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Poverty, Growth and Income Inequality in Kenya: A SAM Perspective

Rhoda Gakuru
Naomi Mathenge

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THE KENYA INSTITUTE FOR PUBLIC POLICY RESEARCH AND ANALYSIS (KIPPRA)

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Rhoda Gakuru
Naomi Mathenge

Macroeconomics Division
Kenya Institute for Public Policy
Research and Analysis

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Bishops Garden Towers, Bishops Road
P.O. Box 56445, Nairobi, Kenya
tel: +254 20 2719933/4; fax: +254 20 2719951
email: **admin@kippra.or.ke**
website: http://www.kippra.org

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Abstract

This study seeks to highlight the levels of income inequality in Kenya and its implications on various policy options targeted at reducing poverty. The 2003 Kenya SAM is used to develop a multiplier simulation model, which tracks the linkages among the demand-driven shocks on economic growth, income generation and consequently income distribution implications on different economic groups.

In the first section of the multiplier analysis, we determine the major sectors that can be used to promote generalized economic development in Kenya. Trade, hotels and restaurants sectors, manufacturing sector and agriculture sector are among the major sectors in Kenya that play the highest role in the development of the domestic economy. The study further decomposed the global multipliers to highlight in microscopic detail the linkages between each household group income and productive sector accounts (agriculture and manufacturing), whose income has been exogenously injected.

The empirical results from the multiplier analyses show that due to high inequality in Kenya, stimulation of growth in agriculture and manufacturing sectors mainly benefit the richest urban household deciles, who own most of the factors of production. Kenya will need to focus not only on economic growth, but also on inequality in order to effectively tackle poverty in the country. Based on the major sectors selected for this study, agriculture has higher direct effects on the incomes of rural households, while manufacturing has higher direct effects on the incomes of urban households.

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1. Introduction

In Kenya, inequality manifests itself in various dimensions, including access to basic social amenities, access to opportunities, inequalities in levels of income as well as inequalities arising due to gender bias. This study focuses on income inequality, as it is the most direct way to assess disparities in consumption levels in various economic groups.

The study highlights the levels of income inequality in Kenya, and its implications on various policy options targeted at reducing poverty. Using the Kenya 2003 Social Accounting Matrix (SAM), a multiplier analyses is conducted to identify and examine the effects of the different policy options on the various household incomes. SAM and multiplier decomposition models link household income to the country's productive structure. This type of model can be used in policies linked to reduction of poverty, and more specifically to household income redistribution. In Kenya, studies mainly focus either on growth, poverty or income distribution independently. Studies focusing on the three issues are mainly qualitative as opposed to quantitative.

This study assesses both direct and indirect effects of an exogenous injection to various sectors in the economic system on incomes of different household groups. The main contribution that this study makes to the debate on income inequality in Kenya is the microscopic analysis of the global multipliers from the 2003 Kenya SAM to show the transmission mechanism of household income from an injection into production sectors (agriculture and manufacturing).

The study is organized as follows: Section one gives an overview of the relationship between poverty, growth and inequality; section two looks at the existing literature; section three focusses on the methodology used, while the results are in section four. The study is then summarized, policy recommendations and suggestions for future research are provided in section five and six, respectively.

1.1 Poverty, Growth and Inequality in Kenya

Absolute poverty refers to the inability of individuals/households to attain a predetermined minimum level of consumption at which basic needs of a society are assumed to be satisfied. Table 1.1 provides national and regional absolute poverty measures in Kenya. Substantial regional differences in the incidence of poverty exist in Kenya. About half of the

Table 1.1: Summary of poverty estimates in Kenya

Year	Data source	Poverty indices		
		National (%)	Rural (%)	Urban (%)
1992	1992 WMS I	-	46.00	29.30
1994	1994 WMS I	40	46.80	29
1944	1994 WMS II	38.80	39.70	28.90
1997	7997 WMS III	52.30	52.90	49.20
2000	Mwabu *et al.*, 2002 WMS III	56.80	59.60	51.50
2005	KIHBS	45.90	49.10	33.70

Source: Wambugu and Munga (2009)

rural population and between 29 to 50 per cent of the urban population were poor in the 1990s and 2000s. Rural poverty is marked by its common connection to agriculture and land, whereas urban poverty is more heterogeneous in how incomes are generated (Wambugu and Munga, 2009). Generally, about half of the population in Kenya cannot meet the minimum level of basic needs and thus live in poverty.

According to Thurlow et al. (2007), accurate comparison of poverty over time is difficult in Kenya because the last three household surveys used different designs and implementation methods. For instance, the 1992 Welfare Monitoring Survey (WMSI) covered half of the country, the 1994 WMS (II) covered all districts, while the 1997 WMS (III) excluded North Eastern Province. With the above limitations in mind, the estimates in Table 1.1 suggest that there was a decline in poverty nationally as well as in both rural and urban areas.

Income inequality generally refers to the disparity in levels of income among individuals/households in the economy. Income inequality is thus a narrow way of looking at overall inequality in a given community, but it is the most direct way to assess disparities in consumption levels in various economic groups. The most common approach used to measure inequality is the Gini coefficient based on the Lorenz curve. It assesses inequality in income and consumption. The Gini coefficient ranges between zero and one, with the values closer to one indicating greater inequality.

Available estimates of the Gini coefficient for Kenya show that inequality has been increasing in the country. According to the available household surveys,[1] the country's Gini based on general household income was estimated at 0.419 in 1997, compared to 0.459 in 2005/06.

Table 1.2 compares household data from the 1997 welfare monitoring survey and 2005/06 KIHBS. The households are first grouped into rural and urban, and then divided into 10 household groups. These groups are ranked from the poorest (1) to the richest (10). Inequality is higher in urban areas than in rural areas. Comparing the average expenditure of the poorest and richest deciles in 2005/06, 39 per cent of average expenditure by urban households is by the country's top 10 per cent urban households, while only 2 per cent of average expenditure by urban households is by the bottom 10 per cent urban households. According to the 2005/06 KIHBS, the richest rural decile spends 29 per cent of average expenditure of the rural households, while the poorest rural decile spends only 2 per cent.

