UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

May 2014
Bachelor's Thesis (15 hp)
Department of Economics

The growth-poverty-inequality nexus

– is Sub-Saharan Africa fitting the global pattern of development?

Supervisor: Arne Bigsten

Jakob Enlund
841026-3233

Table of content

1. Introduction

During the last couple of decades, poverty has increasingly become an issue of global concern and interest. The Millennium Development Goals (MDGs) agreed by all UN members in 2000 has halving extreme poverty between 1990 and 2015 as its first goal. One year to the finish line, remarkable success has been recorded at the global level. The World Bank (2013) estimates that extreme poverty has been halved in developing regions already five years ahead of schedule, with the proportion of people living under 1.25 dollar a day having been reduced from 47 per cent in 1990 to 22 per cent in 2010.

However, the progress has according to estimates by the World Bank (2013) been uneven among countries and regions, with China and India being attributed most of the global poverty reduction and, most notably, Sub-Saharan Africa (SSA) lagging behind with a modest drop from 56 to 48 per cent between 1990 and 2010. SSA is the only region that saw a steady increase in the number of people living in extreme poverty, rising from 290 million in 1990 to 414 million in 2010. Out of the 27 countries that in 2010 are estimated to have extreme poverty rates at 40 percent or above, 26 are situated in SSA. This disappointingly low level of poverty reduction in SSA has occurred despite of relatively strong income growth. SSA had an unweighted average GDP growth of more than 5 % between 1995 and 2010[1]. The Economist noted in December 2011 that *"over the ten years to 2010, six of the world's ten fastest-growing economies were in sub-Saharan Africa"*.

Strong growth performance and concurrent low poverty reduction, in particular in SSA, has given rise to a vast literature on drivers of pro-poor growth and the role of income distribution in the growth-poverty relationship. While it has been generally agreed that income growth is the main driver of poverty reduction, a debate has occurred during the last decade on how much attention should be paid to the levels and changes of income inequality when conducting poverty reducing strategies (see for example Basu 2013 or Ravallion 2007). Numerous studies have identified income inequality as an important factor in the relationship between income growth and poverty reduction (e.g. Ravallion, 1997; Easterly, 2000; Bourguignon, 2003; Kalwij and Verschoor, 2007; Fosu 2009).

The literature is not always completely cohesive in its message though. For example, an influential study by Dollar and Kraay (2002) find that incomes of the poorest fifth of society grow proportion-

[1] Author's calculations based on growth data from the International Monetary Fund, World Economic Outlook Database October 2013, available from <http://www.imf.org/external/pubs/ft/weo/2013/02/weodata/index.aspx> [11 June 2014].

ally with average incomes, implying that the poor, on average and over time, benefits from growth just as much as the rest of society. The study does not exclude the possibility of a significant role of income inequality but simply implies that any effective poverty reduction strategy should have growth-enhancing policies at its very centre. The study could still perhaps have been contributing to the notion addressed in a study by Ravallion (2007) that *"the only thing that really matters to reducing absolute income poverty is the rate of economic growth"*, implying that little or no attention should be paid to levels or changes in income distribution.

A growing number of studies and policy makers question this notion and point towards the importance of income distribution in the growth-poverty nexus. Most notably, in 2013 the World Bank Group endorsed two new goals beyond the 2015 horizon, namely i) ending extreme poverty by 2030 and ii) shifting focus from average economic growth to promoting income growth amongst the bottom 40 percent of people. Looking ahead, the World Bank Group (2014) acknowledges that growth alone, even if assumed to be quite strong, will not achieve the targeted poverty reduction by 2030, but point towards the need for inclusive growth and adequate attention towards income inequality and how it evolves. Going into the post-2015 era of poverty reduction, special attention might be required towards the growth-poverty-inequality nexus in the region with the most high poverty rate countries in the world, namely SSA.

Against this backdrop, this thesis will revisit the empirical evidence on how the poverty-reducing effect of income growth is affected by income inequality. Further exploring the role of income inequality in poverty reduction, we also examine how much poverty reduction we can expect from distributional changes in developing countries, i.e. the inequality elasticity of poverty. For the above mentioned reasons, we will do this with a particular focus on SSA to see if this region fits the global pattern of development or if we should have different expectations on what growth can achieve in SSA as compared to the rest of the world.

Using the latest available World Bank country data on poverty, inequality, and mean income we create an unbalanced cross-country panel data for the period 1982 - 2011. The data is then applied to several recently used models to explain differences in poverty reduction and how income inequality and its evolvement affect it.

The thesis is organized as follows. Section 2 outlines the theoretical framework and past studies on the growth-poverty-inequality nexus. Section 3 presents the empirical method and the model to be used, including methodological problems associated with it. Section 4 first presents the data and

then presents and discusses the empirical results for the whole world as well as for SSA in comparison to the rest of world. Section 5 concludes by underlining some of the implications of our results.

2. Theoretical framework and past studies

This section will explore relevant theories and past studies on the interrelationship between growth, inequality and poverty reduction, with a particular focus on how income inequality affects the poverty reducing effect of income growth. As outlined by Thorbecke (2013), the interrelationship between growth, inequality and poverty has several causal links associated with it, all which are relevant for this study. It should be noted that the focus of this paper is poverty reduction, so the relationship between growth and inequality will only be touched upon in this section but not be tested empirically or analysed further in the subsequent sections of the paper.

Our focus will be on absolute poverty[2], and in particular the World Banks "dollar a day" poverty line which now translates into 1,25$/day or 38$/month, measured in 2005 PPP US-dollars. This measure, also referred to as the headcount poverty index, is equal to the proportion of people living on income levels below the poverty line. This is the poverty measure much at the centre of global poverty discussions at the moment, not the least because the World Bank's aforementioned newly adopted poverty target is defined in this measure. However, while not being our main focus, we will also discuss two other common poverty measures, the poverty gap index and squared poverty gap index.[3]

2.1. The relationship between growth and inequality

The most famous theoretical argument on growth's effect on inequality was formulated by Simon Kuznets in the 1950s. Kuznets hypothesis was that growth initially increases inequality but decreases it after a certain level of average income is obtained, forming an inversed U-shaped pattern of inequality over time – the Kuznets curve. Kuznets argued that this was caused by dual economy dynamics between a poor, rural economy with relatively equal distribution of income on

[2] We adhere only to absolute measures of poverty in this study, fully acknowledging that relative poverty measures could be an alternative. For a discussion on the implications of this choice, see for example Ravallion and Lokshin (2005).

[3]The poverty gap index is a measure of the intensity of poverty and is equal to the income distance between the average income of the poor and the poverty line, expressed in proportion to the poverty line. The squared poverty gap index is said to measure the severity of poverty by putting even more weight on the income distance of the poor to the poverty. This is done by squaring the income distance to the poverty line for each observation/household.

the one hand, and a more modern, industrialized and unequal economy on the other (Kuznets, 1957). A developing nation's transition from agriculture to industrial sector would increase inequality at first, because income would rise relatively quicker in urban areas, but then start to decrease once a certain level of urbanisation has been met. The theory has been intensively tested empirically but with mixed results (Acemoglu and Robinson 2002).

A number of studies have found that growth has no correlation with changes in inequality, eg, Ravallion and Chen (1997), Ravallion (2001) and Dollar and Kraay (2002). Empirical evidence thus seems to suggest that growth, on average, tends to be distribution neutral, at least in the short and medium term. In growing economies, income distribution seems to worsen just about as often as it's improving. This finding is relevant for our study, because if all income levels on average grow at the same rate over time, absolute poverty theoretically must decrease if mean income rises, perhaps leading one to conclude that the main policy focus should be on how to achieve high income growth and less attention should be given to the level and changes of inequality.

