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# Evaluating general equilibrium impacts of Kenya's cash transfer programme for orphans and vulnerable children (CT-OVC)

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# Evaluating general equilibrium impacts of Kenya's cash transfer programme for orphans and vulnerable children (CT-OVC) *

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS - ROME - 2013

* This summary was prepared for the United Nations Food and Agriculture Organization (UN-FAO), UNICEF/ESARO and The World Bank. We are greatly indebted to Karen Thome for her helpful suggestions and assistance.

**The From Protection to Production (PtoP) project is financed principally by the UK Department for International Development (DFID) and the Food and Agriculture Organization of the UN (FAO), with additional support from the European Union. The research underlying this p aper also received support from the World Bank**
**The PtoP project is part of a larger effort, the Transfer Project, joint with UNICEF, Save the Children and the University of North Carolina, to support the implementation of impact evaluations of cash transfer programmes in sub-Saharan Africa.**



ISBN

## Abstract

There are a number of cash transfer (CT) programmes in Sub-Saharan Africa intended to aid the most vulnerable households. Because targeting strategies limit eligibility to resource-constrained and labor-poor households, the design of these programmes would seem to work against the creation of positive production spillovers. From a local economy-wide perspective, though, beneficiary households are a conduit through which new cash enters the rural economy. As they spend their cash, the beneficiary households unleash general equilibrium (GE) effects that transmit programme impacts to others in the economy, including non-beneficiaries. Most households that do not receive cash transfers are ineligible because they fail to meet the poverty-related criteria and are not labor constrained; they may be better positioned to expand production when demand is stimulated by cash transfers.

The local economy-wide impact evaluation (LEWIE) methodology is designed to understand the full impact of cash transfers on local economies, including on the production activities of both beneficiary and non-beneficiary groups; how these effects change when programmes are scaled up to larger regions; and why these effects happen. All of these aspects are important for designing projects and explaining their likely impacts to governments and other sponsoring agencies.

The traditional starting point for constructing GE models is the development of a social accounting matrix (SAM) for a given geographic area; the LEWIE model requires the construction of household-village (local) social accounting matrices (SAMs) using household, enterprise, and community survey data collected as part of the baseline and/or follow up surveys in each of the countries in which evaluations of cash transfer programmes are carried out. Separate SAMs are constructed for the households that will receive the randomized transfer, for control-group households, and when available, for ineligible households in both the beneficiary and control villages.

## Contents

# Introduction

The objective of the Kenya cash transfer programme for orphans and vulnerable children (CT-OVC) is to "encourage fostering and retention of OVCs within their families and communities, and to promote their human capital development."[1] The programme reached over 130,000 households across the country in 2011 and is projected to reach 300,000 households. The CT-OVC transfer is a flat monthly payment of Ksh 1500 (approximately US$21, increased to Ksh 2000 in 2011/12). The beneficiary households are ultra-poor and contain OVC.[2]

The primary goal of the CT-OVC programme is to build human capital and improve the care of OVC; however, there are reasons to believe that it affects the economic livelihood of both beneficiary and non-beneficiary households. The programme transfers represent a significant share of beneficiary-household income (18%, by our calculations). Thus, they significantly raise the purchasing power of poor households. Most beneficiaries are rural and depend on subsistence agriculture; cash transfers may help them overcome liquidity constraints and other impediments to their production of food and other productive activities.

The Programme also injects a considerable amount of liquidity into local economies. Viewed from a local economy-wide perspective, the beneficiary households are the conduit through which cash gets channeled into the local economy. Eligibility criteria may limit the Programme's productive impact on beneficiary households, which are more labor and capital-constrained than ineligible households. (Despite this, the experimental results reported in Asfaw, et al., do find evidence of productive impacts in these households, as described below). However, as the beneficiary households spend this income, they transmit Programme impacts to other households within the local economy, including ineligible households likely to be in a more favorable position to increase production in response to rising local demand. Whether the new demand simulated by the transfers results in a real expansion of the local economy or price inflation depends on the local supply response as well as integration with outside markets. Capital constraints, together with the elasticity of the local labor supply, play an important role in shaping local outcomes.

The results presented below reveal significant spillover effects of the CT-OVC transfers in local economies. Local income multipliers (that is, changes in income per Ksh transferred) are significantly greater than 1.0 in nominal terms, even when capital and labor constraints limit the local supply response. Most of the Programme's productive impact on local economies is among the ineligible households. These households do not benefit directly from the transfers; however, they tend to be better positioned in terms of capital and labor to increase their production in response to higher local demand for goods and services.

Nevertheless, capital, liquidity, and labor constraints limit the supply response by both eligible and ineligible households. This reduces the income multiplier in real terms—that is, adjusting for changes in local prices. Under some conditions we find that supply constraints result in income

[1] Oxford Policy Management (OPM), CT-OVC evaluation report, July, 2010.
[2] Further details of the program appear in The Kenya CT-OVC Evaluation Team's 2012 reports and in Asfaw, et al. (2012).

multipliers that are not significantly greater than 1.0. Our analysis uncovers differences in Programme impacts across regions that reflect market integration as well as supply constraints.

Our findings highlight the importance of the local supply response in order to achieve significant real income gains from the CT-OVC Programme. Cash transfers can loosen liquidity constraints on production in beneficiary households; however, they do not have this direct effect in the ineligible households. Complementary interventions to stimulate the supply response in ineligible as well as eligible households can significantly increase the real income multipliers created by the CT-OVC Programme.

The local economy-wide impacts reported in this paper compliment the experimental analysis by Asfaw, et al. (2012) by capturing spillovers within local economies and by offering structural explanations for Programme impacts.

# 1. The CT-OVC Impact Evaluation

The impact evaluation of the CT-OVC has two components, one experimental, and the other using a local economy-wide simulation approach.

## 1.1. Experimental Analysis

The experimental approach compares programme beneficiaries with a group of controls, interviewed before the programme began and again four years later. The average effect of the programme on outcomes of interest among the treated households can be estimated by comparing changes in the outcome between them and the control households. The results, reported in Asfaw, et al (2012), reveal positive impacts on the accumulation of productive assets (particularly small livestock) in the households that receive the CT-OVC transfers. The experimental study also finds a positive impact on adult labour supply from these households, along with a reduction in child labour on beneficiary farms.

These findings illustrate the value of experimental methods to identify average effects of the CT-OVC transfers on the beneficiary households. They do not tell us why the Programme has the effects that it does, only whether there appear to be effects. In economics parlance, they are a “reduced-form” rather than a “structural” approach to project impact evaluation. They also do not tell us how cash transfers to the treated households affect nontreated households.

## 1.2. Local Economy-wide Impact Evaluation

The second component of the evaluation was designed to complement the experimental analysis and address the limitations outlined above. Local economy-wide impact evaluation (LEWIE) simulation methods are used to assess the likely impacts of the CT-OVC on the local economy, including indirect effects on ineligible households. They allow us to understand the mechanisms by which project impacts get transmitted within the treated regions. Confidence bounds around simulated impacts are constructed by using Monte Carlo methods.3 The findings from experiments can help inform LEWIE, for example, by providing evidence of the responsiveness of the local labor supply—an important factor shaping local programme multipliers. Taken together, experiments and LEWIE enable us to achieve a more comprehensive evaluation of project impacts than is possible using either method alone.

This paper reports the findings of our LEWIE simulations. It begins by describing how the CV-OTC programme's impacts may be transmitted through the economy, followed by an explanation of the LEWIE modeling approach, data, findings, and implications for programme design.

## 2. Local Impacts of the CT-OVC

With a coverage of 130,000 households in 2011 and a scale-up to 300,000, the CT-OVC provides a significant infusion of cash into Kenya's rural economy. The Programme's immediate impact is to raise the purchasing power of the beneficiary households. The value of the transfer represents an average of 14 percent of the expenditures of the treated households[4]. As these households spend their cash, the transfer's impacts immediately spread from the beneficiary households to others inside (and outside) of the treated villages. Doorstep trade, purchases in village stores, periodic markets, and purchases outside the village potentially set in motion income multipliers within the treated sites. Some impacts leak out of the project area, as well, potentially unleashing income multipliers in non-treated locales. In theory, if treated and control villages interact directly or indirectly, for example, through periodic markets, control group contamination could occur: the incomes of control households could rise. This might make it difficult to identify programme impacts on incomes and a wide range of other outcomes. The evaluation was designed to minimize the likelihood that CT-OVC impacts will be transmitted to the control sites.

As the programme is scaled up, the control group will vanish, and the CT-OVC payments will have direct and indirect effects throughout the rural economy. A LEWIE model, which captures local general-equilibrium effects, offers insights into how spillovers are likely to influence Programme outcomes in the pilot as well as the scale-up phases.

Validation of findings is generally viewed as a major strength of randomized control trials (RCTs) but a weakness of simulation methods. Our analysis uses a new Monte Carlo method to construct confidence bands around simulation results. This is made possible by the availability of micro survey data and the use of econometrics to estimate LEWIE model parameters.

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[3] J.E. Taylor and M. Filipski, *Beyond Experiments: Simulation Methods for Impact Evaluation*. (Book manuscript in progress.)

[4] Asfaw, S., Davis, B., Dewbre, J., Federighi, G., Handa, S. and Winters, P. (2012). *The impact of the Kenya CT-OVC programme on productive activites and labour allocation (July 13,2012)*: Food and Agriculture Organization. We independently arrived at a similar number (18%) when compiling the input data for the LEWIE model.

## 3. Treatment Effects in a General-Equilibrium Setting[5]

Let ρ denote the true effect of one unit of cash transfer on an outcome of interest (say, income) in the treated household. The power of randomization is that it can enable us to estimate ρ by comparing the outcome for those who get the treatment ($Y_{1,T}$, where subscript T denotes the treatment group) with the outcome for an otherwise identical control group ($Y_{1,C}$, where the subscript C denotes the control group).

The minute the treated household spends its cash, it transmits the impact of the treatment to another (non-treated or treated) household. (Assuming we have a viable control group, this spending will not directly affect control households.) Let $\alpha_{T,NT}$ and $\alpha_{T,T}$ denote, respectively, the resulting income impact on non-treated (NT) and treated households inside or outside the treated site (e.g., village). These households are now infected by the treatment, and they, in turn, affect other non-treated or treated households. We can denote these second-order effects by $\alpha_{NT,NT}$, $\alpha_{C,NT}$, $\alpha_{NT,C}$ and $\alpha_{C,C}$. The chain of impacts continues and converges on a total GE impact. Let $\alpha^{GE}$ denote the total GE effect of a 1-unit cash transfer to the treated. It is the sum of second and higher-round indirect effects of the treatment on the treated and non-treated populations within the treated economy; that is, $\alpha^{GE} = \alpha_T^{GE} + \alpha_{NT}^{GE}$. In a well-designed randomized control trial, the estimate of ρ includes the GE effects on the treated households; thus, the expected total impact of the treatment is:

$$\alpha^{GE} = \rho + \alpha_{NT}^{GE}$$

The classical experimental assumptions (including randomization) ensure that $E(Y_{1,T} - Y_{1,C}) = \rho$; however, the expected total impact of the programme does not equal ρ unless $\alpha_{T,NT} = 0$, which is not tenable given that the cash is spent, most likely near home. Otherwise, the direction and magnitude of the indirect effects depends on the sign and magnitude of all the $\alpha$'s.

This derivation assumes a viable control group; however, the control group, in practice, might not be immune to the GE effects of the treatment even in the short run. A valid experiment requires finding a control population for which $\alpha_{T,C}^{GE} = 0$ yet that is identical to the treatment group except for the treatment. In practice, often we end up with a control group that is not likely to be isolated from the GE effects of the treatment (e.g., drawn from the same villages as the treated households or nearby villages, in order to hold locality characteristics constant). If

[5] This section draws heavily from Chapter 2 of J.E. Taylor and M. Filipski, *Beyond Experiments: Simulation Methods for Impact Evaluation* (book in progress), Department of Agricultural and Resource Economics, UC Davis

$\alpha_{T,C}^{GE} \neq 0$, this obviously raises the specter of bias in estimating $\rho$ as well as adding a new component to the programme's total impact.

In the case of impact evaluations based on RCTs, control households are not chosen from the same or neighboring villages. This minimizes the potential for control group contamination, while randomization assures that on average the household and community characteristics will be balanced. In this evaluation, therefore, we will consider spillovers from treated to non-treated (that is, ineligible) households within the treated sites and assume that the cluster design avoids spillovers to control households.

