Local economy-wide impact evaluation of the United Republic of Tanzania's Productive Social Safety Nets

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Acknowledgements

Abbreviations

CCT	conditional cash transfer
FAO	Food and Agriculture Organization of the United Nations
GAMS	Generalized Algebraic Modeling System
GDP	gross domestic product
GoT	Government of the United Republic of Tanzania
IE	impact evaluation
LE	Livelihood Enhancement
LEWIE	Local economy-wide impact evaluation
NPS	National Panel Survey
PAA	Project Area Authorities
PSSN	Productive Social Safety Net
PW	Public Works
RCT	Randomized Control Trial
TASAF	Tanzania Social Action Fund
TZS	Tanzanian shillings
UNICEF	United Nations Children's Fund
WB	World Bank

Summary

To reduce extreme poverty and break its intergenerational transmission, in 2012 the Government of the United Republic of Tanzania initiated the Productive Social Safety Net (PSSN) – the flagship social protection programme implemented by the Tanzania Social Action Fund (TASAF). The PSSN is based on a set of integrated interventions targeted for the poorest and most vulnerable households: i) a labour-intensive public works (PW) programme; ii) conditional cash transfers (CCTs); iii) a Livelihood Enhancement (LE) component providing support to households' economic driven interventions (such as community savings and investments); and iv) Targeted Infrastructure, supporting development and rehabilitation of social infrastructures under education, health and water sectors. During the period 2013–2019, TASAF vastly scaled up the programme in five waves, enrolling 1.1 million households and 5.1 million individuals in 9 960 communities, representing approximately 10.5 percent of the total population.

A randomized impact evaluation was embedded within the scaled-up design of the PSSN, which found that even after a short period of implementation (2015–2017), the PSSN achieved several objectives including: increased consumption and food security, investment in better living conditions and human capital accumulation. To complement the findings of the official PSSN impact evaluation, in this study we analyse the indirect effects of the PSSN on the overall local economy. The programme transfers represent a significant share of beneficiary-household income, and therefore they significantly raise the purchasing power of poor households. The PSSN injects a considerable amount of liquidity into the United Republic of Tanzania's rural economies. Viewed from a local economy-wide perspective, the beneficiary households are the conduit through which cash gets channelled into the local economy. As the cash is spent, the transfers' impacts immediately spread from the beneficiary households to others inside (and outside) the targeted areas.

This study used a local economy-wide impact evaluation (LEWIE) model to simulate income and production spillovers from the PSSN. CCTs create both nominal and real income multipliers that significantly exceed one. Each Tanzanian shilling (TZS) transferred to poor households raises nominal or "cash" income in local economies by TZS 2.09 (while the real or inflation-adjusted multiplier is 1.55). The CCT and PW increase real income but also increase production activities, with households without labour increasing by more than the others in crop production while ineligible households receive more of the increase in value in other activities. If PW assets increase agricultural productivity in the local economy, multipliers and real income are much higher than in the other scenarios. Assuming PW assets increase agricultural TFP by 5 percent, the real income multiplier increases from 1.56 to 2.96, an increase of 1.4. The percent real income growth in the local economy also increases by 2.67 percentage points (from 2.99 to 5.66).

1. Introduction

Despite solid economic growth over the last two decades, about a fourth of the United Republic of Tanzania's population remains poor and highly vulnerable. While economic growth in the country averaged about 6.1 percent per year between 2000 and 2019, progress in reducing poverty has not been equally strong.[1] According to World Bank (2020), poverty declined considerably from 34.4 to 28.2 percent between 2007 and 2012, while decreasing at a much slower pace to 26.4 percent in 2018. However, this achievement in poverty reduction is not shadow-free. Given the high population growth rates, the absolute number of people living below the national poverty line has increased to 14 million in 2018. Further, with a large share of the population living just above the poverty threshold, many vulnerable households and individuals are at risk of falling back into poverty. Persistent gaps in the distribution of poverty remain between urban and rural areas, and across geographic regions.

To improve the situation of the poorest segments of the population, the Government of the United Republic of Tanzania (GoT) established the Tanzania Social Action Fund (TASAF). During phase I (2000–2005), TASAF provided delivery of social services, capacity enhancement for communities – including overseeing 1 704 community-run, small-scale infrastructure projects – and assisted 113 646 direct beneficiaries living in food-insecure households with cash-for-work (Lenneiye, 2006).

In phase II (2005–2013), TASAF addressed the lack or shortage of social services, expanded the capacity enhancement component, implementing 12 347 projects, and piloted a community-based conditional cash transfer (CCT) programme reaching 11 576 households in three of the poorest districts in the country (Bagamoyo, Chamwino, and Kibaha). An impact evaluation of this pilot found that the community-based CCT programme led to improved outcomes in both health and education. Further, households used the resources to invest in livestock, in children's shoes and insurance, while the poorest households also increased savings. This suggests that the households focused on reducing risk and on improving their livelihoods rather than principally on increasing consumption (Evans *et al.*, 2014).

In 2013, the Government of the United Republic of Tanzania started the third phase of TASAF, which was to enable poor households to increase incomes and opportunities while improving consumption (GoT, 2011). TASAF phase III is centred on the Productive Social Safety Net (PSSN), a national social protection programme aimed at creating the building blocks of a comprehensive, efficient, and permanent productive social safety net system for the poor and vulnerable section of the Tanzanian population.

The PSSN aims to increase income and consumption and improve the resilience capacity among vulnerable populations, while strengthening children's human capital. It represents the key public programme to reduce extreme poverty and break its intergenerational transmission. It is composed of the following set of integrated interventions:

i) <u>Cash transfers and Public Works</u> (PW). All households targeted for the programme receive an unconditional transfer, ensuring a basic level of support. Targeted households with children are

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[1] Average gross domestic product (GDP) growth rate between 2000 and 2019 has been calculated using GDP at constant local currency from the World Bank Development indicators
https://databank.worldbank.org/source/world-development-indicators

eligible for a variable conditional transfer if they fulfil key conditions focused on the use of education and health services.[2] Households with labour also have the opportunity through Public Works Projects to earn additional income to help meet basic needs during the lean season and avoid negative coping strategies. The main objectives of the public works component are household consumption smoothing and community asset formation. Public works projects commonly relate to agriculture, soil and water conservation/management, and rehabilitation of degraded areas (de Hoop *et al.*, 2020). The PW scheme guarantees fifteen days of paid work per month to one person per household. Table 1 reports a summary of the fixed and variable monetary benefits provided by the programme. Eligibility of households for the CCT and PW component is determined through a three-tier mechanism, starting with a geographical selection of the poorest communities, followed by a community-based targeting, resulting in a list of poor and vulnerable households, which is then verified with a proxy means test (PMT).

ii) <u>Livelihood Enhancement (LE)</u>. This component provides support to households' economic driven interventions, which enhance livelihoods and increase incomes (through community savings and investments). The aim is to improve savings' capacity of beneficiaries, invest in livelihood enhancing activities, and support them with business development skills and technical training.

iii) <u>Targeted Infrastructure</u>. This component supports the development of social infrastructures under education, health and water sectors. More specifically, the focus is to: i) construct/rehabilitate primary and secondary schools' classrooms, teachers' houses, toilets, water points, teachers' offices, libraries, laboratories, and dormitories; ii) construct/rehabilitate health facilities (including outpatient dispensaries, maternal child health centres, staff houses, toilets, incinerators, and water points. iii) develop potable water supplies.

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[2] "Children ages five and older who are enrolled in school and attend at least 80 percent of school days are considered as having complied with education co-responsibilities. Health compliance is only required for children five and older, requiring monthly health visits to children under 24 months and once every six months for older children" (Rosas *et al.*, 2019, p. 6)

Table 1. Productive Social Safety Net benefit scheme

PSSN component	Transfer type	Transfer name	Co-responsibility	Benefit (TZS)	Monthly cap (TZS)	Annual max (TZS)
BT	Fixed	Basic transfer	Extreme poverty	10 000	10 000	120 000
CCT	Fixed	Household child benefit	HH with children under 18	4 000	4 000	48 000
	Variable	Infant benefit	Infants 0-5 health compliance	4 000	4 000	48 000
	Variable	Individual primary benefit	Child in primary education compliance	2 000	8 000	96 000
	Variable	Individual lower secondary benefit	Child in lower secondary education compliance	4 000	12 000	144 000
	Variable	Individual upper secondary benefit	Child in upper secondary education compliance	6 000		
PW	Variable	Public works benefit	Extreme poverty + older than 18 able to work	2 500	37 500	150 000

Note: PSSN = Productive Social Safety Net. TZS = Tanzanian shilling. BT = Basic Transfer. CCT = conditional cash transfer. PW = Public Works. HH = household.

The PSSN operates nationally, covering all local government authorities in the mainland, as well as Unguja and Pemba islands in Zanzibar. During the period 2013–2019, TASAF vastly scaled up the programme in five waves, enrolling 1.1 million households and 5.1 million individuals in 9 960 communities, representing approximately 10.5 percent of the total population (TASAF, UNICEF and REPOA, 2018). To demonstrate that the PSSN was generating the intended impacts, a randomized impact evaluation (IE) was built into the scale up design (Rosas *et al.*, 2019), contributing also to the thriving literature of the effectiveness of cash transfer programmes (Bastagli *et al.*, 2019). According to the midline evaluation, even after a short period of implementation (2015–2017), the PSSN achieved several objectives:

1) reduction of poverty, increased consumption and food security, investment in better living conditions;
2) increased school enrolment, especially for primary school age children;
3) greater take-up of health services and preventive practices;
4) impact on productive activities and assets, moving away from casual labour to non-farm self-employment.

Despite the excellent performance, evaluators concluded that the PSSN required a long-term commitment and a coordinated set of complementary interventions to make impacts on well-being and livelihoods sustainable for the long-term and in order to move people out of poverty.

To complement the findings of the official PSSN impact evaluation, in this study we analyse the indirect effects of the PSSN on non-eligible households and the overall local economy. The programme transfers represent a significant share of beneficiary-household income and therefore they significantly raise the purchasing power of poor households.[3] The PSSN injects a considerable amount of liquidity into the United Republic of Tanzania's rural economies. Viewed from a local economy-wide perspective, the beneficiary households are the conduit through which cash gets channelled into the local economy. According to the Living Standards Measurement Survey 2014/15, households in rural United Republic of Tanzania spend over 80 percent of their income inside the local economy (Figure 1), primarily for direct purchasing of agricultural goods and at retail shops. As the cash is spent, the transfers' impacts immediately spread from the beneficiary households to others inside (and outside) the targeted villages. Income multipliers within the targeted areas are set in motion by doorstep trade, purchases in village shops, periodic markets and purchases outside the village. Some impacts extend beyond the programme area, potentially unleashing income multipliers in non-programme sites. In this way, cash transfers stimulate economic growth. Existing research suggests that the indirect impacts of social interventions, including on poor households, are significant (e.g. Thome *et al.*, 2013; Taylor and Filipski 2014; Taylor *et al.*, 2016; Thome *et al.*, 2016). Because of production and income spillovers, the full impact of social programmes on rural economies may substantially exceed the direct impacts on beneficiaries.

Figure 1. Budget shares by expenditure categories, rural households
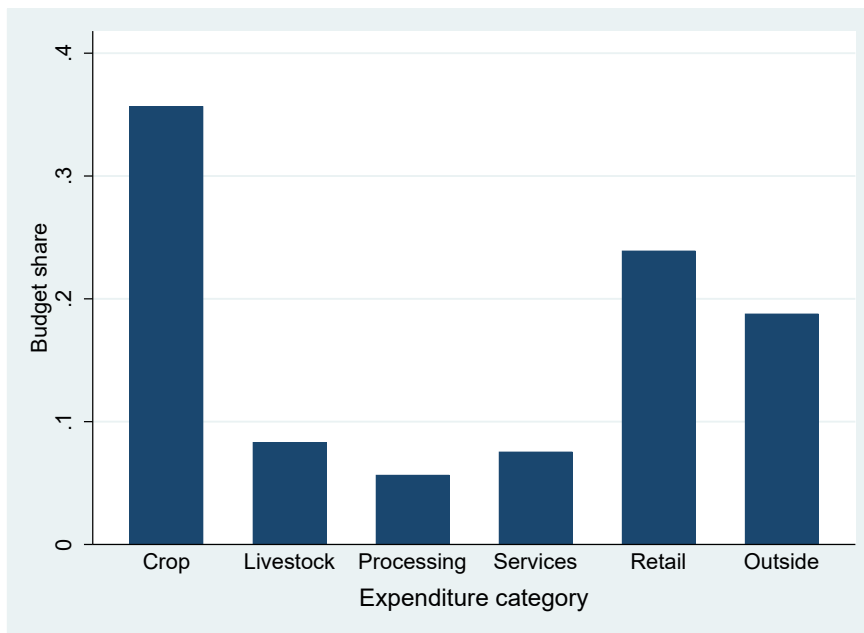
Source: Author's own elaboration adapted from the *Tanzania National Panel Survey (NPS) - Wave 4, 2014 - 2015*. Rural areas only. *https://doi.org/10.48529/y3gj-d018*

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[3] According to Rosas *et al.* (2019), transfers received range between 16 and 17 percent of household consumption, depending on the use of the administrative data or self-reported amounts. However, factoring for full compliance, the potential benefits make up 20 percent of household consumption.

2. Methodology

We design and carry out a Local economy-wide impact evaluation (LEWIE) to uncover the direct and indirect impacts of the PSSN. Simulations using the LEWIE model provide estimates of impacts on the activities and incomes of target groups, as well as the indirect (spillover) effects on groups not targeted by the PSSN programme components. By treating eligible households, the PSSN "treats" the local economies to which these households belong, via income and production spillovers. Market interactions shift impacts from beneficiary to non-beneficiary households.

It is difficult and costly to estimate indirect effects of multifaceted programmes like the PSSN using experimental approaches. This is because spillovers tend to dilute as they move through local economies. In most cases, the indirect impacts on a single non-beneficiary household tend to be small, even though the sum of impacts on all non-beneficiaries may be quite large – even larger than the sum of direct impacts on targeted households. Because of this, identifying spillovers requires surveying large numbers of ineligible households. Almost all impact evaluations seek to identify average treatment effects by comparing outcomes in eligible households at treated and control sites. They almost never survey households that are not eligible for programs. Trying to evaluate spillovers from a programme with multiple components like the PSSN requires even larger and more costly surveys of ineligible as well as eligible households.

Table 1 presents a theory of change, which describes how PSSN programme components can create local-economy impacts. Figure 1 summarizes the LEWIE model and the channels through which these policies could affect beneficiary and non-beneficiary households. The policy option transmits impacts through a variety of ways depending on its specificity:

(1) Savings groups created through the LE component, cash transfers to vulnerable households with children and wages paid to labour unconstrained households can help farmers overcome liquidity constraints and increase their investment in new agricultural and non-agricultural activities. Nonetheless, the main impacts of the cash transfers operate through an increase in exogenous income. Further, Public Works can contribute to create/rehabilitate assets, such as watershed management and irrigation canals, which are supposed to increase productivity of land for all households in rural areas of the United Republic of Tanzania. Transfer of skills and technology through public works can improve productivity of direct beneficiaries too.

(2) Production and consumption linkages transmit impacts to other beneficiary households and to non-beneficiary households.

(3) Non-beneficiary households then transmit impacts through production and consumption linkages to the other household groups.

(4) In subsequent rounds of spending, households continue to transmit to each other.

(5) Leakages, in the form of expenditures on consumption and production outside the rural economy reduce the effect of subsequent cycles on local incomes and production. Although leakages reduce local-economy impacts, they transmit benefits to other parts of the country.

Table 2. Theory of change – Summary of PSSN impacts on beneficiary and non-beneficiary households

Programme and its components	Channel of impact on beneficiaries	Spillovers to non-beneficiaries
CCT: Cash transfer to vulnerable households with children **PW**: - Wages paid to labour unconstrained households for constructing public works - Assets created - Skills and technology transferred **LE:** - Access to saving and lending services - Financial education	• Increase in exogenous income for poor beneficiaries • Reduced liquidity constraints • Human capital accumulation (long-term) • Investment in income-generating activities • Increase in partial and total factor productivity	Spending on goods from local farms and businesses Production expands to meet increased demand If production does not expand, inflationary impacts occur Increase in hiring of agricultural labour

Source: Authors' own elaboration.
Note: CCT = conditional cash transfers; PW = Public Works; LE = Livelihood Enhancement.

