RURAL – URBAN WELFARE INEQUALITIES IN MALAWI: EVIDENCE FROM A DECOMPOSITION

Master of Arts (Economics) Thesis

By

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DECLARATION

I, the undersigned, hereby declare that this thesis is my original work and that, to the best of my knowledge, has never been submitted for similar purposes to this or any other university or institution of higher learning. Acknowledgements have been duly made where other people's work has been used. I am solely responsible for all errors contained herein.

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DEDICATION

For Rosaria Klerani Muhome

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To God be the glory and honour for making all things possible!

ABSTRACT

In this study usage is made of the Integrated Household Survey of 2004-2005 data to examine welfare inequalities between rural and urban areas in Malawi. Consumption expenditure per adult equivalent (lnC) is the welfare indicator.

Firstly, the study estimates linear welfare regressions and performs decompositions at the mean using the Oaxaca-Blinder (1973) Method. The results obtained indicate that a greater percentage of the welfare gap is attributable to differences in characteristics rather than discrimination.

Secondly, the method of quantile regression decomposition as proposed by Machado-Mata (2005) is applied to analyze the difference between the rural and urban distribution of lnC. The findings indicate that across the entire distribution, the welfare gap is primarily due to differences in characteristics between rural and urban sectors rather than differences in returns to those characteristics.

Policy indications emerging from the study suggest that consistent actions in providing education and employment opportunities would reduce inequality in Malawi. Such initiatives coupled with enhanced labour market flexibility and investment in rural infrastructure would address the twin problem of poverty and inequality.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

PAP	Poverty Alleviation Policy
PMS	Poverty Monitoring Systems
ADMARC	Agricultural Development and Marketing Corporation
IMF	International Monetary Fund
MPRS	Malawi Poverty Reduction Strategy
MEGS	Malawi Economic Growth Strategy
NSO	National Statistical Office
GOM	Government of Malawi
MDGs	Millennium Development Goals
MGDS	Malawi Growth and Development Strategy
IHS	Integrated Household Survey
JCE	Junior Certificate Education
MSCE	Malawi School Certificate of Education

CHAPTER ONE

1.0 Introduction

1.1 Background and Motivation

The relative emphasis placed on rural versus urban areas in the development policies of developing countries has shown considerable variation over time. Traditionally, development theory and practice have adopted a simplified concept of rural and urban areas, with the words rural referring to areas predominantly dependent on agriculture as the principle activity, whereas urban areas are thought to engage primarily in industrial production and services.

The relationship between urban and rural sectors in many developing countries including Malawi is thus characterized by an economic dualism, hence the coexistence of a modern urban sector and a traditional rural sector. This duality arose because many developing countries pursued a heavy industrialization development strategy based on the transfer of resources and labor surpluses from the traditional (or rural) sector to the modern (or urban) sector (Nafziger, 1984). This development strategy largely favored the development and growth of the urban sector at the expense of rural areas. The expected trickle down effects to rural areas did not materialize in reality.

To a large extent, this dualism has facilitated the isolated treatment of issues affecting each space. The key premise is that the lack of economically optimal rural-urban linkages is bad for economy-wide growth in that it divides societies, leads to inefficiencies, and is a root cause of inequality, which is in itself growth inhibiting (World Bank, 2005). Since the early 1990s, various economic studies explaining spatial differentiation have emerged. Generally, three types of arguments can be identified: the first focuses on geographical endowments determining comparative or absolute advantages; the second focuses on the existence of backward and forward linkages; and the last argument relates to urban biases in government policies in taxing, pricing, and investment/spending (Braun, 2007).

Such disparities have resulted in poverty with multiple facets and differences in cause between the rural-urban divide. Whereas rural poverty is largely due to low agriculture productivity and its consequent stagnation, poor transport and other infrastructures, as well as lack of wage employment, urban poverty is due to low incomes, lack of access to infrastructure and services, including clean water and safe sanitation facilities, which is made worse by overcrowding (Fallavier *et al* 2005). The government of Malawi recognizes poverty reduction as the ultimate goal of development policy. Since 1994, the government has focused on the social dimensions of adjustments and the need for safety nets. Among the implemented government strategic documents include the Malawi Poverty Reduction Strategy and the current Malawi Growth Development Strategy[1].

Purportedly, welfare disparity between rural and urban areas in Malawi can be attributed to two sources: (1) differences in characteristics of the groups under comparison, for instance from low income generating qualifications and credentials possessed by rural households; (2) discrimination or bias represented by different rates of return of the individual characteristics, i.e. the level of the household qualifications and credentials resulting from discrimination. This research focuses on whether differences in socio-economic and demographic characteristics i.e. endowments of households, hold the key to understanding the welfare gap between rural and urban areas, or whether the disparity is a result of pure bias in development orientation afforded the two areas. In order to answer these questions, the determinants of welfare for rural and urban households will be examined and a methodology that allows such an investigation of the sources of the disparity in welfare will be implemented.

1.2 Problem Statement

There are substantial rural-urban differences in the incidence of poverty in Malawi, with the rate of incidence being lower in urban areas than in rural areas. The Integrated Household Survey of 2004/2005 indicates a slight reduction in poverty rates although the disparity between rural and urban rates remains. The poverty headcount rate for urban

[1] These government strategic documents are discussed in chapter two.

Malawi is estimated to be 25.4% whereas rural areas have a rate of 55.9%. At national level 52.4% of the population lives below poverty line (NSO, 2005).

A large and expanding literature exists which tries to shed light on the nature and extent of poverty. Most of this literature has mainly used income and expenditure household surveys to construct income poverty profiles by comparing household expenditure with a poverty line for Malawi or the country. Alternatively studies have dwelled on the determinant(s) of poverty analysis which is a multi-variate analysis that extends the analysis of the poverty profile by attempting to infer the causality of specific household characteristics on household welfare. For an extensive survey of this literature see Lipton and Ravallion (1995). In Malawi, these studies include Bokosi (2006), Mukherjee and Benson (2003), Government of Malawi (2001), which manifests that poverty studies are scanty and scarce. This study addresses existing gaps in the poverty literature by systematically investigating the causes of welfare differential between rural and urban areas in Malawi.

1.3 Significance of the Study

The rural-urban gap is important for explaining overall inequality in Malawi. Increasing inequality is important for several reasons among Malawian households. Firstly, increasing inequality suggests a lower rate of poverty reduction than might be obtained during periods of rapid economic growth with less inequality. Secondly, if inequality is a rural-urban phenomenon, then it might lead to migration. Most rural dwellers migrate to urban areas in search of greener pastures because they feel the urban areas hold more opportunities for them than rural areas. This influx into urban areas results in over-population and over-taxing of amenities available to urban areas. Finally, increasing inequality may have political implications; if perceived as an unfair consequence of transition reform; it would result in discontent among people and undermine popular support for further reforms.

This study contributes to the literature examining welfare inequalities in Malawi and Africa. In particular, updated estimates are provided of the nature and extent of welfare experienced by Malawians. Further, differences in welfare are decomposed into

characteristics effects and coefficients/discrimination effects using the decomposition technique proposed independently by Oaxaca (1973), Blinder (1973) and Machado-Mata (2005). This type of analysis will provide quantitative assessment of the sources of rural-urban welfare differential. This will have a direct bearing on policy making as it will aid in prioritizing regions and different types of households in an effort to tailor resources to the needy.

1.4 Objectives of the study

The main purpose of this study is to investigate the rural-urban welfare inequalities in Malawi. Specifically the study will:

- Determine the socio-economic and demographic characteristics of households that affect consumption per adult equivalent (the welfare indicator) in the rural and urban areas.
- Determine the relative contribution of endowments and discrimination to overall welfare inequality between rural and urban areas.

1.5 Hypotheses

In order to achieve the above objectives the following null hypotheses will be investigated:

- There is no significant influence of demographic and socioeconomic characteristics on welfare in rural and urban areas.
- There is no welfare inequality between rural and urban areas resulting from household endowments.
- There is no welfare inequality between rural and urban areas resulting from bias/discrimination.

1.6 Organization of the Study

The remainder of the study is organized as follows. Chapter two provides the policy framework undertaken to address the welfare needs of Malawians. In Chapter Three,

theoretical and empirical review is provided paying particular attention to measurement and decomposition of welfare issues. Chapter Four outlines the methodology employed to study welfare inequalities in Malawi. This is followed by detailed presentation and discussion of results from estimated welfare model and inequality decompositions. The final chapter draws conclusions and implications from the study results.

CHAPTER TWO

2.0 Overview of the Malawian Economy

2.1 Country Background

Malawi is a poor country whose economy is predominantly based on agriculture, with tobacco, sugar and tea as main export commodities. The agricultural sector accounts for more than a third of gross domestic product and generates more than 90 percent of the foreign exchange earnings. The World Bank (2003) notes that approximately 84% of agriculture value-added originates from 1.8 to 2 million smallholder farmers who on average own only 1 hectare of land and crop production accounts for 74% of all rural incomes. The economy is unable to guarantee food security, much less provide sustainable economic growth for the nation. As a result, the bulk of the population that significantly contributes to the total wealth of the nation remains poor.

Health indicators are declining in the face of HIV and AIDS and the continued ravages of more traditional infectious diseases. HIV and AIDS is pandemic in Malawi with the sero-prevalence rate estimated at 14.1%. Life expectancy has fallen from 48 years in 1990 to 40.5 years in 2005. Child mortality, estimated at 118 per 1,000 live births in 2006 is one of the highest in the region. Less than half of the population has access to safe water and two fifth of the population are illiterate. The development challenges are great.

The population of Malawi grew from 8.0 million in 1987 to 9.9 million in 1998 as enumerated in the 1998 Population and Housing census. This represents an increase of 24% and a growth rate of 2% per year. Population density increased from 85 persons per square kilometre in 1987 to 105 persons per square kilometre in 1998. Projections of the Population and Housing Census indicate a population of over 12.3 million people for mid 2006. Forty seven percent of the population is under the age of 15, whereas only 4% are over sixty-five years of age.

2.2 Macroeconomic Performance

Since independence (1964), Malawi pursued an agricultural sector-led development strategy which paid dividends in the early years of independence. This is manifested by the self-sufficiency in food production enjoyed particularly in the 1970s. The economy grew at an average rate of 6 percent per annum. However, the policies that favoured the estate sector which concentrated more on tobacco made the economy vulnerable to external shocks. Further to that, the system of pan-territorial and pan-seasonal prices undermined the profitability of smallholder farming and acted as an implicit taxation extracted by ADMARC (Jayne and Jones, 1997), hence reduced incentives for growth and created distortions in the economy. Kydd and Christiansen (1982) demonstrated that adverse pricing policies and other government interventions effectively favoured the large scale agricultural interests, at the expense of the smallholder farmers.

Malawi experienced a crisis that manifested itself in poor and negative growth of the economy, deteriorating terms of trade, transport bottlenecks due to trade route redirection, rising cost of fuel, adverse weather conditions and weakening internal demand between 1979 and 1981. The rate of growth on average declined from 2.9% in the period 1960-1979 to –1.0% per annum during the 1980's (Frausum and Sahn, 1996). The crisis exposed fundamental weaknesses of the estate-led export strategy that led to the marginalization of the smallholder sector with consequent welfare implications.

The economic crisis described above pushed Malawi towards the adoption of World Bank sponsored Structural Adjustment Policies and IMF Stabilization measures in 1981. The emphasis was on policies that would stimulate the growth and development of the agricultural sector due to its importance in the livelihood systems of a majority Malawians. The reforms in the agricultural sector were aimed at removing biases against the smallholder sector and increasing the participation of smallholder farmers in the production of high value export crops such as tobacco, cotton and groundnut. Reform in the agricultural sector included the removal of subsidies on fertilizer, decline in taxation of

smallholder farmers, privatization and liberalization of marketing arrangements and activities of agricultural parastatals (Frausum and Sahn, 1996).

