

Determinants of Income Poverty in Rural Africa: Empirical Evidence from Kenya and Nigeria

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Abstract

Growth and development aid have proved to be insufficient for alleviating rural poverty in Africa. Thus, efforts should be directed toward enhancing the capacities of rural households to utilize their productive assets, human capital, and land more efficiently in order to alleviate poverty on their own. This paper uses panel and cross-sectional regressions, with socio-economic and demographic survey data collected from rural communities of Kenya and Nigeria, to explore the determinants of income and poverty in rural Africa. Results from the regressions reveal very intriguing insights. Household size has a significantly large and negative effect on income. The value and size of land owned are both important for explaining differences in income amongst rural households. Ownership of non-durable assets including tools and livestock improves households' income generating ability. The results also reveal strong evidence of the feminisation of poverty in rural Kenya, which implies that women should be a major focus of poverty alleviation efforts in Africa. Lastly, based on the surveys for this study, the level of inequality was found to be higher in rural Kenya than some other developing countries.

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I INTRODUCTION

While many African countries achieved encouraging growth rates within the past decade or so, poverty rates still remain very high, which implies that more should be done to alleviate poverty beyond a focus on growth¹. The policy challenge, therefore, is: what else should be done beyond growth to alleviate poverty? What kinds of investments are more effective in alleviating rural poverty? Who should be targeted, and with what instruments? This paper tries to address these questions by exploring income determinants in rural communities in Kenya and Nigeria.

Following their implementation of structural adjustment, good governance and institutional reform during the past two decades, many African countries have witnessed significant increases in economic growth rates. Some African countries were amongst the best growth performers in developing countries: from 2001 to 2008, the average per capita growth rate was 10% in Angola, 6% in Chad, 5.5% in Ethiopia, 5.7% in Mozambique, 7.4% in Sierra Leone, and 5.2% in Sudan (see Table 1). Compared to East Asian and Latin American countries, however, growth in Africa has been slow in alleviating poverty. Some researchers even claim that growth may have exacerbated poverty and inequality in the region (Nissanke and Thorbecke, 2008: 12). Figure 1 shows that Sub-Saharan Africa (SSA) has the highest poverty rate amongst developing countries, with nearly 60% of the working population living below \$1.25 per day. In highlighting the extent of poverty in Africa, Schaefer [2005, quoted in Ikejiaku (2009)] points out that "it is pathetic that an average African has grown poorer over the past decades, notwithstanding enormous aid disbursement and substantial gains in technology and trade that have helped boost growth in other regions, particularly on the Asian continent."

The high poverty rate in Africa is puzzling and paradoxical for a number of reasons. First, the region is endowed with natural resources that are in great demand worldwide. Africa has 40 percent of the world's hydroelectric power supply; most of the world's diamonds and chromium; half of the world's gold reserve; the bulk of its cobalt; 50 percent of its phosphates; 40 percent of its platinum; 7.5 percent of its coal; 8 percent of its known petroleum reserves; 12 percent of its natural gas; 3 percent of its iron ore; and several million acres of uncultivated land (Lamb, 1983, quoted in Ayittey, 1999: 5-6). Second, resource-poor countries in East Asia have done better than Africa in drastically reducing their poverty rates, prompting the intriguing question of why they have been more successful. Lastly, Africa has received several billions of dollars in development aid from bilateral and multilateral sources during the past five decades. As Figure 2 shows, in 2005 aid as a percentage of gross national income was 5 percent in Africa, compared to less than 1 percent in East Asia and Latin America. Since the 1960s Africa has received more aid than other developing regions; the amount of aid to the region has been estimated at over \$1 trillion since independence (Moyo and Ferguson, 2009).

While evidence points to the prevalence of poverty and high unemployment rates in African countries, the extent, nature, and determinants of income poverty in African rural communities are unclear. This is despite the fact that a preponderance of the poor in Africa reside in villages. Case studies of poverty in Africa commissioned by the African Economic Research Consortium (AERC) in the late 1990s have confirmed what has long been suspected: poverty is more severe in rural than urban Africa. Rural and urban areas in African countries

are also the most unequal in the world (Ali, Mwabu and Gesemi, 2002). As Wermer (2010) points out, "poverty in developing countries is predominantly a rural phenomenon." Indeed, of the 1.2 billion people living in extreme poverty in developing countries, about 75 percent live in rural areas (Wermer, 2010). It is, therefore, not surprising that whenever rural poverty is reduced, the overall poverty rate goes down as well. As observed by the World Bank (2008, p.3), "the recent decline in the \$1-a-day poverty rate in developing countries - from 28 percent in 1993 to 22 percent in 2002 - has been mainly the result of falling rural poverty (from 37 percent to 29 percent).

This paper is premised on the notion that, in addition to growth and aid, a strategy for reducing rural poverty in Africa is to strengthen the capacities of rural dwellers to generate income through more efficient use of their assets. If this premise is correct, then the following questions need to be addressed: which assets are typically available to rural dwellers in Africa, and how salient are they as conduits for poverty eradication? How might these assets be better used to generate income and alleviate poverty? What constraints do rural households face in the efficient use of their assets? What role can policy makers and development agencies play in helping rural households overcome those constraints? These are empirical questions that cannot be addressed by analysis of aggregate data such as GDP per capita, poverty headcount index, human development index, etc. A better understanding of rural asset utilization, income generation and constraints to poverty reduction requires micro-level information gathered through household surveys and community mapping (Ali, Mwabu, and Gesemi, 2002: 3).

A major goal of this paper is to use panel and cross-section regressions, with data collected from surveys in rural Kenya and Nigeria, to explore the determinants of inter-household income variations. The paper uses the survey results to explore the interconnections between the demographic characteristics of rural households and their economic profiles. Analysis of the survey data also provides insights into assets that are crucial for income generation and poverty reduction in rural Africa. The paper is structured as follows. After the introduction in Section I, Section II reviews literature on the determinants of income and poverty alleviation in rural communities of developing countries. Section III formulates a simple theoretical model, followed by an empirical model in Section IV. Section V introduces the data and provides descriptive statistics. Section VI discusses the empirical results and differences between Kenyan and Nigerian rural households. Section VII is the summary, conclusions and policy recommendations of the paper.

