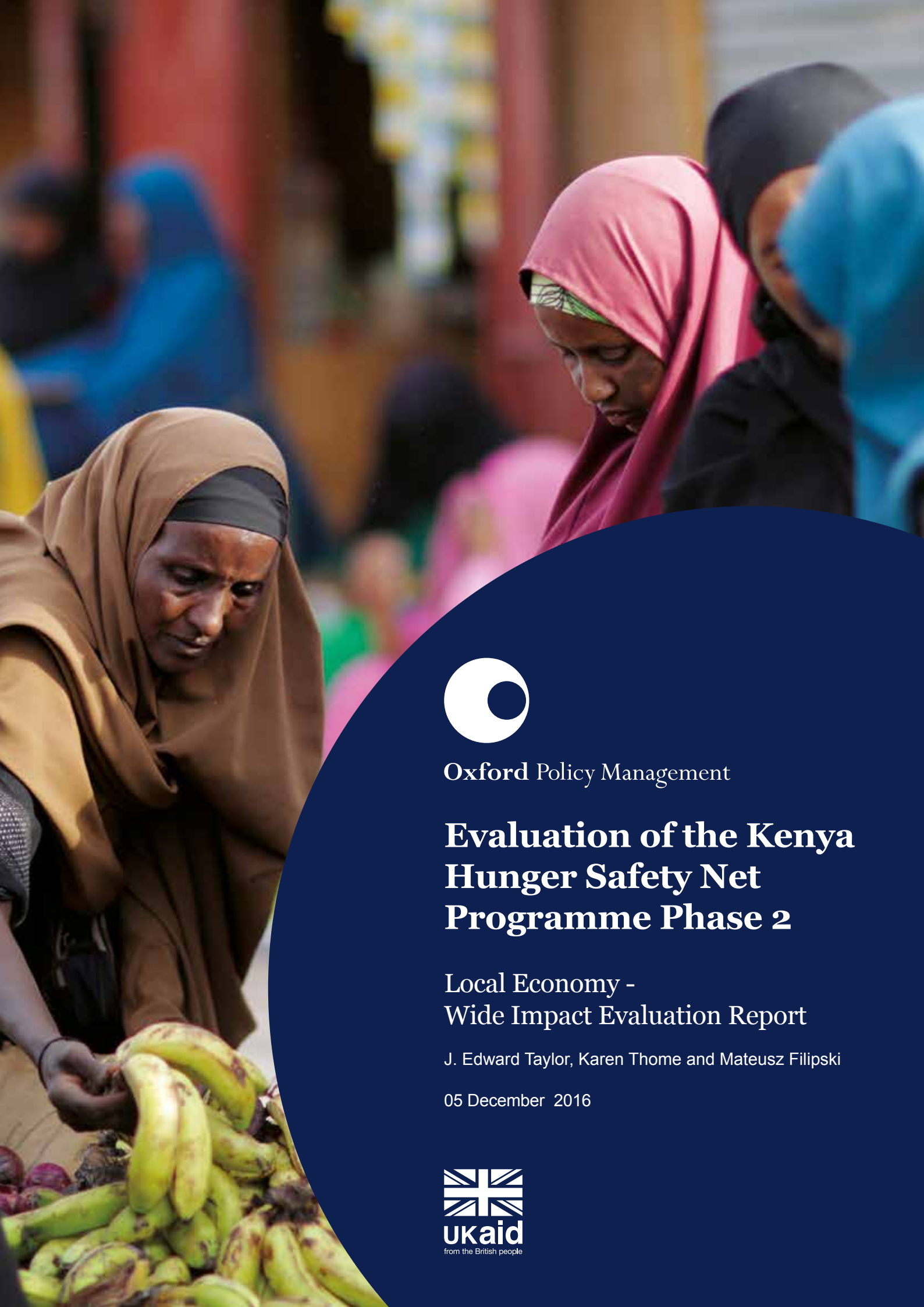

Oxford Policy Management

Evaluation of the Kenya Hunger Safety Net Programme Phase 2

Local Economy - Wide Impact Evaluation Report

J. Edward Taylor, Karen Thome and Mateusz Filipski

05 December 2016

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All opinions expressed, and any mistakes, remain the responsibility of the authors.

NB The original version of this report omitted some material from sections 1 and 2. This has now been included and the report republished with different cover image and photographs throughout to differentiate it.

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List of abbreviations

DFID Department for International Development

GAMS General Algebraic Modelling System

HSNP Hunger Safety Net Programme

KSH Kenya Shilling

LEWIE Local Economy-Wide Impact Evaluation

MDP Ministry of Devolution and Planning

MIS Management Information System

NDMA National Drought Management Authority

NSNP National Safety Net Programme

OPM Oxford Policy Management

PILU Programme Implementation and Learning Unit

RD Regression Discontinuity

SAM Social Accounting Matrix

WFP World Food Programme

1 Introduction

1.1. The Hunger Safety Net Programme

The HSNP is an unconditional Cash Transfer programme that targets people living in extreme poverty in four counties in northern Kenya: Marsabit, Mandera, Turkana and Wajir.

It is currently in its second phase, in which it aims to provide the poorest 100,000 households with regular cash payments, and reach up to an additional 180,000 households with periodic emergency payments to help mitigate the effects of shocks such as drought[1]. HSNP Phase 2 (HSNP2) runs from July 2013 to March 2017.

Under HSNP2, 383,235 households across the four counties have so far been registered into the HSNP Management Information System (MIS). The registration exercise took place between December 2012 and June 2013 and was intended to be a census of the population of the four counties. It was planned that all households be registered for bank accounts, with the HSNP providing regular cash transfers to 100,000 of these. These regular beneficiaries of HSNP are known as 'group 1'. The rest of the households in the MIS are known as 'group 2'. A large number of these are eligible to receive HSNP 'emergency payments' in cases of drought.

At the time of writing, some 275,978 households had been registered with active accounts, 84,619 of which were Group 1 beneficiary households[2] . An on-going effort is in place to finalise account registration and activation for the remaining households. Once this is achieved, Group 1 households that have not yet received any payments will be paid their full entitlement from the HSNP, dating back to July 2013.

Currently the transfer is worth KES 2,700 per month (approximately £22/$27)[3]. The transfer is made directly into routine beneficiaries'[4] bank accounts every two months. Emergency beneficiaries receive a single month's transfer (i.e. currently KES 2,700) if their area is deemed to be in severe or extreme drought in any given month. Some of Group 2 have thus received one or more emergency payments, while others have received no payments.

HSNP2 transfers are targeted to households rather than individuals, with each household selecting one individual with a national ID to open the bank account and collect the transfer on each payment day. Just under 62% of households have selected a female recipient, and slightly over half of these women are the head of their household.

The HSNP is implemented under the NDMA, which reports to the Ministry of Devolution and Planning (MDP). An internationally procured Programme Implementation and Learning Unit (PILU) sits within the NDMA. The PILU manages and monitors the delivery of the HSNP and provides oversight of a rights and grievances mechanism for the programme. The PILU reports to the NDMA and HSNP Steering Committee. The HSNP is delivered in partnership with implementing partners HelpAge International, which manages the programme rights component, and Financial Sector Deepening Trust and Equity Bank, which manage and deliver the payments component respectively.

Further details about the context in Northern Kenya, where this programme is implemented, and the targeting approach of the programme can be found in the quantitative impact evaluation report[5].

[1] The HSNP first phase ran from 2009 to 2013 and provided around 69,000 households (approx. 496,800 people) with regular electronic Cash Transfers every two months.

[2] See www.hsnp.or.ke/index.php/dashboards/at-a-glance [accessed 9/3/2016].

[3] The original value of the HSNP transfer was KES 2,150 every two months. This was paid to each beneficiary household (or individual in the case of the Social Pension component). The value was calculated as 75% of the value of the World Food Programme (WFP) food aid ration in 2006, when the value of the transfer was first set. Over time, the value of the transfer has increased.

[4] A note on the use of the word 'beneficiary': The evaluation team recognise that it is a potentially problematic word, as it assumes benefit, and also carries normative connotations which place the person receiving in a position of relative weakness to the benefactor. However, we use 'beneficiary' throughout this report because it is consistent with the language the programme uses to describe recipients of the HSNP.

