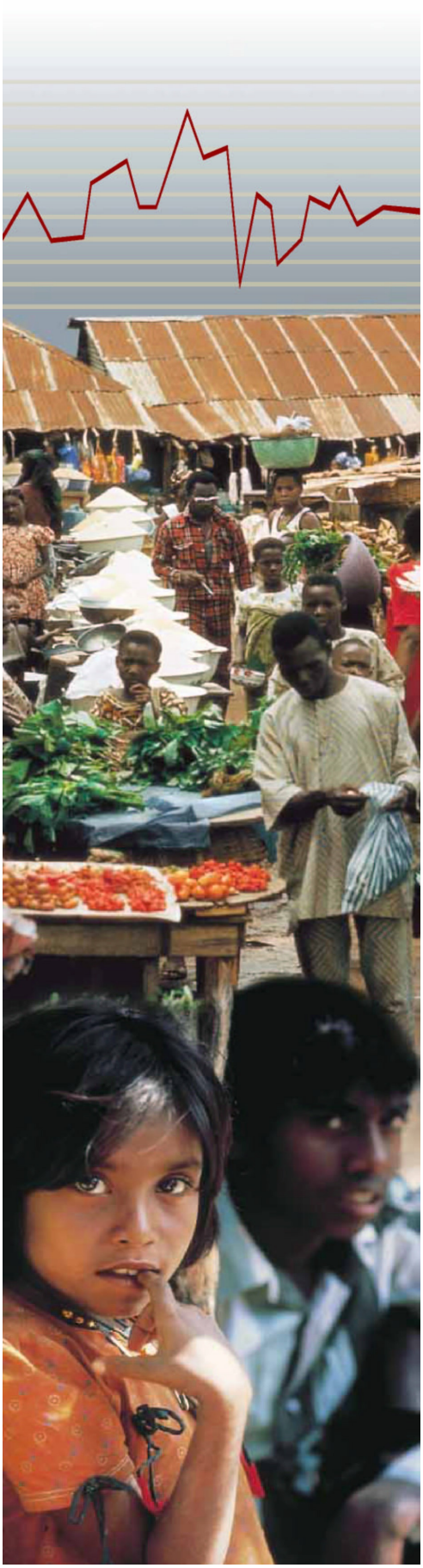

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Transient and Chronic Rural Household Poverty: Evidence from Kenya

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Abstract

Most of the earlier studies of poverty in Kenya have basically been static in nature. They have attempted to measure household welfare -- incidence, gap and severity-- at a point in time. Such studies are undeniably vital. However, they do not necessarily provide a good indication of welfare stability over time. This study makes an empirical contribution to poverty analysis in Kenya by incorporating poverty dynamics dimension. We first examine poverty dynamics using economic transition matrices. Next, we decompose total poverty into transient and chronic poverty components using transient poverty as censored fluctuation and equally-distributed equivalent poverty gaps approaches for comparison. The latter approach introduces inequality into poverty decomposition. Finally, we establish important correlates of poverty components using quantile-censored and non-parametric regressions. Given the high rural household poverty incidences and the country's limited resources, this study has critical implications for economic policy in Kenya.

Key words: Poverty dynamics, Chronic poverty, Transient poverty, Transition matrices, Panel data, Inequality, Kenya

JEL Classifications: C23, D31, D63, I30, I32

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1. Introduction

1.1 Overview of Poverty in Kenya

Kenya maintains a mixed economy in which the government is actively involved in development planning motivated by the need to optimize the use of the country's limited resources to meet national policy priorities. The fundamental policy priorities identified since independence are poverty, ignorance, and poor health (Republic of Kenya, 1965). Since then the goal of economic policy in Kenya has been to mobilize and ensure efficient utilization of resources to achieve high economic growth, an imperative to have its citizens enjoy decent living standards. Despite these creditable objectives, the country's economic performance has been weak leading to high poverty incidences (Figure 1). Poverty is multidimensional and manifests itself in various forms. In general terms, poverty is defined as the inability to attain a certain predetermined minimum level of consumption at which the basic needs of a society are assumed to be satisfied. In Kenya, about 56 percent of the population is poor; implying that at least one in every two people is poor (Republic of Kenya, 2003a). About three quarters of the poor live in rural areas while the majority of the urban poor live in slum and *peri*-urban settlements.

Poverty incidences vary across regions. More than 50 percent of the population in all provinces in Kenya, except the Central province, is poor (Republic of Kenya, 2003a). Even though the North Eastern province has the highest proportion of people living in poverty (68 percent), it contributes only 3 percent to the national rural poverty level. Nyanza and Rift Valley provinces have the highest contribution to the national rural poor (23% respectively). While the results of poverty mapping work indicate similar patterns in levels of poverty at the provincial levels, at sub-district levels they depict large differentials (Republic of Kenya, 2003b). For instance, rural poverty incidences within the Central province (least poor province) range from 10 per cent to 56 percent across its 171 locations. Poverty mapping at the parliamentary constituency level also portrays similar patterns as well, with some constituencies in regions considered non-poor from a national perspective emerging as critically poor (Republic of Kenya, 2005).

Non-income indicators of poverty have also worsened. The education sector has been characterized by declining enrolment rates, high dropouts, grade repetition, low completion, and poor transition rates (Republic of Kenya, 2001). According to the Human Development Index (HDI) of the United Nations Development Programme, life expectancy declined from 58 years in 1986 to 48 years in 2004, partly due to the HIV/AIDS pandemic. According to the Joint United Nations Programme on HIV/AIDS (UNAIDS); the overall adult infection rate was 7 percent in 2003 with some 1.2 million Kenyans living with the virus, while

girls and young women were more likely to be infected than men. About 100,000 children were infected and some 650,000 children have been orphaned as a result of the disease. Infant and child mortality rates have also worsened. Gender disparities have persisted, with women having on average lower educational attainment, less access to health services, and a heavier workload than men. Trends in nutritional status of children under the age three show that the percent of stunted children (short for their age) increased from 29 percent in 1993 to 31 percent in 2003 (Republic of Kenya, 2003b). The percent of children aged 12-23 months who were fully vaccinated dropped from 79 percent in 1993 to 52 percent in 2003.

1.2 Policy Responses

Rising poverty levels prompted the country to draft a Poverty Reduction Strategy Paper (PRSP) (Republic of Kenya, 2001). This initiative was in accord with a long-term vision outlined in the National Poverty Eradication Plan (NPEP) and the United Nations endorsed Millennium Development Goals (MDGs). The PRSP was a product of broad-based and in-depth consultations among key stakeholders and in particular, the poor. It outlined priorities and measures necessary for poverty reduction and economic growth. The PRSP was central to the development of a Medium Term Expenditure Framework (MTEF) budget that started in 2000/01. The MTEF budget aims at improving the quality of expenditure and shifting of resources towards pro-poor activities and programs.

Even though the PRSP led to a better understanding of causes of poverty, there were some contentious issues as far as its implementation was concerned. The will to link PRSP priorities to the national budget was indiscernible (Kabubo-Mariara et al., 2004). For example, as per the PRSP agriculture and rural development emerged as the highest priority sector nationally. However, a review of the national budget indicates that budget allocation to the agriculture and rural development sector has remained low (Republic of Kenya, 2004). The government was also reluctant to implement key political and economic governance measures highlighted in the PRSP such as fighting corruption. The PRSP also recommended a monitoring and evaluation system so that the stakeholders could hold the government responsible for lack of implementation of PRSP's priorities. The recommendation was ostensibly ignored.

Beginning 2003, a new government came to power, the National Rainbow Coalition (NARC). The government embarked on an economic recovery process by preparing a broad nationwide development framework, the Economic Recovery Strategy for Wealth and Employment Creation (Republic of Kenya, 2003). Backed by the private sector, the government passionately renewed the fight against poverty. Among other pro-poor programs, the government initiated free primary education (FPE) and a constituency development fund (CDF). Unlike other development funds that have to permeate the central

government and its larger administrative bureaucracies, funds under CDF go directly to the local level (constituencies), thus providing people at the grassroots the opportunity to make expenditure decisions that maximize their welfare consistent with the theoretical predictions of decentralization theory (Kimenyi, 2005).

1.3 Study Problem and Objectives

The high poverty incidence in Kenya has created a desire for empirical studies and sustained generation of new knowledge and innovations to inform poverty reduction strategies. Most of the earlier studies of poverty have basically been static, focusing on poverty incidence, gap, and severity at a point in time. Whereas such studies provide very valuable information on poverty characteristics and distribution, they do not necessarily provide a good indicator of welfare stability over time (Mckay and Lawson, 2002). There are a lot of movements in and out of poverty as well as within poverty itself. Poverty is dynamic in that the poor are not poor all the time (Yaqub, 2000). Poverty trends focus narrowly on inter-temporal changes in aggregate poverty in which households remain anonymous while poverty dynamics focus on inter-temporal changes in poverty of specific households.

In our existence, there is the 'sometimes poor' (transient) intermingling with the 'always poor' (chronic). By definition, transient poverty is temporary with households experiencing movements into and out of poverty while the chronic-poor experience persistent poverty over a reasonably long period of time (McKay and Lawson, 2002). Transient poverty may be a result of crop failure or low demand for casual labor while chronic poverty may be attributed to accident, age, or alcoholism (Hulme and McKay, 2005). The design of poverty reduction policies and strategies is a fragile exercise. Increasing research on welfare mobility has shown that the determinants of chronic poverty are likely to be different from those of transient poverty; and so are the appropriate respective policy responses (Jalan and Ravallion, 2000; Mckay and Lawson, 2002; and Duclos et al., 2006). Studies on poverty dynamics provide useful insights into what determines movements into and out of poverty and why some households remain trapped in poverty. As Haddad and Ahmed (2003) notes, chronic poverty is a more serious situation than transient poverty. Thus, effective and well founded anti-poverty programs entail knowing the relative importance of chronic as opposed to transient poverty.

Consequently, this study was an attempt to analyze rural household poverty dynamics by decomposing aggregate household poverty into its chronic and transient components in Kenya. Correlates of poverty components were also established. By identifying common or separate chronic and transient poverty correlates, we allow the policy maker options for crafting an appropriate policy toolkit for each poverty component to address poverty. The chronic poverty toolkit will address the predicament of the chronic

poor, while the transient poverty toolkit will assist the transient poor as well as safeguard them from falling into the dire chronic poverty. Given the high household poverty incidences and resource scarcity in the country, results emanating from this study are crucial. The rest of the paper is organized as follows. The second section briefly discusses previous work on poverty dynamics in Kenya. The third section presents the methodology and the data. The fourth section presents the results and discussions, while the fifth section is the paper's conclusion.

