SCHOOL OF ECONOMICS AND MANAGEMENT

What impact does income inequality have on economic growth?
- A regional study of Sub-Saharan Africa and the case of South Africa.

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Introduction

This paper intends to shed light on the effect of income inequality on economic growth in one of the most unequal regions in the world: Sub-Saharan Africa. The region is experiencing some of the world's highest levels in income inequality, making it a relevant choice for exploring the effect of income inequality on growth (United Nations Development Programme, 2017).

In order to extend the insight into how income inequality can affect economic growth, a subsequent case study of one country will be conducted. The country selected for this case is South Africa. According to World Inequality Database, in 2017, South Africa had the highest Gini-coefficient in Sub-Saharan Africa at 0.74, measured by the pre-tax national income Gini coefficient (World Inequality Database - Data, 2020). The World Bank labels the country's severe income inequality accompanied by the disparities in wealth distribution in South Africa as some of the country's most serious issues in terms of development (World Bank, 2019). These decisive facts remain key for motivating the choice of South Africa for the case study of how income inequality impacts economic growth.

The methodology for this study is based on panel data and panel regression analysis (Dougherty, 2016). Firstly, a regional study will commence using a panel of Sub-Saharan African countries to determine the relationship between income inequality and economic growth. The Gini coefficient will be used both in terms of its aggregate value and split up in quintile shares. Then, several panel regressions will be computed to estimate how income inequality affects GDP per capita growth with respect to Sub-Saharan Africa.

This will be followed by the case study of South Africa, which will use the computed panel regression in the regional study to estimate how much the country's Gini coefficient has impacted its GDP per capita growth. After an overview of the income inequality between and within ethnic groups in the country, hypothetical comparisons of how South African GDP per capita growth would have emerged 1994-2013 with the lower Gini coefficient in 1994 being held constant will be made. The results will be compared to how the growth rates actually emerged 1994-2013 under the real Gini values. In addition the same methods will be used with respect to the estimate the impact of income inequality on levels of GDP per capita in South Africa 1994-2013.

Regarding limitations for the study, the time period, 1994-2013, was decided on with regard to the politically turbulent state of South Africa before 1994. In addition, several countries have been excluded from the regional panel study of Sub-Saharan Africa due to lack of available data.

The introduction is followed by an entry into previous research on the relationship between income inequality and economic growth. Then, a description of the methodology will follow, accompanied by theoretical aspects and data. Subsequently, the panel study of Sub-Saharan Africa will be introduced along with its results, followed by the case study of South Africa. The study is finalized with a concluding discussion.

1. Related literature and theory

1.1. Previous results

Just as previously mentioned, the impact of income inequality on growth is a phenomenon that has received much attention over the years in economic research. Yet, while the impact of income inequality on growth has raised much interest, it remains still a point of contention between economists in terms of methods, measurements, results and varying significance.

The impact of income inequality on economic growth has often been labeled a negative one. These claims are made by Persson and Tabellini (1994), Rodrik and Alesina (1994), and Alesina and Perotti (1996), who all argue for a negative relationship between economic growth and the level of income inequality.

One channel used to explain the negative relationship is that income inequality becomes a factor that discourages investment, a strongly positively related variable to economic growth. This can occur through different channels, one of them being that levels of income inequality are followed by redistributive policies, such as taxes, who in turn lead to lost incentives for investors and thus lower growth (Persson-Tabellini, 1994; Rodrik-Alesina, 1994). Another culprit is asserted to be political instability. As income inequality arises, political stability erodes and thereby leads to a decrease in investment (Perotti-Alesina, 1996).

Contrary to literature mentioned above, Kristin J. Forbes (2000) and, to some extent, Robert J. Barro (2000) point to potential positive influences from inequality on growth. Forbes (2000)

mentions that a rise in income inequality can have a positive impact on economic growth in the short- and medium term. Through the use of improved inequality data and panel estimation techniques, a statistically significant and robust positive relationship between income inequality and economic growth can be found across various samples up until the medium term. However, such a relationship does not seem present for very poor countries (Forbes, 2000).