Evaluating the expected full impact of a treatment within a treatment village requires quantifying the GE impacts on the non-treated as well as treated within the treatment area in the short run and, if the treatment is expanded, potentially everywhere in the long run. In the simplest case, $\rho$ and $\alpha_{NT}^{GE}$ might be estimated using SAM multiplier (or constrained multiplier) models that nest within them the treatment and non-treatment groups. We opt for a more flexible approach that allows us to consider the possible effects of resource constraints, nonlinearities, and price effects while performing LEWIE simulations.

## 4. Methodology

Our first step in modeling the direct and indirect effects of the CT-OVC is to identify the relevant household groups. The intersection of treatment and control villages and eligible and non-eligible households generates the six household groups shown in Table 1. Groups A and B are eligible to receive the transfer, but B is in control villages that do not receive the transfer. Groups C and D are households with OVCs, but that do not meet eligibility for the programme based on the poverty criteria. Groups E and F are households that do not have OVCs and are therefore ineligible for the programme.

**Table 1** **Household Groups by Eligibility and Village-type**

| | Treatment Village | Control Village |
|---|---|---|
| OVC, Eligible | A. Treatment[6] | B. Control |
| OVC, Ineligible | C | D |
| No OVC, Ineligible | E | F |

[6] Some treatment households were subject to conditional transfers that required participation in certain activities. We do not model the two treated groups separately.

Unfortunately, ineligible households were not included in the evaluation surveys; thus, data on ineligible households had to be culled from a separate source, as described below. Besides complicating our analysis, this makes it impossible to distinguish group E from F.

The programme evaluation area covers seven districts throughout Kenya. Our LEWIE analysis focuses on the six rural districts; it excludes sub-locations in Nairobi. The study area was designed to investigate the scale up of the programme during Phase 2 of the pilot study (between 2007 and 2009). This includes the districts that were involved in the pre-pilot phase as well as 4 new districts.[7]

Rather than combining all six rural districts into a single evaluation model, we opt for a regional focus. The aggregation of districts into regions was based on proximity and considerations of sample size. (There was not a sufficiently large household sample to permit separate models for each district.) Region 1 includes four districts in Nyanza provence in the west: Kisumu, Homabay, Migori, and Suba. Region 2 is comprised of two districts in the east, Garissa and Kwale.

This design makes it possible to compare Project impacts in regions that are different geographically, socio-economically, and in terms of market integration, notwithstanding inevitable differences between districts within the same region.[8] Table 2 compares average per-capita expenditures by household group between the two regions, which for all but one group are significantly lower in Region 2 than in Region 1.

**Table 2 Comparison of Average Per-capita Expenditures**

| Household Group | Region 1 | Region 2 | Significance Level for Difference |
|---|---|---|---|
| A | 33342 | 30286 | *** |
| B | 31570 | 24485 | |
| C | 28855 | 25145 | * |
| D | 29924 | 23332 | * |
| E,F | 75080 | 37136 | *** |

Difference significant at *10% (**5%) (***1%) level

Within each region we focus on the treated villages (that is, the villages containing beneficiary households). Assuming that the randomization strategy was effective, there are no spillovers to analyze in the control villages.

[7] We note that in the districts in the evaluation area, there are some non-evaluated villages that were added to the treatment group in 2008 (our sample was selected into treatment in or before 2007).

[8] Kisumu, Homabay, Migori, and Suba share borders. Kwale borders the Ocean while Garissa is landlocked in the northeast. Region 2 households tend to be poorer, particularly those in Garissa.

Table 3 shows the number of households of each type in the treatment and control villages in the evaluation area.[9]

**Table 3** **Number of Households of Each Type in the LEWIE Evaluation**

| Household Group | Region 1 | | Region 2 | |
|---|---|---|---|---|
| | Treatment Village | Control Village | Treatment Village | Control Village |
| OVC, Eligible | A. 1940 | B. 2791 | A. 591 | B. 397 |
| OVC, Ineligible | C. 3993 | D. 3823 | C. 465 | D. 654 |
| No OVC, Ineligible | E. 19434 | F. 22525 | E. 5569 | F. 5644 |
| Total Transfer in Ksh | 34,920,000 | | 10,638,000 | |

It is important that we include the ineligible households in our LEWIE model, since they interact with the eligible households through businesses, the labor market, etc., and these spillovers can have important income-generating effects. The treatment and non-beneficiary households interact within the treated villages.

We also need to identify the principal economic activities in which these households participate, the households' income sources, and the goods and services on which households spend their income. These will constitute the accounts in our model. Table 4 summarizes these accounts. Household groups participate in crop and livestock production, retail, service, and other production activities, and in the labor market. The retail sector includes village stores, which obtain most of their goods outside the village, in the rest of the project area, and in the rest of Kenya. It also includes households' spending outside the village but within the project area. Production activities use five different factors: hired labor, family labor, land, capital, and purchased inputs. Household groups in a given village are linked by the hired labor market, by local markets for commodities, and by inter-household transfers. Villages are linked by trade in goods, services, and tradable factors. The treated villages also interact with the rest of the country, "importing" and "exporting" goods and selling labor.

[9] The populations were derived from census data used by OPM in the original sampling.
In these data we know district and village populations, but not which villages are treated.

**Table 4** **Accounts in the LEWIE Model**

| | |
|---|---|
| **Households** | |
| A | OVC Eligible, Treated Villages |
| B | OVC Eligible, Control Villages |
| C | Meet OVC but not Poverty Criteria, Treated Villages |
| D | Meet OVC but not Poverty Criteria, Control Villages |
| E | CT-OVC Ineligible, Treated Villages |
| F | CT-OVC Ineligible, Control Villages |
| **Activities** | |
| crop | Crops |
| live | Livestock |
| ret | Retail |
| ser | Services |
| prod | Other Production |
| **Commodities** | |
| crop | Crops |
| live | Livestock |
| ret | Retail |
| ser | Services |
| prod | Other Production |
| outside | Produced Outside Village in Project Area |
| **Factors** | |
| HL | Hired Labor |
| FL | Family Labor |
| LAND | Land |
| K | Capital |
| PURCH | Intermediate Inputs |
| **ROW** | Rest of Kenya |

## 5. Data

We use four data sources to collect income and expenditure information for each household group and business type. First, we use the 2009 and 2011 iterations of the Kenya Health, Economic, Demographic and Social Survey of Families with OVC (HEDS-OVC).[10] We also use the 2004-2005 Kenya Integrated Household Budget Survey (KIHBS).[11] Finally, we use data from a 2011 business enterprise questionnaire developed specifically for this project.

The 2011 HEDS survey is the third round of a household survey developed for impact assessment of the CT-OVC programme. However, it is the first round of these surveys that incorporates questions about where purchases and sales took place, which is necessary for the LEWIE model. We used this survey to generate expenditure and income totals for the A and B household groups.

The 2009 HEDS survey was similar to the 2011 survey in the expenditure categories, except that it lacked the "where" question. While the 2011 survey focused only on eligible households, the 2009 version included all households with orphans, including those in groups C and D.

Since neither HEDS survey includes households without OVCs (groups E and F), we turned to the 2005 KIHBS survey to generate their expenditure and income totals. We also used the KIHBS survey to construct income aggregates for groups C and D, which we were unable to do with the 2009 HEDS.

Since the KIHBS survey was not designed with the CT-OVC impact analysis in mind, we needed to make adjustments to correctly identify the household groups and programme region. First, we limited our observations to households in the evaluation-area districts. Second, we used demographic information and the health of the caretakers to identify households that *did not* have OVCs – we labeled these groups E and F. Finally, we used income criteria for CT-OVC programme eligibility to divide the remaining households (which had OVCs) into A/B and C/D groups. In short, we used the actual criteria used in targeting.

We scaled each set of survey observations up to the population sizes for the evaluation area shown in Table 2 (last section). This gives us the correct proportions of household types and asset ownership within a village. We also took care to inflate the values from the 2009 and 2005 surveys to 2011 Ksh.[12]

A final important source of data was the business questionnaire. This survey contained detailed information on location for business inputs. It allowed us to see what percentage of business

[10] The 2011 iteration was developed and administered by the Ministry of Gender, Children & Social Development; University of North Carolina, and Research Solutions Africa. Oxford Policy Management (OPM) carried out the 2009 iteration and original sampling.

[11] This survey was administered by the National Bureau of Statistics and the data was made available through the FAO's RIGA project (http://www.fao.org/economic/riga/en/).

[12] We used the Kenyan consumer price inflation rate from the IMF International Financial Statistics.

purchases for each sector that were bought from other retail, service or production businesses within the village, from local sellers of crops and livestock, and from outside of the village. It also gave us another source for calculating the share of business revenue that was allocated to family labor, hired labor, and capital, and provided us with information on how to translate business revenue to profits for the household surveys that only had revenue information.

Locations were generally imputed using the following method: Surveys that contained location data like the 2011 HEDS Survey and the 2011 business enterprise questionnaire were matched to those surveys that did not have locations. We generated percentages of total income or expenditure to a specific location by household group and district from surveys with locational data. These percentages were than used to allocate expenditures or incomes from the 2009 HEDS Survey or the 2005 KIHBS survey using matched household groups where possible and matched districts.

The need to impute the locations for the ineligible households is one obvious downside of using multiple data sources. Another is that the questionnaires, and thus the disaggregated expenditure and income categories, differ by source (HEDS versus KIHBS). The levels of aggregation we use in our model allow us to overcome this difficulty but prohibit some furthur disaggregation by activity/expenditure/income type that might be of interest. Finally, one focus of this project is to study productive impacts. By using older data sources (HEDS), we have to assume econometrically-estimated budget shares for groups E and F are similar to what they would be using more recent data (that is, if these groups had been included in the KIHBS). It is probably a reasonable assumption that expenditure patterns for large groups of households did not change significantly over this period. Production technologies are assumed to be the same across household groups; that is, households are assumed to use similar methods to produce given types of goods and services. Our production function estimates do not change appreciably if Groups E and F are omitted from the data. The assumption that there were not changes in income patterns for Groups C through F is reasonable given the level of aggregation and the relative economic stability of the rural economy over this period. The Monte Carlo methods we use to construct confidence bounds (described below) represent a fairly exacting test of the sensitivity of simulation outcomes to errors in these parameters. Although we are confident of the reliability of our simulations, these concerns underscore the importance of including ineligible households in baseline surveys.

## 6. LEWIE Data Input

Survey data have two main purposes in the construction of LEWIE models. First, they provide initial values for each variable of interest: output of crop and other activities; inputs of land, labor, capital, and purchased inputs; consumption expenditures, public and private transfers, and so on. 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, marginal budget shares and subsistence minima for consumption functions, etc. Tables 4a and 4b, below, present excerpts from the LEWIE data input spreadsheet for the Kenya CT-OVC evaluation, showing the parameters and initial values related to crops for each of the six household groups (the spreadsheet is split into these two tables for ease of presentation; the following excerpts were taken from the Region 2 spreadsheet).

This data input table was structured to interface with GAMS, where the LEWIE model resides. Its columns give the names of variables or parameters, the name of the commodity, the factor name (in the case of factors), then the values for each household group. In this model, crop production involves four kinds of factor demands (FDs): hired labor (HL), family labor (FL), land, and capital (K), along with purchased inputs (PURCH). The first five rows give the baseline levels of each for each of the four household groups. The next five rows give the estimated Cobb-Douglas production function exponents (beta), and the next five the standard errors of these estimates (se). The following two rows (acobb and acobbse) give the estimated production function shift parameter and its standard error. The remaining rows contain consumption function parameters: alpha and alphase are the estimated budget share and its standard error, and the last row, the intercept, assumed here to be zero (corresponding to a Stone-Geary utility function without subsistence minima).

