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Trade liberalisation, market behaviour and food security: Evidence from Tanzania

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Trade liberalisation, market behaviour and food security

Evidence from Tanzania *

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Abstract

The increasing dependency on food imports for food security in the Global South implies a higher vulnerability to trade shocks. Trade barriers, such as export restrictions on stable food crops, are commonly used by developing countries in times of crisis. Surges in international food prices raise the real incomes of the farmers selling food while hurting the net food consumers. Trade restrictions may stabilise the domestic availability and price of food for net consumers in the short run. However, the question remains how liberalisation after a long period of ad-hoc export restriction influences rural producers. This working paper examines the effects of lifting a maize export ban on farmers' food security and market behaviour in Tanzania. Using data from the National Panel Surveys over multiple waves, the study employs a difference-in-difference methodology to analyse the association at the household and district level. The results suggests that farmers who sold maize under the ban reduced their maize production and shifted to other stable crops, becoming less commercialised and disconnected from the market after liberalisation. A borderline significant negative association on household-level dietary diversity and quality is observed in regards to food security.

Keywords: Food Security, Export Ban, Food Trade, Tanzania, Market Integration

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1 Introduction

Inflation in global food prices can have catastrophic consequences for the world's poorest countries, especially if food imports are a critical source of the national food supply. Trade liberalisation and its implications for food security have been debated for centuries. One example is the disputes concerning British Corn Law from 1815, which repeal in 1845 is said to be the origin of Britain's free trade food regime (Winders 2009). In recent years, the food crisis in 2007-08 spurred increased attention to the debate, as soaring international food prices directly affected food accessibility worldwide. Many developing countries, especially net food-importing countries, began restricting trade and increasing domestic food production to reduce their dependency on global food systems. In February 2022, the Russian invasion of Ukraine caused already skyrocketing global food prices due to climate change and the Covid-19 pandemic to reach the highest level ever, making it timely and highly relevant to revisit the debate again (UN 2022).

Under Global and African human rights laws, all have the right to adequate food. Although the African Charter does not expressly protect the right to food, in the case of Nigeria in 2002, the African Commission wrote:

> *"The right to food is inseparably linked to the dignity of human beings and is therefore essential for the enjoyment and fulfilment of such other rights as health, education, work and political participation. The African Charter and international law require and bind Nigeria to protect and improve existing food sources and to ensure access to adequate food for all citizens."* (SERAC & CESR v Nigeria, 155/96).

From this standpoint, governments are obligated to implement policies and programs to ensure the availability and access to safe and nutritious food for all. In the international trade arena, the World Trade Organization (WTO) regulates trade restrictions through the Agreement on Agriculture (AoA) and the General Agreement on Tariffs and Trade (GATT). Article XI of GATT 1994 generally prohibits WTO members from implementing quantitative restrictions on importing or exporting any product. However, the prohibition can be lifted in cases where

> *"export prohibitions or restrictions temporarily [are] applied to prevent or relieve critical shortages of foodstuffs or other products essential to the exporting contracting party"* (XI:2a).

The increasing dependency on food imports for food security in the Global South implies a higher vulnerability to international food price volatility. Due to a lack of an effective operating market, resource reallocation may not be an option, and the governments resort to using export restrictions to stabilise domestic food prices in times of rapidly increasing food prices. Given that the majority of rural households continue to rely on agriculture as a source of income, fluctuating food prices directly impact their livelihoods. In theory, the export ban will disproportionately benefit domestic consumers by decreasing food prices while simultaneously causing harm to domestic producers and traders by restricting their access to the lucrative international market prices. The impact varies by region and urbanity, yet Ivanic & Martin (2008) find that poverty increases are significantly more frequent than poverty reductions when restricting trade. Trade restrictions can potentially stabilise the domestic availability and price of food, yet uncertainty remains about how these bans influence the rural and often relatively poorer producers.

Like one-third of the world's countries, the government of Tanzania imposed export restrictions around the time of the food crisis in 2007/08 (Shama 2011). Using a Computable General Equilibrium model, Diao & Kennedy (2016) showed that export bans in Tanzania could decrease producer prices by 7-26 per cent depending on the region and thereby diminishing farmers' incentives to produce maize. While several studies have examined the effects of export restrictions on a country's economy and prices, fewer studies have looked at the implication on producers when liberalising from such a ban. As export restrictions are often ad hoc and improvisational, they can cause increased uncertainty for farmers and investors, who ultimately will substitute their resources and be less responsive to future opportunities. Sen (1982) argues that policies that aim to increase food availability can potentially worsen food security risks through negative effects at the household level. Hence, we explore the association between abolishing an export ban and well-being at the household level.

Utilising the National Panel Survey (NPS) implemented in Tanzania over multiple waves from 2008 to 2019, we construct a dataset of households and districts over time. The highly detailed microdata allows us to construct multiple measures of food security related to access and utilisation as well as market and investment behaviour. To examine the relationship between liberalising the maize sector and farmers' food security and market behaviour, we apply a general difference-in-difference methodology - also known as the *"controlled before-and-after study"*.

Overall, our results suggest that farmers who, under the ban, were selling maize invested significantly less in maize production when the ban was abolished relative to other rural households. They subsidised maize with other stables crops like cassava, rice, and sweet potato. Likewise, we see that the farmers in the treatment group have become less commercialised. This outcome contradicts the prediction and may be due to the arbitrary use of the export ban by the Tanzanian government. The association between the liberalisation of the maize market and food security was borderline negative significant on dietary diversity and quality at the household level.

The paper is organised as follows: Section 2 provides a historical and contextual overview. Section 3 outlines the data and methodology used. Section 4 presents the main results. Finally, Section 5 includes a brief discussion and conclusion.

2 Historical and country context

The transnational movement of food has increased rapidly over the past fifty years, amounting to an annual 1.5 trillion USD in 2018. The global agricultural trade that has occurred since 1945, referred to as the post-war *"food regime"* by Friedmann & McMichael (1989), has been heavily influenced by the agricultural policies of the United States (US). In the name of national security and social protection of farmers, remaining a highly influential political group, the US, followed quickly by other wealthy nations, began subsidising domestic food production through price support and various protectionist policies. The extensive farmer support led to massive overproduction of food in the US and Canada as well as Europe under the European Community Common Agricultural Policy (CAP) in the 1950s-1970s. Rather than downsizing production, the governments sought to dispose of the costly domestic agricultural surpluses as export or food aid to the developing world, resulting in cheap food, often significantly below production costs, flooding the international market. Specifically, under Public Law 480 (PL 480) from 1954, US agricultural surpluses were to be exported on either concessional or grant to *"friendly countries"* using the program as a form of diplomacy under the Cold War, hence its popular name *"Food for Peace"* (Barrett & Maxwell 2007; Clapp 2020). In the 1950s, shipments under PL 480 reached one-third of US total agricultural exports (Cochrane 1960). The belief was that developing countries would create a preference for imported grains, ultimately making them dependent on imports in the future. By 1996, United States Agency for International Development (USAID) could accurately report that *"Nine out of ten countries importing U.S. agricultural products are former recipients of food assistance."* (USAID 1996, p.53).