Moreover, Barro (2000) states that income inequality in a highly developed society can have a positive impact on growth, while a skewed income distribution in a poor country can have negative influences on growth. Above a certain threshold of per capita GDP, there seems to be a positive influence of income inequality on economic growth (Barro, 2000).

The results from Barro (2000) receive attention in several articles on the relationship between income inequality and economic growth in studies on Sub-Saharan Africa. Firstly, the results influence authors to divide the countries depending on their level of development, since Barro argues that there is a tendency for inequality to be more harmful for developing countries than developed ones (Hakura et al., 2016).

In addition, further mention of Barro's results are made by Guleryuz (2017), in the context of how initial conditions regarding inequality can affect growth. This refers to his result that low-income countries experience a negative growth effect from income inequality while high-income countries receive a positive lift to growth (Guleryuz, 2017).

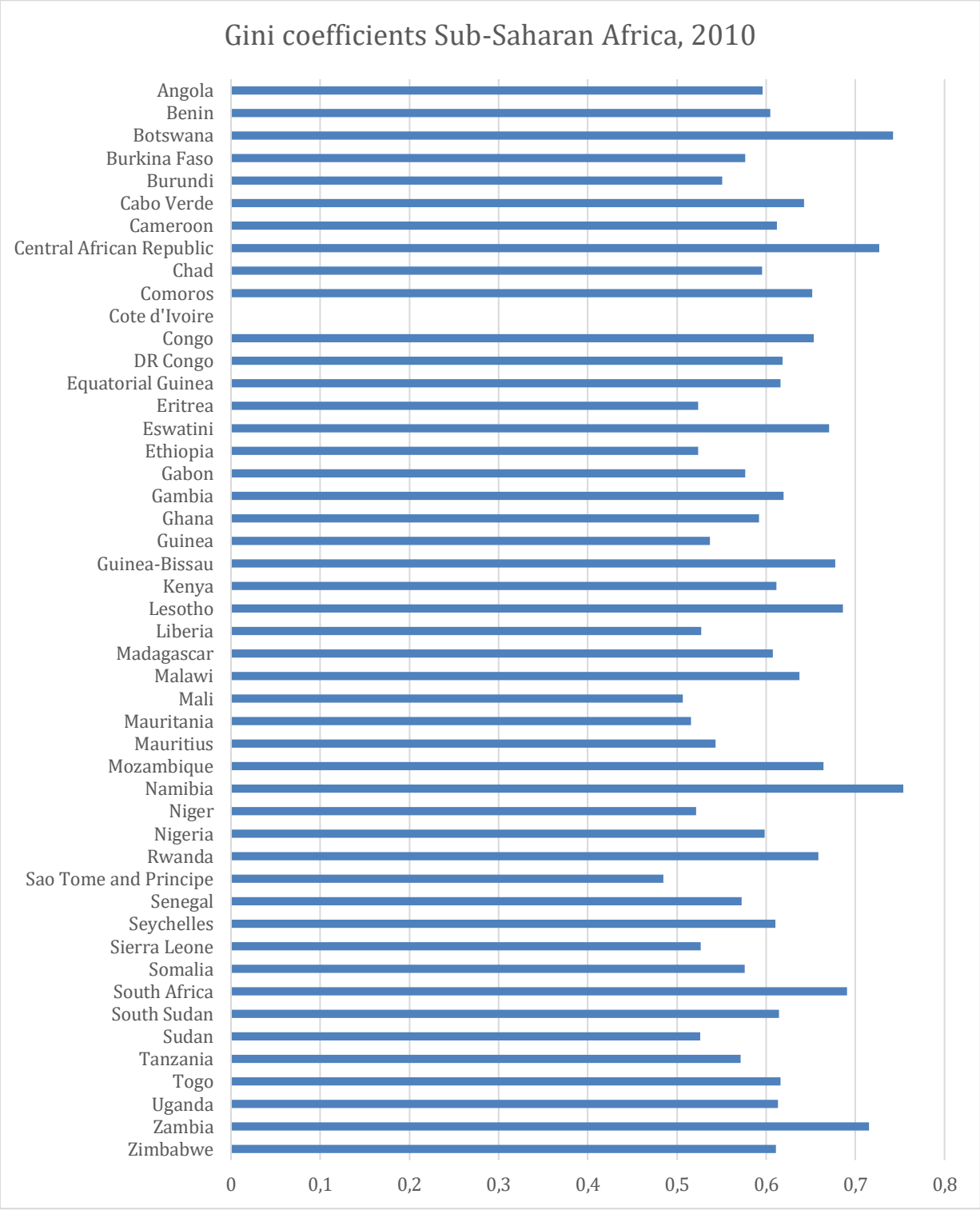
The existing literature on growth and inequality in Sub-Saharan Africa seems more or less convinced that the relationship between the former and the latter tends to be negative in the long run (Hakura et al. 2016). Suggestions for high growth losses due to income inequality are reported for Sub-Saharan Africa in particular, along with suggestions of a negative effect of inequality on growth in the long run (Hakura et al., 2016; Mbabazi et al., 2001). Such assertions relate to Barro's results of a more harmful impact of income inequality on growth in developing countries.