[5] OPM, Hunger Safety Net Programme Evaluation of HSNP Phase 2 Quantitative Household Impact Evaluation Report, December 2016.

1.2 Evaluation approach

Oxford Policy Management (OPM) is conducting an independent evaluation of the HSNP that has been commissioned by DFID of which this report is a part. The evaluation is designed to provide evidence on programme performance and impact for use by all programme stakeholders, including the PILU, NDMA, DFID, The National Safety Net Programme (NSNP) and Government of Kenya, plus other national and international stakeholders. The evidence produced is expected to inform future decision-making and accountability for funding, as well as the wider community interested in cash transfers, both nationally and internationally.

The evaluation consists of a number of related components, including:

- a robust mixed-methods impact evaluation;
- an operational evaluation including continuous independent programme monitoring; and
- policy analysis; and

The evaluation includes a communications and learning workstream to disseminate the outputs from the various activities carried out under each component.

The Local Economy-Wide Impact evaluation (LEWIE) belongs to the impact evaluation component of the HSNP2 evaluation. The objectives of the impact evaluation as a whole are to provide a comprehensive evaluation of the effects produced by the scaled-up HSNP transfers on targeted households and individuals, as well as on the communities and local markets in which they live and work. In addition to the LEWIE, the impact evaluation also includes a qualitative research component and a quantitative household impact evaluation. The quantitative household impact evaluation is based on a single round of data collection and employs a regression discontinuity (RD) approach. The same data underpins both the LEWIE and the quantitative household impact evaluation.

These research components have been designed to complement one another and deliver as full an understanding as possible of what impacts the HSNP2 programme has had, and the causal pathways for those impacts. The evaluation objectives, research questions and overall design are described in further detail in the evaluation inception report[6]. The specific evaluation questions addressed under the impact evaluation component are given in the quantitative evaluation report[7]. In addition to the standalone reports for each component of the impact evaluation, a final report will also be produced to synthesise the findings from the quantitative household impact evaluation, the LEWIE study and the qualitative research studies together, so as to provide a comprehensive summary assessment of the impact of the HSNP2.

1.3 Objectives of the LEWIE

The primary aims of the LEWIE study are to investigate the impact of the HSNP cash transfers on the local economy, including on the production activities of both beneficiary and non-beneficiary households.

The premise for the LEWIE analysis is that by providing support to poor households, the programme also injects new cash into local economies. Viewed from a local economy-wide perspective, the beneficiary households are a conduit through which cash is channelled into the local economy. As these households spend their cash, the impacts of the transfer spread from the beneficiary households to others inside and outside of the treated counties. Doorstep trade and purchases in village stores, in markets, and in commercial centres nearby transmit impacts from beneficiaries to non-beneficiaries in the region. Market linkages eventually transmit impacts outside the treated counties, to the rest of Kenya, but while cash circulates within the four counties, it potentially creates income multipliers that exceed the amount of cash transferred.

Thus while the qualitative and quantitative components of the impact evaluation focus primarily on understanding the effects of the HSNP2 at the beneficiary level, as well as the contextual factors and processes that produce these outcomes of interest, the LEWIE seeks to uncover the potential multiplier effects of the HSNP on the entire local economy and production activities within it.

1.4 Structure of the report

The remainder of this report is structured as follows. Section 2 describes the LEWIE framework including an explanation of the intuition underpinning the analytical approach, the structure of the LEWIE model and the data on which it relies. Section 3 provides technical detail on the parameters of the model and how it is constructed. It also explains the calculation of the income multiplier estimate and describes the pathways of influence. Section 4 presents the study findings and results and offers concluding thoughts.

[6] OPM, Hunger Safety Net Programme Evaluation of HSNP Phase 2 Inception Report, July 2015.
[7] OPM, 2016, op cit.

2 LEWIE Framework

2.1 Intuition behind the LEWIE

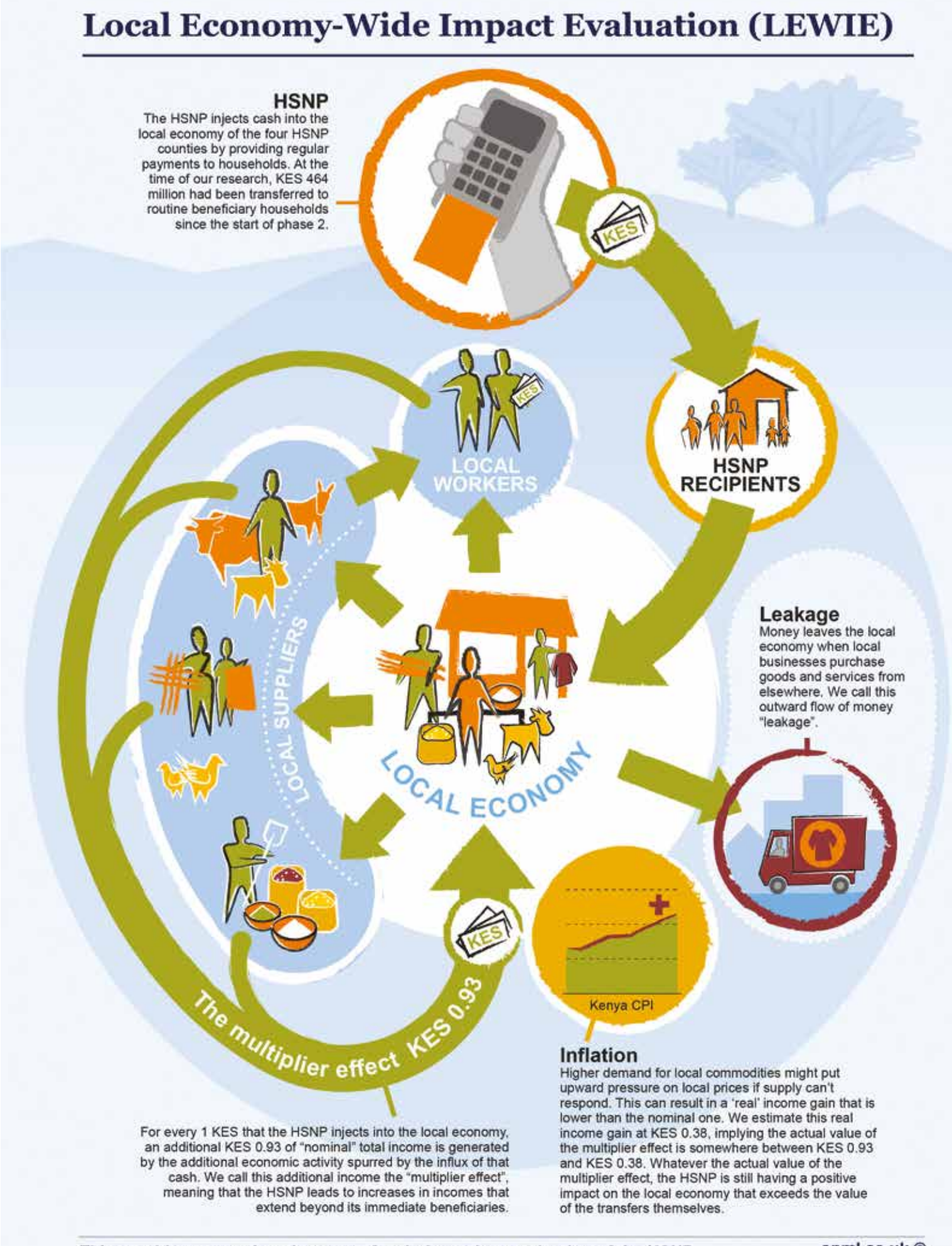
Within the four HSNP counties, the HSNP transfers directly impact targeted poor households by providing them with cash.

Beneficiaries, in turn, spend their income on goods and services supplied inside and outside the local economy. The survey revealed that beneficiaries spend cash in trading centres, in village markets, in periodic visiting markets, or through informal trade with neighbours ('doorstep trade').

Increased demand by beneficiaries translates into higher incomes for the businesses that supply these goods and services, as well as for the households that own or provide labour and other inputs to these businesses. These households include non-beneficiaries. As their incomes rise, so too do their expenditures, and this unleashes new rounds of demand and income gains in the local economy.