Governments in the least developed part of the world attempted to protect their domestic agricultural markets with similar policies, such as import terrifies, state-run marketing boards, and price control. Yet, following the two oil crises in 1973 and 1979, most developing countries were highly indebted and had little choice but to accept the conditions under the structural adjustment programs (SAPs) imposed by the International Monetary Fund (IMF) and the World Bank. Pushed by the Reagan and Thatcher administrations in the 1980s, these programs required adopting neo-classical economic policies known as the Washington Consensus. As a result, developing countries began liberalising their agricultural markets, removing trade barriers and subsidies, while the more developed countries sustained their complex farm support policies. Despite drastic currency devaluations, the lack of import protection and agriculturalist support, combined with high transaction costs, meant that farmers in developing countries had no means of competing with the inexpensive imported food from abroad (Clapp 2020).

The inclusion of agriculture under GATT/WTO rules was formalised with the completion of the 1986-94 Uruguay Round. Prior to this, agriculture was exempt from GATT. According to Clapp (2006), the decision to include agriculture was driven by the increasing costs of agricultural protectionism in the 1980s for the USA, EU, and Japan. When the Agreement of Agriculture (AoA) was formed along with the WTO in 1994, countries committed to significantly reducing agricultural subsidies. A new round of multilateral trade negotiations was to take place in 1999, yet the meeting was dissolved due to an anti-WTO protest called the "Battle of Seattle". The message from the estimated 30,000 to 40,000 protesters was clear, globalisation and the WTO is widening the wealth gap between the rich and the poor while claiming to correct the disparity and reduce world hunger (Summers 2001). Rightly so, despite starting from a higher level than developing countries, the OECD countries exploited loopholes in AoA. Where the rich countries pledged to reduce support to farmers by at least 20 per cent before the year 2000, the OECD countries increased in absolute terms their support to farmers from US$271.2 billion in 1986-88 to US$330.6 billion in 1998-00 (Diakosavvas 2003).

It is not the intention here to provide an exhaustive account of subsequent events, but specific changes, particularly regarding power dynamics, are worth noting. In earlier negotiations, the US and EU had drafted proposals for agricultural agreements. Yet, when the talks eventually resumed in 2001 under the Doha Development Round, the developing countries had formed several agricultural collisions to make their voices heard. Representing two-thirds of the world's population, the Group of 20 (G-20), including India, Brazil, China and South Africa, had established a negotiating force that the US and EU could not ignore. Additionally, another group of developing countries, the Group of 33, advocated for a "special safeguard mechanism" (SSM) and "special and differential treatment" (SDT) under WTO rules, which would allow them to protect vulnerable segments and develop their agricultural sectors. Although developed countries had long implemented similar policies, they rejected special treatment to the poorer nations. The Dora Round of trade negotiations which initially sought to correct the biasses built into the AoA, collapsed multiple times over the following decades (Clapp 2006, 2020). In the aftermath of the food crisis in 2007/08, an intense debate among policymakers worldwide erupted, yet despite multiple attempts from some WTO members, significant agricultural reform changes are still to materialise.

As a result, the global food economy has become highly asymmetric, in which the least developed nations' ability to feed themselves has crumbled over the past fifty years. From being net agricultural exporters in the 1960s, they are now highly dependent on imports for food security, making them highly susceptible to shocks to the international market, such as conflict, trade wars, pandemics and climate hazards.

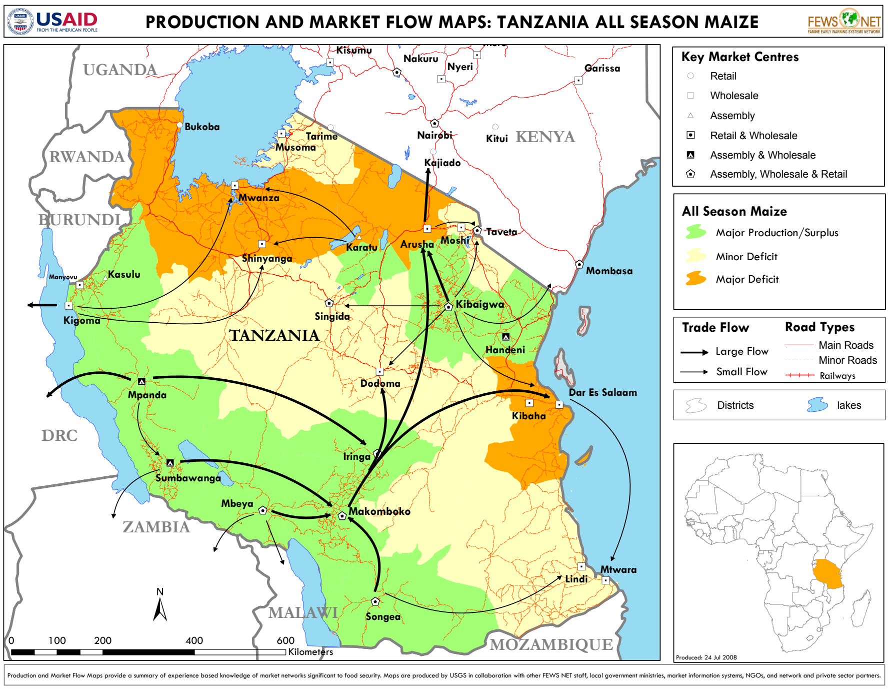

Figure 1: Production and trade flow of Maize in Tanzania

Note: This production and trade flow map document the market networks, catchment areas and trade flow patterns of maize within Tanzania. These maps are available for major products in most countries covered by FEWS (2010).

2.1 The Tanzanian case

Agriculture plays a crucial role in the economy of Tanzania, with the potential to drive economic growth, structural transformation and job creation (Estmann et al. 2022). However, the sector faces several challenges, including poor infrastructure, market access, lack of modern inputs and technology, and uneven government support. Like many countries south of the Sahara, agriculture accounts for a relatively small share of the GDP despite being a significant source of employment. In Tanzania, agriculture employs two-thirds of the workforce and accounts for around a quarter of value-added (see Table 8 in Appendix).

Maize is considered the most important staple crop in Tanzania, being a source of food and income for the majority of farmers. Maize is grown in various regions in Tanzania, with significant production areas in the southern highlands and less in other regions, see Figure 1. These regional differences may be traced back to the National Maize Project (1974-1979), which mainly supplied subsidised agricultural inputs to the southern regions. According to a FAO report from 2012, 65 per cent of 3 million households in Tanzania were involved in maize production, covering 45 per cent of arable land. The majority of these households were smallholder farmers with an average of 3 acres of land, generating close to 50 per cent of rural cash income (Barreiro-Hurle 2012; USAID 2010).

Maize yields in Tanzania may be lower than those of its prime trading partners in the region, yet maize exports could become a vital income source for farmers and a driver of growth in the country. Firstly, given Tanzania's location and diversity, the country has two rainfall regimes (unimodal and bimodal), allowing domestic maize production nearly all year round, see Figure 4 in the appendix. Secondly, climate projections suggest that where Tanzania's neighbouring countries may face severe dry conditions that could decrease agricultural production, Tanzania may only be mildly affected (S. A. Ahmed et al. 2012). If this transpires, it will allow Tanzania to export grain to countries experiencing shortages.