Economic growth increased significantly from 0.27 in 1997 to 6.3 per cent in 2006, and per capita incomes in 2005/06 were just about 1997 levels as shown in Figure 1.1, while poverty decreased from 52.3 per cent in 1997 to 45.9 per cent in 2005/06. Although the proportion of the population living in poverty has declined, the number of those

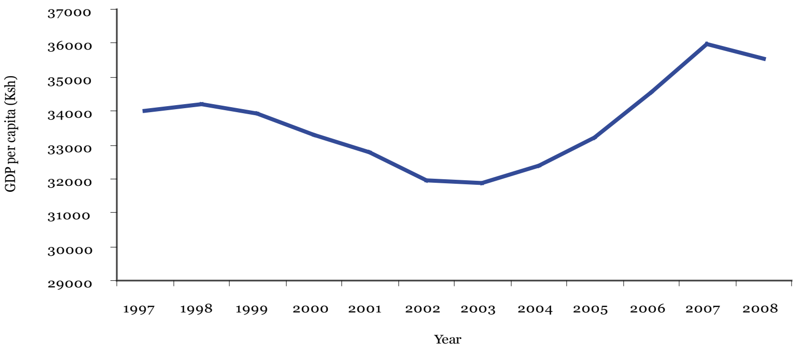
Table 1.2: Average rural and urban expenditure by decile, 2005/06 and 1997

Decile	2005/2006				1997			
	Rural	Share (%)	Urban	Share (%)	Rural	Share (%)	Urban	Share (%)
1 (Poorest)	466	2	1,100	2	444	3	1,009	3
2	813	4	1,888	3	609	4	1,525	4
3	1,038	5	2,404	4	755	5	1,809	5
4	1,244	6	2,955	5	914	6	2,123	5
5	1,458	7	3,578	6	1,088	7	2,455	6
6	1,719	9	4,288	7	1,283	8	2,869	7
7	2,039	10	5,009	9	1,531	10	3,502	9
8	2,473	12	6,058	10	1,862	12	4,469	11
9	3,147	16	8,202	14	2,402	16	6,422	16
10 (Richest)	5,741	29	22,823	39	4,589	30	13,756	34

Source: World Bank (2008)

[1] Although widely used to measure inequality, Gini coefficients should be interpreted with caution because of the size and type of data used for their calculation. 1997 coefficient was based on WMS111, while the 1999 coefficient used LFS 98/99. The two surveys have different samples collected at different times of the day, which will affect the Gini co-efficient calculated such that the two might not compare directly.

Figure 1.1: Real per capita GDP in Kenya (1997-2008)



Source: Government of Kenya, Economic Survey (Various issues)

living below the poverty line is estimated to have increased from 13.4 million in 1997 to about 16.6 million in 2006 (KIPPRA, 2009). The Gini coefficient increased slightly from 0.419 in 1997 to 0.459 in 2005/06 implying increased inequality.

It has been argued that the increase in growth between 2003 and 2006 positively affected only a few groups in the society, leaving out those without ownership of factors of production such as land and capital as well as those without the relevant skills for employment. This led to increased inequality in income distribution, such that even though there was an increase in per capita income growth, only a small part of the society benefited, while the rest were not able to tap into the resources generated by the increase in growth. Such scenarios have led to what is commonly referred to as "an unequal distribution of the national cake". High inequality in Kenya has been blamed for poor development in the country.[2]

Rapid economic growth is viewed as the key to alleviating poverty in Kenya (Wambugu and Munga, 2009). All core public policy documents emphasize rapid and sustained economic growth as a way of alleviating poverty. Some of the policy documents include:

[2] Inequality in distribution of consumption gains, 1997-2005/06. Average welfare gains over the period 1997-2005/06 as a whole were very much concentrated, in particular amongst the wealthiest quintiles, urban residents, and in terms of provinces, Nairobi (especially), Nyanza and Eastern. For many other groups, the aggregate improvement over the period was very limited and practically stagnant. Most striking are the findings that the poorest quintile lost out in absolute terms, and gains for the second bottom quintile were only about one per cent annually. Even for the middle quintile, growth in consumption was below average (World Bank, 2008).

- National Poverty Eradication Plan (1999-2015)
- Economic Recovery Strategy for Wealth and Employment Creation (ERSWEC) 2002-2007
- Vision 2030

To a large extent, the development policies were on the right path, as there was an increase in GDP growth between 1997 and 2005/06. Despite the significant increase in economic growth, poverty decreased only slightly and inequality levels increased. Although changes in poverty depend on economic growth and changes in income inequality, the responsiveness of poverty to these variables depends on the degree of initial inequality (Wambugu and Munga, 2009). According to Bourguignon (2004), the optimal economic growth-income distribution policy mix would have to vary across countries. Changing income distribution is more important for reducing poverty in highly unequal economies, while economic growth is relatively more important for poverty reduction in countries with low inequality. From this context, Kenya will need to focus not only on economic growth, but also on inequality in order to effectively tackle poverty in the country.

2. Literature Review

The relationship between poverty, growth and inequality has been widely explored in recent years. The extent to which the poor gain from economic growth is a major topic in development policy analysis and discussions. Traditionally, it was widely believed that gains from rapid economic growth would automatically trickle down to the poor, hence the main task for development policy was to increase growth by various policy instruments. However, recent empirical studies show that economic growth and poverty reduction move together, but the response of poverty to growth varies across countries. Consequently, the question of how sensitive poverty is to economic growth has become the subject of extensive research.

The relationship between growth and poverty is complex and depends, to a large extent, on the relationship between growth and inequality (Datt and Ravallion, 1992). If there is a rise in inequality while the economy is growing, this may not only offset the poverty-reducing effects of growth, but also retard subsequent growth through an increased emphasis on redistribution in favour of non-accumulable factors (Ghosh and Pal, 2004). Thus, understanding the sources or causes of inequality and its relationships with poverty is crucial in formulating appropriate policy responses for fighting poverty.

Some recent empirical evidence tends to confirm the negative impact of inequality on growth.[3] Others have found that the level of initial income inequality is not a robust explanatory factor of growth, though high inequality in the distribution of assets such as land has a significantly negative effect on growth (Bigsten and Levin, 2001). The implication of these relationships is that economic growth is necessary but not sufficient for poverty reduction (Wambugu and Munga, 2009). A recurring issue in discussions on development is whether the main focus of development strategies should be placed on growth or poverty, and/or on inequality. Poverty reduction requires economies to address inequality and economic structures, in addition to sustaining high levels of economic growth. It is widely agreed that rapid elimination of absolute poverty is a meaningful goal for development, and to achieve the goal of rapidly reducing absolute poverty requires strong, country-specific combinations of growth and distribution policies.

[3] For a comprehensive review of literature on Poverty, Growth and Inequality (PGI triangle), refer to the study by Bigsten and Levin (2001) where they have conducted a review of recent literature on this relationship.

Recent studies by Round (2003), Pyatt and Round (2004), Civardi and Lenti (2008) and Pansini (2008) have demonstrated the importance of the SAM and multiplier decomposition models in the analysis of income distribution by linking household income to the country's productive structure. This type of model can be used in policies linked to reduction of poverty and more specifically to household income redistribution. SAM decomposition models provide a structure for examining the potential effects of exogenous policy or external shocks on incomes, expenditure and employment of different household groups, in a fixed price setting (Round, 2003).

Studies by Bottiroli (1990), Bottiroli and Targetti (2002), Bottiroli and Targetti (2007) and Jami (2006) used a SAM based analysis to develop a multiplier simulation model, which enables tracking and quantifying the nature and extent of the linkages in the economic growth, income generation and concomitant poverty and distribution implications from different socio-economic groups. Jami (2006) showed that in Bangladesh, the sectoral growth patterns impart differential income impacts on various socio-economic groups. The impact of the growth stimuli that originated from agricultural sectors would be different for different households from growth stimuli originating from the manufacturing sector. Thus, different growth patterns would bear diverse poverty and inequality implications in Bangladesh.