Part of the programme's impact leaks out of the local economy, through trade with the rest of the country. However, to the extent that higher income stimulates the demand for local goods and services, market linkages between beneficiaries and non-beneficiaries can create significant local income spill-overs. These spill-overs can benefit the households that receive cash transfers as well as others in the local economy. Figure 1 provides a simple illustration of these local linkages and subsequent spill-over effects of HSNP2 transfers.

Figure 1 Markets transmit impacts (spill-overs) from beneficiaries to non-beneficiaries within treated counties, producing local income multipliers.



Households that sell goods or services to households that are supported by the HSNP transfers see their incomes rise; in this way, they also become treated by the transfer. They, in turn, treat other households through their spending. If neighbouring villages participate in this market, the transfer will treat them indirectly as well.

A LEWIE model to quantify the local economy-wide impact of the HSNP2 programme captures the linkages that transmit impacts from treated to non-treated households. LEWIE pays particular attention to the arrows connecting local economic actors in this diagram. With a good model of how local economies work, we can simulate the effects of the transfer programme on both treated and non-treated households, as well as the total impact on the local economy. For example, we can determine the potential local income multiplier of each Kenya Shilling (KSH) transferred to a treatment household in the HSNP2 programme.

2.2 LEWIE Model Structure

For this analysis, the 'local economy' is defined to be the four counties where the HSNP is implemented: Turkana, Marsabit, Mandera and Wajir.

The model structure is based on the principal economic activities in which the households participate, the households' income sources, and the goods and services on which households spend their income. Table 1 summarises and defines each of these 'accounts' in our model. They include nine production activities and the corresponding commodities that they produce; six factors, including two types of labour (family, hired), land, capital, livestock capital (herd), and purchased inputs; and four household groups.

The four households groups are analogous to the groups defined in the quantitative impact evaluation report. These are:

- Group 1 households with a PMT-score less than the lower bandwidth for the regression discontinuity analysis (that is, households eligible to receive routine HSNP payments but not included in the RD treatment group used for the quantitative household impact evaluation). In this report we refer to these households as Group A.
- Group 1 households within the RD bandwidth (that is, households eligible to receive routine HSNP payments that are included in the RD treatment group used for the quantitative household impact evaluation). In this report we refer to these households as Group B.\
- Group 2 households within the RD bandwidth (that is, households not eligible to receive routine HSNP payments, but who may have received emergency payments in the past. These households form the RD comparison group used for the quantitative household impact evaluation). In this report we refer to these households as Group C.
- Group 2 households with a PMT-score greater than the upper RD bandwidth (these households are not included in the RD comparison group used for the quantitative household impact evaluation). In this report we refer to these households as Group D.

Table 1: Accounts in the Kenya HSNP2 LEWIE

Category	Code	Description
Activities and Commodities	CROP	Crops
	LIV	Livestock and products
	TRANS	Transport
	FAFH	Food processing
	RETAIL	Retail
	TR	Petty trading
	SERV	Services
	PROD	Other locally-produced goods
	Outside	Produced outside the programme area
Factors	HL	Hired labour
	FL	Family labour
	LAND	Land
	K	Capital
	HERD	Livestock capital (herd)
	PURCH	Purchased inputs
Households	A	HSNP2 eligible below the RD band
	B	HNSP2 eligible inside the RD band
	C	HSNP2 ineligible inside the RD band
	D	HSNP2 ineligible above the Rd band

The households in the study area purchase a variety of locally supplied goods and services, including crops, livestock and livestock products, transport services, processed foods, diverse services, and other locally produced goods. They also spend their income on goods sold in local stores (retail) or by petty traders. In addition to locally supplied goods, there are 'outside' commodities, comprising all goods purchased by households or businesses outside the county. Most of these are goods sourced by local businesses and traders outside the county then sold to households in our four groups. The household and business surveys gathered detailed information about the location and sources of purchases by households and businesses.

It is important that we include the ineligible households in our model, because they interact with the eligible households through local markets, and these market interactions can have important income-generating effects.

2.3 LEWIE data sources

The LEWIE study and quantitative impact evaluation both rely on the data collected by the quantitative survey for the evaluation. This survey consists of three instruments:

- Household questionnaire
- Business questionnaire
- Livestock trader questionnaire.

Fieldwork was conducted in 187 sub-locations across the four counties (44 in Mandera, 46 in Wajir, 48 in Marsabit and 49 in Turkana)[8] .

[8]This was based on sub-location sampling using the probability proportional to size method. The aim was to sample 200 sub-locations, but due to the varying population sizes of the sub-locations in our sample frame, some ended up being sampled twice using this method.

2.3.1 The household questionnaire

A household questionnaire was carried out in a total of 5,980 households, against a target of 6,384. This questionnaire included modules on livestock, assets, land, food and non-food consumption, transfers, food security, subjective poverty, saving and borrowing, household jobs, household business activities and livestock trading. The survey covered both households receiving the HSNP transfers and those who are not.

Data from the household questionnaire was used for both the quantitative regression discontinuity analysis, propensity score matching analysis used in the quantitative household impact evaluation (see OPM, December 2016) and the LEWIE analysis presented in this report. The sampling strategy for the household survey is described in detail in the quantitative impact evaluation report[9].

2.3.2 The business questionnaire

A business questionnaire was conducted in the three main commercial hubs of each county. The purpose of the survey was to learn more about local economic activities and livelihoods in the HSNP counties, and the data was used for the LEWIE analysis. The aim was to capture information on three main sectors of the local economy:

- Retailing – shops that sell retail goods on which a price mark-up is applied;
- Services;
- Producers – businesses that transform inputs into outputs.

In each sub-location, a sample of seven businesses from each category was targeted.

Since no sampling frame for local businesses was available, the survey research teams in each county undertook a listing exercise of all businesses on the main commercial centre of the selected sub-locations. The following categories of businesses were excluded from the listing:

- Temporary stalls or mobile sellers located outside permanent kiosks;
- Banks;
- Education institutions (schools, universities etc.);
- Health facilities.

Once the listing was completed, the team leader sampled the required number of businesses using a step sampling approach. Overall, 282 business questionnaires were administered in the four counties. Field teams collected data from an additional replacement sub-location in some counties when this was close to an area for household data collection, and therefore more interviews were completed than expected. All data was retained for analysis.

2.3.3 The livestock questionnaire

Since livestock trading is a very important activity in the HSNP counties, we interviewed a number of livestock traders to understand better how the market works. In each county, three main livestock markets were targeted for interviews. Each team was asked to interview four traders in each of the sub-locations, leading to a total sample size of 12 livestock trader interviews per county. Sampling of livestock traders was mostly done purposively. To the extent possible, team leaders sampled livestock traders in order to achieve a balance between those trading large animals, those trading small or medium value animals, those trading only within the HSNP counties and those who also trade outside the HSNP counties.

The targeted sample size was achieved in all counties.

[9] OPM, Hunger Safety Net Programme Evaluation of HSNP Phase 2 Quantitative Household Impact Evaluation Report, December 2016.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3 Parameterising the model

3.1 Calculation of household budget shares

The household survey provides information on household expenditures and location of purchases, as well as on income sources.

We used data from this survey to estimate household expenditure functions, which tell us how each additional KSH of income is spent by each of the four household groups. This is extremely important, because it is through their expenditures that the beneficiary households pass on impacts of the programme to others, including ineligible households, within the local economy. Ineligible households, in turn, transmit programme impacts to others through their own spending, including back to eligible households.

Table 2 (based on the table in Annex A) shows how the households spend their income. The Table reveals that spending patterns are similar between the two groups inside the RD bandwidth (B and C), but they differ between the eligible and ineligible groups outside the bandwidth (A and D). By far, households spend most of their income in retail businesses within the county. Out of every KSH of income, households spend 56-80 shillings in every hundred in local retail businesses. The highest local retail share is for group A and the lowest, Group D. Group D households spend a larger share of their income outside the county.