Similarly, food insecurity in the fast-growing cities of East Africa, like Dar es Salaam, is predicted to become a considerable challenge in the future. With investment in improved linkages between rural and urban areas, the increasing demand from the cities can become an opportunity for rural farmers (Wenban-Smith et al. 2016). Figure 1 indicates the maize trade flows within Tanzania during the studied period. It primarily follows three routes, one from the surplus maize regions in the Southern Highlands to the Makambako-Iringa and then to Dar es Salaam or exported to Kenya. The route used for export to Kenya varies depending on the price difference. When high, it is sent from the south through Arusha, while only the northern regions of Manyara and Tanga export to Kenya in times of low maize prices. Lastly, a smaller quantity is transported from the western region to the lake area (Barreiro-Hurle 2012).[1]

Despite the potential benefits of exporting, the government of Tanzania has often imposed export bans on maize with the argument to stabilise prices for the domestic market and redirect rural surpluses to the cities, thereby ensuring food security for the urban population. Table 1 showcases several instances in the time frame of this study of how Tanzania and other countries in the region have implemented export bans. With the abolishment of the export ban in October 2011, the Tanzanian government additionally signed the G8 Cooperation Framework, in which Tanzania committed to *"implement alternatives to the export ban"* with the objectives of *"increased stability and transparency in trade policy"* (G8 2012).

[1]See Figure 3 for additional illustrations.

Table 1: Dates of 13 export bans in Tanzania and trade partners.

Country	Start month	End month
Tanzania	July-03	January-06
Tanzania	August-06	December-06
Tanzania	January-08	October-10
Tanzania	May-11	October-11
	Regional trade partners	
Ethiopia	January-06	July-10
Ethiopia	March-11	Post-2011
Kenya	October-08	Post-2011
Malawi	July-05	February-07
Malawi	April-08	August-09
Malawi	December-11	Post-2011
Zambia	Pre-2002	July-03
Zambia	March-05	July-06
Zambia	May-08	July-09

Source: The starting and ending dates of 13 short-term export bans implemented by five countries during this period were identified using local newspaper archives and FEWS NET monitoring reports (Porteous 2017). It should be noted that while the implementation and lifting of bans are announced publicly, the extent to which these bans are enforced is not observable.

3 Data and methodology

The paper employs the microdata from the National Panel Survey (NPS), collected by Tanzania's National Bureau of Statistics and part of the World Bank's Living Standards Measurement Study - Integrated Surveys on Agriculture (LSMS-ISA) program. The NPS gathers information about agricultural and non-agricultural activities as well as various socioeconomic and demographic characteristics of households in Tanzania. The survey has been conducted five times, with waves taking place in 2008/09, 2010/11, 2012/13, 2014/15, and 2019/20 (NBS 2009, 2011, 2013, 2015a,b, 2020). The two most recent waves have adopted a different sampling methodology, resulting in two distinct panels. However, a representative sub-sample was selected to allow for tracking a subset of households through all five waves. It is worth noting that the full sample from wave five has yet to be publicly available.

As previously noted, like many other countries in the region, Tanzania implemented export bans on food stables in the 2000s and early 2010s. The first wave of the NPS was implemented during the maize export ban. As detailed in Table 1, the Tanzanian government lifted the ban for a short period between October 2010 and May 2011 during the second round of NPS data collection. To simplify the analysis and to avoid potential influence from this, we, in the primary analysis, exclude the data from the second wave. Additionally, we only employ the sub-sample of the fifth wave for robustness testing.

To evaluate the impact of the removal of export bans on rural farmers, we excluded households in urban areas and islands, as well as households in rural areas that did not engage in farming at the baseline (2008/09). The three waves of data consist of a total of 5,966 observations, from which we have constructed two balanced panels. The illustration in 2 demonstrates the widespread distribution of

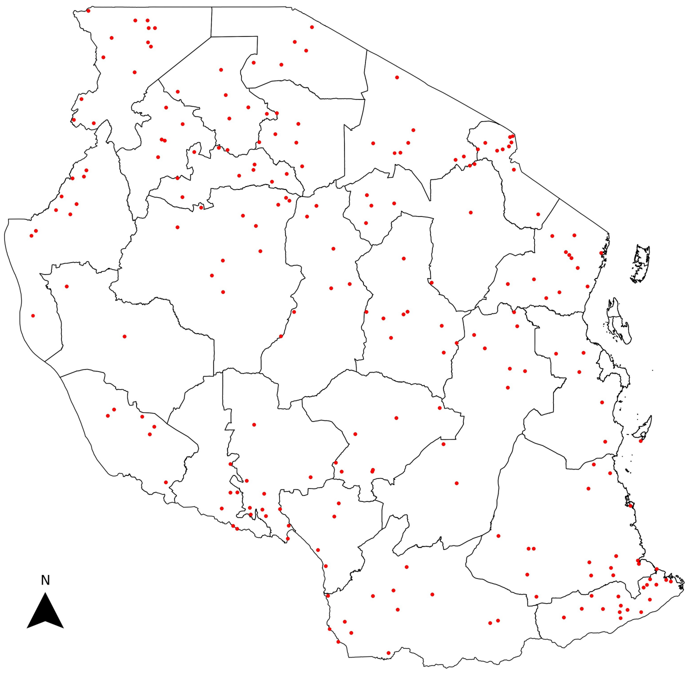

Figure 2: Location of household in sample

Note: Constructed by the author from average ward longitude and latitude data from the Tanzanian NPS (2008/09, 2012/13).

households throughout Mainland Tanzania. The first panel utilises household-level data, incorporating data from the first and third waves (with 1,244 households per wave). Because of the few systematic differences between farmers who leave the survey and those who remain, attrition bias is low. The second panel examines district averages to include data from the fourth wave, resulting in a dataset that covers one pre-treatment period and two post-treatment periods. It comprises 97 districts per wave, 34 in the treatment group.

The upper section of Table 1 lists our dependent variables, which can be grouped into three categories: (1) maize production, (2) commercialisation, and (3) food security. Within the first group, there are two outcomes. The first outcome measures the direct investment by calculating the proportion of land used for planting maize in relation to the total land owned by the household. The second outcome evaluates whether farmers are replacing other stable food crops, such as rice, cassava, sorghum and sweet potato, with maize by calculating the proportion of land used for planting maize relative to the land used for planting other stable food crops. Given that the maize market liberalisation increases farmers' incentives to invest in maize by providing access to international market prices, we expect an increase in both rates.

The third and fourth outcomes are related to the farmers' market behaviour and integration. Inspired by Carletto et al. (2017), the third measure is the Crop Commercialisation Index. The CCI captures a household's 'revealed' marketing behaviour by measuring the level of commercialisation in agricultural production, with a score of 0 indicating pure subsistence farming and 100 indicating a fully commercialised strategy. One of the benefits of this index is that it gives a more nuanced picture rather than simply categorising farmers as either commercial or non-commercial or as producers of staple or cash crops (Carletto et al. 2017). The fourth outcome captures integration in the market by measuring vertical market linkages. The measure takes the value one if the household sells crops to a formal entity. Inspired by Castro (2021), we split this measure into two channels, one linking to cooperatives and farmer organisations and one to business contacts and local merchants.[2] With the export ban abolished, we hypothesise that households will sell more of their crops, and an increased fraction of the farmers will sell through formal entities that can link them to the international market.