However, the economy has continued to show signs of staggering growth. The growth in real GDP between 1990 and 1999 averaged 4.3%. Malawi's real GDP growth has been highly variable during 2001-04 and much below the targeted rate of 6% per year. Drought, combined with poor government policy and the suspension of donor assistance, retarded real GDP growth to 1.9% in 2002. The recovery in maize production pushed real GDP growth to 4.4% in 2003. However, low rainfall levels in the 2004/05 growing season reduced the harvest, and slowed real GDP growth to an estimated 4.2% in 2004 (Africa Development Bank, 2005). Overall, fluctuation in GDP is a result of the high dependence on rain-fed agriculture. The economy fails to diversify as the industrial sector remains basic and constrained by an unfavourable investment environment, weak entrepreneur class, undeveloped human capital, and high transport and power costs (Africa Development Bank, 2005).

2.3 The Poverty Situation

The incidence of poverty in Malawi is widespread and severe. Table 1 presents the disparity between rural and urban areas in terms of poverty headcount[2]. About 52.4% of the Malawi population in 2005 was rated to be lining below the poverty line representing a total of over six million people. About one in every five people lives in dire poverty such that they cannot even afford to meet the minimum standard for daily-recommended food requirement. The poverty estimates in 2005 have marginally declined from the 1998 case of 54.1%. The statistics further indicates that in both 1998 and 2005 poverty was more pronounced in rural than in urban areas in Malawi.

[2] The tables should be interpreted with caution as IHS 1 and IHS 2 are not directly comparable since different methods were used in the surveys. However, the national poverty estimate for IHS 1 was computed based on comparable measured household characteristics. Comparable rates for rural an urban areas were not available.

Table 1 Poverty Headcounts (% of population) for Malawi

Survey Year	National	Rural	Urban
2004-2005 (IHS 2)	52.4	55.9	25.4
1997-1998 (IHS 1)	54.1	66.5	54.9

Source: NSO (2005) and NSO (1998)

The gap in welfare levels between rural and urban areas has not diminished over the years in Malawi. In 1998, the richest 20 percent of the population consumed 46.3 percent while the poorest 20 percent consumed only 6.3 percent of total goods and services. Consumption was also more unequally distributed within urban areas where the Gini-coefficient was 0.52 as opposed to 0.374 for rural areas.

Table 2 Gini-Coefficients[3] for Malawi (Individual consumption).

Survey Year	National	Rural	Urban
2004-2005	0.39	0.34	0.48
1997-1998	0.401	0.374	0.520

Source: NSO (2005) and NSO (1998)

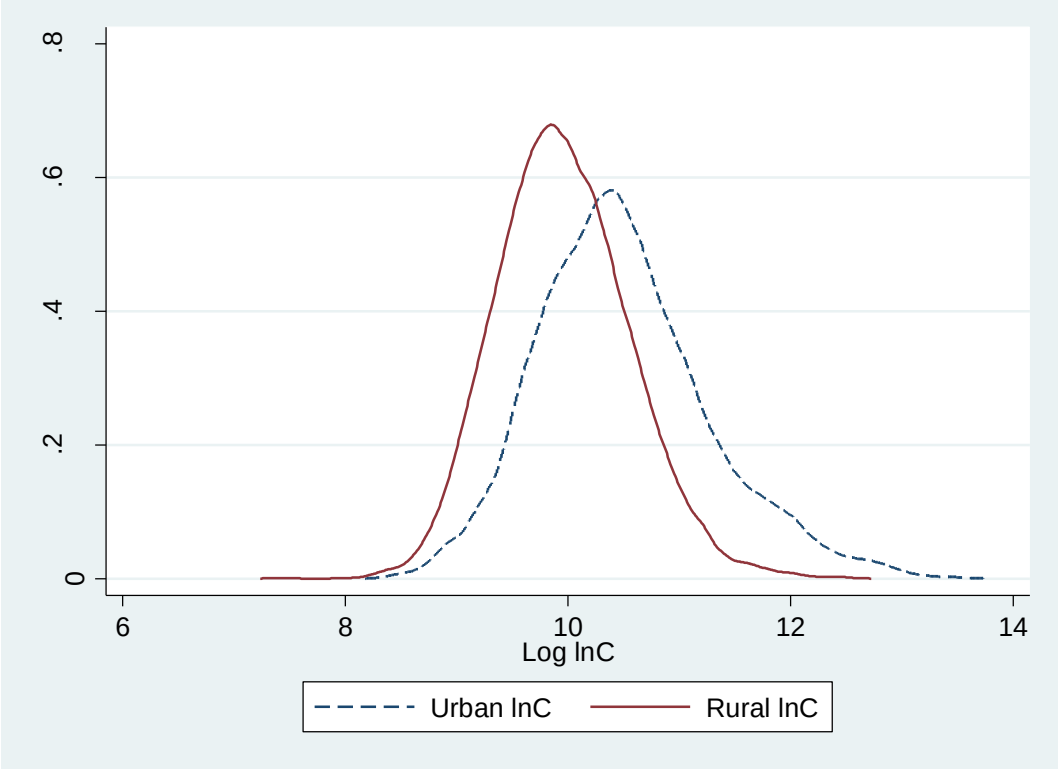
Certainly, from Table 2 above income inequality still persist in the country. Malawi registered a very high inequality index (Gini 0.39) for the year 2005, reflecting profound inequalities in the access to assets, services and opportunities across the population. The IHS-2 report indicates that the richest 10 percent of the population has a median per capita income that is eight times higher (MK50, 373 per person per annum) than the median per capita income of the poorest 10% (K6, 370 per person per annum). Furthermore, the richest 10 percent of the population has a median income that is three times higher than the overall

[3] The Gini-coefficient is an income inequality index and is measured as the average of the absolute value of the differences between consumption levels of all individuals in the population relative to the mean consumption level of the population.

median income in the country. Evidently, urban areas have by far the greatest inequality. This is largely because most of the wealthiest households reside in urban areas, and not because of higher number of ultra-poor (GOM and World Bank, 2006).

The rural-urban inequality is further illustrated in Figure 1.1 below. This figure shows kernel density estimates of urban and rural household welfare based on the IHS-2 data. The urban density is clearly to the right of the rural density implying that for the same level of consumption there are more people in urban than rural areas. The figure also displays that the difference between rural and urban densities is greater in the right tail of the density. The urban rich are better off than their rural counterparts to a greater extent than the urban poor are better off than the rural poor.

Figure 1: Kernel densities of log real consumption expenditure per adult equivalent (lnC)



2.4 Policy Highlights

During the early seventies and eighties, the government of Malawi focused on strategies aimed at accelerating economic development, rather than poverty reduction. The 'Statement of Development Policies' adopted for the periods 1977-1986 and 1987-1996 are reflective of this orientation. Social development received attention only to the extent that it served the purposes of economic growth (Kishindo, 1997). These policies were aimed at translating the achieved growth into poverty reduction, improved income distribution and reduction of ignorance and disease (GoM and UNDP, 1993).

However, under the guidance of the World Bank, the government adopted in 1990 a development strategy that sought to bring growth objectives and poverty reduction strategies together. The 1994 Poverty Alleviation Policy (PAP) framework was the first attempt. PAP sought to raise the productivity of the poor through a sustainable and participatory socio-economic development process. Nonetheless, PAP suffered from the absence of a well articulated action plan to ensure a holistic approach to implementation. In particular, it did not give any priority to groups in poverty and lacked the appropriate interventions for these target groups (Kalemba, 1997).

Given the above experience, in 1996 the Government embarked on long-term perspective study to define the future of the Country. The study culminated in the Malawi Vision 2020 which was launched in 1998. To operationalise the vision, Malawi launched the Malawi Poverty Reduction Strategy (MPRS) in April, 2002 with the overall goal of achieving 'sustainable poverty reduction through empowerment of the poor.' To ensure that the pillar of 'sustained pro-poor economic growth' is achieved the Ministry of Economic Planning and Development facilitated the formulation of the Malawi Economic Growth Strategy (MEGS). The essence is to set the right macroeconomic conditions, legal and regulatory environment within which economic growth, investment and trade can take place. MEGS recognize the vital contribution that the private sector can make to achieve the required and sustainable level of 6 percent annual economic growth rate necessary to reduce poverty by half, by the year 2015.

Malawi's long-run development goals identified in the government's Vision 2020 document are in tandem with the Millennium Development Goals (MDGs). These long-term aims are closely related to the goals articulated in the new Malawi Growth Development Strategy (MGDS), which has five thematic areas. The first theme relates to *Sustainable Economic Growth*; aimed at creating wealth for the nation and enable the poor to determine their economic destiny. It boarders on issues of ownership and management of the country's wealth, food security and participation in economic activities. The second theme is *Social Protection* which aims at protecting the vulnerable and mitigating the impacts of disasters.

Thirdly, the theme of *Social Development* recognizes that a healthy, educated and productive population is necessary to achieve poverty reduction and sustainable economic growth. The fourth theme of *Infrastructure* is recognized as a prerequisite for growth and poverty reduction. Finally the theme of *Good Governance* underpins the achievement of all the growth and social objectives.

In conclusion, the foregone discussion has provided the background of the Malawi economy and the policies undertaken to address the poverty situation. Poverty rates in Malawi are higher in rural than in urban areas. Therefore, any policy that leads to higher growth in rural areas would also lead to greater poverty reduction. It is yet to be seen if the current MGDS would address existing rural-urban inequalities and achieve a more balanced growth across sectors and regions.

CHAPTER THREE

3.0 Literature Review

3.1 Theoretical Review

3.1.1 Theory of the Measurement of Welfare

Welfare refers to an economic well being of an individual, group or economy. Important components of welfare include; freedom, health status, life-expectancy, levels of education or living standards all of which are related to income and consumption. To measure welfare one can use the money metric utility approach, Samuelson (1974), which measures levels of living by the money required to sustain them. An alternative approach, based on Blackorby and Donaldson (1987) is the concept of welfare ratios, whereby welfare is measured as multiples of a poverty line.

To begin with the money metric utility, a household is assumed to have a consumption problem in which it chooses the consumption of individual goods to maximize utility within a given budget and at given prices. Consumer preferences over goods are thought of as a system of indifference curves, each linking bundles that are equally good, and with higher indifference curves better than lower ones. A given indifference curve corresponds to a given level of welfare, well-being, or living-standards, so that the measurement of welfare boils down to labeling the indifference curves, and then locating each household on an indifference curve (Deaton and Zaidi, 2002).

Browning and Chiapori (1998) show that if behaviour of the household is efficient it will maximize the weighted sum of each member's utility, subject to the budget constraint. Each utility function may depend on consumption (x) and leisure (l) of all household members. It is also conditioned by observables that affect tastes (such as age, gender and education) denoted φ and unobservable taste heterogeneity of all members (μ). Therefore, the household seeks to:

(3.1) Maximize $\sum_m U_m(l, x, \varphi, \mu)$

subject to $px = \sum_m \left[W_m (T_m - l_m) + Y_m \right]$

where p is a vector of prices, w are wages, T is total time, U are individual welfare weights, subscript *m* indicates money metric utility and Y is non-labour income. This model is often modified or extended to yield welfare functions.

The adequacy of "money-metric" measures such as the above can be critiqued from a number of perspectives, including one which notes that household income or expenditure only adequately reflect individual material well-being if the household has access to a market at which it can purchase all goods at given prices (Carter and May, 1999; Ravallion,1996). Goods such as available safe water and sanitation services, however, have large indivisibility and public good components that make it impossible for a single household to marginally purchase more of such goods. More generally, some analysts[4] would argue that access to safe water, adequate shelter are better indicators of welfare and human possibility than are incomes or expenditure-based measures.

