the government after the independence of the country (Karanja, 1996). In the periods 1968–1972 and 1973–1977, the Kenyan maize producer surplus reduced by about KES 431 million and 901 million, respectively (which amounts to an average annual loss of KES 86.2 million and 180.2 million, respectively). These losses could be attributed to an 80% decline in the overall food production due to the exodus of settlers from large farms and the transition to African farming after the independence of Kenya (Heyer et al., 1976; Karanja, 1996).

In the 1963–1967 and 1968–1972 periods, the Kenyan maize consumer surplus reduced by KES 9 million and 63 million, respectively. This implies that the maize consumer losses averaged KES 1.8 million and 12.6 million per annum, respectively. However, the consumers gained KES 46 million in the period 1973–1977, which indicates that the annual consumer surplus increased by KES 9.2 million in the same period. A decrease in the consumer surplus in the period 1963–1972 could be attributed to trade imbalance. During this period, the Kenyan maize export volumes were greater than import volumes (FAOSTAT, 2019). The net economic losses in the periods 1963–1967, 1968–1972 and 1973–1977 were about KES 50 million, KES 494 million and KES 856, respectively. These losses could not be attributed to the trade policy itself, but rather to the declining economic performance of the country elicited by the adjustments from the colonial rule, which led to the declining per capita food production and the global oil crisis (Karanja, 1996).

These periods coincided with the implementation of structural adjustment policies which required the registration of maize producer gains and losses. The producers lost KES 6,934 million in the period 1978–1982 and gained about KES 774 million in the period 1983–1987. This implies that the producer losses averaged KES 1,386.8 million, whereas their gains averaged KES 154.8 million per year in the periods 1978–1982 and 1983–1987, respectively. The producer surplus loss in the period 1978–1982 could be attributed to drought in 1980, as well as inefficiencies in the marketing boards (Kirimi, 2012). Similarly, the consumer losses averaged KES 145 million in the period 1983–

1987, whereas their gains averaged KES 1,562 million in the period 1978–1982. Therefore, a loss of KES 29 million per annum and a gain of KES 312.4 million per annum were recorded. A significant increase in the consumer surplus in the period 1978–1982 could be attributed to the subsidized sifted maize meal prices and food security status of the country during this period, resulting from the strict control of maize prices by NCPB (Nzuma, 2007). The resultant net effect of maize importation was a loss of KES 5,372 million in the period 1978–1982 and a gain of about KES 629 million in the period 1983–1987. The producer surplus gain and the resultant net gain from the maize importation in the period 1983–1987 could be attributed to stable producer incomes as a result of stable pan territorial and pan seasonal maize prices in the entire country during this period. Secondly, this could be attributed to structural adjustment programs that reduced the government involvement in the maize marketing and maize price control (Nyairo, 2011; Kirimi, 2012). The structural adjustment programs possibly created the incentives for investment in the maize sub-sector, which resulted in positive maize production effects. According to the FAOSTAT estimates (2019), the volume of Kenyan maize imports and exports almost balanced in the 1980s. Therefore, the gains from maize exports could have possibly offset the potential losses from maize importation.

Despite the gains from trade liberalization policies (which were implemented in the mid-1980s), the maize producers lost about KES 5,962 and KES 3,505 million in the periods 1988–1992 and 1993–1997, respectively (as a result of the continued trade openness). Consequently, losses of KES 1,192.4 and KES 701 million per year were recorded in the periods 1988–1992 and 1993–1997, respectively. Similarly, the maize consumers lost KES 104,100 million in the period 1988–1992, but gained KES 3,613 million in the period 1993–1997 (which suggests a loss of KES 20, 820 million in the period 1988–1992 and a gain of KES 722.6 million in the period 1993–1997). The net social effects of maize importation entailed a loss of KES 110,062 million and a gain of KES 108 million in the periods 1988–1992 and 1993–1997, respectively. Immense losses in the consumer and producer surplus in the period 1988–1997 could be attributed to the elimination of intra-regional trading of maize in Kenya in 1993, as well as to the fact that the National Cereal Produce Board became the sole maize buyer and seller in the country (Kirimi, 2012). Moreover, Kenya ratified the Uruguay Round of Agreement on Agriculture (URAA) and acceded to WTO (Ndirangu, 2017). This trigged an increased importation of maize, which was possibly a disincentive to investments in the maize production for most Kenyan commercial maize producers. The estimated maize imports to Kenya rose from 100 thousand tonnes in the 1980s to almost 270 thousand tonnes in the 1990s (FAOSTAT, 2019).