The last three outcomes aim to capture different aspects of food security. The first is the Months of Adequate Food Provisioning (MAHFP), which is calculated according to the Food and Nutrition Technical Assistance Project and measures the number of months a year in which households have not reported food shortages (Bilinsky & Swindale 2010). Next, we consider measures of consumption diversity and quantity. We use the Household Diet Diversity Score (HDDS) to assess the diversity of diets. The HDDS measures the number of food groups consumed by a household (Swindale & Bilinsky 2006). Hoddinott & Yohannes (2002) show that dietary diversity is a good measure of household food access. Our last measure is an adapted version of the recently developed metric, the Global Diet Quality Score (GDQS) (Bromage et al. 2021). The GDQS has several advantages compared to other simple diet-related metrics, such as HDDS, as it incorporates a dimension of the quantity of consumption in the metric scoring to allow for a more sensitive assessment of healthy diets. It was invented to address the need for a single metric that reflects the dimensions of diet quality related to both under- and overnutrition and their associated risks (A. Ahmed et al. 2022). Several validation studies were published in 2021, covering 14 countries, including Mexico, the US, China, India, and ten countries in Sub-Saharan Africa. These studies found that the GDQS performed comparably or better than other metrics in capturing nutrient inadequacy and risk for diet-related non-communicable diseases (Angulo et al. 2021; Birk et al. 2021; Bromage et al. 2021; Castellanos-Gutiérrez et al. 2021; He et al. 2021; Matsuzaki et al. 2021). The GDQS metric is based on the consumption of 25 different food groups, which are divided into three categories: 16 food groups that are considered healthy, 7 food groups that are considered unhealthy, and 2 food groups (red meat and high-fat dairy) that are considered unhealthy when consumed in excessive amounts. The GDQS score is assigned to individuals by considering their consumption of each food group within a 24-hour reference period, with point values assigned based on the quantity consumed for each food group (Intake 2021). As the National Panel Survey data is at the household level and uses a seven-day recall period, we follow A. Ahmed et al. (2022) and compute a household-level GDQS (HGDQS). More precisely, we examine each household's consumption using the NPS's detailed household food consumption module over the seven-day recall period and then convert this to a daily adult

[2]The main model utilises the combined measure, with results of the separated measures in the appendix.

equivalent. We predict that an increase in maize production and sales, may increase the households food provision, but reduce their diet diversity and quality due to additional maize consumption.

The bottom of Table 2 summarises the control variables, which encompass household characteristics (e.g. household size, married status), maize production factors (intercropping, fertiliser use, improved seeds), and indicators affecting food security and productivity (number of livestock, land ownership documentation, access to extension services, use of financial services, non-farm business involvement).

Table 2: Descriptive statistics of dependent and control variables

		Mean of variables					
		Treatment		Control		Pooled	
Dependent	Description	2008	2012	2008	2012	Mean	SD
Maize investment	"Maize investment" refers to the proportion of land dedicated to growing maize within a household's total land area: (Acres of maize planted$_{it}$/total acres$_{it}$) $*$ 100	62.82	57.22	42.47	50.62	50.63	(29.7)
Maize substitute	"Maize substitute" represents the proportion of land used for growing maize compared to other staple food crops: (Acres with maize$_{it}$/acres with stables$_{it}$) $*$ 100	84.10	84.94	60.25	70.68	71.10	(35.3)
CCI	The Crop Commercialization Index (CCI) is a ratio of the total revenue generated from crop sales to the value of all crop production: (Value of crop sales$_{it}$/Value of all crop$_{it}$) $*$ 100	61.41	58.27	48.75	53.94	53.92	(31.7)
VML	The Vertical Market Linkages (VML) takes a value of 1 if the household sells its produce to formal entities and 0 if it does not.$^+$	0.06	0.03	0.03	0.02	0.03	(0.18)
MAHFP	Months of Adequate Food Provisioning (MAHFP) is the duration, in months, that a household has reported having enough food supply throughout the year.	11.49	10.88	11.25	10.57	10.98	(1.86)
HDDS	The household Diet Diversity Score (HDDS) counts the number of food groups consumed by the household over the past week.*	5.85	5.63	5.51	5.43	5.55	(1.66)
HGDQS	The household Global Diet Quality Score (HGDQS) measures the overall diet quality, determined by food group consumption.**	18.92	18.99	18.24	18.63	18.59	(3.07)
Confounders							
Size of land	The estimated acres of land owned by the household.	6.86	7.34	5.97	7.55	6.84	(12.8)
Intercropping	Takes the value 1 if the household practices intercropping on at least one of their plots, 0 otherwise.	0.75	0.73	0.66	0.74	0.71	(0.46)
Land ownership	Takes the value 1 if the household holds formal legal ownership documentation for at least one of their plots, or 0 if they do not.	0.09	0.15	0.09	0.17	0.13	(0.34)
Extension svc.	Takes the value 1 if household reached by extension services otherwise 0. We do not distinguish between public and private services.	0.52	0.35	0.47	0.36	0.42	(0.49)
Fertiliser use	Takes the value 1 if household employs fertiliser (organic/inorganic), 0 otherwise	0.39	0.39	0.30	0.36	0.34	(0.48)
Improved seed	Takes the value of 1 if the household uses improved seeds, and 0 if traditional seeds.	0.05	0.40	0.04	0.41	0.23	(0.42)
Financial svc.	Takes the value of 1 if the household uses formal financial services, such as loans for mortgage or insurance.	0.00	0.01	0.01	0.01	0.01	(0.09)
TLUs	Tropical Livestock Units (TLUs) measures of household livestock size. It is a standard unit of measurement that allows for the comparison of livestock populations across different countries, regions, or livestock types.	2.30	2.10	3.11	1.98	2.46	(21.2)
HH size	Number of household members	5.37	5.78	5.65	6.03	5.78	(3.24)
HH married	Takes the value 1 if household head is married, 0 otherwise.	0.71	0.72	0.69	0.66	0.68	(0.47)

Source: Authors' calculations based on the Tanzania NPS data (2008, 2012, 2015).
Note: $^+$ Two groups of formal entities exist: the first encompasses cooperatives, farmers organisations, agro-processing factories, and employers, while the second encompasses private companies, business contacts, local merchants, and distribution officers. * The food groups considered in the HDDS are cereals, roots/tubers, vegetables, fruits, meat/poultry, eggs, fish/seafood, pulses and legumes, milk, oil/fats, sugar/honey and miscellaneous. ** Fore more info see Table 1 in Intake (2021).

3.1 Methodology

The present study employs a difference-in-differences (DD) methodology to assess the relationship between the abolition of an export ban on various socioeconomic outcomes. The DD approach compares the changes in outcomes for a treatment group (subject to the policy change) to the changes in outcomes for a control group (not subject to the policy change) over time. Utilising the panel structure of the NPS data allows for control of both time-invariant and time-varying confounding factors. Nevertheless, as a robustness test, we employ propensity score matching (PSM) to match farmers in the treatment group with those in the control group based on a set of covariates believed to be related to the treatment assignment.

Household model:

Due to the nationwide implementation of the policy change, it is not possible to distinguish a natural treatment and control group, making it difficult to avoid violating the Stable Unit Treatment Value Assumption (SUTVA). As a result, we do not claim causality. Instead, we identify farmers who are not purely subsistence farmers but sell some of their surplus maize in the baseline period. Given that they already are in the market during the ban, we believe that they will be more affected by the abolition of the ban compared to those who only meet their household needs. In the control group, farmers that are not producers of maize, but have similar characteristics to the affected farmers at baseline, are included.