**Table 5a** **Top Panel of LEWIE Input Spreadsheet**

| Variable | Commodity | Factor | Households | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | A | B | C | D | E | F |
| FD | crop | HL | 540.12 | 432.48 | 359.21 | 422.53 | 2905.07 | 2462.35 |
| FD | crop | FL | 3425.84 | 2743.09 | 2278.36 | 1224.53 | 18426.06 | 7136.20 |
| FD | crop | LAND | 3416.54 | 2735.64 | 2272.17 | 3024.30 | 18376.04 | 17624.69 |
| FD | crop | K | 654.76 | 524.27 | 435.45 | 2631.65 | 3521.68 | 15336.44 |
| FD | crop | PURCH | 167.20 | 133.88 | 111.20 | 371.12 | 899.30 | 2162.76 |
| beta | crop | HL | 0.0658 | 0.0658 | 0.0658 | 0.0658 | 0.0658 | 0.0658 |
| beta | crop | FL | 0.4176 | 0.4176 | 0.4176 | 0.4176 | 0.4176 | 0.4176 |
| beta | crop | LAND | 0.4164 | 0.4164 | 0.4164 | 0.4164 | 0.4164 | 0.4164 |
| beta | crop | K | 0.0798 | 0.0798 | 0.0798 | 0.0798 | 0.0798 | 0.0798 |
| beta | crop | PURCH | 0.0204 | 0.0204 | 0.0204 | 0.0204 | 0.0204 | 0.0204 |
| se | crop | HL | 0.0618 | 0.0618 | 0.0618 | 0.0618 | 0.0618 | 0.0618 |
| se | crop | FL | 0.1348 | 0.1348 | 0.1348 | 0.1348 | 0.1348 | 0.1348 |
| se | crop | LAND | 0.1016 | 0.1016 | 0.1016 | 0.1016 | 0.1016 | 0.1016 |
| se | crop | PURCH | 0.0506 | 0.0506 | 0.0506 | 0.0506 | 0.0506 | 0.0506 |
| acobb | crop | | 5.9109 | 5.9109 | 5.9109 | 5.9109 | 5.9109 | 5.9109 |
| acobbse | crop | | 0.9004 | 0.9004 | 0.9004 | 0.9004 | 0.9004 | 0.9004 |
| alpha | crop | | 0.1376 | 0.0476 | 0.0100 | 0.0100 | 0.0100 | 0.0100 |
| alphase | crop | | 0.0271 | 0.0296 | 0.0050 | 0.0251 | 0.0081 | 0.0081 |

See appendix for abbreviations.

For the Kenya LEWIE, this panel is followed by similar panels for livestock, retail, other services, and other production.

The bottom panel of the input table (5b) contains other household parameters and initial values of variables not related to production activities or commodities.

The first four rows of this panel contain household endowments of each factor, and the following three rows, total hired labor supplied to the local economy, rest of Kenya, and rest of world (migration). This model does not attempt to explain the supply of hired labor to the rest of the country or world, which is likely to be determined by a fairly complex, network-driven process. Thus, in the impact evaluation these are treated as fixed variables; however, the within-region availability of labor depends on them, so it is important to collect data on these variables in the survey and include them in the LEWIE.

The rest of the last panel contains data on estimated parameters and standard errors on household private transfers outside (transfout) and inside (transfin) the village; savings; expenditures outside the village (EXP ZOI and EXPROCO, both residuals); non-CT-OVC transfers; and remittances (Remits).

**Table 5b** **Bottom Panel of LEWIE Input Spreadsheet**

| Variable | Commodity | Factor | Households | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | A | B | C | D | E | F |
| endow | | HL | 4200.281 | 8237.004 | 9567.677 | 13456.48 | 263382.2 | 266929.3 |
| endow | | FL | 9562.983 | 4833.376 | 64921.54 | 32840.53 | 171424.8 | 57155.72 |
| endow | | LAND | 4231.319 | 3108.976 | 2329.531 | 3531.799 | 19806.47 | 26744.01 |
| endow | | K | 15916.68 | 6892.998 | 69227.03 | 172015 | 137294.9 | 282750.6 |
| ZOIENDOW | | HL | 1547.52 | 507.9417 | 1492.701 | 2099.411 | 35309.85 | 35785.39 |
| ROCENDOW | | HL | 3367.345 | 1738.033 | 4387.182 | 6170.36 | 343800.8 | 348430.9 |
| ROWendow | | HL | 0 | 104.2125 | 2.560085 | 3.600636 | 840.2975 | 851.6141 |
| transfout | alpha | | 0.015069 | 0.025204 | | | 0.01071 | 0.01071 |
| transfoutse | se | | 0.001964 | 0.007696 | | | 0.004308 | 0.004308 |
| transfin | alpha | | 0.005659 | 0.000544 | | | 0.042099 | 0.042099 |
| transfinse | se | | 0.001647 | 0.003955 | | | 0.01476 | 0.01476 |
| sav | alpha | | 0.016942 | 0 | 0 | 0.001869 | | |
| savse | se | | 0.005599 | 0.002203 | 0.000359 | 0.001735 | | |
| EXPZOI | | | 0.007882 | 0.013826 | 0.074009 | 0.08087 | 0.060809 | 0.060809 |
| EXPROCO | | | 0.033107 | 0.124134 | 0.028759 | 0.010901 | 0.114634 | 0.114634 |
| NONSCtransfers | | | 4780.388 | 3477.373 | 1041.244 | 1464.459 | 11617.06 | 11773.51 |
| Remits | | | 1611.745 | 2340.315 | 2478.069 | 3485.284 | 24032.04 | 24355.69 |
| NumberHH | | | 591 | 397 | 465 | 654 | 5569 | 5644 |

## 7. Constructing the LEWIE-SAM

The LEWIE data input spreadsheet contains all of the information needed to construct a baseline social accounting matrix (SAM) for each relevant household group, the treatment and control villages, and each region. The household SAMs are nested within village SAMs, and the village SAMs are nested within a regional SAM.

The SAM represents a snapshot of the project area economy at a given point time. The estimated parameters together with baseline values of each variable in the spreadsheet were used to construct the SAM. The SAM is an intermediate output from our LEWIE model as well as a starting point for evaluating the impacts of the CT-OVC on local economies. The use of production and expenditure functions estimated econometrically from the baseline household data distinguishes this from other SAMs and is a novel feature of this approach.

Appendices A and B presents the baseline SAMs for the two regions. These SAMs are an output of the LEWIE model; their construction is described below. The SAMs summarize the flows of income within household groups, villages, and the project-region economy in millions of Ksh.

We can get a sense of how the SAMs work by following a cash transfer through the matrices. The cash transfer goes only to the treated households (Group A). The household columns in the SAMs show how households spend their income. Dividing each number in a column by the column total, we get average budget shares. The average budget shares are reported in Tables 7a-b. For all groups and both regions the largest shares are on retail. Expenditure shares are similar between the two groups eligible for the CT-OVC (A and B) in Region 1; however, some differences are apparent in Region 2. Both spend a higher share of their income on local crops in Region 2. All groups spend more on goods purchased outside the village in Region 1. Overall, expenditure patterns favor the creation of local growth linkages more in Region 2 than in Region 1. These tables give us a quick answer to the question "What does a household do when it receives a cash transfer?" Most likely it will spend the cash in proportions similar to those in the table, generating increases in demand.

**Table 7a** **Average Budget Shares, Treated and Control Households – Region 1**

| Account | Group A | Group B | Group C | Group D | Group E | Group F |
|---|---|---|---|---|---|---|
| Crop in the village | 0.02 | 0.01 | 0.19 | 0.08 | 0.00 | 0.00 |
| Livestock in the village | 0.02 | 0.02 | 0.04 | 0.03 | 0.01 | 0.01 |
| Retail goods from village store | 0.58 | 0.63 | 0.41 | 0.57 | 0.43 | 0.43 |
| Village services | 0.11 | 0.10 | 0.09 | 0.07 | 0.21 | 0.21 |
| Productive activities in Village | 0.02 | 0.01 | 0.02 | 0.03 | 0.05 | 0.05 |
| Outside of Village | 0.24 | 0.22 | 0.25 | 0.23 | 0.31 | 0.31 |

**Table 7b** **Average Budget Shares, Treated and Control Households – Region 2**

| Account | Group A | Group B | Group C | Group D | Group E | Group F |
|---|---|---|---|---|---|---|
| Crop in the village | 0.14 | 0.05 | 0.01 | 0.01 | 0.01 | 0.01 |
| Livestock in the village | 0.01 | 0.02 | 0.01 | 0.01 | 0.06 | 0.06 |
| Retail goods from village store | 0.56 | 0.71 | 0.88 | 0.91 | 0.70 | 0.70 |
| Village services | 0.21 | 0.06 | 0.06 | 0.05 | 0.06 | 0.06 |
| Productive activities in Village | 0.02 | 0.01 | 0.01 | 0.01 | 0.05 | 0.05 |
| Outside of Village | 0.07 | 0.15 | 0.03 | 0.01 | 0.13 | 0.13 |

Local expenditures indirectly benefit other households in the treated villages, in the first instance, the households that supply the goods and services demanded by the treated households. Tables 8a-b, taken from the commodity (COMM) columns of the SAM, show which households (rows) supply different goods and services (columns). The two eligible groups supply an almost negligible share of local goods and services in Region 1. The highest is for Group B's livestock activity, but it provides only 4 percent of total livestock supply in this region. Supply shares for the four ineligible groups are much higher, reaching as high as 68 percent (Group C, crops) to 91 percent (Group F, other production). In Region 2, the treatment Group A supplies 18 percent of local crops; however, like in Region 1, overall the ineligible households are the chief suppliers of goods and services to the local economy. The message in this table is clear: if the CT-OVC stimulates production, it is likely primarily to be by ineligible households. This highlights the importance of considering spillovers of cash transfers in our evaluations.

In order to increase their supply of goods and services, households and businesses hire labor and purchase inputs. This creates another round of spillovers. Table 9 illustrates the importance of input demands in creating linkages inside and outside the economy. Constructed from the activity (ACT) columns of the SAM, it shows how much money ineligible households in the treated villages in Region 1 spend on different inputs per Ksh of output value in each activity. The first data column reveals that, for every 100 Ksh of crop output, this household group spends 6 on hired labor and 5 on purchased intermediate inputs; it invests 16 Ksh of family labor; and the returns to land and capital are 39 and 34, respectively. Most of the value of retail sales (72 Ksh per 100) goes to purchase goods from outside the village. This is not surprising: retail sectors usually represent the major leakage from a local economy. Most of the goods stores sell are shipped in from other parts of the country.

The commodity (COMM) columns in the LEWIE SAM show how much of the supply of commodities consumed in the project area come from each household group in the treated and non-treated villages, and how much is brought in from the rest of the world. Purchases by stores (retail) send benefits to other parts of the country and abroad. The latter are outside the scope of the local impact evaluation.

**Table 8a** The Supply of Goods and Services by Household Group – Region 1

| Sam Account | | | COMM crop | COMM live | COMM ret | COMM ser | COMM prod |
|---|---|---|---|---|---|---|---|
| ACT | A | crop | 0.01 | | | | |
| ACT | A | live | | 0.02 | | | |
| ACT | A | ret | | | 0.00 | | |
| ACT | A | ser | | | | 0.00 | |
| ACT | A | prod | | | | | 0.00 |
| ACT | B | crop | 0.01 | | | | |
| ACT | B | live | | 0.04 | | | |
| ACT | B | ret | | | 0.00 | | |
| ACT | B | ser | | | | 0.02 | |
| ACT | B | prod | | | | | 0.00 |
| ACT | C | crop | 0.68 | | | | |
| ACT | C | live | | 0.22 | | | |
| ACT | C | ret | | | 0.01 | | |
| ACT | C | ser | | | | 0.32 | |
| ACT | C | prod | | | | | 0.00 |
| ACT | D | crop | 0.30 | | | | |
| ACT | D | live | | 0.13 | | | |
| ACT | D | ret | | | 0.04 | | |
| ACT | D | ser | | | | 0.30 | |
| ACT | D | prod | | | | | 0.01 |
| ACT | E | live | | 0.27 | | | |
| ACT | E | ret | | | 0.44 | | |
| ACT | E | ser | | | | 0.16 | |
| ACT | E | prod | | | | | 0.08 |
| ACT | F | live | | 0.32 | | | |
| ACT | F | ret | | | 0.51 | | |
| ACT | F | ser | | | | 0.19 | |
| ACT | F | prod | | | | | 0.91 |

**Table 8b** **The Supply of Goods and Services by Household Group – Region 2**

| Sam Account | | | COMM crop | COMM live | COMM ret | COMM ser | COMM prod |
|---|---|---|---|---|---|---|---|
| ACT | A | crop | 0.18 | | | | |
| ACT | A | live | | 0.00 | | | |
| ACT | A | ret | | | 0.01 | | |
| ACT | A | ser | | | | 0.00 | |
| ACT | A | prod | | | | | 0.00 |
| ACT | B | crop | 0.04 | | | | |
| ACT | B | live | | 0.01 | | | |
| ACT | B | ret | | | 0.00 | | |
| ACT | C | crop | 0.05 | | | | |
| ACT | C | live | | 0.01 | | | |
| ACT | C | ret | | | 0.06 | | |
| ACT | C | ser | | | | 0.21 | |
| ACT | D | crop | 0.07 | | | | |
| ACT | D | live | | 0.02 | | | |
| ACT | D | ret | | | 0.28 | | |
| ACT | D | ser | | | | 0.29 | |
| ACT | E | crop | 0.32 | | | | |
| ACT | E | live | | 0.47 | | | |
| ACT | E | ret | | | 0.15 | | |
| ACT | E | ser | | | | 0.25 | |
| ACT | E | prod | | | | | 0.09 |
| ACT | F | crop | 0.34 | | | | |
| ACT | F | live | | 0.49 | | | |
| ACT | F | ret | | | 0.51 | | |
| ACT | F | ser | | | | 0.25 | |
| ACT | F | prod | | | | | 0.91 |