II LITERATURE REVIEW ON THE DETERMINANTS OF INCOME AND POVERTY IN RURAL COMMUNITIES OF DEVELOPING COUNTRIES

Before we undertake an empirical analysis of the determinants of income in rural Kenya and Nigeria in the next section, we review some of the literature on income and poverty in developing countries in this section. Lack of productive assets has been identified as a major constraint for raising the incomes of rural households in developing countries. What is unclear, however, are the types of assets important for rural households in Africa. Identi-

fication of crucial rural assets would enable policy makers to invest in the appropriate assets and capabilities, and thus avoid targeting assets that are ineffective in alleviating poverty. Mehrotra and Delamonica (2007: 61) argue that, in rural communities with excess labor supply, land is a major asset that determines household incomes. Thus, land ownership, as well as the quality of land owned is a major source of inequality in rural communities of developing countries. They attribute the high rates of rural poverty in parts of east and southern Africa (including Kenya, South Africa, Namibia, and Zimbabwe) to concentration of landholdings.

Three forms of concentration of landholdings can be observed in African rural communities, with different implications for rural income and poverty. First, colonial expropriation of land ownership rights from indigenous Africans led to a concentration of land ownership in the hands of a few commercial farmers, especially in southern Africa. Second, recent trends toward commercial farming in Africa has resulted in farmers selling their land to rich commercial farmers, many of whom are absentee landlords. This has resulted in income insecurity amongst landless farmers, who now must depend on salaried work or non-farm sources of income. Third, population explosion in African rural communities has resulted in the subdivision of land into very small holdings, making it difficult for households to achieve scale economies. One of the consequences has been declining productivity, falling incomes and rising poverty.

To address the problems arising from concentration of landholdings, the World Bank (2008, p.9) proposes land reform that enhances access to land, as well as efficiency in land use. Specifically, it argues that "land reform can promote smallholder entry into the market, reduce inequalities in land distribution, increase efficiency, and be organized in ways that recognize women's rights." A key issue explored in the empirical section of this paper is whether land ownership explains inter-household variations in income amongst our sample households in Kenya and Nigeria. How about the salience of livestock ownership, which is prevalent in rural Africa?

Contrary to expectations, Alarya et al. (2011) find that livestock ownership is not a major source of income for households in Niger Republic. They conclude that irrigated agriculture and nonfarm income from self-employment are the main sources of income for the wealthy group. While livestock is not a major source of income, the authors conclude that it is "both a tool for seasonal work and security, as well as a short and medium-term insurance." Krishna and Shariff (2011) make a distinction between factors that reduce households' risk of being trapped in poverty, and those that help households escape from poverty. They argue that ownership of "rural-origin" material assets such as agricultural land can prevent a household from falling into poverty. On the other hand, they also point out that agricultural land fails to guarantee extricating people from poverty. According to the authors, the key to alleviating poverty is whether the village is close to a city. Specifically, "households residing in villages located fewer than 5 km from the nearest city and connected by better bus services and denser telephone links had significantly higher odds of breaking out of poverty." This point has been corroborated by Khandker and Koolwall (2010), who argue that proximity to an urban area is important because it enables rural households to have access to electricity and paved roads. With reference to Bangladesh, they find that a one percent increase in households with electricity in the village leads to a 0.8 percent increase in total per capita income. Access to a paved road results in a 33 percent increase in total per capita income

(Khandker and Koolwall, 2010: 1121). These arguments and results can be interpreted as meaning that non-farm sources of income are critical for rural poverty alleviation – an issue we discuss below, as well as in the empirical section.

Education has been found to be an important determinant of income and poverty in rural societies. According to the World Bank (2008 p.8), "while land and water are critical assets in rural areas, education is often the valuable asset for rural people to pursue opportunities in the new agriculture, obtain skilled jobs, start businesses in the rural non-farm economy, and migrate successfully. There are several mechanisms by which education can be critical for poverty reduction in rural Africa. Educated members of a rural household could obtain wage employment in the non-farm sector. Since total-factor productivity tends to be higher in the non-farm sector than in the farm sector, this form of income diversification helps increase the household's income, and sometimes may extricate the entire household from abject poverty. As well, formal education enables households to better manage their assets, such as keeping track of their revenues, costs, savings, and investment. Rural households could also use investment in the education of some members of the household as an insurance policy against risks from famine, droughts, natural disasters, and other negative exogenous events. One of our goals in this paper is to assess the salience of education vis-à-vis other assets.

Income generation amongst rural households is not just a matter of asset ownership; it is also about strategic behavior in the use of assets. Decisions such as allocation of time between farm and non-farm activities; which household members should undertake formal education and for how long?; migration of some household members and associated remittances, and household size are important determinants of poverty in rural Africa. One strategic behavior that has been found to be pervasive in rural Africa is income diversification – a subject that has generated controversy in the literature. The debate centers on whether this phenomenon is economically efficient and poverty-alleviating. We discuss the evidence first, and then highlight the nature of the debate. The evidence suggests that most rural families generate income from farming, livestock ownership, and a wide array of off-farm productive activities, mainly organised around self-employment rather than wage labor. Turner et al. (2011: 84) note that, in the Sahelian zone of West Africa, farming households rely less on farming income, but depend more on livestock rearing and migrant labour remittances. They point out that income diversification is driven by the quest to cope with economic and climatic constraints. Consistent with the above proposition, Haggblade and Reardon (2010) argue that rural household income level depends on the availability of non-farm sources of income. They observe that the expansion of the non-farm rural economy has the effect of absorbing landless and marginal farmers, which raises their productivity and incomes. They suggest a complementary relationship between the rural farm sector and the non-farm rural economy. An expansion in the farm sector usually spurs demand for non-agricultural products such as manufactured goods, services, and agricultural equipment and inputs. Even for landowning farmers, non-farm sources of income can be an effective way of diversifying their risks from agriculture.

Is income diversification good and efficient for rural households? Answers are unclear in the literature, but we explore the issue in the empirical section with regard to households in rural Kenya and Nigeria. While Krishna and Shariff (2011) argue that households drawing a greater proportion of their income from non-agricultural sources have a higher

propensity to escape from poverty, Bryceson (2004) contends that diversification results in a shift of resources to non-agricultural activities, thus undermines agricultural production by accelerating the pace of "de-agrarianisation and depeasantisation." Eastwood et al. (2006) argue that "distress diversification" often leads to rural dependency, in which households are forced to depend on income sources outside of the village. These income sources (remittances, wages, transfers, etc.) are often volatile, and expose households to further risks and uncertainty. In the next section, we go beyond the literature to consider a theoretical framework that explains the interconnections between households' incomes and certain essential variables.

III A SIMPLE THEORETICAL MODEL

In this section, we formulate a simple theoretical model of rural income determination that incorporates the major assets discussed in the previous section. In the next section, we investigate the extent to which survey data from rural Kenya and Nigeria support insights from the literature review and our theoretical model.