We estimate the treatment effect using the DD approach, with farmer-fixed effects and several control variables. Let Y be our outcome of interest related to maize production, commercialisation or food security of farmer i at time t, while D_i denotes the treatment indicator, taking the value of 1 if farmer i is in the treatment group (sold maize in the baseline period) and 0 otherwise. Farmer-level fixed effects are captured by α_i and T_t is the time indicator, taking the value of 1 if the observation is from the post-treatment period, while $X_{i,t}$ represents a set of time-varying farmer-specific controls. $D_i * T_t$ is the interaction term, representing the difference-in-differences effect:

$$Y_{it} = \alpha_i + \beta_1 D_i + \beta_2 T_t + \beta_3 D_i * T_t + \theta X_{i,t} + \epsilon_{it} \tag{1}$$

We construct several sensitivity analyses to ensure the robustness of the results, such as applying PSM (see Appendix 6 for more detail).

District model:

In addition to the above, we explore the effect of the policy change at the district level, letting us exploit the fourth wave of the survey. To identify the treatment group, we postulate that the intensity of the policy varies by region, with maize farmers in regions with a surplus of maize production being affected more significantly by the ban than those in deficit regions. At baseline, the Southern Highlands of

Iringa, Rukwa, Ruvuma, and Mbeya had a surplus of maize production compared to consumption levels, see Figure 1. In contrast, coastal and central regions had minor or significant deficits. Furthermore, according to Diao & Kennedy (2016), an export ban on maize will affect producer prices significantly more in these regions of Tanzania. We exploit these differences to create a treatment indicator D_d, taking the value of 1 if the district d is located in one of the surplus regions and 0 if not. Like the household-level analysis, $X_{d,t}$ represents a set of time-varying controls, yet now averages by district. District-level fixed effects are captured by α_d and $D_d * T_t$ denote again the interaction term, representing the difference-in-differences effect:

$$Y_{dt} = \alpha_d + \beta_1 D_d + \beta_2 T_t + \beta_3 D_d * T_t + \theta X_{d,t} + \epsilon_{dt} \tag{2}$$

4 Results

Table 3 shows the results of the household and district models regarding the impact on production and market behaviour. The household model identifies the treatment group (not purely subsistence maize farmers) to have reduced their maize production in proportion to their land size after the market liberalisation. This group also substituted maize with other stable crops, such as cassava, rice, and sweet potato, to a significant extent compared to farmers who did not sell maize before the liberalisation. This outcome contradicts our predictions, which could be due to the arbitrary and impulsive use of the export ban, as previously noted. As we report in Table 1, the Tanzanian government lifted the maize export ban in October 2010, only to reintroduce it in May 2011. The maize planting season in Tanzania (as seen in Figure 4) falls within this timeframe, whereas surplus harvesting and marketing happen during the ban's reinstatement.[3] Households that sold maize prior to the abolition of the ban in 2011 and tried to take advantage of the lifted ban in 2010 may not immediately invest in new market opportunities but wait until they are confident that trade restrictions will not be reinstated. Herefore, we observe a decrease in maize production and market integration. The Crop Commercialisation Index (CCI) suggests that farmers have become less commercialised. There is also a barely significant indication that they are less likely to participate in formal market entities. The district model includes wave 4, two years after the ban was lifted, and should therefore provide further insight. However, our analysis reveals no significant association of the ban on the outcomes when comparing surplus to deficit regions.

When looking at food security, we find only borderline significant estimations suggesting that the liberalisation had no immediate impact on food stability. Nevertheless, we find a small but negative association between the policy change and dietary diversity and quality when looking at the household level. This

[3]In Northern Tanzania, with its bimodal rain regime, maize is planted from October to November and harvested/sold from July to October. In the rest of the country, maize is planted in November and December and harvested/sold from May to September (Rivers et al. 2010).

result is likewise partly in contrast with our expectations. The control group, which now produces and sells relatively more maize compared to the treatment group, we had expected to consume more maize as well. This could lead to an improvement in adequate food provision but may result in a less diverse and nutritious diet, which is associated with various health problems. Instead, the results may suggest that the farmers use their increased sales revenue to purchase a variety of food, improving the diversity and quality of their diets. The district level results are non-significant.

Similar outcomes are obtained using Propensity Score Matching and by running the model on a limited number of households over the four waves of data (see to Table 5 and Table 6 in Appendix).

Table 3: Production and market behaviour

	Household model								District model							
	Investment		Substitution		CCI		VML		Investment		Substitution		CCI		VML	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
DD	-12.02***	-12.68***	-10.02***	-8.50***	-20.17***	-19.40***	-0.03*	-0.03*	-2.22	-0.39	-2.49	-0.69	-2.29	-1.92	-0.01	-0.01
	(2.34)	(2.31)	(2.04)	(2.05)	(2.69)	(2.7)	(0.02)	(0.02)	(3.31)	(3.13)	(3.87)	(3.24)	(3.09)	(2.96)	(0.01)	(0.01)
Land size		-0.26***		-0.10		0.05		0.00		-0.41***		-0.06		0.11		0.00
		(0.07)		(0.09)		(0.15)		(0.00)		(0.11)		(0.17)		(0.23)		(0.00)
Intercropping		-2.07		18.02***		4.01**		-0.01		6.88		35.3***		13.94***		0.02
		(2.09)		(2.01)		(1.94)		(0.01)		(6.10)		(6.89)		(4.97)		(0.02)
Land ownership										7.91		3.49		-1.98		0.02
										(10.48)		(13.30)		(8.57)		(0.04)
Extension svc.		-3.31**		-4.64***		3.78**		0.01		-8.98		-2.21		19.14***		0.08**
		(1.67)		(1.65)		(1.77)		(0.01)		(6.05)		(5.56)		(4.91)		(0.03)
Fertiliser										-4.32		-14.77*		7.63		0.03
										(7.03)		(8.67)		(7.03)		(0.02)
Improved seed		4.25**		2.04		2.48		0.00		16.70***		14.88**		11.41*		0.00
		(2.03)		(2.03)		(2.17)		(0.01)		(5.97)		(7.32)		(6.77)		(0.03)
Financial svc.						4.17		0.00						14.54		-0.09
						(10.99)		(0.01)						(36.45)		(0.19)
Post dummy	7.17***	5.25***	10.05***	7.15***	7.45***	6.55***	0.00	0.00	7.94***	-0.80	11.74***	3.43	4.87***	1.42	-0.01	0.00
	(1.28)	(1.52)	(1.38)	(1.54)	(1.31)	(1.52)	(0.01)	(0.01)	(2.18)	(3)	(2.46)	(3.59)	(1.85)	(3.37)	(0.01)	(0.01)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes								
District FE									Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2488	2488	2488	2488	2488	2488	2488	2488	291	291	291	291	291	291	291	291
R-squared	0.03	0.05	0.05	0.13	0.05	0.05	0.01	0.01	0.12	0.22	0.17	0.36	0.04	0.20	0.02	0.10

Note: *** p<.01, ** p<.05, * p<.10. Standard errors are reported in parentheses. The household model uses clustered standard errors. See Table 5 for results using PSM. Due to the significantly lower number of observations (97 per wave), there is higher uncertainty in the estimates relative to the household model. To account for this, we utilise the bootstrap method to construct the standard deviation. We draw 500 samples with replacements from the original dataset and estimate the DD effect for each sample. The mean and standard deviation of the distribution of the treatment effect estimates are used to construct a 95% bootstrapped confidence interval.