2. Overview of Previous Works on Poverty Dynamics in Kenya

Ordinarily, one would wish to steer away from studying such a depressing subject as poverty (Ayako et al., 1997). However, the increasing incidence of poverty and the drive to discover its causes and solutions have led many researchers be involved poverty analysis. Most of the earlier studies in Kenya are static and descriptive in nature. Some of them focus on inequality and welfare (House and Killick, 1981; Hazlewood, 1981; and Bigsten, 1981) while several other studies have constructed poverty profiles (Foster, Greer and Thorbecke, 1984; Greer and Thorbecke, 1986a, 1986b; Mwabu et al., 2000; Manda et al., 2000; Geda et al., 2001; and Oyugi et al., 2001). Recently, Okwi et al. (2006) used spatial regression techniques to explore the effects of geographic factors on poverty in Kenya.

Focusing strictly on poverty dynamics studies in Kenya, we recognize that the absence of panel data collected for the same sets of households over multiple periods of time has constrained poverty dynamics studies. Place et al. (2003) attempted to distinguish the chronic poor from transient poor and to identify correlates of chronic poverty in 120 rural households in western Kenya. The duration between data collection was only two years. Chronic poverty was estimated using four different yardsticks: intake of energy requirements; intake of protein requirements; non-food expenditures per capita; and value of liquid assets. The study established that secondary education was important in reducing chronic poverty. Chronic poor households were likely to be headed by women and were less likely use fertilizer or animal manure. With the protein measure, the chronic poor were distinguished by their lack of credit access.

Using the first two waves (1997 and 2000) of Tegemeo Agricultural Monitoring and Policy Analysis Project (TAMPA) 1500 households panel data, Gamba and Mghenyi (2004) categorized rural households using the poverty 'spells' approach. Households that were below the poverty line in both 1997 and 2000 were categorized as 'chronic poor'. On the other hand, those which entered into poverty or exited from poverty between 1997 and 2000 were classified as 'transitory poor,' while those that remained above the poverty line in both years were labeled 'non-poor'. Then using a probit model, they attempted to identify

determinants of chronic poverty. They established that chronic poverty dominated transitory poverty. The estimation results indicated that the value of assets, head of household age, the number of household members aged over 40, the acreage cultivated, and education level were negatively related to chronic poverty.

Kristjanson et al. (2004) and Krishna et al. (2004) examined poverty dynamics in 20 western Kenya villages between 1978 and 2003 using a community-based 'stages of progress' methodology. The primary assumption in this methodology is that knowledge about changes in the situation of particular households is widely shared among members of close-knit communities. Thus, eliciting information from community members can assist in re-constructing the sequence of events associated with household welfare mobility. In these studies, escape from poverty was associated with diversification of income sources through formal employment, livestock farming, and small businesses. Another important reason cited was small family sizes. On the other hand, reasons for descent into poverty included: poor health and health-related expenses; heavy funeral expenses; low levels of education; large family size; unproductive land; death of income earner; high dependencies; low paying jobs; and small land holdings.

Mango et al. (2004) examines the social aspects of dynamic poverty traps in Vihiga, Baringo, and Marsabit districts. The research approach was qualitative. It involved community level workshops, case studies, and interviews with key informants. The results obtained were not significantly different from other earlier studies. Escape from poverty was associated with education, getting a well paying job, diversification in on-farm and off-farm activities, and wider social networks (clan support or farmer groups). Reasons for falling into to poverty included: death of income earner; poor health and health-related expenses; loss of employment; reduced land sizes; unproductive land; increased dependencies; and frequent natural catastrophes (droughts and floods). Barret et al. (2006) examines risk management, marginal returns on productive assets, and asset dynamics across settings distinguished by different agro-ecological and market access conditions in Kenya. The results indicate that exit rates from poverty are low. The study associates persistence of poverty with unskilled labor power and low asset holding and loss. There was also evidence of geographic poverty traps in less-favored regions.

In general, most of the earlier studies on poverty dynamics in Kenya focus only on some regions and use relatively small sample sizes. To circumvent data deficiencies, most of them adopt less rigorous methodologies while others resort to unusual definitions of poverty concepts. But despite these variations, the studies tend to agree on the general correlates of chronic poverty. In this study, we attempt to overcome these limitations by expanding our analysis to cover more regions of the country. We also use conventional

definitions of poverty concepts as well as attempt to apply recent innovations in household poverty decomposition analysis.

3. Methodology and Data Sources

This section looks at data analysis methods and data sources. To analyze rural household poverty dynamics, the economic transition matrices ('spells') approach is employed. Transition matrices provide information on the number of households moving in and out of poverty. Transition matrices also give information on transient and chronic poverty based on the households' length or 'spells' in poverty. The transient poor in this approach is defined as those households that have income or consumption above the designated poverty line in at least one period out of the periods the welfare indicator is measured. The chronic poor have their welfare measure below the poverty line in all the periods (Baulch and McCulloch 1998).

To decompose aggregate poverty into chronic and transient components, we use two approaches for comparison: transient poverty as censored fluctuation approach as proposed by Jalan and Ravallion (2000) (hereafter referred to as J&R) and the Equally Distributed Equivalent (EDE) Poverty Gaps approach proposed by Duclos et al. (2006). The J&R approach, as explained by Duclos et al. (2006), has some weaknesses that EDE overcomes. For example, as opposed to J&R, the EDE approach is a money-metric measure of welfare and inequality, and is thus very useful in efficiency and cost-benefit analysis. The J&R approach is also known to yield confounding results that an increase in poverty aversion decreases the level of both transient and chronic poverty. Lastly, we discuss the methodology of estimating the correlates of transient and chronic poverty.

3.1 Poverty Dynamics and Transition Matrix

For economic transition matrices, we group the households' incomes into three income groups, namely:

Group 1: 0- pline1

Group 2: pline1-pline2

Group 3: pline2- Max(y)

where pline1: lower poverty line or food poverty line while pline2 is the absolute poverty line (food plus non food poverty line). The non-food elements include non-food expenditures on health, education, fuel, clothing, and transport. Let P be a matrix of n x n transitions, the ijth element of which, P_{ij}, is the percentage in the income group i at time t_0 of those who at time t_1 were in class j. The units which moved from one income group to another between time t_0 and time t_1, are referred to as 'mobiles' while those who remain in their original income class

are ‘immobiles’. According to Woolard and Klasen (2004), mobiles who experienced a positive change in relative well-being ($i < j$) are referred to as "winners" as opposed to “losers" ($i > j$).

3.2 Chronic and Transient Poverty Components

3.2.1 Jalan and Ravallion’s Approach

This approach was developed by Rodgers and Rodgers (1993) and used by Jalan and Ravallion (1998a and b). Transient poverty is measured as fluctuations in the squared poverty gap around the squared mean, income-normalized poverty gap. The contribution of household i to total poverty is defined as:

$$p_i = p(y_{i1}, y_{i2}, ..., y_{iT}) \tag{1}$$

where y_{it} is the standard living of household i at time t, and there are T times in which it is measured and p is some well-defined poverty measure. We use the familiar Foster-Greer-Thorbecke (FGT) measure because of its additive decomposability property. Thus, total household poverty $P_i^{TT}(T)$ is defined as the expectation over time of the poverty measure at each point in time p_i.

$$P_i^{TT}(T) = T^{-1}\sum_{t=1}^{T} p(y_{it};\alpha;z) \tag{2}$$

where

$$p(y_{it};\alpha;z) = \begin{cases} \left(1 - \frac{y_{it}}{z}\right)^{\alpha} & if \quad y_{it} < z \\ 0 & if \quad y_{it} \geq z \end{cases} \tag{3}$$

z is the poverty line, and the value $\alpha \geq 0$ is a measure of ‘poverty aversion’[1]. Precisely, it is a measure of aversion to inequality and variability. In our analysis, we use $\alpha = 2$ (squared poverty gap), which is more sensitive to distribution and variability. Chronic poverty for household i is obtained by replacing the household’s income y_{it}, for all t times measured, by estimated permanent income:

$$E_T[y_i] = T^{-1}\sum_{t=1}^{T} y_{it} \tag{4}$$

Thus, household’s chronic poverty $P_i^{CH}(T)$ is then defined to be:

$$P_i^{CH}(T) = P(E_T[y_i];\alpha;z) \tag{5}$$

[1] If we use $\alpha = 0$ (poverty headcount index), if $\alpha = 1$ (poverty gap index), and if $\alpha = 2$ (squared poverty gap index).

This can be expressed as the expectation over time of the household's chronic poverty, but since chronic poverty is invariant with time:

$$P_i^{CH}(T) = \begin{cases} \left(1 - \frac{E_T[y_i]}{z}\right)^2 & if \quad E_T[y_i] < z \\ 0 & if \quad E_T[y_i] \geq z \end{cases} \tag{6}$$

Transient poverty $P_i^{TR}(T)$ is calculated as a residual after subtracting the component of non-transient (chronic) poverty from aggregate poverty:

$$P_i^{TR}(T) = P_i^{TT}(T) - P_i^{CH}(T). \tag{7}$$

It is important to note that if households were to receive their permanent income (time mean income) which J&R assumes remains constant throughout, then no transient poverty would be observed. Therefore, the measure of transient poverty indicates how much of a household's poverty can be attributed to transient income rather than permanent income. However, permanent income can be allowed to vary if it is defined as the value of income predicted by a trend (linear or non-linear) over the whole period. As Hulme and Shepherd (2003) cautions however, this approach requires relatively large time periods and is thus not applicable in the current study.