Figure 2. Summary of programmes' transmission mechanisms for rural of the United Republic of Tanzania
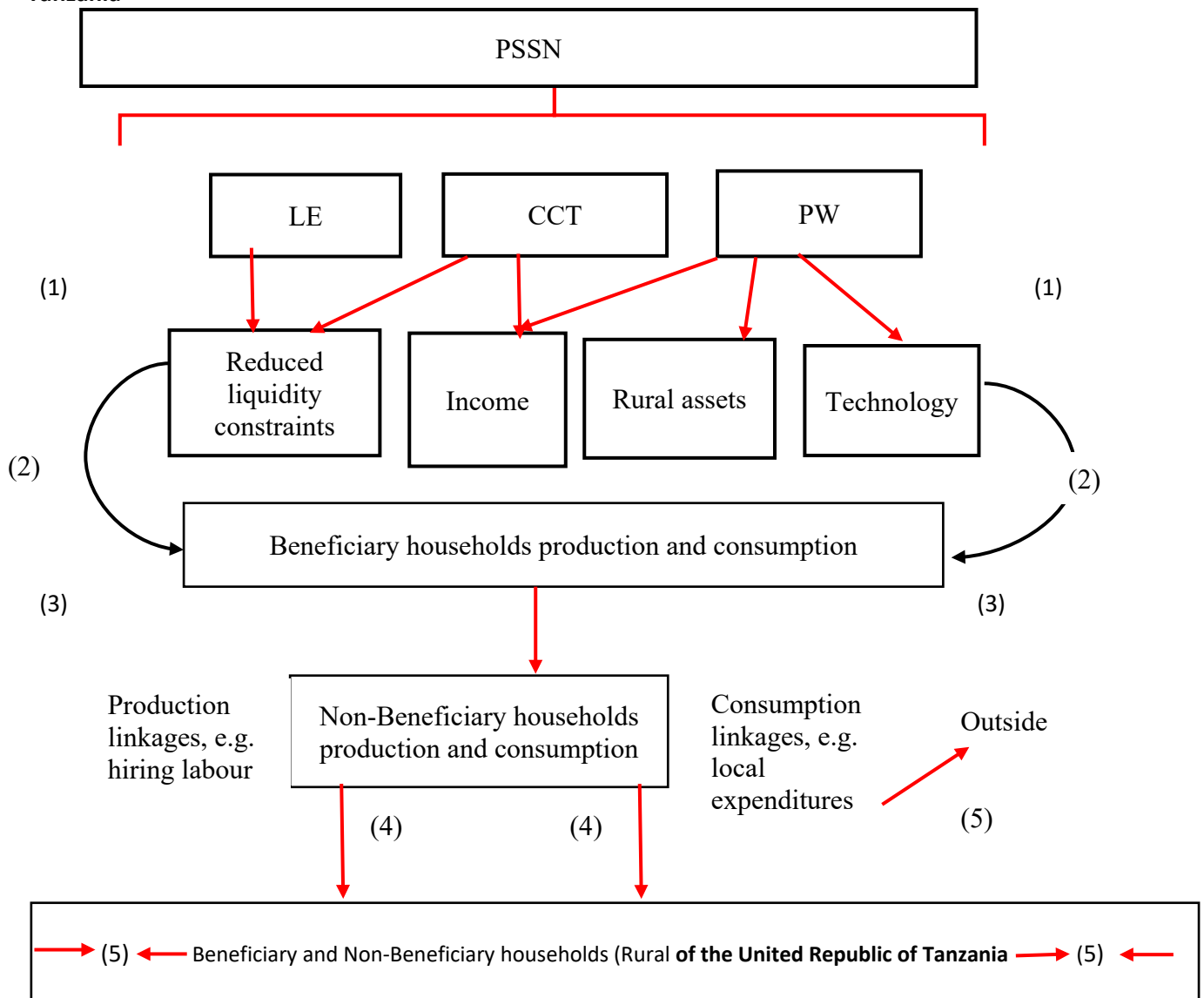
Source: Authors' own elaboration.
Note: PSSN = Productive Social Safety Net. CCT = conditional cash transfers; PW = Public Works; LE = Livelihood Enhancement.

3. Data

The PSSN IE relies on a stratified two-staged cluster randomized control trial (RCT) with a multiple treatment arms design, including communities from two Project Area Authorities (PAA) in Zanzibar and 16 PAAs in Mainland (Rosas *et al.*, 2019). In the first stage, communities were randomly assigned to either the control group, the CCT only group, or the CCT+PW group. The PSSN IE data would meet basic requirements of a LEWIE analysis, since the sampling at the baseline included ten households ineligible for the PSSN in each community of the two treatment groups to assess the targeting performance of the programme. However, these IE data are not available to the public yet. Therefore, the primary source of information to build the LEWIE model for rural of the United Republic of Tanzania is the 2014/2015 National Panel Survey (NPS). This is the fourth round in a series of nationally representative household panel surveys, which collect information on a wide range of topics including: agricultural production, non-farm-income-generating activities, consumption expenditures, and a wealth of other socioeconomic characteristics. The household survey provides the information needed to estimate most of the LEWIE model parameters, including household- and commodity-specific expenditure functions and production functions for household activities including crop and livestock. However, with respect to non-farm business, such as small-scale retail and non-retail services and processing activities, the NPS falls short of data on intermediate input demands by retail, service, and local non-agricultural production sectors, as well as by value added shares for each business type. This includes data on products and services purchased by businesses in the local economy and how much value added these purchases add to the final products sold. Although this information was not asked in the NPS 2014/15, we piggy-backed on a data collection exercise carried out by the Food and Agriculture Organization of the United Nations (FAO) between July and October 2020, which was centred on food retailers in 17 territorial markets, covering a diverse set of livelihood zones and agro-ecological conditions. While in the food retailers' survey we included key variables needed for the estimation of structural parameters of the retail sector, in the areas nearby the territorial markets we also carried out a similar non-food retail survey, covering both retailers of non-food commodities and businesses related to processing and services activities. We use these surveys to estimate the intermediate demand shares for goods and services supplied as inputs from other businesses inside or outside the programme area. The limitations of these data, besides being from a source other than the NPS, are that they are not representative of all rural districts of the United Republic of Tanzania, but only a small subset of districts. Nevertheless, we believe that input-output relationships in non-agricultural production activities do not vary widely across rural areas of the United Republic of Tanzania.

3.1 Household taxonomy and summary statistics

The LEWIE analysis requires a practical household taxonomy in order to carry out simulations and compare outcomes across beneficiary and non-beneficiary household groups. In this LEWIE study, we cluster households based on eligibility for the CCT and PW components of the PSSN and it includes the following:

A. Poor households without labour capacity

B. Poor households with labour

C. Ineligible households

Table 3 presents summary statistics for each of these household groups in rural areas. In general, households eligible for the PSSN are larger than ineligible households, the differences being mainly driven by a greater number of children in all school-age categories (pre-primary 0–5, primary 6–12 and secondary 13–17). Households without labour capacity have also a slightly higher number of older people (60+ years) and this leads to higher dependency ratios. A relatively larger proportion of older-female, less-educated heads also characterizes households without labour capacity. These data are consistent with the evidence from impact evaluations in the region, which are focused on the poorest and most vulnerable segment of the population (Davis *et al.*, 2016). PSSN ineligible households have generally better levels of education and generally better living conditions as shown by higher per-adult-equivalent monthly food and total consumption, value of harvest and cultivated land. Surprisingly, PSSN eligible households without labour capacity have relatively larger livestock capital than ineligible households. We interpret this finding by livestock ownership being very often considered a form of precautionary saving, rather than investment into agricultural activities.

3.2 The business surveys

The food retailers' survey mapped 17 territorial markets located in various parts of the country, as shown in Table 4.[4] The evaluation team selected these markets among a list built by a service provider, which carried out a preliminary market analysis in the districts targeted for their diverse livelihood zones and agro-ecological conditions. Almost all markets mapped were open on a daily basis, with the exception of the Nyandira market in the Mvomero district, which had a weekly frequency instead. To make the sample representative of the retailers' demographic characteristics and of the commodities produced in the nearby rural economies, we stratified retailers based on their sex and age and on the products sold by them.

Table 5 provides some basic average characteristics of the 556 food retailers interviewed. Overall, we observe that almost 60 percent of retailers are women, though there are large discrepancies across markets, with Igwachanya and Kwasadala well above a 70 percent proportion of women, while in Kinyasini only 18 percent of the business owners are women.

These retailers are on average 37 years of age, with little differences between markets. On average, business owners reported working on these markets for more than 10 months during the year prior to the data collection and for about 23 days each month. This entails that the food retailers attend markets for approximately an average of six days per week. Retailers in the Nyandira market show the lowest average attendance rate, though the 9.3 days per month highlight some reporting errors by the respondents, given the weekly frequency of this market. On average, the number of food categories sold by the retailers interviewed in this study is 1.5. This entails some degree of specialization in a specific market niche. To this end, Figure 3 reports the proportion of retailers selling specific commodities groups. While 27.5 percent sold cereals and tubers, pulses and fruits, a slightly lower share is engaged in the sale of leafy and other vegetables (17 percent) and nuts and seeds (14 percent). Finally, only 4.3 and 7.6 percent trade dairy products and meat/fish respectively.

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[4] Territorial markets are domestic markets embedded into local and/or national food systems, characterized by horizontal (i.e. non-hierarchical) relations among the various stakeholders and by a wide range of products offered (CFS, 2016). They can be formal, informal or a hybrid between the two and are mostly remunerative for smallholder farmers who have greater bargaining power over prices (Vicovaro and Celardo, 2021).

The retail sector typically purchases some goods locally, and our sample of food retailers selling in territorial markets is no exception (Figure 4). Actually, the share of expenses for direct purchases of commodities from local producers is relatively high (21 percent). Many goods/services are purchased from other retailers/traders too (18 percent). However, most of the commodities sold by these small-scale businesses come from outside the local economy, Because of this, the food retail sector can be considered as an "import" sector, making the tradable goods from outside the local economy available to households and businesses within the communities.

As mentioned before, nearby the territorial markets we also carried out a similar non-food retail survey, covering a wide range of non-farm income generating activities. Of the 424 businesses interviewed, fewer than 9 percent are retailers of non-food products, such as agricultural inputs, clothes and shoes. However, most of these micro- and small-enterprises are related to processing (43 percent) or services (47 percent). The low number of regular employees or even employed family members, which are on average 0.7 and 0.4 respectively, highlight the individual nature of the majority of these businesses (Table 6). These figures are substantially homogenous across sectors. Since business owners rely mostly on their own labour effort, they tend to carry out these activities almost each day of the month, and for about 10.2 months during the year. Business owners engaged in the services sector tend to pay much higher wages on average than in the processing and the retail non-food sector. However, the latter also reports a much larger volume of revenues, indicating higher margins/profits from their activities.

Table 3. Household summary statistics, rural of the United Republic of Tanzania

	Household group			
	Without labour	With labour	Ineligibles	Total
No. members in the hh	6.8	5.2	4.6	5.1
No. hh members 0-5 years	1.5	1.0	1.0	1.1
No. hh members 6-12 years	1.9	1.0	1.0	1.1
No. hh members 13-17 years	1.2	0.6	0.4	0.6
No. hh members 18-59 years	1.9	2.4	2.0	2.0
No. hh members 60+ years	0.4	0.2	0.3	0.3
Share of dependents in hh (%)	72.5	50.3	53.3	56.2
Orphan living in hh (%)	20.2	14.0	10.1	12.4
Female headed hh (%)	38.1	22.6	25.6	27.3
Head of hh age	48.6	43.3	44.6	45.1
Head of hh married (%)	68.1	76.0	74.7	73.8
Head of hh widow (%)	17.0	10.7	11.1	12.1
Head of hh years of education	3.3	4.2	5.2	4.7
Highest years of education in hh	6.0	6.6	7.0	6.8
Pae monthly consumption - 1 000 TZS	29.5	31.5	101.9	78.4
Pae monthly food consumption - 1 000 TZS	21.0	21.8	68.4	52.9
Share of food consumption (%)	70.6	67.8	66.5	67.4
Cultivated land – acres	4.7	4.5	6.0	5.5
Tropical livestock units	1.6	1.1	1.4	1.4
Value of harvest – 1 000 TZS	862	747	1 157	1 036
Value of livestock – 1 000 TZS	850	585	822	790
observations	408	365	2579	3352

Source: Authors' elaboration from the *Tanzania National Panel Survey (NPS) - Wave 4, 2014 - 2015.* https://doi.org/10.48529/y3qj-d018
Notes:
Rural areas only, applying survey weights.
hh = household, pae = per adult equivalent, TZS = Tanzanian shilling.

Table 4. Business survey markets location

Market	Region	District	Agro-ecological area	Livelihood
Majengo	Dodoma	Dodoma Urban	arid lands	sorghum—sunflower—grape
Saba saba	Dodoma	Dodoma Urban	arid lands	sorghum—sunflower—grape
Kibaigwa	Dodoma	Kongwa	arid lands	sorghum—maize—pigeon peas
Matumbwe	Geita	Mbogwe	plateaux	cassava—paddy—maize
Lugunga	Geita	Mbogwe	plateaux	cassava—paddy—maize
Ilula	Iringa	Kilolo	south & west highlands	coffee—banana
Soko Kuu Mafinga	Iringa	Mufindi	south & west highlands	tree plantations with crops-pyrethrum and tea
Kwasadala	Kilimanjaro	Hai	north highlands	coffee—banana
Boma Ng'ombe	Kilimanjaro	Hai	north highlands	coffee—banana
Nyandira	Morogoro	Mvomero	south & west highlands	sisal—sugar cane-cattle
Igwachanya	Njombe	Wanging'ombe	south & west highlands	rice—maize
Didia	Shinyanga	Shinyanga Rural	semi-arid lands	cotton-livestock—cassava
Dutwa	Simiyu	Bariadi Vijijini	semi-arid lands	cotton-paddy—cattle
Soko Kuu Sola	Simiyu	Maswa	semi-arid lands	sorghum—cotton-sweet potatoes—cattle
Chogo	Tanga	Handeni	coast	maize—cassava—cashew
Chanika	Tanga	Handeni	coast	maize—cassava—cashew
Kinyasini	Zanzibar	Kaskazini A	coast	fish—clove

Source: Authors' own elaboration.

Table 5. Average food retailers characteristics, by market

	% Female	Age	No. Months in operation	No. Days per month	No. Product categories sold	No. Retailers interviewed
Boma Ng'ombe	58.3	33.6	11.1	23.2	1.9	12
Chanika	25.0	51.0	10.6	27.9	1.9	8
Chogo	71.4	37.8	9.6	25.3	1.1	14
Didia	72.7	33.3	8.9	25.0	2.2	11
Dutwa	72.7	37.0	9.7	26.7	1.5	11
Igwachanya	80.0	35.1	5.7	25.6	1.0	10
Ilula	25.0	41.5	6.7	23.1	1.3	12
Kibaigwa	54.5	40.9	9.1	26.2	1.2	33
Kinyasini	18.2	37.3	10.5	23.8	1.1	33
Kwasadala	74.7	39.0	11.5	12.8	1.4	87
Lugunga	50.0	38.9	9.7	23.8	1.1	14
Majengo	50.8	34.1	11.4	28.9	1.4	128
Matumbwe	70.4	33.7	9.8	25.1	1.1	27
Nyandira	56.8	42.4	8.4	9.3	3.7	44
Saba Saba	66.7	32.9	10.5	27.5	1.1	72
Soko Kuu Mafinga	65.4	39.0	10.0	27.0	1.8	26
Soko Kuu Sola	64.3	37.6	10.0	26.4	1.7	14
Total	58.5	36.9	10.3	23.2	1.5	556

Source: Authors' own elaboration from the collected food–retailers survey data.

Figure 3. Share of retailers by products sold
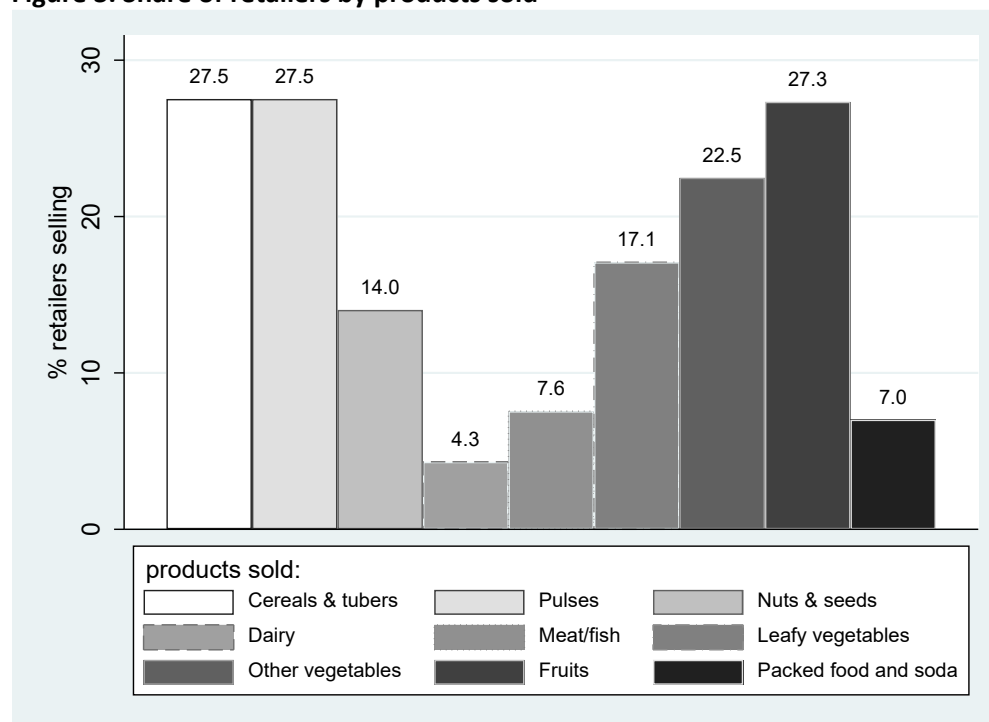
Source: Authors' own elaboration from the collected food–retailers survey data.