Table 2: Household budget shares

Sector/item	Household group			
	A	B	C	D
CROP	0.6%	0.9%	3.4%	0.2%
LIV	0.1%	5.5%	6.2%	0.8%
TRANS	1.1%	1.2%	1.0%	1.8%
FAFH	0.6%	2.1%	1.7%	9.4%
RETAIL	80.0%	71.6%	68.7%	55.9%
TR	5.8%	5.8%	6.3%	12.5%
SERV	5.9%	4.3%	3.9%	1.8%
PROD	1.0%	1.3%	1.3%	1.4%
Outside	6.1%	7.3%	7.5%	16.2%

The income multipliers associated with HSNP2 depend in large part on whether retail and petty trade activities are owned by people who live in the counties, whether they hire labour from within the counties, and whether they purchase their merchandise from people in the counties. The retail activities are located within the counties. However, they obtain most of their merchandise from trading centres or other sources outside the counties. Thus, the retail sector represents an important point of leakage from the local economy. Petty traders are more likely to source merchandise within counties. Because northern Kenya is not a rich agricultural area, the potential to create income multipliers through local crop production are limited. Livestock production is widespread, but two of the household groups spend only a very small percentage of their income on livestock products.

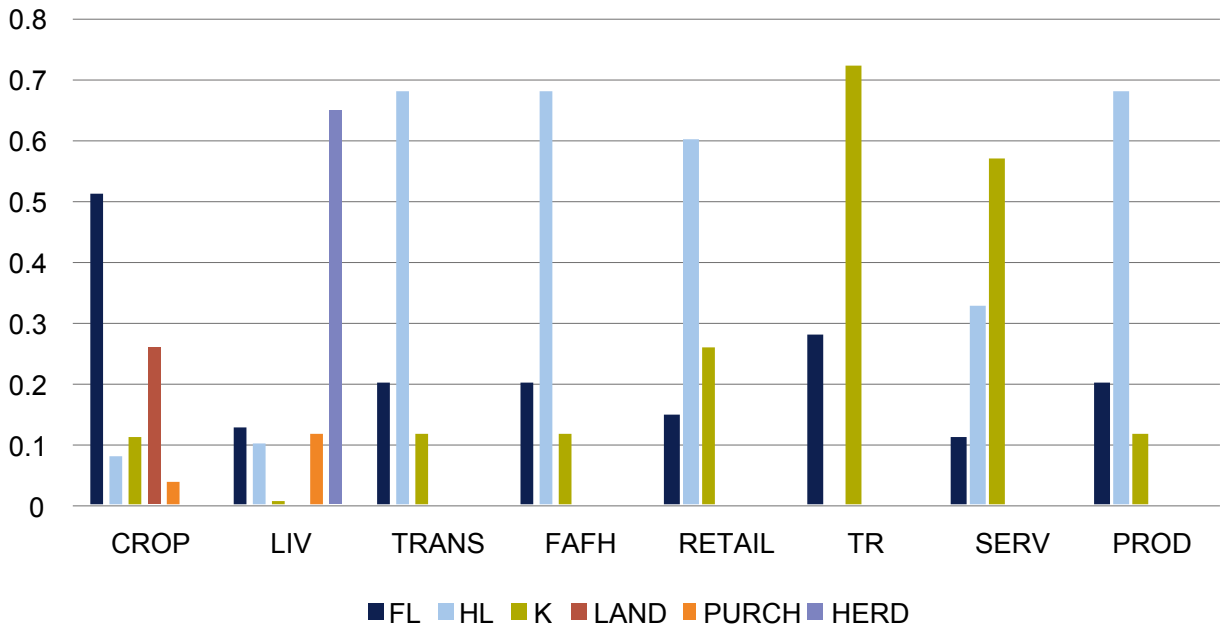
We also use the household data to estimate production functions for crop and livestock production, and to consider the intermediate demands for those activities. Data from both household and business surveys were used to do the same for the remaining activities. Production functions relate the physical output of a production process to the physical inputs or factors of production and are critical to include in our LEWIE model because they tell us how local production responds to changes in demand stimulated by the HSNP2. They also reveal how changes in production translate into changes in input demands and thus into income for those who supply inputs – for example, wage labourers. Households that sell labour to others in the local economy benefit if labour demand and/or wages increase as a result of the programme.

Figure 2 (constructed from the table in Annex A) shows the share of each factor in total value added generated by each of the local production activities. These were estimated econometrically and are the exponents on Cobb-Douglas production functions.

Family labour accounts for just over 50 cents per KSH of value added in crop production, about 30 cents in petty trading, and 15 cents in retail (the blue bars in figure 2). The retail sector creates added value in the form of price mark-ups above the wholesale cost of merchandise sold by stores and venders. A large share of value-added in this sector goes to wages (0.6); the

rest (0.26) is profits, or the return to capital (in the form of inventory; this is the investment people have made in their stores and merchandise). Hired labour shares are highest in transport, food processing, and other production (the red bars). Most livestock value-added is comprised of the return to livestock capital (herd). High labour and profit shares channel income from production activities into the households that supply labour or own capital. Purchased inputs account for only small shares of value-added in crop and livestock activities (the light blue bars).

Figure 2: Factor value-added shares vary across local production activities



3.2 Calculation of HSNP2 Income Multipliers

Income multipliers from the HSNP2 are calculated by dividing the impact on total income by the amount of cash transferred to the beneficiary households. The income multipliers tell us the increase in income from each additional KSH transferred to poor households. For example, a multiplier of 1.5 indicates that each KSH transferred generates an additional KSH 0.5 in income within the treated counties. We can calculate multipliers for total household income as well as for the income of each household group, including non-beneficiaries. The income gain to non-beneficiary households is called a programme spill-over. We can also derive production multipliers (the change in value of production per KSH of HSNP2 transfer).

3.2.1 LEWIE data input matrix

The complete data input sheet for the LEWIE model appears in the table in Annex A. The data input table was structured to interface with the General Algebraic Modelling System (GAMS), which was used to program the LEWIE model[10]. The columns give the names of variables or parameters, the names of the commodities produced or demanded, the factors used in production, and the values for each household group.

The survey data have two main purposes in the construction of LEWIE models. First, they provide initial values for each variable of interest: output of crops and other activities; demand for commodities and factors in each activity; consumption expenditures; public and private transfers, etc. Second, they provide the data to econometrically estimate each of the parameters of interest in the model and their standard errors: exponents and shift parameters in Cobb-Douglas production functions for each activity; marginal budget shares for consumption functions; etc.

The values in the table are weighted totals of each household income and expenditure category by household group. This ensures that we have the correct relative sizes of spending and incomes by each group and a balanced representation of the treated counties.

10 www.gams.com

Annex A includes the budget (alpha) and Cobb-Douglas exponents (beta), as well as the production function shift parameters (acobb), the starting values of factor demands (FD), and the standard errors (se) of the share estimates. The standard errors are generally small compared with the estimated value-added shares (beta) and budget shares (alpha). This indicates that the data from the quantitative surveys permitted us to estimate these parameters with a great deal of precision and it lends confidence to the simulations that follow.

3.2.2 Parameterising the model

Economies—even village ones—tend to be complex, and developing a LEWIE model is a balancing act between complexity and feasibility. Our task is to design models that are simple enough to implement and estimate using data from surveys, yet rich enough to capture the most relevant linkages that may transmit the impacts of HSNP2 payments through local economies.

The first few rows for each sector in the annex table give levels of intermediate demands for each household group. These are followed by levels of each factor, with different factor mixes in different activities. We do not expect all inputs to generate value added; the intermediate inputs are not substitutable for other inputs and their demand is represented by Leontief input-output coefficients.

The next set of rows give the estimated Cobb-Douglas production function exponents (beta) and standard errors of these estimates (se). The estimated production function shift parameters and their standard errors (acobb and acobbse) follow. The remaining rows contain consumption function parameters – alpha and alphase are the estimated budget share and standard error, respectively. The intercept of each demand function is assumed to be zero (corresponding to a Stone-Geary utility function without subsistence minima). We use the expenditures in the county or the household income from each activity to determine the size of each activity.