There are however a number of reasons for caution when interpreting these results. For example, as pointed out by Ravallion (2007), considerable measurement error is likely in some of the data used in the above studies. Also, more recent evidence suggests that growth trends during the 1990s and beyond have put a slight upward pressure on inequality (Lopez, 2005 and Ravallion 2007). One should also keep in mind that the result does not imply that all kinds of growth stimulating policies are distribution neutral. For example, a study by Lundberg and Squire (2003) find that trade openness tend to increase income inequality. Furthermore, the results only focuses on the average growth process and does not take into account the high cross-country variation of poverty reduction generated by growth, something we will come back to in section 2.2.

Regarding the reversed causal link, from inequality to growth, most studies seem to conclude that inequality has a detrimental effect on growth. There are however conflicting theories on the issue.

The credit market imperfection theory argues that inequality hampers growth because low income individuals tend to under-invest in human and physical capital due to their more limited access to investment. A higher proportion of low-income individuals, ceteris paribus, will therefore generate less aggregated investment and thus lower growth (see for example Banarjee and Newman, 1993 and Galor and Zeira, 1993). There are also political economy channels in which initial inequality is argued to hamper growth. Alesina and Rodrik (1994) and Persson and Tabellini (1991) argues that higher initial inequality leads the "median voter" to support income redistribution, i.e. higher rates

of distortionary taxes, which will lead to lower rates of growth. Inequality might also lead to economic and political instability that in turn will hamper investment and growth (Alesina and Perotti, 1996), or impede on the social cohesion that enhances a country's resilience to volatility in the external environment (Rodrik 1999).

On the other hand, several theories argue that inequality has a positive effect on income growth. Lazear and Rosen (1981) argue that that inequality generates incentives for entrepreneurship and innovation. Barro (2000) argue that in poor countries, high inequality might generate positive effects on growth if it allows at least a few people to accumulate the minimum capital needed to start a business. Kaldor (1957) points to the fact that rich people tend to save a larger proportion of their income and argue that higher inequality therefore will raise aggregate investment and as a result income growth.

Turning to the empirical evidence on the issue, most results generally supports the view that inequality has a negative effect on growth, but a non-negligible part of the literature finds either some evidence for the opposite or no systematic relationship what so ever.[4]

For the purpose of the empirical tests in this study, we will lean on the ambiguous empirical and theoretical results in previous research and assume that there is no correlation or systematic relationship between growth and inequality.

2.2. Inequality and the growth elasticity of poverty

While the conclusion that absolute poverty tends to fall with income growth is unsurprising, empirical evidence shows that there is a wide variation as to how much poverty reduction a certain level of growth generates. For example, using a dataset of 117 poverty spells in 47 countries Ravallion (2001) estimates that a three per cent growth rate will generate a poverty headcount drop by anywhere between a modest 1.8 percentage points and a dramatic 10.5 points the first year. The empirical literature tells us that most of the variation in the poverty reducing effect of income growth, i.e. the growth elasticity of poverty, can be attributed to either initial levels or changes in inequality. (e.g. Ravallion, 1997; Easterly, 2000; Bourguignon, 2003; Kalwij and Verschoor, 2007; Ferreria 2010; Thorbecke 2013;).

[4]For a good and recent overview of the empirical findings of the issue, see IMF (2014) or Ferreira (2010)

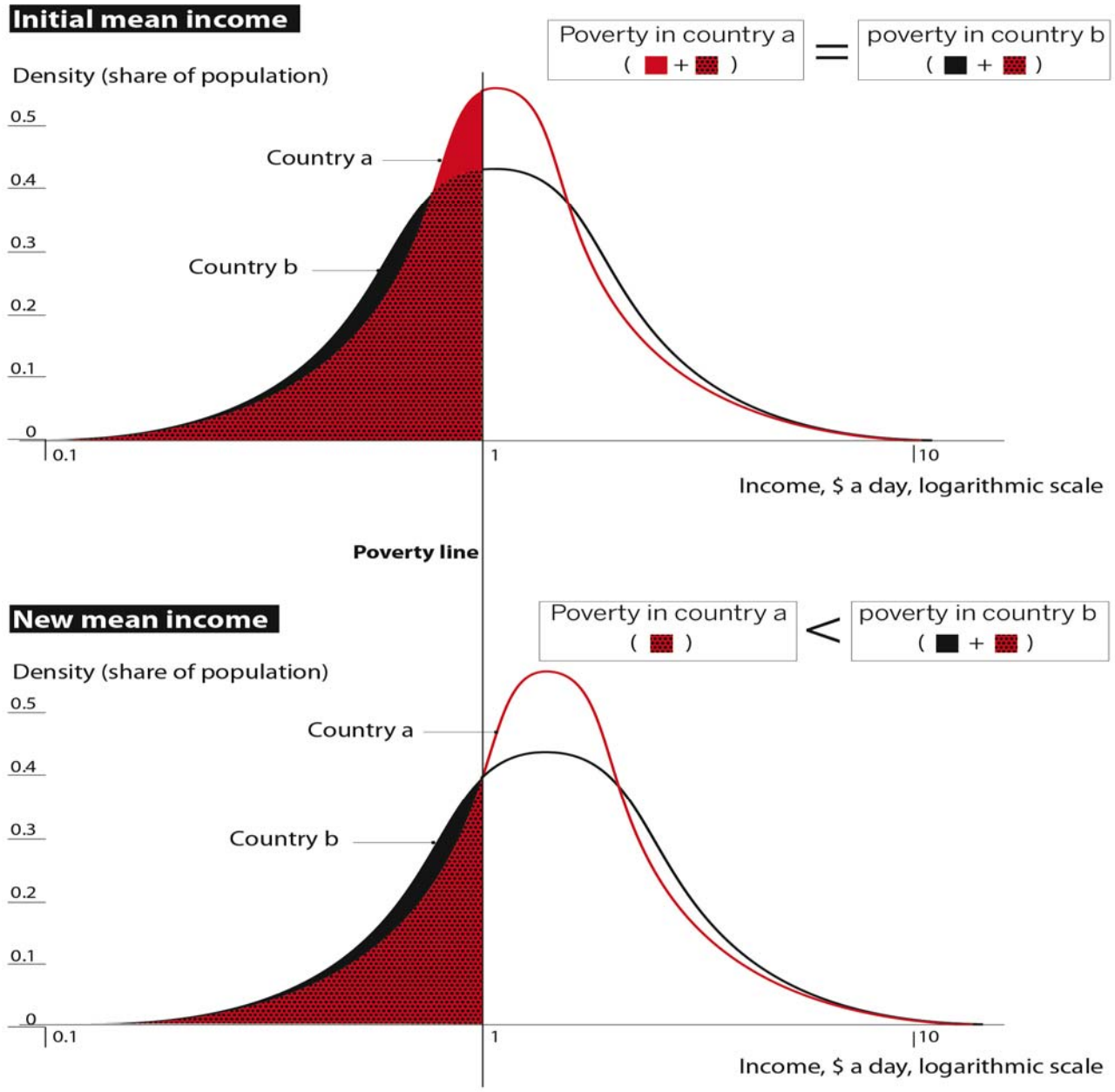
Initial inequality

Intuitively, it seems clear that a higher level of inequality implies that an increase in income, holding relative distribution constant, will result in a lower rate of absolute poverty reduction. If the poor has a relatively small share of a countries total income, they will also tend to be accrued a relatively small share of any income rise. Fosu (2009) and Ravallion (1997) find that initial inequality, measured as the gini-coefficient at the start of a growth period, affects the income elasticity of poverty.