Figure 4. Retail activity expenditures
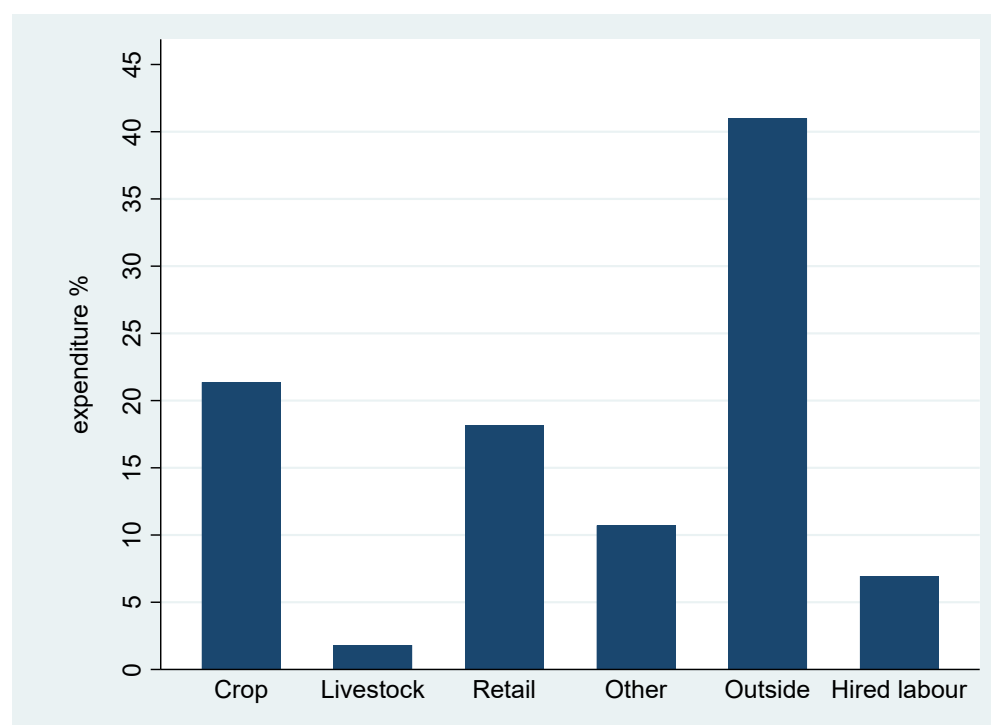
Source: Authors' own elaboration adapted from the collected food–retailers survey data.

Table 6. Non-food retailers, services and processing business characteristics

	Retail non-food	Processing	Services	Total
No. Months in operation	10.1	10.3	10.2	10.2
No. Days per month in operation	26.9	26.4	27.7	27.1
No. Regular employees	0.66	0.60	0.79	0.69
Monthly wages, TZS	87 750	148 612	161 973	148 623
Casual labour payments	6 429	25 130	10 654	16 071
No. Employed family members	0.53	0.42	0.41	0.42
Monthly sales, TZS	1 682 105	583 546	789 458	779 616
No. observations	38	185	201	424

Source: Authors' own elaboration from the collected non-food retailers, services and processing business survey data.

3.3 Estimation of model parameters

We estimated the model parameters econometrically, using microdata from the 2014/15 NPS and the more recent business surveys. Econometric estimation always requires making some assumptions about functional forms. Cobb-Douglas production functions are by far the most widely used in economics to represent technological relationships between inputs and outputs. They allow for nonlinearities, and they can be estimated with the data from our household and business surveys.

Tables from 7 to 9 report the production function estimates. The panels in these tables present production function estimates for crops, livestock, and household non-farm businesses (separately for retail, processing and services activities). The parameter on each factor represents the elasticity of output with respect to the factor. Assuming constant returns to scale, this elasticity is also the factor's share in the activity's total value-added. Standard errors appear in parentheses underneath each parameter estimate. Asterisks (*, **, and ***) indicate that an estimated parameter is different from zero at the .10, .05, and .01 significance level, respectively.

Crop production for poor households without labour capacity, meaning without capacity to work on the public works, still use a high proportion of family labour (0.77). Poor households with labour are similar (0.51). The wealthier ineligible households, however, receive more value from their land than their family labour – a 1 percent increase in land cultivated leads to a 0.46 percent increase in harvest value.

Livestock production also relies heavily on family labour – ranging from 0.08 to 0.47. It also has significant shares of livestock capital which includes livestock owned 12 months prior plus livestock purchases. This represents their livestock herd during the year and ranges from 0.29 for households without labour to 0.72 for ineligible households. As expected, increases in livestock capital lead to a significant rise in the value of their current herd.

Businesses do not rely as much on capital – the value of their building or other assets – but rather business inputs which can include the flow of goods they purchase for resale. These are usually purchased from outside the local economy and do not have an impact on local multipliers. They also use labour fairly intensively – from 0.18 to 0.34.

Table 7. Crop production function estimates by household group

	Crop production shares		
	Without labour	With labour	Ineligibles
Land, hectares cultivated	0.061	0.27	0.456
	(0.16)	(0.08)	(0.46)
Days of family workers	0.771	0.509	0.292
	(0.21)	(0.07)	(0.03)
Days of hired workers	0.151	0.118	0.146
	(0.15)	(0.12)	(0.15)
Value of seeds, fertilizer and pesticides, TZS	0.044	0.039	0.047
	(0.01)	(0.01)	(0.01)
Value of crop capital, TZS	0.01	0.064	0.058
	(0.1)	(0.03)	(0.02)
Constant	9.1	9.26	10.16
	(0.61)	(0.38)	(0.23)
Number of observations	327	284	1 110

Source: Authors' own elaboration adapted from *the Tanzania National Panel Survey (NPS) - Wave 4, 2014 - 2015.* https://doi.org/10.48529/y3qj-d018
Notes:
Rural areas only.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. TZS = Tanzanian shilling. Variables are transformed using the inverse hyperbolic sine transformations. All regressions include district-fixed effects and use robust standard errors. Production functions are run as constrained regressions where its Cobb-Douglas factor coefficients are constrained to equal 1. Robust standard errors in parentheses.

Table 8. Livestock production function estimates by household group

	Livestock production shares		
	Without labour	With labour	Ineligibles
Land for livestock grazing, ha	0.14	0.05	0.08
	(0.09)	(0.13)	(0.06)
Days of family workers	0.22	0.47	0.08
	(0.11)	(0.19)	(0.08)
Days of hired workers	0.26	-0.09	0.03
	(0.06)	(0.06)	(0.01)
Value of livestock capital	0.29	0.49	0.72
	(0.08)	(0.22)	(0.11)
Value of livestock inputs, TZS	0.10	0.08	0.09
	(0.02)	(0.04)	(0.02)
Constant	8.17	6.09	2.82
	(1.02)	(2.79)	(1.27)
Number of observations	221	167	761

Source: Authors' own elaboration adapted from the *Tanzania National Panel Survey (NPS) - Wave 4, 2014 - 2015.* https://doi.org/10.48529/y3qj-d018
Notes:
Rural areas only.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. TZS = Tanzanian shilling; ha=hectares. Variables are transformed using the inverse hyperbolic sine transformations. Value of livestock capital equals the value of livestock herd 12 months prior to the survey plus the value of livestock purchases in the last 12 months. All regressions include district fixed effects.

Production functions are run as constrained regressions where its Cobb-Douglas factor coefficients are constrained to equal 1. Robust standard errors in parentheses.

Table 9. Business production function estimates

	Retail	Services	Production
Days of family workers	0.178	0.297	0.340
	(0.07)	(0907)	(0.12)
Days of hired workers	0.118	0.105	0.130
	(0.04)	(0.04)	(0.05)
Value of business inputs, TZS	0.439	0.450	0.431
	(0.14)	(0.13)	(0.13)
Value of business capital, TZS	0.265	0.149	0.098
	(0.09)	(0.09)	(0.07)
Constant	4.379	5.258	5.596
	(1.23)	(1.16)	(1.66)
Number of observations	462	185	201

Source: Authors' own elaboration adapted from *the collected food and non-food retailers, services and processing business surveys data.*
Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. TZS = Tanzanian shilling. Variables are transformed using the inverse hyperbolic sine transformations. All regressions include district fixed effects. Production functions are run as constrained regressions where its Cobb-Douglas factor coefficients are constrained to equal 1. Robust standard errors in parentheses.

The linkages created by production activities depend on the production functions as well as on intermediate inputs purchased locally or in outside markets. In this regard, non-farm production has much larger leakages – via the purchase of intermediate inputs from outside markets – than crop or livestock production. Out of every TZS of total retail sales, village stores spend TZS 0.19 to purchase merchandise outside the local economy. The share for other non-farm production is 0.2. In contrast, crop production activities spend only 0.01 per TZS of output value on intermediate inputs from outside markets (e.g. seeds), and there is no share for livestock production of output value.

On the consumption side, we assume linear expenditure functions without subsistence minima,[5] implying Cobb-Douglas utility. We estimated a separate system of demand equations for each household group, yielding the group-specific marginal budget shares shown in Table 10. Standard errors appear in parentheses underneath the estimated budget shares.

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[5] Simply stated, subsistence minima are the minimum amounts (e.g. of food) that households must consume in order to survive.

Table 10. Estimated household expenditure shares, by group

Expenditure item	Expenditure shares by household group		
	Without labour	With labour	Ineligibles
Crops	0.406	0.497	0.311
	(0.019)	(0.022)	(0.012)
Livestock	0.143	0.070	0.143
	(0.012)	(0.011)	(0.007)
Retail	0.207	0.208	0.209
	(0.018)	(0.021)	(0.009)
Services	0.065	0.073	0.174
	(0.009)	(0.009)	(0.007)
Processing	0.037	0.044	0.019
	(0.006)	(0.006)	(0.002)
Out	0.142	0.108	0.145
	(0.025)	(0.027)	(0.011)
Number of observations	352	313	1 317

Source: Authors 'own elaboration adapted from *the Tanzania National Panel Survey (NPS) - Wave 4, 2014 - 2015. https://doi.org/10.48529/y3qj-d018*
Notes:
Rural areas only.
Standard errors in parentheses. Seemingly unrelated regression (SUR) estimates. Local expenditures refer to expenditures in the village or nearby village.

Most household groups make a significant share of their expenditures – between 31 percent and 50 percent – on local crops purchased directly from farmers in their village, or from a neighbouring village. Local crops constitute between 0.41 (households without labour) and 0.5 (households with labour) of every TZS spent by eligible households, but smaller shares – 0.31 – of expenditures by ineligible households. Livestock, or meat and livestock by-products such as eggs and milk purchased from local herders, also accounts for a large share of household expenditures (0.07 for households with labour and 0.14 for households without labour and ineligibles). Expenditure shares are also large for local retail (0.21) and other non-farm activities (0.07–0.17) that, in turn, purchase inputs outside the local economy. A significant share – between 0.11 and 0.14 – also comes from outside the village or a neighbouring village. These outside shares represent leakages from the local economy, though they may stimulate income growth in other parts of the country.

Estimating income spillovers is a key objective of this LEWIE analysis. Income spillovers depend on several considerations, including:

1. How we define the local economy. How far out from the beneficiary households we "cast our net" will determine what constitutes a local purchase and what constitutes a leakage, thereby affecting the multiplier. In general, the farther out one casts one's net, the larger the income multiplier. The definition of "local economy" is inherently arbitrary and reflects, to an important degree, the interests of researchers and policy makers. For our analysis, the local economy includes the beneficiary's village and neighbouring villages, while "outside" can be towns, cities and further abroad.

2. The share of income that households – both poor households with and without labour capacity and ineligible – spend within this local economy. The larger the expenditure share outside the local economy, the larger the leakage and smaller the potential income multiplier.
3. Which goods and services supplied by local farms and businesses, households spend their income on, as well as where these activities, in turn, obtain intermediate inputs. If households spend a large part of their income in local shops, which in turn procure their merchandise in outside markets, the potential income multiplier is smaller than if households demand local crops, which use few inputs from outside the local economy.

Real income multipliers also depend on the local supply response to increases in demand, which influences prices and thus the purchasing power of households' cash. The more elastic the local supply response, the larger the real-income impact, and the smaller the inflationary impact. If households' budget share on goods and services from a given activity – say, retail – is large, but the activity spends a large share of its revenue on inputs obtained from outside markets, the impact on local income might be limited, but so is the potential inflationary impact. On the other hand, if households spend a large share of their income on goods produced locally, the result may be a large real-income multiplier, if the local supply response is elastic, or a small real-income multiplier (and inflation) if the local supply response is inelastic.

Land and capital inputs in our model are fixed – a standard short-run assumption in agricultural household and LEWIE models. If households have access to underutilized land and capital that they can bring into production as local demand increases, our simulations will tend to underestimate local income multipliers in the long run and possibly also in the short run. In that case, one might consider the production and income impacts from our simulations as conservative.

4. Simulations and results

4.1 Simulations

We used the LEWIE model to perform the following simulations:

4.1.1 CCT only

We estimate the local economy effects of the CCT transfers on eligible and ineligible households. Based on the total number of households without labour capacity and the average amount given to each household (Table 1), we estimate the amount distributed as TZS 293 billion annually. We simulate this as an exogenous transfer to those households.

4.1.2 PW only

The second simulation estimates the impact of the public works wages only on the households with labour capacity as well as the spillover effects to the other households in the local economy. Based on the total number of households with labour capacity targeted by the programme and the average amount given to each household (Table 1), we estimate the amount distributed as TZS 157 billion annually. We again simulate this as an exogenous transfer to those households.

4.1.3 CCT + PW

Under this scenario we combine both the CCT transfers and the public works transfers to estimate the impact on the local economy. The combined transfers total to TZS 450 billion annually. This scenario closely resembles the main components of the PSSN, although it does not yet assume that the PW assets and skill building have productive impacts on the agriculture in the local economy.

4.1.4 CCT + PW + 5% TFP increase

This simulation is similar to the previous except that we assume that the assets created by the PW have an increase in agricultural total factor productivity (TFP) of 5 percent. This means that for a given level of inputs in crop and livestock production, households now produce more output. The public works assets in the PSSN consist of soil and water conservation/management, and rehabilitation of degraded areas which may increase the TFP of agriculture. While there is scant evidence of these specific public works assets (or other public works assets) having a productive impact in the sub-Saharan African context, there is evidence of other water projects such as small-scale irrigation having large impacts on agricultural productivity and the profitability of small farms (USAID, 2020). This scenario can be seen as an optimistic impact of the public works assets in addition to the impacts of the CCT and PW wages.

The findings from these simulations follow.

4.2 Results

4.2.1 CCT only

Figure 5 shows the nominal and real income multipliers of the CCT of the PSSN in the absence of other programme components. These are the total benefits of the CCT including spillovers divided by the total transfer. They tell us that for every TZS 1 of transfer, TZS 2.09 in nominal income is created and TZS 1.55 in real (inflation-adjusted) income. This is greater than the TZS 1 of transfer and shows that the impact of the cash goes beyond the direct impact of the treated. Through the injection of cash into the local economy, an extra TZS 1.09 in nominal income and TZS 0.55 in real income is created.

Figure 5. Nominal and real income multipliers of CCT component
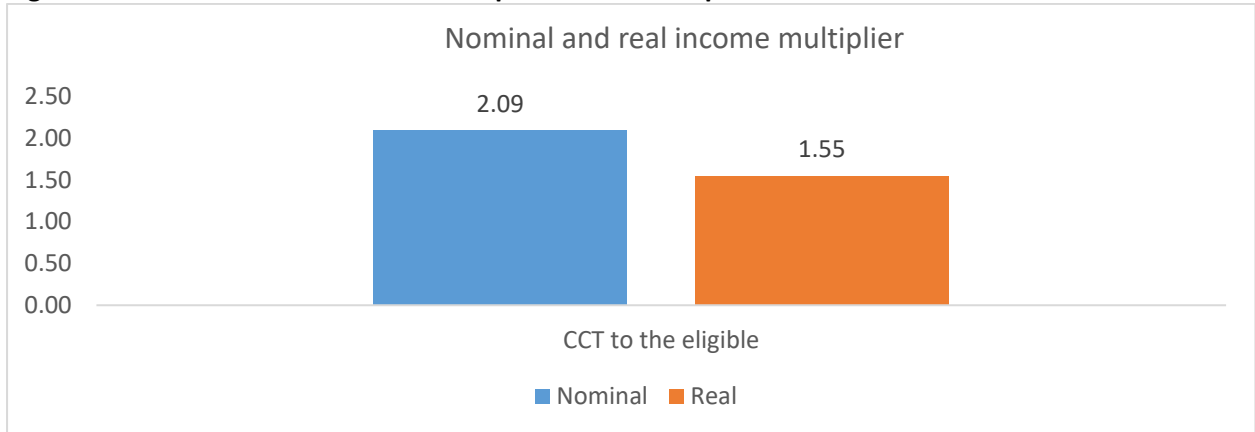
Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with Generalized Algebraic Modeling System (GAMS).*
Note: CCT: conditional cash transfers.

Figure 6 comes from LEWIE studies of income multipliers of social cash transfer (SCT) programmes taken from the FAO From Protection to Production project (Thome *et al.*, 2016). The United Republic of Tanzania multipliers compare favourably across other countries; a nominal income multiplier of 2.09 and a real income multiplier of 1.55 places the impact of the United Republic of Tanzania CCT higher than all countries except Lesotho, Ghana, and Ethiopia (Hintalo) for nominal income, and only lower than Ethiopia for the inflation-adjusted real income.