The alternative approach utilizes welfare ratios. The basic idea is to express the standard of living relative to a baseline indifference curve. In poverty analysis, a natural choice is the poverty indifference curve, the level of living that marks the boundary between being poor and non-poor. The welfare ratio is then, the ratio of the household's expenditure to the expenditure required to reach the poverty indifference curve, both expressed at the prices faced by the household.

Unlike money metric utility, which is a money measure - the minimum amount of money needed to reach an indifference curve, the welfare ratio is a pure number – the standard of living as a multiple of the poverty line. The welfare ratio is advantageous for purposes of distributional analysis. In particular, much policy is conducted on the basis that transfers of money are more valuable the lower in the distribution is the recipient. This may take the form of a focus on poverty where the poor are given preference over the non-poor, which

[4] See Todaro and Smith (2006) , Younger(2003), Amartya Sen (1999)

can cause difficulties in the context of money metric utility (Blackorby and Donaldson, 1988). Nonetheless, welfare ratios do not necessarily indicate welfare correctly. For instance, it is possible for a policy to make someone better off and yet decrease their welfare ratio which is not the case with money metric utility measure of welfare.

According to Ravallion (1992) the concept of 'standards of living' or 'well-being' can either be welfarist or non-welfarist. The welfarist approach typically emphasizes expenditure on all goods and services consumed, including consumption of home production valued at appropriate prices. In other words, well being is assessed solely based on utility information derived from the individual preferences. By contrast, the non-welfarist approach bases assessment of well-being on attainment of certain basic achievements, such as food, clothing and shelter (Bhorat *et al* 2001). According to the World Bank (2000) a pronounced deprivation in well-being could be defined as poverty.

Despite the different conceptions of well-being or welfare highlighted above, most empirical studies exclusively consider the satisfaction of material needs by defining a basket of goods necessary to sustain minimum standards of living. As a result income and consumption expenditure have been the preferred and most widely used measures of well-being. Bhorat *et al* (2001) provides a list of alternative measures of welfare as follows: per capita consumption, household consumption, per capita income, per capita food expenditure, per capita caloric intake, budget share of food expenditure; and average educational level of adult household members.

3.1.2 Inequality Measures in Literature

The measurement and comparisons of inequality is a complex issue. This is because it is influenced by the welfare of any individual or household in a society, and because welfare itself is affected by so many factors. Inequality could then imply different things for different people. It could be conceptualized as a dispersion of a distribution, whether one is focusing on income, consumption or some other welfare indicator or attribute of the population. Inequality is a broader concept than poverty in that it is defined over the whole

distribution, not only the censored distribution of individuals below a certain poverty line (World Bank, 1999).

Economists and policy analysts may wish to assess the contribution to overall inequality of inequality with and between different sub-groups of the population, for instance within and between workers in agricultural and industrial sectors, or urban and rural sectors. Decompositions of inequality measures can shed light on both its structure and dynamics. Inequality decomposition is a standard technique for examining the contribution to inequality of particular characteristics. Such measures allow decomposition of inequality which is desirable for both arithmetic and analytic reasons (World Bank, 1999).

Several measures have been proposed in the literature for characterizing inequality in the distribution of income or expenditure (Kakwani, 1980; Glewwe, 1986; Fields, 1980; Thiel, 1979; Sen, 1973; Shorrocks, 1984, and Litchfield, 1999). Literature suggests that any appropriate measure of inequality that can conveniently be applied to welfare analysis must conform to set properties. These include: (i) the mean dependence condition; (ii) the population size independent condition; (iii) the Pigou-Dalton transfer sensitivity; (iv) the symmetry condition; and (iv) the decomposability condition.

This study touches on the symmetry condition and the decomposability property. The symmetry condition requires that the inequality measure be independent of any characteristic of household other than the welfare indicator, whose distribution is being measured. On the other hand the decomposability condition takes three forms: group decomposability; sources decomposability and decomposability of shared household welfare (Baye and Fambon, 2002).

Adams and Alderman (1992) argue that group decomposability requires overall inequality to be related in a consistent manner to the subgroups in the partition. That is to say, a fall in inequality in subgroups is expected to be accompanied by a fall in overall inequality. The beauty of using inequality measure that allows decomposition lies in that, they not only allow the determination of inequality in the whole sample, but also in sub-sample

characteristics, say, in terms of occupation, educational level or gender of the household head.

Fields (1997) proposes a decomposition technique, which allows one to assess the importance of household specific attributes in explaining the level of inequality, where the amount explained by each factor is independent of the inequality measures used. The method involves running a standard set of regressions. An alternative approach is the quantile regression methodology, where instead of estimating the mean of a dependent variable conditional on the values of the independent variables, one estimates the median: minimizing the sum of the absolute residuals rather than the sum of squares of the residuals as in ordinary regressions. It is possible to estimate different percentiles of the dependent variables, and so to obtain estimates for different parts of the income or expenditure distribution. Furthermore, it is possible to use different independent variables for different quantiles, reflecting the view that data may be heteroskedastic with different factors affecting the rich and poor (Deaton, 1997).

3.2 Empirical Review

Various attempts have been made to investigate the factors affecting a household's welfare/ poverty incidence and its decomposition. Most empirical studies, however, have focused on determinants of poverty (Geda *et al* 2001; Mukherjee and Benson, 2003)[5]. Recent publication by Nguyen *et al* (2006) decomposes the rural-urban welfare gap in Vietnam. Other decompositions have been across race; Bhaumik *et al* (2006) in Kosovo, caste; Gang *et al* (2002) in India, or across gender differentials; Albrecht *et al* (2006). Here is a review of some literature for comparative analysis.

Nguyen *et al* (2006) using the Vietnam Living Standards Surveys from 1993 and 1998 examined inequality in welfare between urban and rural areas. Real per capita household consumption expenditure (RPCE) was used as a measure of welfare. The urban-rural gap was found to be primarily due to differences in covariates such as education, ethnicity, and

[5] For a comprehensive analysis of poverty and policy, see Lipton, M. and Ravallion M., (1995)

age. This was true across the entire distribution. The study also applied a quantile regression decomposition technique to analyze the difference between the urban and rural distributions of log RPCE. The results obtained indicated that household characteristics explained the welfare gap at lowest quantiles. However, Skoufias *et al* (1999) observed that usage of per capita values may give a distorted picture of intra-household allocation of resources because the consumption requirements of people differ by age, sex and other demographic characteristics. Instead, per adult equivalent scales should be used to convert household real expenditures into money metric utility measures of individual welfare.

Other empirical studies have focused on the wage gap between men and women. Albrecht *et al* (2006) used a quantile regression decomposition method to analyze the gender gap between men and women who work full time in the Netherlands. In addition to shedding light on the sources of the gender gap in the Netherlands, they make two methodological contributions. First, they proved that the Machado-Mata quantile regression decomposition procedure yields consistent and asymptotically normal estimates of the quantiles of the counterfactual distribution that it is designed to simulate. Second, they show how the technique can be extended to account for selection. Their decompositions show that the majority of the gender log wage gap is due to differences between men and women in returns to labor market characteristics rather than to differences in the characteristics.

In a similar study, Bhaumik *et al* (2006) decomposed differences in poverty incidence (headcount ratio) using estimates from a regression equation. The decomposition is done following the Oaxaca methodology. A significance test was developed for characteristics and coefficients effects from decomposition results. The authors highlight that Oaxaca decomposition method overcomes the dependency path problem. This is a problem that arises when sequentially replacing the value associated with one of the groups with the corresponding values of other (or comparison) groups in order to compute the contribution of an individual variable or its coefficient towards the overall difference in the gap. Nevertheless, the Oaxaca method is not without fault. The method tends to concentrate on the mean level of consumption and not the entire distribution which might be more informative.

Gang *et al* (2002) with results from decompositions concluded that allocating more resources towards scheduled group children and shifting the educational focus from higher education to primary and secondary schools will decrease the discrepancy in poverty incidence between the scheduled groups and non-scheduled households in India. The decomposition analysis revealed that differences in characteristics explain the poverty rate gap more than differences in coefficients.

Different empirical studies focusing on welfare/ poverty determinants were also reviewed to give an indication of probable variables affecting welfare in Malawi. Okojie (2002) examined the linkages between gender of household heads, education and household poverty in Nigeria between 1980 and 1996. Notably the data utilized was adjusted for price differentials over time and across regions of the country. Per capita expenditure was used as the indicator of poverty, while the unit of analysis was the household. Trends in inequality were analyzed using Gini coefficients and the Theil's index. The multivariate analysis showed that female-headed households were more likely to be poor after controlling for other individual and household characteristics. Education and household size exerted significant influences on household welfare and the probability of being poor. The higher the educational attainment of the head of household, the higher the welfare and the less the likelihood of the household falling into poverty.

To inform poverty reduction initiative in Malawi, Bokosi (2006) studied the dynamics of poverty between 1998 and 2002 using a bivariate probit model. The results indicated that education of household head, per capita acreage cultivated and changes in household size are significantly related to the probability of being poor in 2002 irrespective of poverty status in 1998.

Using data from the 1997–98 Malawi Integrated Household Survey Mukherjee and Benson (2003) conducted an empirical multivariate analysis of household welfare. The model was used to simulate the effects of changes in key household characteristics and assess the likely impact on poverty of a number of poverty reduction policy interventions. The results

show that higher levels of educational attainment, especially for women, and the reallocation of household labor away from agriculture and into the trade and services sector of the economy would be effective in reducing poverty in Malawi.

In conclusion, the literature reviewed suggests several factors that influence welfare of a household. Among the variables that determine welfare status of the household includes; education, sex of the household head, household size and land ownership. However, there seem to be no universally accepted theoretical model of welfare and generally extensions of consumption and income functions are used in modeling. The current study utilizes money metric measures of welfare which measures levels of living by the money required to sustain them. Consumption expenditure adjusted by adult equivalent scales is used as a measure of welfare.

CHAPTER FOUR

4.0 Methodology

4.1 Model Specification and Estimation Technique

4.1.1 The Welfare Model

The approach to assessing the determinants of welfare in Malawi in this study is based on modeling the natural logarithm of annual consumption expenditure of survey households, our household welfare indicator. The unit of analysis used in this study is the household. The welfare model adapted from Mukherjee and Benson (1998) is specified as follows:

$$\ln C_j = \beta_0 + \sum_{i=1}^{n} \beta_j X_{ij} + \varepsilon_i \qquad (4.1)$$

where C_j is annual consumption of household j in Malawi Kwacha (MK); X_j is a set of exogenous household characteristics or other determinants, and ε is a random error term. The measure of consumption being used is consumption per adult equivalent. Ordinary Least Squares is used to estimate the semi-log functional form welfare equation. Different diagnostic test are carried out to assess the plausibility and reliability of the model.[6]

4.1.1.1 Dependent Variable

The dependent variable, the natural log of total annual consumption expenditure is used. This welfare indicator as reported by IHS survey households (unlogged) was made up of four components:

- Total food consumption
- Total non-food and non-durable goods expenditure
- Estimated use-value of durable consumer goods; and
- Rental value of housing for the household.

The best method of measuring welfare remains the subject of debate among researchers (see Ravallion, 1996). The use of a consumption-based, rather than an income-based,

[6]A detailed discussion of the diagnostic tests used is presented in chapter 5.

measure of welfare is motivated by two considerations in this study. Firstly, in an agricultural economy such as Malawi, income is often very lumpy. Farmers receive a large amount of cash income after the harvest, and very little the rest of the year. This is despite that households are constantly expending their income and consuming throughout the year. Consumption expenditure is a smoother measure of welfare through time than is income. Consumption tends to be more stable due to the availability of consumption smoothing opportunities such as saving, borrowing and community based risk sharing (Gebremedhim and Whelan, 2005). In other words, consumption can be viewed as realized welfare, whereas income is more a measure of potential welfare. Second, in Malawi a greater proportion of household income is derived from self-employed business or subsistence-oriented agricultural production. Assigning income values to the proceeds of these enterprises is often problematic (Mukherjee and Benson, 1998; Hentschel and Lanjouw, 1996).