The lower panels of the LEWIE input matrix summarise where expenditures by households and businesses take place. The revsh parameters give the share of revenue coming from local sales versus sales outside the counties. The VA2IDsh parameters indicate the value of intermediate inputs purchased by each sector, from other sectors as well as from outside the county, per unit of value added generated. These parameters reflect the spatial organisation of the four counties, the region across which we simulate the impacts of the cash transfers. Households consume and produce local commodities and they can export production or import goods from outside markets. The linkages between the counties and the 'rest of the world' determine how the transfer's influences flow between households in the local economy and whether spill-overs accrue to households locally.

The LEWIE computer programme uses the parameter estimates and baseline data in the input matrix to calibrate a general equilibrium model of the project-area economy. This model consists of separate models of household groups calibrated and nested within a model of the treated counties. The new demands created by HSNP2 payments can stimulate production if the local supply response is high (elastic). If the local supply response is inelastic, however, increases in local demand may have inflationary instead of expansionary effects. The LEWIE model can be used to test the sensitivity of transfer impacts to the local supply response and distinguish nominal from real-income (price-adjusted) multipliers, as described below.

3.2.3 Validating the model

Validation is always a concern in simulations. Econometrics provides us with a way to validate the model's parameters; significance tests provide a means to establish confidence in the estimated parameters and functions used in our simulation model. As we have seen, our parameter estimates are highly significant, lending credibility to the model and credence to our simulation results. Econometric estimation of model parameters opens up a new and interesting possibility in regard to validation. The estimated standard errors for each parameter in the model can be used together with Monte Carlo methods to perform significance tests and construct confidence intervals around project impact simulation results, by means of the following steps:

1. Use parameter estimates and starting values for each variable obtained from the microdata to calibrate a baseline LEWIE model.

2. Use this model to simulate the impact of cash transfers to eligible households.

3. Make a random draw from each parameter distribution, assuming it is centred on the estimated parameter with a standard deviation equal to the standard error of the estimate. This results in an entirely new set of model parameters. Using these parameters, calibrate a new baseline LEWIE model, and use this model to simulate the impact of cash transfers to eligible households again.

4. Repeat Step 3 a large number of times. This will produce a large number of observed simulation results on each outcome of interest.

5. Finally, construct percentile confidence intervals $(\hat{Y}^*_{1-\alpha/2}, \hat{Y}^*_{\alpha/2})$ where $\hat{Y}^*_p$ is the p^{th} quantile of the simulated values $(\hat{Y}^*_1, \hat{Y}^*_2, \ldots, \hat{Y}^*_J)$. For example, for a 95% confidence interval, we find

the cut-offs for the highest and lowest 2.5% of simulated values for the outcome of interest. This is similar to the percentile confidence intervals in bootstrapping.

This Monte Carlo procedure allows us to use what we know about the variances of all our parameter estimates simultaneously to perform a comprehensive sensitivity analysis grounded in econometrics. If the model's parameters are estimated imprecisely, this will be reflected in wider confidence bands around our simulation results, whereas precise parameter estimates will tend to give tighter confidence intervals. The precision of some parameter estimates might matter more than others within a general equilibrium framework. Structural interactions within the model may magnify or dampen the effects of imprecise parameter estimates on simulation confidence bands. The method is described in Taylor and Filipski (2014).

3.3 Pathways of influence and markets

In the LEWIE model, the HSNP2 payments increase spending in the treatment households. This increases the demand for goods supplied inside the treated counties as well as outside the counties, in the rest of Kenya. The impact of increased demands on production and on the local income multiplier depends on the supply response to prices in the treated counties. The more elastic the supply response, the more the transfers will tend to create positive spill-overs in the county economy. The more inelastic that response, the more transfers will raise prices instead of stimulating production. If the production supply response is very inelastic (i.e., constraints limit producers' ability to raise output), the transfers will tend to be inflationary rather than having a real effect on the county economies. Higher output prices benefit producers but harm consumers. If wages increase, employed workers will benefit, but producers will be adversely affected. The total impact of the HSNP2 on the economy of the treated counties depends on the interplay of these price and output effects.

The retail sector purchases some goods locally; however, most of the items sold in local stores come from outside the counties. Because of this, retail is largely an 'import' sector, making tradable goods from outside available to households and businesses within the counties. The mark-up (difference between wholesale and purchase prices) represents the value added of the retail sector: it is the non-tradable component of retail sales. An increase in household demand for retail goods does not affect the prices stores pay for their inventory (these prices are set outside the counties). However, it can have an influence on the mark-up. Increases in the demand for locally produced food and livestock products can affect the prices of these goods. In response, households may resort to buying food, livestock and non-agricultural goods from local stores, trading centres, markets or other sources linked to markets outside the counties.

Prices may be determined inside or outside the counties. A challenge in LEWIE is that we generally do not know exactly where prices are determined. In real life, changes in prices outside of an economy may be transmitted into the economy. Given the size of the HSNP2 transfers, there is little reason for transfers to affect prices outside the treated counties.

Transaction costs in local markets can limit the transmission of prices. If transaction costs are high, there may be limited trade between the counties and the rest of the country. In this case, prices are determined by the interaction of local supply and demand. In northern Kenya, changes in local demand may affect the prices of food and livestock products purchased directly from producers in the treated counties (including the implicit prices of home-produced food) as well as through local retail activities. In practice, it is common to find that some goods are non-tradable—that is, their prices are determined locally—while other goods are tradable, with prices set outside the local economy.

Simulations require making assumptions about where prices are determined, which in LEWIE and other general equilibrium models is called 'market closure'. We evaluate the impacts of the HSNP2 under assumptions that we believe reasonably reflect the structure of markets in and around the treated counties. We assume local (county) markets for crops, livestock, retail, services, fish, other non-agricultural production and both types of labour (family, hired). Even though most of the price of a good sold in a local store is determined outside the county, the mark-up – or value added – may change when local demand changes. For example, if the demand for retail goods rises, prices charged by local stores and vendors may increase. The LEWIE simulations provide insight into whether there might be some inflationary effect of HSNP2 transfers.

We do not know what the elasticity of labour supply is. We assume a nearly perfectly elastic labour supply (η=100). This reflects an excess labour supply in the HSNP2 project area; it is similar to the way labour is treated in Social Accounting Matrix (SAM) multiplier models. Excess labour supply can be expected to lower inflationary pressures by limiting wage increases. Increases in labour demand raise employment but not wages. Inflationary pressures are not entirely removed, however, because land and capital constraints continue to limit the local supply response to some extent.

4 Results

4.1 The direct and indirect impacts of HSNP transfers

The LEWIE model was used to simulate the impacts of HSNP2 cash transfers on the treated counties' economies, taking into account non-linearities and local price effects. The results are income and production multipliers per KSH transferred to eligible households.

Table 3 presents the key simulation findings using our preferred model specification, which assumes an elastic labour supply (consistent with rural un- and under-employment). Prices of goods purchased outside the treated counties or in integrated markets are exogenous, since they are determined in outside markets. In addition to the multiplier effects, 95% confidence bounds were constructed around the income multipliers using 1,000 random draws from each parameter distribution.

Table 3: Simulated impacts of Kenya HSNP2

Assumptions		
Elasticity of labour supply		100
Local markets		Crop, live, ret, tr, ser, fafh, HL, FL
Integrated markets		Prod, trans, OUTSIDE, PURCH
Iterations		1,000
Multipliers		
Total income multiplier		
Nominal		1.93
(CI)		(1.84-2.03)
Real		1.38
(CI)		(1.34-1.42)
hH income multiplier (nominal)		
A	Nominal	0.50
	Real	0.50
B	Nominal	0.78
	Real	0.66
C	Nominal	0.49
	Real	0.29
D	Nominal	0.16
	Real	-0.07
Production activities		0.03
	CROP	0.03
	LIV	0.03
	RET	1.46
	TR	0.16
	TRANS	-0.03
	SERV	0.07
	FAFH	0.04
	PROD	0.00

The HSNP2 transfers generate a total nominal income multiplier of 1.93, with a confidence interval of 1.84 to 2.03. That is, each KSH of transfer generates an additional KSH 0.93 of total income gain, or spill-over, within the four counties.

Higher demand for local commodities may put a small amount of upward pressure on prices, raising consumption costs for all households and resulting in a real-income multiplier that is lower than the nominal one. Under the assumptions of this simulation, the real-income multiplier of the HSNP2 transfers within the treated counties is 1.38. Although lower than the nominal multiplier, with a confidence interval of 1.34 to 1.42 it is significantly greater than 1.0.