3.2.2 EDE Poverty Gaps Approach

Following Duclos et al. (2006), in equation (1) we define normalized poverty gap as

$$g_{ij} = (1 - y_{ij}) \tag{8}$$

where y_{ij} is household i's normalized income in time j (the income and the poverty line are normalized by the poverty line of time j). There are N households and T times. The vector $g = (g_1, g_2, ..., g_n)$ and $g_i = (g_{i1}, g_{i2}, ..., g_{it})$ are the corresponding vectors of poverty gaps. Over the N households and T times, and over the vector g, the poverty measure indices are defined as

$$P_\alpha(g) = (NT)^{-1} \sum_{i=1}^{N} \sum_{j=1}^{T} g_{ij}^{\alpha}. \tag{9}$$

To measure social welfare and inequality, we define 'equally-distributed equivalent' (EDE) poverty gap $\Gamma_\alpha(g)$, poverty gap if assigned to all households and in all times, would produce the same poverty measure as generated by the distribution g of poverty gaps. Then (8) implies that $\Gamma_\alpha(g)^\alpha \equiv P_\alpha(g)$. Then,

$$\Gamma_\alpha(g) = \sqrt[\alpha]{P_\alpha(g)}. \tag{10}$$

$\Gamma_1(g)$ is the average poverty gap. Note $\Gamma_1(g)$ as a measure of poverty does not take into account inequality within the group, and inequality in poverty raises the social cost of poverty above the average poverty gap ($\Gamma_1(g)$). This implies that an inequality-corrected measure of poverty should be more than $\Gamma_1(g)$ to be sensitive to the existence of inequality among the poor. Such a property holds for $\Gamma_\alpha(g)$ whenever $\alpha \geq 1$. Whenever all households have the same size of poverty gap, then $\Gamma_\alpha(g) = \Gamma_1(g)$ holds. A mean-preserving increase in the income spread between two households, with at least one of them being poor, strictly increases $\Gamma_\alpha(g)$ whenever $\alpha \succ 1$. So for a given α, the more important the difference between $\Gamma_\alpha(g)$ and $\Gamma_1(g)$ is, the more unequal the distribution of poverty gaps is. Intuitively, a measure of the cost of inequality in the distribution of poverty gaps is then $C_\alpha(g) = \Gamma_\alpha(g) - \Gamma_1(g)$. $C_\alpha(g)$ is given in per capita money-metric terms, thus easy to compare directly with $\Gamma_1(g)$ and other money-metric indicators. It is the cost in average poverty gap that a Social Decision Maker (SDM) would be willing to pay to eliminate all inequality in the distribution of poverty gaps, without a change in total poverty (Atkinson 1970). It is always non-negative. Thus, total poverty can be expressed as

$$\Gamma_\alpha(g) = \Gamma_1(g) + C_\alpha(g). \tag{11}$$

Transient poverty generates variability consequently inequality in the household poverty. We can use the developed framework to capture its significance. Let $\gamma_\alpha(g_i)$ be the EDE poverty gap for household i, subsequently

$$\gamma_\alpha(g_i) = \sqrt[\alpha]{(T^{-1}\sum_{j=1}^{T} g_{ij}^{\alpha})}. \tag{12}$$

Invoking the cost-of-inequality developed earlier, a natural measure of the cost of transiency in household i's poverty status is

$$\theta_\alpha(g_i) = \gamma_\alpha(g_i) - \gamma_1(g_i) \tag{13}$$

which is non-negative $\forall \alpha \geq 1$. The EDE gap $\gamma_\alpha(g_i)$ can be interpreted as the variability-adjusted poverty status while $\gamma_1(g_i)$ is household i's average poverty gap. In the context of risk aversion, $\theta_\alpha(g_i)$ would be household i's risk premium while $\theta_\alpha(g_i) + \gamma_1(g_i)$ is his variability-adjusted poverty status. Analogously to the SDM argument, household i would be willing to pay $\theta_\alpha(g_i)$ in units of his average poverty gap to eradicate variability in his poverty gap status. Aggregating the transiency cost $\theta_\alpha(g_i)$ across the N households to obtain the aggregate magnitude of transiency we get

$$\Gamma_\alpha^T(g) = N^{-1}\sum_{i=1}^{N}\theta_\alpha(g_i)\,. \tag{14}$$

$\Gamma_\alpha^T(g)$ is the cost of inequality within households.

Next we consider the distribution of household EDE poverty gaps $\gamma_\alpha(g_i)$. This represents the distribution of household ill-fare in the presence of both chronic and household transient poverty. Expressing this distribution as $\gamma_\alpha = [\gamma_\alpha(g_1), \gamma_\alpha(g_2), ..., \gamma_\alpha(g_N)]$, aggregating poverty with γ_α is then

$$\Gamma_\alpha(\gamma_\alpha) = \sqrt[\alpha]{N^{-1}\sum_{i=1}^{N}\gamma_\alpha(g_i)^\alpha}\,. \tag{15}$$

The cost of inequality in the EDE poverty gaps γ_α then equal

$$C_\alpha(\gamma_\alpha) = \Gamma_\alpha(\gamma_\alpha) - \Gamma_1(\gamma_\alpha)\,. \tag{16}$$

$C_\alpha(\gamma_\alpha)$ is the *cost of inequality between households*. Duclos et al. (2006) validates that total poverty $\Gamma_\alpha(g)$ is given by

$$\Gamma_\alpha(g) = \Gamma_1(g) + C_\alpha(\gamma_\alpha) + \Gamma_\alpha^T(g) \tag{17}$$

where $\Gamma_1(g)$ is the sum of the average poverty gap in the population, $C_\alpha(\gamma_\alpha)$ is cost of inequality in household EDE poverty gaps and $\Gamma_\alpha^T(g)$ is the transient poverty. The chronic poverty is thus expressed as the difference between total and transient poverty

$$\Gamma^\Phi(g) = \Gamma_1(g) + C_\alpha(\gamma_\alpha) \tag{18}$$

Transient poverty is the cost of the variability of poverty gaps across time. Total poverty is thus the sum of chronic and transient poverty:

$$\Gamma_\alpha(g) = \Gamma^\Phi(g) + \Gamma_\alpha^T(g) \tag{19}$$

Thus, the total cost of inequality $C_\alpha(g)$ in poverty gaps is the sum of the cost of inequality between households $C_\alpha(\gamma_\alpha)$ and that of inequality within households $\Gamma_\alpha^T(g)$. Note that, if we would have assumed that transient poverty is just equal to the cost of inequality, then we would be overestimating its component and underestimating the chronic component.

3.3 Determinants of Poverty Components

In this study, we estimate the correlates of J&R poverty components. The earlier studies adopted a similar approach (Yue et al., 2005; Cruces and Wodon, 2003; Muller, 2002; and Jalan and Ravallion, 2000). We thus regress chronic and transient poverty at household level on a common set of households and household heads' characteristics:

$$P_i^{CH} = \alpha_{1i} + \beta_{1i}^{'} X + \varepsilon_{1i} \quad (20)$$

$$P_i^{TR} = \alpha_{2i} + \beta_{2i}^{'} X + \varepsilon_{2i} \quad (21)$$

where vector X and ε denote the explanatory variables and random disturbances respectively. By examining the estimated coefficients' significance, it becomes easy to establish important correlates of both transient and chronic poverty.

To estimate equations 20 and 21, we use censored quantile regression. This approach was originally proposed by Koenker and Bassett (1978) and since then it has gained much popularity in literature (Muller, 2002; Cruces and Wodon, 2003; and Yue et al., 2005). Unlike Tobit models, censored quantile regressions models are robust to distributional misspecifications of the error term (Arabmazar and Schmidt, 1982). Tobit is known to be inconsistent and inefficient in the presence of heteroscedasticity and non-normality of error terms since poverty indexes are censored at zero. The censored quantile regression approach is useful when the conditional distribution does not have the standard shape - asymmetric, fat-tailed, or truncated distributions. Censored quantile regression permits estimating various quantile functions of a conditional distribution. Each quantile regression characterizes a particular (center or tail) point of a conditional distribution; combining different quantile regressions thus provides a more complete description of the underlying conditional distribution.

3.4 Data and Variables

The analysis uses panel data drawn from 1500 rural households interviewed in 1997, 2000 and 2004. The data was collected by Tegemeo Agricultural Monitoring and Policy Analysis project between Tegemeo Institute (Egerton University) and the Department of Agricultural Economics (Michigan State University). A stratified sampling technique was used to take into account the ecological diversities inherent in the country. All the districts were classified into eight agro-regional zones. Agro-regional zones bring together areas with similar broad climatic conditions, agricultural activities, and rural livelihoods. Using standard proportional sampling aided by the national census data, households were sampled for interviews. The Northern arid region was only covered in the first wave, however. The region's rural inhabitants are nomadic pastoralists without permanent homes. This made it extremely intricate and expensive to trace the households that were interviewed in the first wave in the subsequent two waves.

Going by the permanent income hypothesis, welfare indicators based on expenditure are preferred over those based on income. The argument is that, consumption is a better indicator of lifetime welfare. Nevertheless, owing to consumption panel data unavailability, we use household incomes instead. The analysis takes into account differences in needs

due to different household sizes and composition by converting total household income into income per adult equivalent using World Health Organization (WHO) adult equivalence scales. These scales are derived from detailed studies of the nutritional requirements of males and females of different ages in developing countries. We control temporal price variability using consumer price indices (CPIs). A large proportion of the households surveyed in the first wave were found to be continually surveyed in the subsequent two waves. While the ten percent sample attrition was found to be largely random, some minor adjustments were made to take care of HIV/AIDS related attrition found pronounced in the Western lowlands region.

The choice of the explanatory variables used to estimate Equations 8 and 9 was guided by economic theories, results from earlier studies on poverty in Kenya, and data availability. According to human capital theories, household earnings are largely explained by age and education attainment. Thus, head of household age and education attainment were incorporated into the model. Household size and sex of the head were also included. Household dependency burden (dependency ratio) is also an important welfare explanatory variable. Dependency ratio is measured as the number of individuals aged below 15 or above 64 divided by the number of individuals aged 15 to 64. Other variables included crop acreage; crop and income diversification; technology adoption; and access to credit and markets. Crop acreage included the family's own land as well as hired fields under crop. Diversification indices were measured using the Simpson Index of Diversification (SID). The SID ranges between zero and unit. If the estimated SID is close to zero, it indicates specialization; on the other hand, SID close to unit indicates high levels of diversification. Technology adoption (fertilizer) and access to credit and markets determine the economic returns to household production. While use of fertilizer enhances crop productivity, credit availability assist households to bridge short-term liquidity gaps especially in obtaining farm inputs. Thus information was elicited on fertilizer use in the year preceding the survey as well as access to credit either in cash or in kind from whatever source. Data on the distance to the nearest market where households could either sell their farm produce or procure farm inputs was also gathered. Spatial variables, agro-regional dummies, were included to explore the effects of geographic factors on poverty.

4. Results and discussion

We present the study results in this section. First we present the panel variables overview followed by results from household poverty dynamics and decomposition of total household poverty analyses. We conclude by presenting the correlates of chronic and transient poverty.