The producer surplus increased by KES 1,019 million in the period 1998–2002 and decreased by KES 2,910 million in the period 2003–2007, resulting in a gain of KES 203.8 million annually in the period 1998–2002 and a loss of KES 580 million annually in the period 2003–2007. The producer surplus decrease in the period 2003–2007 could be attributed to duty-free access to the maize imports from the COMESA and EAC countries. On the other hand, the consumer surplus decreased by KES 7,012 million in the period 1998–2002, prior to increasing by KES 5,627 million in the period 2003–2007. The changes in maize prices and quantities resulted in a net loss of KES 5,993 million and a net gain of KES 2,717 million in the periods 1998-2002 and 2003-2007, respectively. Both the consumer and net economic losses in the period 1998–2002 corroborate the findings of Jayne et al. (2006), who indicated that import tariffs imposed frequently within a period lead to higher domestic prices by as much as 10% (which could be a disincentive for maize consumers).

The Kenyan maize producers gained KES 29,550 million in the period 2008–2012, whereas the maize consumers lost KES 58,540 million. During this period, the producer welfare improved due to a positive producer surplus of KES 5,910 million per annum, whereas the consumer surplus decreased by KES 11,708 million per annum. This could be accounted for by a general increase in food prices globally, which was occasioned by the global financial crisis of 2007-2008. In addition to oil prices, the global food price spikes of basic food crops hit the population in developing countries (Sundaram, 2010). The liberalization of agricultural trade regulations also allowed for the transmission of high food prices, which possibly resulted in higher producer and consumer prices. The quantity changes may have been caused by high input costs triggered by rising oil prices, thus diminishing the impact of maize imports on consumer prices. Consequently, the producer surplus improved because of higher producer prices, whereas the consumer surplus decreased due to higher consumer prices. Additionally, the consumer surplus loss suggests the need for an increase in strategic grain reserves to cushion maize consumers from persistent global price spikes.

The consumer prices in Kenya did not ease after the aftermath of the 2008 global food crisis. This could be attributed to artificial shortages of the food staple in Kenya during this period, created by inconsistent policies over the past years. As a result, the consumer surplus decreased by about KES 492,800 million in the period 2013–2016, leading to a reduction in consumer welfare by KES 98,560 million per annum. However, the producer surplus increased by KES 88,180 million. This implies that, on average, the producer surplus increased by KES 17,636 million per annum. The economic loss in the same period was KES 404,620 million. The net economic loss in the period 2013–2016 was the largest since the 1960s. As the largest loss recorded in the consumer surplus was coupled with the

overall economic welfare loss during this period, it is clear that the money lost during this period, as a result of maize importation, could have been channelled to increase the government allocation to input subsidies (an average of KES 3.45 billion was allocated only for the 2013/2014, 2014/2015 and 2015/2016 financial years (GOK, 2014; 2015; 2016).

The results obtained provide evidence of ambiguous effects of maize imports on the economic welfare of maize producers and consumers in Kenya. The price of maize appears to play a secondary role in determining the outcomes of post-trade reforms undertaken in Kenya. The inconsistencies in the timing and implementation of trade policies could be attributed to the ambiguous effects of imports in Kenya. Imports play a crucial role in improving the competitiveness of domestic industries. The inconsistency in the implementation of the trade policies could be attributed to a lack of capacity of the Kenyan government to regulate and stabilise maize production and prices through imports. This could be due to governance problems or failure (Poultion et al., 2006; Jayne & Tschirley, 2009; d'Hôtel et al., 2013: Wamalwa & Were, 2021). The empirical evidence displayed suggests that government interventions in the market may fail to provide production or consumption incentives of a balance due to policy inconsistency or ineffective implementation of the policy reforms.