Source: authors' calculations based on NPS data (NBS 2009, 2013, 2015b).

Table 4: Food security and dietary patterns

	Household model						District model					
	MAHFP		HDDS		HGQDS		MAHFP		HDDS		HGQDS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
DD	0.10	0.09	-0.26*	-0.24*	-0.44*	-0.42*	0.04	0.04	-0.04	0.02	-0.12	0.01
	(0.16)	(0.16)	(0.14)	(0.14)	(0.25)	(0.25)	(0.14)	(0.15)	(0.13)	(0.12)	(0.27)	(0.28)
Land size		0.00		0.01		0.00		0.02*		0.00		-0.01
		(0.00)		(0.01)		(0.01)		(0.01)		(0.01)		(0.01)
Intercropping		-0.02		0.02		0.14		0.38		0.41		0.08
		(0.12)		(0.10)		(0.18)		(0.29)		(0.3)		(0.63)
Land ownership								0.32		-0.03		-0.36
								(0.42)		(0.42)		(0.73)
Extension svc.		-0.02		0.04		-0.02		0.09		0.00		-0.84*
		(0.11)		(0.09)		(0.17)		(0.29)		(0.22)		(0.45)
Fertiliser use								0.60		0.07		1.22**
								(0.39)		(0.31)		(0.55)
Improved seed		-0.21		0.17		0.44**		-0.06		1.11***		1.58**
		(0.13)		(0.11)		(0.20)		(0.34)		(0.35)		(0.66)
Financial svc.		0.69		-0.45		-0.77		3.02		0.41		-5.2*
		(0.65)		(0.51)		(0.60)		(1.90)		(1.41)		(2.68)
TLUs		0***		0.00		0.00		0.01		0.00		-0.01
		(0.00)		(0.00)		(0.00)		(0.03)		(0.03)		(0.04)
Post dummy	-0.78***	-0.71***	-0.02	-0.09	0.43***	0.26*	-0.93***	-0.94***	0.11	-0.36**	0.73***	-0.04
	(0.08)	(0.10)	(0.06)	(0.08)	(0.12)	(0.15)	(0.09)	(0.16)	(0.08)	(0.15)	(0.15)	(0.31)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes						
District FE							Yes	Yes	Yes	Yes	Yes	Yes
Observations	2478	2478	2488	2488	2488	2488	291	291	291	291	291	291
R-squared	0.09	0.09	0.00	0.01	0.01	0.02	0.40	0.44	0.01	0.14	0.13	0.23

Note: *** $p<.01$, ** $p<.05$, * $p<.10$. Standard errors are reported in parentheses. The household model uses clustered standard errors. See Table 5 for results using PSM. Due to the significantly lower number of observations (97 per wave), there is higher uncertainty in the estimates relative to the household model. To account for this, we utilise the bootstrap method to construct the standard deviation. We draw 500 samples with replacements from the original dataset and estimate the DD effect for each sample. The mean and standard deviation of the distribution of the treatment effect estimates are used to construct a 95% bootstrapped confidence interval.
Source: authors' calculations based on NPS data (NBS 2009, 2013, 2015b).

5 Discussion and conclusion

A diverse array of actors, including civil society organisations and advocates for food sovereignty, support the utilisation of export restrictions by governments and argue that agriculture should be treated differently in international trade law due to its unique characteristics. These trade sceptics argue that the vital role of food in society should be prioritised over trade, emphasising the importance of local food systems and goals such as environmental sustainability, social justice, and the right to food. They argue that countries should have the autonomy to determine their own food security and agricultural policies (Clapp 2020). Historically, governments have sought to maintain autonomy over their food supply, particularly in times of crisis and war. The food sovereignty movement, which originated in Brazil under the name La Via Campesina, calls for the rights of communities to shape their own agricultural systems, including preserving traditional ecological farming methods practised by millions of small-scale farmers worldwide. They argue that corporations' growing dominance of global food supply chains poses a threat to the autonomy and livelihoods of farmers in the context of trade liberalisation. Likewise, the critics of agricultural trade liberalisation contend that specialisation in export crops can result in adverse environmental consequences, such as biodiversity loss and deforestation (Clapp 2015; Desmarais 2007). Furthermore, they assert that trade liberalisation has contributed to the proliferation of energy-dense processed foods, which strongly correlates with the rise of obesity and non-communicable diseases (An et al. 2020).

On the other hand, organisations such as the Bretton Woods Institutions and the World Trade Organization, as well as several member countries of the Organisation for Economic Co-operation and Development (OECD), view agricultural trade liberalisation as a means of enhancing food security (OECD 2013; World Bank 2012; Zorya et al. 2014). These actors argue that increased and freer trade can promote the specialisation of production according to comparative advantages, resulting in greater efficiency across various industries, including agriculture. Countries with optimal growing conditions for specific crops should produce and export them to countries that specialise in producing other goods. According to proponents of trade liberalisation, freer trade can lead to an increased food supply, stable food prices, and economic growth, all of which positively correlate with improved availability and access to food security for both importing and exporting countries. The WTO also maintains that trade liberalisation can facilitate the transfer of technology, knowledge, and best practices, aiding in enhancing agricultural productivity and food security (Clapp 2015, 2020).

This study has several limitations, including the challenge of identifying a control group that meets the SUTVA assumption. Nevertheless, it aims to re-ignite the discussion on trade liberalisation in foods. The difference-in-difference exercise in Tanzania found that lifting the export ban on maize, the country's major food source, did not lead to increased production or market integration for farmers previously producing and selling maize. Instead, these farmers shifted away from maize and became less commercialised, with a slight indication of reduced diet diversity and quality compared to the control group. In a globalised and unequal world with multiple challenges to future global food security, agricultural trade issues remains a vital topic to discuss and explore further.