Figure 6. Income multipliers from LEWIE studies in sub-Saharan Africa
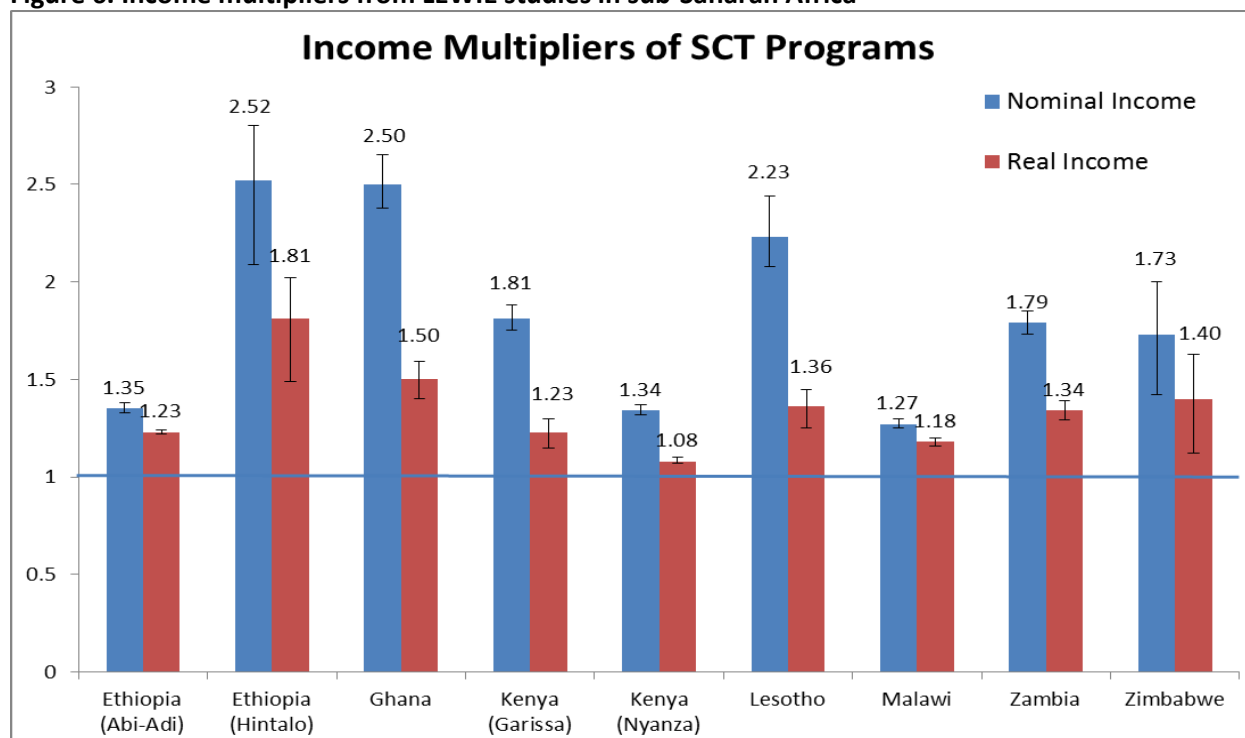
Source: Thome, K., Taylor, J.E., Filipski, M., Davis, B. & Handa, S. 2016. *The local economy impacts of social cash transfers. A comparative analysis of seven sub-Saharan countries.* FAO, Rome. *https://www.fao.org/3/i5375e/i5375e.pdf*

Figure 7 shows the percent increase in nominal and real income in the local economy. This can also be thought of as the percent increase in local gross domestic product (GDP). In the CCT only simulation, we estimate a 2.61 percent increase in nominal local GDP and a 1.93 percent increase in real income for the local economy. Figure 8 shows the distribution of that real percent increase across household groups. Poor households without labour capacity are those directly impacted by the transfer in this scenario and thus increase their income the most. They increase their income by 13.29 percent through direct and indirect spillovers. The other two groups receive spillover benefits, receiving the cash from the CCT through consumption and production linkages. Poor households with labour capacity increase their real income by 1.34 percent and ineligible households by 0.55 percent.

Figure 7. CCT increases nominal and real income in the local economy

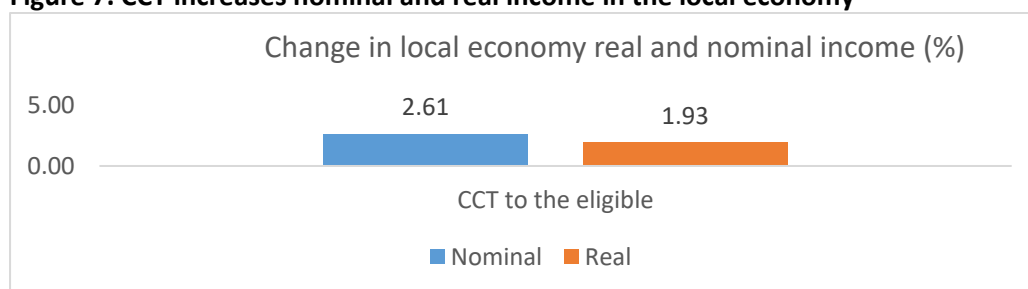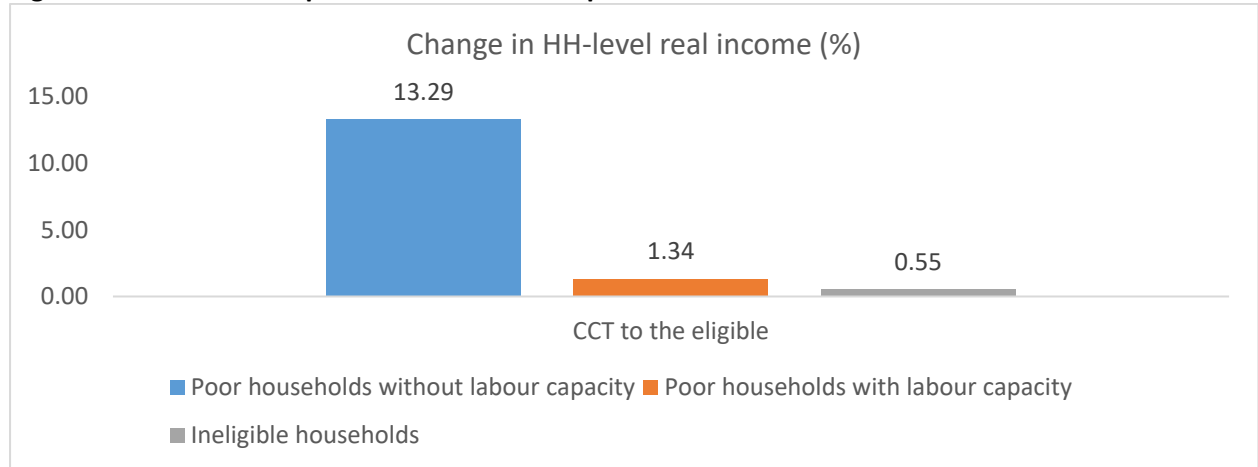*Source*: Author's own elaboration adapted from the LEWIE simulations carried out with GAMS.
Note: CCT: conditional cash transfers.

Figure 8. Distribution of percent real income impacts of the CCT across households

Change in HH-level real income (%)

- Poor households without labour capacity
- Poor households with labour capacity
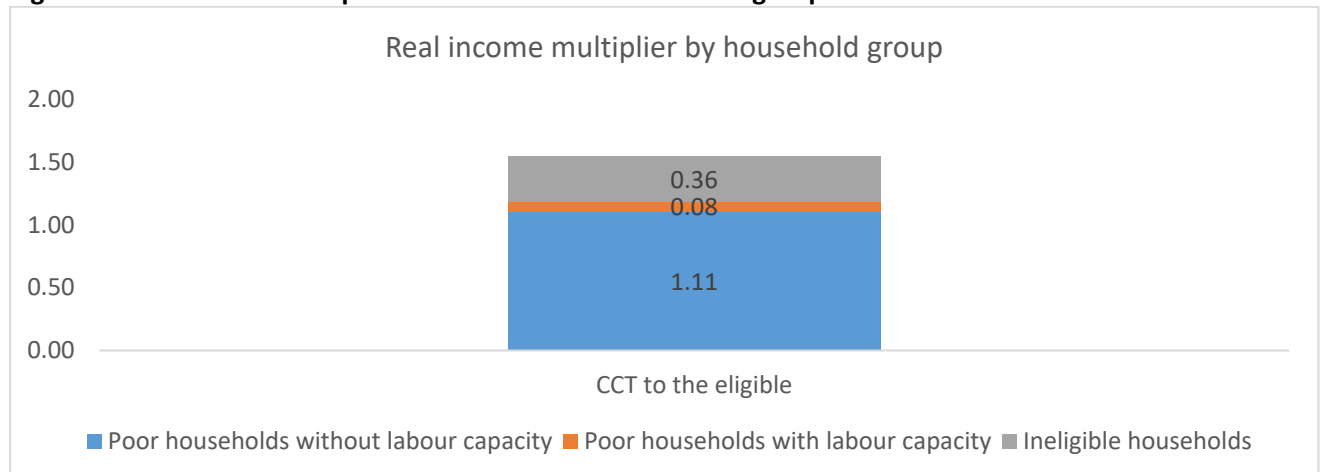- Ineligible households

Source: Authors' own elaboration adapted from the *LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers.

Percentage increase in real income for ineligible households is not high, they do receive most of the Figure 9 shows the distribution of the impact of TZS 1 in CCT across household group. Similar to the impact on real percentage income, households without labour capacity receive the most benefit TZS 1.11 per TZS 1 in transfer. Besides the direct impact, they receive 0.11 in spillover benefits. Poor households with labour capacity receive 0.08 in spillover benefits per TZS 1 in transfer and ineligible[6] households receive 0.36 in benefits. Altogether this adds up to TZS 1.55 per TZS 1 in transfer, the same as the total income multiplier for the local economy. Although the p spillover benefits from the CCT. Ineligible households are wealthier than the other groups and have more farm and non-farm businesses in the local economy. They therefore receive the most indirect benefits from the cash, as direct beneficiaries spend their benefits on local goods and services.

Figure 9. Real income multiplier of the CCT across household groups

Real income multiplier by household group

- Poor households without labour capacity
- Poor households with labour capacity
- Ineligible households

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers.

Figure 10 shows the increase in production of the activities in the local economy. All activities increase through the impact of the CCT and the cash circulating through the local economy. Production

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[6] In this simulation ineligibles include poor households with labour capacity, but because in later simulations they will also be included as direct beneficiaries, we do not include them in the group called "ineligibles". This group is comprised only of those that are non-poor in the local economy.

expands by 2.49 percent in crops, 1.23 percent in livestock, 1 percent in processing/manufacturing, 0.64 percent in services, and a 2.17 percent increase in local retail. As we mentioned earlier in the paper, some of the benefits of the CCT leaks out of the local economy, but much of the benefits accrue to local farm and non-farm businesses.

CCT transfers create spillovers by stimulating the demand for goods and services in the local economy. Local production expands to satisfy this demand. The production multiplier increases by TZS 1.59 per TZS 1 spent. The value of total production in the local economy, valued at pre-transfer prices, increases by TZS 1.59 per TZS 1 transferred to poor households without labour capacity. Figure 11 shows the distribution of the multiplier across activities with the largest parts coming from local crop production (0.52) and retail (0.46), which expand to meet the increase in local demand.

Figure 10. CCT impacts on production across activities

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
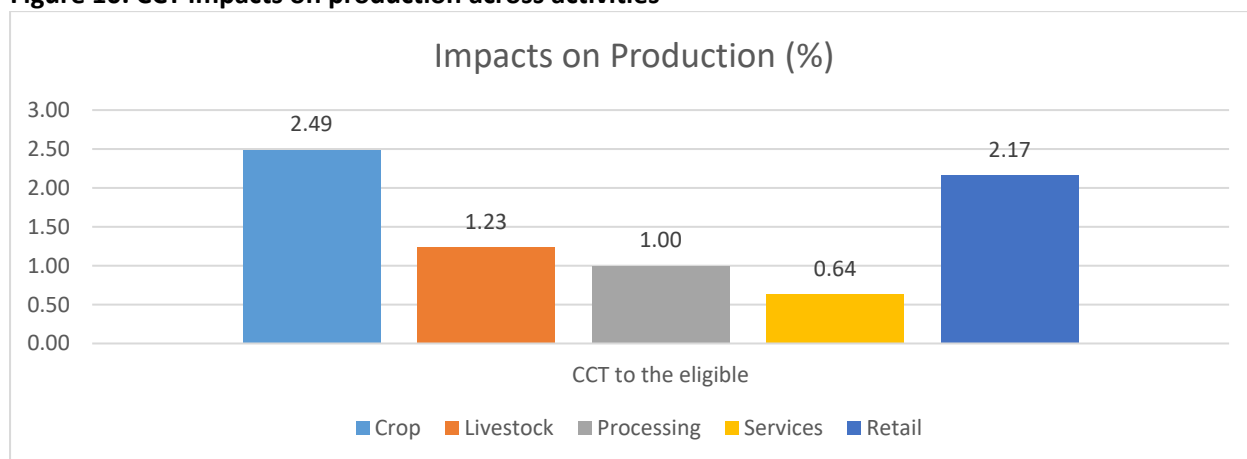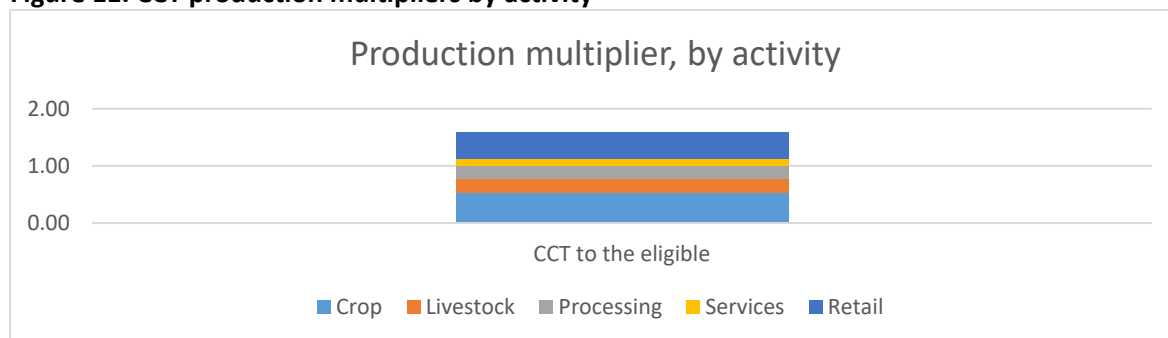*Note:* CCT: conditional cash transfers.

Figure 11. CCT production multipliers by activity

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers.

Figure 12 shows the production increases across household groups by percent of total value in a given activity. Poor households without labour capacity increase their local crop production by the highest of all households. The CCT acts not only as an increasing social protection for these poor households, but also in increasing their production of local crops. This is consistent with the results of many studies on SCTs (see Thome *et al.*, 2016). The ineligible households have the highest increase in the other activities compared to the other household groups. On average, those households are in a more favourable position than CCT-eligible households to increase their supply of goods and services.

Figure 12. Production percent increases of CCT for each household as a percent of total production

Total production increases across household groups (% of total)
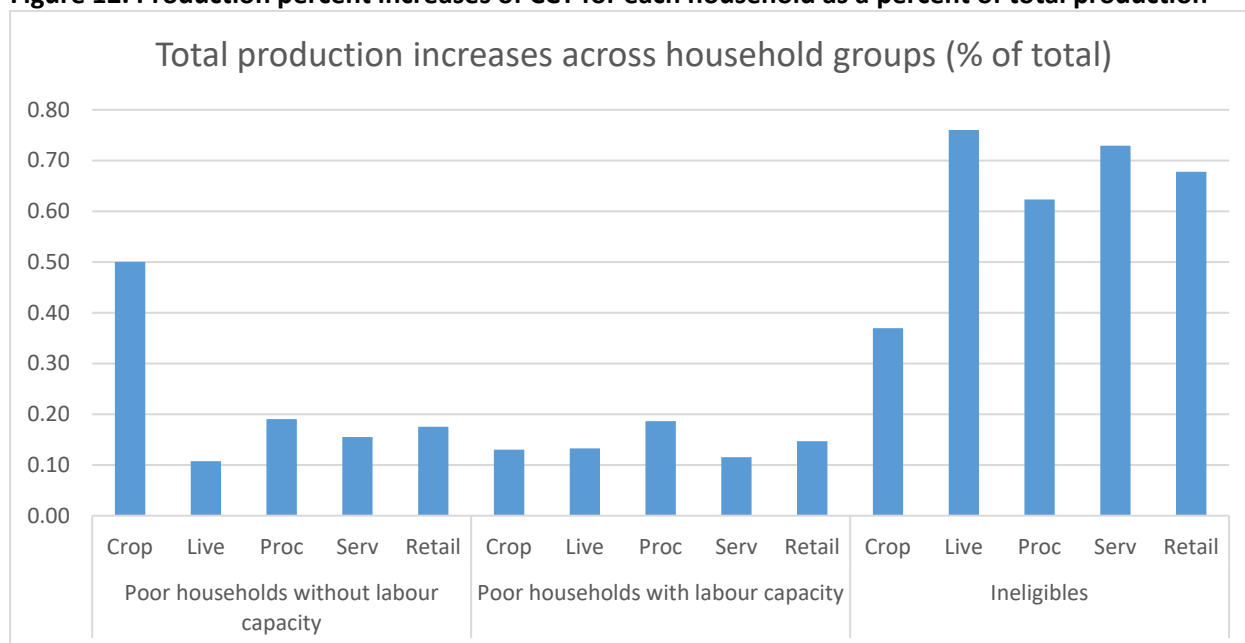
Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers.

Figure 13 shows that consumption increases across all households as well. With an increase in income, households consume more of the different food and non-food goods and services. They increase their calories, providing them with additional food security, another benefit of the CCT. This is especially true for the direct beneficiaries of the CCT; poor households without labour capacity increase their consumption of goods and services by around 13 percent on average.