Theoretically, as shown by Ravallion (2007), it is somehow ambiguous as to how the growth elasticity of poverty reduction is affected by the level of inequality. The way poverty responds to increases in income when distribution is held constant depends on the exact shape of the distribution function as well as on the mean level of income in relation to the absolute poverty line. More specifically, it depends on the cumulative distribution function evaluated at the poverty line, as illustrated in Figure 1. The top graph of Figure 1 illustrates two countries at the beginning of a growth period, country a and country b, that has the same headcount poverty rate, the same mean income level, but different cumulative distribution functions, i.e. country a is more equal than country b. The bottom graph illustrates the same countries after a distribution neutral rise in the mean income. Given the steeper slope of the cumulative distribution function at the poverty line in country a compared to country b, the resulting poverty reduction of any income rise, ceteris paribus, will be higher in the more equal country a. Hence, as is illustrated in the bottom graph of Figure 1, the resulting poverty rate after the growth period will be lower in country a. One can also note that the slope of the distribution function at the poverty line will also be affected by the actual level of mean income, implying that the initial level of mean income in relation to the absolute poverty line will affect the income elasticity of poverty.

Looking at the empirical evidence, past research tells us that a higher level of initial inequality lowers the effect that any subsequent income growth has on absolute poverty (Thorbecke, 2013). In other words, a given level of growth will generally result in higher poverty reduction if income is equally distributed and lower poverty reduction if income is unequally distributed in society. Likewise however, as Ravallion (1997) points out, the adverse impact that economic contraction has on the poor also seem to decrease with higher inequality.

Figure 1 - Income elasticity of poverty depending on initial income distribution

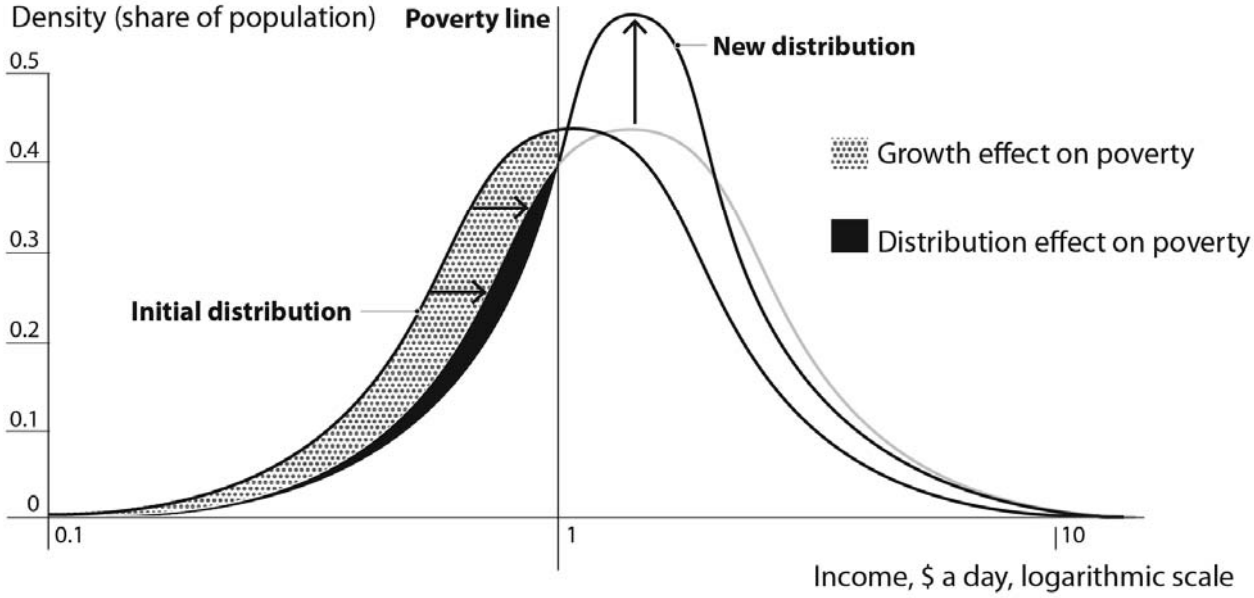


Changing inequality

That growth tends to be distribution neutral on average does not mean that it doesn't change but only that it rises just about as often as it falls in growing economies. Irrespective of the initial level of inequality in a given country, the poverty reducing effect of income growth can be offset by concurrent negative changes in income distribution. For example, as shown by Datt and Ravallion (1992), growth in Brazil during the 1980s was entirely offset by worsening income distribution, resulting in the headcount index of poverty remaining unchanged at 26,5% during the whole decade.

Any poverty reduction can be attributed to two main sources, either changes in mean income or changes in the distribution of income. Figure 2 illustrates a country which raises mean income and decreases inequality at the same time, making it possible to quantify the poverty reducing effects for improvements in inequality (black area) and changes in mean income (grey area).

Figure 2 - Decomposing poverty reduction into distribution and growth effect



It should be noted that in extremely poor countries where the absolute poverty line is above mean income, we can expect that a decrease in inequality, holding mean income constant, could actually exacerbate headcount poverty because in such economy high inequality would enable at least a small proportion of the population to have incomes levels above the poverty line. This would imply that for extremely poor countries, raising income growth should be the main focus if the aim is to lower the headcount poverty rate. However, looking at the other poverty measures, like the poverty gap or squared poverty gap, worsening inequality would make the poor fewer but more worse off, something that could either raise or lower those poverty measures, depending on the shape of the distribution function and the mean income in relation to the poverty line. This point illustrates a major weakness of solely using the headcount poverty measure as it does not capture the depth or severity of the existing poverty, but only how many people falls below a certain income threshold.

Looking at the empirical evidence, one finds that increasing inequality has on average had quite substantial negative effect on the growth elasticity of poverty reduction. Ravallion (2001), for example, finds that for growing economies with falling inequality, the poverty headcount index

declined with a median rate of 10 percent per year, while growing economies with rising inequality only had a 1 percent per year decline in absolute poverty.

In conclusion, theoretical and empirical evidence suggests that progressive distributional changes will affect the pace of poverty reduction in two ways. First, for a given level of income, poverty will immediately decrease through the shift of resources from the rich to the poor. Second, progressive distributional changes will lead to a lower level of inequality and, as explained above, increase the poverty-reducing effect of any future growth process. We now move on to test these findings on the latest available data.

3. Empirical method

We follow most of the literature when deriving the estimating equation for poverty. For illustrative purposes and following Kalwij and Verchoor (2007) we start by using a simple model estimating the growth elasticity of poverty without including distributional changes:

$$p_{it} = b_1 + b_2 y_{it} + \varepsilon_{it} \qquad (1)$$

where *i* is a country index, *p* is the growth rate of the proportion of people living under the poverty line, *y* is the growth rate in mean income, and ε is the error term. Both variables are annualized growth rates between observation year *t* and the closest year-observation available before that, *t-1*. Ravallion and Chen (1997) call this the 'empirical' elasticity, as the estimated growth elasticity will be consistent with actual changes in inequality. However, as illustrated in section 2.2., any change in the headcount poverty index can be decomposed into i) a change in the mean income and ii) a change in the distribution of income. A way to test this identity on empirical data is to extend model (1) to also include changes in the distribution of income. Such a model can be written as

$$p_{it} = b_1 + b_2 y_{it} + b_3 g_{it} + \varepsilon_{it} \qquad (2)$$

where *g* is the growth in inequality measured as the Gini-coefficient (Bourguignon, 2003). This model is consistent with the identity linking poverty reduction to either changes in mean income or income distribution. It does however take the inequality and growth elasiticies of poverty to be constant over different levels of income and for different levels of inequality. As was illustrated in Figure 1, the growth elasticity of poverty will be affected by the exact shape of the distribution function evaluated at the poverty line, which in turn can be affected by both the level of inequality

and the level of mean income. An improved version of equation (2) is therefore to add the initial level of inequality at the start of the growth spell as well as the initial level of mean income. A recently common fully specified model including these variables and based on the assumption that income is log-normally distributed can be written as:

$$p_{it} = b_1 + b_2 y_{it} + b_3 g_{it} + b_4 y_{it} G^i + b_5 y_{it}(Z/Y^i) + b_6 g_{it} G^i + b_7 g_{it}(Z/Y^i) + b_8 G^i + b_9 (Z/Y^i) + \varepsilon_{it} \quad (3)$$

where G^i is the initial level of inequality at the start of the period, Z/Y^i is the initial ratio of the poverty line Z and the initial level of the mean income Y^i (eg., Bourguignon (2003), Kalwij and Verschoor (2007) and Fosu (2011). All growth variables are expressed in logarithmic changes and all level variables are expressed in natural logarithms.