4.1 Overview of the Sample Characteristics

The summary of the panel variables is provided in table 3. We present the pooled sample characteristics. On average, households had an annual income of Ksh3224 per adult equivalent. Most of the households in the sample were found to be male headed (84 percent). On average, the household head was found to be 54 years old. Majority (54%) of the household heads had only achieved primary level education. About 25 percent of the household heads lacked formal education. Only 17 percent and four percent had secondary and post secondary education, respectively. The average household size was seven members. A sizeable number of households were found to have a large number of members who were either too young or too old to work (dependency ratio of 43%).

Turning to household economic variables, crop acreage averaged 4.7 acres while maize productivity was 5.4 bags per acre. About 71 percent of the households reported having used fertilizer. The figure might seem a bit too high, but whether the households were using the recommended fertilizer types and the right quantities remain an issue open to further research. About 41 percent of the households reported having accessed credit either in cash or in kind. Qualitative data indicated that funds accessed are either used to procure farm inputs or meeting pressing and urgent social needs such as school fees and medical bills. Most of the households are about 3km away from the markets. Considering the number of crops grown and household income sources, crop diversification (0.5) exceeded income diversification (0.4).

4.2 Poverty and Economic Mobility

Transition matrices are constructed to observe the proportion of households within the panel datasets that move from one income group to another between the study periods[2]. Two poverty lines, food and absolute, were developed. The food poverty line is the cost of consuming 2250Kcalories per day per adult and it consists of a basket of 17 food items in Kenya. This food basket takes into account the consumption patterns of the Kenya population. The 2250Kcalories figure is based on the recommendations of the Food and Agriculture Organization (FAO) of the United Nations and the WHO on food consumption for specific age groups (Republic of Kenya 1998). The food poverty line was estimated at Ksh1520 in 2004. The absolute poverty line derivation takes into account the basic non-food requirements (health, education, fuel, clothing, and transport) of the population. The non-food component in Kenya is calculated using the non-food household spending for households within the range of the food poverty lines (defined as -20% and +10% of the food poverty line). The absolute poverty line was estimated at Ksh2031 for 2004.

[2] DAD Version 4.4 software for Distributive Analysis developed by Jean-Yves Duclos, Abdelkrim Araar and Carl Fortin of University of Laval, Canada was used to perform transition matrices analysis.

Results from the transition matrices analysis are presented in tables 4, 5, 6 and 7. The last column in table 4 shows household distribution in percentages depending on [1] whether they were below the food poverty line; [2] between the food and absolute poverty line; or [3] above the absolute poverty line in the base period (1997). The last row shows how the household distribution was in 2000 using the same criteria. In 1997 only 38 percent of the households were below the food poverty line while 52 percent were above the absolute poverty line. In 2000, the percentage of households below the food poverty line increased to 49 percent. The most important point to note here is that even though the number of households below the poverty line increased between 1997 and 2000, not all the poor households in 1997 remained poor. There were movements into and out of poverty. While 23 percent remained poor in 2000 (immobile), 13 percent had their welfare improve to an extent of being categorized as being above the absolute poverty line in 2000. Conversely, 19 percent of the total households had their welfare decline from being above the absolute poverty in 1997 to below the food poverty line in 2000. Generally, entries into poverty exceeded exits out of poverty between 1997 and 2000.

Next, we examine poverty dynamics in the period between 2000 and 2004 (Table 5). The number of households below the poverty line dropped from 49 percent in 2000 to 40 percent in 2004. Similarly, between 2000 and 2004 there were significant movements into and out of poverty. About 26 percent of the total households remained poor (immobile) in 2004 while 17 percent escaped poverty and were now classified above the absolute poverty line in 2004. Eleven percent of the total households categorized above the absolute line in 2000, plunged into poverty (below the food poverty) in 2004. Overall, exits out of poverty exceeded entries into poverty between 2000 and 2004. In table 6, we present an overview showing the households' welfare status in the three periods (1997, 2000 and 2004) to underscore the poverty dynamics story that studies based on cross sectional data will never tell. The results indicate that, 23 percent of the total households were strictly non-poor (above the food poverty line) over the three periods. Eleven percent of the households were consistently mired below the food line over the entire period. The rest (66%) of the households had spells (mobiles) in different poverty status as shown in table 6. The Central highlands (38%) had the largest contribution to the non-poor households (Table 7). On the other hand, Western lowlands (30%) and Coastal lowlands (22%) had the highest contribution to the consistently poor households in the three periods. Coastal (29%) and Eastern (24%) lowlands had the highest percentage of the mobiles (those who experienced spells in different welfare status).

Generally, the poverty incidence trends observed in 1997 (38%), 2000 (49%) and 2004 (40%); the net entries into poverty in the 1997-2000 period; and the net exits out of

poverty in the 2000-2004 period, mirror the general economic growth trends as presented in figure 1. In 1997, the overall GDP grew by 2.4 percent while in 2000 it plummeted to negative 0.3 percent. Since then, the economic growth has been on the upward trend. The dynamics could also be associated with transition in political power from Kenya Africa National Union (KANU) party to the National Rainbow Coalition (NARC) party in 2002. The NARC government, as alluded to earlier, introduced innovative poverty interventions like free primary education (FPE) and constituency development fund (CDF) that go directly to local levels (constituencies). With the new government, the macroeconomic climate has also stabilized. These results hint that macroeconomic-level shocks are probably transmitted through the markets to impact on the rural households' welfare. The large contribution to non-poor households by the Central highlands and High potential maize zone could be attributed to the fact that these regions are characterized by relatively stable and secure livelihoods. They grow cash crops and are generally agricultural production surplus zones. The huge contribution by the lowlands regions to the consistently poor and the 'mobiles' could be attributed to the unreliable rainfall and frequent droughts that expose inhabitants to frequent livelihood disturbances and food insecurity problems.

4.3 Poverty Decomposition

Next, we embark on J&R and EDE total poverty decomposition. We use per adult equivalent household income, food poverty line, and weight households by their sampling weight times household size. Estimations are done using STATA programs[3]. We provide corrections for the statistical biases introduced by a small number of time observations (similar to the bias generated when estimating the variance of a given variable when the number of observations is very small). In the J&R approach, these biases directly affect estimation of chronic poverty while in the EDE approach they directly affect the estimation of transient poverty. The J&R transient poverty and the EDE chronic poverty are also biased since they are both derivatives of biased estimators (recall equations 7 and 18). Statistical bias corrections significantly enhance the precision of poverty estimates. The J&R transient poverty dominate chronic poverty (Table 8). Transient poverty represents 56 percent of the total J&R poverty. After bias correction, the bias corrected transient poverty increases as expected to account for 75 percent of the total J&R poverty. The J&R approach is known to overestimate transient poverty component (Duclos et al., 2006). All the estimates discussed from now onwards are bias corrected.

[3]Both the J&R and EDE decompositions were done using the Distributive Analysis STATA Package (DASP) routines developed by Abdelkrim Araar and Jean-Yves Duclos of University of Laval, Quebec, Canada.

Apparently, the exact position of the poverty line selected affects the results. Figure 2 clearly shows that in certain ranges of the income distribution, even fairly small movements of the poverty line can have large effects on the estimated incidence of poverty and its chronic and transient proportions. The left vertical axis shows the numerical value of estimates while the right vertical axis displays the ratio of transient over chronic poverty. Increasing the poverty line from Ksh500 to Ksh2500 holding $\alpha = 2$ unsurprisingly increases all of the poverty estimates but has a stronger effect on chronic poverty as compared to transient poverty. The ratio of transient over chronic poverty is exceedingly sensitive to the choice of poverty line.

In table 9, we use the same data to decompose total poverty but this time using the EDE approach. In this case, chronic poverty is more important than transient poverty. It represents 79 percent of the total EDE poverty. The total poverty is 0.354 while average gap is 0.198. The chronic poverty is estimated at 0.278. The transient poverty, inequality within households, is estimated at 0.076. It is the cost in average poverty gap units that households would collectively accept to give to eliminate within-households variability of poverty status. The cost of inequality between households is 0.080 and is the cost in average poverty gap units that the SDM would want to spend to remove between-households inequality in welfare status. Total cost of inequality in poverty gaps is the sum of the cost of inequality between households and that of inequality within households, and is thus estimated at 0.156. As said earlier, all the EDE estimators have a money-metric cardinal value. In this scenario, a social decision maker (SDM) would be willing to spend at most about 21 percent of the cost of the total poverty to eliminate intra- household inequality in poverty status. The difference between EDE and J&R approaches is apparent. For the same α and the same poverty line, the EDE transient poverty now represents only 21 percent of total poverty while in the J&R it accounted for 75 percent.

Figures 3 -10 show the relationship between the two poverty components and other selected variables using non-parametric regressions. In non-parametric regression, the functional form of the relationship between the response variable and the associated predictor variable does not need to be specified in order to fit a model to a set of data (Duclos and Araar, 2006). Figures 3 and 4 show the expected transient and chronic poverty levels given the permanent income. As expected, both J&R and EDE chronic poverty decrease sharply with an increase in permanent income. Transient poverty increases gently with income reaching a maximum and then falls in the two approaches.

Next, we estimate the expected J&R chronic and transient poverty given permanent income by gender. Chronic poverty declines with permanent income for all households but with female-headed households generally experiencing more chronic poverty than male-

headed households (Figure 5). Both male- and female- headed households experience increasing transient poverty as permanent income increases, reaching a maximum and then declines (Figure 6). By and large, female-headed households experience higher transient poverty levels compared to households headed by their male counterparts. This result concurs with findings by Place et al. (2004) that chronically poor households are likely to be headed by women. Generally, households with fewer members experience more chronic poverty (Figure 7). As household size expands, households experience reduced expected chronic poverty, reaching a minimum threshold (three members), then thereafter, chronic poverty increases. While this observation confirms the hypothesis that larger families are more likely to fall into poverty, it also shows that extremely small households are disadvantaged. The transient poverty slightly increases with household size. This finding confirms results from Kristjanson et al. (2004), Krishna et al. (2004), and Mango et al., (2004) that relatively large households are vulnerable to chronic poverty.

When rural households are not constrained by land, they tend to maximize crop acreage to compensate for poor soils and unavailability of financial resources, and to secure land intensification technologies. Chronic poverty declines as households' crop acreage increase (Figure 8). Transient poverty is not strongly correlated to crop acreage. Both chronic and transient poverty decline as households' maize productivity increases (Figure 9). Maize is the Kenyan staple food crop and it is indeed grown by the majority of the rural households (Muyanga, 2004). Transient poverty declines at a rate slightly lower that that of chronic poverty with increased productivity levels.