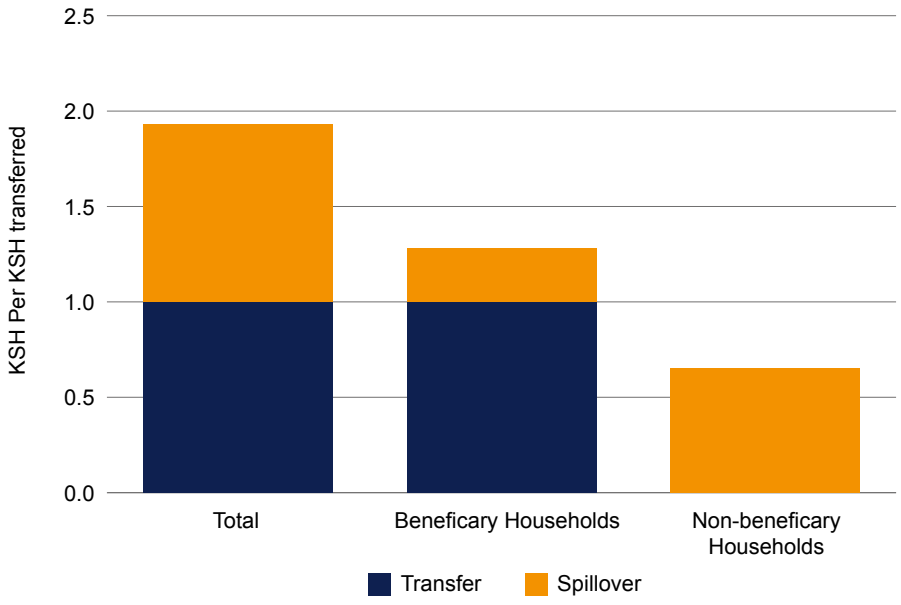
These findings imply that the KSH 464 million transferred to poor households in a routine pay cycle increases local incomes by KSH 856 to 945 million in nominal terms, and by KSH 624 to 661 million in real or inflation-adjusted terms. The findings confirm that the HSNP2 transfers generate local income multipliers that are significantly greater than 1.0, regardless of whether they are measured in nominal or real terms.

On the other hand, they illustrate that, without efforts to ensure a high supply response in the local economy, part of the impact may be inflationary instead of real. Even a relatively small increase in the local current price index (CPI) can result in a much smaller real-income multiplier, because it potentially affects all expenditures by all household groups.

The middle panel of Table 3 gives the simulated impacts on the nominal and real incomes of each household group. The total nominal income impact for the two treated groups (A and B) is 1.28 (0.50 + 0.78). Treated households receive the direct benefit of the transfer and a spill-over of KSH 0.28 per KSH transferred. The ineligible households (C and D) do not receive the transfer but still benefit from a KSH 0.65 increase (0.49 + 0.16) in nominal income for each KSH transferred. Their combined real-income gain is smaller but still positive: 0.22.

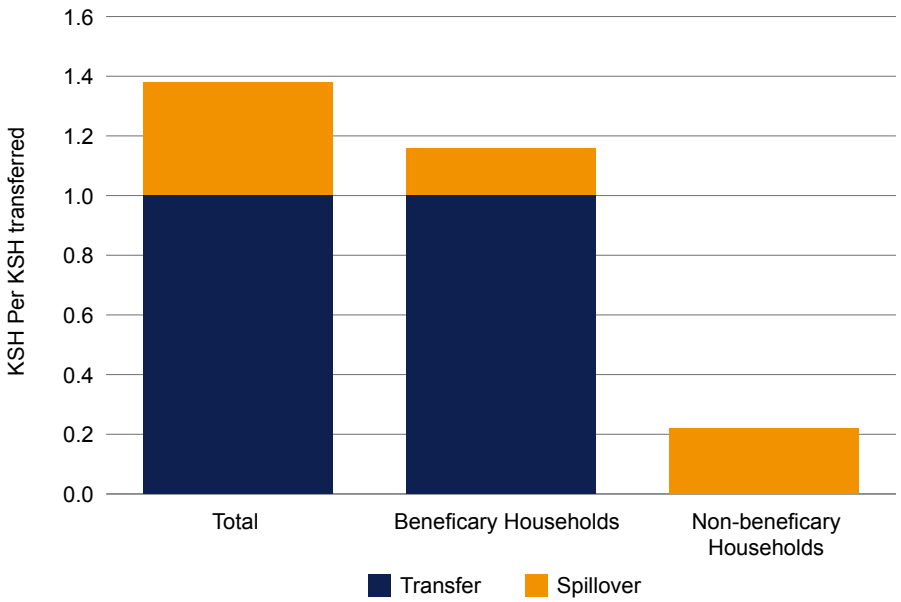
Figure 3 and Figure 4 illustrate the nominal and real income spill-over effects of HSNP2 transfers. The blue part of each bar indicates the transfer itself, which goes entirely to the beneficiary households. The orange part represents the spill-over, which accrues mostly to non-beneficiary households. The transfers' spill-over effect on local economies, both nominal and real, is statistically significant and favours the households that do not receive transfers.

Figure 3 Nominal income multipliers from HSNP2 transfers



The blue portion of each bar represents a 1 KSH transfer and the orange portions indicate the nominal-income spill-over effect of the transfer within the counties. The impact on local nominal incomes significantly exceeds the amount transferred.

Figure 4 Real income multipliers from HSNP2 transfers



The programme has significant production impacts, shown in the bottom panel of Table 3. The largest impact is on retail sales (1.46), followed by petty trading (0.16). Impacts on services, food processing, crop and livestock production range from 0.03 to 0.07. There is no significant impact on other production, and a slight negative effect on transport (-0.03).

4.2 Conclusions

The results from our LEWIE simulations show that cash transfers to poor households under the Kenya HSNP2 can have a significant positive impact on incomes of both beneficiary and non-beneficiary households in the treated counties. The income benefits of this programme within the counties are larger than the amount transferred to poor households. Our simulations show that each KSH transferred to a poor household raises total nominal income in the treated counties by 1.93.

Increased demand for local commodities may put upward pressure on prices if the local supply response is constrained. Inflation raises consumption costs for all households and, in our simulations, results in a real-income multiplier that is lower than the nominal multiplier. This real-income multiplier effect of the transfers is 1.38, with a 95% confidence interval of 1.34-1.42. Although the multiplier is lower than the nominal (cash income) multiplier, it is still significantly greater than 1.0, meaning that under the worst of circumstances each KSH transferred leads to an increase of more than one KSH in local income.

This implies that the KSH 464 million transferred to poor households each routine pay cycle increases local incomes by KSH 856 to 945 million in nominal terms, and by KSH 624 to 661 million in real or inflation-adjusted terms.

The trade-off between supply response and inflation depends on the availability of factors to produce commodities. Complementary programmes that increase the supply response (such as access to credit to invest in capital and other productive inputs) could increase the real-income and production impacts of the HSNP2.

The distribution of benefits across household groups—beneficiaries and non-beneficiaries—in the HSNP2-treated counties is shaped by the types of commodities purchased, the relative proportion of beneficiaries in the local population and the structure of local markets. The cash transfers stimulate demand in the local economy, triggering a supply response that creates production spill-overs. Much—but not all—of the production and income spill-overs created by the programme are found in the ineligible households. Overall, these findings reveal that the HSNP2 programme treats not only the beneficiary households but also the economies in which they participate, with significant benefits for non-beneficiary households as well.