Consider a rural household i with units of labour l , land holding z , and human capital h . The household may or may not own any production capital or livestock. For simplicity, denote production capital and livestock as k . In rural areas, there are two types of households: the first one do not own any capital or livestock and therefore, they devote 100% of their labour time to farm work. The second type of households own production capital and/or livestock; thus, they need to choose an optimal time allocation between farm (for instance, crops planting) and non-farm work (for example, livestock rearing, food processing, manufacturing, trade, business, etc.).

The income maximisation problem of each household can be modeled as:

$$\begin{aligned} \max_u \quad & y = A_f(ul)^{1-\eta}z^\eta + A_{nf}(1-u)lhk \\ & \text{given } z > 0, k \geq 0, 1 \geq u \geq 0, 1 > \eta > 0, \end{aligned} \tag{1}$$

where y represents household income, and A_f and A_{nf} are farm and non-farm total factor productivity (TFP), respectively. Each household spends an optimal amount of time u working on farm, and the rest on non-farm work.

Not all households have productive capital k . If $k = 0$, the household will spend 100% of its time on farm work so that $u^* = 1$. Then the per-capita income is given by:

$$\frac{y^*}{l} = A_f\left(\frac{z}{l}\right)^\eta \tag{2}$$

With a fixed amount of land holding z , a larger household will have lower per-capita income due to decreasing returns to labour. This is consistent with our expectations and many previous research. The seminal paper by Lewis (1954) points out that unlimited labour supply in economies with abundant labour tends to push the marginal product of labour downward. One solution is for the excess labour to seek other employment opportunities. For example, they could work outside of the farm sector by either migrating to urban areas or work in rural non-farm sector. In reality, however, such opportunities do not always present

themselves to every rural agent. Rural households for whom labour mobility is infeasible are stuck (or trapped) in the farm sector, and a bigger household size will lower the marginal product and per-capita income.

If the household has some productive capital and livestock $k > 0$, then the optimal time spent on farm work is given by:

$$u^* = \left[\frac{A_f(1-\eta)}{A_{nf}} \right]^{\frac{1}{\eta}} \left(\frac{z}{l} \right) h^{-\frac{1}{\eta}} k^{-\frac{1}{\eta}} \quad (3)$$

Equation (3) implies that, households with more per-capita land allocate more time to farm work. Meanwhile, human capital h has a negative impact on the optimal choice of u^* . In other words, households with more human capital tend to devote more time to the non-farm sector. This is because non-farm sector work has higher return to human capital than farm sector, so that better educated individuals will self-select into non-farm occupations.

If we substitute equation (3) into (1), and divide it by l , we obtain the maximised per-capita income:

$$\frac{y^*}{l} = A_{nf} h k - \underbrace{\left[(1-\eta)^{\frac{1}{\eta}} - (1-\eta)^{\frac{1-\eta}{\eta}} \right]}_{>0} \frac{A_f^{\frac{1}{\eta}}}{A_{nf}^{\frac{1}{\eta}}} \left(\frac{z}{l} \right) (h k)^{-\frac{1-\eta}{\eta}} \quad (4)$$

The above expression indicates that, for households with income sources other than land, their per-capita income depends on human capital and productive capital. Better education and higher level of human capital help raise income. Productive capital, including livestock, has a positive impact on per-capita income. This highlights the importance of productive assets and livestock in alleviating rural income, and it indicates that rural households with more diverse income sources have better opportunities to escape poverty.

IV AN EMPIRICAL MODEL

The simple theoretical model shows that the determinants of household income can be divided into four groups. The first category includes demographic factors such as age, family size, and female proportion in the household. The second set of factors are those affecting production capacity and earning, such as education and human capital. The third includes land holding, while the fourth category consists of other productive capital, such as tools, equipment, and livestock.

Thus, the empirical model of household income determination can be written as:

$$\log(y_i/l_i) = \alpha_0 + \alpha_1 d_i + \alpha_2 h_i + \alpha_3 z_i + \alpha_4 k_i + \epsilon_i, \quad (5)$$

where $\log(y_i/l_i)$ is the logarithm of per-capita income of household i . d_i is a vector including household size, the average age of adult family members, proportion of female family members, farm labour, non-working family members, disabled members, and students. h_i is a proxy for average education level of the household. z_i represents land holding and land value. k_i is a vector of livestock and production assets. To estimate the empirical model, we use survey data from households in rural Kenya and Nigeria.

V DATA AND DESCRIPTIVE STATISTICS

The Kenyan survey interviewed 593 households, 3599 individuals in the Trans-Nzoia and Uasin Gishu districts of the country in both 2007 and 2009. These districts are made up of the Kalenjin tribe, as well as settlers from South Africa, Scotland, England and Zimbabwe. The Kalenji tribe number around 3 million people, and are the fourth largest tribe in Kenya. They are traditionally pastoralists, and believed to have migrated from Sudan to their current location about 2000 years ago. The Nigerian survey was conducted in the village of Umuluwe in southeastern Nigeria (consisting of the Igbo tribe), and it covered 300 individuals in the village. However, because of incomplete information and other technical problems, data from 193 of those individuals were used for this study. Table 2 provides definitions and summary statistics of variables in both the Kenyan and Nigerian surveys.

The two surveys are similar but not exactly the same in minor details. First, the two surveys were conducted during the same period of time: the Kenyan survey took place in 2007 and 2009, and the Nigerian data were gathered in 2007. Second, both surveys cover information on household income and demographic characteristics such as age, education, family size, asset ownership, etc. Third, the two data sets differ in their units: the Kenya survey adopts household as its unit of analysis, while the Nigerian survey uses individual (the interviewee). For example, the Kenyan survey asked: "what is the household income?" whereas the Nigerian survey asked "what is your income?" instead. In the Nigerian survey, the questionnaire was designed to focus on individuals rather than households, and this is because in the Igbo culture, members of a household (specifically husband and wife) keep separate incomes and assets. Though they live together, they make independent decisions with regard to key resource-allocation issues. Lastly, given the low life-expectancy of the villagers (about 52 years), the Nigerian sample contains a large number of female-headed households and widowers.

In the rest of this section, we discuss some key socio-economic features of our sample communities.

1. Income

In Kenya and Nigeria, most rural households rely on income from self-employment (both farm and non-farm), rather than salaried employment in the labour market. This implies that they are less susceptible to labour market shocks than the urban poor. The lack of exposure to shocks, however, comes with a price. During periods of economic boom when urban workers tend to receive increasing wages, rural households often lose. Instead, they experience welfare losses as a result of changes in relative prices precipitated by urban wage increases.