Chronic poverty declines with the value of the physical assets owned by families (Figure 10). Assets include the aggregated value of items such ox ploughs, wheelbarrows, bicycles, radios, televisions, livestock, motor vehicles, and farm machinery but excluding land. These results underscore the importance of physical assets in income generation thereby keeping chronic poverty at bay (Barret et al., 2006). The relationship between transient poverty and households' assets is apparently not strong. This is because the constraints that hold back assets from uninterrupted income generation are possibly the same factors that to some extent cause transient poverty, e.g. drought. Also, assets are fixed (illiquid) in the short-term and thus not easily convertible into 'money at call on short notice' to intervene in case of transient poverty. We are also not ruling out cultural attachments to large animals, given that livestock dominate the rural households' assets. In case of short-term consumption or income interruptions, household will be more inclined to seek casual labor or dispose of small livestock such as chickens before thinking of selling cattle.

Poverty components decrease with the highest level of education attained by the household head (Table 10). The households that have heads without formal education contribute 54 and 76 percent to transient and chronic poverty, respectively. Educated heads have higher income earning potential and more alternative income earning opportunities, and are thus better able to improve the quality of their respective households' welfare. These results underscore the importance of education in poverty reduction. The importance of education in chronic poverty reduction is also highlighted in earlier works on poverty dynamics in Kenya (Place et al. 2003; Gamba and Mghenyi, 2004; Kristjanson et al., 2004; Krishna et al., 2004; and Mango et al., 2004). Table 11 provides poverty information by agro-regional zones. As expected, the Central highlands contribute nil to chronic poverty. Households living in the Central highlands are unlikely to experience chronic poverty. Central highlands' contribution to transient poverty is only four percent. Western highlands contribute six percent to transient and four percent to chronic poverty. The relatively dry lowlands recorded high transient and chronic poverty contribution. The Coastal and the Eastern lowlands contributed 38 and 22 percent, respectively to transient poverty. The Western lowlands contributed the most (46%) to total chronic poverty. These results confirm the earlier findings obtained using transition matrices results.

4.4 Determinants of transient and chronic poverty

Next we derive the correlates of chronic and transient poverty in rural Kenya. We circumvent the censoring problem by doubling the absolute poverty line to increase the pool of chronic and transitory-poor households and decrease the number of never-poor households. The earlier studies adopted a similar procedure in their analysis (Cruces and Wodon, 2003 and Jalan and Ravallion, 2000). Censored quantile regressions are estimated at the 0.8^{th} quantile[4]. The explanatory variables are measured at the beginning of the period under investigation to ascertain whether the base scenario explains poverty components derived from the entire panel period. While we have made an effort to reduce endogeneity and multicollinearity problems in our choice of the explanatory variables, we appreciate the inherent difficulties in eliminating these econometrics problems.

We now turn to the regression results (Table 12). The results indicate that relatively large households tend to experience more transient and chronic poverty. This result concurs with our earlier finding using the non-parametric regression approach (Figure 7). Chances of households with high number of either too young or too aged members to be poor are very high. Dependency ratio is positively related to both transient and chronic poverty. However, it is only statistically significant for chronic poverty. This result confirms Kristjanson et al.

[4] The estimation was performed using the **qcenreg** STATA routine developed by Robert Vigfusson at Northwestern University.

(2004), Krishna et al. (2004); and Mango et al. (2004) findings that high burdened households are more likely to drift into chronic poverty. The age of the household head is positively related to the two components of poverty but the relationships are not statistically significant. Female-headed households are likely to be chronically poor compared to male-headed counterparts, confirming the earlier results from the non-parametric regression (Figures 5 and 6). Poverty, whether transient or chronic, is a decreasing function of education. Households headed by educated heads are unlikely to be chronic or transient poor (informal education level is the control variable). Poverty decomposition results analysis yielded similar results (Table 11). However, primary education is not statistically significantly related to transient poverty. Heads with primary education or no formal education have less income earning opportunities to effectively cushion their households from seasonal welfare disturbances.

Large crop acreage is significantly associated with low poverty. Similar findings emerged in our earlier non-parametric regression (Figure 8). This finding is supported by earlier studies by Gamba and Mghenyi (2004), Kristjanson et al. (2004) and Mango et al. (2004). High crop diversification significantly reduces all poverty components. Households minimizing risks by planting a variety of crops are less likely to fall into chronic and transient poverty. Highly specialized households stand to be at high risk in case of crop diseases and market price fluctuations. The importance of crop diversification in poverty reduction is also underscored by Mango et al. (2004). Income diversification reduces all poverty components. Naturally, households with a variety of income sources are less likely to be poor. However, it is only statistically significantly related to chronic poverty. Studies by Place et al. (2003), Kristjanson et al. (2004), Krishna et al. (2004) and Mango et al. (2004) also registered similar findings. Despite confounding relationships between distance to markets and poverty components, the relationships are not statistically significant. Households that were accessing credit of whatever kind are found to likely be less poor. This relationship was statistically significant for both chronic and transient poverty reduction. Credit availability allows households to bridge short-term liquidity gaps especially in obtaining farm inputs. Similar results are obtained when we considered households that reported use of modern productivity-enhancing technologies (e.g. fertilizer). Use of fertilizer is negatively and significantly related to both chronic and transient poverty. Place et al. (2003) also established evidence linking the chronic poor to low use of fertilizer and limited access to credit.

Poverty is also found to be associated with the region where the households are located. Using Western lowland as the control variable, living in all other regions is found to significantly reduce poverty but at varying degrees. Recall that Western lowland registered

the highest contribution to chronic poverty (Table 10). Living in the Central highlands and Western highlands reduces chances of chronic poverty more than in the lowlands. Living in the Coastal and Eastern lowland regions were found to increase vulnerability to transient poverty while inhabitants of Central and High potential maize zones were found less vulnerable to transient poverty. As alluded to earlier, the high potential regions have stable livelihoods while the lowlands are prone to drought and famine. These results confirm the results from the transition matrices and poverty decomposition. They also concur with the results of Barret et al. (2006), that there exists geographic poverty traps in lower-potential regions in Kenya. There are also other studies that seem to echo our findings, though from different perspectives. Kristjanson et al. (2004), Krishna et al. (2004) and Mango et al. (2004) associated chronic poverty to unproductive land while Mango et al. (2004) links chronic poverty to natural catastrophes. The lowland regions in Kenya have eroded and degraded soils making them unproductive. The lowlands are also more associated to natural calamities such rainfall unreliability and droughts.

5. Conclusion and Policy Implications

This study contributes to poverty analysis by incorporating the dimension of poverty dynamics to poverty analysis in Kenya. First we analyzed poverty dynamics using economic transition matrices. We observed that there were significant movements into and out of poverty over the study period. Next we decomposed total poverty into transient and chronic poverty components using transient poverty as censored fluctuation (J&R) and equally distributed equivalent (EDE) poverty gaps approaches. The difference between the EDE and the J&R approaches in household poverty decomposition has emerged clear. For the same measure of risk aversion (α) and the same poverty line, in the J&R approach transient poverty was found to dominate chronic poverty while in the EDE approach chronic poverty was significant. Thus, the significance of poverty components depends on the methodology and choice of poverty line. A slight change of the poverty line significantly alters the ratio of the two poverty components. Lastly, using non-parametric regressions and censored quantile regression, we attempted to identify important correlates of poverty components. As shown in the discussion, most of the findings in this study are supported by earlier studies on poverty dynamics in Kenya. Even though these studies adopt varying approaches, their results appear to converge. The results from the current study can tremendously assist anti-poverty targeting and poverty reduction policies both in Kenya and other similar sub-Saharan countries. In table 13 we provide a summary of our results in what we refer to as the policy makers' transient and chronic poverty *toolkit*.

Anti-chronic poverty targeting criteria must take into account household sizes, gender of household head, dependency ratios, and farm sizes. Also, the lowlands and other regions frequented by drought, crop failures, and transitory food insecurity should be considered. Turning to policy lessons, the role of education in poverty reduction and especially on chronic poverty has emerged as important. Poverty is both a cause and an effect of insufficient access to quality education. Education is critical to breaking the cycle of poverty. For the poor parents, the opportunity to obtain primary education for their offsprings is the first empowering step in their journey out of poverty. Missed schooling opportunities are supposed to be taken as a serious `irreversible disinvestment'. The recently launched free primary education program in Kenya is a step in the right direction. However, as shown in this study, the success of education in reducing poverty hinges on primary graduates excelling beyond primary schools. Thus, policies aimed at enhancing access to post primary education such as provision of secondary and post secondary bursaries for students from targeted households and regions will be appropriate.

Due to the connection between high chronic poverty and large families, family planning programs that educate households about the virtues of having small families (moral suasion) while supporting them in birth control need to be promoted to assist in reducing rural household sizes and high dependency burdens in the long run. Households headed by females were found to be likely chronic poor. Women poverty is largely a result of deprivation in basic capabilities. Thus, policies aimed at eradicating illiteracy and closing gender gaps in education would be appropriate. Also, the absence of health services and clean water sources usually translate into added burdens for women. Cultural practices that restrict women's access to resources perpetuate women's economic disadvantage. This calls for legal reforms and enforcement of laws relating to women's property ownership and inheritance, laws relating to age of marriage, and sex discrimination in the labor market.

Land-intensification technologies such as the use of fertilizer, and improving maize productivity were found critical in poverty reduction. Sustaining a transition out of poverty will require substantial increase in agricultural productivity. There is a consensus that a much higher use of fertilizer and hybrid maize seeds will be critical for African countries to generate 'green revolutions'. This calls for the government to support non-market distorting programs to promote fertilizer and hybrid seed use, and policies to expand their distribution networks. The government will also need to strengthen the agricultural extension system.

Closely related to productivity is the finding that households with small crop acreage are likely to be chronically and transient poor. However, with the land frontier shrinking due to population pressure and consequent land subdivision, future growth in agriculture will increasingly have to come from yield increases rather than from area expansion (Eicher,

1994). Access to credit either in cash or in kind was found to reduce chances of households falling into chronic and transient poverty. Credit helps households to smooth consumption and expenditure in the face of short-term liquidity problems. Policy responses would include promotion of community banks, private rural banks, savings and credit cooperatives, agricultural development banks, and credit non-governmental organizations. Rural communities also must learn to save the little they earn, thus promotion of a saving culture would be imperative. Programs that guarantee farm inputs credit would also be appropriate.