Annex A Excerpt from Data Input Matrix

A.1 Production and demand in the LEWIE data input

Variable	Commodity	Commodity	Factor	Household group			
				A	B	C	D
FD	LIV		HERD	7589.6	946846.5	1332894.7	710309.9
FD	LIV		K	95.7	11942.1	16811.1	8958.8
FD	LIV		PURCH	3234.7	203141.9	275655.2	435100.0
FD	LIV		HL	1157.6	144416.8	203298.4	108339.3
FD	LIV		FL	1464.9	182753.8	257266.1	137099.1
beta	LIV		HERD	0.65	0.65	0.65	0.65
beta	LIV		K	0.01	0.01	0.01	0.01
beta	LIV		PURCH	0.12	0.12	0.12	0.12
beta	LIV		HL	0.10	0.10	0.10	0.10
beta	LIV		FL	0.13	0.13	0.13	0.13
se	LIV		HERD	0.06	0.06	0.06	0.06
se	LIV		K	0.01	0.01	0.01	0.01
se	LIV		PURCH	0.03	0.03	0.03	0.03
se	LIV		HL				
se	LIV		FL				
acobb	LIV			1.29	1.29	1.29	1.29
acobbse	LIV			0.61	0.61	0.61	0.61
FD	CROP		LAND	4.2	1892.9	2037.5	1621.9
FD	CROP		K	1.8	811.7	873.7	695.5
FD	CROP		PURCH	6.6	1067.4	679.0	740.6
FD	CROP		HL	1.3	585.5	630.3	501.7
FD	CROP		FL	8.2	3713.8	3997.5	3182.1
beta	CROP		LAND	0.26	0.26	0.26	0.26
beta	CROP		K	0.11	0.11	0.11	0.11
beta	CROP		PURCH	0.04	0.04	0.04	0.04
beta	CROP		HL	0.08	0.08	0.08	0.08
beta	CROP		FL	0.51	0.51	0.51	0.51
se	CROP		LAND	0.08	0.08	0.08	0.08
se	CROP		K	0.06	0.06	0.06	0.06
se	CROP		PURCH	0.03	0.03	0.03	0.03
se	CROP		HL				
se	CROP		FL				
acobb	CROP			7.94	7.94	7.94	7.94
acobbse	CROP			0.48	0.48	0.48	0.48
INTD	TR	TRANS		5.3	1135.4	1600.7	1069.5
INTD	TR	LIV		4.1	873.7	1231.7	822.9
INTD	TR	CROP		2.6	566.9	799.2	534.0
INTD	TR	SER		3.7	799.6	1127.3	753.2

Variable	Commodity	Commodity	Factor	Household group			
				A	B	C	D
INTD	TR	PROD		3.3	720.3	1015.5	678.5
INTD	TR	TR		15.7	3375.2	4758.3	3179.1
INTD	TR	RET		32.8	7052.0	9942.0	6642.5
INTD	TR	OUTSIDE		42.5	9138.9	12884.1	8608.1
FD	TR		FL	616.8	23323.3	37389.5	16647.4
beta	TR		FL	0.28	0.28	0.28	0.28
se	TR		FL	0.15	0.15	0.15	0.15
FD	TR		K	1577.9	59669.9	95656.3	42590.4
beta	TR		K	0.72	0.72	0.72	0.72
se	TR		K				
acobb	TR			7.80	7.80	7.80	7.80
acobbse	TR			0.52	0.52	0.52	0.52
INTD	RET	TRANS		190.5	7017.1	21743.8	39871.3
INTD	RET	LIV		21.6	796.4	2467.9	4525.4
INTD	RET	CROP		3.5	128.3	397.5	729.0
INTD	RET	SER		27.1	998.8	3095.0	5675.2
INTD	RET	PROD		70.4	2594.3	8038.7	14740.5
INTD	RET	TR		236.6	8716.4	27009.2	49526.6
INTD	RET	RET		271.9	10019.9	31048.5	56933.3
INTD	RET	OUTSIDE		1425.5	52524.0	162754.4	298441.3
FD	RET		HL	2332.6	735330.9	7174237.6	83886.6
FD	RET		FL	23.9	6842.4	5609.1	58969.8
FD	RET		K	11599.4	1296923.5	12653400.7	147953.2
beta	RET		FL	0.15	0.15	0.15	0.15
beta	RET		HL	0.60	0.60	0.60	0.60
beta	RET		K	0.26	0.26	0.26	0.26
se	RET		FL	0.20	0.20	0.20	0.20
se	RET		HL	0.12	0.12	0.12	0.12
se	RET		K				
acobb	RET			8.83	8.83	8.83	8.83
acobbse	RET			0.69	0.69	0.69	0.69
INTD	SER	TRANS			132.1	357.8	573.3
INTD	SER	LIV			698.7	1892.2	3031.5
INTD	SER	CROP			0.8	2.2	3.5
INTD	SER	SER			249.4	675.4	1082.1
INTD	SER	PROD			107.8	291.9	467.7
INTD	SER	TR			614.9	1665.3	2668.1
INTD	SER	RET			2340.4	6338.5	10155.3
INTD	SER	OUTSIDE			2213.7	5995.5	9605.6
FD	SER		HL		8741.7	14642.5	96584.1
FD	SER		FL		1365.9	620.9	34635.9
FD	SER		K		7168.3	3258.5	181771.4

Variable	Commodity	Commodity	Factor	Household group			
				A	B	C	D
beta	SER		HL		0.33	0.33	0.33
beta	SER		FL		0.11	0.11	0.11
beta	SER		K		0.57	0.57	0.57
se	SER		HL		0.07	0.07	0.07
se	SER		FL		0.29	0.29	0.29
se	SER		K				
acobb	SER				8.60	8.60	8.60
acobbse	SER				0.99	0.99	0.99
INTD	TRANS	TRANS		3.6	174.4	17308.4	22667.6
INTD	TRANS	SER		0.6	28.8	2855.9	3740.1
INTD	TRANS	LIV		0.0	0.5	44.7	58.6
INTD	TRANS	PROD		0.0	0.1	5.8	7.6
INTD	TRANS	TR		0.0	1.5	145.6	190.7
INTD	TRANS	RET		0.1	6.2	618.5	810.0
INTD	TRANS	OUTSIDE		1.2	55.9	5547.3	7264.9
FD	TRANS		HL	23.9	266.7	5821.5	6913.2
FD	TRANS		FL	295.7	48152.8	8320025.4	3370.8
FD	TRANS		K	177.2	28851.9	4985137.6	2019.7
beta	TRANS		HL	0.68	0.68	0.68	0.68
beta	TRANS		FL	0.20	0.20	0.20	0.20
beta	TRANS		K	0.12	0.12	0.12	0.12
se	TRANS		HL	0.05	0.05	0.05	0.05
se	TRANS		FL	0.11	0.11	0.11	0.11
se	TRANS		K				
acobb	TRANS			7.43	7.43	7.43	7.43
acobbse	TRANS			0.35	0.35	0.35	0.35
INTD	PROD	TRANS		0.1	151.1	18.7	546.0
INTD	PROD	SER		0.0	25.4	3.1	91.7
INTD	PROD	PROD		0.5	631.4	78.1	2282.2
INTD	PROD	TR		0.1	119.0	14.7	430.0
INTD	PROD	RET		0.5	640.8	79.3	2316.1
INTD	PROD	OUTSIDE		0.7	936.8	115.9	3386.0
FD	PROD		HL	2.4	5333.5	8299.4	11248.2
FD	PROD		FL	209.9	15214570	19592660	118836.2
FD	PROD		K	125.8	9116165.2	11739400.6	71203.5
beta	PROD		HL	0.68	0.68	0.68	0.68
beta	PROD		FL	0.20	0.20	0.20	0.20
beta	PROD		K	0.12	0.12	0.12	0.12
se	PROD		HL	0.05	0.05	0.05	0.05
se	PROD		FL	0.11	0.11	0.11	0.11
se	PROD		K				
acobb	PROD			7.43	7.43	7.43	7.43