Pansini (2008) looked at income distribution in different households in Vietnam. The study showed how to assess both direct and indirect effects of an exogenous income injection on mean incomes of different household groups. Using the decomposition of SAM based multipliers technique, the study enlightened in microscopic detail the linkages between each household endowment in terms of factors, the features of the productive system, and shed light on the most powerful links among different components of the economic system affecting the distribution of income. Empirical results using Vietnamese SAM 2000 show that the highest effects are related to injections in agriculture and injections to the less skilled labour force. This type of multiplier decomposition allows the study to show which production sectors would increase incomes of low income households, thus presenting a policy option for improving the distribution of income. A similar study by Civardi and Lenti (2008) also successfully applied this methodology to the Italian economy. Results showed that indirect effects were lower than direct effects, implying that injections in agriculture and public Administration sectors did not generate increased intermediate demand and did not create significant extra income for all the household groups.

Using the Kenya 2003 SAM as our main source of data, we derive the accounting fixed price multipliers matrix.[4] The decomposition of SAM based multipliers technique is then used (Pyatt and Round, 2006) to decompose each element of the accounting price multiplier matrix to enlighten in "microscopic detail," the linkages between each household group's income and other accounts whose income has been exogenously injected.

[4] See equation 3 under methodology for definition of accounting fixed price multipliers matrix.

3. Methodology

3.1 The Kenya 2003 SAM

A Social Accounting Matrix (SAM) is a logical arrangement of statistical information concerning income flows in a country's economy within a particular time period, usually one year (Huseyin, 1996). As such, it links production activities, factors of production and institutions, among other accounts. It captures the circular interdependence characteristic of any economic system. Depending on the degree of disaggregation, the SAM can provide a conceptual basis to study the distribution of factor incomes and, consequently, income inequality in a country within a single framework.

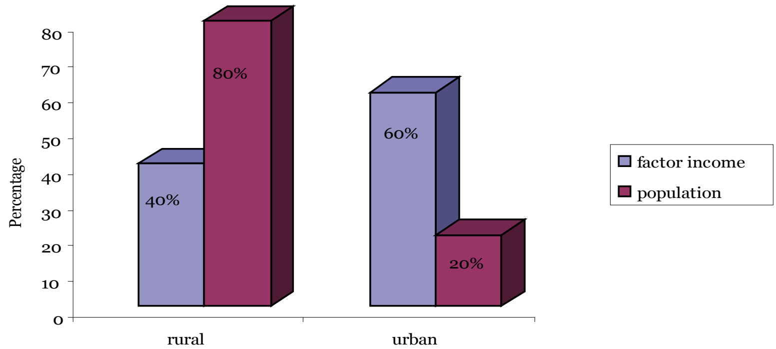
There has only been about two major Social Accounting Matrices developed for Kenya since independence (1963). The first SAM was developed in 1976 by Vandermoortele (ILO) and the second was developed in 2003 by KIPPRA and IFPRI. Construction of the Kenya 2003 SAM was necessitated by lack of an up to date tool for analyzing policies in Kenya, especially at the sectoral level, as well as the need for a highly disaggregated SAM (Kiringai *et al.*, 2007). There has also been a regional SAM based on the 2003 National SAM as well as a Vision 2030 SAM based on the 2003 National SAM.

The aggregated Kenya 2003 SAM in Table 3.1 shows total aggregate demand as 1,878,092 million and value added as 1,010,400 million. Total factor income was Ksh 1,010,400 million of which 46 per cent went to households. From the disaggregated SAM, the income share of rural households is 39.90 per cent, while that of urban households is 60.10 per cent. This shows that rural households have relatively low incomes, given that rural population accounts for about 80 per cent of total population in Kenya, while urban areas in Kenya account for only 20 per cent of the population[5] (Figure 3.1).

Though Kenya's SAM 2003 is set up in a standard basic framework, the choice of level of disaggregation depends on the objective of the study and on the availability of data. For a SAM to be useful in income distribution analysis, the SAM should give a high level of detail about the circular flow of income, showing transactions between various

[5] United Nations Population Division, World Urbanization Prospects: The 2007 Revision Population Database.

Figure 3.1: Factor incomes and population distribution in Kenya



Source: United Nations population division, World Urbanization Prospects: The 2007 Revision Population Database and the Kenya 2003 National SAM

institutions with production activities. As such, the institutions category (enterprises and households) data needs to be highly disaggregated.

The Kenya 2003 micro SAM is highly disaggregated. It is divided into 6 standard accounts: production account (activities and commodities), factors of production (labour, land and capital), institutions (enterprises and households), government (a government account and taxes), capital account (savings/investment) and the rest of the world account.

Household income data is highly disaggregated in the Kenya 2003 micro SAM. The household income data is first divided into two broad categories using location–rural and urban. From each location (rural/urban), the household income data is arranged in an ascending order, where the total population (in each region) is divided into 10 equal groups or deciles. The top decile represents 10 per cent of the population households, with the highest income and the bottom decile representing the 10 per cent of the population households with the lowest income. For a more detailed explanation of the 2003 National SAM, refer to the study by Kiringai *et al.* (2007).

3.2 The Model

The SAM is a conceptual representation of statistical data. It does not constitute a model. We need to transform the SAM into an economic model that can simulate the effects of shock/injections from the exogenous variables to the endogenous variables and analyse how

Table 3.1: Kenya SAM 2003 (Ksh Millions)

	Activities	Commodities	Factors	Enterprises	Households	Taxes	Govt	Capital	Rest of the World	Total
Activities		1,783,049			95,043					1,878,092
Commodities	867,692	117,117			772,972		202,913	196,723	281,387	2,438,804
Factors	1,010,400									1,010,400
Enterprises			544,860				41,297		4,909	591,066
Households			461,261	335,194			17,898		91,014	905,367
Taxes		131,756		37,053	33,603					202,412
Govt			4,279	7,332	6,298	202,412			5,677	225,998
Savings				204,248	-2,549		-36,286	17,498	31,310	214,221
Rest of the World		406,882		7,239			176			414,297
Total	1,878,092	2,438,804	1,010,400	591,066	905,367	202,412	225,998	214,221	414,297	

the effects are transmitted through the interdependent SAM system. The total direct and indirect effects of the injection on the endogenous accounts, that is the total outputs of the different production activities and the incomes of the various factors and socio-economic groups, are estimated through the multiplier process (Thorbecke, 2000). To transform the SAM to an economic model, we make a few assumptions: all the relations are linear, prices are fixed, there exists excess capacity, and there also exists unemployed or underemployed labour resources. As long as excess capacity and a labour slack prevail, any exogenous change in demand can be satisfied through a corresponding increase in output without having any effects on prices (Pansini, 2008).