Derived from the theoretical framework presented in section 2, the following hypothesis is associated with the above models. When mean income growth increases, poverty growth decreases, hence the sign of b_2 is expected to be negative. Increased growth in inequality is by definition increasing poverty in most economies, ceteris paribus, so b_3 is expected to be positive. b_4 is expected to be positive, because a higher level of initial inequality G^i is assumed to decrease the poverty-reducing effect of income growth y. A higher initial level of income, here represented by a lower value of (Z/Y^i), is expected to increase the poverty-reducing effect of income growth y, hence the value of b_5 is expected to be positive (Bourguignon 2003). The sign of b_6 is somewhat more unclear but might be expected to be negative, so that the negative effect that worsening inequality has on poverty increases with higher initial levels of inequality. The sign of b_7 might also be expected to be negative, so that countries with lower income might see poverty increase with improving distribution because it increases the likelihood of people falling below the poverty line, as commented on in section 2.2. b_8 and b_9 is expected to be positive, because increased initial inequality and lower initial income is assumed to increase poverty.

From equation (3), it is possible to derive the elasticities of income growth and changes in inequality on poverty reduction:

$$E_y = b_2 + b_3 G^i + b_4 (Z/Y^i) + \varepsilon_{it} \quad (4)$$

$$E_g = b_5 + b_6 G^i + b_7 (Z/Y^i) + \varepsilon_{it} \quad (5)$$

Since SSA is of particular interest in this thesis, we also test the equivalence model 1-3 for SSA versus non-SSA to see if the region fits the global pattern of poverty reduction.

3.1. Methodological problems

Several potential problems with the application of this model to our data set should be noted. As specified by Kalwij and Vershoor (2007), the error term and the explanatory variables may be correlated for several reasons. Firstly, since income and poverty estimates are derived from the same income survey data, we have reason to believe that errors in estimates of income is correlated with the error term in the model. Secondly, there might be unobserved factors that varies over time that effects both poverty and growth which, if ignored, will result in an omitted variable bias. Lastly, the household data that we rely upon have measurement errors which, due to improved survey methods (Chen and Ravallion, 2004), likely have decreased over time and therefore will yield us a spurious relationship between growth and poverty.

It's also important to underline that causality is likely to also run in the opposite direction than assumed in the above model, that is, from poverty to growth. The theoretical arguments for this link are to a large extent overlapping with those arguing for a link from inequality to growth. Perry et al (2006) finds that poverty impedes and dampens income growth for a number of reasons. First, poor people are likely to be less productive because they often suffer from bad health and/or low-quality education, which lower their human capital stock. Second, lower human capital stock also diminishes prospects for migration and mobility. Third, extreme poverty and high income inequality might give rise to exacerbated political, ethnic or racial conflicts which in turn is likely to hamper income growth. Fourth, poor people and regions have more limited access to financial markets and other essential elements necessary for economic development and investment, such as infrastructure and property rights. Lastly, poor people tend to underinvest in human capital because they are more vulnerable to labour market risks.

Another problem will be if the growth variable is correlated with the gini-coefficient. As stated in section 2.1., this study will lean on the ambiguous empirical and theoretical results in past studies and assume that this is not the case.

Because of the risk of reversed causality in our model, or correlation between our explanatory variables and the error term, there is a need to use instrument variables. However, due to difficulties in obtaining usable instrument variables for our model, we are forced to rely on regular ordinary

least square regression analysis in this study. This restriction will put our results into serious question. A discussion on the possible use of instrument variables in our model is further explored in Annex 4.

4. Data and results

The data used in this analysis is taken from the most recently available World Bank global database.[5] Based on national household survey data on mean income, 801 unbalanced observations are available for some 120 countries. Each observation contains information on the poverty headcount, poverty gap, poverty squared gap, and the Gini-index of inequality.

Depending on the country and type of household survey, mean income is either estimated from household income or consumption. Past studies identify household consumption as a far better estimation of current economic welfare than income. Surveys measuring consumption are more likely to be reported accurately, partly because pure income data might be considered private and sensitive information, and therefore incline people to report data below their true value. Consumption based surveys also requires fewer assumptions and have fewer nonresponses (see for example, Ravallion (1992) and Deaton and Zaidi (2002)). Therefore, consumption estimates are generally preferred in this study. Nonetheless, income estimates are accepted here because we are only interested in the percentage change over time. However, we do discard all poverty spells where the survey changes from an expenditure to and income survey or vice versa.

We discard countries where only one observation is available, making it impossible to construct a poverty spell. We also discard all observations that have missing values on any of the variables, all observations who are not nationally representative and all observations where the headcount poverty is negligible.[6]

There are likely to be substantial measurement errors in these spells due to incomparability between different household surveys. Extreme and implausible values exist. For example, Moldova reports an annual growth rate in mean income of around staggering 53% between 2005 and 2006. To tackle this problem somewhat, we drop all observations that report the highest and lowest 5% in the

[5] The World Bank global database is available at http://go.worldbank.org/NT2A1XUWP0
[6] We follow the example of Kraay (2005) and define ”negligible” as less than 2 percent.

distribution of either income growth or changes in the poverty headcount.[7]

This yields us a total of 364 poverty spells in 80 countries spanning almost three decades, from 1982 to 2011. 89 of these observations are SSA and 545 are non-SSA. There are 31 SSA and 49 non-SSA countries in the sample.

While our main focus will be on the World Banks "dollar a day" headcount poverty index, we do however also present and discuss results for the other common poverty measures, the poverty gap index and squared poverty gap index. Following related literature and also much dependent on the availability of data, we use the Gini-coefficient as the measure of inequality in this study.

4.1. Empirical finding at the global level

Table 1 present the regression results for the whole sample of countries. Looking at the results of equation (1), we see that growth alone only can explain around 20% of changes in poverty reduction. Adding changes of income inequality in equation (2), we can now explain 48% of the cross-country changes in poverty reduction, implying that movements in inequality are indeed an important part of the growth-poverty story. The fully specified model (3) raises the explanatory power to 61%, indicating that initial inequality and income level also matters. This rise of R^2 when we expand the poverty model follows the same pattern as for Fosu (2011), who uses a similar but slightly smaller dataset.

All coefficients have the positive or negative sign we expected. Our test confirms that income growth is an important factor explaining poverty reduction. Studying the reduced model (1) we find an income elasticity of -1.1 for our global data set and a little larger, -1.3, when controlled for changes in inequality in model (2). We note that this is substantially lower than for example Kalwij and Vershoor (2007) which estimates the income elasticity in model (1) at -2.32, although it should be noted that they use the two-dollar-a-day absolute poverty line and a much smaller dataset. Fosu (2011) on the other hand finds a much lower growth elasticity, -0.33, using the same poverty line as we are and a much more similar dataset.

Studying model (2) and (3) we confirm previous findings that inequality plays a significant role in the growth-poverty nexus. A higher initial level of inequality negatively affects the income elasticity

[7] This follows a similar method used by Kraay (2005). In our dataset, we end up dropping all observations who report annual growth rates outside the span -13% and 17%, and annual headcount poverty changes outside -36% and 35%.

of poverty reduction and worsening inequality raises poverty (b_3 and b_4 are significantly positive).