Another issue which immediately arises in conducting welfare analysis is how to make comparisons between households of different sizes and composition. The problem with the use of per capita consumption as a measure of welfare is the inherent assumption that (i) everyone in the household receives an equal allocation of items consumed irrespective of age or gender, (ii) everyone in the household has the same needs irrespective of age or gender, and (iii) the cost for two or more people living together is the same as if they lived separately (Skoufias, Davis, and Behrman, 1999).

In essence, by simply deflating household expenditures by total household size implicitly ignores any economies of scale in consumption within the household. This is because people can share some goods and services, such that the cost of being equally well-off does not rise in proportion to the number of people in the household. Additionally, the consumption requirements of people differ by age, sex and other demographic characteristics. It follows per capita measures of expenditure distort the picture of intra-household allocation of resources and understate the welfare of big households relative to the living standards of small households (Deaton and Zaidi, 2002).

Alternatively, equivalence scales are used to make comparable consumption aggregates of households with differing size and demographic compositions. In this study, adult equivalent scales (AES) are used to convert household real expenditure into money metric utility measure of individual welfare as follows:

(4.2) $$AES = (A + \sum a_{ij} K_{ij})$$

where A is the number of adults in the household, i = age group and j = sex; 1 = male or 2 = female. K_{ij} is therefore, the non adult person in age group i for sex j, α_{ij} is the equivalence for age group i for sex j. Household size is then measured not in number of persons, but in number of adult equivalents (Grebremedhin and Whelan, 2005; Deaton, 1997). The consumption per adult equivalent is then found by dividing the total household consumption expenditure by the number of adult equivalents. The adult equivalent scales used in this study are presented in appendix 1.

Although adult equivalent scales are a significant improvement, they are not without faults. White and Masset (2003) observed that consumption of non-food items in particular is not very closely linked, if at all, to the age and gender of an individual. School fees or transport costs, for instance, will typically be assessed on a per capita basis, rather than with any consideration of age and sex. However, in the Malawian case more than 60% of income is spent on food hence the use of adult equivalent scales is more appropriate.

4.1.1.2 Explanatory variables

The potential explanatory variables of welfare in this study are determined based on the available literature from previous studies in Malawi.

(a) Demographic Characteristics

The demographic variables in this study include age in years of household head, sex of household head, marital status of household head and household size. Welfare increases with age as the individual acquires more human capital (education and experience). However, at older ages income and therefore welfare may fall with retirement and declining productivity. A quadratic term of age is considered to capture potential non linear relationship between age and welfare. A negative relationship is therefore hypothesized between welfare and the square of age.

Female-headed households are more likely to be poor than male-headed households. Household size reflects the dependency ratio as well as the number of workers in the household. With respect to welfare, the larger the family size the greater the numbers of dependants, implying more resources are required to meet the needs of household members.

(b) Education characteristics

The maximum education level attained by any adult aged 20 to 59 years in the household is used. Education is hypothesized to have a positive relationship with income, and therefore with welfare. Education categories include: primary education, secondary education, and tertiary education dummies with no education dummy variable as the reference category.

(c) Credit access

Accessibility of credit is expected to positively impact welfare. Of interest here is whether the household accessed credit for business or farming purposes.

(d) Labour market factors

The variable whether the household head is engaged in formal wage employment will be considered. The hypothesis is that employment of the household head for a wage positively contributes to welfare.

(e) Physical assets

In Malawi possession of land is perceived as an important asset together with livestock ownership. It is expected to positively relate to welfare. The land variable is measured as the log of hectares of land cultivated per adult equivalent. In computing the log value of livestock, the following animals are considered: cattle, goats, sheep, pigs and chickens. The missing log values of livestock and other physical assets were recoded following the approach in Chirwa (2007): Sherlund *et al* (2002) where the natural logarithm of zero is equated to one-tenth of the smallest non-zero value in the sample.

(f) Crop diversification

The number of crops the household cultivated that are not maize or tobacco is investigated as a measure of the diversity in crop cultivation. These include the food crops such as cassava, groundnut, rice, millet, sorghum, and beans and the cash crops such as cotton, sugar cane, soyabean, sunflower, and tea. Crop diversity is expected to positively

contribute to welfare of a household. A tobacco dummy is also included to see whether cultivation of tobacco positively influence welfare.

(g) Seasonality factor

The Second Integrated Household Survey was administered between March 2004 and April 2005 in all the districts of Malawi. The said period include; lean period (quarters 1 and 4) during which household consumption expenditure is high due to scarcity; and the marketing period (quarters 2 and 3) when households have harvested and consumption expenditure is low due to abundant supply. Seasonal dummies are included to account for possible disparities in consumption between the two periods.

Table 3 below presents the definitions of variables that are used in the welfare model.

Table 3 Variable Definitions

a. Dependent Variable	
ln C	log of annual consumption expenditure per adult equivalent
b. Explanatory Variables	
age_hd	age of household head in years
age_hdsq	age of household head squared
sexhd	dummy = 1 if sex of household head is female, 0 otherwise
maristat	dummy = 1 if household head is married, 0 otherwise
hhsize	Number of people in the household
maxedu2	dummy = 1 if maximum education is primary education (PSLC), 0 otherwise
maxedu3	dummy = 1 if maximum education is junior secondary education (JCE), 0 otherwise
maxedu4	dummy = 1 if maximum education is full secondary education (MSCE), 0 otherwise
maxedu5	dummy = 1 if maximum education is non-university diploma, 0 otherwise

maxedu6	dummy = 1 if maximum education is university graduate, 0 otherwise
urban	dummy = 1 if area of residence is urban , 0 otherwise
wagejob	Dummy = 1 if household head works for a wage, 0 otherwise
aeland	acreage of land cultivated by the household per adult equivalent
lnaelvstval	log of the value of livestock owned by the household per adult equivalent
lnaevassets	log of the value of other physical assets (e.g. chair, table, bed, radio) per adult equivalent
tob_dum	dummy = 1 if household cultivates tobacco, 0 otherwise
divcrops	number of crops cultivated not maize or tobacco
credit	dummy = 1 if household accessed credit for business or farming purposes, 0 otherwise
mktseason	dummy = 1 if marketing period (quarters 2and 3), 0 otherwise

4.1.2 The Decomposition of Welfare Differentials

There are several methods of decomposing welfare. This study decomposes welfare gap at the mean using the Oaxaca - Blinder (1973) and Machado-Mata (2005) methodology which decomposes the gap across the entire distribution of consumption.

According to Blinder (1973) the most common way to study the dispersion in individual household's welfare is to estimate a regression of the form (4.1) above using Ordinary Least Squares Method. Since we are particularly interested in comparing two groups (such as rural - group that suffers discrimination and urban - advantaged group), it makes sense to estimate an equation like (4.1) for each group:

(4.2) $$\ln C_j^R = \beta_0^R + \sum_{i=1}^{n} \beta_j^R x_{ij}^R + \varepsilon_i^R$$

(4.3) $$\ln C_j^U = \beta_o^U + \sum_{i=1}^{n} \beta_j^U X_{ij}^U + \varepsilon_i^U$$

where the R superscript indicates the rural area and the U superscript indicates the urban areas. Given equations (4.2) and (4.3), the portion of the differential explained by the regression is computed as; $\sum_j \beta_j^U \bar{x}_j^U - \sum_j \beta_j^R \bar{x}_j^R$, and the amount which is captured by the shift coefficient as; $\beta_0^U - \beta_0^R$. The latter is typically attributed to discrimination or bias. As an extension, notice that the explained part of the differential comes from both differences in the coefficients, β_j^R and β_j^U , and differences in the average characteristics, $\bar{x}^R$ and $\bar{x}^U$. Specifically,

(4.4) $$\ln C_j^U - \ln C_j^R = \beta_0^U - \beta_0^R + \sum_j \beta_j^U \bar{x}_j^U - \sum_j \beta_j^R \bar{x}_j^R$$

The explained component can be written as:

(4.5) $$\sum_j \beta_j^U \bar{x}_j^U - \sum_j \beta_j^R \bar{x}_j^R = \sum_j \beta_j^U (\bar{x}_j^U - \bar{x}_j^R) + \sum_j \bar{x}_j^R (\beta_j^U - \beta_j^R)$$

where the first sum is the value of the advantage in endowments possessed by the rural as evaluated by rural households equation. The second sum is the difference between how the rural equation would value the characteristics of the urban group and how the urban equation actually values them. In other words, the first sum is "attributable to the endowments," while the second is "attributable to the coefficients."

An alternative formulation of the above is the Oaxaca (1973) methodology, formulated as:

(4.6) $$C^U - C^R = (x^U - x^R)\beta^U + x^R(\beta^U - \beta^R)$$

where *x* is a vector of average values of welfare-determining characteristics, β is the vector of coefficients and, as before, *U* and *R* superscripts denote urban and rural areas, respectively.

The first term of the equation (4.6) measures that part of the gap explained by welfare differences in average characteristics. The second term is the residual component which accounts for differences in unobservable characteristics and welfare discrimination. The first term is often interpreted as the size of the welfare gap if there were no discrimination. Under this interpretation, (4.6) uses urban welfare coefficient estimates as the proxy for

welfare structure in the absence of discrimination (Christie and Shannon, 2001). Generally, in literature the coefficients of the dominant group relative to the comparison group are used in the counterfactual hence the use of urban coefficients in this study. The two methods described above have been dubbed the Oaxaca-Blinder method of decomposition in literature.

To deepen our understanding of welfare inequality in Malawi, the Machado-Mata (2005) methodology of decomposition is also adopted. This method requires estimation of quantile regressions and is advantageous because it allows for covariates to have marginal effects (returns) that vary with household's position in the welfare distribution. The mean regression methods described above cannot reveal such variations (Nguyeni *et al* 2006). In other words, the Oaxaca-Blinder decomposition is disadvantageous because it only concentrates on the mean level of consumption when it is also important to focus on the entire consumption profile.

The Machado-Mata (2005) technique is applied to decompose the rural-urban gap across the entire distribution. This involves estimating equation (4.1) above for rural and urban households, then constructing a counterfactual distribution of rural *ln* C using urban distribution covariates. This counterfactual distribution estimates the distribution of rural *ln* C that would have prevailed if the rural households were endowed with the urban distribution of household characteristics but received the returns that pertain to the rural area. The contribution of the differences in distribution of covariates to the rural-urban gap is estimated by comparing the counterfactual and empirical rural distribution. The remaining gap is attributed to the combined differences in the returns to the covariates.

The study examines how the relationship between *ln* C and household characteristics differ between rural and urban areas at various quantiles of the *ln* C distribution. Following the work of Nguyen *et al* (2006), this is done by estimating the regression of the form:

(4.7) $$Q_\theta\left\langle \ln C \middle| X, U\right\rangle = \beta_\theta^0 + X\beta_\theta + U\varphi_\theta^0 + UX\delta_\theta$$

where ln C is log total annual consumption expenditure per adult equivalent for a household, $Q_\theta\left\langle \ln C \middle| X, U\right\rangle$ is the θ^{th} conditional quantile of ln C, β_θ^0 is the regression

intercept, U is the urban dummy (taking a value of 1 for urban and 0 otherwise), X is the covariate matrix (including all regressors except U), U*X is a matrix of interactions between the urban dummy and all covariates. The β_θ represents the returns to covariates at the θ^{th} quantile. The coefficients φ_θ^0, δ_θ give the θ^{th} quantile intercept and slope differential associated with the urban location.