Households with diversified crops and income sources are less likely to fall into chronic poverty. Hence, agricultural extension should encourage crop diversification and more so into to high value crops. Diversification of income sources in the short-run could include other income generating activities such as bee keeping, livestock, and small businesses. In the long-run, and coupled with education and skills, diversification into formal employment is appropriate. Non-parametric regressions results underscored the importance of physical assets in chronic poverty mitigation. Programs that promote and sensitize communities about accumulation of physical assets are in order. Households living in regions faced by frequent crop failures, drought, and famine should be targeted for support using the various policy interventions discussed. More specifically, a lasting food and nutrition security policy must be formulated. Such a policy should consider diversification of income sources, generation of appropriate lowland technologies (crops and seeds), and feasibility of crop growing under irrigation.

Table 1: Panel data coverage

Agro regional zones	*Districts Included in the Panel*
Coastal Lowlands	Kilifi, Kwale
Eastern Lowlands	Taita Taveta, Machakos, Makueni, Mwingi, Kitui
Western Lowlands	Kisumu, Siaya
Western Transitional	Bungoma, Kakamega
High Potential Maize Zone	Trans Nzoia, Uasin Gishu, Nakuru, Narok, Bomet, Lugari
Western Highlands	Kisii Central, Vihiga, Butere /Mumias
Central Highlands	Meru Central, Muranga, Nyeri
Marginal Rain Shadow	Laikipia

Source: Authors' Compilation

Table 2: Conversion factors to compute adult equivalents

Age	Adult Equivalence	
	Males	*Females*
Under 1 year	0.33	0.33
1 - 1.99	0.46	0.46
2 - 2.99	0.54	0.54
3 - 4.99	0.62	0.62
5 - 6.99	0.74	0.70
7 - 9.99	0.84	0.72
10 - 11.99	0.88	0.78
12 - 13.99	0.96	0.84
14 - 15.99	1.06	0.86
16 - 17.99	1.14	0.86
18 - 29.99	1.04	0.80
30 - 59.99	1.00	0.82
60 and over	0.84	0.74

As per the World Health Organization

Table 3: Summary of the panel variables

Variables	2004	2000	1997	Pooled	Expected sign
Mean annual income per adult equivalent (Ksh)	3,416	3,009	3,248	3,224.3	-
Male headed (%)	85	88	80	84.3	-
Female headed (%)	15	12	20	15.7	+
Mean age of household head (years)	56.3	53.5	52.5	54.1	+
Education level of the household head (%)					
None	23	26	27	25.3	+
Primary	61	52	50	54.3	-
Secondary education	14	18	18	16.7	-
Post secondary	2	4	6	4.0	-
Mean household size	7	8	7	7.3	+
Dependency ratio	45	39.8	44.6	43.1	+
Mean acreage under crop	4.7	5.5	3.8	4.7	-
Maize productivity (bags/acre)	5.9	5.5	4.8	5.4	-
Fertilizer use (%)	85	64	65	71.3	-
Credit access (%)	32	49	41	40.7	-
Distance to the nearest market (Km)	2.8	3.4	4	3.4	+
Crop diversification index	0.58	0.53	0.44	0.5	-
Income diversification index	0.46	0.37	0.41	0.4	-

Table 4: 1997-2000 Economic transition matrix

		2000			
		Below food	Between food	Above absolute	Total
1997	Below food poverty line (Ksh1,520)	23%	2%	13%	38%
		(0.03)	(0.01)	(0.01)	(0.03)
	Between food and absolute poverty lines	7%	1%	3%	10%
		(0.01)	(0.00)	(0.01)	(0.02)
	Above absolute poverty line (Ksh2,031)	19%	5%	27%	52%
		(0.02)	(0.01)	(0.06)	(0.05)
	Total	49%	8%	43%	100%
		(0.06)	(0.01)	(0.06)	(0.00)

Standard errors in parenthesis

Table 5: 2000-2004 Economic transition matrix

		2004			
		Below food poverty line (Ksh1,520)	Between food and absolute poverty lines	Above absolute poverty line (Ksh2,031)	**Total**
2000	Below food poverty line (Ksh1,520)	26%	6%	17%	49%
		(0.04)	(0.01)	(0.05)	(0.06)
	Between food and absolute poverty lines	3%	2%	3%	8%
		(0.01)	(0.01)	(0.01)	(0.01)
	Above absolute poverty line (Ksh2,031)	11%	3%	29%	43%
		(0.02)	(0.01)	(0.05)	(0.06)
	Total	40%	11%	49%	100%
		(0.04)	(0.02)	(0.05)	(0.00)

Standard errors in parenthesis

Table 6: Summary of the households' welfare status in 1997, 2000 and 2004

	Below food poverty line	Between food and absolute poverty lines	Above absolute poverty line	Proportion (%)	
Non-poor			3 spells		23
Transient poor		1 spell	2 spells	6	66
		2 spells	1 spell	1	
	1 spell		2 spells	19	
	1 spell	1 spell	1 spell	10	
	1 spell	2 spells		2	
	2 spells		1 spell	22	
	2 spells	1 spell		6	
Chronic poor	3 spells				11

Table 7: Households' welfare status in 1997, 2000 and 2004 across regions (estimates)

Region	Out of poverty		Mobile		Stuck in poverty	
	Number	%	Number	%	Number	%
Coastal Lowlands	922,992	17	4,785,546	29	597,629	22
Eastern Lowlands	990,385	18	3,850,118	24	404,209	15
Western Lowlands	106,843	2	1,679,071	10	811,342	30
Western Transitional	563,603	10	1,800,393	11	288,995	11
High Potential Maize	745,124	13	1,432,772	9	320,618	12
Western Highlands	100,902	2	880,292	5	168,441	6
Central Highlands	2,117,563	38	1,950,023	12	70,596	3
Column total	5,547,412	100	16,378,215	100	2,661,830	100

Table 8: J&R transient and chronic poverty, with and without bias correction; $\alpha = 2$;

Index	Without bias corr.	%	With bias corr.	%
Bias	---	---	-0.0246 (0.0039)	---
Transient poverty $P^{TR}(T)$	0.0700 (0.0060)	56	0.0946 (0.0098)	75
Chronic poverty $P^{CH}(T)$	0.0554 (0.0087)	44	0.0308 (0.0075)	25
Total poverty $P^{TT}(T)$	0.1254 (0.0135)	100	0.1254 (0.0135)	100

asymptotic standard errors within parenthesis

Table 9: EDE transient and chronic poverty, with and without bias correction; $\alpha = 2$;

Components	Without bias corr.	%	With bias corr.	%
Average gap $\Gamma_1(g)$	0.198 (0.0063)		0.198 (0.0063)	
Cost of inequality between households $C_\alpha(\gamma_\alpha)$	0.097 (0.0023)		0.080 (0.0027)	
Transient poverty $\Gamma_\alpha^T(g)$ - Inequality within households	0.059 (0.0018)	17	0.076 (0.0023)	21
Chronic poverty $\Gamma^\Phi(g)$	0.295 (0.0061)	83	0.278 (0.0061)	79
Total poverty $\Gamma_\alpha(g)$	0.354 (0.0066)	100	0.354 (0.0066)	100

asymptotic standard errors within parenthesis

Table 10: Chronic and transient poverty by the household head education level

Group	Total Poverty	Proportion (%)	Transient (%)	Chronic (%)
None	0.1625	46	54	76
Primary	0.1113	37	33	27
Secondary	0.0892	12	10	0
Post secondary	0.0428	6	2	0
TOTAL	0.1283	100	100	100%

Table 11: Chronic and transient poverty by agro regional zones

Group	Total Poverty	Proportion (%)	Transient (%)	Chronic (%)
Central highlands	0.032	13	4	0
Coastal lowlands	0.141	31	38	14
Eastern lowlands	0.122	21	22	12
High potential maize	0.096	10	6	17
Western highlands	0.162	4	6	4
Western lowlands	0.276	9	14	46
Western transitional	0.115	11	11	7
TOTAL	0.128	100	100	100

Table 12: Censored quantile regression for the determinants of the squared poverty gap for rural Kenya, 1997-2004

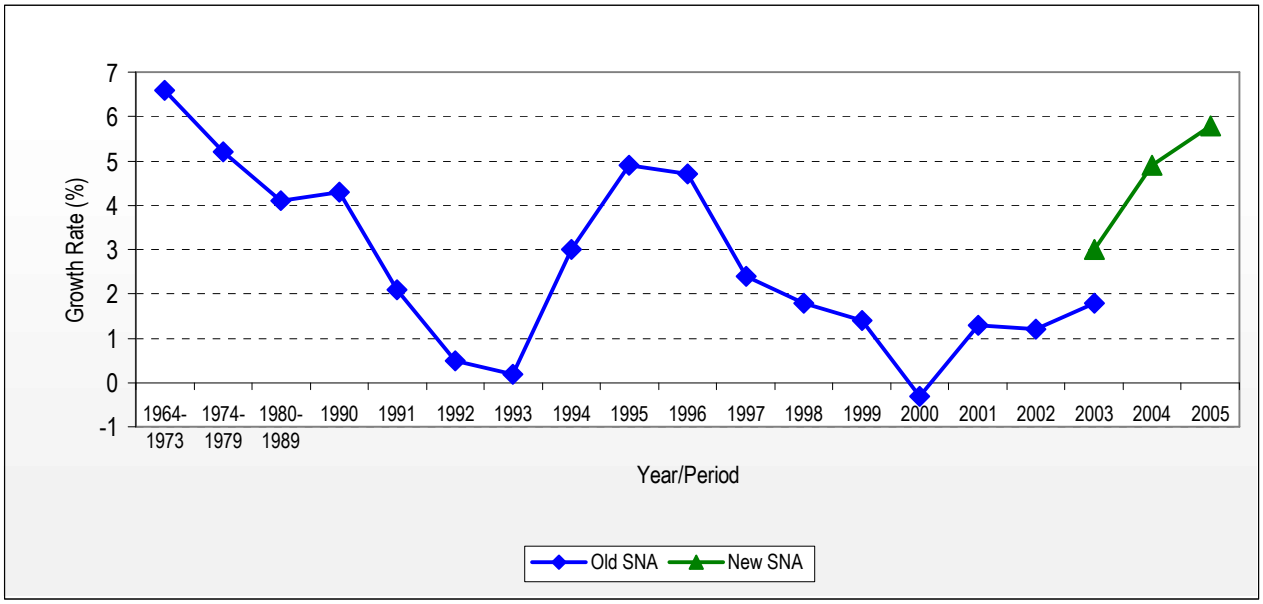
Variable	Transient (T)	Chronic (C)
Household size	0.021	0.071
	(0.009)*	(0.012)**
Age of household head	0.001	0.002
	(0.003)	(0.004)
Female head household dummy	0.005	-0.063
	(0.016)	(0.019)**
Primary education dummy	-0.005	-0.063
	(0.014)	(0.016)**
Secondary education dummy	-0.047	-0.137
	(0.020)*	(0.025)**
Post secondary education dummy	-0.097	-0.201
	(0.026)**	(0.040)**
Dependency ratio	0.011	0.070
	(0.009)	(0.012)**
Cultivated land	-0.003	-0.054
	(0.002)*	(0.005)**
Crop diversification index	-0.074	-0.254
	(0.036)*	(0.045)**
Income diversification index	-0.048	-0.119
	(0.047)	(0.056)*
Distance to nearest market	-0.000	0.002
	(0.001)	(0.002)
Credit access dummy	-0.032	-0.081
	(0.013)*	(0.015)**
Fertilize use dummy	-0.025	-0.099
	(0.015)*	(0.018)**
Coastal lowlands dummy	0.072	-0.172
	(0.030)*	(0.037)**
Eastern low lands dummy	0.050	-0.164
	(0.025)*	(0.030)**
Western transitional dummy	0.045	-0.151
	(0.024)*	(0.029)**
High potential maize zone dummy	-0.001	-0.172
	(0.024)	(0.029)**
Western highlands dummy	0.103	-0.213
	(0.026)**	(0.030)**
Central highlands dummy	-0.019	-0.247
	(0.024)	(0.028)**
Constant	-0.909	-6.262
	(0.953)	(1.205)**
Number of obs	1290	997
Pseudo R2	0.1052	0.3251