The ambiguous effects or rather the unintended outcomes could also be attributed to ad hoc and discretionary trade policies implemented by the government (d'Hôtel et al., 2013). The discretionary policies create uncertainty for local maize traders and importers. Import tariffs are frequently implemented and unannounced changes made sporadically. Furthermore, the government implements maize export bans. These events deprive both producers and consumers gains that would have possibly accrued from the maize trade. Additionally, the NCPB sets the official producer and consumer pricing structure, which, in turn, influences market prices. The maize imports are subjected to the same price regime as domestic maize. Therefore, the imports have little impact on the price of maize (Ariga & Jayne, 2010; Mulinge et al., 2014).

Maize is predominantly produced by smallholder farmers in Kenya. However, Ariga & Jayne (2010) posit that the imposition of import tariffs or bans only benefit large scale farmers who market their surplus at higher market prices. The import restriction through prices or bans for most of the periods of the analysis could be possibly attributed to the argument of Ariga & Jayne (2010). The distributional effects of import restriction could have negative effects on maize-buying rural and urban households. It is crucial to note that smallholder farmers retain large proportions of maize output during shortages, which usually coincide with hasty government interventions in the market. The retention of maize output raises market prices which exert negative effects on consumers because maize imports rarely off-set the effect of maize supply deficits.

Nevertheless, the ambiguous policy effects of imports on the producer and consumers welfare may not be entirely attributed to the trade policy implemented. McCorriston (2013) opine that the liberalization of the agricultural sector in the developing countries does not operate in a policy vacuum. Other macroeconomic policy reforms occur alongside trade policies which impact the intended effects of trade policy change. According to McCorriston (2013), isolating the effects of macroeconomic policies from the trade policy is a daunting task in the developing countries, Kenya included. Moreover, the effect of trade liberalization may be outweighed by other macroeconomic policies (Onjala, 2020), implying that the effect of trade policy on the economic welfare is influenced by other policies implemented elsewhere in the economy. For instance, Biswas & Sengupta (2015) cite exchange rate policies as important to explaining the effect of trade policies in developing countries. This is further supported by the fact that the exchange rate is an important determinant of maize import demand.

CONCLUSION

In this research, the effects of maize imports on the maize producer and consumer welfare in Kenya were simulated for the period 1963–2016. The results obtained show that maize imports have ambiguous effects on the economic welfare of Kenyan maize producers and consumers. For consumers to gain from a trade policy, maize producers have to lose, and vice versa. Additionally, the results show that the net gain in the economic welfare from the trade policy was registered in only 3 out of 11 periods under review. The remaining 8 periods under review registered net economic losses. This is a clear indication that the resultant effect of maize importation would be a net societal loss and a loss in the government revenue. Therefore, it can be concluded that trade policy interventions in the maize subsector does not always result in the intended outcomes. However, it should be noted that maize import effects on the economic welfare of Kenyan maize producers and consumers cannot be entirely linked to the trade policy, but also to other macroeconomic policies.

On balance, maize trade policy outcomes should be aligned and supported by other macroeconomic policies in order to eliminate inconsistencies. Moreover, the maize trade policy should align domestic prices with world prices in order to provide producer incentives. The alignment of domestic prices to international prices will also allow the

efficient allocation of production resources, which, in turn, will improve the competiveness of the domestic maize sub-sector. This will enable both maize producers and consumers benefit from the sector, thus ensuring its sustainability and development. These recommendations can be achieved by NCPB, which should set maize purchase prices that are based on import parity prices. The government should avoid implementing discretionary policies in order to eliminate market uncertainties. The government should also enhance the consumer surplus by implementing food safety nets through building strategic grain reserves that would be used for price stability. This can be achieved by rechanneling part of the annual budgetary allocation for maize imports to irrigation and water projects such as the Galana Kulalu irrigation project so as to eliminate overreliance on the rain fed production of maize. This will positively affect the Kenyan domestic maize production and diminish overreliance on maize imports.

In the present study, it was not possible to fully explore the distribution of welfare gains and losses of the maize producers and consumers in Kenya because of the lack of data differentiated by household types. Collecting data on small-scale and large-scale producers, as well as on rural and urban maize consumers, requires conducting surveys. Future research should consider such analysis based survey data collection.

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