The counterfactual distribution can be denoted as $F\left\langle \ln C^* \middle| Z^U, \beta^R \right\rangle$, where Z is distribution of covariates and β is the collection of vector of quantile regression coefficients (returns) at the various quantiles.[7] $F\left\langle \ln C^* \middle| Z^U, \beta^R \right\rangle$ is constructed using the Machado-Mata[8] algorithms as follows:

- For each quantile θ = 0.01, 0.02, … , 0.99, estimate regression coefficients $\beta^R(\theta)$ using the rural data.
- Using urban data generate fitted values $\ln C^*(\theta) = Z^U \beta^R(\theta)$. This generates for each quantile N^U fitted values, where N^U is the size of the urban sub sample.
- Select randomly s = 100 of the elements of $\ln C^*(\theta)$ for each θ and stack these into a 99*100 element vector $\ln C^*$. The empirical cumulative distribution function (CDF) of these values is the estimated counterfactual distribution.

The decomposition compares the counterfactual distribution with the empirical urban and rural *ln* C distributions, defined as $\ln C^*(\theta), \ln C^U(\theta)$ and $\ln C^R(\theta)$ respectively. The difference between the θ^{th} quantile of the urban and rural distributions is given as:

(4.8) $$\ln C^U(\theta) - \ln C^R(\theta) = \left[\ln C^U - \ln C^*(\theta)\right] + \left[\ln C^*(\theta) - \ln C^R(\theta)\right]$$

The first term on the right-hand side of the equation (6) above is the returns effect which measures the contribution of the difference in returns to the rural-urban gap at the θ^{th} quantile. The second term is the covariates effect which measures the contribution of the covariates values to the rural-urban gap at the θ^{th} quantile.

[7] The superscripts R and U denote rural and urban where as the asterisk implies generated values.

[8] See Albrecht et al (2006) for the econometrics underlying the Machado-Mata quantile regression decomposition technique.

4.2 Data Sources

Data used in the study is obtained from the second Integrated Household Survey done in 2004-2005 by the National Statistical Office (NSO). The survey collected data on the demographic, education, income, expenditure and employment characteristics of households among others. The survey collected information from a representative sample of 11,280 households (9,840 rural households and 1,440 urban households). The sampling design is representative at both national and district level hence the survey provides reliable estimates for those areas. The usable sample size is 8,941 and 1,402 households in rural and urban areas, respectively. The data is analyzed using STATA (version 10.0).

CHAPTER FIVE

5.0 Results and Discussions

5.1 Descriptive Statistics for the Variables in the Welfare Model

Table 4 presents the descriptive statistics for the variables that are hypothesized to determine household welfare.

Table 4 Descriptive statistics for variables used in Econometric analysis

Variable	Urban				Rural			
	Mean	Standard Deviation	Min.	Max.	Mean	Standard Deviation	Min.	Max.
lnc*	10.473	0.807	7.89	13.21	9.899	0.686	6.98	12.75
Age_hd*	37	12.051	14	96	41	14.396	16	99
age_hdsq*	1485	1071	196	9216	1859	1345	256	9801
sexhd*	0.147	0.354	0	1	0.209	0.406	0	1
maristat*	0.749	0.434	0	1	0.773	0.419	0	1
hhsize*	4.425	2.310	1	15	4.777	2.303	1	27
maxeduc2*	0.161	0.368	0	1	0.126	0.332	0	1
maxeduc3*	0.215	0.411	0	1	0.106	0.308	0	1
maxeduc4*	0.195	0.397	0	1	0.039	0.193	0	1
maxeduc5*	0.031	0.172	0	1	0.0038	0.0615	0	1
maxeduc6*	0.049	0.216	0	1	0.0026	0.051	0	1
wagejob*	0.531	0.499	0	1	0.222	0.415	0	1
aeland**	0.120	0.297	0	5.23	1.609	33.943	0	1887
lnaelvsval*	-0.912	3.117	-2.19	12.41	3.355	4.429	-2.19	12.31
naevassets*	6.699	3.101	-2.30	13.50	4.982	3.264	-2.30	13.62
tob_dum*	0.0399	0.196	0	1	0.212	0.409	0	1
divcrops*	6.779	7.909	0	16	14.986	3.896	0	16
credit*	0.080	0.271	0	1	0.130	0.336	0	1
mktseason	0.501	0.500	0	1	0.502	0.500	0	1

Notes:

For all categorical variables, mean is the proportion of those respondents with dummy variable 1. All variables were tested for statistical significance between rural and urban samples. The asterisk * and ** imply significant difference at 1% and 20% respectively.

The statistics show a slight but significant difference in the mean log consumption per adult equivalent between urban and rural households at MK10.473 and MK9.899, respectively. Striking differences exists with regard to maximum education level in the households. The highest level of education attained by urban household adults is junior secondary education with a rate of 21%, against 13% attaining primary education in rural areas. These

household heads have 37 (urban) and 41 (rural) years of age on average. The majority of urban households (53%) work for a wage as opposed to 22% in rural areas.

In terms of household size, rural residents have registered a maximum of 27 as opposed to 15 members in urban households. Although the difference is only statistically significant at 20%, rural households own a greater percentage of land per adult equivalent relative to urban households. Furthermore, about 21% of rural households cultivate tobacco whereas this activity is only undertaken by 4% of the urban sample population. With regard to access to credit, the proportion difference between rural and urban areas is statistically significant at 1% level of significance. Although the financial system is more developed in urban areas than in rural areas, on average access to credit is better in rural areas. About 13% of rural sample population accessed credit as opposed to 8% in urban areas.

5.2 Econometric Analysis of the Welfare Model

Table 5 presents regression results for urban and rural welfare models. These results were obtained having examined the models robustness and reliability. Diagnostic checks are carried out to ensure that the model estimation, hypotheses testing and statistical inferences are made with precision. A correlation analysis carried out between the different variables showed that there is a low degree of multicollinearity that can be ignored. The Breusch-Pagan test detected the presence of heteroskedasticity which is resolved by using robust regressions. The specification of the model is a good fit as revealed by the Ramsey RESET test. The results of these tests are presented in appendix two.

Having ascertained the fundamental diagnostic tests, the welfare model is estimated using the method of Ordinary Least Squares. Approximately, the urban model explains 55% of the variability in welfare. On the other hand, the rural model explains only 41% of the variation in welfare among rural households. However, on overall both models are statistically significant at 1% level of significance based on the F-Statistic and we reject the hypothesis that all parameters except the constant are equal to zero. With a few exceptions, the signs on the parameters are as expected.

Table 5 OLS Estimation Results of Welfare Models[9]

	Urban			*Rural*		
Variable	***Coefficient***	***t-Statistic***	***Elasticity***	***Coefficient***	***t-Statistic***	***Elasticity***
intercept	10.2250	67.85	-	10.6012	188.60	-
age_hd	-0.0030	-0.43	-	-0.0100	-4.29[a]	-0.0010
agehdsq	0.00004	0.58	-	0.00007	2.89[a]	7.20e^{-06}
sexhd	-0.0996	-1.64	-	-0.1017	-4.15[a]	-0.0103
maristat	-0.1806	-3.52[a]	-0.0172	-0.1804	-7.34[a]	-0.0182
hhsize	-0.1285	-15.36[a]	-0.0123	-0.1363	-40.59[a]	-0.0138
maxeduc2	-0.0144	-0.35	-	0.0759	4.40[a]	0.0077
maxeduc3	0.1811	4.36[a]	0.0173	0.0923	4.76[a]	0.0093
maxeduc4	0.3722	8.23[a]	0.0355	0.2546	8.00[a]	0.0257
maxeduc5	0.6452	6.85[a]	0.0616	0.6111	5.23[a]	0.0617
maxeduc6	1.1079	12.72[a]	0.1058	0.6734	3.90[a]	0.0680
wagejob	0.0312	0.98	-	0.0337	2.36[b]	0.0034
aeland	0.1765	2.51[b]	0.0169	0.00029	1.61	-
lnaevasset	0.1093	15.73[a]	0.1093	0.0691	35.22[a]	0.0691
lnaelvstval	-0.0109	-2.10[b]	-0.0109	0.0024	1.77[c]	0.0024
tob_dum	-0.1382	-1.66[c]	-0.0132	0.1328	9.29[a]	0.0134
divcrops	-0.0018	-0.78	-	-0.0094	-6.07[a]	-0.0095
credit	0.0554	0.95	-	0.0897	5.24[a]	0.0091
mktseason	0.1204	4.05[a]	0.0115	0.1762	15.69[a]	0.0178
R^2 = 0.5461 F-statistic (18, 1383) = 88.77 prob. > F = 0.000 N = 1402				R^2 = 0.4109 F-statistic (18, 8922) = 288.05 prob. > F = 0.000 N = 8941		

Notes:

The t-statistics are based on robust standard errors.

Superscripts a, b and c indicates significance at 1%, 5% and 10% level, respectively.

[9] The same specification of welfare models is used for purposes of decompositions.

Demographic Variables

The age of the household head has a relatively small negative impact on the welfare of the household. In spite of the small magnitude of the coefficients, the variable is statistically significant in the rural areas at 1% level. Households headed by older individuals in rural areas, *ceteris paribus*, tend to enjoy lower welfare than those headed by younger individuals. In contrast, in the urban centers the level of household welfare does not seem to be determined by the age of the head. Similar results were found by Mukherjee and Benson (2003) in their study on determinants of poverty in Malawi.

The model also considered age squared of the household head which was found to be significant and positive in rural areas, with the bottom of the U-shape at approximately 38 and 71 years in urban and rural areas, respectively. This implies that, *ceteris paribus* at household head age of less than 38 or 71, the addition of another year by the household head reduces per adult equivalent consumption, but at a decreasing rate.

There is also a gender dimension to welfare. The sex of the household head is statistically significant at 1% in the rural welfare model. This variable is however, insignificant in urban areas. Incidentally, the negative sign for gender of household head reflects that being female; the welfare level is lower than being male-headed household. This is not surprising given the multiple responsibilities and greater constraints that women face in Sub-Saharan Africa in trying to access resources and services than men (Cleaver, 1993). Furthermore, a study by Datt *et al* (2000) on determinants of poverty in Mozambique found similar results. The estimation results also show that the married household heads have lower welfare level, than those otherwise.

In terms of the number of people in the household, the impact on welfare is as expected. The coefficients are negative and statistically significant at 1% level in both rural and urban areas. This is a common finding in the welfare studies (see for instance Lipton and Ravallion 1995; Lanjouw and Ravallion 1995). This implies that welfare enjoyed is reduced by having larger households. The level of household welfare declines by approximately12.9% and 13.6% in urban and rural areas, respectively from a unit change in

the household size. This reflects high dependency levels for households with relatively more children members or the fact that household members are not working or they are being remunerated poorly, which in totality leads to a reduction in per adult equivalent consumption.

Education Variables[10]

The maximum education level attained by any adult household member is found to significantly contribute to welfare in both rural and urban areas except for basic primary education in urban areas. This postulates that basic education would not suffice to increase household's welfare in urban areas of Malawi. Similar findings were obtained in Eritrea by Arneberg and Pederson (2001) that there is need for complementary factors to be provided along side with education so as to alleviate poverty.

The estimated coefficients which are significant at 1% are consistently positive, highlighting or perhaps confirming the expectation that education attainment enhances welfare. Raising the maximum level of education attained by any member in the household by one step, i.e., from junior secondary education to full secondary education, will raise household per adult equivalent consumption on average by 10% in rural, by 20% in urban, by 29% in rural, and by 45% in the urban areas. The increase in urban welfare is higher than in rural areas, possibly reflecting that the remunerative economic opportunities from education in rural areas of Malawi are very few. This is substantiated in the poverty profile report which noted that Malawians gain more economic advantages from their education in urban centres (National Economic Council, 2000).