6 Appendix

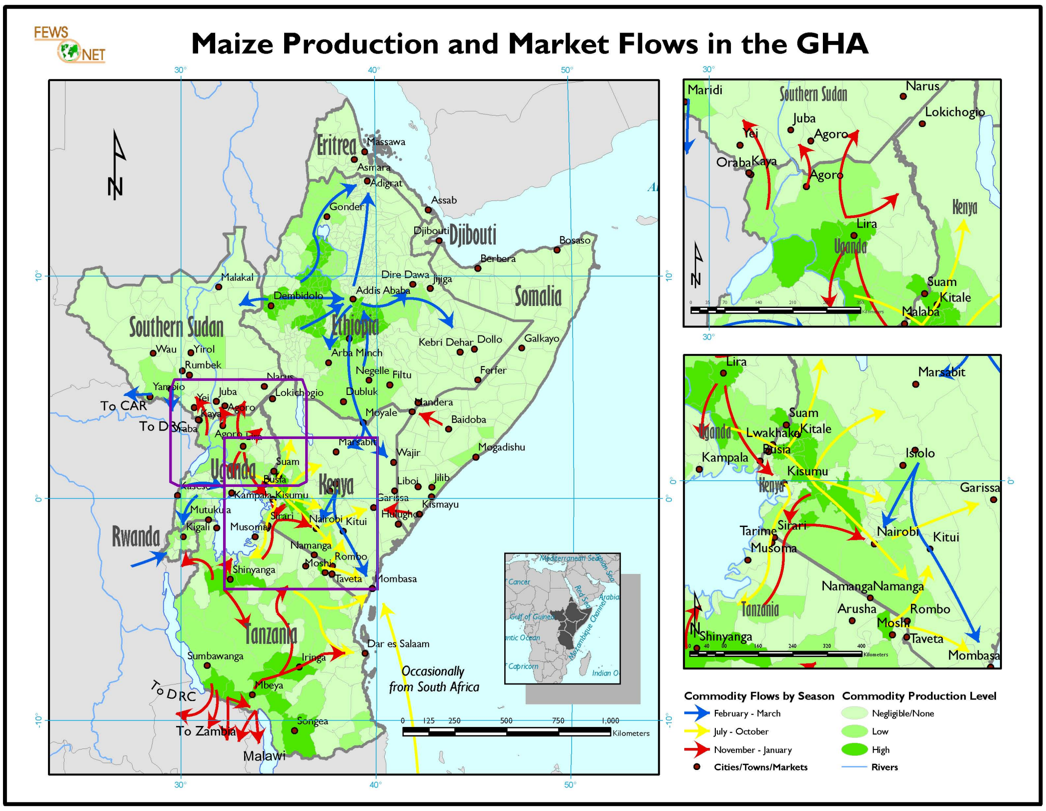

Figure 3

Source: FEWS (2010).

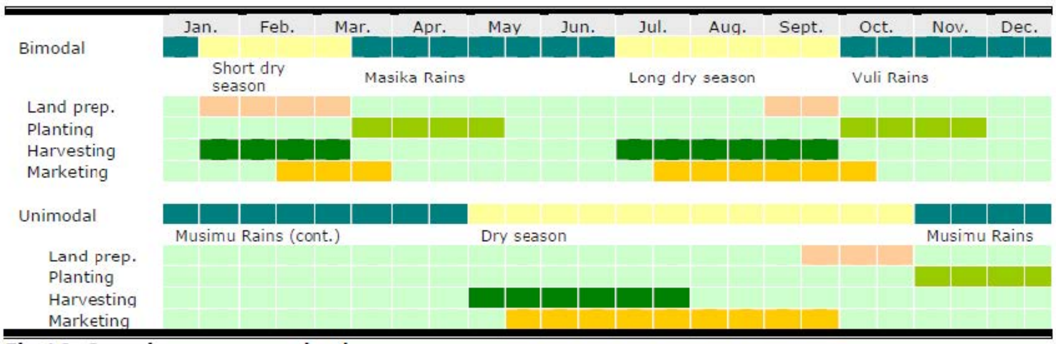

Figure 4: Cropping seasons calendar in Tanzania

Source: WFP, Vulnerability Analysis and Mapping Unit. Extracted from Rivers et al. (2010).

Propensity Score Matching, robustness test

The initial step in the analysis involves determining the likelihood of each farmer in the sample receiving the treatment. We use a logistic regression model that considers factors including land ownership, agroecological zone, level of vegetation, use of improved seeds and Fertiliser, household size and household characteristics such as the marital status at the start of the study. This results in a propensity score for each farmer. Next, we use the propensity scores to match farmers in the treatment group with those in the control group, using a nearest-neighbour matching algorithm without replacement. Finally, we estimate the treatment effect by using the Differences-in-Differences (DD) approach. The results are seen in Table 5.

Table 5: DD result utilising Propensity Score Matching - household model

	Maize production				Commercialisation and linkages				Food security					
	Investment		Substitution		CCI		VML		Food Provision		HDDS		HGDQS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
DD	-10.68***	-12.11***	-6.81**	-5.84**	-21.58***	-20.58***	-0.02	-0.02	-0.02	-0.04	-0.19	-0.19	-0.59*	-0.57*
	(3.14)	(3.05)	(2.92)	(2.77)	(3.4)	(3.41)	(0.02)	(0.02)	(0.2)	(0.2)	(0.17)	(0.17)	(0.32)	(0.32)
Land size		-0.07		-0.10		0.11		0.00		0.01		0.01		0.00
		(0.08)		(0.15)		(0.19)		(0.00)		(0.01)		(0.01)		(0.02)
Intercropping		-6.86**		9.14***		4.29		-0.01		-0.26		-0.13		-0.05
		(3.04)		(2.58)		(2.86)		(0.02)		(0.17)		(0.16)		(0.28)
Land ownership		-6.17		-2.97		0.13		0.01		-0.29		-0.10		-0.28
		(3.95)		(3.75)		(3.98)		(0.02)		(0.20)		(0.20)		(0.37)
Extension svc.		-6.08**		-7.01***		3.47		0.03*		0.02		-0.09		0.02
		(2.48)		(2.28)		(2.54)		(0.02)		(0.17)		(0.12)		(0.25)
Fertilizer use		-0.71		1.44		3.56		0.03		0.61***		0.23		-0.04
		(3.83)		(3.27)		(3.67)		(0.02)		(0.23)		(0.19)		(0.36)
Improved seed		1.90		-1.42		4.95		0.00		-0.34*		0.08		0.42
		(2.91)		(2.79)		(3.16)		(0.02)		(0.18)		(0.17)		(0.30)
Financial svc.						6.24		-0.02		1.28		-1.30		-2.46***
						(11.96)		(0.02)		(1.16)		(0.82)		(0.74)
TLUs										-0.02		-0.01		-0.02
										(0.02)		(0.01)		(0.03)
Post dummy	6.00**	5.91**	6.7***	5.4**	8.92***	6.82***	-0.01	-0.01	-0.68***	-0.53***	-0.04	-0.09	0.63***	0.48*
	(2.46)	(2.76)	(2.48)	(2.52)	(2.39)	(2.59)	(0.01)	(0.01)	(0.14)	(0.16)	(0.12)	(0.13)	(0.23)	(0.25)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1096	1096	1096	1096	1096	1096	1096	1096	1091	1091	1096	1096	1096	1096
R-squared	0.02	0.05	0.02	0.06	0.07	0.08	0.01	0.03	0.08	0.11	0.01	0.02	0.01	0.03

Note: *** p<.01, ** p<.05, * p<.10. Standard errors are reported in parentheses (clustered). Source: authors' calculations based on NPS data (NBS 2009, 2013).