However, there are further claims that the impact of inequality is conveyed through policies associated with high levels of inequality, and that it is not income inequality itself that inhibits growth (Mbabazi et al. 2001). In addition, suggestions of a bidirectional relationship between growth and income inequality are made in terms of causality (Akanbi, 2016).

Table 1. Outline of the literature on growth and inequality in Sub-Saharan Africa. (Sources: Barro, 2000; Hakura et al., 2016; Akanbi, 2016; Mbabazi et al., 2001; Guleryuz, 2017).

Author	Region	Method	Variables	Time period	Results
Barro, 2000	Latin America, Sub-Saharan Africa et al.	Neoclassical growth model, panel regressions	GDP/capita growth (dep.), initial level of per capita GDP, institutional variables	1965-1995	Negative impact of income equality on growth in poor countries, positive impact in rich countries
Hakura et al., 2016	High-middle-and low income countries	System GMM, regressions, time series	GDP/capita growth (dep.), income ineq., gender ineq., et al.	1995-2014	Negative impact of inequality on growth in developing countries
Akanbi, 2016	South Africa	Cointegration, panel causality analysis	GDP growth (dep.), poverty, inequality	1995-2012	Positive impact of a more equal income distribution on growth in South African provinces
Mbabazi, et al. 2001	44 developing countries	Panel & cross-section regressions	log initial GDP (dep.), income inequality, trade lib., investment, natural resources et al.	1970-1994	Non-significant impact of income inequality on growth in the short run
Guleruyz, 2017	North-and Sub-Saharan Africa and Middle East	Panel data estimation & random effects model	GDP/capita growth (dep.), land inequality, initial income, government effectiveness	1996-2014	Positive impact of land inequality on growth in the medium run

Chart 1. The Gini coefficients for Sub-Saharan Africa in 2010. (Source: World Inequality Database, 2020).



1.2. Methodology

Just as conveyed from Table 1, the methods used for measuring the impact of income inequality on economic growth in the literature constitute cross-section and panel regression analysis with the use of fixed effects (Barro, 2000; Mbabazi et al., 2001). The usage of System GMM and cointegration methods is also present (Hakura et al., 2016; Akanbi, 2016) accompanied by random effects model to estimate the influence of time-invariant, initial conditions on economic growth in her sample of countries (Guleryuz, 2017). Panel unit root tests are also conducted (Akanbi, 2016).

The research tends to include additional explanatory variables behind economic growth when conducting research on the relationship between income inequality and growth. These include variables such as gender inequality, investment and trade liberalization (Hakura et al., 2016; Barro, 2000; Mbabazi et al., 2001).