The average annual household income is 58997.20 KSH, or 737 USD in the Kenyan data. Correspondingly, the average income of the interviewees in the Nigerian data set is 93448.68 Naira, or 654.15 USD. While the Kenyan figure corresponds with the official GDP per capita for the country (720 USD in 2007, according to World Development Indicators), that of Nigeria is far less than the official GDP per capita of 1,123 USD. Thus, official per capita incomes may underestimate the extent of rural poverty in some African countries².

Our survey shows that per-capita income per day is 34.50 KSH in Kenya, or about 0.5 USD, much lower than the poverty line of 1 USD per capita per day defined in the Millennium Development Goals. The Nigerian data set does not contain household size; therefore, we cannot calculate per-capita income per day in Nigeria. As an alternative, we compare the headcount index for male and female villagers in both Kenya and Nigeria, and the results are summarised in Tables 3 and Table 4. The tables suggest that there are more poor households in rural Kenya than Nigeria, with about 88% of households in the Kenyan sample living below \$1 per day, compared with about 54% for the Nigerian sample. Poverty also appears to be more feminised in Kenya than in Nigeria; 90% of the female-headed households in Kenya live below \$1 per day, whereas 73% of the women in the Nigerian sample live below \$1 per day. In Nigeria, only 35% of the male individuals interviewed live below \$1 per day, compared with 88% for male-headed households in Kenya.

2. Household size / Number of children

The household size in the Kenyan data varies from 1 to 14, with an average of about 6, including children, adults and seniors. The Nigerian survey did not explicitly record household size; instead, it recorded the number of children in a household – 5.31 on average. If we add adult family members such as parents and grandparents, the average household size in the Nigerian data should be at least 7. In comparison, Kenyan households are smaller than the Nigerian ones.

3. Age

The surveyed individuals are younger in Kenya than in Nigeria. The average age of adult household members (that is, 12 years old and above) is 31 years in Kenya, while the average age of those interviewed in Nigeria is 47 years.

4. Female proportion

The proportion of women in both the Kenyan and Umuluwe samples is almost the same-about 48%.

5. Education and apprenticeship

The number of years of education of adult household members in the Kenyan survey is 7.44 years, compared with 5.37 years in Nigeria. In addition, the Nigerian survey also provides length of apprenticeship training⁴, which is 1.77 years on average. Although the educational levels of households in our sample are low, they are higher than the average levels of educational attainment in rural areas of developing countries. Those averages have been reported as four years for rural adult males and less than three years for rural adult females in SSA, South Asia, and the Middle East and North Africa (World Bank, 2008, p.9).

6. Land ownership

A Kenyan household owns 1.49 acre of land, whereas a Nigerian owns 1.56 acre. In addition, the Kenyan survey shows that the value of household land holding is 8201.28 KSH. In other words, the average rental value of an acre of land in Kenya is 5504.21 KSH (or 78 USD).

7. Farm animals

Farm animals not only provide a source of income, but also are part of household assets. The common farm animals shown in both surveys are chickens and goats. On average, a Kenyan household owns 9 chickens and 0.21 goats, while a Nigerian owns 2.95 chickens and 0.48 goats. In addition, a Kenyan household owns 0.03 pigs, 1.86 cattle, 1.58 sheep and 0.13 donkeys. Comparatively speaking, Kenyan farmers own more farm animals than Nigerians. This is not surprising, as the Kenyan districts in which the surveys were conducted have a savannah-type vegetation, compared to the rainforest vegetation in southeastern Nigeria, which is less conducive to animal rearing.

8. Other variables (unique to the Kenyan survey)

In the Kenyan survey, only about 14.8% of the households have a female head, meaning that most families are headed by males. About 27.3% of the individuals are farm laborers, 6.5% of household members do not work, and 51% of the household members are students.

VI RESULTS

Regression of the Kenyan data

In this section, we discuss estimation results from the Kenyan survey data, and then compare them with results from the Nigerian data. The comparative studies highlight similarities as well as some cultural distinctions between the two countries. Table 5 presents the results from the panel regression, described in Eq. 5, using the Kenyan data. The following variables are significant for income in rural Kenya: household size, the average age of adults in a household, the square of the average age of adults in a household, the proportion of female family members, the number of years of schooling of the adult members of the household, per capita land holding, the per capita rental value of land owned by a household; the value of durable assets owned by the household, proportions of farm labour, proportion of non-working family members, and proportions of students and disabled family members.

Specifically, a one-unit increase in household size reduces per-capita household income by about 16 percent. This is consistent with our theoretical model which predicts that a larger household size has negative effect on not only household income, but also per-capita household income.

The positive coefficient on age and negative coefficient on the square of age imply an inverted U-shape relation between per-capita income and age. As members of a household get "too old," average household income declines, albeit at a very low rate. Proportion of female family members has a downward effect on household income. A one percentage point increase in female proportion reduces per capita income by 0.63 percent. This implies that women in rural Kenya have a lower earning power than men. Therefore, providing job training and extending more job opportunities to women will significantly improve family income. As expected, education is a determinant of income, albeit a weak one. The results show that one additional year of schooling in rural Kenya raises the household's average income by about 5 percent. This result can be explained by the fact that, as the number of educated household members increases, the number engaged in farming decreases. Our

finding is consistent with the one by Ali, Mwabu and Gesemi (2002: 3) that "improvements in education, health care, safe water and sanitation" are correlated with lower poverty rates in Africa." Studies by the Kenyan Central Bureau of Statistics and the AERC show that poverty is more severe amongst people without any schooling (Ali, Mwabu, and Gesemi, 2002: 22). Specifically, these studies find that the poverty rate amongst uneducated people in Kenya is above 50 percent, compared with 30 percent for literate households (Ali, Mwabu, and Gesemi, 2002: 23). Our regression results suggest that, contrary to the World Bank (2008) study cited earlier on in Section II, education is not the most important asset in rural Kenya.

Lewis (1954) argues that labour surplus (or "unlimited labour supply") is the main force that pushes the marginal product of labour down to zero, assuming limited capital and land. Therefore, we are not surprised by our regression result, which shows that the proportion of farm labour in the household has a large negative effect on earnings. A one percentage point increase in the proportion of households engaged in farming reduces per capita income by 1.14 percent. With limited land and unlimited labour supply, each household owns a small share of land. Given the lack of access of rural households to modern agricultural technologies, agricultural production thus becomes inefficient and fails to take advantage of economies of scale. This is one reason why farming is mainly for subsistence in rural Africa, but poverty reduction would require more diverse income sources.