In developing a multiplier model using the SAM, each account should be designated as endogenous or exogenous. By design/ convention, accounts beyond the control of domestic institutions are made exogenous. In this case, Government (including taxes) savings/ investment and rest of the world accounts will be classified as exogenous. The endogenous accounts are therefore limited to production factors and institutions (households and enterprises). Defining the endogenous accounts in this way helps to focus on the interaction between two accounts–production and households, interacting through factors of production.

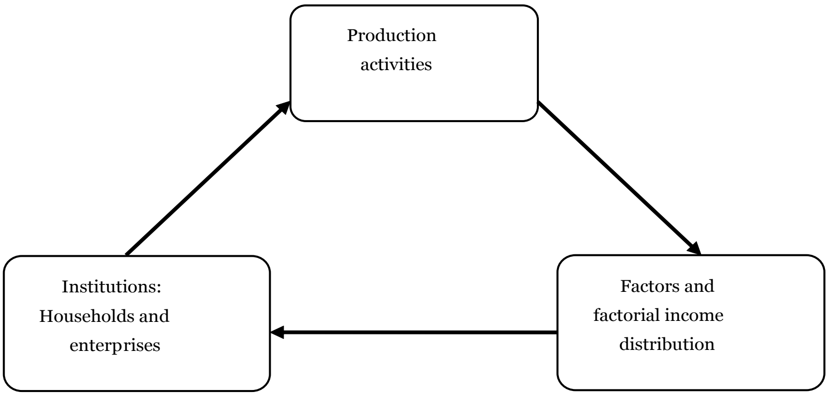
Figure 3.2 shows a simplified relationship among the endogenous accounts. Value added generated by various production activities is allocated as income accruing to the factors of production. Factorial income is distributed to institutions, including households and enterprises. Various institutions in turn spend their income on different commodities generated by the production activities.

Table 3.2 shows endogenous and exogenous accounts in the SAM as shown by Pansini 2008. For analytical purposes, the matrix of endogenous transactions is represented in summary form by the matrix T and can be used to define a matrix A_n of column shares by dividing elements in each column of T by its column total (Round, 2003).

$$T = A_n \cdot y \quad (1)$$

Where A_n (given by T/y) is defined as the matrix of average expenditure propensities; x is a column vector which represents the exogenous injections; and y is the total of each endogenous account, which shows total demand for products. Using these notations, the general model is given as:

Figure 3.2: Circular flow of income in the endogenous accounts



$$y = A_n \cdot y + x = (I - A_n)^{-1} \cdot x \quad (2)$$

$$y = Ma \cdot x \quad (3)$$

Ma is the "global multiplier matrix" or the "accounting fixed price multipliers matrix". The multiplier matrix *Ma* allows relating exogenous injections of income to the endogenous accounts. From the above equation, *y* is derived by multiplying the vector of exogenous injections with the multiplier matrix, which gives the overall effect of a change in any of the exogenous components. The global multiplier matrix shows the overall effects resulting from direct and indirect transfer, and closed loop processes generated by a change in the exogenous variables.

Table 3.2: Schematic representation of endogenous and exogenous accounts in a SAM

			Expenditures				
			Endogenous accounts			Exogenous accounts	
			Activities	Factors	Private institutions	Sum of other accounts	Total receipts
Receipts	Endogenous accounts	Activities	T11		T13	X1	Y1
		Factors	T21			X2	Y2
		Private institutions		T32	T33	X3	Y3
	Exogenous accounts	Sum of other accounts	L1	L2	L3	LX	Y4
		Total expenditures	Y1	Y2	Y3	Y4	

Source: Pansini (2008)

3.3 Multiplier Decomposition

Pyatt and Round (2006) multiplicative decomposition method is used where they decompose each element of the total multiplier matrix to show, in microscopic detail, the relative contribution of the forces operating behind the multiplier. This type of decomposition allows for the SAM to be used for policy analysis at household level.

According to Round 2003, the SAM multiplier analysis can give us some indication of the possible resultant effects of an exogenous shock on factoral and institutional distributions of income as well as on the structure of output. However, to create more transparency and in particular to examine the nature of linkage in the economy that leads to these outcomes, it is possible to decompose the SAM multipliers further.

The global multiplier matrix *Ma* can be decomposed into three multiplicative components (Box 1):

$$Ma = M_3 M_2 M_1 \quad (4)$$

M_1 is referred to as the 'transfer multiplier'. It represents the within group effects; that is the multiplier effects of an exogenous injection into one set of accounts will have on the same set of accounts. M_2 is referred to as the open-loop multiplier. It captures the cross/spill over effects, where effects of an exogenous injection into one endogenous account are transmitted to other endogenous accounts. M_3 is referred to as the closed loop multiplier. It shows the multiplier effects due to the full circular flow from exogenous accounts to endogenous accounts. "It represents the consequences of a change in *x* traveling around the entire system to reinforce the initial injection" (Pyatt and Round, 2006 as sited by Pansini, 2008).

From equation 3 and 4, we can write y as:

$$y = (M_3 M_2 M_1)\, x \quad (5)$$

Where M_1, M_2 and M_3 are all multiplier matrices.

As in Pansini (2008), when we focus on personal/household income distribution, the equation of interest is the equation on private institutions incomes (y_3):

$$y_3 = (M_{33} M_{32} M_{31})\, x \quad (6)$$

Box 1: Multiplicative decomposition

This decomposition technique is adopted from Pyatt and Round (1979). For more detailed description of this method refer to Pyatt and Round (1979) as well as Pansini (2008). The global multiplier matrix Ma can be decomposed into three multiplicative components:

$Ma = M_3 M_2 M_1$

To derive M_3, M_2, and M_1 we first define A_n and A_o and A* as shown below:

An=Average propensities

$$A_n = \begin{vmatrix} A_{11} & 0 & A_{13} \\ A_{21} & 0 & 0 \\ 0 & A_{32} & A_{33} \end{vmatrix}$$

A_o= Diagonal matrices of A_n

$$A_o = \begin{vmatrix} A_{11} & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & A_{33} \end{vmatrix}$$

$$M_1 = (I - Ao)\text{-}1 = \begin{vmatrix} {}_1M_{11} & 0 & 0 \\ 0 & I & 0 \\ 0 & 0 & {}_1M_{33} \end{vmatrix}$$

$A^* = (I - A_o)\text{-}1\ (A_n - A_o)$

$$M_2 = I + A^* + A^{*2} + A^{*3} = \begin{vmatrix} I & {}_2M_{12} & {}_2M_{13} \\ {}_2M_{21} & I & {}_2M_{23} \\ {}_2M_{31} & {}_2M_{32} & I \end{vmatrix}$$

$$M_3 = (I - A^{*3})\text{-}1 = \begin{vmatrix} {}_3M_{11} & 0 & 0 \\ 0 & {}_3M_{22} & 0 \\ 0 & 0 & {}_3M_{33} \end{vmatrix}$$

Hence, $M_a = [1 - A^{*3}]\ {-1}\ (I + A^* + A^{*2} + A^{*3})\ (I - A_o)^{-1}$

$$y_3 = M_{31}x_1\ M_{32}x_2\ M_{33}x_3 \quad (7)$$

Where: $M_{31} = {}_3M_{33}\ {}_2M_{31}\ {}_1M_{11}$ (8)

$M_{32} = {}_3M_{33}\ {}_2M_{32}$ (9)

$M_{33} = {}_3M_{33}\ {}_1M_{33}$ (10)

Equation 6 indicates that the sub-matrices of interest for this aim are represented, respectively by M_{33}, M_{32}, M_{31} describing the multiplier effects on the household income. We then use the "rAs" technique by Pyatt and Round (2006) to further decompose each element of the multiplier matrix. This technique allows us to assess the linkages between the different SAM accounts; it sheds light on the most powerful linkages among different components of the economic system affecting the distribution of income.