Wage Employment

The results reveal that, in rural areas working for a wage significantly contributes to welfare. The variable is significant at 5% level of significance. The median welfare of a rural household whose head is wage-employed is 3.4% higher than that of a household head in other forms of employment. Although positive in urban areas, the variable is not

[10] The variables education of the household head and maximum education of any member in the household were also considered when modelling. The study reports only the maximum education of any adult (20-59 years) since its statistics were more appealing.

statistically significant. Implying that there are no statistical differences in welfare between different forms of employment i.e. self employed and wage employed households enjoy same level of welfare in urban areas.

The magnitude of rural coefficients should be interpreted with some caution, as only a small proportion of the rural household heads sample is wage employed (22%), implying that the estimates are based on relatively few observations.

Physical assets variables

Ownership of land per adult equivalent is expected to provide notable welfare benefits. Acreage of land cultivated is found to be statistically significant at 5% level in urban areas. Increasing per adult equivalent cultivatable land in urban areas would change a household's welfare by 18%. The striking part of the results is the non-significance of land in rural areas. In contrast, the study by Mukherjee and Benson (2003) in Malawi found that possession of land increased welfare which was measured on per capita basis. Nonetheless, Geda *et al* (2001) observed that land is important in poverty reduction in as far as its quality is improved and the necessary complementary inputs such as fertilizer that may enhance productivity are made available to the households.

In terms of value of livestock owned, the variable was found to be statistically significant at 5% and 10% level in urban and rural cases, respectively. Unlike in urban areas, the value of livestock owned positively affects welfare in rural areas. The positive impact of livestock value on welfare in rural areas is consistent with results obtained by Mukherjee and Benson (2003). In Malawi the majority of urban dwellers do not possess livestock, and if they do it is at low scale resulting in low relative value of livestock owned.

In addition, possession of other physical assets was also considered as potential determinant of welfare. The variable significantly affects a household's welfare in both rural and urban areas at 1% level. Welfare changes by the proportions 11% and 6.9% in urban and rural areas, respectively from a change in value of possessed other assets.

Crop Diversification variables

The cultivation of tobacco is found to significantly contribute to welfare at 10% and 1% in urban and rural areas, respectively. In the rural model, the coefficient is positive meaning that the average welfare levels for households cultivating tobacco is 14.2% higher than those not engaging in tobacco cultivation. On the other hand, with cultivation of tobacco in urban areas the household realizes a welfare decline equivalent to 12.9%.

The negative coefficient for this variable possibly reflects the increased marketing and processing costs faced by urban farmers growing the crop usually estate-based where they face the principle–agent relationship. World Bank (2003) argues that the contribution of estates to tobacco produced has declined due to reduced prices and profitability of tobacco and lack of wood for curing. In addition, the liberalization of burley tobacco has reduced the availability of labour that could be used by urban farmers. The benefits from tobacco are further reduced by the introduction of the intermediate buyers system which provides a channel for tenants to bypass the estates.

Crop diversification is found to significantly affect welfare in rural areas at 1% level of significance. The negative relationship could perhaps suggest that the returns from these crops are not positively significant. Additionally landholding size is the major constraint limiting the income-earning potential of smallholders in Malawi. As observed by Alwang and Siegel (1999), land scarcity is exacerbated by food security concerns in Malawi. Due to lack of confidence in markets, smallholders plant a high percentage of their land to low-value food staples. In their study they found that diversification, although rational, results in relatively lower income levels. However, these results are contrary to what Mukherjee and Benson (2003) found that crop diversification positively contributes to welfare in rural areas.

Credit access

Access to credit for farming or business purposes was found to significantly contribute to welfare of the household in rural areas at 1% level. The average welfare level of households that accessed credit in rural areas is 9.38% higher than that of households that did not access credit. This is consistent with findings by Geda *et al* (2006) in Ethiopia. It follows that credit is an important component of consumption smoothing and hence it is pro-poor as it enhances the welfare of the households. This variable is however, not significant in urban areas.

Seasonality

The variable to account for seasonality is statistically significant in both models at 1% level of significance. The results reveal that during marketing period, the median welfare level is 13% and 19% higher than that obtained during lean periods in urban and rural areas, respectively.

5.3 Rural- Urban Gap Decomposition Results

In this section we present the findings from decompositions of welfare gap into characteristics and coefficients effects. The decompositions are done at the mean using the Oaxaca-Blinder method and across the entire distribution using the Machado-Mata procedure.

5.3.1 Oaxaca-Blinder Decomposition Results

Using the Oaxaca-Blinder decomposition method, the results in Table 6 below were obtained. The predicted mean annual consumption is MK10.473 and MK9.899 for urban and rural areas, respectively. The overall rural-urban gap is estimated at 0.574. In a similar study, Nguyen *et al* (2006) found an existing welfare gap between rural and urban areas of 0.520 in Vietnam. The welfare gap in Malawi is broken into the explained component 0.339, representing 59% of the total gap and the unexplained component of 0.235, which accounts for 40% of the total gap. The explained gap is attributed to differences in household characteristics, where as the unexplained gap is due to discrimination or pure bias.

In Table 6, the percentage shares of each element are displayed. The largest contributor to the welfare gap explained by endowments is the value of physical assets in the household with a 20% share. This is followed by education characteristics.

Table 6 Oaxaca – Blinder decompositions of the welfare gap results

Causal Factor	Amount Attributable to Characteristics		Amount Attributable to Coefficients	
	Estimate	Share (%)	Estimate	Share (%)
age_hd	0.041	7.14	0.255	44.43
agehdsq	-0.027	-4.70	-0.039	-6.79
sexhd	0.006	1.05	0	0
maristat	0.004	0.70	0	0
hhsize	0.048	8.36	0.034	5.92
maxeduc	0.1	17.42	0.05	8.71
wagejob	0.01	1.74	-0.002	-0.35
aeland	0	0	0.022	3.83
lnaevasset	0.117	20.38	0.269	46.86
lnaelvstval	-0.01	-1.74	0.012	2.09
tob_dum	-0.023	-4.01	-0.011	-1.92
divcrops	0.077	13.41	0.052	9.06
credit_dum	-0.004	-0.70	-0.002	-0.35
mktseason	0	0	-0.028	-4.88
intercept	0	0	-0.376	-65.51
Total	**0.339**	**59%**	**0.235**	**41%**

Notes:
A + sign indicates advantage for urban; a - sign indicates advantage for rural households. Components may not add to totals due to rounding. Share is the ratio of the contribution of each factor to the 'predicted' overall difference in welfare in percentage terms.

Differences in the maximum education attained by adults in the household contribute together a total of 17.4% to the explained component of the welfare gap. When disaggregated the results further show that the coefficients effect of various education

categories are quite small, while the characteristics effect is substantial. This underlines the importance of obtaining higher level of education for household members as it is the gap in the education attainment between the rural and urban households that is one of the major causes of welfare inequality.

From the explained component results, it can be seen that accessing credit, cultivation of tobacco, value of livestock possessed and age squared variables favour the rural households, while the gaps in the remaining variables all disfavour the rural households. The constant term also contributes to reducing the welfare gap. The constant term may reflect underlying differences between the two groups which are not captured by the other explanatory variables.

5.3.2 Quantile Regressions

The study proceeds by estimating a restricted version of equation (4.7) that includes only the intercept and the urban dummy. This gives a clear description of the degree to which the rural-urban gap increases at higher quantiles since the estimates of φ_θ^0 are estimates of the rural-urban gap at the designated quantiles. Table 7 shows quantile regression results in comparison with OLS results to illustrate the gain in richness that the former produce.

Table 7 Estimates of the rural-urban gap at the mean and at various quantiles

Coefficient	OLS	Quantiles				
		5th	25th	50th	75th	95th
base	9.8985	8.8246	9.4298	9.8762	10.3402	11.0467
urban	0.5744	0.3908	0.4876	0.5427	0.6198	0.9013

Notes: All estimates are statistically significant at 1% level of significance.

The coefficients labeled 'base' are the estimates of *ln*C for the base category: a rural household. The coefficients labeled 'urban' are the coefficients on the urban dummy. This gives the difference in *ln*C between θ^{th} percentile of urban distribution and the θ^{th} percentile of the rural distribution. If these coefficient are small, they can be multiplied by 100 and indicate approximately the percentage by which urban households real annual consumption

per adult equivalent exceed those of rural household. These coefficients are statistically significant and increase across the quantiles.

The coefficients on the urban dummy reflect the differences in distribution of covariates and differences in returns to those covariates. To enable discussion of the differences, a full model (equation 4.7) is estimated, including interactions of the urban dummy with all the remaining covariates. The results for the quantiles 5, 25, 50, 75 and 95 are presented in appendix 4.[11]

The coefficient on the urban dummy measures the rural-urban gap that is unexplained by the covariates in the regressions. After controlling for covariates, the unexplained gaps are negative and statistically significant at the 5th, 25th and 50th percentiles only. This implies that at higher quantiles (0.75 and 0.95) there is no statistical evidence of discrimination. The unexplained gap increases as we move up the quantiles and declines again at the 95th quantile.

(a) Returns to Covariates

The patterns of returns to education across quantiles vary between rural and urban households. The maximum education attained by any adult in the household is found to be statistically insignificant in the 5th quantile except for the category of MSCE, which is significant at 10% level. This is not surprising given that households in 5th quantile spend only 1% of their income towards education (NSO, 2005)[12].

Returns to education tend to increase with subsequent higher quantiles for instance, base returns to maxeduc4 (MSCE) range from approximately 0.119 to 0.227 and were highly significant (1%) in all quantiles except 5th percentile (5%). In addition, although the rural returns remained positive for the entire distribution across all quantiles, this is not the case with the urban differentials. The urban returns to education are negative and significant at

[11]In some quantile regressions there are statistically insignificant coefficients. For the purposes of decomposition, same specification is used at all quantiles.

[12] To be interpreted with caution since usage is made of household per capita quantile and not per adult equivalent.

the 50th and 75th percentile for Primary education. The negativity of primary education in urban areas is consistent with OLS results obtained in this analysis. The implication is that rural households are better off with primary education than their urban counterparts at the 50th and 75th percentiles.

For rural households, returns from employment in wage paid job are statistically significant at 25th percentiles only. The urban differential is negative and statistically significant at 5% level at 95th percentile only. It follows at the top of the distribution of *ln*C; wage employment of the household head in urban areas is welfare reducing than in rural areas. Thus, extending opportunities of wage employment improves welfare in rural areas.

With regard to the value of other physical assets in the household, both the base returns and the urban differentials remained positive and statistically significant at 1% level except at the top of the distribution for the urban case. Furthermore, rural returns remained essentially about the same ranging from 0.08 to 0.06.

The results for the tobacco dummy are consistent with those obtained using OLS in that cultivation of tobacco positively and negatively contribute to welfare in rural and urban areas, respectively. The rural returns from cultivating tobacco ranged from 0.071 to 0.187 across the entire distribution, with the variable insignificant at the 5th percentile.

Turning to the credit access variable we see that the base category remained positive and significant for the entire distribution at different levels. This is consistent with expectation that credit access for business and farming purposes enhances welfare. Households accessing credit were better off in rural areas at the 25th percentile that has registered higher return of 0.114. On the other hand, the differential impact of credit in urban areas is negative through out the distribution and statistically insignificant across all quantiles.