**Table 9** Input Shares of Output Value by Sector, Household Group C - Region 1

| Account | | ACT C crop | ACT C live | ACT C ret | ACT C ser | ACT C prod |
|---|---|---|---|---|---|---|
| COMM | ret | | | 0.11 | 0.20 | 0.08 |
| COMM | ser | | | 0.02 | 0.03 | 0.04 |
| COMM | prod | | | 0.01 | 0.01 | 0.04 |
| COMM | OUTSIDE | | | 0.72 | 0.45 | 0.50 |
| FACT | HL | 0.06 | 0.07 | 0.03 | 0.03 | 0.01 |
| FACT | FL | 0.16 | 0.09 | 0.08 | 0.04 | 0.30 |
| FACT | LAND | 0.39 | 0.25 | | | |
| FACT | K | 0.34 | 0.49 | 0.03 | 0.23 | 0.03 |
| FACT | PURCH | 0.05 | 0.11 | | | |

## 8. The Direct and Indirect Impacts of the CT-OVC: LEWIE Results

The simplest behavioral assumption we can make is that future behavior is proportional to past behavior. This means that households will spend the same share of an additional unit of income as the share spent from current income on a given good or service; that input-output coefficients in production activities remain stable before and after the transfer, that the share of income transferred to other households will remain constant, and so on. The linearity assumptions allow one to simulate the CT-OVC's impacts in an unconstrained SAM accounting multiplier model. The beauty of a multiplier model is its computational simplicity. However, SAM multiplier models assume that all responses are linear and there are no price effects within the local economy. Linearity means that there are not diminishing marginal returns to production activities. The absence of price effects reflects the assumption that all supplies (of factors as well as goods) are perfectly elastic; thus, a 1-Ksh increase in demand for labor, food, etc., stimulates an equivalent increase in supply. This assumption may be appropriate in an economy with surplus labor and where producers have the ability to adjust their output before increases in demand push up prices in the local economy. However, the assumptions of linearity and elastic supplies in our multiplier analysis could overstate the multiplier effect of the CT-OVC otherwise.

The alternative to use the parameter estimates and baseline data (Tables 3a and 3b) to calibrate a general equilibrium LEWIE (GE-LEWIE) model.[13] This is a LEWIE analogue to computable general equilibrium (CGE) model widely used for policy analysis. However, LEWIE consists

[13] Actually, a SAM multiplier model is a GE model. Usually when we refer to GE models, though, we refer to models with nonlinear responses, resource constraints, and prices.

of separate models of household groups calibrated and nested within a model of the project area economy. The GE-LEWIE model is more flexible and arguably more realistic than SAM-LEWIE multiplier models, and it lends itself to validation in ways that SAM multipliers do not. It can be used to test the sensitivity of transfer impacts to the local supply response and distinguish nominal from real (price-adjusted) income multipliers, as described below.

## 9. The GE-LEWIE Model

You can think of the LEWIE-SAM, above, as the output of a GE model that includes all production activities, incomes, and household expenditures in the local economy. SAMs are the basic data input for CGE models; many or most of the parameters in a CGE model can be computed directly from a SAM.[14] The LEWIE SAM is different from a conventional SAM, though, because it was constructed using parameters econometrically estimated from the baseline data. Thus, we do not need the SAM to parameterize our GE-LEWIE model; both the SAM and GE model are constructed from the same data input sheet illustrated in Tables 3a-3b. The equations in the GE-LEWIE model are summarized and compared to SAM multiplier assumptions in the Appendix.

Validation is always a concern in GE modeling. 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. If the structural relationships in the simulation model are properly specified and precisely estimated, this should lend credence to our simulation results. Assumptions concerning functional form are critical to GE models, but they are equally critical to any econometric estimation exercise (including those involving experiments). The same methods used to choose among functions in econometric modeling can be used to decide upon functions in a simulation model. The same methods used to verify any econometric model (e.g., out-of-sample tests) are relevant when parameterizing simulation models.

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, using the following steps:

1. Use parameter estimates and starting values for each variable obtained from the micro-data, consistent with the household SAMs, to calibrate a baseline GE-LEWIE model.

2. Use this model to simulate the project, for example, a cash transfer to eligible households.

[14] Taylor, J.E., "A Methodology for Local Economy-wide Impact Evaluation (LEWIE) of Cash Transfers" (FAO, 2012) explains how to use a LEWIE SAM to parameterize production and expenditure functions.

3. Make a random draw from each parameter distribution, assuming it is centered 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 GE-LEWIE model, and use this model to simulate the same project again.

4. Repeat step 3 *J* (say, 500) times. This will yield 500 observed simulation results on each outcome of interest.

5. 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 $(\hat{Y}^*_1, \hat{Y}^*_2, ..., \hat{Y}^*_J)$. For example, for a 95% confidence interval, we find the cutoffs 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 were 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 GE framework. Structural interactions within the model may magnify or dampen the effects of imprecise parameter estimates on simulation confidence bands.

In the GE-LEWIE model, the CT-OVC transfers increase spending in the treatment households. This increases the demand for goods supplied inside the treated villages as well as outside. The impact of increased demands on production and on the local income multiplier depends on the supply response to prices. The more elastic the supply response, the more the transfers will tend to create positive spillovers in the economy. The more inelastic, the more transfers will raise prices instead of stimulating production. If the production supply response is very inelastic (that is, constraints limit producers' ability to raise output), the transfers will tend to be inflationary rather than having a real effect on the local economy. 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 CT-OVC on the economy of the treated sites 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 local economy. Because of this, retail is largely an "import" sector, making tradables from outside available to households and businesses within the village. The mark-up (difference between sale and purchase prices) represents the value-added of the retail sector. It is the nontradable component of retail sales. An increase in households' demand for retail goods does not affect the prices stores pay for their inventory (these prices are set outside the local economy). 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, periodic markets, or other sources linked to markets outside the local economy.

## 10. GE-LEWIE Findings

The GE-LEWIE model was used to simulate the impacts of both the initial and scaled-up CT-OVC on the project-area economy, taking into account nonlinearities and local price effects. In these simulations, prices may be determined inside or outside the local economy.

A challenge in GE analysis 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; for example, higher world prices for corn might have an effect on domestic prices at the port of entry into the country (if trade policies permit this), and changes in port-of-entry prices may be transmitted to a greater or lesser extent through the rural economy. Given the size of the CT-OVC and the randomized cluster design, there is little reason for transfers to affect prices outside the treated site in the initial phase of the Programme.

Transaction costs in local markets can limit the transmission of prices. If transaction costs are high, prices may be determined by the interaction of local supply and demand. Changes in local demand may affect the prices of food and livestock products purchased directly from producers (including the implicit prices of home-produced food), unless retail purchases are a perfect substitute for these goods.

The assumption that villages cannot freely "import" wage workers from outside the region is reasonable where transportation is expensive, unreliable, or nonexistent. In this case, programmes can affect local wages. Wage effects are muted to the extent that households have an elastic supply of labor. (Labor supply impacts can be estimated experimentally once follow-on survey data are available.)

Simulations require making assumptions about where prices are determined, that is, market closure. We first evaluate the impacts of the CT-OVC under assumptions that we believe reasonably reflect the structure of markets in the treated villages. Then we test the sensitivity of our simulation results to these closure assumptions, as well as to the elasticity of labor supply.

In the simulations presented below we assume that locally-grown crops, livestock, retail, and other services, as well as labor, are tradable locally. Given high transaction costs with the rest of the country and abroad, it is reasonable to assume that the prices of these goods are determined in local markets.

If villages are not too far apart, they may hire workers from neighboring villages. Thus, we assume hired-worker wages are determined locally. Some workers migrate to jobs in the city or abroad (e.g., in South Africa). However, the processes shaping migration tend to be complex and affected by factors other than wages.[15] The LEWIE assumes that the CT-OVC will not affect migration or remittance income.

We do not know what the elasticity of labor supply is. We assume a nearly perfectly elastic labor supply ($\eta$=100).[16] This reflects excess labor supply in rural Kenya; it is similar to the way labor is treated in SAM multiplier models. Excess labor supply can be expected to lower inflationary pressures by limiting wage increases. It does not remove inflationary pressures, however, because land and capital constraints continue to limit the local supply response.

Local service activities and stores primarily serve households within the local economy. The prices of these, like labor, are therefore assumed to be determined locally. Nevertheless, most of the merchandise sold in village stores is purchased from sources outside the local economy at fixed prices. The cost of this merchandise equals approximately 72% of gross sales in the retail sector. This limits the extent to which increases in local retail demand can exert upward pressure on retail prices.

All of our simulations use the Monte Carlo method, described above, to construct confidence intervals around our estimates of local income multipliers.

Table 10 presents the key findings from the GE-LEWIE CT-OVC evaluation. For the total nominal and real income multiplier effects, it presents both simulated impacts and, in parentheses, 90% confidence intervals around each impact. The confidence intervals were constructed using 250 random draws from each parameter distribution.

The pilot CT-OVC generates different local multipliers in the two regions. In Region 1 it produces a total income multiplier of 1.34 in nominal terms, with a 90-percent confidence interval (CI) of 1.32 to 1.37. The multiplier is higher in Region 2: 1.81 (CI: 1.75 to 1.88). That is, the 34.92 million Ksh transfer programme produces a 46.79 million Ksh increase in income in Region 1, and the 10.64 million Ksh of transfers in Region B raise total income there by 19.26 million Ksh. However, higher demand puts upward pressure on prices. This raises consumption costs for all households and results in a real-income multiplier that, although significantly greater than 1.0, is lower than the nominal one: the real income multiplier of the programme is 1.08 (CI: 1.07 to 1.10) in Region 1 and 1.23 (CI: 1.15-1.30) in Region 2.

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15 See, for example, Worlds in Motion: Understanding International Migration at the End of the Millennium, by Douglas S. Massey, Joaquin Arango, Graeme Hugo, Ali Kouaouci, Adela Pellegrino and J. Edward Taylor (Oxford University Press, 2005).

16 Higher elasticities do not have an appreciable effect on CT-OVC multipliers.

**Table 10** **Simulated Impacts of the CT-OVC Pilot Using the GE-LEWIE Model (Simulation 1)**

| | | Assumptions | | |
|---|---|---|---|---|
| Recipient household | | A only | | |
| Elasticity of hired/family labor supply | | 100 | | |
| Liquidity constraint on/off | | off | | |
| Village Markets | | crop, live, ret, ser, FL, HL | | |
| Zoi-wide Markets | | (none) | | |
| Integrated Markets | | prod, outside, purchased inputs | | |
| Amount transferred | | 34M(Reg. 1) and 10M(Reg. 2) | | |
| iterations | | 250 | | |
| REGION | REGION 1 | | REGION 2 | |
| | Multiplier | Level change* | Multiplier | Level Change* |
| Total Income | | | | |
| Nominal | 1.34 | 46.86 | 1.81 | 19.23 |
| (CI) | ( 1.32- 1.37) | (46.49 -47.87 ) | ( 1.75- 1.88) | (18.60 -19.96 ) |
| Real | 1.08 | 37.87 | 1.23 | 13.05 |
| (CI) | ( 1.07- 1.10) | (37.78 -37.52 ) | ( 1.15- 1.30) | (12.24 -13.78 ) |
| Household Income | | | | |
| A nominal | 1 | 35.05 | 1.05 | 11.12 |
| cpi increase in % | 0.09% | 0.09% | 1.24% | 1.24% |
| real | 1 | 34.89 | 0.98 | 10.43 |
| C nominal | 0.12 | 4.23 | 0.23 | 2.48 |
| cpi increase in % | 0.23% | 0.23% | 0.46% | 0.46% |
| real | 0.05 | 1.91 | 0.16 | 1.75 |
| E nominal | 0.22 | 7.57 | 0.53 | 5.63 |
| cpi increase in % | 0.07% | 0.07% | 0.47% | 0.47% |
| real | 0.03 | 1.06 | 0.08 | 0.87 |
| Production Effects | | | | |
| crop | 0.01 | 0.42 | 0.08 | 0.89 |
| live | 0.01 | 0.27 | 0.02 | 0.17 |
| ret | 0.8 | 27.83 | 0.98 | 10.39 |
| ser | 0.1 | 3.58 | 0.16 | 1.67 |
| prod | -0.01 | -0.31 | -0.09 | -0.94 |

*Millions of Ksh

One the one hand, this finding confirms that the CT-OVC generates local income multipliers 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 stimulating a real expansion of the economy. The same programme can have different impacts on prices in different settings. We can see this in the table above. The local consumer price index rises by 0.46 to 1.24 percent in Region 2 (depending on the household group) but only 0.09 to 0.23% in Region 1.[17] 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. We will return to this concern below.