If m_{ij} is the (i, j) element of the matrix Ma, we can write it as:

$m_{i,j} = d'_i Ma d_j$

Substituting equation 4, we get:

$d'_i M_3 M_2 M_1 d_j = i'(\hat{r} A \hat{s})i$

Where d'_i and d_j are vectors in which, respectively, the i[th] element and the j[th] element are equal to one and all others are equal to zero (Pyatt and Round, 2006; Pansini, 2008; Civardi and Lenti, 2008). In vector *i*, all elements are equal to one (Pyatt and Round, 2006 and Pansini, 2008). Matrix *A* and vectors *r* and *s* are defined as follows:

$r' = d_i M_3$; $A = M_2$ $\hat{s} = M_1 d_j$

It follows that each $m_{i,j}$ must therefore be equal to the sum of all elements of an $\hat{r} A \hat{s}$ type transformation of the matrix M_2, when the vector r' is formed from the i^{th} row of M_3 and the vector *s* is formed from the j^{th} column of M_1 (Pyatt and Round, 2006).

The matrix $\hat{s}$ shows how the consequences of a particular injection into the account *j* "will be amplified as a result of transfer effects within the category of accounts in which the initial stimulus arises" and the matrix $A=M_2$ explains how these initial effects will spread across to accounts belonging to other categories, that is the so called open loop effect (Pyatt and Round, 2006). Finally, $\hat{r}$ "quantifies the consequences for account *i* of the circulation around the entire system of the stimuli generated via the first two mechanisms". All three mechanisms are important for diagnostic reasons, since they allow us to account for m_{ij} in a microscopic detail (Pyatt and Round, 2006).

This decomposition technique allows us to identify four different effects in which the single accounting multiplier m_{ij} can be divided into direct-direct effect, indirect-direct effect, direct-indirect effect and indirect-indirect effect (Pansini, 2008). Following Pansini (2008), these four different effects in which the single accounting multiplier m_{ij} can be explained are as follows:

(i) Direct-direct effect is the direct effect of an injection in the j[th] account of production activity on the i[th] household group, without considering any other indirect effect on other activity sectors or household groups.

(ii) Indirect-direct effect is the effect from other production sectors, different from the one affected by the exogenous injection, on the i^{th} household group. It captures the effect that an increase in the demand for j^{th} sector has on other sectors, and the effect on the i^{th} household group.

(iii) Direct-indirect effect is the effect from the j^{th} account of production affected by the exogenous injection on other household groups, different from the i^{th}. It captures the effect that an increase in the demand for j^{th} sector has on the income of other household groups, and the effect on the i^{th} household group.

(iv) Indirect-indirect effect is the effect from other accounts of production, different from the one affected by the exogenous injection on the other household groups, different from the i^{th}. It captures the effect that an increase in the demand of production of the j^{th} sector has on other sectors, and the effect on other household groups.

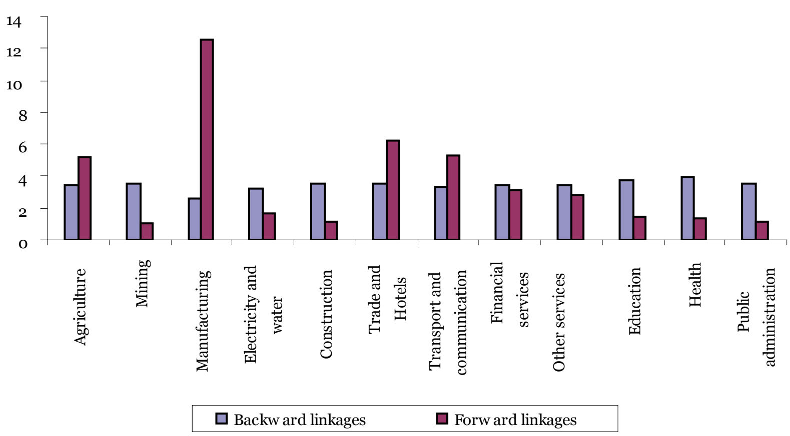
4. Analysis of Results

4.1 Sectoral Linkages

This section uses the *Ma* matrix derived in section 3 to conduct multiplier analysis and look at sectoral linkages in the Kenya 2003 SAM. The production activity sub-matrix shows that any injection into one production activity has different effects for the other activity incomes due to activation of the demand of intermediate goods. The diagonal elements of the production matrix in the *Ma* matrix show how much a production sector is internally integrated. The diagonal elements of this matrix are all greater than one, indicating that a unit injection on the i^{th} sector due to an exogenous injection has an effect on the income of the same sector higher than one due to the multiplicative process of the circulation of income through the economic system. These diagonal elements provide a relative measure of how much a production sector is internally integrated (Pansini, 2008). The column totals give the backward linkages, while the row totals give the forward linkages. Identifying the key industry linkages emphasizes the role that each sector plays in the development of the domestic economy and, therefore, informs domestic policy directed towards economic development (Wanjala and Kiringai, 2007). Figure 4.1 gives a summary of these linkages.

From Figure 4.1, we can conclude that the manufacturing sector does not rely heavily on output from other sectors (lowest rank in backward

Figure 4.1: Forward and backward linkages



Source: Own computation from Kenya 2003 SAM linkages), but other sectors rely heavily on its output (highest forward linkage). The opposite applies for mining and quarrying. It relies heavily on other sector outputs but other sectors do not rely heavily on its output (lowest forward linkage).

4.2 Simulations Using the Kenya 2003 Micro SAM

Since the Ma matrix reflects the total effects, it does not show the income distributional mechanisms in the economy. Growth in different production sectors will ultimately lead to growth in household incomes and our objective is to show how these incomes are distributed to the various household groups. We will look at results from some simulation exercises performed using the multiplier model explained in the previous section. We will focus on the household section of the global multiplier matrix, namely M_{31}, M_{32} and M_{33} (Table 4.1).

H_{10} represents the poorest rural household decile, h_{19} represents the richest rural household decile, H_{21} represents the poorest urban household decile, and h_{29} represents the richest urban household decile,[6] and h_{29} represents the richest urban household decile.