The coefficients of other variables like age of household head, age squared, and sex of household head among others do not display particularly interesting patterns across quantiles. However, marginal effects discussed above generally vary across quantiles. To

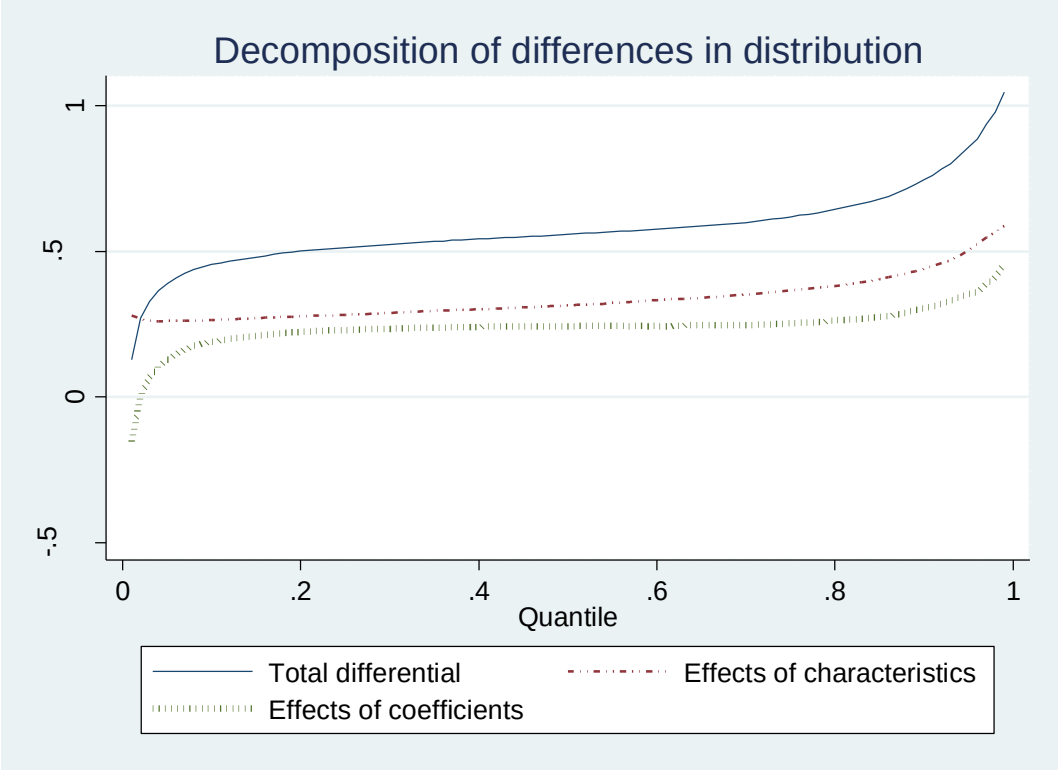
summaries the effects of covariates and returns on the size and change in the rural-urban gap, the Machado-Mata (2005) decomposition is employed.

(b) Machado-Mata Decomposition results

The previous section highlighted that returns to certain characteristics vary across conditional quantiles of the consumption distribution and also differ between urban and rural areas. Similarly, the distributions of covariates differ between the two areas. The Machado-Mata procedure decomposes the welfare gap into that proportion due to differences in characteristics between the regions and due to differences in the returns to the characteristics for the entire distribution. The counterfactual distribution that gives the log consumption distribution that rural household would enjoy if they had the same characteristics as urban households is obtained.

In order to see the results over the whole distribution, it is best to view them graphically. Figure 2 below shows the returns and covariates effects for quantiles 5 to 95, with 95% confidence bounds. The observed total differential gap is increasing as we move up to higher levels of welfare. Additionally, the differences in log consumption are closer to zero and one at lowest quantiles and highest quantiles, respectively. The welfare differentials are thus smaller at lower quantiles as compared to higher quantiles. The pattern displayed by the characteristics effect is such that between the 20^{th} and 60^{th} percentiles, the effect is approximately the same. This is also true for coefficient effects between the 20^{th} and 60^{th} percentiles. Furthermore, it can be seen that both effects are larger at higher quantiles, resulting in a larger rural-urban gap at higher quantiles. In other words, positive discrimination exists consistently across the entire distribution and this is more pronounced among the rich households.

Figure 2: Decomposition of Differences in Distribution of lnC



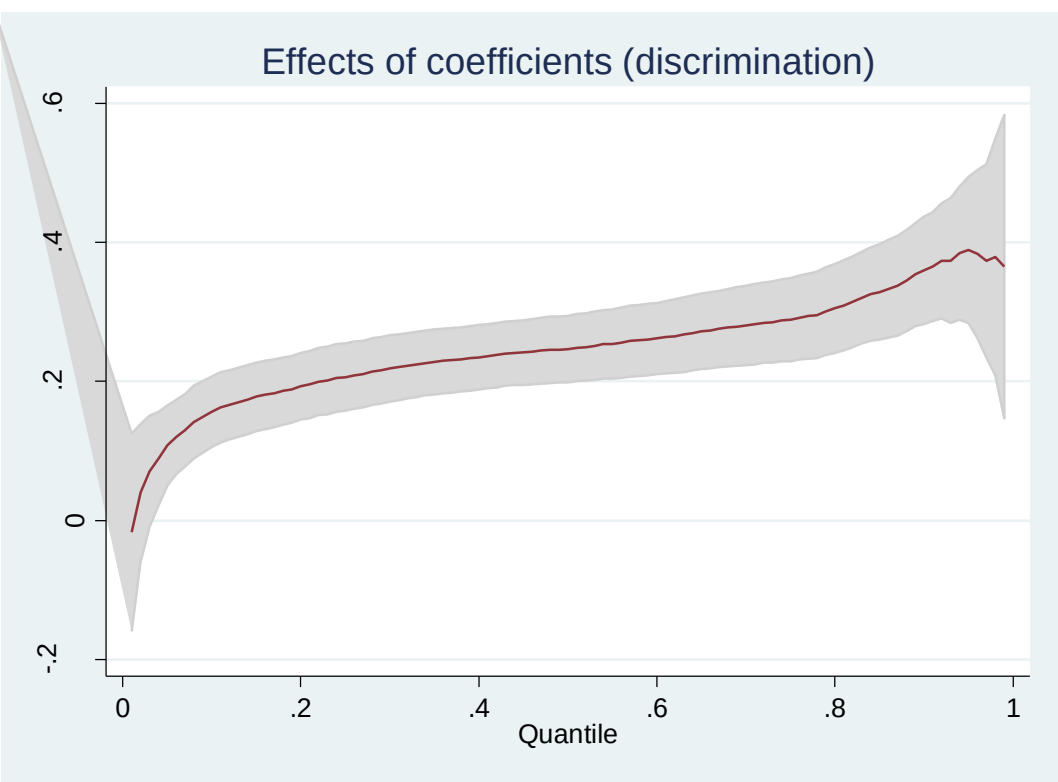
The dominance of covariate effects throughout the distribution means that for the Malawian households, differences in household characteristics matter more than differences in returns to those characteristics. Furthermore, the dominance of the covariates over returns effects at the top of the distributions means that for the most well-off households, their attributes are paid less by urban markets. That is, even though the urban households have relatively higher returns, the welfare gap is caused primarily by the differences in characteristics.

In contrast to these results, Nguyen et *al* (2006) found that characteristics effects and returns effects dominated at the bottom and top of the log consumption distribution in Vietnam, respectively. Arguably, this reflected the fact that the poor typically work in jobs

that pay little above the subsistence level; hence rural-urban variation in market returns is not important among the poor.

The effects of discrimination in Malawi on welfare levels are further confirmed by the graphical presentation in Figure 3 below. Although discrimination is observed across all quantiles, it is more pronounces at the highest quantile. The effects of log consumption range from 0 to approximately 4.

Figure 3: Effects of Coefficients (discrimination)



In conclusion, we reconcile the results from the Oaxaca-Blinder decomposition and the Machado-Mata decomposition. There is agreement on the results from the two procedures that a greater proportion of welfare differentials in Malawi is explained by characteristics effects. However, the results are enriched by the Machado-Mata procedure where it is clear that the effects of characteristics are dominant across the entire distribution not only at the mean. Again, it is observed that discrimination exists across the entire distribution and is

more pronounced among the rich which was not forthcoming from the Oaxaca-Blinder decomposition results. It can therefore, be stated that the Machado-Mata procedure gives a better picture of the welfare differential in Malawi.

CHAPTER SIX

6.0 Conclusion and Policy implications

6.1 Summary of the Study

The present study has attempted to investigate the rural-urban welfare inequalities in Malawi based on Integrated Household Survey of 2004-2005. This has been done in two stages: (1) by examining the determinants of welfare in rural and urban areas using Ordinary Least Square and Quantile regressions; (2) by decomposing welfare inequality into the relative contribution of endowments and discrimination using Oaxaca-Blinder (1973) and Machado-Mata (2005) decomposition methods.

The study hypothesized that socio-economic and demographic factors do not influence household welfare in rural and urban areas. All the demographic variables – age, age squared, marital status, sex of the household head and household size - are statistically significant in the rural model providing evidence to reject the null hypothesis. Interestingly, in urban areas the variables age and age squared of the household head do not influence welfare of the household.

Results obtained indicate that the maximum education attained by any adult aged 20-59 years is vital to ensure higher levels of welfare. The different education categories are statistically significant in both models except for primary education in urban areas. The study further found that accessing credit for business or farming purposes boosts household's welfare in rural areas only.

Unlike in urban areas, the wage employment of the household head is another important factor that is associated with positive welfare in rural areas. The finding suggests that extending wage employment opportunities to rural household whose predominant occupation is agriculture would improve their welfare.

The variables value of livestock and tobacco cultivation were found to have negative and significant influence on welfare of urban households. In contrast, the same variables positively contribute to welfare in rural areas.

The study further hypothesized that there is no welfare inequality between rural and urban areas resulting from household endowments. Results from the Oaxaca-Blinder decomposition indicate existence of welfare inequality gap between rural and urban areas. This is largely explained by differences in characteristics which account for 59% of the gap. The remaining 41% of the gap is attributable to discrimination. Consequently we reject the last hypothesis that no welfare inequality exist between rural and urban areas resulting from bias/discrimination.

In addition, the Machado-Mata procedure of decomposition indicates that both covariate and returns effects are larger at the top of the distribution as is the rural-urban welfare gap. The covariate effects dominate the whole distribution of consumption. In other words, urban households are better off than their rural counterparts in Malawi due to differences in characteristics.

6.2 Policy Implications

The findings presented in this study hold several implications for the design of poverty reduction strategies. The first relates to the importance of both human and physical capital endowments in determining welfare in Malawi. The importance of education for both rural and urban households cannot be overemphasized as education represents an important policy tool that can be used to escape poverty by households and reduce the rural-urban welfare inequality. The study also indicates the importance of smaller household sizes in ensuring higher welfare levels. The current fertility rate of six children per woman[13] should be reduced as a matter of urgency as this will reduce the dependency ratio. The poor can be

[13] NSO and ORC Macro (2005) 'Malawi Demographic and Health Survey 2004,' Calverton, Maryland: NSO and ORC Macro.

subsidized in their investments in family planning and education since relatively the rich households can afford these investments.

The non-significance of cultivated land per adult equivalent in rural areas suggests that farming will be increasingly unable to sustain the livelihoods of many land-constrained households. There is need to improve the quality of land and provide the necessary complementary inputs such as fertilizer that enhance its productivity. In addition, deliberate polices to ensure substantial shifts in labor from agriculture to non-farm sectors in the rural areas could contribute to poverty reduction.