Figure 13. Consumption impacts of CCT across households
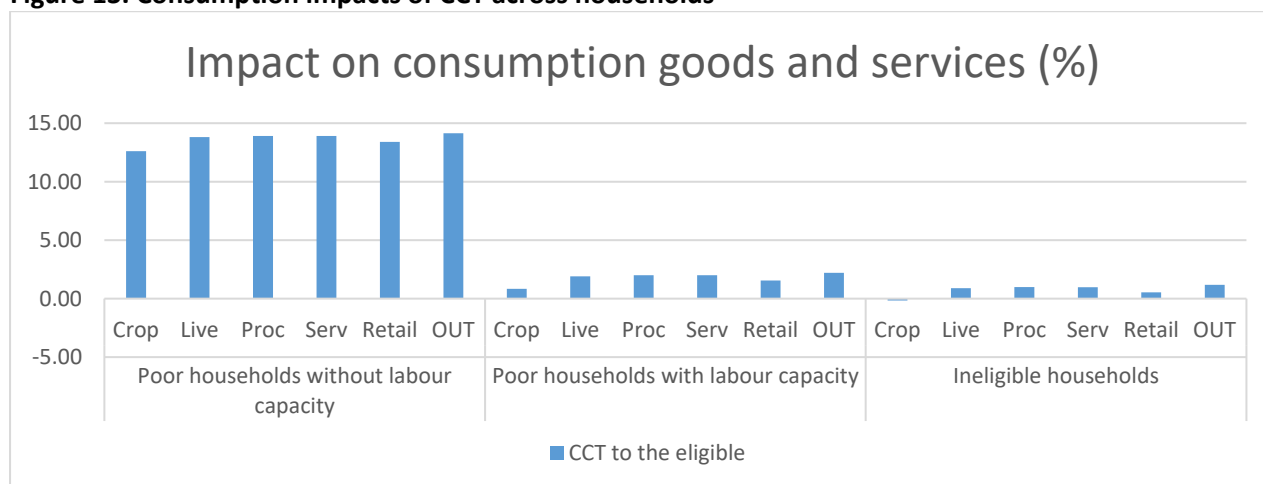

Impact on consumption goods and services (%)

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
*Note:* CCT: conditional cash transfers.

4.2.2 PW only

Figures 14–21 show the results of the PW transfers in the absence of other programme components. These transfers go to the households with labour capacity that engage in the public works. We

estimate that the total value of the wages distributed are TZS 157 billion. The results of this simulation are similar to the previous one except that the impacts are mainly on the eligible for this simulation: poor households with labour capacity, with some spillovers to the other two groups.

Figure 14 shows the nominal and real income multipliers. For every TZS 1 of transfer, TZS 2.18 in nominal income is created and TZS 1.58 in real income. These are similar multipliers to the CCT cash transfer to households without labour capacity (2.09 nominal and 1.55 real). As shown in Figure 15, the distribution of the multiplier impacts is concentrated mainly on the targeted households (1.08), but also impact the ineligible households (0.38) and the poor without labour capacity (0.12). Cash given as wages to PW households gets spent on local retail and other businesses and is invested in household activities. It impacts all households in the local economy.

Figure 14. Public Works nominal and real income multiplier
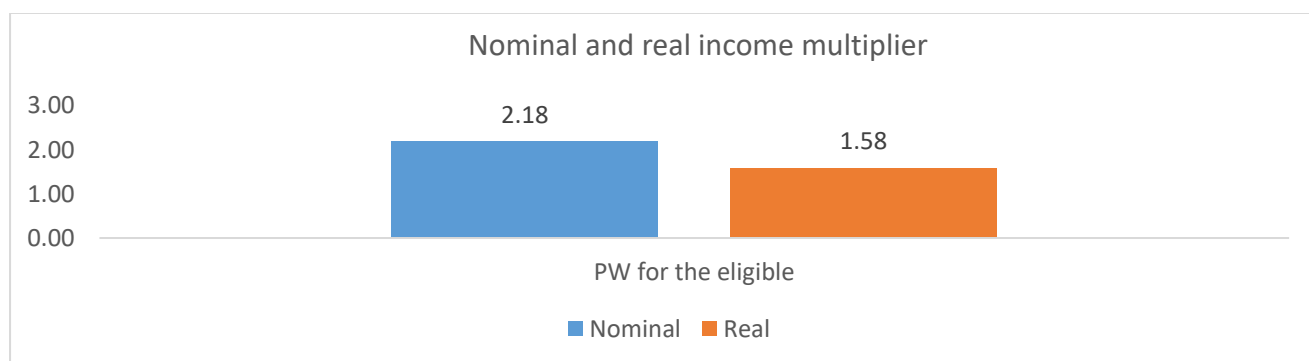
Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: PW: Public Works.

Figure 15. Real income multiplier of Public Works across household groups
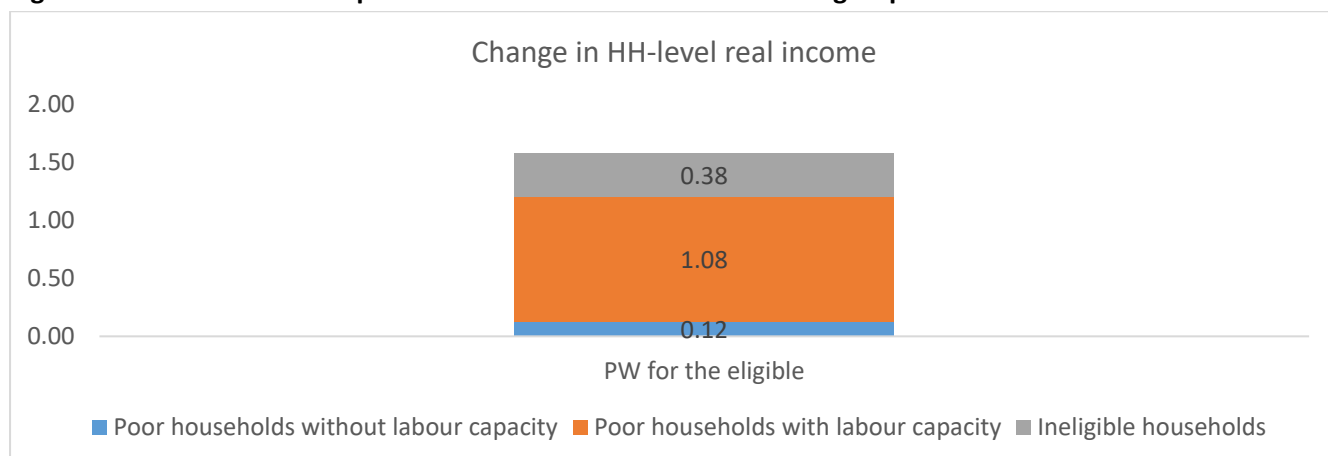
Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: PW: Public Works.

Figure 16 shows a 1.46 percent increase in nominal local GDP and a 1.06 percent increase in real income for the local economy. This is lower than in the previous scenario because the total amount dispersed is smaller than the total amount of cash given out to poor households without labour capacity. Figure 17 shows the distribution of that real percent increase across household groups. Poor households with labour capacity are now those directly impacted by the transfer in this scenario, and thus increase their income the most. They increase their income by 9.6 percent. The other two groups receive spillover benefits: poor households without labour capacity increase their real income by 0.79

percent and ineligible households by 0.31 percent. These percentages are smaller than in the other scenario again due to the smaller total amount of cash dispersed under the PW only simulation. As in the previous simulation all households benefit from the increase in cash injected into the local economy.

Figure 16. Percent real income increases of PW in the local economy (nominal and real)

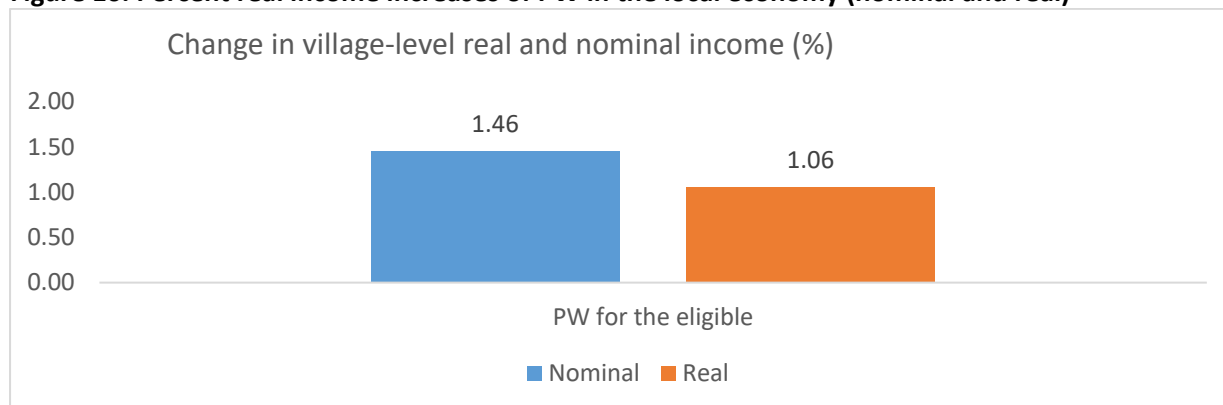*Change in village-level real and nominal income (%)*

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS*.
Note: PW: Public Works.

Figure 17. Distribution of percent real income PW impacts across households
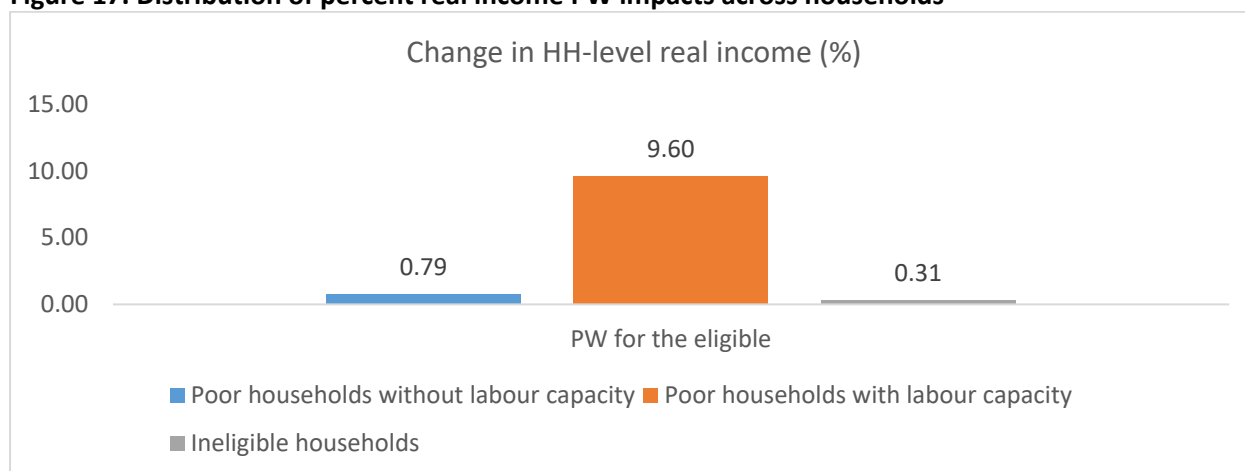
Change in HH-level real income (%)

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS*.
Note: PW: Public Works.

Figure 18 shows the increase in production of the activities in the local economy. Similar to the previous scenario, all activities increase through the impact of the PW and the cash circulating through the local economy. Production expands by 1.53 percent in crops, 0.53 percent in livestock, 0.57 percent in processing/manufacturing, 0.37 percent in services, and a 1.18 percent in local retail.

Figure 18. PW impacts on production across activities

Impacts on Production (%)

Crop: 1.53
Livestock: 0.53
Processing: 0.57
Services: 0.37
Retail: 1.18

PW for the eligible

■ Crop ■ Livestock ■ Processing ■ Services ■ Retail

Source : Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note : PW: Public Works.

The production multiplier for the cash given as wages to households with labour capacity increases by TZS 1.64 per TZS 1 spent. Figure 19 shows the distribution of the multiplier across activities with the largest parts coming from local crop production (0.6) and retail (0.46). Local farmers and retailers expand their production of goods and services in response to the additional cash entering the local economy.

Figure 19. PW production multipliers by activity

Production multiplier, by activity

PW for the eligible

■ Crop ■ Livestock ■ Processing ■ Services ■ Retail

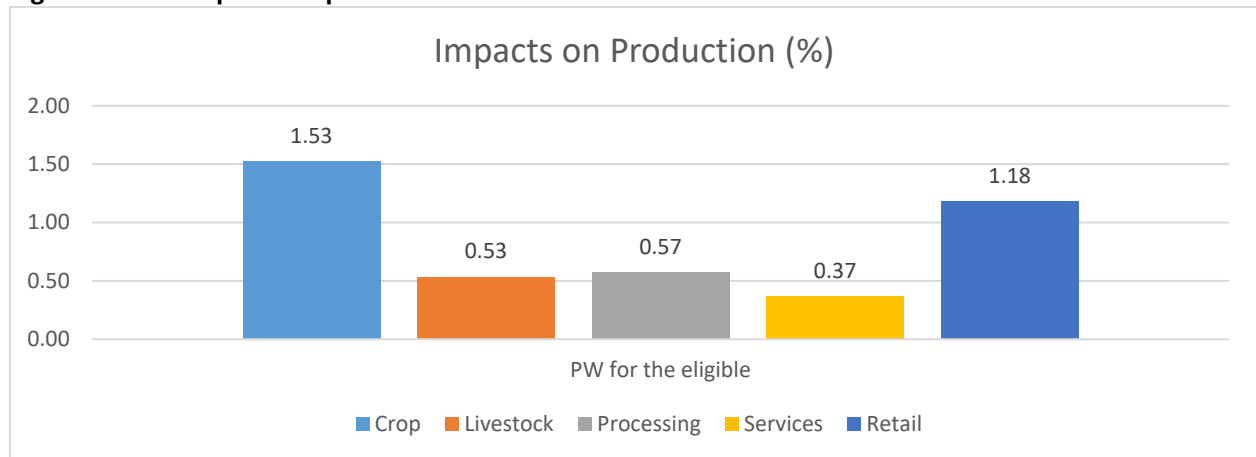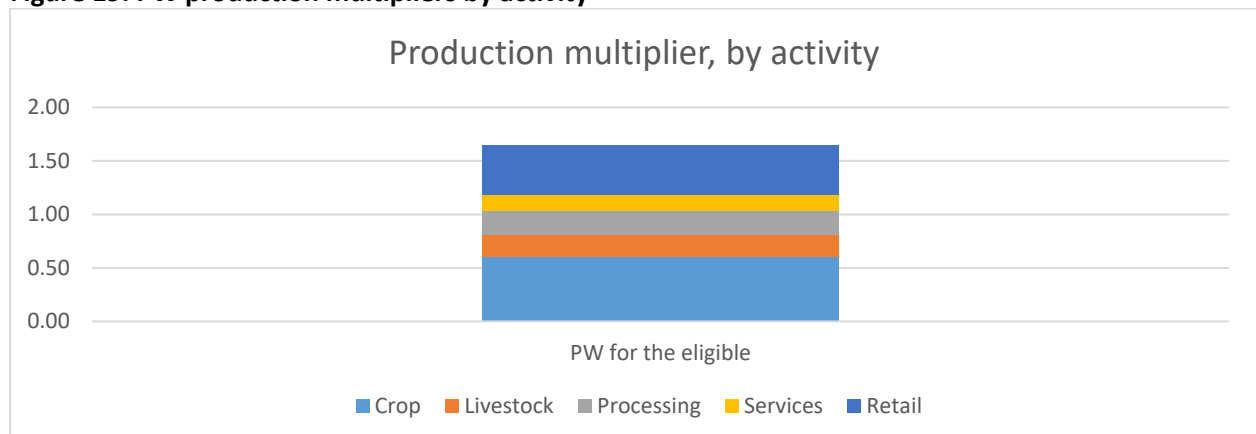*Source* : Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note : PW: Public Works.

In order to evaluate which household group's production is benefiting most from the cash grants, we look at what percent of the increase in total production value each household group received (Figure 20). Even though the target group has changed for this scenario, poor households with labour capacity increase their local crop production by the highest of all households. They capture most of the indirect benefits to this sector (although ineligibles are not far behind – 38 percent of the total increase in production to 49 percent). The ineligible, wealthier, households have the highest increase in the production of other activities compared to the other household groups.

Figure 20. Production percent increases of Public Works
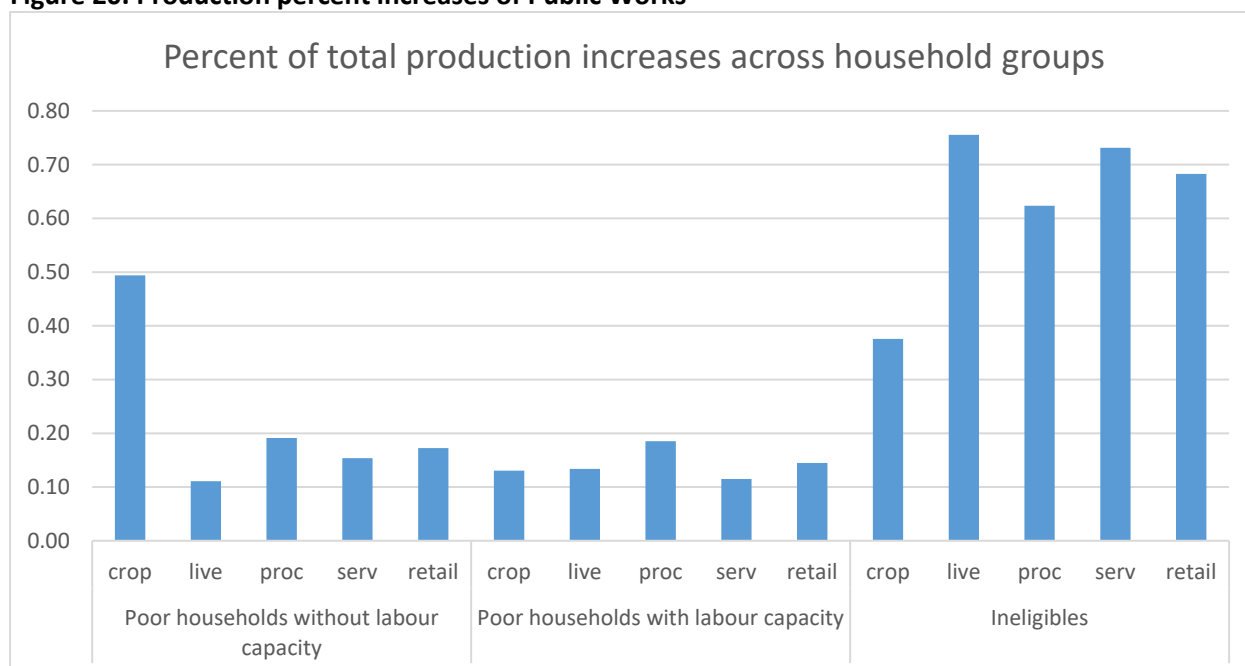

Percent of total production increases across household groups

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: PW: Public Works.