The notable difference in total income multipliers between regions begins with the household expenditure shares. In region 1 households make around a quarter of their purchases out of the ZOI (Table 7a). The share of out-of-ZOI expenditures for households in region 2 is less than half that of region 1 (Table 7b). The size of the total multiplier is dependent on the transfer increasing demand for goods and services in the ZOI; increased purchases outside the ZOI do not raise the total income multplier because the income earned by businesses making those sales accrues to households outside the ZOI. The same is true for the use of resources in productive activities. In region 2, purchased inputs represent a somewhat smaller value share than in region 1. This means that in region 2, increases in local production contribute more to the local multiplier. Overall, it can be said that the multiplier in region 2 is slightly higher because this region is somewhat less integrated with outside markets.

The middle panel of the table gives simulated impacts on the nominal and real incomes of each household group. Treated households (Group A) receive the direct benefit of the transfer. In Region 1, we do not find evidence of a significant income multiplier for this group. However, there is a positive spillover effect to the ineligible households of .12 Ksh per 1.0 Ksh transferred. Their total income increases by 4.23 million Ksh (1.91 million in real terms), even though they do not receive the transfer.

Spillovers are larger in Region 2, where the ineligible households' nominal income rises 0.23 per Ksh transferred to the eligible households (0.16 Ksh in real terms). Spillovers create a positive feedback on eligible households, raising their income by an additional 0.05 per Ksh transferred. Thus, in Region 2, the beneficiary households benefit both directly and indirectly from the transfer programme.

Assuming the randomized cluster design is effective, impacts of the CT-OVC are not transmitted from treated to control villages. In order for there to be spillovers to the control group, treated villages would have to transact with control villages (say, in regional markets), or with villages that transact with control villages. The more market layers there are separating treated and control sites, the more muted the transmission of impacts will be.

The programme has production impacts that vary considerably across sectors and regions. The cash transfers stimulate the production of crops and livestock in Region 2 by 0.08 and 0.02 per Ksh transferred, but the impact on these sectors is small (0.01) in Region 1. The largest positive effects are on retail, which has multipliers of 0.8 and 0.98 in Regions 1 and 2, respectively. The service sector also benefits (0.10 to 0.16). Increasing demand stimulates these four sectors by putting some upward pressure on prices. That is, prices are the mechanism by which impacts are

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[17] The CPI is different for different household groups because it is an average of prices weighted by households' expenditure shares on different goods and services. Thus, two groups with different spending patterns will have different CPIs in the LEWIE simulations.

transmitted within the local economy. The higher the local supply response, the larger the real expansion in the local economy and the smaller the resulting inflation level will be.

Table 11 provides a breakdown of production impacts by household group. The first data column reports the average multiplier from all 250 runs of the simulation; the second, the standard deviation; and the final two, the 90-percent confidence interval on multiplier impacts. The programme generates positive productive impacts that are significant in all but tradables production. However, most of the production spillovers of the programme accrue to the ineligible households. For example, for each Ksh transferred to beneficiary households in Region 2, the value of crop production increases by 0.02 to 0.03 Ksh in eligible households and 0.03 to 0.07 in the ineligible Group E. In Region 1 there is almost no response from any group. The largest production multipliers are for retail in Group E: 0.74 to 0.80 in Region 1 and 0.69 to 0.70 in Region 2. The finding of higher productive impacts on ineligible households reflects the eligibility criteria of the programme, which targets asset and labor-poor households least likely to have an elastic production response. Service and other production impacts in the beneficiary households are negligible.

**Table 11 Production Impacts by Household Group and Sector**

| Sector and Household | | Region 1 | | | | Region 2 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | mean | stdev | pct5 | pct95 | mean | stdev | pct5 | pct95 |
| crop | A | 0 | 0 | 0 | 0 | 0.03 | 0.01 | 0.02 | 0.03 |
| | C | 0.01 | 0.002 | 0.010 | 0.010 | 0.01 | 0.003 | 0.004 | 0.007 |
| | E | 0 | 0 | 0 | 0 | 0.05 | 0.02 | 0.03 | 0.07 |
| live | A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | C | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | E | 0.004 | 0.001 | 0.003 | 0.005 | 0.02 | 0.01 | 0.02 | 0.02 |
| ret | A | 0 | 0 | 0 | 0 | 0.02 | 0.01 | 0.01 | 0.04 |
| | C | 0.02 | 0.01 | 0.01 | 0.04 | 0.28 | 0.08 | 0.16 | 0.41 |
| | E | 0.77 | 0.02 | 0.74 | 0.80 | 0.68 | 0.09 | 0.69 | 0.70 |
| ser | A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | C | 0.07 | 0.01 | 0.05 | 0.06 | 0.07 | 0.02 | 0.09 | 0.06 |
| | E | 0.03 | 0.01 | 0.04 | 0.03 | 0.09 | 0.02 | 0.06 | 0.12 |
| prod | A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | C | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | E | -0.01 | 0.003 | -0.010 | -0.010 | -0.08 | 0.04 | -0.08 | -0.09 |

The fifth sector, non-agricultural production, is assumed to be tradable, with prices set outside the local economy. Although it does not benefit from higher output prices, it is adversely affected by slightly higher wages. (Hired and family wages, in this high labor supply scenario, rise by 0.03% or less in the two regions.) Thus, its output decreases slightly in Region 1 (by 0.01%) and more in Region 2 (0.09%). This result illustrates that the productive impacts of the CT-OVC vary across sectors and can be negative under some circumstances.

There is good news and bad news about tradables sectors (as well as the high tradable content of retail) in LEWIE. The good news is that increased local demand does not lead to inflation in tradable goods, because by definition, the prices of tradables are exogenous to the local economy. The bad news is that local price increases cannot convey positive impacts on tradables sectors. This can reduce the multiplier effect of the CT-OVC and other transfers on the local economy.

### Robustness Tests

We tested the robustness of the simulation results to different assumptions concerning market closure and labor supply elasticities. Table 12 compares results under three alternative sets of assumptions. Simulation 1 is the same as in Table 10, above. It is included in this table for purposes of comparison. Simulation 2 is identical to Simulation 1, except that it assumes that the supply of both hired and family labor in the project area is unresponsive, with a low elasticity (1.0). This simulation illustrates the importance of labor supply in shaping project impacts. Simulation 3 is identical to Simulation 2, except it assumes that households face liquidity constraints that limit their purchase of productive inputs, e,g., fertilizer.

**Table 12 Sensitivity of Results to Simulation Assumptions**

| | | | | | | |
|---|---|---|---|---|---|---|
| Recipient household | A only | | A only | | A only | |
| Elasticity of hired/family labor supply | 100 | | 1.00 | | 1.00 | |
| Liquidity constraint on/off | off | | off | | on | |
| Village Markets | | | crop, live, ret, ser, FL, HL | | | |
| Zoi-wide Markets | | | (none) | | | |
| Integrated Markets | | | prod, outside, purchased inputs | | | |
| Amount transferred | | | 34M(Reg. 1) and 10M(Reg. 2) | | | |
| iterations | | | 250 | | | |
| | Simulation 1 | | Simulation 2 | | Simulation 3 | |
| | Region 1 | Region 2 | Region 1 | Region 2 | Region 1 | Region 2 |
| Total Income multipliers | | | | | | |
| Nominal | 1.34 | 1.81 | 1.43 | 1.9 | 1.43 | 1.9 |
| (CI) | ( 1.32- 1.37) | ( 1.75- 1.88) | ( 1.42- 1.43) | ( 1.94- 1.91) | ( 1.39- 1.50) | ( 1.78- 2.05) |
| Real | 1.08 | 1.23 | 1.02 | 0.94 | 1.01 | 0.93 |
| (CI) | ( 1.07- 1.10) | ( 1.15- 1.30) | ( 1.00- 1.02) | ( 0.92- 0.96) | ( 1.01- 1.01) | ( 0.90- 0.94) |
| Wage effects | | | | | | |
| Hired Labor | 0.00% | 0.01% | 0.25% | 0.68% | 0.25% | 0.68% |
| Family Labor | 0.01% | 0.03% | 0.35% | 1.67% | 0.35% | 1.67% |
| Household Income multiplier | | | | | | |
| A nominal | 1 | 1.05 | 1 | 1.05 | 1 | 1.05 |
| cpi increase in % | 0.09% | 1.24% | 0.14% | 1.62% | 0.14% | 1.68% |
| real | 1 | 0.98 | 1 | 0.96 | 1 | 0.96 |
| C nominal | 0.12 | 0.23 | 0.14 | 0.26 | 0.14 | 0.26 |
| cpi increase in % | 0.23% | 0.46% | 0.30% | 0.81% | 0.32% | 0.81% |
| real | 0.05 | 0.16 | 0.06 | 0.14 | 0.05 | 0.14 |
| E nominal | 0.22 | 0.53 | 0.28 | 0.59 | 0.28 | 0.59 |
| cpi increase in % | 0.07% | 0.47% | 0.12% | 0.80% | 0.12% | 0.81% |
| real | 0.03 | 0.08 | -0.04 | -0.16 | -0.04 | -0.17 |
| Production Multipliers | | | | | | |
| crop | 0.01 | 0.08 | 0.01 | 0.07 | 0.01 | 0.06 |
| live | 0.01 | 0.02 | 0.01 | 0 | 0 | 0 |
| ret | 0.8 | 0.98 | 0.75 | 0.73 | 0.75 | 0.73 |
| ser | 0.1 | 0.16 | 0.07 | 0.13 | 0.07 | 0.13 |
| prod | -0.01 | -0.09 | -0.1 | -0.43 | -0.1 | -0.43 |

Simulation 2 produces nominal income multipliers of 1.43 and 1.9 in Regions 1 and 2, respectively. Simulation 3 produces similar nominal multipliers (though with wider confidence bands). However, in both new simulations and regions the multipliers are lower in real terms. The assumption of inelastic labor supply creates upward pressure on wages in Simulations 2 and 3; the local wage rises 0.25 to 0.68 percent in Regions 1 and 2, respectively, and the implicit family wage increases by 0.35 to 1.67 percent. Higher wages put upward pressure on the prices of goods and services, raising the CPI by as much as 1.62% (Simulation 2, Region 2, Group A). The higher CPI decreases real income multipliers for eligible as well as ineligible households. Although ineligible households continue to reap spillover benefits from the Programme, these benefits are small compared with the total expenditures of this group, which are now more expensive than before. The real multipliers for ineligible households drop from 0.14 to 0.06 in Simulation 2. The total real income multiplier for the treated economies drops from 1.08-1.23 in Simulation 1 to 1.02-0.94 in Simulation 2, and they are no longer significantly greater than zero.

In Simulation 3, a liquidity constraint on purchasing crop variable inputs further limits the local supply response. Predictably, this creates additional inflationary pressure. The CPI rises a bit more, and the real total income multiplier falls slightly in both regions. As in Simulation 2, we cannot reject the null hypothesis of zero spillovers in real terms. The nominal multiplier remains positive and significantly greater than 1.0, however.

The limiting effect of labor and liquidity constraints is evident in the production multipliers presented at the bottom of Table 10. They are uniformly lower in Simulations 2 and 3 than in Simulation 1.

In the high unemployment environment characterizing rural Kenya, we believe it is unlikely that there are significant labor constraints on production. Nevertheless, Simulations 2 and 3 illustrate the importance of production constraints in shaping programme benefits. Liquidity constraints are likely to have an important effect on the local supply response, particularly in non-beneficiary households, which do not receive transfers that might loosen these constraints but which are far and away the main source of new supply. When these constraints bind, transfers may have an inflationary effect that negatively impacts some non-beneficiaries.