Variable	Commodity	Commodity	Factor	Household group			
				A	B	C	D
acobbse	PROD			0.35	0.35	0.35	0.35
INTD	FAFH	TRANS			133.7	127.5	163.2
INTD	FAFH	LIV			2485.4	2369.4	3033.7
INTD	FAFH	CROP			4.3	4.1	5.3
INTD	FAFH	PROD			8641.4	8238.3	10547.8
INTD	FAFH	SER			2504.3	2387.5	3056.8
INTD	FAFH	TR			1329.6	1267.6	1622.9
INTD	FAFH	RET			2004.4	1910.9	2446.5
INTD	FAFH	OUTSIDE			2016.1	1922.0	2460.8
FD	FAFH		HL		47696.1	4149.7	13091.3
FD	FAFH		FL		1920.1	600112.6	85288.0
FD	FAFH		K		1150.5	359571.5	51102.3
beta	FAFH		HL		0.68	0.68	0.68
beta	FAFH		FL		0.20	0.20	0.20
beta	FAFH		K		0.12	0.12	0.12
se	FAFH		HL		0.05	0.05	0.05
se	FAFH		FL		0.11	0.11	0.11
se	FAFH		K				
acobb	FAFH				7.43	7.43	7.43
acobbse	FAFH				0.35	0.35	0.35
cmin	PROD			0.00	0.00	0.00	0.00
cmin	TRANS			0.00	0.00	0.00	0.00
cmin	SER			0.00	0.00	0.00	0.00
cmin	LIV			0.00	0.00	0.00	0.00
cmin	CROP			0.00	0.00	0.00	0.00
cmin	FAFH			0.00	0.00	0.00	0.00
cmin	TR			0.00	0.00	0.00	0.00
cmin	RET			0.00	0.00	0.00	0.00
cmin	OUTSIDE			0.00	0.00	0.00	0.00
alpha	PROD			0.01	0.01	0.01	0.01
alpha	TRANS			0.01	0.01	0.01	0.02
alpha	SER			0.06	0.04	0.04	0.02
alpha	LIV			0.00	0.05	0.06	0.01
alpha	CROP			0.01	0.01	0.03	0.00
alpha	FAFH			0.01	0.02	0.02	0.09
alpha	TR			0.06	0.06	0.06	0.12
alpha	RET			0.80	0.72	0.69	0.56
alphase	PROD			0.00	0.00	0.00	0.00
alphase	TRANS			0.00	0.00	0.00	0.01
alphase	SER			0.01	0.00	0.01	0.01
alphase	LIV				0.01	0.01	0.01
alphase	CROP			0.01	0.00	0.03	0.00

Variable	Commodity	Commodity	Factor	Household group			
				A	B	C	D
alphase	FAFH			0.00	0.00	0.00	0.03
alphase	TR			0.02	0.01	0.01	0.03
alphase	RET			0.04	0.02	0.02	0.03
endow			HL	8599.7	335717.6	516251.7	705019.4
ROWendow			HL	1885.6	240098.9	335833.7	1045092
Other Transf				41.1	26557.0	40359.0	5147.6
NumberHH				0.2	26.7	41.5	31.6
HHexp				13521.1	10892.7	9931.8	13374.4
HHinc				68284.0	57005.9	56491.2	86423.6
revsh_vil	RET			1.00	1.00	1.00	1.00
revsh_vil	TR			0.95	0.95	0.95	0.95
revsh_vil	SER			0.97	0.97	0.97	0.97
revsh_vil	PROD			0.97	0.97	0.97	0.97
revsh_vil	TRANS			1.00	1.00	1.00	1.00
revsh_vil	FAFH			1.00	1.00	1.00	1.00
revsh_row	RET			0.00	0.00	0.00	0.00
revsh_row	TR			0.05	0.05	0.05	0.05
revsh_row	SER			0.03	0.03	0.03	0.03
revsh_row	PROD			0.03	0.03	0.03	0.03
revsh_row	TRANS			0.00	0.00	0.00	0.00
revsh_row	FAFH			0.00	0.00	0.00	0.00
VA2IDsh	RET	TRANS		0.12	0.12	0.12	0.12
VA2IDsh	RET	LIV		0.00	0.00	0.00	0.00
VA2IDsh	RET	CROP		0.00	0.00	0.00	0.00
VA2IDsh	RET	SER		0.02	0.02	0.02	0.02
VA2IDsh	RET	PROD		0.05	0.05	0.05	0.05
VA2IDsh	RET	TR		0.15	0.15	0.15	0.15
VA2IDsh	RET	RET		0.18	0.18	0.18	0.18
VA2IDsh	RET	OUTSIDE		0.92	0.92	0.92	0.92
VA2IDsh	TR	TRANS		0.00	0.00	0.00	0.00
VA2IDsh	TR	LIV		0.00	0.00	0.00	0.00
VA2IDsh	TR	CROP		0.00	0.00	0.00	0.00
VA2IDsh	TR	SER		0.00	0.00	0.00	0.00
VA2IDsh	TR	PROD		0.00	0.00	0.00	0.00
VA2IDsh	TR	TR		0.01	0.01	0.01	0.01
VA2IDsh	TR	RET		0.01	0.01	0.01	0.01
VA2IDsh	TR	OUTSIDE		0.01	0.01	0.01	0.01
VA2IDsh	SER	TRANS		0.00	0.00	0.00	0.00
VA2IDsh	SER	LIV		0.00	0.00	0.00	0.00
VA2IDsh	SER	CROP		0.00	0.00	0.00	0.00
VA2IDsh	SER	SER		0.00	0.00	0.00	0.00
VA2IDsh	SER	PROD		0.00	0.00	0.00	0.00

Variable	Commodity	Commodity	Factor	Household group			
				A	B	C	D
VA2IDsh	SER	TR		0.00	0.00	0.00	0.00
VA2IDsh	SER	RET		0.02	0.02	0.02	0.02
VA2IDsh	SER	OUTSIDE		0.01	0.01	0.01	0.01
VA2IDsh	PROD	TRANS		0.00	0.00	0.00	0.00
VA2IDsh	PROD	SER		0.00	0.00	0.00	0.00
VA2IDsh	PROD	PROD		0.00	0.00	0.00	0.00
VA2IDsh	PROD	TR		0.00	0.00	0.00	0.00
VA2IDsh	PROD	RET		0.00	0.00	0.00	0.00
VA2IDsh	PROD	OUTSIDE		0.00	0.00	0.00	0.00
VA2IDsh	TRANS	TRANS		0.09	0.09	0.09	0.09
VA2IDsh	TRANS	SER		0.01	0.01	0.01	0.01
VA2IDsh	TRANS	LIV		0.00	0.00	0.00	0.00
VA2IDsh	TRANS	PROD		0.00	0.00	0.00	0.00
VA2IDsh	TRANS	TR		0.00	0.00	0.00	0.00
VA2IDsh	TRANS	RET		0.00	0.00	0.00	0.00
VA2IDsh	TRANS	OUTSIDE		0.03	0.03	0.03	0.03
VA2IDsh	FAFH	TRANS		0.00	0.00	0.00	0.00
VA2IDsh	FAFH	LIV		0.01	0.01	0.01	0.01
VA2IDsh	FAFH	CROP		0.00	0.00	0.00	0.00
VA2IDsh	FAFH	SER		0.02	0.02	0.02	0.02
VA2IDsh	FAFH	PROD		0.06	0.06	0.06	0.06
VA2IDsh	FAFH	TR		0.01	0.01	0.01	0.01
VA2IDsh	FAFH	RET		0.01	0.01	0.01	0.01
VA2IDsh	FAFH	OUTSIDE		0.01	0.01	0.01	0.01

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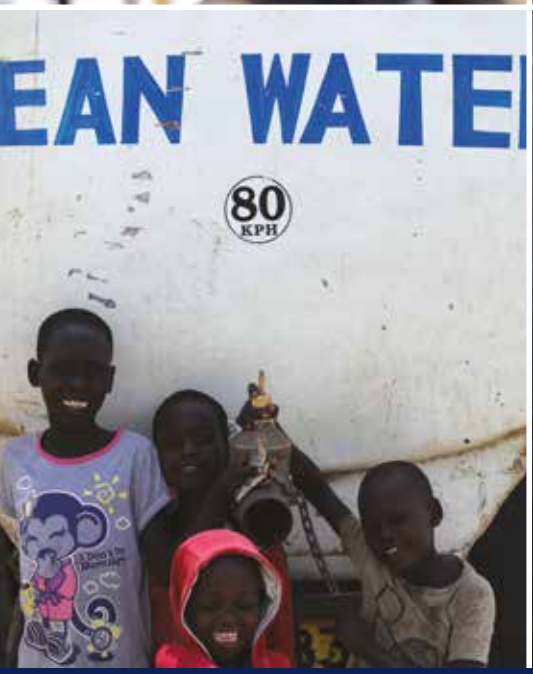


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