Consumption patterns are similar to the previous simulation; targeted households increase their consumption of all goods and services by a significant amount (Figure 21). Poor households with labour capacity increase their consumption by roughly 10 percent. Households benefit from an increase in calories, and potentially in nutrition for their children. They also procure more items and services in the local economy. All other households also benefit from the PW intervention, as was the case for the CCT.

Figure 21. PW consumption impacts across households

Impact on consumption goods and services (%)

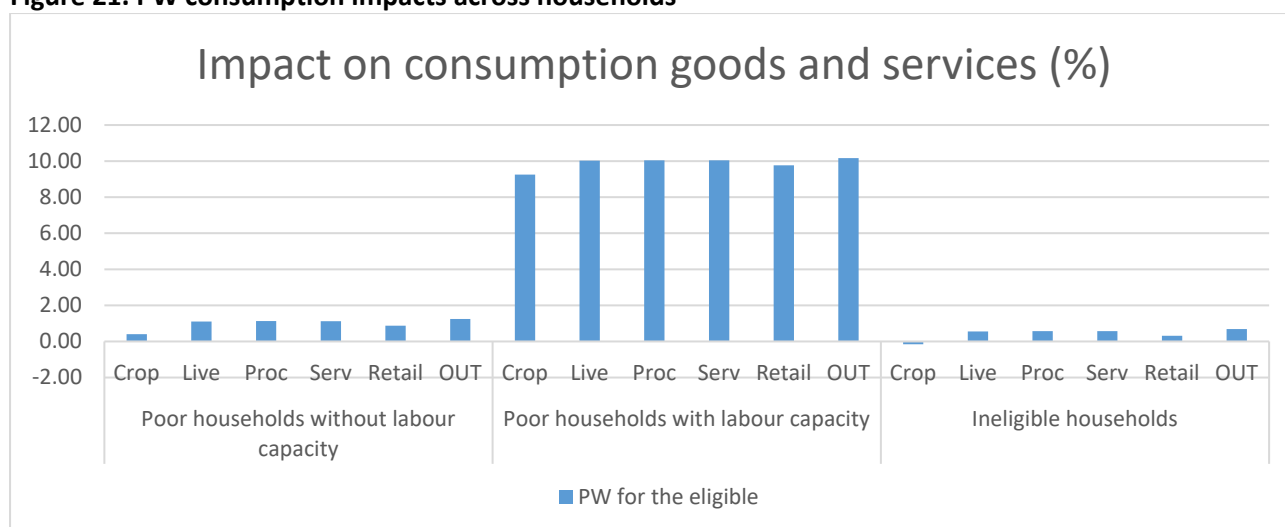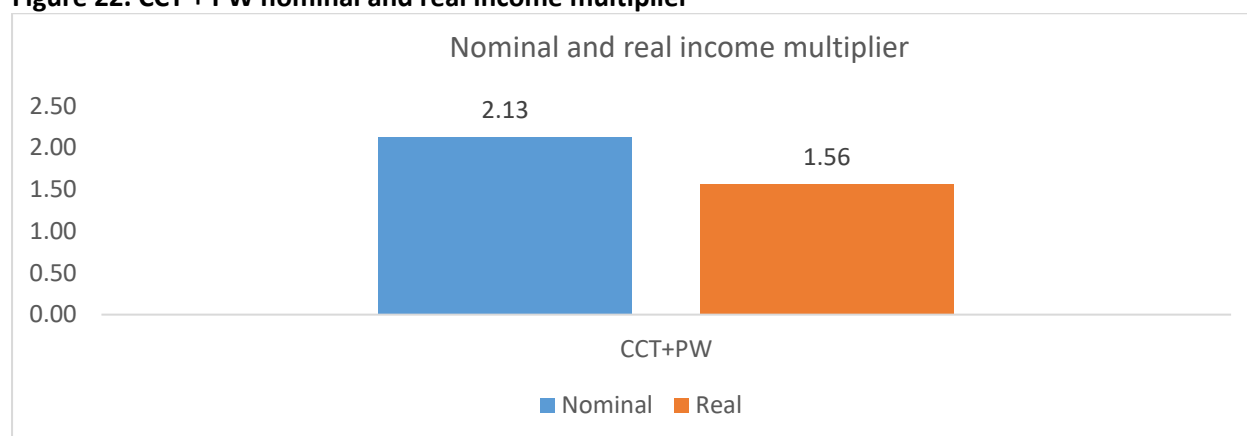*Source:* Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: PW: Public Works.

4.2.3 CCT + PW

In this scenario, we combine both the CCT and PW intervention to see the direct and indirect benefits of the PSSN. This most closely reflects the largest components of the PSSN programme. Figures 22–29 show the results of the CCT+PW. These transfers go to households with (PW) and without labour capacity (CCT). For every TZS 1 of transfer, TZS 2.13 in nominal income is created and TZS 1.56 in real, inflation-adjusted, income (Figure 22). While the estimated impact per TZS 1 is similar to the previous scenarios, the impacts are more substantial. The reason is that while the absolute amount of cash entering the local economy increases with respect to the previous two scenarios, the structure of the economy – where households spend their money and with what share of their budgets, and how they use their factor inputs for their activities, do not. How the cash impacts the local economy per TZS spent therefore does not change from the previous simulations. The distribution of the impacts, however change as now both the poor without labour capacity and the poor with labour capacity receive cash (Figure 23). Ineligible households receive almost the same proportion of the multiplier as in the previous scenarios (0.37) while the beneficiary households now divide up the impact of the total transfer in roughly the proportion of the amount given to each group. The distribution of the multiplier impacts is concentrated mainly on the targeted households (1.08), but it also impacts the ineligible households (0.38) and the poor without labour capacity (0.12).
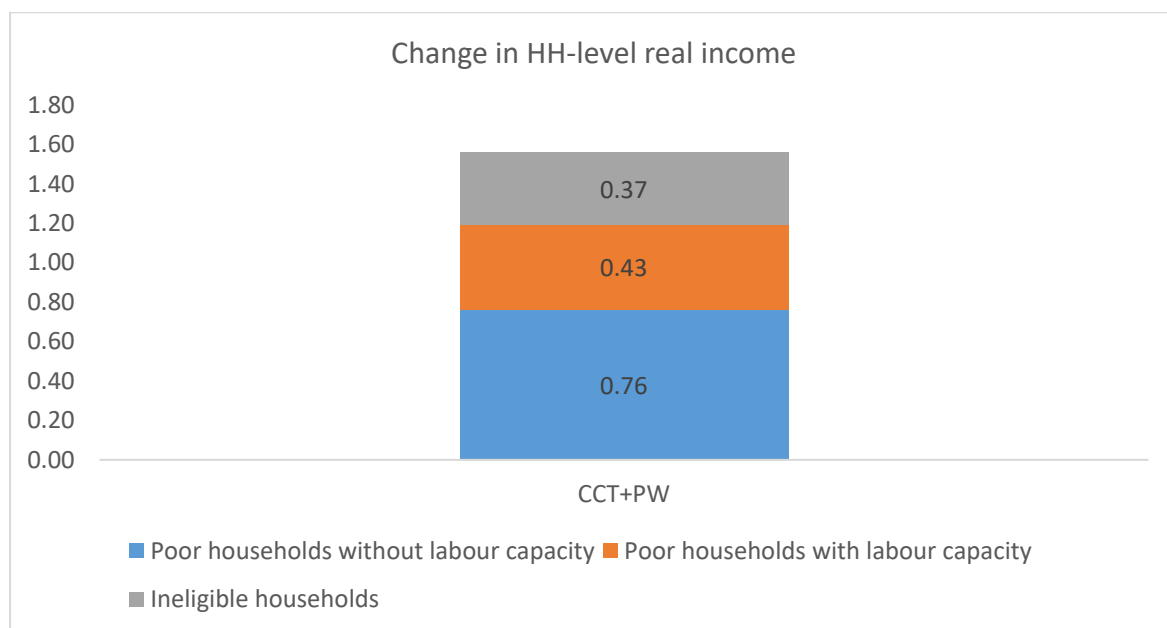
Figure 22. CCT + PW nominal and real income multiplier

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers; PW: Public Works.

**Figure 23. CCT + PW real income multiplier across household groups**

Change in HH-level real income

Value	
0.37	Ineligible households
0.43	Poor households with labour capacity
0.76	Poor households without labour capacity

■ Poor households without labour capacity ■ Poor households with labour capacity
■ Ineligible households

Source: Authors' own elaboration adapted from the *LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers; PW: Public Works.

Figure 24 shows a 4.07 percent increase in nominal local GDP and a 2.99 percent increase in real income for the local economy. This is the largest percent increase of the three scenarios representing the direct and indirect impact of the TZS 450 billion disbursed under the CCT and PW. Figure 25 shows the distribution of the real percent increase across household groups. Poor households without labour capacity benefit the most relative to their base income (14 percent) while poor households with labour capacity increase their annual income by 11 percent and the ineligibles by 1 percent. The ineligible households are now the only group not receiving the direct benefits of the PSSN, but they still capture a substantial portion of the spillovers. Their income gains are muted by the inflationary impact on local goods and services due to the additional demand now present in the local economy.[7]

Figure 24. Percent real income increases in the local economy (nominal and real) by combining CCT and PW
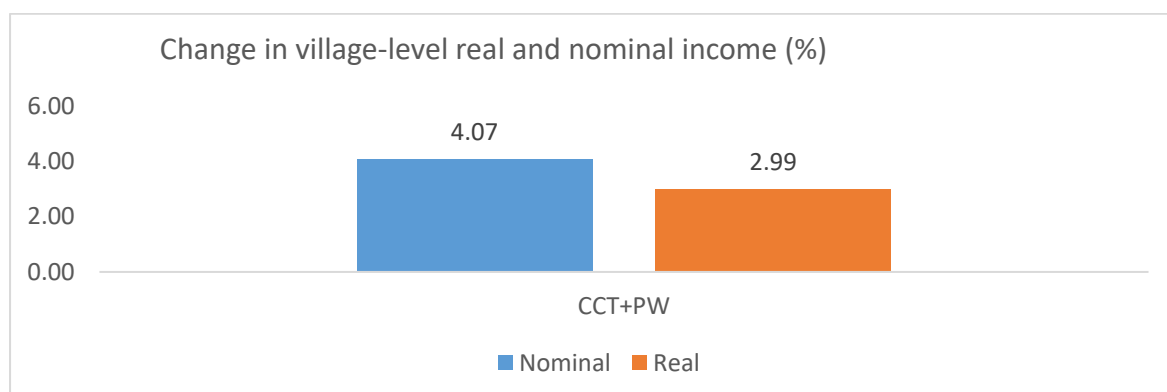
Change in village-level real and nominal income (%)

Nominal	Real
4.07	2.99

■ Nominal ■ Real

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers; PW: Public Works.

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[7] Not all of the additional cash from the CCT+PW can be absorbed in a productive expansion in local goods and services, and so leads to higher prices.

Figure 25. Distribution of percent real income impacts of the CCT+PW across households

Change in HH-level real income (%)

- Poor households without labour capacity: 14.05
- Poor households with labour capacity: 10.89
- Ineligible households: 0.86

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers; PW: Public Works.

Figure 26 shows the increase in production of the activities in the local economy. All activities increase through the impact of the CCT+PW, especially in local crop production and retail. This scenario represents the largest impacts thus far – production expands by 4.03 percent in crops, 3.35 percent in retail, 1.77 percent in livestock, 1.58 percent in local processing and manufacturing, and 1 percent in services.

Figure 26. Impacts of CCT+PW on production across activities

Impacts on Production (%)

- Crop: 4.03
- Livestock: 1.77
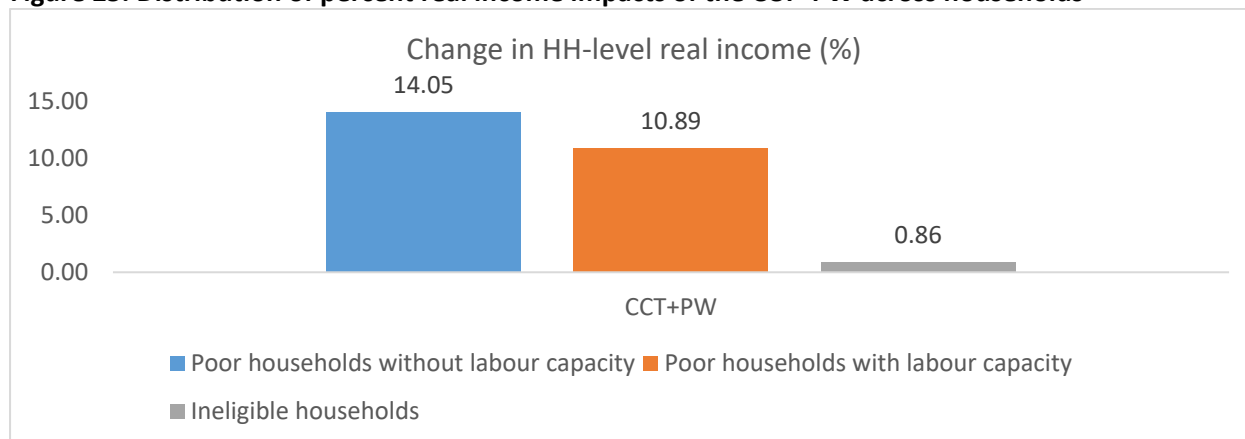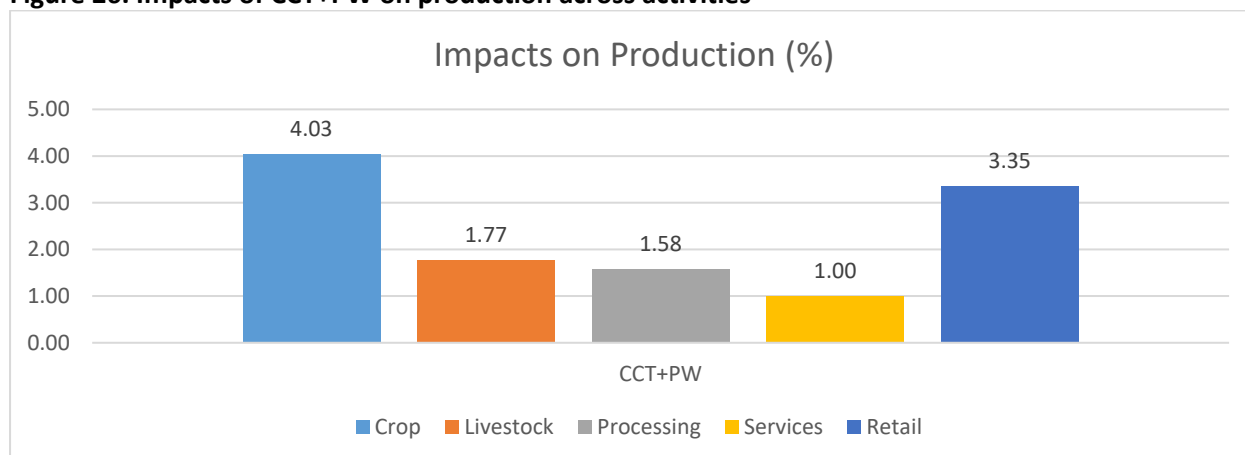- Processing: 1.58
- Services: 1.00
- Retail: 3.35

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers; PW: Public Works.

The production multiplier is 1.61 per TZS 1 in CCT+PW, which is slightly less than the PW only group (1.59) and slightly greater than the CCT only group (1.64). Again, the largest components of the expansion in production come from local crops (0.46) and local retail (0.55) (Figure 27). Other activities also expand; livestock increases by 0.24 per TZS 1 distributed, processing by 0.22 and services by 0.14 per TZS 1 in CCT+PW.

Figure 27. Production multipliers of CCT+PW by activity

Production multiplier, by activity

The percent of the increase in total production value each household group received is similar to the other two scenarios (Figure 28). Even though ineligibles end up with a low percentage increases in their real income, they still benefit most in terms of their capture of spillovers and expansion of production in most of their activities.

Figure 28. Production percent increases of CCT+PW

Percent of total production increases across household groups

Figure 29 shows an expansion in consumption of all goods and services. Poor households without and with labour capacity increase their consumption by an average of 14 percent and 11 percent respectively, while ineligibles increase their consumption by 1.5 percent.