Per capita holding of land and its rental value are both significant at 5 percent level. If land holding increases by one acre, per capita income increases by 16.4 percent. Meanwhile, rental value reflects the quality and desirability of the land. As expected, a 1 percent increase in land rental value leads to an 9 percent increase in per capita income.

Also important for income generation in rural Kenya are family owned assets, including livestock and other assets. A one-unit increase in sheep increases per capita income by 2.7 percent. Assets related to farm production have larger impact on income: a one-unit increase in the following variables increases per capita income by the corresponding percentages: kiosk 24.6 percent, mill 53.5 percent, ox plough 32.5 percent, sprayer 18 percent, bicycle 21 percent, and barrow 13.9 percent. Motor bikes and tractors are both insignificant, probably because very few households in the survey actually own these two assets.

Comparison of results from the Kenyan and Nigerian surveys

Given the heterogeneous nature of African societies, an important question is whether results from the Kenyan survey apply to other rural communities in Africa? To address this question, we use the Nigerian survey to estimate a cross-sectional regression, with some of the explanatory variables in Table 2. While we recognise that the Nigerian data are not entirely comparable with the Kenyan survey, we believe that a comparison of the two countries would provide additional insights into the determinants of income in rural Africa. It would also serve as a robustness check on the Kenyan regression results.

The results of the regression on the Nigerian data are summarised in Table 6. Similar to the Kenyan case, older individuals earn lower incomes than younger people in rural Nigeria. This is again supported by the negative coefficient of the square of age, together with the positive coefficient of age. In other words, as people grow older, their income level first increases and subsequently decreases. Similarly, educational attainment has a positive effect

on income in the Nigerian village. An additional year of schooling raises average individual income by about 5 percent, compared to Kenya's 4.8 percent. One can safely say, therefore, that education has similar effects on the incomes of rural dwellers in both countries.

Although data on apprenticeship training are not available in the Kenyan sample, we find that years of apprenticeship does have some effect on income in the Nigerian sample. The regression results suggest that one additional year of apprenticeship increases income by about 16 percent. Surprisingly, the coefficient on the interaction term between formal education and apprenticeship is negative, implying that individuals who combine apprenticeship training with formal education tend to earn lower income than individuals with only a formal education or just apprenticeship training. While this result may appear to be counter-intuitive, it can be explained by the fact that educated individuals who engage in activities that require apprenticeship training earn incomes that are not commensurate with their investment in education. In other words, their earnings do not reflect their marginal productivities, which in turn may lead them to expend less efforts in a given activity. The regression result suggests, at the very least, that having a formal education is unnecessary for success in local professional activities such as carpentry, masonry, bakery, tailoring, auto and electronics repairs.

To determine whether there are gender differences in income amongst rural dwellers, we introduce a dummy variable "isfemale," which equals one if the interviewee is female and zero otherwise. As Table 6 shows, the coefficient on the dummy variable is negative and significant, suggesting that female villagers in Nigeria earn lower incomes than their male counterparts. A male villager's income is on average $\exp(1.35) = 3.86$ times that of a female villager. Correspondingly, Table 5 shows that the proportion of women in a typical household in Kenya also has a significant negative impact on the household's average income. The similar results in both countries suggest that a key to poverty reduction in African countries is to enhance women's income earning capability. Women are usually at a disadvantaged position in the society – less education, lower social status, lack of land rights, unfair treatment in the job market and workplace, etc. Some recent initiatives in African countries that focus on protecting women's rights and improving their earning and living conditions have shown encouraging payoffs. For example, the adoption of a Gender and Development Protocol in 2008 by the South African Development Community helps protect women's legal and land rights, increasing women's ability to feed themselves and their children (Gertholtz, 2009). This Protocol should be adopted by other African countries in order to address the feminisation of poverty.

There are a number of differences between the determinants of income in Kenya and Nigeria. While household size is an important determinant of income in Kenya as indicated earlier on, the number of children does not seem to affect income variations in the Nigerian village. This perhaps explains why Nigerian villagers tend to have many children. In an undeveloped village like Umuluwe of Nigeria, the opportunity cost and the marginal cost of raising children are very minimal, compared to Western societies. In the case of Kenya, the nomadic nature of the households in the Trans-Nzoia and Uasin Gishu districts makes it difficult for them to move around with too many children. Thus, those with many children would have to give up livestock rearing in order to take care of their children, which would then result in an income reduction. The differences in our coefficient estimate are attributable to the distinctive cultural factors in the two countries.

Both the Kenyan and Nigerian surveys include livestock assets such as chickens and goats. Unlike Kenyans for whom sheep is an important income generating livestock, chickens are the most important livestock for income generation amongst the Igbos in Nigeria. Ownership of one additional chicken increases an individual's income by 6.1 percent in this village. Cattle, sheep, goats and chicken are considered the most important livestock in rural African communities, as they have both economic and cultural values (Kristjanson, at el., 2004). Their economic values include a source of food, cash income, hides and skins, manure and draft power. Our empirical results reinforce the importance of livestock for rural households to extricate themselves out of poverty traps. To increase both the number and efficiency of livestock, policy makers can provide knowledge to villagers on how to raise livestock, how to prevent livestock disease, etc. More efficient markets for livestock, as well as feeds, will also be beneficial.

There are a number of unexpected, and indeed surprising, results from both the panel and cross-sectional results. First, the panel regression results for Kenya suggest that farming is not an important determinant of income amongst households. It is usually believed that most African villagers are peasants who till the land to support their livelihood. The regression results reveal that there are other non-farm sources of income for rural dwellers in Africa. As well, the proportion of students in a household does not seem to be significant for income generation within the household. This may be due to the fact that children are all expected to help their parents in whatever economic activity they are engaged in, regardless of whether they are students. In the Nigerian case, it is surprising that land ownership has a negative impact on income in the village, though this effect is relatively weak as manifested by the level of significance of the coefficient of land (see Table 6). This may be due to the fact that most of the villagers have extremely small land holdings (an average of 1.56 acres of land per household). Such small land holdings prevent them from reaping the benefits of economies of scale, and only provide means of subsistence.

Further discussions

Income inequality and Gini Coefficients

Although poverty is known to be prevalent in rural Africa, the extent of inequality is less understood. To gain insight into the nature of income distribution in rural Kenya and Nigeria, we use our survey data to compute Gini coefficients for the sample communities. As Table 7 shows, the Gini coefficients for rural Kenya and Nigeria are at high levels of 59 percent and 66 percent respectively, compared to other regions. Derringer and Squire (1996: 582) estimate the Gini coefficients for various regions of the world and they present the data as follows: 51 percent for Africa, 38 percent for East Asia, 32 percent for South Asia, 49 percent for Latin America, and 34 percent for industrial countries. It does seem, therefore, that inequality in rural Kenya and Nigeria found in our study is not only higher than other continents of the world, but also exceeds the African average.