Table 1 – Regression results for the whole world

Variable/model	(1)	(2)	(3)
$\mathbf{b_1}$ (constant)	-0.022 [a] (-3.61)	-0.011 [b] (-2.22)	-0.114 (-1.15)
$\mathbf{b_2}$ (dlog y_{it})	-1.073 [a] (-9.61)	-1.282 [a] (-14.06)	-7.309 [a] (-4.40)
$\mathbf{b_3}$ (dlog g_{it})		1.916 [a] (14.03)	5.458 [b] (2.33)
$\mathbf{b_4}$ (dlog y_{it} * dlog $G_{i(t-1)}$)			1.634 [a] (3.63)
$\mathbf{b_5}$ (dlog y_{it} * dlog $(Z/Y)_{i(t-1)}$			0.348 [b] (2.33)
$\mathbf{b_6}$ (dlog g_{it} * dlog $G_{i(t-1)}$)			-1.336 [b] (-2.12)
$\mathbf{b_7}$ (dlog g_{it} * $(Z/Y)_{i(t-1)}$)			-1.782 [a] (-9.32)
$\mathbf{b_8}$ (dlog $G_{i(t-1)}$)			0.029 (1.06)
$\mathbf{b_9}$ (dlog $(Z/Y)_{i(t-1)}$)			0.004 (0.56)
N	364	364	364
R^2	0.2	0.48	0.61

t-values in brackets
a = 0.01 significance; b = 0.05 significance; c = 0.10 significance

From the results, we derive equation (3) and (4) to see how the income and inequality elasticities are affected by initial levels of income and inequality:

$$E_y = -7.309 + 1.634G^i + 0.348(Z/Y^i) \qquad (7)$$

$$E_g = 5.458 + -1.336G^i + -1.782(Z/Y^i) \qquad (8)$$

Consistent with previous literature, we find that countries with low inequality and high income relative to the absolute poverty line are on average expected to be more successful in translating subsequent income growth into poverty reduction. We also find that countries with higher initial inequality and lower initial income level would be less efficient in combating absolute poverty by decreasing inequality.

Turning to the results for the poverty gap and squared poverty gap indices, presented in Annex 1, we find a similar story. We note that income growth alone seem to explain less than ten percent of

the change in these poverty measures while model (2) and (3), with inequality added to the picture, shows explanatory powers of around 40 percent or above. All coefficients have the sign expected but significance seems to weaken for most of them moving to the higher order of poverty measures. In particular, we note that the significance of b_4 and b_7, i.e. the effect of initial inequality on the income and inequality elasticities, weakens in the poverty gap model and disappears when we use the poverty squared index. This finding is similar to that of Fosu (2009) which finds a weaker role of initial inequality in the higher order poverty measures than in the headcount measure. In the same vein, we find that the role of initial mean income in relation to the poverty line seem to diminish when moving to the higher order poverty measures. This seems relatively intuitive, since the slope of the distribution function at the poverty line will be less relevant when giving more weight to the people living at income levels far below the poverty line. Looking at the effect of changes in inequality on poverty, *b3,* we do however find a significant effect for all poverty measures.

4.2. How does SSA fit the global pattern?

So, how does SSA fit into the global pattern? Table 2 presents each model once again, but with SSA separated from the rest of the world. The first column under each model presents the results for non-SSA, whereas the second column presents the difference between SSA and non-SSA for each coefficient. Hence, the SSA coefficient is the non-SSA coefficient plus the SSA difference figure.

Studying model (2) in Table 2, we find that the income elasticity of poverty is significantly lower in SSA compared to the rest of the world. We conduct a Chow test to test the equivalence of the regressions for non-SSA versus SSA and can reject the null hypothesis that the regressions for the two regions are equivalent at the 1% level of significance. In other words, any rise in mean income will generate significantly less poverty reduction in SSA compared to the rest of the world. Likewise, we find that any reduction in income inequality will generate significantly less poverty reduction in SSA as compared to non-SSA.

However, once the poverty function is fully specified in model (3), our results indicate that any of the difference in the income and inequality elasticities between SSA and the rest of world can be attributed to differences in initial levels of inequality and initial levels of income in relation to the absolute poverty line. Conducting a Chow test once again, we cannot reject the null hypothesis that the fully specified regressions for non-SSA and SSA are equivalent. Hence, we can conclude that the reason we can expect less poverty reduction for any given level of income growth or reduction of inequality in SSA is because SSA is poorer and more unequal from the outset.

Table 2 – Comparing Sub-Saharan Africa with the rest of the world

Variable/model	(1)		(2)		(3)	
	Non-SSA	SSA difference	Non-SSA	SSA difference	Non-SSA	SSA difference
$\mathbf{b_1}$ (constant)	-0.026[a] (-3.72)	0.014 (1.00)	-0.0108[b] (-2.00)	0.002 (0.22)	-0.140 (-1.03)	0.129 (0.51)
$\mathbf{b_2}$ (dlog y_{it})	-1.141[a] (-9.32)	0.408 (1.39)	-1.478[a] (-15.78)	0.732[a] (3.33)	-6.625[a] (-3.49)	2.347 (0.41)
$\mathbf{b_3}$ (dlog g_{it})			2.617[a] (16.62)	-1.900[a] (-7.19)	6.388[b] (2.09)	-7.994 (-1.11)
$\mathbf{b_4}$ (dlog y_{it} * dlog $G_{i(t-1)}$)					1.314[b] (2.41)	-0.399 (-0.26)
$\mathbf{b_5}$ (dlog y_{it} * dlog $(Z/Y)_{i(t-1)}$					-0.007 (-0.03)	0.848 (1.57)
$\mathbf{b_6}$ (dlog g_{it} * dlog $G_{i(t-1)}$)					-1.561[c] (-1.74)	2.090 (1.08)
$\mathbf{b_7}$ (dlog g_{it} * $(Z/Y)_{i(t-1)}$)					-1.750[a] (-4.11)	0.277 (0.34)
$\mathbf{b_8}$ (dlog $G_{i(t-1)}$)					0.037 (0.93)	-0.035 (-0.50)
$\mathbf{b_9}$ (dlog $(Z/Y)_{i(t-1)}$)					0.008 (0.51)	-0.005 (-0.21)
N	364		364		364	
R^2	0.21		0.56		0.62	

t-values in brackets
a = 0.01 significance; b = 0.05 significance; c = 0.10 significance

This finding is consistent with that of Kalwij and Vershoor (2007) and Fosu (2011), but however not consistent with the findings of Fosu (2009) who finds significantly lower income and inequality elasticities of poverty in SSA compared to non-SSA, also when initial inequality and initial mean income is added to the model. Looking at the higher order poverty measures, presented in Annex 3, we find similar results but much fewer significant variables also when comparing to the global dataset, with the fully specified model showing very few significant variables for the poverty gap and squared poverty gap measures.

To get the magnitude of the difference between income and inequality elasticities in SSA and non-SSA that can attributed to levels of inequality and mean income, we move back to model (2) which tells us that on average, SSA has a growth elasticity of poverty of -0.746, significantly lower than the -1.478 estimated for the rest of the world. In other words, a one per cent increase in mean income is estimated to generate a 0.75 per cent decrease in the poverty headcount rate in SSA, whereas the same rate of growth on average is expected to generate about 1.5 per cent poverty headcount drop in the rest of the world. In a similar way, the inequality elasticity of poverty is 2.617 in non-SSA while being as low as 0.717 in SSA. The ratios between non-SSA/SSA in the income

and inequality elasticities are 2.0 and 3.65, respectively, indicating that income growth is relatively more efficient than reductions in inequality in SSA compared to non-SSA. In other words, because countries in the SSA are more unequal and poorer from the outset, they should on average be more focused than the rest of the world on achieving high income growth as compared to reductions in inequality. This finding is similar to Fosu (2009) which observe non-SSA/SSA ratios of income and inequality elasticities of 2.6 and 4.5, respectively.