Figure 29. Consumption impacts of CCT+PW across households

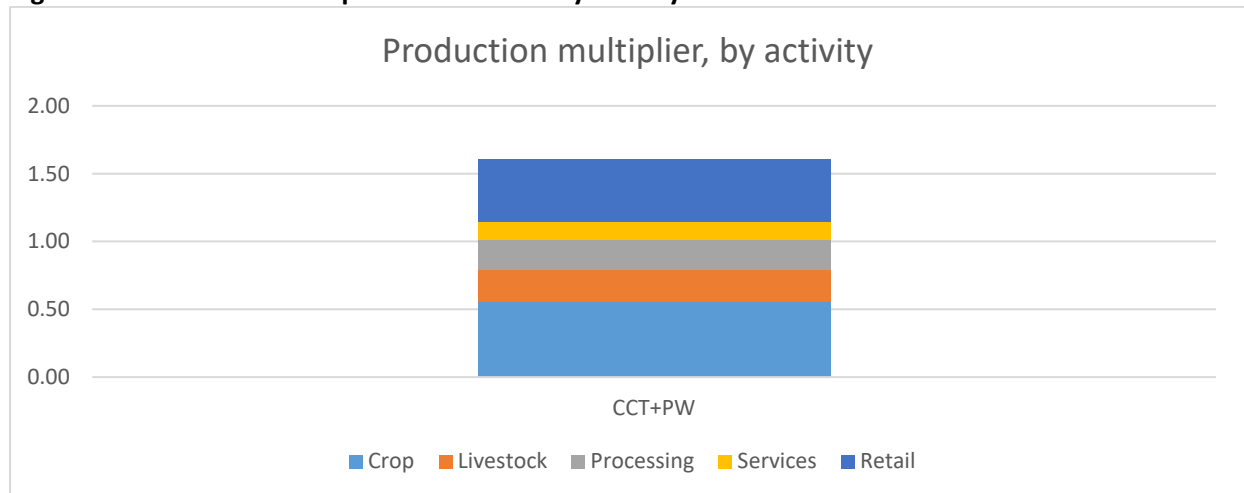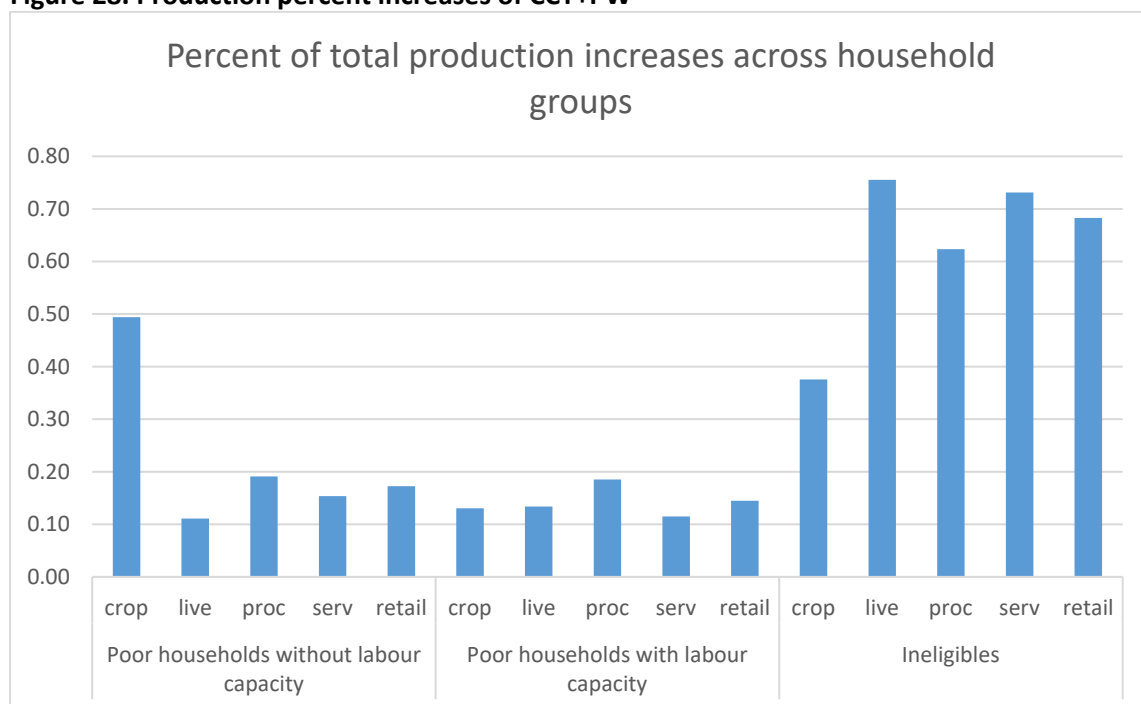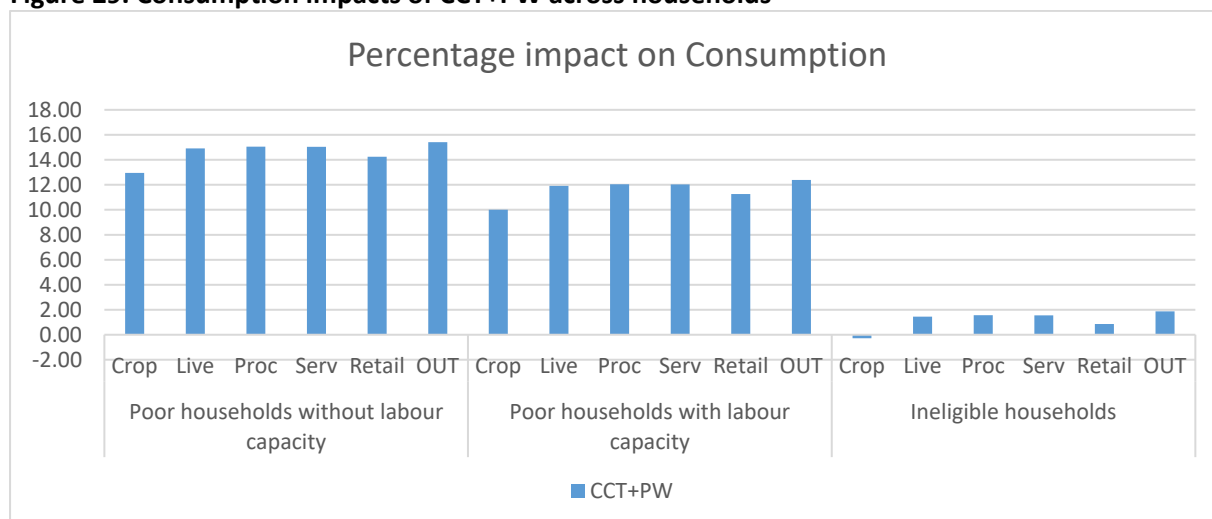

Percentage impact on Consumption

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers; PW: Public Works.

4.2.4 CCT + PW + 5% TFP increase.

In our final scenario, we include a 5 percent increase in the Total Factor Productivity (TFP) of households' agriculture. This reflects an optimistic scenario where public works assets benefit the local community by increasing the agricultural productivity of the local economy. Figures 30–37 show the results of the CCT+PW+TFP5. The CCT goes to poor households without labour, the PW goes to poor households with labour capacity, and the TFP increase impacts all households in crop and livestock production.

For every TZS 1 of transfer, TZS 2.34 in nominal income is created and TZS 2.96 in real, inflation-adjusted, income (Figure 30). The increase in agricultural productivity caused by the productive public works assets causes both real and nominal multipliers to increase. Increased supply of local farm goods drives down prices so that the real, inflation-adjusted, multiplier is greater than the nominal multiplier. This optimistic scenario demonstrates that increasing the TFP of agriculture can greatly increase the real income multiplier for the local economy.

All households increase their benefits from each TZS 1 of transfer over the CCT+PW+TFP5 scenario. Ineligible households receive 1.43 of the total multiplier, more than in any previous scenario. Beneficiary households receive the other 1.53. All groups therefore receive both direct and indirect spillover effects of the cash plus TFP increase (Figure 31).
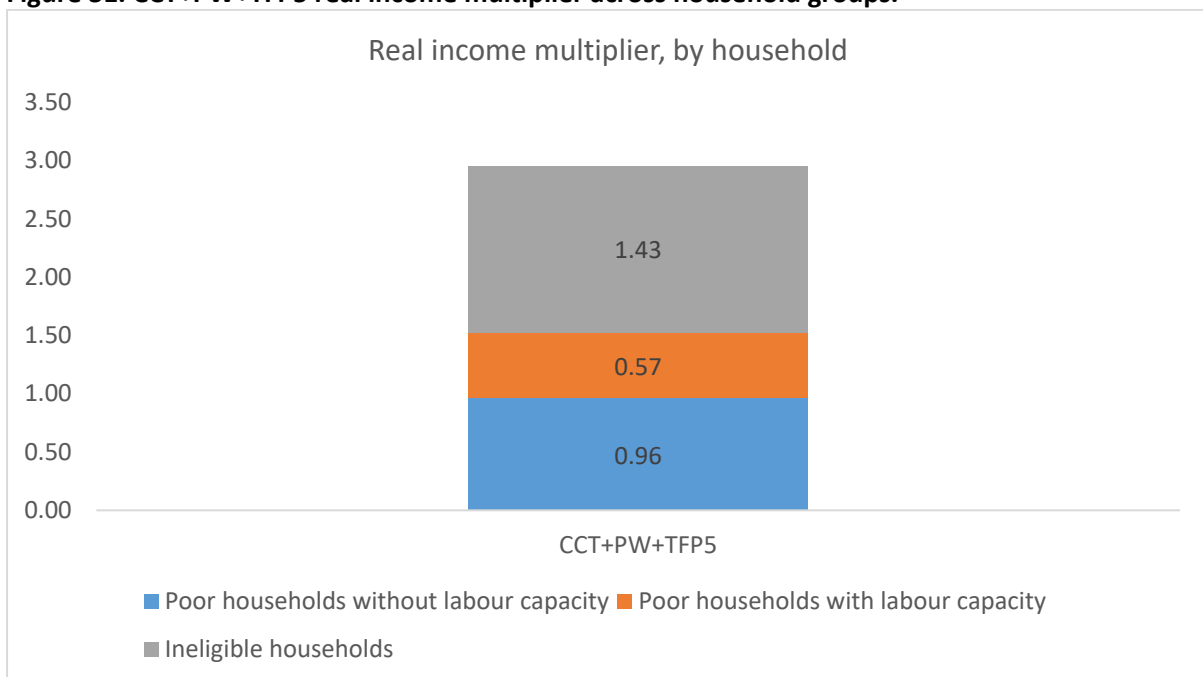
Figure 30. CCT+PW+TFP5 nominal and real income multiplier
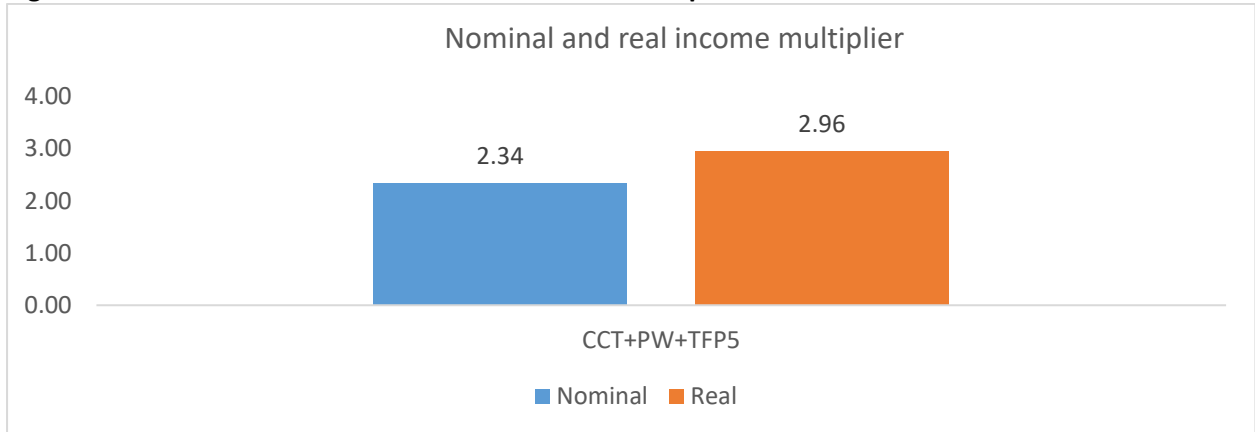
Nominal and real income multiplier

2.34 (Nominal) 2.96 (Real)

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers; PW: Public Works; TFP5: 5 percent increase in Total Factor Productivity.

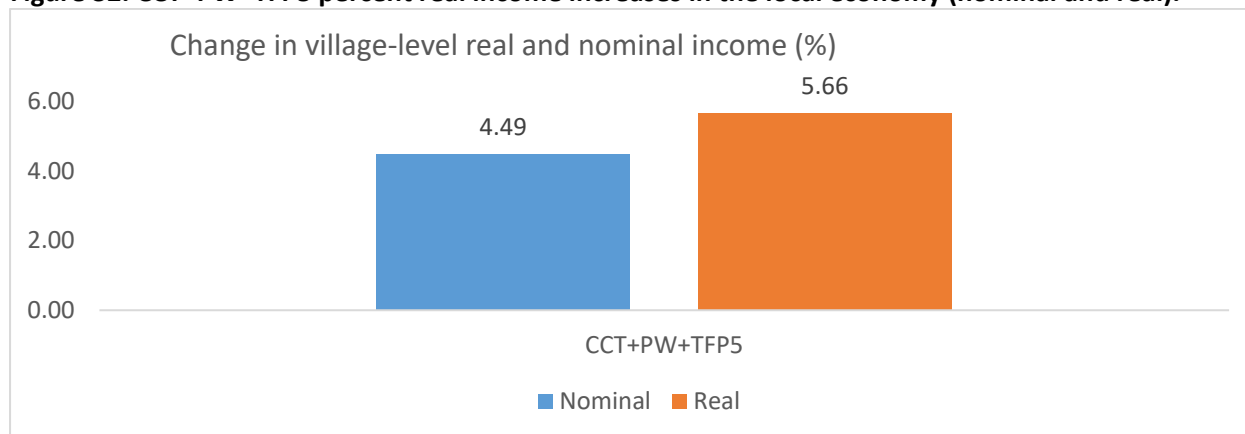**Figure 31. CCT+PW+TFP5 real income multiplier across household groups.**

Real income multiplier, by household

Ineligible households: 1.43
Poor households with labour capacity: 0.57
Poor households without labour capacity: 0.96

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers; PW: Public Works; TFP5: 5 percent increase in Total Factor Productivity.

Figure 32 shows a 4.49 percent increase in nominal local GDP and a 5.66 percent increase in real income for the local economy. This is the highest of any of the scenarios and shows that having effective public works assets increases the impact of the cash. While cash can create inflationary impacts, productive interventions such as the creation of agricultural assets reduce inflation and lead to an increase in real income for the local economy.

Impacts at the household level are now substantial (Figure 33). Households without labour capacity increase their real income by over 17 percent, while households with labour capacity and receive public works wages plus the agricultural technology benefit increase their income by over 14 percent. Even the ineligible households, which under the previous scenarios did not receive a high percentage increase in real income, received over a 3 percent increase under this scenario.
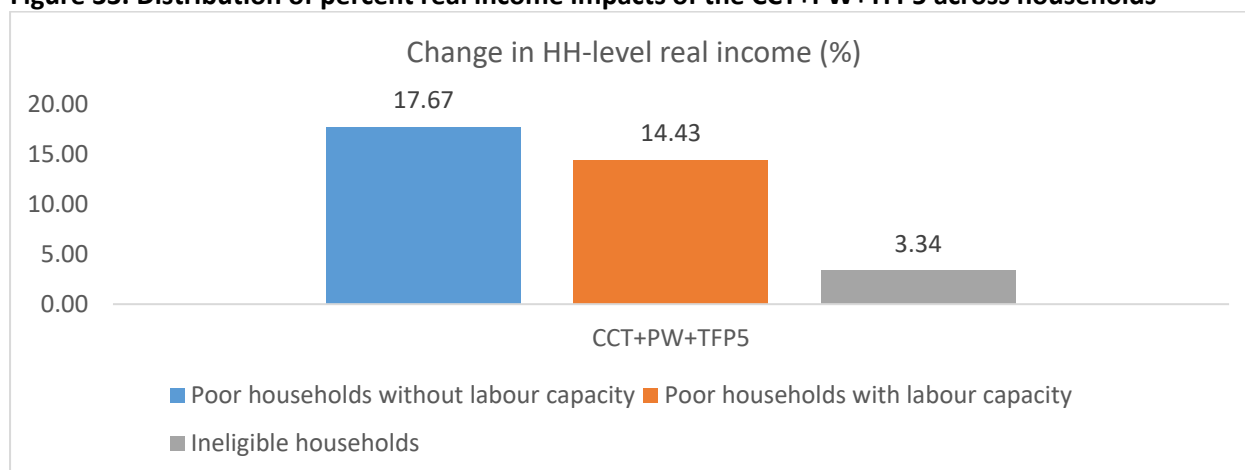
Figure 32. CCT+PW+TFP5 percent real income increases in the local economy (nominal and real).

Change in village-level real and nominal income (%)

Nominal: 4.49
Real: 5.66

CCT+PW+TFP5

■ Nominal ■ Real

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers; PW: Public Works; TFP5: 5 percent increase in Total Factor Productivity.

Figure 33. Distribution of percent real income impacts of the CCT+PW+TFP5 across households

Change in HH-level real income (%)

17.67
14.43
3.34

CCT+PW+TFP5

■ Poor households without labour capacity ■ Poor households with labour capacity
■ Ineligible households

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers; PW: Public Works; TFP5: 5 percent increase in Total Factor Productivity.