Which assumptions are most likely to characterize the project area is an important question. It is noteworthy, though, that all of the simulations presented above produce income multipliers that are significantly greater than 1.0 in nominal terms (none of the confidence intervals in Table 12 contain 1.0). However, when there are labor and liquidity constraints on the local supply response, real income multipliers are not significantly different from 1.0. The finding that most of the positive spillovers of the programme accrue to the ineligible households reflects the eligibility criteria of the programme, which targets the poorest and most vulnerable households. Households that are poor in assets, including both physical and human capital, have a lower production response than ineligible households. The results suggest that there are productive impacts; however, to find them we need to look mostly in the ineligible households.

### Targeting

A final concern relates to targeting. The impact simulations assume perfect targeting with no exclusion or inclusion errors. This means that the initial impacts are determined by eligible households' expenditure patterns. If some of the transfers go to ineligible instead of eligible households, the initial impacts of the programme will be influenced by ineligible households' expenditure patterns. Because indirect impacts depend on initial impacts, they will be affected, as well. To the extent transfers loosen production constraints in ineligible households, imperfect targeting could in theory enhance productive impacts while diminishing social ones; however, the overall impact is not clear a-priori. In principal, our model could be used to simulate the local economy-wide implications of imperfect targeting, but this was not done for this report.

## 11. Nominal Versus Real Transfer Multipliers

All of our LEWIE simulations find a divergence between nominal and real multipliers from the CT-OVC Programme. This does not mean that price inflation necessarily will erode project benefits. LEWIE is not a prediction tool. Its value is to provide a method to systematically evaluate the likely impacts of government programmes on beneficiaries as well as non-beneficiaries and identify the key factors likely to shape them.

LEWIE gives us insights into what might cause a divergence between nominal and real impacts and what would have to happen to avoid having an inflationary impact on the local economy. Divergence between nominal and real multipliers happens when supply response is inelastic. What makes this happen? A comparison of simulations 1 and 2 illustrates the importance of local factor supply. When the labor supply is inelastic, the Programme pushes up wages and local prices. An elastic labor supply closes the gap between nominal and real benefits. However, even a surplus rural labor supply (which is likely in rural Kenya) does not eliminate inflationary impacts. Fixed capital and land also limit the local supply response.

When one or more factors are fixed, increased demand has an inflationary effect on factor prices which limits the real growth of the economy. The notion that fixed factors influence price effects of government programmes is not new. Economists have long recognized the importance of fixed factors, particularly land, in shaping the impacts of government programmes. Studies from high-income countries find that much of the effect of government subsidy programmes becomes capitalized in higher land values and rental rates.[18]

In rural Kenya, land and capital markets are not sufficiently developed to tell us how cash transfers affect rental rates. LEWIE, however, does provide us with simulated impacts on implicit rental rates, which reflect the extent to which fixed factors (land and capital) constrain the local economy's supply response to the Programme. In Simulation 1 the implicit rental rates on capital increase between 0.66 and 3.44 percent in Regions 1 and 2, respectively.[19] In a SAM multiplier model, capital (like other factors) would increase to meet its increased demand when transfers stimulate the local economy. This would prevent rental rates from rising. In the LEWIE simulations presented above, capital (like land) is assumed to be fixed. This, together with decreasing marginal returns to other inputs, constrains the local supply response, even when the labor supply elasticity is high.

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[18] A recent example is Kirwan, B. E. 2009. "The Incidence of U.S. Agricultural Subsidies on Farmland Rental Rates." *The Journal of Political Economy*, 117(1): 138-164. In high-income countries capital is generally not viewed as a constraint on agricultural production in the medium to long run, due to well-functioning capital markets.

[19] These are the changes in implicit rental rates weighted by the capital stocks in each activity and household group.

We can modify the LEWIE model to allow capital to increase concurrent with the CT-OVC transfers. This would correspond to there being unused capital that could be brought on line to support local production, or alternatively, access to credit or savings to invest in new capital in order to alleviate capital constraints.

Table 13 simulates the local economy-wide impact of the CT-OVC transfers allowing for new capital investment sufficient to prevent upward pressure on rental rates. This simulation uses Simulation 1 as its base. That is, labor is assumed to be in abundant supply, and liquidity constraints on purchased variable inputs are not binding. To facilitate comparison, the results from Simulation 1 are presented in the first data column, and the new simulation's finding are in the column labeled "Simulation 4."

**Table 13 Simulation 1 with Capital Accommodation**

| | | | | |
|---|---|---|---|---|
| Recipient household | A only | | | |
| Elasticity of hired/family labor supply | 100.00 | | | |
| Liquidity constraint on/off | off | | | |
| Village Markets | crop, live, ret, ser, FL, HL | | | |
| Zoi-wide Markets | (none) | | | |
| Integrated Markets | prod, outside, purchased inputs | | | |
| Amount transferred | 34M(Reg. 1) and 10M(Reg. 2) | | | |
| Iterations | 250 | | | |
| Additional simulations | **Capital increases** | | | |
| | Simulation 1 | | Simulation 4 | |
| | Region 1 | Region 2 | Region 1 | Region 2 |
| Total Income multipliers | | | | |
| Nominal | 1.34 | 1.81 | 1.21 | 1.66 |
| (CI) | ( 1.32- 1.37) | ( 1.75- 1.88) | ( 1.20- 1.23) | ( 1.60- 1.73) |
| Real | 1.08 | 1.23 | 1.18 | 1.57 |
| (CI) | ( 1.07- 1.10) | ( 1.15- 1.30) | ( 1.17- 1.19) | ( 1.51- 1.63) |
| Wage effects | | | | |
| Hired Labor | 0.00% | 0.01% | 0.00% | 0.01% |
| Family Labor | 0.01% | 0.03% | 0.00% | 0.03% |
| Rent Effects (range) | 0.66% | 3.44% | 0.01% | -0.02% |
| | ( 0.61%- 0.72%) | ( 3.01%- 3.90%) | ( -0.03%- 0.06%) | ( -0.40%- 0.32%) |
| Household Income multiplier | | | | |
| A nominal | 1 | 1.05 | 1 | 1.04 |
| cpi increase in % | 0.09% | 1.24% | 0.03% | 0.64% |
| real | 1 | 0.98 | 1 | 1.01 |
| C nominal | 0.12 | 0.23 | 0.06 | 0.18 |
| cpi increase in % | 0.23% | 0.46% | 0.12% | 0.09% |
| real | 0.05 | 0.16 | 0.03 | 0.16 |
| E nominal | 0.22 | 0.53 | 0.15 | 0.44 |
| cpi increase in % | 0.07% | 0.47% | 0.00% | 0.05% |
| real | 0.03 | 0.08 | 0.15 | 0.4 |
| Production Multipliers | | | | |
| crop | 0.01 | 0.08 | 0.01 | 0.09 |
| live | 0.01 | 0.02 | 0.01 | 0.09 |
| ret | 0.8 | 0.98 | 0.79 | 1.09 |
| ser | 0.1 | 0.16 | 0.19 | 0.3 |
| prod | -0.01 | -0.09 | 0.01 | 0.05 |

New capital investment virtually eliminates the upward pressure on capital rents.[20] This nearly eliminates the gap between nominal and real income multipliers. (The difference that remains reflects other constraints in the economy, including diminishing marginal returns to variable inputs, as well as fixed land.) Real-income multipliers are now well above 1.0, with 90-percent CIs of 1.17 to 1.19 in Region 1 and 1.51 to 1.63 in Region 2.

These simulations illustrate the importance of capital constraints in shaping Programme impacts. Given eligible and ineligible households' generally limited access to liquidity and credit, they suggest that complementary programmes to loosen capital constraints may be critical in order to reap significant real income multipliers from the CT-OVC Programme. Given that the vast majority of productive impacts are among ineligible households, which do not benefit from the Programme, it is important to include them in such programmes.

Another way to avoid inflationary pressures is through integration with outside markets. Prices of tradables purchased outside the local economy do not change when incomes go up. This includes wholesale prices of merchandise sold in the retail sector. One might think, then, that better integration with outside markets might increase the real income multiplier of cash transfer programmes. This is usually not the case, though, because trade with outside markets transmits Programme benefits out of the project area to the rest of Kenya (or abroad). Such leakages might be good for people outside the treated site, but they erode local (nominal) multipliers. In the extreme, if all new expenditures stimulated by the CT-OVC are on goods and services produced outside the local economy, the multiplier will be 1.0: each Ksh transferred will increase the beneficiary households' income by 1 Ksh but have no local spillover effects.

This is one reason to focus complementary programmes on increasing the local supply response. A second reason is that many goods and most or all factors tend to be nontradable. Capital, labor, local services, the value-added portion of retail sales would not easily be replaced by "imports" into the local economy, even if transaction costs with outside markets were low.

## 12. Scaling up the programme

So far we have only been simulating the effects of the pilot programme: a cash transfer to households in group A. However, we know that households in group B will also receive a transfer in the scaled-up phase of the programme. LEWIE allows us to simulate that phase ex-ante. Table 14 compares the results of simulation 1 in the pilot (first column – same as in Table 10) and scaled-up phase (second column). Comparing the two columns shows that the scaled-up intervention essentially yields the same impacts as the pilot, but on a larger scale.

[20] The changes in implicit rents reported in the table differ slightly from zero because of the stochastic element in the Monte Carlo simulations used to generate the distributions of CT-OVC impacts.

For both regions, there is no significant difference in the total income multiplier between the pilot and the scale-up simulations. In region 1 the confidence intervals around the real income multiplier overlap: 1.07-1.10 in the pilot and 1.05-1.08 in the scale-up (in region 2 those ranges are respectively 1.15-1.30 and 1.21-1.31). Production impacts, at the bottom of the table, are also very similar between the two phases of the programme. At the village level, results for the Treated village (of either region) are identical in both phases of the programme. This is mostly due to the randomization scheme of the programme, which ensures that the treated and control zones are geographically separated and share no common markets. Therefore, just as the pilot treatment in the treated (T) villages had no effect in the non-treated (NT) villages, the scale-up has no reason to affect T villages differently than the pilot.

The programme also has similar impacts between the treatment and control villages in both regions. In region 1, the real income multiplier in NT is within the range 1.03-1.08, which overlaps with the range for T (1.07-1.10). In region two, the overlapping ranges are 1.27-1.38 and 1.15-1.30. This not only suggests that the scale-up phase will have impacts similar to those of the pilot; it also comforts us in the use of group B as a control for group A. Within each region, the treatment and control groups are similar in terms of household characteristics as well as in terms of the linkages they create within their respective villages.

**Table 14** **Simulation 1 in the Pilot and Scale-up Phase**

| | Assumptions | | | |
|---|---|---|---|---|
| Recipient household | A only | | A and B | |
| Elasticity of hired/family labor s | 100 | | | |
| Liquidity constraint on/off | off | | | |
| Village Markets | crop, live, ret, ser, FL, HL | | | |
| Zoi-wide Markets | (none) | | | |
| Integrated Markets | prod, outside, purchased inputs | | | |
| iterations | 250 | | | |
| Additional simulation | Project Expansion to Non-treated village | | | |
| Amount transferred | 34M(Reg. 1) and 10M(Reg.2) Simulation 1 | | A:34M B:50M(Reg.1) and A:10M B:7M (Reg.2) Simulation 5 | |
| | region1 | region2 | region1 | region2 |
| Total Income Multipliers | | | | |
| Nominal | 1.34 | 1.81 | 1.3 | 1.71 |
| (CI) | ( 1.32- 1.37) | ( 1.75- 1.88) | ( 1.28- 1.32) | ( 1.66- 1.77) |
| Real | 1.08 | 1.23 | 1.07 | 1.26 |
| (CI) | ( 1.07- 1.10) | ( 1.15- 1.30) | ( 1.05- 1.08) | ( 1.21- 1.31) |
| Village Income Multipliers | | | | |
| T nominal | 1.34 | 1.81 | 1.34 | 1.81 |
| village cpi increase | 0.09% | 0.51% | 0.09% | 0.51% |
| real | 1.08 | 1.23 | 1.08 | 1.23 |
| (CI) | ( 1.07- 1.10) | ( 1.15- 1.30) | ( 1.07- 1.10) | ( 1.15- 1.30) |
| NT nominal | 0 | 0 | 1.27 | 1.56 |
| village cpi increase | 0.00% | 0.00% | 0.09% | 0.13% |
| real | 0 | 0 | 1.06 | 1.32 |
| (CI) | ( 0.00- 0.00) | ( 0.00- 0.00) | ( 1.03- 1.08) | ( 1.27- 1.38) |
| Production Multipliers | | | | |
| crop | 0.01 | 0.08 | 0.01 | 0.06 |
| live | 0.01 | 0.02 | 0.01 | 0.02 |
| ret | 0.8 | 0.98 | 0.81 | 1.03 |
| ser | 0.1 | 0.16 | 0.09 | 0.12 |
| prod | -0.01 | -0.09 | -0.05 | -0.19 |

## Conclusions

As the CT-OVC injects cash into local economies the demand for goods and services increases. Higher spending immediately transmits impacts from beneficiary to non-beneficiary households inside and outside the treated villages. Our CT-OVC impact simulations indicate total impacts that significantly exceed the amounts transferred under the programme in nominal terms. The Monte Carlo methods used in this LEWIE analysis make it possible to place confidence bounds around estimated transfer multipliers. Our 90% confidence intervals on nominal income multipliers lie well above 1.0 and in some cases approach 2.0, indicating significant positive spillovers from transfers.