Household incomes (M_{31}): This matrix shows the income effects on household incomes as a result of a unit injection into the production system in the SAM. The incomes of rural households increase by a multiplier of 0.5526, on average, while that of urban households increase by a multiplier of 0.9698. Agriculture produces higher effects across all households, compared to manufacturing which produces the least multipliers for households. This means that the manufacturing sector has the least impact on households' income, an indication

Table 4.1: Summary of M_{31}, M_{32} and M_{33}

	M_{31}	M_{32}	M_{33}
h_{10}	0.1742	0.2533	1.2802
h_{19}	1.0795	2.3721	2.6326
h_{21}	0.0063	0.0163	1.0079
h_{29}	6.0556	8.7579	8.1934
Rural average	0.5526	1.1234	1.8868
Urban average	0.9698	1.4445	2.1731
Total average	0.7497	1.2754	2.0224

Source: Own computation from Kenya 2003 SAM

[6] Data for h20 is not given in the Kenya 2003 micro SAM, and it is assumed to be significant for the purpose.

that the agricultural sector is more important in creating incomes for households compared to manufacturing.

Factor incomes (M_{32}): This matrix measures the impact on household income from an exogenous injection directed to the factor account. With a unit injection into the factors of production, rural households' income increase is by a multiplier of 1.1234 on average, while that of urban households is by a multiplier of 1.4445.

Redistribution of factor incomes among households (M_{33}): This matrix shows the effects on household income from an exogenous injection into the income of household groups. Diagonal elements are all greater than one, indicating that a unit injection on the income of a households group results to an increase greater than one of the income of the same household group due to the multiplicative effect of the circulation of the income through the system. On average, increase in rural households' income is by a multiplier of 1.8869 and that of urban households by a multiplier of 2.1731.

4.3 Multiplier Decomposition and Household Income

In this section, we show the results from the multiplier decomposition of the global accounting multipliers. The results show the structural components of the global multipliers. This way, we are able to show the capacity of an activity to stimulate household incomes either directly and/or indirectly. The choice of agriculture is due to its income generating capacity for households, while manufacturing was chosen due to the fact that other sectors rely very heavily on its output (highest forward linkages).

Disentangling the effects of injections into the productive system on different households allows for complete accounting of a global multiplier, and it shows that stimulating an activity stimulates other activities whose effects will be transmitted to other households with varying degrees of effects. Such decomposition will show the direct effect of an injection in the respective account of the productive sector on the household without considering any other effects activated in the other sectors or households. Table 4.2 shows the results of the decomposition (based on the $\hat{r}A\hat{s}$ type of transformation).

The corresponding element of total multiplier (m_{ij}) for a unit injection to agriculture on h_{10} is 0.0202405, which is further decomposed in

Table 4.2: Agriculture decomposition on the poorest rural household (H_{10})

Column j (injection)	Row 1 (effect of injection to	Household groups	Direct-direct effects	Indirect-direct effects	Total effects from injection in j	Direct-indirect effects	Indirect-indirect effects	Total effect on households	Total multiplier
agric	h_{10}	h_{10}	0.01106	0.00106785	0.012073	0.001068	0.007099312	0.008167	0.0202405
agric	h_{10}	h_{11}	0.000291	2.27144E-05	0.000314	0.011782	0.008144448	0.019927	0.0202405
agric	h_{10}	h_{12}	0.000358	2.74126E-05	0.000385	0.011715	0.00813975	0.019855	0.0202405
agric	h_{10}	h_{13}	0.000478	3.65461E-05	0.000514	0.011596	0.008130616	0.019726	0.0202405
agric	h_{10}	h_{14}	0.000531	4.20109E-05	0.000573	0.011543	0.008125151	0.019668	0.0202405
agric	h_{10}	h_{15}	0.000629	4.33892E-05	0.000672	0.011444	0.008123773	0.019568	0.0202405
agric	h_{10}	h_{16}	0.000722	5.01909E-05	0.000772	0.011352	0.008116971	0.019469	0.0202405
agric	h_{10}	h_{17}	0.000714	4.97363E-05	0.000764	0.011359	0.008117426	0.019477	0.0202405
agric	h_{10}	h_{18}	0.000724	5.06503E-05	0.000775	0.011349	0.008116512	0.019466	0.0202405
agric	h_{10}	h_{19}	0.000876	7.04062E-05	0.000947	0.011197	0.008096756	0.019294	0.0202405
agric	h_{10}	h_{21}	1.29E-06	5.92382E-07	1.88E-06	0.012072	0.00816657	0.020239	0.0202405
agric	h_{10}	h_{22}	4.79E-06	1.35071E-06	6.14E-06	0.012069	0.008165812	0.020234	0.0202405
agric	h_{10}	h_{23}	1.05E-05	2.79464E-06	1.33E-05	0.012063	0.008164368	0.020227	0.0202405
agric	h_{10}	h24	1.55E-05	5.6266E-06	2.12E-05	0.012058	0.008161536	0.020219	0.0202405
agric	h_{10}	h_{25}	2.27E-05	9.89063E-05	3.25-05	0.0012051	0.008157272	0.020208	0.0202405
agric	h_{10}	h_{26}	4.29E-05	1.83719E-05	6.13E-05	0.01203	0.00814879	0.020179	0.0202405
agric	h_{10}	h_{27}	0.000248	7.35702E-05	0.000322	0.011825	0.008093592	0.019919	0.0202405
agric	h_{10}	h_{28}	0.000255	0.000105892	0.00036	0.011819	0.008061271	0.01988	0.0202405
agric	h_{10}	h_{29}	0.001183	0.000449948	0.001633	0.010891	0.007717214	0.018608	0.0202405

Source: Own Computation from Kenya 2003 SAM

Table 4.3: Direct effects from the decomposition of global multipliers (%)

	Agriculture				**Manufacturing**			
	h_{10}	**h_{19}**	**h_{21}**	**h_{29}**	**h_{10}**	**h_{19}**	**h_{21}**	**h_{29}**
h_{10}	59.6	0.9	1.1	1.1	53.0	0.9	0.6	0.6
h_{11}	1.6	1.6	1.9	1.9	1.2	1.3	0.9	0.9
h_{12}	1.9	1.9	2.3	2.3	1.4	1.6	1.0	1.1
h_{13}	2.5	2.5	3.1	3.2	1.9	2.1	1.4	1.5
h_{14}	2.8	2.9	3.4	3.5	2.2	2.4	1.5	1.6
h_{15}	3.3	3.3	4.3	4.3	2.3	2.5	1.8	1.8
h_{16}	3.8	3.8	4.8	4.8	2.7	2.9	2.0	2.1
h_{17}	3.8	3.8	4.8	4.8	2.7	2.9	2.0	2.1
h_{18}	3.8	3.8	5.1	5.1	2.7	2.9	2.1	2.2
h_{19}	4.7	63.7	6.8	7.4	3.6	52.7	3.0	3.5
h_{21}	0.0	0.0	40.7	0.0	0.0	0.0	56.2	0.0
h_{22}	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
h_{23}	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
h_{24}	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
h_{25}	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.4
h_{26}	0.3	0.3	0.5	0.5	0.7	0.7	0.7	0.7
h_{27}	1.6	1.5	2.8	2.7	3	3.1	3.1	3.0
h_{28}	1.8	1.7	3.1	3.0	4.1	4.3	4.3	4.3
h_{29}	8.1	7.9	14.6	54.9	17.7	18.9	18.7	73.8

Source: Own Computation from Kenya 2003 SAM

Table 4.2. The results show the four different effects as explained in the methodology (direct-direct, indirect-direct, direct-indirect and indirect-indirect).