Next, we compare inequality in rural Kenya and Nigeria with that of rural China, a country that has succeeded significantly in reducing rural poverty. Regardless of the many differences between rural areas in Africa and China, China's success in poverty reduction in the past three decades may yield useful insights and implications for Africa. As shown in

Table 7, the Gini coefficient of rural China⁵ is 0.466, much lower than that of rural Kenya (0.589) and rural Nigeria (0.656). Figure 3 shows the Lorenz curves for rural areas in China, Kenya, and Nigeria. The further away a Lorenz curve is from the 45 degree line, the more unequal the corresponding distribution is. Therefore, income distribution in rural Nigeria (the green curve) is most unequal, followed by rural Kenya (the red curve), and China (the black curve), which is the least unequal amongst the three.

Some analysts believe that China's relatively lower inequality is partly attributable to government's social welfare programmes (that is, unemployment benefit, health care insurance, etc.), which improve the access of the poor to basic public services. Furthermore, the Chinese government also introduced several anti-poverty measures, such as subsidised loan programme for poor farmers, the food- for-work programme whereby unemployed people work on public infrastructural projects in exchange for food, consumption subsidies, free education and cheap health care for the poor, as well as welfare and disaster relief programmes (Liu, 2007: 198). Last but not least, the Chinese government has adopted more liberal policies on rural-urban labour mobility. Research has shown that migrant workers help narrow gaps in human capital, credits and loans, and overall income levels between rural and urban areas in China (Liu, 2010).

Income diversification

As pointed out in Section II, diversification of income sources has become a strategy for villagers in developing countries to increase their income. But there is controversy about whether such a strategy is optimal for villagers, an issue we explore in this sub-section. Table 5 shows that households that rely on farm labour tend to earn lower income in rural Kenya. Unfortunately, the Nigerian survey does not include information on farm or non-farm labour; thus we cannot draw a direct comparison in terms of the impact of farm labour on income generation. However, both data sets contain information on interviewees' income sources and income levels, from which we were able to determine the most important sources of income.

In the Kenyan survey, we observe a very balanced distribution of households among various types of income sources. Nevertheless, the amount of income varies significantly across different sources. In terms of mean value, "profit (farm produce sale)" provides the highest income (22855.29 KSH), followed by salaried employment (10164.73 KSH), petty trade business (9626.31 KSH), non-farm labour (6287.91 KSH), etc. Notice that income from farm labour (5779.99 KSH) is merely one quarter of that from profit (see Table 8).

In the Nigerian survey, 21.27% of the interviewees generate their income from profit, 13.12% from farming, 7.24% from salary, and the rest from various jobs, such as petty trading, basket weaving, etc., each of which represents a very small share (less than 5%) of total income (see Table 9).

Measured by mean values, individuals receiving profit enjoy the highest income level (208763.8 Naira), followed by salaried workers (149437.5 Naira), and farmers (19927.59 Naira). All the mean values are higher than the corresponding median, indicating a right-skewed income distribution for each type of income earners. The difference between mean and median is most prominent for profit earners, suggesting that income inequality within this group is the largest.

The examination of income sources and levels suggests that, in all the surveyed rural communities, individuals enjoy the best income generation opportunities if they receive profit from non-farm activities, a conclusion that questions the notion that income diversification is perverse for rural dwellers.

The second best is salaried employment. Those who depend on farm labour *per se* tend to receive lower income, if not the lowest. For rural areas in African countries with scarce land but abundant labour, it is of crucial importance for them to explore more diversified work outside of the farm sector. The government can help by providing rural residents access to skills and knowledge.

VII CONCLUSIONS

Though many African countries have achieved impressive economic growth in recent times, an unusually high proportion of their population still live in abject poverty. Economic growth in Africa has not been effective in alleviating poverty, narrowing income inequality, and providing ample employment opportunities in the region. Foreign aid and foreign direct investment, again, may not be adequate in preventing these countries from falling into deeper poverty traps. Considering that macro-level policy variables alone may not be effective in combative rural poverty, this paper has focused on micro level economic activities of rural households in Kenya and Nigeria. The goal has been to identify constraints on income generation in these rural communities.

Education has a positive effect on household earning: an additional year of schooling is able to raise household income by 4.8%. The effect of age is non-linear: income first increases then decreases as people grow older. A larger household size decreases per-capita household income by 15.7% according to the Kenya survey. Consequently, efforts should be made to reduce fertility rates in rural Africa, where the demographic transition is yet to occur due to pervasive poverty, lack of education, lack of access to family planning resources, and cultural constraints. Data in both countries show that rural women tend to earn significantly lower incomes than their male counterparts, poverty-alleviation measures in Africa should be focused primarily on women. The practice of giving male members of a household priority in educational decisions and apprenticeship training should be discouraged. There should be a campaign for educating more female members of households through scholarship awards and even cash transfers, as is currently the case in Bangladesh, Brazil, and Mexico. Education in the rural context should transcend formal education to include vocational training, skills acquisition and knowledge transfer in the areas of new methods of agricultural and livestock production, as well as business management skills. Both the size and rental value of land have positive effects on income in Kenya, which supports the recent political campaign on improving the protections of land and property rights in rural Africa. Moreover, ownership of productive assets including tools and livestock is an important source of income for rural dwellers in Africa. One strategy for reducing income poverty, therefore, is to strengthen the capacities of rural dwellers to maintain a large and healthy stock of animals. This may include the establishment of livestock breeding and multiplication centers to facilitate breeding improvement. Villagers could also be assisted in obtaining pesticides to control diseases or prevent disease outbreaks. They could also be provided with free mass treatment

of livestock diseases, as well as the construction and equipping of veterinary diagnostic laboratories. To help reduce the cost of animal rearing, subsidies should be provided to villagers to purchase animal feeds. Transportation costs to the market can be prohibitive in many rural African communities; therefore, villagers should be provided with subsidised public transport.

Contrary to the views expressed by some analysts, diversification of income sources appears to be an effective strategy for rural dwellers to increase their income. Of the various sources of income, however, the best income source is profit, followed by salaried employment, non-farm labour, and lastly, farm labour. To encourage more diverse and versatile employment in rural communities, the government can provide locals with more training in specialised skills, know-how, employment information in different sectors, and support for migrant workers.