It should be underlined that there is a wide variety to levels of inequality and mean income in SSA which is not caught in the above elasticity estimates. We therefore add the levels of inequality and mean income to the equation and estimate elasticities for each SSA country using our global estimate for equation (7) and (8). This will yield us estimates for each countries prospects for reducing poverty by either improving income distribution or increasing income growth. The results are presented in Table 3 and illustrate the wide variety in elasticities due to large cross-country differences in initial inequality and income level. The income elasticities ranges from 0.69 for Zambia to 1.73 for Tanzania and the inequality elasticities ranges from -0.14 for Madagascar and 3.33 for South Africa.

Table 3 – Estimated growth and inequality elasticities for Sub-Saharan countries

Country	*Income elasticity*	*Inequality elasticity*			
Angola	-1,33	1,25	**Mali**	-1,66	1,14
Botswana	-1,01	2,13	**Mauritania**	-1,54	1,94
Burkina Faso	-1,42	1,23	**Mozambique**	-1,13	0,72
Burundi	-1,49	0,29	**Namibia**	-0,98	2,3
Cameroon	-1,71	2,55	**Niger**	-1,63	1,31
Central African Republic	-0,83	0,61	**Nigeria**	-1,36	0,88
Côte d'Ivoire	-1,51	1,97	**Rwanda**	-0,99	0,71
Ethiopia	-1,73	1,6	**Senegal**	-1,5	1,72
Gambia, The	-1,27	1,68	**Sierra Leone**	-1,56	1,1
Ghana	-1,43	1,77	**South Africa**	-1,2	3,33
Guinea	-1,45	1,27	**Swaziland**	-1,13	1,52
Guinea-Bissau	-1,56	1,12	**Tanzania**	-1,37	0,56
Kenya	-1,18	1,27	**Togo**	-1,55	1,79
Lesotho	-1,06	1,32	**Uganda**	-1,32	1,44
Madagascar	-1,01	-0,14	**Zambia**	-0,69	0,08
Malawi	-1,18	0,67			

N.B. For each country we use the most recently available data for mean income and income inequality. The reported estimated elasticities are therefore based on country data spanning from 1993 for Botswana to 2011 for Senegal. Most of the estimates are however from 2000 or later. The exact years for every country can be found in Annex 3.

Not surprisingly, and consistent with previous literature, we conclude that poverty reducing strategies in SSA must be tailored after country-specific circumstances, especially regarding the initial level of inequality and mean income. Madagascar illustrates the importance of this point, reporting a poverty headcount rate of staggering 81 per cent in 2010 and therefore, and as touched upon in section 2.2., would actually increase the proportion of people living below the extreme poverty line if income inequality was to improve with no concurrent income growth. Clearly, increasing income growth must be at the very heart of the poverty reducing policy strategy in such economy.

5. Conclusions

This thesis has revisited the empirical evidence on how the poverty reducing effect of income growth is affected by inequality, with a particular focus on SSA and whether this region fits the global pattern of development. Using the latest available World Bank data on poverty, inequality, and mean income we created an unbalanced cross-country panel data for 80 developing countries during the period 1982 – 2011. We use this data on several models with three different poverty measures as the dependent variable and the explanatory variables involving the PPP-adjusted mean income and the gini-coefficient of inequality. We also estimated the responsiveness of poverty to changes in inequality.

The thesis confirms previous findings that the income elasticity of poverty reduction is depending on both the initial level of inequality and the initial level of income. Higher levels of inequality and lower levels of income tend to reduce the poverty reducing effect of any future income growth. We also find that SSA countries on average suffers from substantially lower responsiveness of poverty to both income growth and improvements in inequality, but finds that this difference can be attributed to the fact that SSA is poorer and more unequal than the rest of the world from the outset. Additionally, we estimated the responsiveness of poverty to changes in inequality and find that worsening inequality exacerbates poverty and that this effect is increasing with higher initial levels of inequality and lower initial levels of mean income.

Our results should however be interpreted with caution due to methodological and econometric weaknesses in our analysis, most notably because of the risk of endogenous variables in our models and non-neglible measurement errors in the household surveys on which our dataset is based.

Looking behind the average in our region of interest, we find a wide variety in income and inequality elasticities between SSA countries, implying that poverty reducing strategies needs to be

tailored for country-specific circumstances and poverty profiles. By outlining estimates for the prospects of poverty reduction for SSA countries, we provide a useful starting point for more country specific analysis and further understanding of the drivers of poverty reduction, inequality and pro-poor growth.

References

Acemoglu and Robinson 2002. The Political Economy of the Kuznets Curve. Review of Development Economics.

Alesina, A., and R. Perotti, 1996, "Income Distribution, Political Instability and Investment," *European Economic Review*, Vol. 40(6), pp. 1203–28.

Alesina, A., and D. Rodrik, 1994, "Distributive Politics and Economic Growth," *Quarterly Journal of Economics*, Vol. 109(2), pp. 465–90.

Persson, T., and G. Tabellini. 1991. Is inequality harmful for growth? Theory and evidence. *National Bureau of Economic Research.*

Banerjee, A.V., and A.F. Newman. 1993. Occupational choice and the process of development. *Journal of political economy*:274-298.

Barro, R. J, 2000, "Inequality and Growth in a Panel of Countries," *Journal of Economic Growth*, Vol. 5(1), pp. 5–32.

Basu, K. 2013. "Shared Prosperity and the Mitigation of Poverty in Practice and in Precept." *Policy Research Working Paper 6700*, World Bank, Washington, DC.

Bourguignon, F. (2003), "The growth elasticity of poverty reduction: Explaining heterogeneity across countries and time periods," in Eicher, T. S. and S. J. Turnovsky (Eds.), *Inequality and Growth: Theory and Policy Implications* (pp.3-26). Cambridge, MA: MIT Press.

Chen, S., Ravallion, M., 2004. How Have the World's Poorest Fared Since the Early 1980s? *World Bank Policy Research Working Paper 3341*, World Bank, Washington, DC.

Datt, G. and Ravallion, M. (1992) Growth and redistribution components of changes in poverty: a decomposition to Brazil and India in the 1980s. *Journal of Development Economics*, 38, pp. 275–295.

Deaton, A. and S. Zaidi (2002), A Guide to Aggregating Consumption Expenditures, *Living Standards Measurement Study*, Working Paper 135.

Dollar, David and Aart Kraay, (2002), 'Growth is Good for the Poor,' *Journal of Economic Growth*, 7(3): 195-225.

Easterly, W. (2000) The effect of IMF and World Bank programs on poverty. *World Bank, mimeo*, Washington, DC.

Ferreira, F., 2010. "Distributions in Motion—Economic Growth, Inequality, and Poverty Dynamics." *Policy Research Working Paper 5424*, World Bank, Washington, DC.

Fosu, A.K. (2009), "Inequality and the Impact of Growth on Poverty: Comparative Evidence for Sub-Saharan Africa," *Journal of Development Studies*, 45(5), 726-745.

Fosu, A.K. (2011), "Growth Inequality and Poverty Reduction in Developing Countries: Recent Global Evidence.," *OECD Developement Center*. Background paper.

Galor, O., and J. Zeira. 1993. Income distribution and macroeconomics. *The Review of Economic Studies* 60 (1):35.

IMF (2014). Redistribution, Inequality and Growth. *IMF Staff Discussion Note.* (Washington DC: International Monetary Fund)

Kaldor, N., 1957, "A Model of Economic Growth," *The Economic Journal*, Vol. 67(268), pp. 591–624.