By decomposing each element of the multiplier matrix, we show the relative contribution of the forces operating behind the multiplier. This allows one to distinguish the most powerful link in an economic system that affects households' income. The summary of the above decomposition results are given in Table 4.3. This table shows the effect of an injection in agriculture and manufacturing on selected household deciles. For example, to calculate the total direct effect of an exogenous injection into agriculture from the total multiplier on the poorest rural household would be: (0.012073/0.0202405)*100=59.6 per cent. Tables on agriculture are in the appendix; however, those on manufacturing can be provided on request.

The direct effect from an exogenous injection in agriculture on h_{10} represents 59.6 per cent of the total effect on households, compared to manufacturing with a direct effect of 53.0 per cent on the same household. For h_{19}, the direct effects from agriculture and manufacturing are 63.7 per cent and 52.7 per cent, respectively. For urban households, the direct effects from agriculture on h_{21} and h_{29} are 40.7 per cent and 54.9 per cent respectively, while direct effects from manufacturing on the urban household deciles are 56.2 per cent and 73.8 per cent, respectively.

We note that the direct effects from agriculture to rural households are higher than direct effects to urban households. However, h_{29} receive higher direct effects from agriculture than h_{21}. The opposite is true for direct effects from manufacturing, where urban households receive higher direct effects from the sector than rural households. The h_{29} household expenditure decile (the richest urban household decile) has very high direct effects compared to the other household deciles. These results point to the inequality in the ownership of factors of production, and are later translated to inequalities in the distribution of household income.

Higher indirect effects from agriculture to h_{21} is an indication that the link between agriculture and h_{21} is not strong. Stimulating the agricultural sector generates intermediate demand for agricultural outputs, which generates extra income for the other household deciles, which in turn generate income for h_{21}. The study by Pyatt and Round (2006) also finds similar results where the indirect effects from food processing to small scale farm households in Indonesia were higher than the direct effects. The direct–indirect effects (calculated as in Table 4.3) from agriculture are highest for h_{21} (50.8%) compared to h_{10} (5.3%), h_{19} (31.4%) and h_{29} (40.6%). Therefore, for h_{21}, their incomes are activated from other households and not directly from agriculture.

In other studies, direct effects on households from selected productive sectors have been found to be higher than the indirect effects (Civardi and Lenti, 2008; and Pansini, 2008). This study also finds similar results where direct effects are higher, save for the effects from agriculture on h_{21}.

We can conclude that agriculture has the most powerful link to the incomes of the low rural household deciles, compared to the manufacturing sector, which has stronger linkages on the incomes of high income deciles by a much higher margin than that of agriculture.

The analysis gives insights into the existence of inequality from a SAM perspective. The empirical results from our multiplier analyses show that due to high inequality in Kenya, stimulation of growth in the productive sector mainly benefits the richest urban household decile, who own most of the factors of production.

5. Conclusion

From our sector analysis, the manufacturing sector does not rely heavily on other sectors, but other sectors rely heavily on its output. It also has the least effect on the incomes of households compared to agriculture with a higher effect on household incomes. Local linkages between and among manufacturing industries are weak to generate growth and reduce the level of inequality. From our analysis, the manufacturing sector generates the least incomes for households, implying that agriculture is a more important sector for household income generation.

The decomposition methodology has shown different results for different households. Direct effects from an exogenous injection to agriculture on rural households were higher than for urban households. Among the rural households, the highest rural decile (h_{19}) received higher direct effects than the lowest rural decile (h_{10}). Likewise, the highest urban decile (h_{29}) received higher direct effects than the lowest urban decile (h_{21}). On the other hand, direct effects from manufacturing on urban deciles were higher than on rural deciles. This means that the link between agriculture and rural households is higher than the link between agriculture and urban households. This link is weakest between agriculture and the poorest urban decile (h_{21}). From a policy perspective, activating the agricultural sector is not the most important for the poorest urban decile. They derive more benefits from activation of other sectors. These other sectors get activated from the increased demand following an exogenous injection in agriculture.

On the other hand, the direct effects from manufacturing were highest for h_{29} (73.8%), an indication that these are the households that own the majority of the factors of production (labour and capital) in the manufacturing sector. This does not compare well with the direct effects from manufacturing on the other households at 53 per cent for h_{10}, 52.7 for h_{19}, and 56.2 per cent for h_{21}. The differences in the direct effects point to the level of income inequalities among households that stem from the ownership of the factors of production.

Benefits from injections vary according to households. The highest urban expenditure decile benefits more than any other household group. When we target the agriculture sector, the highest income accrues to the highest urban expenditure decile. If the government wants to reduce poverty among the urban poor by targeting the poorest urban household decile using the manufacturing sector, only 56.2 per cent of the initial injection would accrue to this household group. About 18.9 per cent of this injection would accrue to the richest urban household decile, while the other urban household deciles receive a total of only 8.8 per cent of the initial injection, hence widening the income inequality gap. For effective development, the government should ensure that policy measures on growth and poverty reduction are developed together with inequality policies.

6. Suggestions for Further Research

In this study, we assumed that all the relations are linear, prices are fixed, there exists excess capacity, and there also exists unemployed or underemployed labour resources. An extension of this study on poverty and inequality in Kenya will be carried out using a Computable General Equilibrium model.