Standard errors within parenthesis; * significant at 5%; ** significant at 1%

Table 13: Policy makers' toolkit for transient and chronic poverty

Transient	Chronic	Policy proposals
○ Large household sizes	○ Large household sizes	- Target for support - Family planning programs
	○ Female headed households	- Target for support - Adult and girl-child education to close gender gaps in education - Health services, water, etc to lessen women excess burdens - Legal reforms focusing on property ownership and inheritance, discrimination at labor market, physical violence and age of marriage
	○ Households with high dependency ratios	- Target for support - Family planning programs - Efficient pension schemes
○ Households with small farms	○ Households with small farms	- Adoption of land-intensification technologies
○ Regions-lowlands, areas frequented by drought and crop failures	○ Regions-lowlands, areas frequented by drought and crop failures	- Target for support - Food and nutrition security policy - Income sources diversification - Promotion of suitable technologies (seeds and crops) - Explore irrigation possibilities
○ Secondary and post secondary education	○ All levels of education	- Free primary education - Secondary and post secondary bursaries for students in targeted households and regions
○ Crop diversification	○ Crop diversification	- Crop diversification - Diversification into high value crops - Support agricultural extension services
	○ Income sources diversification	- Diversification into other income generating activities such as bee keeping and livestock improvement programs
○ Credit access	○ Credit access	- Facilitate access to small amounts of credit to rural areas - Community banks, private rural banks, savings and credit cooperatives, and credit NGOs. - Promotion of saving culture
○ Productivity enhancing technologies	○ Productivity enhancing technologies	- Promote non-market distorting programs to enhance fertilizer and hybrid seeds use. - Support seed and fertilizer distribution networks - Programs to guarantee farm inputs credits - Support agricultural extension services

Figure 1: Gross domestic product growth rates in Kenya



Source: Republic of Kenya, Economic Surveys (various issues). Note: A new System of National Accounts (SNA) was introduced in 2003 that captures activities in some fast growing sub-sectors that were ignored by the old SNA.

Figure 2: Transient and chronic poverty components

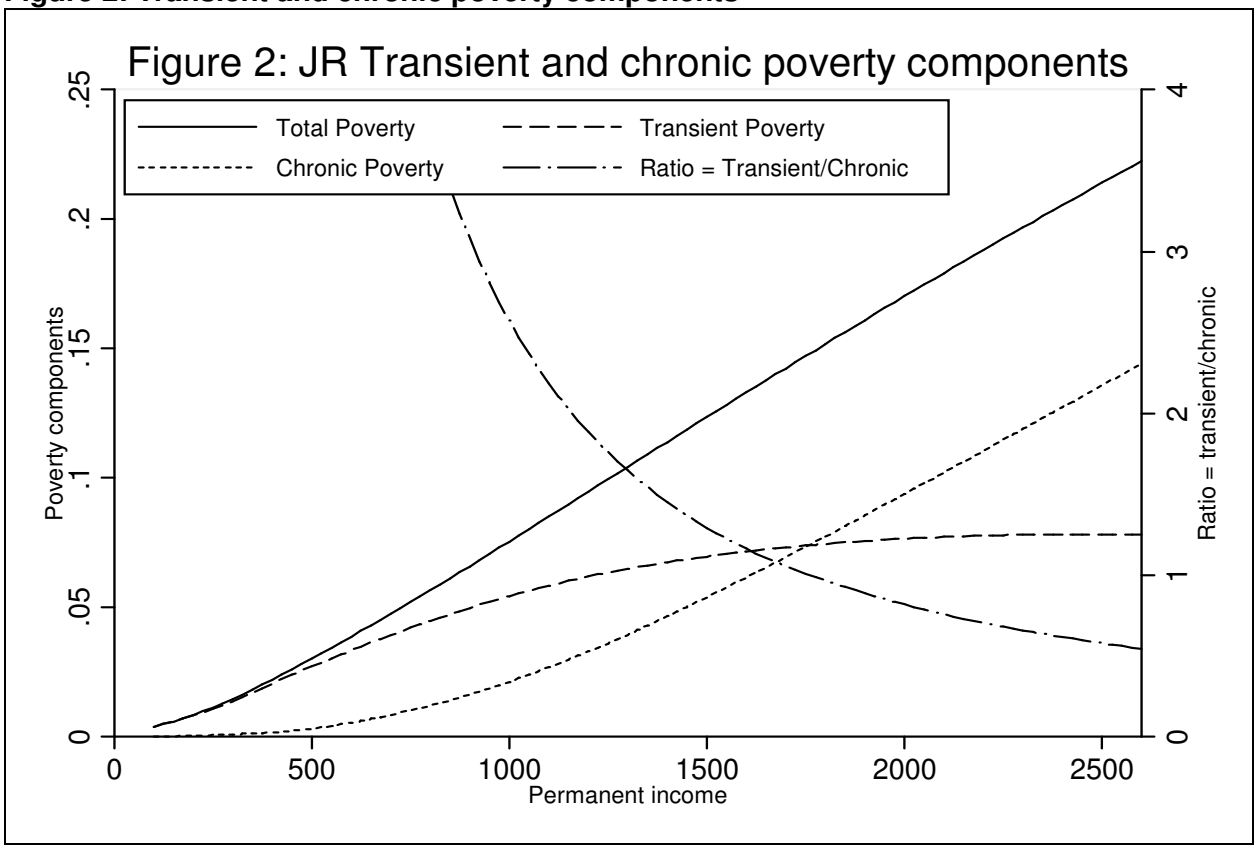


Figure 3: Transient and chronic poverty

(Linear Locally Estimation Approach | Banwidth = 455.8768)

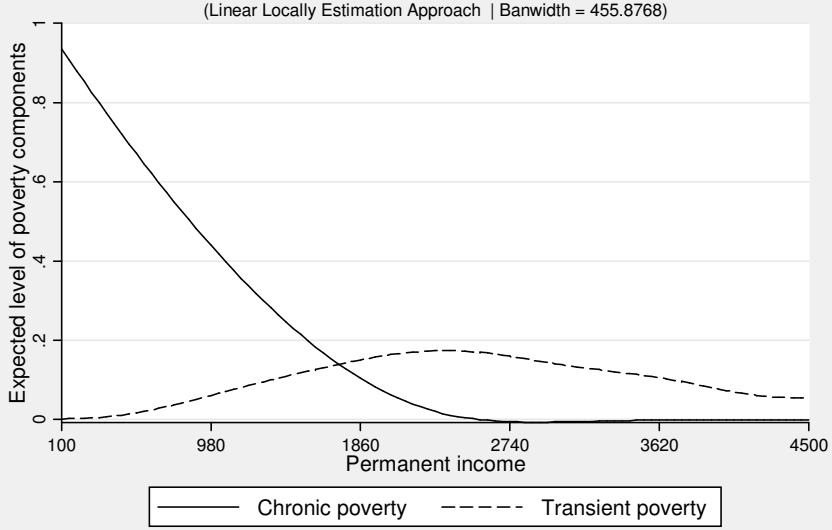


Figure 4: EDE Transient and chronic poverty

(Linear Locally Estimation Approach | Banwidth = 455.8768)

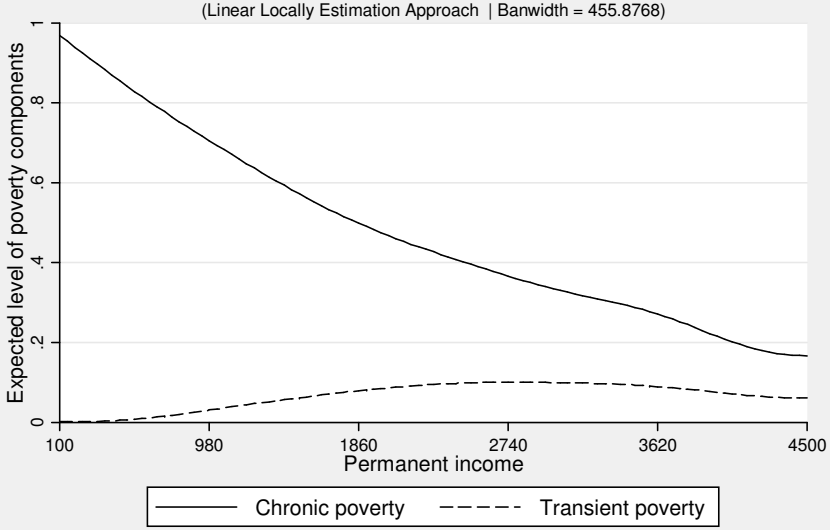


Figure 5: Gender and chronic poverty

(Nadaraya-Watson Estimation Approach | Banwidth = 413.8098)