Kalwij, A. and A. Werschoor (2007), "Not by Growth Alone: The Role of the Distribution of Income in Regional Diversity in Poverty Reduction," *European Economic Review*, 51, pp. 805-829.

Kuznets, S. 1955. Economic growth and income inequality. *The American Economic Review* 45 (1):1-28.

Lazear, E.P., and S. Rosen, 1981, "Rank-Order Tournaments as Optimum Labor Contracts," *Journal of Political Economy*, Vol. 89(5), pp. 841–64.

Lopez, H. (2005), 'Growth and Inequality: Are they Connected?" *mimeo*, World Bank.

Lundberg and Squire 2003 – The simultaneous evolution of growth and inequality.*The Economic Journal*, 113 (April), 326–344.

Perry, G. P., O. S. Arias, J. Humberto Lopez, W. F. Maloney and L. Serven (2006) Poverty Reduction and Growth: Virtuous and Vicious Circles. *Washington, D.C: The World Bank.*

Ravallion, Martin (1992), Poverty Comparisons, A Guide to Concepts and Methods, *Living Standards Measurement Study*, Working Paper 88, World Bank, Washington D.C.

Ravallion, M, 1997. Can high-inequality developing countries escape absolute poverty? *Economics Letters 56*, 51–57.

Ravallion, M (2001), 'Growth, Inequality and Poverty: Looking Beyond Averages', *World Development*, 29(11), 1803-1815.

Ravallion, M (2007), 'Inequality is bad for the poor', *World bank Policy Research Working Paper Series No. 3677.*

Ravallion, M. and Chen, S. (1997), 'What Can New Survey Data Tell Us about Recent Changes in Distribution and Poverty?', *World Bank Economic Review*, 11(2), 357-82.

Rodrik, D., 1999, "Where Did All the Growth Go? External Shocks, Social Conflict, and Growth Collapses," *Journal of Economic Growth*, Vol. 4(4), pp. 385–412.

Thorbecke, E. 2013, The Interrelationship Linking Growth, Inequality and Poverty in Sub-Saharan Africa. Journal of African Economies, Vol. 22, *AERC Supplement 1*, pp. i15–i48

World Bank (2013) *Millennium Development Goals Report 2013* (Washington DC: World Bank)

World Bank Group (2014) *Prosperity for all. Ending Extreme poverty.* Spring meetings 2014 (Washington DC: World Bank)

Appendix

Annex 1 – Regression results for poverty gap index

Table 3 – regression results for the whole world

Variable/model	(1)	(2)	(3)
$\mathbf{b_1}$ (constant)	-0,030[a] (-3,16)	-0,012 (-1,64)	-0,086 (-0,54)
$\mathbf{b_2}$ (dlog y_{it})	-1,128[a] (-6,69)	-1,448[a] (-10,61)	-7,067[a] (-2,64)
$\mathbf{b_3}$ (dlog g_{it})		2,937[a] (14,36)	47,350[c] (1,94)
$\mathbf{b_4}$ (dlog y_{it} * dlog $G_{i(t-1)}$)			1,396[c] (1.92)
$\mathbf{b_5}$ (dlog y_{it} * dlog $(Z/Y)_{i(t-1)}$			-0,058 (-0,26)
$\mathbf{b_6}$ (dlog g_{it} * dlog $G_{i(t-1)}$)			-1,623 (-1,60)
$\mathbf{b_7}$ (dlog g_{it} * $(Z/Y)_{i(t-1)}$)			-1,983[a] (-6,43)
$\mathbf{b_8}$ (dlog $G_{i(t-1)}$)			0,021 (0,48)
$\mathbf{b_9}$ (dlog $(Z/Y)_{i(t-1)}$)			0,003 (0,22)
N	364	364	364
R^2	0.1	0.43	0.50

t-values in brackets
a = 0.01 significance; b = 0.05 significance; c = 0.10 significance

Table 4 – Comparing Sub-Saharan Africa with the rest of the world

Variable/model	**(1)**		**(2)**		**(3)**	
	Non-SSA	SSA difference	Non-SSA	SSA difference	Non-SSA	SSA difference
$\mathbf{b_1}$ (constant)	-0,0325[a] (3,02)	0,0126 (0,57)	-0,010 (-1,23)	0,002 (1,23)	-0.126 (-0.57)	0.172 (0.42)
$\mathbf{b_2}$ (dlog y_{it})	-1,109[a] (-5,97)	-0,100 (-0,23)	-1,587[a] (-10,83)	-0,352 (-1,02)	-5.189[c] (-1.69)	-0.699 (-0.08)
$\mathbf{b_3}$ (dlog g_{it})			3,722[a] (15,11)	-2,183[a] (5,28)	5.780 (1.17)	-4.67 (-0.40)
$\mathbf{b_4}$ (dlog y_{it} * dlog $G_{i(t-1)}$)					0.647[c] (0.74)	0.558[c] (0.23)
$\mathbf{b_5}$ (dlog y_{it} * dlog $(Z/Y)_{i(t-1)}$					-0.723 (-1.79)	1.651 (1.90)
$\mathbf{b_6}$ (dlog g_{it} * dlog $G_{i(t-1)}$)					-1.010 (-0.70)	1.031 (0.33)
$\mathbf{b_7}$ (dlog g_{it} * $(Z/Y)_{i(t-1)}$)					-1.456[b] (-2.12)	-0.142 (-0.11)
$\mathbf{b_8}$ (dlog $G_{i(t-1)}$)					0.0353 (0.55)	-0.048 (-0.43)
$\mathbf{b_9}$ (dlog $(Z/Y)_{i(t-1)}$)					0.0106 (0.42)	0.001 (0.03)
N	364		364		364	
R^2	0.10		0.47		0.49	

t-values in brackets
a = 0.01 significance; b = 0.05 significance; c = 0.10 significance

Annex 2 – Regression results for squared poverty gap index

Table 5 – regression results for the whole world

Variable/model	(1)	(2)	(3)
$\mathbf{b_1}$ (constant)	-0,32[a] (-2,59)	-0,010 (-1,02)	-0.014 (-0.06)
$\mathbf{b_2}$ (dlog y_{it})	-1,133[a] (-5,08)	-1,536[a] (-8,29)	-7.069[c] (-1.90)
$\mathbf{b_3}$ (dlog g_{it})		3,700[a] (3.45)	9.662[c] (1.84)
$\mathbf{b_4}$ (dlog y_{it} * dlog $G_{i(t-1)}$)			1.271 (1.26)
$\mathbf{b_5}$ (dlog y_{it} * dlog $(Z/Y)_{i(t-1)}$			-0.373 (-1.19)
$\mathbf{b_6}$ (dlog g_{it} * dlog $G_{i(t-1)}$)			-2.070 (-1.47)
$\mathbf{b_7}$ (dlog g_{it} * $(Z/Y)_{i(t-1)}$)			-2.130 (-4.97)
$\mathbf{b_8}$ (dlog $G_{i(t-1)}$)			0.002 (0.03)
$\mathbf{b_9}$ (dlog $(Z/Y)_{i(t-1)}$)			-0.001 (-0.08)
N	364	364	364
R^2	0.07	0.37	0.42

t-values in brackets
a = 0.01 significance; b = 0.05 significance; c = 0.10 significance