NOTES

1. While advanced industrial societies focus on contemporary issues like climate change, environmental protection, and anti-social behaviors (drugs and crime), poverty remains a central issue in Africa.
2. On the surface, it seems that the average household income in Nigeria should be $654.15 \times 2 = 1308.3$ USD, since 654.15 USD is the average income on the individual level. However, interactions with local residents during the survey tell us that, husbands and wives have sharing income account while keeping their own income accounts. Thus, simply multiplying 654.15 by two would overestimate the household income.
3. Apprenticeship training involves skill acquisition in tailoring, carpentry, auto/electrical repairs, trading, etc.
4. The data set used to obtain Gini coefficient for China is the Research Center for Rural Economy (RCRE) survey data in ten representative provinces.

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Table 1: Best Per Capita Growth Rates in Developing Countries, 2001-2008^(a)

Country	GDP Per Capita, 2008 ^(b)	Avg. Per Capita Growth Rate (%), 2001-2008
Angola	1357	10
Bhutan	1247	6.4
Chad	251	6
China	1963	9.5
Equatorial Guinea	8692	18.8
Ethiopia	190	5.5
India	724	6
Kuwait	N/A	5.2
LAO PDR	475	5
Macao	33732	12
Maldives	3656	6.2
Mozambique	365	5.7
Sierra Leone	262	7.4
Sudan	532	5.2
Trinidad & Tobago	10981	7.3
Vietnam	647	6.2

(a) Source: World Development Indicators Database

(b) In 2000 US\$

Table 2: Definition of variables and summary statistics

Variable	Definition	Kenya Data	Nigeria Data
hhtotinc	Household total income (KSH)	58997.204 (2256.398)	– –
income	Income of the interviewee (Naira)	– –	93449.680 (10131.401)
hhincperday	HH income per-capita per day (KSH)	34.501 (1.879)	– –
incomeperday	Interviewee income per day (Naira)	– –	256.027 (27.757)
<i>d_i</i>: demographic factors			
hhsize	Household size	5.794 (0.065)	– –
children	Number of children	– –	5.305 (0.181)
age_adult	Avg. age of adult HH members	31.276 (0.234)	– –
age	Age of the interviewee	– –	47.914 (0.913)
female_prop	Female proportion in the HH	0.489 (0.005)	– –
isfemale	The interviewee is female	– –	0.482 (0.033)
headisfemale	Proportion of HH w/ female head	0.148 (0.010)	– –
farmlabor_prop	Farm labor proportion	0.273 (0.007)	– –
notworking_prop	Proportion of nonworking HH members	0.065 (0.004)	– –
isstudent_prop	Proportion of students in the HH	0.511 (0.007)	– –
isdisable_prop	Proportion of disabled HH members	0.014 (0.002)	– –
<i>h_i</i>: human capital			
edu_adult	Years of edu of adult HH members	7.442 (0.078)	– –
edu	Years of edu of the interviewee	– –	5.371 (0.281)
apprenticeship	Years of apprenticeship of the interviewee	– –	1.773 (0.158)

z_i: land			
land	HH land ownership (acre)	1.496 (0.041)	1.564 (0.147)
landvalue	Rental value of land (KSH)	8201.280 (293.462)	– –
k_i: capital			
chickens		9.095 (0.422)	2.945 (0.367)
goats		0.211 (0.035)	0.480 (0.075)
sheep		1.576 (0.092)	– –
kiosk		0.085 (0.008)	– –
mill		0.021 (0.004)	– –
plough		0.062 (0.008)	– –
sprayer		0.207 (0.014)	– –
bicycle		0.486 (0.017)	– –
barrow		0.173 (0.017)	– –
motorbike		0.031 (0.005)	– –
tractor		0.011 (0.003)	– –
<i>N</i>	Households	593	224

1 KSH = 0.0125 ~ 0.0162 USD from July 2007 to July 2009

1 Naira = 0.007 ~ 0.008 USD in 2007

Standard deviations are in parentheses

Table 3: Headcount index for per-capita income per day, Kenya (%)

			Female head		Male head	
	< \$1	< \$2	< \$1	< \$2	< \$1	< \$2
Entire Sample	88.48	96.33	90	95.9	88.07	96.39

Table 4: Headcount index for per-capita income per day, Umuluwe* (%)

			Female		Male	
	< \$1	< \$2	< \$1	< \$2	< \$1	< \$2
Non-Migrant	63.3	76.5	80.5	86.2	44.3	65.8
Migrant	25.5	40.0	42.9	52.4	14.7	32.4
Entire Sample	53.8	67.4	73.1	79.6	35.4	55.8

Table 5: Panel regression of per-capita household income

	log(hhinc)	
	Mean	p-value
<i>d_i</i>		
hhsiz	-0.157***	(0.000)
age_adult	0.333**	(0.003)
agesq_adult	-0.008**	(0.004)
agetri_adult	0.000**	(0.005)
female_prop	-0.630**	(0.001)
farmlabor_prop	-1.136***	(0.000)
notworking_prop	-1.184***	(0.001)
isstudent_prop	-1.282***	(0.000)
isdisable_prop	-1.644*	(0.010)
<i>h_i</i>		
edu_adult	0.048**	(0.001)
<i>z_i</i>		
land	0.164*	(0.042)
log(landvalue)	0.090*	(0.024)
<i>k_i</i>		
chicken	-0.000	(0.864)
goats	-0.026	(0.225)
sheep	0.027**	(0.004)
kiosk	0.246*	(0.037)
mill	0.535*	(0.027)
plough	0.327*	(0.013)
sprayer	0.180*	(0.017)
bicycle	0.210**	(0.001)
barrow	0.139*	(0.032)
motorbike	0.182	(0.393)
tractor	-0.183	(0.557)
_cons	5.502***	(0.000)
# of HH	593	

starlevels(* .05 ** 0.01 *** .001)

Table 6: Nigeria: Regression results of income

	log(income)	
	mean	p-value
<i>d_i</i>		
children	-0.012	(0.790)
age	0.570*	(0.024)
agesq	-0.012*	(0.014)
agetri	0.000**	(0.009)
older	-1.473	(0.058)
isfemale	-1.340***	(0.000)
<i>h_i</i>		
edu	0.051	(0.099)
apprenticeship	0.163	(0.066)
eduapp	-0.031**	(0.010)
<i>z_i</i>		
land	-0.082	(0.094)
<i>k_i</i>		
chickens	0.061***	(0.001)
goats	-0.106	(0.222)
_cons	2.584	(0.536)
<i>N</i>	193	

starlevels(* .05 ** 0.01 *** .001)