These findings raise questions about how we should measure the impacts of cash transfers, which include effects on the non-treated groups. They reveal that experiments focusing only on the treated households are likely to significantly understate programme impacts because of general-equilibrium feedbacks in local economies. The size of those feedback effects depends on the degree to which the economy is integrated with outside markets: the cash transfer will create more spillover effects in an economy relying more on local supply of goods and factors, as in region 2.

By stimulating demand for locally supplied goods and services, cash transfers have productive impacts. However, these effects are found primarily in households ineligible for the transfers. This finding is not surprising, given that the eligibility criteria for the CT-OVC favor asset and labor-poor households. It reaffirms the importance of a local economy-wide approach if we wish to capture the transfers' full impact.

The LEWIE evaluation underlines the importance of a high local supply response in generating positive spillovers. Factor and liquidity constraints limit the ability of local households to increase the supply of goods and services in response to the new demand that transfers generate. This results in a greater likelihood of price inflation and a divergence between nominal and real income multipliers. Income multipliers fall when adjusted for the impacts of transfers on local prices. Inflationary effects of transfers and the divergence between nominal and real multipliers decrease if labor is readily available, households have the liquidity to purchase intermediate inputs, and capital constraints on production are less binding.

Our simulations suggest that interventions to loosen constraints on the local supply response are likely to be critical in order to avoid inflationary effects and maximize the real impact of transfers on local economies. Given the dominant role of ineligible households in local production, it is important for complementary interventions (e.g., micro-credit) to target these as well as CT-OVC-eligible households.

# References


Asfaw, Solomon, Benjamin Davis, Josh Dewbre, Giovanni Federighi, Sudhanshu Handa and Paul Winters, "The Impact of the Kenya CT-OVC Programme on Productive Activities and Labour Allocation." Paper prepared for the the "From Protection to Production Project" (http://www.fao.org/economic/ptop/en/), supported by DFID.

Kenya CT-OVC Evaluation Team, "The Impact of the Kenya CT-OVC Programme on Human Capital," Journal of Development Effectiveness, Vol.4(1): 38-49, 2012.

Kenya CT-OVC Evaluation Team, "Impact of the Kenya CT-OVC on Household Spending," Journal of Development Effectiveness, Vol.4(1):9-37, 2012.

# Appendix A. A nested SAM for Region 1

| Sam Account | | | ACT A crop | ACT A live | ACT A ret | ACT A ser | ACT A prod | ACT B crop | ACT B live | ACT B ret | ACT B ser | ACT B prod | ACT C crop | ACT C live | ACT C ret | ACT C ser | ACT C prod | ACT D crop | ACT D live | ACT D ret | ACT D ser | ACT D prod | ACT E live | ACT E ret | ACT E ser | ACT E prod | ACT F live | ACT F ret | ACT F ser | ACT F prod |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ACT | A | crop | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | A | live | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | A | ret | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | A | ser | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | A | prod | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | B | crop | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | B | live | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | B | ret | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | B | ser | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | B | prod | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | C | crop | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | C | live | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | C | ret | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | C | ser | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | C | prod | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | D | crop | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | D | live | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | D | ret | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | D | ser | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | D | prod | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | E | live | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | E | ret | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | E | ser | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | E | prod | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | F | live | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | F | ret | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | F | ser | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT | F | prod | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COMM | | crop | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COMM | | live | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COMM | | ret | | | 1385.77 | 5129.97 | 66.6037 | | | 3407.91 | 24094.8 | 141.011 | | | 15366.8 | 327432 | 90.8231 | | | 49334 | 313492 | 893.375 | | 611343 | 170133 | 8046.27 | | 708578 | 197192 | 95814.2 |
| COMM | | ser | | | 303.958 | 811.215 | 35.4112 | | | 747.498 | 3810.17 | 74.9715 | | | 3370.6 | 51777.6 | 48.2879 | | | 10821 | 49573.2 | 474.981 | | 134093 | 26903.5 | 4277.96 | | 155421 | 31182.5 | 50941.5 |
| COMM | | prod | | | 69.5331 | 294.259 | 31.0703 | | | 170.997 | 1382.09 | 65.7812 | | | 771.055 | 18781.7 | 42.3686 | | | 2475.41 | 17982.1 | 416.756 | | 30675.1 | 9758.93 | 3753.55 | | 35554 | 11311.1 | 44696.9 |
| COMM | | OUTSIDE | | | 8918.3 | 11455 | 417.295 | | | 21932 | 53802.6 | 883.485 | | | 98895.2 | 731141 | 569.038 | | | 317495 | 700013 | 5597.31 | | 3934375 | 379899 | 50412.7 | | 4560142 | 440322 | 600310 |
| FACT | | HL | 195.579 | 222.139 | 340.372 | 743.592 | 10.863 | 147.856 | 516.6 | 837.048 | 3492.55 | 22.9989 | 10363.5 | 3001.35 | 3774.4 | 47461.4 | 14.8132 | 4600.34 | 1734.36 | 12117.4 | 45440.7 | 145.709 | 3662.14 | 150158 | 24660.8 | 1312.34 | 4228.63 | 174041 | 28583.1 | 15627.3 |
| FACT | | FL | 566.815 | 281.109 | 944.933 | 1042.06 | 254.903 | 428.506 | 653.737 | 2323.79 | 4894.39 | 539.673 | 30034.8 | 3798.09 | 10478.4 | 66511.5 | 347.594 | 13332.4 | 2194.77 | 33640 | 63679.8 | 3419.09 | 4634.29 | 416865 | 34559.2 | 30794.4 | 5351.16 | 483167 | 40055.8 | 366696 |
| FACT | | LAND | 1399.9 | 814.651 | | | | 1058.31 | 1894.53 | | | | 74178.6 | 11006.8 | | | | 32927.8 | 6360.43 | | | | 13430.1 | | | | 15507.6 | | | |
| FACT | | K | 1218.14 | 1624.38 | 383.332 | 5762.3 | 21.1561 | 920.904 | 3777.6 | 942.696 | 27064.8 | 44.791 | 64547.9 | 21947.1 | 4250.78 | 367792 | 28.8491 | 28652.7 | 12682.4 | 13646.8 | 352133 | 283.772 | 26779.1 | 169110 | 191103 | 2555.83 | 30921.5 | 196007 | 221499 | 30434.5 |
| FACT | | PURCH | 171.784 | 355.857 | | | | 129.867 | 827.57 | | | | 9102.6 | 4808.03 | | | | 4040.63 | 2778.37 | | | | 5866.58 | | | | 6774.07 | | | |
| INST | | A | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INST | | B | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INST | | C | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INST | | D | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INST | | E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INST | | F | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ROW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Expenditures | | | 3552.22 | 3298.13 | 12346.2 | 25238.4 | 837.303 | 2685.44 | 7670.03 | 30361.9 | 118541 | 1772.71 | 188227 | 44561.4 | 136907 | 1610897 | 1141.77 | 83553.8 | 25750.3 | 439530 | 1542314 | 11231 | 54372.2 | 5446619 | 837017 | 101153 | 62783 | 6312910 | 970146 | 1204521 |

# Appendix A (continued)

| COMM crop | COMM live | COMM ret | COMM ser | COMM prod | COMM OUTSIDE | FACT HL | FACT FL | FACT LAND | FACT K | FACT PURCH | INST A | INST B | INST C | INST D | INST E | INST F | ROW | Total Income |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3552.2183 | | | | | | | | | | | | | | | | | | 3552.22 |
| | 3298.1317 | | | | | | | | | | | | | | | | | 3298.13 |
| | | 12346.196 | | | | | | | | | | | | | | | | 12346.20 |
| | | | 25238.411 | | | | | | | | | | | | | | | 25238.41 |
| | | | | 837.30259 | | | | | | | | | | | | | | 837.30 |
| 2685.4394 | | | | | | | | | | | | | | | | | | 2685.44 |
| | 7670.0311 | | | | | | | | | | | | | | | | | 7670.03 |
| | | 30361.934 | | | | | | | | | | | | | | | | 30361.93 |
| | | | 118541.36 | | | | | | | | | | | | | | | 118541.36 |
| | | | | 1772.7122 | | | | | | | | | | | | | | 1772.71 |
| 188227.31 | | | | | | | | | | | | | | | | | | 188227.31 |
| | 44561.448 | | | | | | | | | | | | | | | | | 44561.45 |
| | | 136907.25 | | | | | | | | | | | | | | | | 136907.25 |
| | | | 1610897.2 | | | | | | | | | | | | | | | 1610897.24 |
| | | | | 1141.7747 | | | | | | | | | | | | | | 1141.77 |
| 83553.792 | | | | | | | | | | | | | | | | | | 83553.79 |
| | 25750.318 | | | | | | | | | | | | | | | | | 25750.32 |
| | | 439530.09 | | | | | | | | | | | | | | | | 439530.09 |
| | | | 1542314.1 | | | | | | | | | | | | | | | 1542314.09 |
| | | | | 11230.99 | | | | | | | | | | | | | | 11230.99 |
| | 54372.196 | | | | | | | | | | | | | | | | | 54372.20 |
| | | 5446619.3 | | | | | | | | | | | | | | | | 5446619.26 |
| | | | 837017.22 | | | | | | | | | | | | | | | 837017.22 |
| | | | | 101153.06 | | | | | | | | | | | | | | 101153.06 |
| | 62782.986 | | | | | | | | | | | | | | | | | 62782.99 |
| | | 6312910.3 | | | | | | | | | | | | | | | | 6312910.31 |
| | | | 970145.77 | | | | | | | | | | | | | | | 970145.77 |
| | | | | 1204520.7 | | | | | | | | | | | | | | 1204520.68 |
| | | | | | | | | | | | 3552.2183 | 2685.4394 | 188227.31 | 83553.792 | | | | 278018.76 |
| | | | | | | | | | | | 3298.1317 | 7670.0311 | 44561.448 | 25750.318 | 54372.19617 | 62782.9858 | | 198435.11 |
| | | | | | | | | | | | 89342.939 | 212310.53 | 409485.13 | 575765.16 | 3910639.302 | 4515572.831 | 133617.9 | 12378675.03 |
| | | | | | | | | | | | 17176.594 | 34466.19 | 86259.948 | 68858.196 | 1916193.641 | 2212608.036 | 243922.4 | 5104154.10 |
| | | | | | | | | | | | 2823.9166 | 4927.0288 | 23897.567 | 31907.741 | 425480.7796 | 491298.0463 | 162088.7 | 1320656.51 |
| | | | | | | | | | | | | | | | | | | 11916580.77 |
| | | | | | | | | | | | | | | | | | 537456.4 | 1074912.71 |
| | | | | | | | | | | | | | | | | | 1.31E-10 | 1621489.52 |
| | | | | | | | | | | | | | | | | | | 158578.81 |
| | | | | | | | | | | | | | | | | | | 1776135.63 |
| | | | | | | | | | | | | | | | | | | 34855.35 |
| | | | | | | 5083.9032 | 5686.0393 | 2214.5469 | 9009.3129 | | | | | | | | 131564 | 153557.85 |
| | | | | | | 12180.799 | 23125.612 | 2952.8333 | 32750.743 | | | | | | | | 266858.8 | 337868.80 |
| | | | | | | 45052.755 | 50388.791 | 85185.462 | 458566.41 | | | | | | | | 367744.2 | 1006937.61 |
| | | | | | | 15817.507 | 30030.01 | 39288.19 | 407398.89 | | | | | | | | 521576 | 1014110.59 |
| | | | | | | 487319.7 | 545037.71 | 13430.139 | 389548.39 | | | | | | | | 7763811 | 9199147.05 |
| | | | | | | 509458.05 | 967221.36 | 15507.636 | 478861.88 | | | | | | | | 8651106 | 10622155.42 |
| | | | | | 11916581 | | | | | 34855.35 | 37364.049 | 75809.582 | 254506.2 | 228275.38 | 2892461.129 | 3339893.526 | | 18779745.99 |
| 278018.76 | 198435.11 | 12378675 | 5104154.1 | 1320656.5 | 11916581 | 1074912.7 | 1621489.5 | 158578.81 | 1776135.6 | 34855.35 | 153557.85 | 337868.8 | 1006937.6 | 1014110.6 | 9199147.047 | 10622155.42 | 18779746 | |