Table 6 – Comparing Sub-Saharan Africa with the rest of the world

Variable/model	**(1)**		**(2)**		**(3)**	
	Non-SSA	SSA difference	Non-SSA	SSA difference	Non-SSA	SSA difference
$\mathbf{b_1}$ (constant)	-0.033[b] (-2,30)	0,005 (0,16)	-0,006 (-0,50)	-0,011 (-0,48)	-0.075 (-0.25)	0.142 (0.25)
$\mathbf{b_2}$ (dlog y_{it})	-1,049[a] (-4,27)	-0,482 (-0,82)	-1,629[a] (-8,05)	0,0613 (0,13)	-4.261 (-1.00)	-1.958 (-0.15)
$\mathbf{b_3}$ (dlog g_{it})			4,517[a] (13,27)	-2,306[a] (-4,04)	7.120 (1.04)	-1.343 (-0.08)
$\mathbf{b_4}$ (dlog y_{it} * dlog $G_{i(t-1)}$)					0.187 (0.15)	1.012 (0.30)
$\mathbf{b_5}$ (dlog y_{it} * dlog $(Z/Y)_{i(t-1)}$					-1.283[b] (-2.28)	2.286[c] (1.88)
$\mathbf{b_6}$ (dlog g_{it} * dlog $G_{i(t-1)}$)					-1.150 (-0.57)	0.108 (0.02)
$\mathbf{b_7}$ (dlog g_{it} * $(Z/Y)_{i(t-1)}$)					-1.443 (-1.51)	-0.452 (-0.25)
$\mathbf{b_8}$ (dlog $G_{i(t-1)}$)					0.024 (0.27)	-0.044 (-0.28)
$\mathbf{b_9}$ (dlog $(Z/Y)_{i(t-1)}$)					0.013 (0.37)	0.009 (0.16)
N	364		364		364	
R^2	0.06		0.38		0.41	

t-values in brackets
a = 0.01 significance; b = 0.05 significance; c = 0.10 significance

Annex 3 – List of usable household surveys by region, country and year

Non-SSA countries	Years
Algeria	1988, 1995
Armenia	1998, 2001, 2002, 2003, 2006, 2007, 2010
Azerbaijan	1995, 2001
Bangladesh	1983, 1985, 1988, 1991, 1995, 2000, 2005, 2010
Belize	1993, 1994, 1996, 1997, 1998, 1999
Bhutan	2003, 2007
Bolivia	1990, 1993, 1997, 1999, 2000, 2001, 2002, 2005, 2006, 2007, 2008
Brazil	1981, 1982, 1983, 1984, 1985, 1988, 1989, 1995, 1996, 1997, 1998, 1999, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009
Cambodia	1994, 2004, 2007, 2008, 2009
Chile	1987, 1990, 1992, 1994, 1996, 1998, 2000
Colombia	1992, 1996, 1999, 2001, 2002, 2003, 2004, 2007, 2009, 2010
Costa Rica	1981, 1986, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2008, 2009
Dominican Republic	1986, 1989, 1992, 1996, 1997, 2000, 2001, 2003, 2007, 2008, 2009, 2010
Ecuador	1987, 1994, 1998, 2000, 2003, 2005, 2007, 2008, 2009, 2010
Egypt, Arab Rep.	1990, 1995
El Salvador	1991, 1995, 1996, 1998, 1999, 2001, 2002, 2003, 2004, 2005, 2007, 2008
Fiji	2002, 2008
Georgia	1999, 2000, 2001, 2002, 2003, 2005, 2006, 2007, 2008, 2009, 2010
Guatemala	1989, 1998, 2000, 2003
Guyana	1992, 1998
Honduras	1991, 1992, 1993, 1996, 1998, 1999, 2001, 2003, 2004, 2005, 2006, 2007, 2008, 2009
Iran, Islamic Rep.	1986, 1990
Kazakhstan	1996, 2001
Kyrgyz Republic	1998, 2002, 2008, 2009, 2010, 2011
Lao PDR	1992, 1997, 2002, 2008
Malaysia	1984, 1987, 1995
Mexico	1984, 1992, 1994, 1998, 2000, 2002, 2004, 2005, 2006, 2008, 2010
Moldova, Rep.	1988, 1992, 2001, 2004
Morocco	1984, 1990, 1998, 2000, 2007
Nepal	1995, 2003, 2010
Nicaragua	1993, 1998, 2001, 2005
Pakistan	1987, 1990, 1996, 1998, 2001, 2004, 2005, 2007
Panama	1979, 1989, 1991, 1995, 1997, 2001, 2002, 2003, 2004, 2005, 2006, 2009, 2010
Paraguay	1995, 1997, 1999, 2001, 2004, 2005, 2007, 2009, 2010
Peru	1985, 1994, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010
Philippines	1985, 1988, 1991, 1994, 1997, 2000, 2003, 2006, 2009
Romania	2000, 2001, 2002
Sri Lanka	1985, 1990, 1995, 2002, 2006, 2009
Tajikistan	1999, 2003, 2007
Thailand	1981, 1988, 1990, 1992, 1996, 1998, 2000
Timor-Leste	2001, 2007
Tunisia	1985, 1990, 1995, 2000

Turkey	1994, 2002, 2003, 2004
Turkmenistan	1988, 1993
Venezuela, RB	1981, 1987, 1992, 1995, 1998, 1999, 2001, 2004
Vietnam	1992, 1998, 2002, 2004, 2006, 2008
Yemen, Rep.	1998, 2005
Angola	2000, 2008
SSA countries	
Botswana	1985, 1993
Burkina Faso	1994, 1998, 2003, 2009
Burundi	1992, 1998, 2006
Cameroon	1996, 2001, 2007
Central African Republic	1992, 2003, 2008
Côte d'Ivoire	1988, 1993, 1995, 1998, 2002, 2008
Ethiopia	1981, 1995, 1999, 2005, 2010
Gambia, The	1998, 2003
Ghana	1987, 1988, 1991, 1998, 2005
Guinea	1994, 2003, 2007
Guinea-Bissau	1993, 2002
Kenya	1992, 1994, 1997, 2005
Lesotho	1986, 1993, 2002
Madagascar	1980, 1993, 1997, 1999, 2001, 2005, 2010
Malawi	1997, 2004, 2010
Mali	1994, 2001, 2006, 2010
Mauritania	1987, 1993, 1995, 2000, 2004, 2008
Mozambique	1996, 2002, 2007
Namibia	1993, 2003
Niger	1992, 1994, 2005, 2007
Nigeria	1985, 1992, 1996, 2003, 2009, 2011
Rwanda	1984, 2000, 2005, 2010
Senegal	1991, 1994, 2001, 2005, 2011
Sierra Leone	2003, 2011
South Africa	1993, 1995, 2000, 2005, 2008
Swaziland	1994, 2000, 2009
Tanzania	1991, 2000, 2007
Togo	2006, 2011
Uganda	1989, 1992, 1996, 1999, 2002, 2005, 2009
Zambia	1988, 1995

Annex 4 – Possible instrument variables

Following in the footsteps of several previous studies (e.g. Kalwij and Vershoor, 2007 and Fosu, 2011), we try to obtain usable instruments variables for changes in the mean income y. From the national accounts, we obtain the PPP-adjusted GDP per capita figure for our relevant years and countries, assuming that any error in this measure will not be correlated with errors in the household surveys used to estimate our poverty, inequality and income estimates. In addition to this, we also use the change in the size of the population as well as lagged values of the Gini-coefficient and mean income. We also follow the example of previous studies by including several interacting terms with the above mentioned instruments, as well as regional dummy variables for the SSA vs. non-SSA model. We are forced to drop 5 variables due to lack of data on PPP-adjusted GDP per capita for Jamaica, but are still left with 359 usable observations compared with 364 in the OLS regressions.

The results, which are not included in the thesis but can be obtained upon request, are very different from the OLS results and arguably implausible. At first, our instruments seem to perform relatively well on model (1) and (2), showing significant and plausible coefficients similar to our OLS estimates. We test the validity of all our instruments using the Hansen test and we cannot reject the null hypothesis that all instruments are valid. However, when the full model is specified we find no significant variables, not even for y, which leads us to conclude that something is wrong and that we are forced to rely on our OLS results. We note that this follows for example Fosu (2009) which do not use instruments in a similar model.