Table 7: Gini Coefficients of Three Developing Countries

	Gini Coefficient
Kenya	0.589
Nigeria	0.656
China	0.466

Table 8: Income from various sources in Kenya, KSH

	Percent	Mean	Median
Profit (farm produce sale)	9.09%	22855.29	12000.00
Salaries employment	9.12%	10164.73	0.00
Petty trade business	9.10%	9626.31	0.00
Farm labor	9.11%	5779.99	0.00
Nonfarm casual labor	9.02%	6287.91	0.00
Remittances	9.10%	1791.48	0.00
Pension	9.11%	963.49	0.00
Rental income	9.09%	723.75	0.00
Others	9.07%	506.64	0.00
Charcoalburning	9.09%	300.60	0.00
Fishing	9.10%	1.69	0.00

1 KSH = 0.0125 ~ 0.0162 USD from July 2007 to July 2009

Table 9: Income from various sources in Nigeria, Naira

	Percent	Mean	Median
Profit	21.27%	208763.80	104000
Salary	7.24%	149437.50	102000
Farming	13.12%	19927.59	15000
Others	58.37%	60509.29	25000

1 Naira = 0.007 ~ 0.008 USD in 2007

Figure 1: Proportion (%) of workers living under \$1.25 a day, 2008

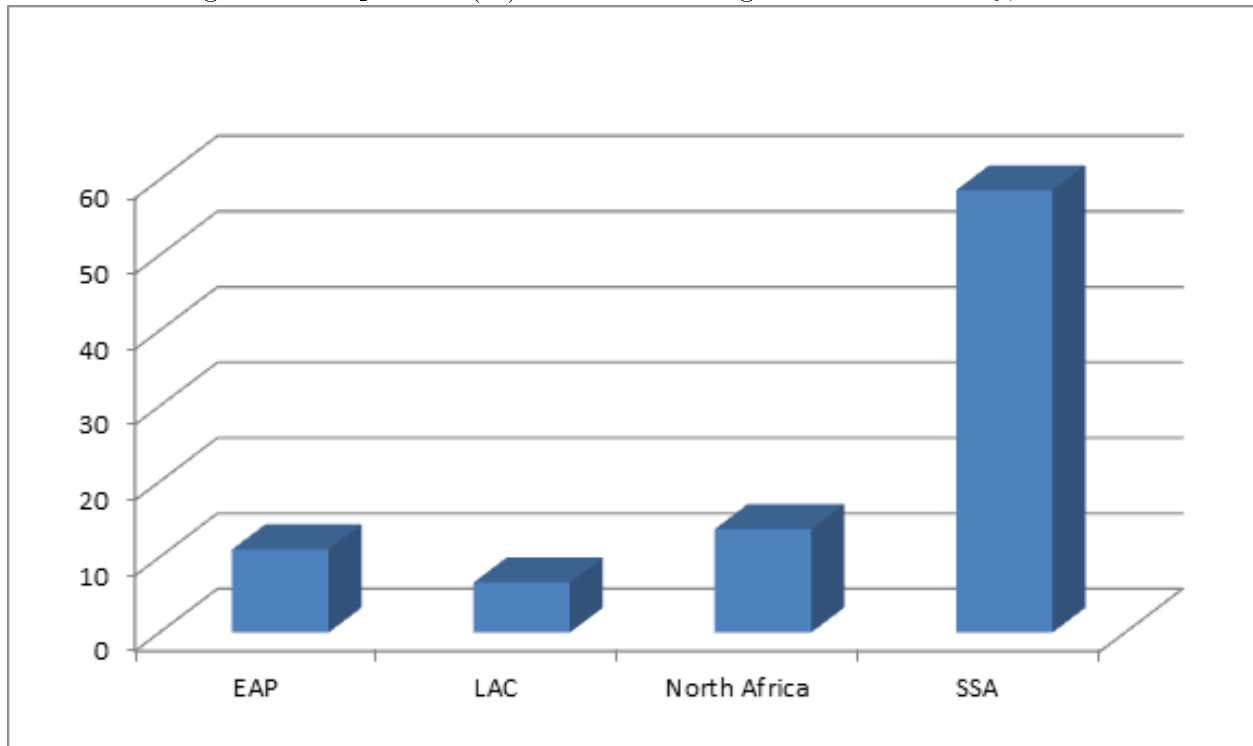


Figure 2: Aid as % of Gross National Income (GNI)

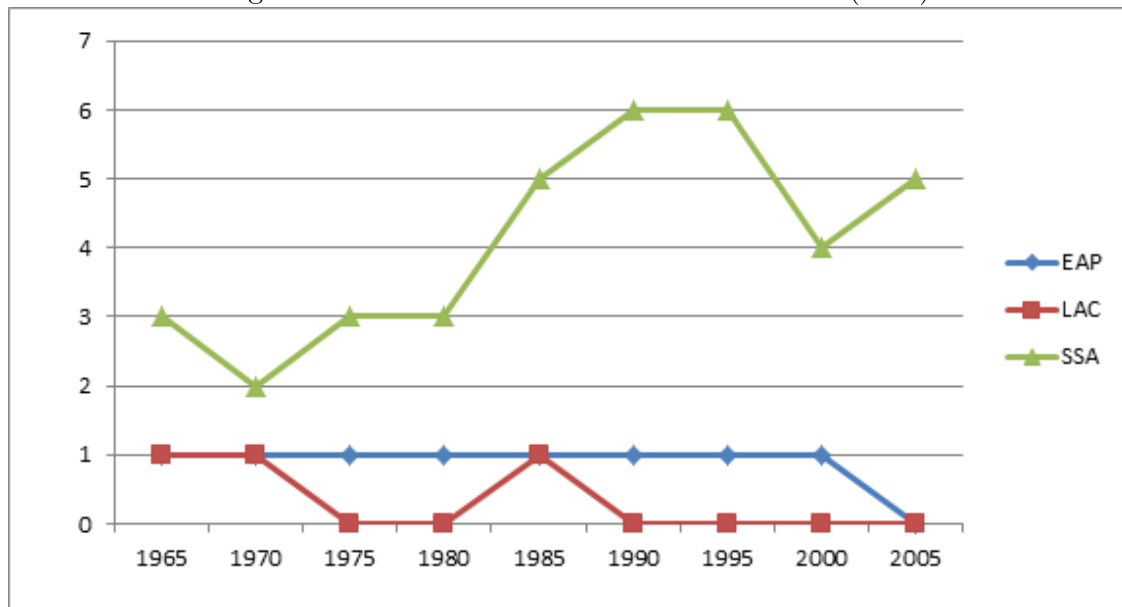


Figure 3: Lorenz curve for rural inequality in three developing countries