A major source of the differences in welfare between rural and urban households lies in the endowments of marketable characteristics. Hence, policies for reducing poverty and the rural-urban gap should include education and employment opportunities. The creation of opportunities for wage employment can be achieved by raising agricultural productivity among farmers; and by increasing opportunities for self-employment. Microfinance is particularly relevant for increasing the productivity of self-employment in the informal sector of the economy. Microfinance would enable farmers to purchase the inputs they need to increase their productivity, as well as financing a range of activities adding value to agricultural output and in the rural off-farm economy.

Development policies that increase returns to characteristics can promote rural-urban linkages and poverty reduction. Specifically, the rural-urban disparity in returns to characteristics could best be addressed by enhanced labour market flexibility and investment in infrastructure in rural areas. This would allow the flow of goods, services and labour to regions that provide better returns.

6.3 Limitations of the Study

The study has attempted to assess rural-urban welfare inequalities in Malawi using data from the second Integrated Household Survey. The problem of the thesis is that it inherits weaknesses of the data source since the survey was not designed to take care of the specific

needs of the present study. For instance the study failed to use the crop diversification variable measured as an index[14] due to the unavailability of data on land allocated to different crops. Regardless of that the study has greatly benefited from the same.

A further limitation of the study is that while both consumption and income are useful money metrics of welfare, they falls short of non-monetary measures of welfare such as health, security, literacy, leisure, political vote among others in the definition of welfare indicator.

[14]Crop diversification can be measured by the Herfindal Index given as $\sum_{i=1}^{n}(\frac{c_i}{\sum_{i=1}^{n} c_i} * 100)^2$,

where c_i = area of land planted to the i^{th} crop.

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APPENDICES

Appendix 1: Adult Equivalent Scales

Age (years)	Sex (1 = male, 2 = female)	Adult Equivalent
30 - 59.99	1	1
30 - 59.99	2	0.82
> = 60	1	0.84
> = 60	2	0.72
18 – 29.99	1	1.04
18 – 29.99	2	0.80
16 – 17.99	1	1.14
16 – 17.99	2	0.86
14 – 15.99	1	1.06
14 – 15.99	2	0.86
12 – 13.99	1	0.96
12 – 13.99	2	0.84
10 - 11.99	1	0.88
10 – 11.99	2	0.78
7 – 9.99	1	0.84
7 – 9.99	2	0.72
5 – 6.99	1	0.74
5 – 6.99	2	0.70
3 – 4.99	-	0.62
2 – 2.99	-	0.54
1 – 1.99	-	0.46
< = 1	-	0.33

Source: World Health Organization: Southern Africa scales

Appendix 2: Diagnostic Tests

(a) Test for Heteroskedasticity Results

H_0: Constant Variance

	$Chi^2(1)$	Prob. > Chi^2
Rural Observations	0.56	0.4531
Urban observations	0.51	0.4767

The test for Heteroskedasticity was carried out using the Breusch-Pagan/ Cook-Weisberg tests with the null hypothesis of constant variance. In both rural and urban welfare models the null hypothesis was rejected. As a correction measure robust regressions were used.

(b) Ramsey RESET Test Results

	F –Statistic	Prob. > F
Rural Model	65.26	0.0000
Urban Model	22.16	0.0000

To ascertain the correct specification of the models the Ramsey RESET test using powers of the fitted values of *ln*C was employed. The null hypothesis that the model has no omitted variables was sustained at 1% level of significance in both rural and urban models.

Appendix 3: Overview of the 2004-2005 Integrated Household Survey (IHS)

The National Statistical Office conducted the second IHS for Malawi from March 2004 to April 2005. The survey is designed to provide information on various aspects of the socio-economic status of households in Malawi. The sample for IHS-2 was drawn using a two-stage stratified sampling procedure from a sample frame using the 1998 Population Census Enumeration Areas. The survey collected information from a nationally representative sample of 11,280 households. The 27 districts were considered as sub-stratum of the main stratum. The urban stratum included the four major urban areas of Mzuzu, Lilongwe, Zomba and Blantyre.

Appendix 4: Within Quantile means of key variables

Urban Expenditure Quantile N= 1402

Variable	Lowest	Second	Middle	Fourth	Highest
lnC	9.215	9.917	10.419	10.960	11.948
age_hd	23	27	33	44	60
agehdsq	529	729	1089	1936	3600
sexhd	0	0	0	0	1
maristat	0	0	1	1	1
hhsize	1	3	4	6	9
maxeduc2	0	0	0	0	1
maxeduc3	0	0	0	0	1
maxeduc4	0	0	0	0	1
maxeduc5	0	0	0	0	0
maxeduc6	0	0	0	0	0
wagejob	0	0	1	1	1
aeland	0	0	0	0.139	0.506
lnaevasset	-2.303	5.891	7.127	8.313	11.01
lnaelvstval	-2.186	-2.186	-2.186	-2.186	6.831
tob_dum	0	0	0	0	0
divcrops	0	0	0	16	16
credit	0	0	0	0	1

Rural Expenditure Quantile N = 8941

Variable	Lowest	Second	Middle	Fourth	Highest
lnC	8.825	9.430	9.876	10.340	11.047
age_hd	23	29	38	51	67
agehdsq	529	841	1444	2601	4489
sexhd	0	0	0	0	1
maristat	0	1	1	1	1
hhsize	2	3	5	6	9
maxeduc2	0	0	0	0	1
maxeduc3	0	0	0	0	1
maxeduc4	0	0	0	0	0
maxeduc5	0	0	0	0	0
maxeduc6	0	0	0	0	0
wagejob	0	0	0	0	1
aeland	0	0.127	0.230	0.408	1.152
lnaevasset	-2.303	4.269	5.980	7.104	8.297
lnaelvstval	-2.186	-2.186	5.314	6.961	8.893
tob_dum	0	0	0	0	1
divcrops	0	16	16	16	16
credit	0	0	0	0	1

Appendix 5: Quantile regression output

Variable	5th percentile		25th percentile		50th percentile		75th percentile		95th percentile	
	Coefficient	t –Statistic	Coefficient	t–Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
urban	-1.1693	-4.90[a]	-0.5338	-2.94[a]	-0.3845	-2.27[b]	-0.2924	-1.27	-0.3921	-1.28
age_hd	-0.0103	-2.34[b]	-0.0098	-3.25[a]	-0.0116	-4.25[a]	-0.0082	-2.28[b]	-0.0119	-2.14[b]
uage_hd	0.0286	2.51[b]	0.0014	0.15	0.0058	0.70	0.0106	0.99	0.0231	1.26
agehdsq	0.0000688	1.48	0.0000644	2.03[b]	0.000086	3.00[a]	0.00006	1.61	0.0001	1.83[c]
uagehdsq	-0.00027	-2.41[b]	0.0000125	0.13	-7.39e-06	-0.08	-0.00005	-0.42	-0.00017	-0.83
sexhd	-0.0865	-1.88[c]	-0.1007	-3.41[a]	-0.0770	-2.78[a]	-0.0899	-2.35[b]	-0.1513	-2.24[b]
usexhd	0.0344	0.34	0.0166	0.22	0.0906	1.28	-0.0226	-0.24	-0.0125	-0.09
maristat	-0.1234	-2.68[a]	-0.1563	-5.26[a]	-0.1372	-4.98[a]	-0.1697	-4.50[a]	-0.3567	-5.43[a]
umaristat	0.0914	0.96	0.0301	0.45	0.0019	-0.03	-0.0637	-0.78	-0.0048	-0.04
hhsize	-0.1331	-27.17[a]	-0.1448	-42.31[a]	-0.1399	-41.76[a]	-0.1364	-27.74[a]	-0.1252	-12.60[a]
uhhsize	0.0130	0.99	0.0261	2.64[a]	0.0179	1.83[c]	0.0043	0.30	-0.0082	-0.32
maxeduc2	0.0261	0.75	0.0607	2.65[a]	0.0753	3.65[a]	0.0855	3.16[a]	0.0654	1.56
umaxeduc2	0.0352	0.40	-0.0452	-0.74	-0.1190	-2.13[b]	-0.2000	-2.77[a]	0.1518	1.44
maxeduc3	0.0357	0.95	0.0573	2.30[b]	0.0755	3.36[a]	0.1235	4.22[a]	0.1766	3.87[a]
umaxeduc3	0.0072	1.08	0.0889	1.49	0.1330	2.49[b]	0.0949	1.38	0.1244	1.26
maxeduc4	0.1191	1.94[c]	0.2089	5.20[a]	0.3108	8.61[a]	0.3257	6.91[a]	0.2266	3.03[a]

umaxeduc4	0.1893	1.76[c]	0.1043	1.47	0.0886	1.38	0.1320	1.63	0.4531	3.85[a]
maxeduc5	0.1489	1.01	0.4995	4.21[a]	0.7330	6.75[a]	0.858	5.84[a]	0.8053	4.45[a]
umaxeduc5	0.3527	1.51	0.0659	0.40	-0.0771	-0.52	-0.0758	-0.39	-0.0741	0.26
maxeduc6	0.1152	0.54	0.2275	1.63	0.9059	6.95[a]	1.0550	6.35[a]	0.9346	3.59[a]
umaxeduc6	0.5440	2.13[b]	0.8024	4.65[a]	0.2334	1.48	0.2066	1.02	0.2993	0.99
wagejob	0.0363	1.25	0.0335	1.77[c]	0.0182	1.06	0.0262	1.17	0.0483	1.38
uwagejob	-0.0218	-0.34	0.0115	0.27	0.0200	0.50	-0.0777	-1.47	-0.1866	-2.25[b]
aeland	0.0002	0.71	0.00011	0.54	0.00053	3.07[a]	0.0004	3.07[a]	0.00006	0.32
uaeland	0.3121	3.46[a]	0.0953	1.41	0.1011	1.75[c]	0.1774	2.37[b]	0.6212	4.20[a]
lnaevasset	0.0819	27.81[a]	0.0628	32.47[a]	0.0667	31.40[a]	0.0649	20.62[a]	0.0718	11.98[a]
ulnaevasset	0.0833	11.33[a]	0.0654	11.69[a]	0.0435	6.68[a]	0.0326	3.05[a]	0.0168	0.82
lnaelvstval	0.0037	1.40	0.0058	3.28[a]	0.0026	1.58	0.0028	1.30	-0.0069	-2.12[b]
ulnaelvstval	-0.0306	-3.55[a]	-0.0146	-2.16[b]	-0.0117	-1.90[c]	-0.0043	-0.53	0.0132	1.11
tob_dum	0.0705	2.46[b]	0.1019	5.40[a]	0.1543	9.08[a]	0.1623	7.28[a]	0.1870	5.43[a]
utob_dum	-0.1780	-1.22	-0.2180	-2.10[b]	-0.2781	-3.06[a]	-0.3235	-2.70[a]	-0.1892	-1.35
divcrops	-0.0074	-2.47[b]	-0.0098	-4.95[a]	-0.0077	-4.32[a]	-0.0102	-4.30[a]	-0.0100	-2.73[a]
udivcrops	0.0069	1.35	0.0086	2.41[b]	0.0057	1.79[c]	0.0075	1.83[b]	0.0006	0.09
credit	0.0773	2.24[b]	0.1136	5.00[a]	0.0889	4.33[a]	0.0579	2.15[a]	0.1077	2.54[b]
ucredit	-0.1275	-1.26	-0.0316	-0.43	0.0125	0.19	-0.0613	-0.70	-0.1352	-1.06
mktseason	0.1359	5.95[a]	0.1718	11.54[a]	0.1836	13.63[a]	0.1811	10.22[a]	0.1491	5.33[a]

umktseason	0.0835	1.40	-0.0053	-0.13	-0.1123	-3.06[a]	-0.0877	-1.82[c]	-0.0491	-0.66
intercept	9.6826	90.98[a]	10.2855	140.95[a]	10.5849	159.12[a]	10.8934	124.24[a]	11.6036	85.23[a]