Table 6: DD result utilising household model in all 5 years

	Maize production				Commercialisation and linkages				Food security					
	Investment		Substitution		CCI		VML		Food Provision		HDDS		HGDQS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
DD	-16.27**	-17.85***	-27.38***	-24.32***	-13.51*	-11.56	-0.06	-0.11*	0.75*	0.70*	-0.19	-0.12	-0.87	-0.62
	(6.45)	(6.62)	(5.11)	(4.88)	(7.66)	(7.21)	(0.05)	(0.06)	(0.41)	(0.41)	(0.25)	(0.26)	(0.59)	(0.58)
Land size		-0.05		-0.28		1.17***		0.01		0.03		0.03*		-0.03
		(0.69)		(0.59)		(0.42)		(0.01)		(0.02)		(0.02)		(0.05)
Intercropping		-6.35		8.29**		1.93		-0.09*		-0.24		0.22		0.67*
		(4.76)		(3.84)		(3.87)		(0.05)		(0.23)		(0.17)		(0.36)
Land ownership		-7.85		-5.00		4.79		-0.2***		-0.43*		0.1		0.39
		(5.03)		(4.29)		(4.38)		(0.05)		(0.25)		(0.19)		(0.42)
Extension svc.		-2.01		1.19		7.85**		-0.07		-0.29		0.23		0.35
		(3.83)		(2.69)		(3.55)		(0.05)		(0.23)		(0.15)		(0.35)
Fertiliser use		-5.80		-7.32**		5.35		-0.19***		-0.12		0.17		0.5
		(5.74)		(3.49)		(4.54)		(0.06)		(0.3)		(0.24)		(0.49)
Improved seed		-0.16		7.40*		5.01		-0.01		0.39		-0.03		-0.05
		(5.14)		(3.83)		(3.37)		(0.05)		(0.25)		(0.16)		(0.37)
Financial svc.						5.06		-0.13		0.73		0.26		-0.56
						(16.3)		(0.12)		(0.56)		(0.69)		(1.39)
TLUs										0.00		0.01		-0.01
										(0.03)		(0.04)		(0.09)
Post dummy	9.52**	11.60**	16.57***	15.06***	2.60	-0.25	0.21***	0.21***	-0.70***	-0.84***	-0.01	-0.04	1.14***	1.17***
	(3.98)	(4.87)	(4.15)	(4.69)	(3.81)	(3.86)	(0.02)	(0.04)	(0.24)	(0.29)	(0.17)	(0.16)	(0.32)	(0.36)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	351	351	468	468	468	468	468	468	468	468	468	468	468	468
R-squared	0.03	0.06	0.08	0.13	0.01	0.07	0.06	0.15	0.03	0.05	0.00	0.03	0.03	0.06

Note: *** p<.01, ** p<.05, * p<.10. Standard errors are reported in parentheses (clustered). Source: authors' calculations based on NPS data (NBS 2009, 2013, 2015a, 2020).

Table 7: Vertical Market Linkages - Group 1 and 2

	Household level					
	VML		VML1		VML2	
	(1)	(2)	(3)	(4)	(5)	(6)
DD	-0.03*	-0.03*	-0.02	-0.02	0.00	0.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.00)	(0.00)
Total land (acres)		0.00		0.00		0.00
		(0.00)		(0.00)		(0.00)
Intercropping		-0.01		-0.02		0.00
		(0.01)		(0.01)		(0.00)
formal land rig s		0.02		0.06**		0.00
		(0.01)		(0.02)		(0.00)
Extension services		0.01		0.02		0.00
		(0.01)		(0.02)		(0.00)
Fertilizer use		0.03**		0.05**		0.00
		(0.01)		(0.02)		(0.00)
Improved seed use		0.00		-0.02		0.00
		(0.01)		(0.02)		(0.00)
Financial services		-0.01		-0.02		0.00
		(0.01)		(0.01)		(0.00)
post	0.00	0.00	-0.01	-0.01	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)
Household FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	291	240	291	240	291	240
R-squared	0.03	0.12	0.03	0.13	0.02	0.09

Note: *** p<.01, ** p<.05, * p<.10. Standard errors are reported in parentheses (clustered). Source: authors' calculations based on NPS data (NBS 2009, 2013).

Table 8: Sectoral employment and value-added (constant prices) in Sub-Saharan Africa

	Employment Shares (%)											
	Tanzania						Sub-Saharan Africa					
Sectors	1975	1985	1995	2005	2010	2015	1975	1985	1995	2005	2010	2015
Agriculture	89.1	87.4	86.1	77.4	71.7	69.0	71.1	66.2	67.5	63.8	60.2	55.9
Industry	2.8	2.3	2.6	4.8	5.9	6.6	8.6	7.8	7.5	8.6	9.9	13.3
Mining	0.3	0.6	0.5	1.0	0.8	0.4	1.0	1.2	0.9	0.6	0.7	1.0
Manufacturing	1.6	1.3	1.4	2.5	3.2	3.8	5.6	4.7	4.7	5.8	6.4	7.6
Utilities	0.1	0.1	0.1	0.3	0.5	0.9	0.3	0.4	0.3	0.3	0.3	0.4
Construction	0.8	0.3	0.5	1.0	1.4	1.5	1.8	1.5	1.6	2.0	2.6	4.3
Services	8.1	10.3	11.3	17.9	22.5	24.4	20.4	26.0	25.0	27.6	29.9	30.8
Trade svc.	3.3	4.2	5.7	7.8	9.8	10.6	8.8	12.0	12.5	13.4	14.6	14.5
Transport svc.	0.9	0.7	0.7	1.3	1.9	2.7	1.7	2.4	2.0	2.2	2.5	2.4
Business svc.	0.2	0.2	0.2	0.5	0.7	0.6	0.6	0.8	1.2	1.7	2.3	3.2
Government svc.	2.3	3.4	3.0	6.3	8.2	8.6	4.4	5.3	4.9	5.3	5.6	5.2
Personal svc.	1.3	1.7	1.6	1.9	1.9	2.0	4.9	5.6	4.4	4.9	4.9	5.6
	Value-added* (% of GDP)											
	Tanzania						Sub-Saharan Africa					
Sectors	1975	1985	1995	2005	2010	2015	1975	1985	1995	2005	2010	2015
Agriculture	30.9	33.4	37.4	30.1	27.3	23.0	33.6	30.6	30.0	27.9	24.5	22.0
Industry	22.4	16.2	17.6	20.8	22.3	25.2	25.2	22.6	24.1	23.9	22.1	23.6
Mining	0.8	0.8	1.3	3.4	2.7	2.7	11.2	7.8	7.0	6.2	4.4	3.4
Manufacturing	11.1	8.2	7.8	7.7	8.8	8.6	8.5	10.3	9.8	9.3	9.0	9.8
Utilities	1.4	2.4	2.3	2.4	2.2	1.8	0.8	1.3	3.5	3.8	3.3	3.5
Construction	9.1	4.9	6.3	7.4	8.6	12.0	4.7	3.2	3.8	4.7	5.3	6.9
Services	46.7	50.4	45.1	49	50.4	51.9	41.2	46.8	45.8	48.2	53.4	54.5
Trade svc.	16.2	13.1	14.6	12.9	13.8	13.9	14.1	14.1	14.9	14.9	16.9	16.8
Transport svc.	8.8	6.9	6.6	9.3	10.8	12.5	5.0	4.8	4.6	7.6	11.8	13.2
Business svc.	9.5	12.3	11.9	13.4	14.1	13.6	9.5	12	12.7	12.5	12.8	12.6
Government svc.	11.6	16.9	11.1	11.6	9.9	10.2	10.9	14.3	12.1	11.3	9.9	9.3
Personal svc.	0.6	1.1	0.9	1.8	1.8	1.7	1.7	1.6	1.6	2.0	2.0	2.6

Source: Extracted from Estmann et al. (2022). Note: Data originates from the Africa Sector Database (ASD) completed by Groningen Growth and Development Centre and covers persons employed and value added by sector in SSA from 1960-2010 (De Vries et al. 2015). The data was extended by Mensah & Szirmai (2018). The data covers the following countries: Botswana, Burkina Faso, Ethiopia, Ghana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Nigeria, Rwanda, Senegal, South Africa, Tanzania, and Uganda. *Gross value added at constant 2005 prices.

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