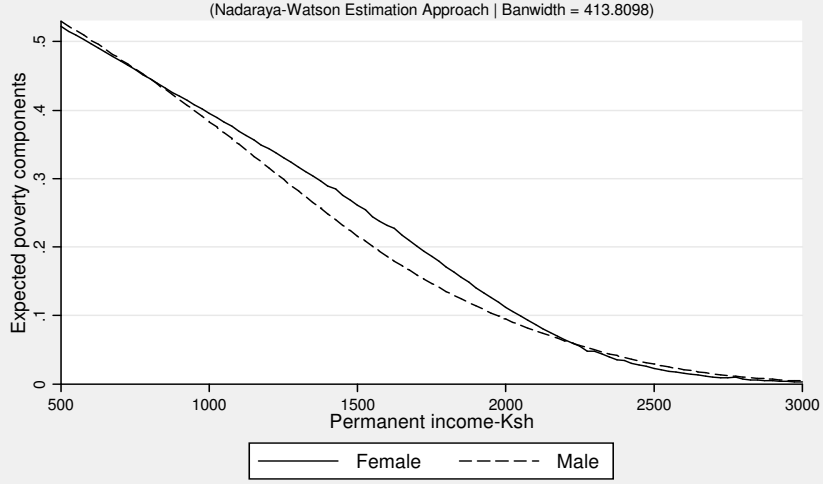
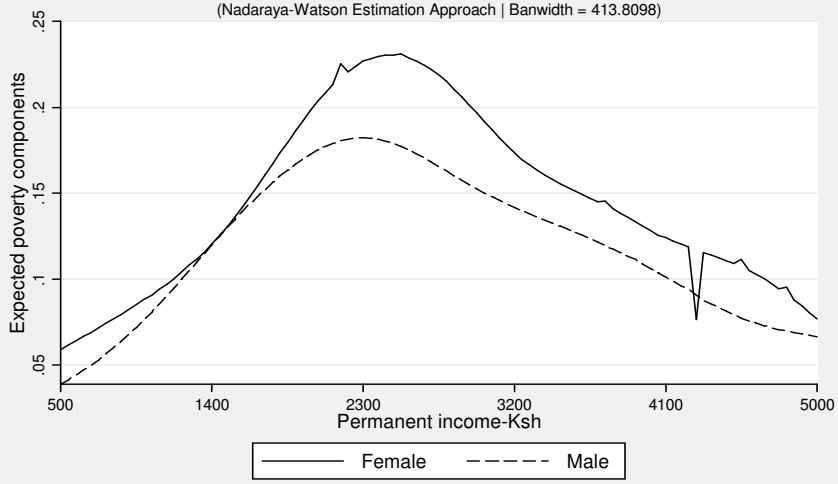


Figure 6: Gender and transient poverty

(Nadaraya-Watson Estimation Approach | Banwidth = 413.8098)



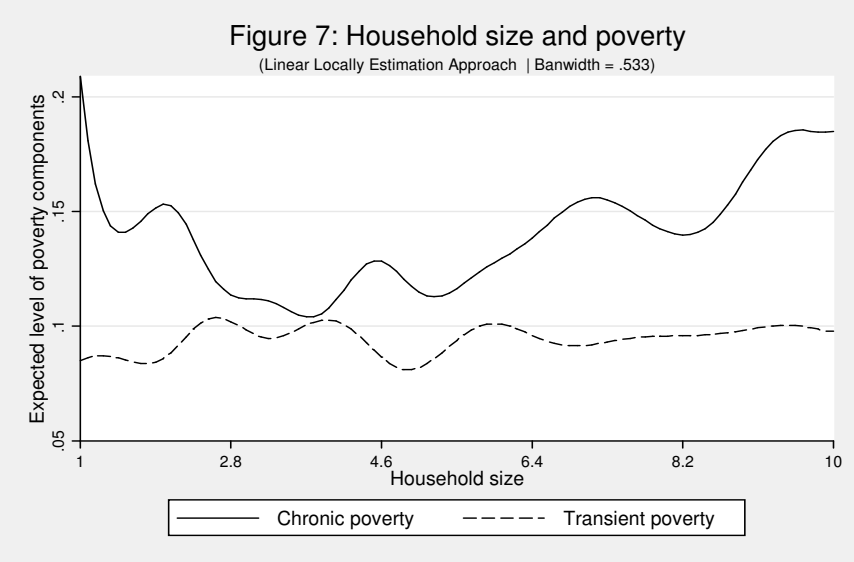


Figure 7: Household size and poverty
(Linear Locally Estimation Approach | Banwidth = .533)
Expected level of poverty components
.05
.1
.15
.2
1
2.8
4.6
6.4
8.2
10
Household size
Chronic poverty
Transient poverty

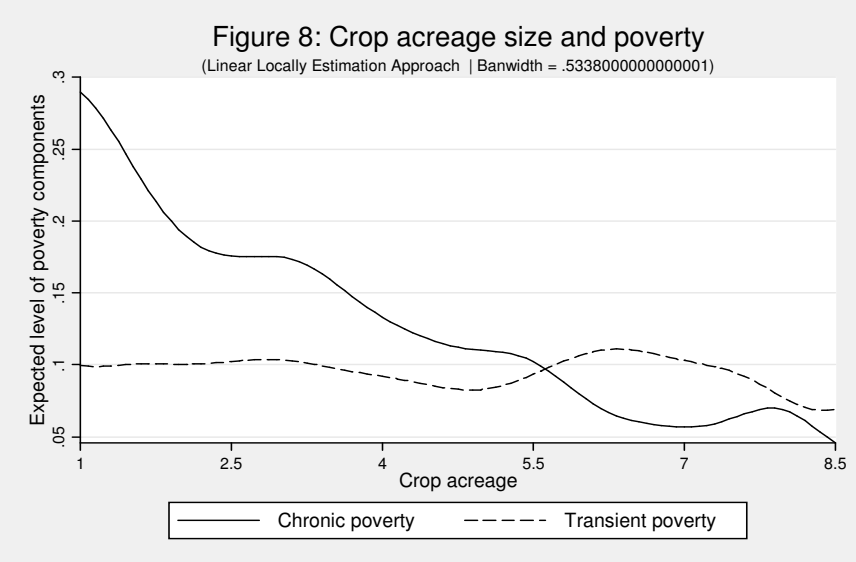


Figure 8: Crop acreage size and poverty
(Linear Locally Estimation Approach | Banwidth = .5338000000000001)
Expected level of poverty components
.05
.1
.15
.2
.25
.3
1
2.5
4
5.5
7
8.5
Crop acreage
Chronic poverty
Transient poverty

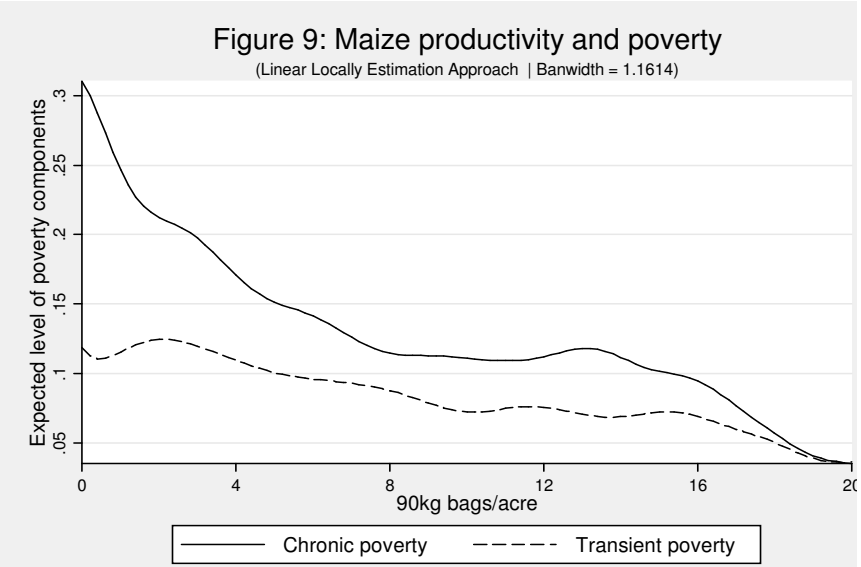


Figure 9: Maize productivity and poverty
(Linear Locally Estimation Approach | Banwidth = 1.1614)
Expected level of poverty components
.05
.1
.15
.2
.25
.3
0
4
8
12
16
90kg bags/acre
Chronic poverty
Transient poverty

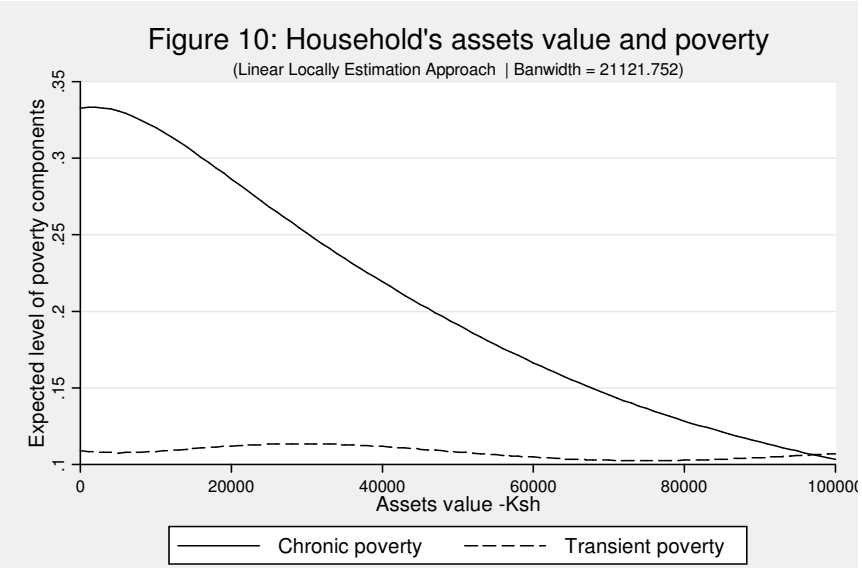


Figure 10: Household's assets value and poverty
(Linear Locally Estimation Approach | Banwidth = 21121.752)
Expected level of poverty components
.1
.15
.2
.25
.3
.35
0
20000
40000
60000
80000
Assets value -Ksh
Chronic poverty
Transient poverty

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