# Appendix B. A nested SAM for Region 2

| Sam Account | ACT A crop | ACT A live | ACT A ret | ACT A ser | ACT A prod | ACT B crop | ACT B live | ACT B ret | ACT C crop | ACT C live | ACT C ret | ACT C ser | ACT D crop | ACT D live | ACT D ret | ACT D ser | ACT E crop | ACT E live | ACT E ret | ACT E ser | ACT E prod | ACT F crop | ACT F live | ACT F ret | ACT F ser | ACT F prod |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ACT A crop | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT A live | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT A ret | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT A ser | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT A prod | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT B crop | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT B live | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT B ret | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT C crop | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT C live | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT C ret | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT C ser | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT D crop | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT D live | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT D ret | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT D ser | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT E crop | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT E live | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT E ret | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT E ser | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT E prod | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT F crop | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT F live | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT F ret | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT F ser | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ACT F prod | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COMM crop | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COMM live | | | | | | | | | | | | | | | | | | | | | | | | | | |
| COMM ret | | | 785.73 | 31.4227 | 14.5238 | | | 260.085 | | | 8929.87 | 1766.27 | | | 42114.1 | 2484.18 | | | 22745.9 | 2136.73 | 395.639 | | | 77298.4 | 2165.51 | 4119.47 |
| COMM ser | | | 388.161 | 75.3202 | 26.375 | | | 128.485 | | | 4411.47 | 4233.76 | | | 20804.9 | 5954.57 | | | 11236.8 | 5121.76 | 718.477 | | | 38186.4 | 5190.73 | 7480.92 |
| COMM prod | | | 133.827 | 11.3603 | | | | 44.2981 | | | 1520.95 | 638.562 | | | 7172.92 | 898.107 | | | 3874.11 | 772.496 | | | | 13165.6 | 782.9 | |
| COMM OUTSIDE | | | 6272.14 | 455.702 | 814.825 | | | 2076.15 | | | 71283.2 | 25615 | | | 336178 | 36026.3 | | | 181571 | 30987.6 | 22196.5 | | | 617039 | 31404.9 | 231114 |
| FACT HL | 415.491 | 103.46 | 565.394 | 38.8549 | 7.052 | 99.4562 | 171.792 | 187.151 | 106.99 | 377.617 | 6425.73 | 2184.04 | 166.741 | 588.502 | 30304.3 | 3071.75 | 742.953 | 13382.8 | 16367.4 | 2642.13 | 192.102 | 777.81 | 14010.7 | 55622.2 | 2677.71 | 2000.21 |
| FACT FL | 2635.34 | 23.8727 | 1569.63 | 54.4506 | 165.476 | 630.823 | 39.6396 | 519.565 | 678.611 | 87.1323 | 17839 | 3060.67 | 1057.59 | 135.792 | 84130.2 | 4304.69 | 4712.35 | 3087.99 | 45438.9 | 3702.62 | 4507.71 | 4933.43 | 3232.87 | 154417 | 3752.49 | 46935.1 |
| FACT LAND | 2628.19 | 17.4819 | | | | 629.11 | 29.028 | | 676.768 | 63.8069 | | | 1054.72 | 99.4406 | | | 4699.55 | 2261.33 | | | | 4920.04 | 2367.42 | | | |
| FACT K | 503.68 | 268.2 | 636.755 | 301.098 | 13.7339 | 120.566 | 445.336 | 210.773 | 129.699 | 978.898 | 7236.76 | 16924.7 | 202.132 | 1525.58 | 34129.2 | 23803.8 | 900.647 | 34692.4 | 18433.3 | 20474.6 | 374.124 | 942.901 | 36320 | 62642.5 | 20750.3 | 3895.45 |
| FACT PURCH | 128.62 | 32.1993 | | | | 30.7879 | 53.4656 | | 33.1202 | 117.523 | | | 51.6166 | 183.156 | | | 229.99 | 4165.06 | | | | 240.781 | 4360.47 | | | |
| INST A | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INST B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INST C | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INST D | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INST E | | | | | | | | | | | | | | | | | | | | | | | | | | |
| INST F | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ROW | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Expenditures | 6311.32 | 445.214 | 10351.6 | 968.209 | 1041.99 | 1510.74 | 739.261 | 3426.5 | 1625.19 | 1624.98 | 117647 | 54423.1 | 2532.8 | 2532.47 | 554834 | 76543.4 | 11285.5 | 57589.6 | 299667 | 65837.9 | 28384.5 | 11815 | 60291.5 | 1018371 | 66724.6 | 295546 |

# Appendix B (continued)

| Sam Account | | | COMM crop | COMM live | COMM ret | COMM ser | COMM prod | COMM OUTSIDE | FACT HL | FACT FL | FACT LAND | FACT K | FACT PURCH | INST A | INST B | INST C | INST D | INST E | INST F | ROW | Total Income |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ACT | A | crop | 6311.323815 | | | | | | | | | | | | | | | | | | 6311.32 |
| ACT | A | live | | 445.21436 | | | | | | | | | | | | | | | | | 445.21 |
| ACT | A | ret | | | 10351.633 | | | | | | | | | | | | | | | | 10351.63 |
| ACT | A | ser | | | | 968.20856 | | | | | | | | | | | | | | | 968.21 |
| ACT | A | prod | | | | | 1041.9864 | | | | | | | | | | | | | | 1041.99 |
| ACT | B | crop | 1510.743185 | | | | | | | | | | | | | | | | | | 1510.74 |
| ACT | B | live | | 739.26098 | | | | | | | | | | | | | | | | | 739.26 |
| ACT | B | ret | | | 3426.5043 | | | | | | | | | | | | | | | | 3426.50 |
| ACT | C | crop | 1625.189313 | | | | | | | | | | | | | | | | | | 1625.19 |
| ACT | C | live | | 1624.9781 | | | | | | | | | | | | | | | | | 1624.98 |
| ACT | C | ret | | | 117647 | | | | | | | | | | | | | | | | 117647.00 |
| ACT | C | ser | | | | 54423.091 | | | | | | | | | | | | | | | 54423.09 |
| ACT | D | crop | 2532.795366 | | | | | | | | | | | | | | | | | | 2532.80 |
| ACT | D | live | | 2532.4661 | | | | | | | | | | | | | | | | | 2532.47 |
| ACT | D | ret | | | 554833.69 | | | | | | | | | | | | | | | | 554833.69 |
| ACT | D | ser | | | | 76543.444 | | | | | | | | | | | | | | | 76543.44 |
| ACT | E | crop | 11285.49311 | | | | | | | | | | | | | | | | | | 11285.49 |
| ACT | E | live | | 57589.607 | | | | | | | | | | | | | | | | | 57589.61 |
| ACT | E | ret | | | 299667 | | | | | | | | | | | | | | | | 299667.00 |
| ACT | E | ser | | | | 65837.911 | | | | | | | | | | | | | | | 65837.91 |
| ACT | E | prod | | | | | 28384.549 | | | | | | | | | | | | | | 28384.55 |
| ACT | F | crop | 11814.9635 | | | | | | | | | | | | | | | | | | 11814.96 |
| ACT | F | live | | 60291.482 | | | | | | | | | | | | | | | | | 60291.48 |
| ACT | F | ret | | | 1018370.7 | | | | | | | | | | | | | | | | 1018370.72 |
| ACT | F | ser | | | | 66724.577 | | | | | | | | | | | | | | | 66724.58 |
| ACT | F | prod | | | | | 295545.56 | | | | | | | | | | | | | | 295545.56 |
| COMM | | crop | | | | | | | | | | | | 6311.3238 | 1510.7432 | 1625.1893 | 2532.7954 | 11285.49311 | 11814.963 | | 35080.51 |
| COMM | | live | | | | | | | | | | | | 445.21436 | 739.26098 | 1624.9781 | 2532.4661 | 57589.60742 | 60291.482 | | 123223.01 |
| COMM | | ret | | | | | | | | | | | | 25214.527 | 22056.38 | 136679.86 | 214386.93 | 703844.7445 | 736866.34 | 1.74623E-10 | 2004296.54 |
| COMM | | ser | | | | | | | | | | | | 9557.0456 | 1877.5696 | 9993.9076 | 10971.707 | 62510.23272 | 65442.964 | 185.7299555 | 264497.23 |
| COMM | | prod | | | | | | | | | | | | 745.63279 | 390.9305 | 1053.0995 | 1641.2153 | 45993.91643 | 48151.768 | 197980.4416 | 324972.09 |
| COMM | | OUTSIDE | | | | | | | | | | | | | | | | | | | 1593034.37 |
| FACT | | HL | | | | | | | | | | | | | | | | | | 153230.426 | 306460.85 |
| FACT | | FL | | | | | | | | | | | | | | | | | | 4.54747E-13 | 391652.81 |
| FACT | | LAND | | | | | | | | | | | | | | | | | | | 19446.89 |
| FACT | | K | | | | | | | | | | | | | | | | | | | 286857.19 |
| FACT | | PURCH | | | | | | | | | | | | | | | | | | | 9626.79 |
| INST | | A | | | | | | | 5958.8641 | 3405.2008 | 2645.6712 | 1723.4665 | | | | | | | | 31485.05897 | 45218.26 |
| INST | | B | | | | | | | 7810.0083 | 15499.129 | 658.13837 | 776.67469 | | | | | | | | 6496.277083 | 31240.23 |
| INST | | C | | | | | | | 40453.759 | 23117.355 | 740.57536 | 25270.105 | | | | | | | | 65865.74253 | 155447.54 |
| INST | | D | | | | | | | 53065.367 | 105309.36 | 1154.1584 | 59660.745 | | | | | | | | 15877.29159 | 235066.92 |
| INST | | E | | | | | | | 106817.8 | 61041.175 | 6960.8855 | 74874.998 | | | | | | | | 757813.5638 | 1007508.42 |
| INST | | F | | | | | | | 92355.051 | 183280.58 | 7287.4625 | 124551.2 | | | | | | | | 647302.4116 | 1054776.71 |
| ROW | | | | | | | | 1593034.4 | | | | | 9626.7862 | 2944.5182 | 4665.3438 | 4470.5002 | 3001.8046 | 126284.4308 | 132209.19 | | 1876236.94 |
| Total Expenditures | | | 35080.50829 | 123223.01 | 2004296.5 | 264497.23 | 324972.09 | 1593034.4 | 306460.85 | 391652.81 | 19446.891 | 286857.19 | 9626.7862 | 45218.262 | 31240.228 | 155447.54 | 235066.92 | 1007508.425 | 1054776.7 | 1876236.943 | |

## Appendix C: Codes and abbreviations

| SAM Accounts | | Input Sheet Elements | |
|---|---|---|---|
| ACT | Activity | FD | Factor Demand |
| COMM | Commodity | Beta, se | Factor value share, with standard error |
| FACT | Factor | Acobb, acobbse | Shift parameter on production function, with standard error |
| INST | Institution | Alpha, alphase | Budget share in consumption, with standard error |
| A, B, C, D, E, F | Household groups | Endow | Factor endowment |
| Crop | Locally grown agricultural crops | Zoiendow | Endowment of factor in the economy (for hired labor) |
| Live | Locally bred livestock | Rocendow, Rowendow | Endowment of factor in the rest of the country and rest of the world (respectively) |
| Ret | Local Retail activity | Transfin, transfinse | Share of income from interhousehold transfers, with standard error |
| Ser | Local Services | Transfout, transfoutse | Share of income transferred to other households, with standard error |
| Prod | Non-Agricultural production | Sav, savse | Savings rate, with standard error |
| OUTSIDE | Goods produced outside of the treatment site | EXPZOI | Expenditure share in nearby villages |
| PURCH | Purchased inputs | EXPROCO | Expenditure share in rest of country |
| HL, FL | Hired and Family Labor | NONSCtransfers | Other external transfers |
| K | Capital | Remits | Remittances |
| | | NumberHH | Number of households in the group |