Figure 34 shows the increase in production of the activities in the local economy. Production expands by more than any of the previous scenarios. As we would expect, the increase in agricultural productivity (plus the cash transfers) increases crop production by 10.61 percent and livestock production by 4.74 percent. This is over 6 percent higher crop production and 3 percent higher livestock production than under the CCT+PW transfer scenario. The cash and extra agricultural production bring about an increase by 4.71 percent in retail, 1.91 percent in production/manufacturing, and 1.22 percent in services.

Figure 34. Impacts on production of the CCT+PW+TFP5 across activities
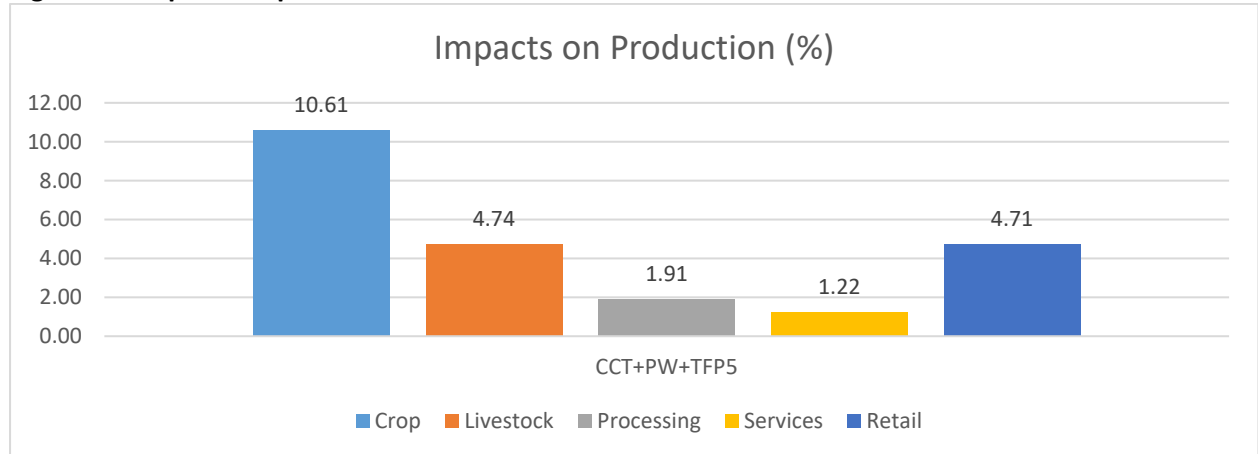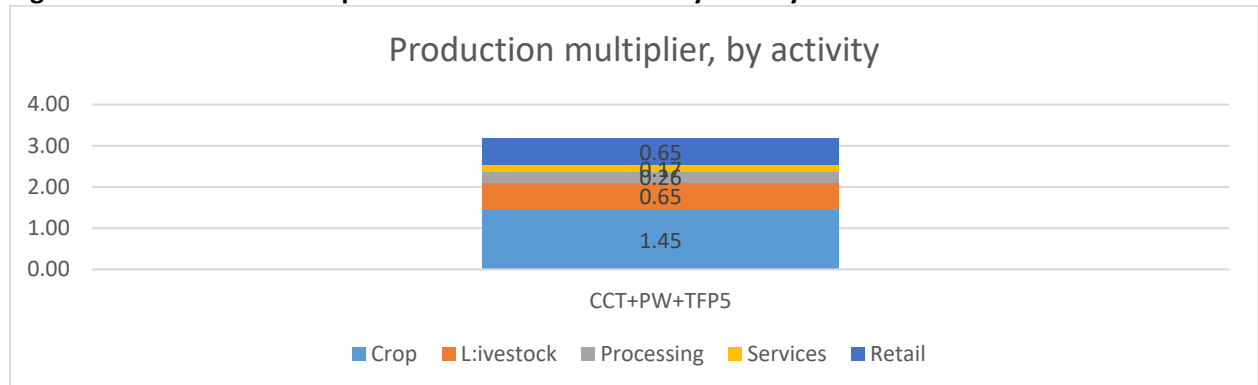

Impacts on Production (%)

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers; PW: Public Works; TFP5: 5 percent increase in Total Factor Productivity.

The production multiplier for the CCT+PW+TFP5 increases by TZS 3.18 per TZS 1 spent. Figure 35 shows the distribution of the multiplier across activities with the largest parts coming from local crop production (1.45), local livestock production (0.65), and local retail (0.65). Farm households benefit from the productive agricultural assets created by the public works part of the PSSN and households' increase in demand for their products because of their additional cash. The other activities also benefit the most under this scenario.

Figure 35. Production multipliers of the CCT+PW+TFP5 by activity

Production multiplier, by activity

Source: Authors' own elaboration adapted from *the LEWIE simulations carried out with GAMS.*
Note: CCT: conditional cash transfers; PW: Public Works; TFP5: 5 percent increase in Total Factor Productivity.

Figure 36 shows us which household group's production is benefiting most from the CCT+PW+TFP5. In this last scenario, ineligible households expand their production by more than the other two household groups, even in crop production. Due to their hold over more productive assets, the productivity increase mostly benefits this group.

Figure 36. Production percent increases of the CCT+PW+TFP5
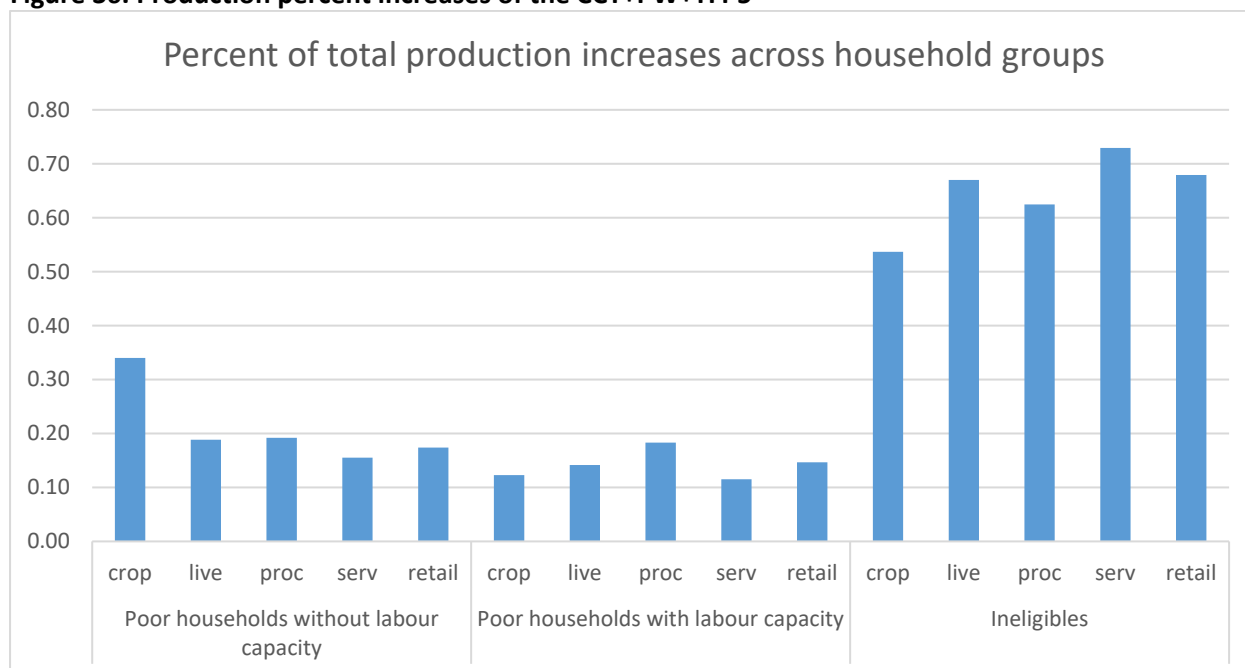
Percent of total production increases across household groups

Consumption increases for all households, higher than under the previous three scenarios (Figure 37). Consumption of food from local farmers and herders (crops and livestock) increase by 20 percent for poor households without labour capacity, while those with labour capacity increase food consumption by over 15 percent. Under the CCT+PW+TFP5 scenario, food security significantly increases for poor households. Ineligibles also expand their consumption from local farmers, buying 4 percent more crops and 7 percent more meat and livestock by-products. All households also consume more retail and production/manufacturing goods and more services than under the previous scenarios.

Figure 37: Consumption impacts of the CCT+PW+TFP5 across households
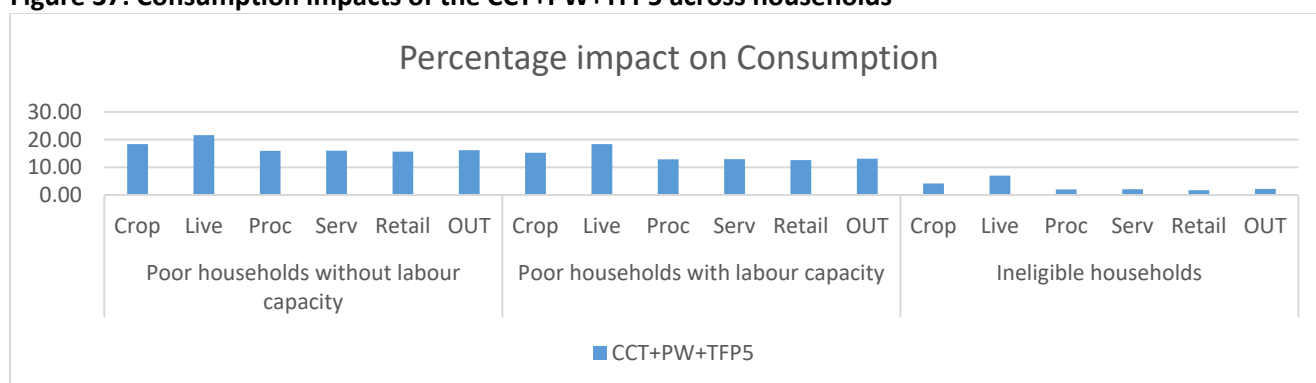
Percentage impact on Consumption

5. Conclusions and recommendations

This paper used a local economy-wide impact evaluation (LEWIE) model to simulate income and production spillovers from the United Republic of Tanzania's Productive Social Safety Net.

Four broad findings emerge from our LEWIE simulations:

1. **The CCT component of the PSSN creates both nominal and real income multipliers that significantly exceed 1.0**. Each TZS transferred to poor households raises nominal or "cash" income in local economies by TZS 2.09. Cash transfers stimulate local demand, which in turn stimulates production and puts some upward pressure on local prices. The real or inflation-adjusted multiplier is 1.55. This real income multiplier is on the higher end of CCT real income multipliers from other sub-Saharan African studies involving both simulations and experiments (Figure 6 above).

2. **The CCT and PW increase real income but also increase production activities**. The production multiplier ranges from 1.58 in the PW only scenario to 3.18 in the CCT+PW+TFP5 scenario. All households increase production of their activities, with households without labour increasing by more than the others in crop production while ineligible households receive more of the increase in value in other activities. The PSSN therefore helps both with social protection but also resilience, as poor households increase their productive capacity. Productive increases in poor households help them to build up their assets and become wealthier in the long-run. See similar findings of social protection leading to productive gains from six sub-Saharan African in the [Protection to Production findings from the FAO](#) (2015–2017).

3. **Combining CCT with PW leads** to similar multipliers as CCT only and PW only but higher percentage increases in income, production and consumption for all households. Even ineligible households, those who do not directly benefit from the cash transfers, benefit through spillover effects. The combined cash transfer of TZS 450 billion creates a percentage increase in real local GDP of 3 percent. Each poor labour-constrained household increases their income by over 14 percent and poor labour-unconstrained households by almost 11 percent. These are significant gains for poor households and help them increase their food security, nutrition intakes and overall consumption of goods and services. It also decreases their vulnerability to future shocks.

4. **If PW assets increase agricultural productivity in the local economy, multipliers and real income are much higher than in the other scenarios.** Assuming PW assets increase agricultural TFP by 5 percent, the real income multiplier increases from 1.56 to 2.96, an increase of 1.4. The percent real income growth in the local economy also increases by 2.67 percentage points (from 2.99 to 5.66). The production multiplier also increases from 1.59 to 3.18. These are significant increases over the cash transfer-only scenario showing the need to get the agricultural assets correct in order to increase productive outcomes. PW should not be thought of as just an income transfer to households with labour capacity.

We draw a few recommendations based on the findings of this study:

1. **The PSSN has protective as well as productive impacts.** The CCT cash and PW wages directly impact poor households, but these poor households are also the conduit to which cash enters and circulates through the local economy. Households with local farm and non-farm goods and services benefit indirectly through the extra cash entering the economy, expanding their production. This creates production and income multipliers that are all greater than one, meaning that the direct plus the indirect spillover benefits are greater than the transfer value. Under the CCT+PW scenario, a total of TZS 450 million enters the local economy and with a multiplier of 1.56, it generates a total of 702 million of extra real GDP. Social protection measures not only benefit the poorest, but can increase production and income for the whole economy.

2. **Income spillovers from the PSSN have important implications for the entire local economy – not just the direct beneficiaries – as ineligible household groups are in a better position to benefit**

from them. Non-poor ineligible households benefit from the CCT, PW and especially the increase in local agricultural productivity – even though the transfers go only to poor households with and without labour capacity. These ineligible groups benefit from the transfers as they have the resources to expand production in response to rising local demand, thus capturing positive income and production spillovers. This can create political buy-in for these programmes in the community, but it also means that asset-poor households do not benefit as much from income spillovers. These households do not have the capacity to respond to the increase in demand, and income gains in such households depend mostly upon whether or not they are direct beneficiaries, highlighting the need to ensure that the poorest are benefiting directly from the transfers.

3. **Interventions – such as the PW asset-creation component of the PSSN – that raise agricultural productivity are found to lower food costs, and this has positive real-income effects for poor households.** Poor households significantly increase their consumption of food and non-food goods and services. Conversely, the CCT and wages from the PW, which increases food demand create new markets for food production. If the policy goal is to raise rural incomes and also to increase agricultural production, this study finds that combining social protection and productive agricultural interventions such as improving the Public Works agricultural assets, or investing in other agricultural productivity-enhancing measures, is a more effective strategy than cash alone.

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Annex – What a LEWIE model looks like

There is a rich tradition in economics of using micro survey data to construct models of agricultural households that are both producers and consumers of food (Singh *et al.*, 1986). LEWIE begins by estimating household-farm models for programme-eligible and -ineligible household groups, then it "nests" these models within a general-equilibrium model of a region of interest. The household models describe each group's productive activities, income sources, and consumption expenditure patterns. In a typical model, households participate in activities such as crop and livestock production, retail, and other business activities, as well as in the labour market. Productive activities combine various factors (e.g. hired labour, family labour, land, capital) and intermediate inputs (fertilizer, seed, and a variety of purchased inputs) to produce an output (corn, prepared meals, a service), which may be consumed by the household or sold to others. Production functions for each activity are the recipes that turn inputs into outputs. We estimate production functions for each activity and household group econometrically, using microdata (here, from the same surveys used for the experimental analyses of programme impacts).

Household groups can purchase goods and services locally or outside the region. Beneficiaries create spillovers to non-beneficiaries by spending cash on the goods and services non-beneficiaries provide. Non-beneficiaries create spillovers to both beneficiaries and other non-beneficiaries by spending their income on goods and services other households provide. We used survey data to estimate econometrically how changes in income affect expenditures by both beneficiary and non-beneficiary households.

Local trade links households within a village, and regional trade links villages to each other and to regional commercial centres. The whole region also interacts with the rest of the country, importing and exporting goods and possibly selling labour. The surveys for this project included questions about where households and businesses bought and sold goods, factors (like labour), and intermediate inputs (like seeds and the merchandise on shop shelves). We used this information to separate out local trade (within the village or with neighbouring villages) from trade with the rest of the region or outside the region. For each good and factor, the total quantities demanded and supplied in the local economy must equal one other. Otherwise, either prices must adjust to ensure a local market equilibrium, or trade, purchases or sales outside the local economy must adjust to resolve an excess demand or an excess supply, respectively. Equations in the LEWIE model ensure that prices adjust to clear markets for goods and services not traded with outside markets (nontradables), and that trade adjusts to clear the markets for goods traded with outside markets (tradables). Nontradables in rural Lesotho include labour, because workers cannot easily move long distances for daily work – services like prepared meals, haircuts, construction, butchers; bulky, costly-to-transport goods, and perishable goods. Tradables include most of the items that line the shelves of small stores, bought outside the local economy or from traders. Examples include cooking oil, salt, soap, paper products, and non-perishable foods.

Survey data play two main roles in the construction of LEWIE models. They provide initial values for all variables in the model (inputs and outputs of each production activity, household expenditures on each good and service). We also use them to econometrically estimate model parameters for each household group and sector, together with standard errors on these estimates. The initial values and parameter estimates are organized into a data input spreadsheet designed to interface with

Generalized Algebraic Modeling System (GAMS) software, which we used to programme the LEWIE model.

Validation is always a concern in General Equilibrium modelling. Econometrics provides a way to validate the model's parameters: significance tests provide a means to establish confidence in the estimated parameters and in the production and expenditure functions used in the simulation model. If the structural relationships in the simulation model are properly specified and precisely estimated, this should build faith in our simulation results. Econometrically-estimated model parameters have standard errors, which can be used with Monte Carlo methods to perform significance tests and construct confidence intervals around project impact-simulation results, as shown by Taylor and Filipski (2014). The LEWIE also takes into account nonlinearities and local price effects. Simulations require making judgements, based on the survey data, about where and how prices are determined (that is, market closure, which usually is not known with certainty). Sensitivity analysis, combined with the Monte Carlo method described above, allows us to test the robustness of simulated impacts to market-closure assumptions.