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Appendix

Appendix 1: Multiplier decomposition: Agriculture and highest rural income decile household (h_{19})

column j (injection)	row I (effect of injection to	Household groups	direct-direct effects	indirect-direct effects	total effects from injection in j	direct-indirect effects	indirect-indirect effects	total effect on households	total multiplier
agric	h19	h10	0.000973	9.44524E-05	0.001068	0.105754	0.011289942	0.117044	0.1181123
agric	h19	h11	0.001702	0.000132697	0.001834	0.105026	0.011251697	0.116278	0.1181123
agric	h19	h12	0.002085	0.000159657	0.002245	0.104643	0.011224737	0.115867	0.1181123
agric	h19	h13	0.002782	0.000212812	0.002994	0.103946	0.011171583	0.115118	0.1181123
agric	h19	h14	0.003133	0.000248102	0.003381	0.103595	0.011136293	0.114731	0.1181123
agric	h19	h15	0.003684	0.00025409	0.003938	0.103044	0.011130304	0.114174	0.1181123
agric	h19	h16	0.004199	0.000292123	0.004491	0.102529	0.011092272	0.113621	0.1181123
agric	h19	h17	0.004158	0.000289614	0.004447	0.10257	0.01109478	0.113665	0.1181123
agric	h19	h18	0.004205	0.000294111	0.0045	0.102522	0.011090283	0.113613	0.1181123
agric	h19	h19	0.069628	0.00559401	0.075222	0.0371	0.005790385	0.042891	0.1181123
agric	h19	h21	7.19E-06	3.31204E-06	1.05E-05	0.106721	0.011381082	0.118102	0.1181123
agric	h19	h22	2.71E-05	7.62611E-06	3.47E-05	0.106701	0.011376768	0.118078	0.1181123
agric	h19	h23	5.96E-05	1.58324E-05	7.54E-05	0.106668	0.011368562	0.118037	0.1181123
agric	h19	h24	8.99E-05	3.25252E-05	0.000122	0.106638	0.011351869	0.11799	0.1181123
agric	h19	h25	0.000125	5.4519E-05	0.000179	0.106603	0.011329875	0.117933	0.1181123
agric	h19	h26	0.000239	0.000102199	0.000341	0.106489	0.011282196	0.117771	0.1181123
agric	h19	h27	0.001404	0.000415917	0.00182	0.105324	0.010968477	0.116293	0.1181123
agric	h19	h28	0.001431	0.000595199	0.002026	0.105297	0.010789196	0.116086	0.1181123
agric	h19	h29	0.006797	0.002585598	0.009383	0.099931	0.008798796	0.108729	0.1181123

Appendix 2: Multiplier decomposition: Agriculture and lowest urban income decile household (h_{21})

column j (injection)	row I (effect of injection to	Household groups	direct - direct effects	indirect - direct effects	total effects from injection in j	direct - indirect effects	indirect - indirect effects	total effect on households	total multiplier
agric	h21	h10	0.000004	0.000000	0.000004	0.000322	0.000088	0.000410	0.000414
agric	h21	h11	0.000007	0.000001	0.000008	0.000318	0.000088	0.000406	0.000414
agric	h21	h12	0.000009	0.000001	0.000010	0.000317	0.000088	0.000404	0.000414
agric	h21	h13	0.000012	0.000001	0.000013	0.000314	0.000087	0.000401	0.000414
agric	h21	h14	0.000013	0.000001	0.000014	0.000313	0.000087	0.000400	0.000414
agric	h21	h15	0.000017	0.000001	0.000018	0.000309	0.000087	0.000396	0.000414
agric	h21	h16	0.000019	0.000001	0.000020	0.000307	0.000087	0.000394	0.000414
agric	h21	h17	0.000019	0.000001	0.000020	0.000307	0.000087	0.000394	0.000414
agric	h21	h18	0.000020	0.000001	0.000021	0.000306	0.000087	0.000393	0.000414
agric	h21	h19	0.000026	0.000002	0.000028	0.000300	0.000086	0.000386	0.000414
agric	h21	h21	0.000115	0.000053	0.000168	0.000210	0.000035	0.000246	0.000414
agric	h21	h22	0.000000	0.000000	0.000000	0.000326	0.000088	0.000414	0.000414
agric	h21	h23	0.000000	0.000000	0.000000	0.000325	0.000088	0.000414	0.000414
agric	h21	h24	0.000001	0.000000	0.000001	0.000325	0.000088	0.000413	0.000414
agric	h21	h25	0.000001	0.000000	0.000001	0.000325	0.000088	0.000413	0.000414
agric	h21	h26	0.000002	0.000001	0.000002	0.000324	0.000088	0.000412	0.000414
agric	h21	h27	0.000009	0.000003	0.000012	0.000317	0.000086	0.000402	0.000414
agric	h21	h28	0.000009	0.000004	0.000013	0.000317	0.000085	0.000401	0.000414
agric	h21	h29	0.000044	0.000017	0.000060	0.000282	0.000072	0.000354	0.000414

Appendix 3: Multiplier decomposition: Agriculture and highest urban income decile household (h_{29})

column j (injection)	row I (effect of injection to	Household groups	direct - direct effects	indirect - direct effects	total effects from injection in j	direct - indirect effects	indirect - indirect effects	total effect on households	total multiplier
agric	h29	h10	0.003632	0.000352393	0.003984	0.297729	0.073127891	0.370857	0.3748414
agric	h29	h11	0.006629	0.000516955	0.007146	0.294732	0.072963328	0.367696	0.3748414
agric	h29	h12	0.008092	0.000619601	0.008712	0.293269	0.072860683	0.36613	0.3748414
agric	h29	h13	0.011034	0.000844186	0.011878	0.290327	0.072636098	0.362963	0.3748414
agric	h29	h14	0.012038	0.00095328	0.012991	0.289323	0.072527004	0.36185	0.3748414
agric	h29	h15	0.014914	0.001028581	0.015942	0.286447	0.072451703	0.358899	0.3748414
agric	h29	h16	0.01669	0.001161028	0.017851	0.284671	0.072319255	0.35699	0.3748414
agric	h29	h17	0.016821	0.001171751	0.017993	0.28454	0.072308533	0.356848	0.3748414
agric	h29	h18	0.017974	0.001257022	0.019231	0.283387	0.072223261	0.355611	0.3748414
agric	h29	h19	0.025774	0.002070751	0.027845	0.275587	0.071409533	0.346996	0.3748414
agric	h29	h21	3.38E-05	1.55549E -05	4.93E-05	0.301327	0.073464729	0.374792	0.3748414
agric	h29	h22	0.000129	3.63784E -05	0.000165	0.301232	0.073443905	0.374676	0.3748414
agric	h29	h23	0.000287	7.64203E -05	0.000364	0.301074	0.073403863	0.374477	0.3748414
agric	h29	h24	0.00045	0.000162709	0.000612	0.300911	0.073317574	0.374229	0.3748414
agric	h29	h25	0.000707	0.00030873	0.001016	0.300654	0.073171553	0.373826	0.3748414
agric	h29	h26	0.001309	0.000560166	0.001869	0.300052	0.072920117	0.372972	0.3748414
agric	h29	h27	0.007672	0.002272921	0.009945	0.293689	0.071207363	0.364897	0.3748414
agric	h29	h28	0.007979	0.003319559	0.011299	0.293382	0.070160725	0.363543	0.3748414
agric	h29	h29	0.149197	0.056752298	0.20595	0.152164	0.016727986	0.168892	0.3748414

Kenya Institute for Public Policy Research and Analysis
Bishops Garden Towers, Bishops Road
PO Box 56445, Nairobi, Kenya
tel: +254 20 2719933/4, 2714714/5, 2721654, 2721110
fax: +254 20 2719951
email: admin@kippra.or.ke
website: http://www.kippra.org

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