1.3. Data

Moreover, the data used in the related literature on the relationship between income inequality and economic growth is firmly constituted by cross-section and panel data (Mbabazi et al., 2001; Akanbi, 2016, Guleryuz, 2017). Time series data was also employed by Hakura et al. (2016).

1.4. Weaknesses in the methodology

The use of the Gini coefficient as a measure of income inequality when estimating its impact on economic growth carries an important weakness of the methodology of the literature. Using this aggregate measure can inflict skewed results of with respect to its impact on growth. Unequal distribution of incomes in the top echelon of the income distribution can benefit economic growth, for example by enabling enterprises to form despite high fixed costs (Voitchovsky, 2005). At the bottom end of the income distribution, a more unequal distribution of incomes act to inhibit growth (Voitchovsky, 2005). Since the Gini coefficient is an aggregate measure of the entire income distribution, this can conceal potential effects of inequality in its various sections, potentially leading to inaccurate results (Voitchovsky, 2005).

The data used in the related literature has also been a point of contention. Forbes (2000) argued the importance of using high quality data, although her sample includes no countries from Sub-Saharan

Africa, while half of the sample consists of OECD countries (Forbes, 2000). Another weakness of previous research on the relationship between income inequality and economic growth in Sub-Saharan Africa is the lack of good data. According to the World Inequality Database, the available inequality data for Sub-Saharan African countries is generally poor in terms of quality (World Inequality Database, 2020). All countries, except South Africa, achieve data quality at ratings ranging between ratings of one out of five to even a rating of zero (World Inequality Database, 2020).

1.5. This study versus the literature

What distinguishes this study from the literature, is the structure of a regional panel regression on the relationship between income inequality and growth which is applied on a case study of a specific country in the region, South Africa. The provision of a macro-perspective of the empirical relationship between inequality and growth, accompanied with a selected case, will offer a unique insight into the phenomenon. Likewise, the connection between the two studies in terms of the application of the results from the regional study on the case study aims to offer new insights on the impact of income inequality on growth.

This study also uses income inequality as a lone explanatory variable, while most previous studies have opted to use additional ones, such as gender inequality and trade liberalization. Finally, the data used in this study will slightly differ from some previous data sets due to the selection of a more recent time period (Guleryuz, 2017; Hakura et al., 2016).

1.6. Theory

Regarding the relevant theory for inequality and growth, Robert J. Barro explains that inequality and growth affect each other through different theoretical aspects, ranging from credit market imperfections, savings rates, socio-political unrest and political economy. A breakdown of the aspects include:

- Distorted economic decision-making due to lack of available credit, influenced by income inequality. For example, poor citizens who are not able to finance long-term investments in education due to limited incomes or wealth reduces productivity and thus inhibits growth. On the contrary, sunk costs faced by businesses and enterprises could prove problematic

with a more egalitarian income distribution. If the median income is too far away from the sunk costs, lower income inequality would deter investments and with that, economic growth (Barro, 2000).

- Political economy refers to how redistribution, due to high inequality levels, can have a negative effect on growth. In order to combat the high levels of inequality, redistribution is carried out, accompanied by higher taxes which in turn act to rule out certain investments and therefore act as a negative aspect to growth. This aspect also includes the harmful effects of corruption and lackluster property rights on economic growth (Barro, 2000).
- Socio-political unrest may occur due to both income and wealth inequality, stirring less productivity in the economy. Again, there are two sides of this theoretical aspect. Less income inequality could provide the potential resistance with more skill and capability to cause political change, making the incentive to reduce the former dependent on how dominant it is (Barro, 2000).
- Investment, according to Barro, acts as positive factor for income inequality on growth. He refers to Keynes' general theory: as incomes rise, so does savings, leading to a spur in economic growth. Redistributing incomes from the wealthy to the poor may decrease savings, leading to a fall in growth (Barro, 2000).

These theoretical aspects are generally referred to throughout the related literature. They tend to influence the determination of variables in the methodology of several authors (Hakura et al., 2016; Mbabazi et al., 2001; Guleryuz, 2017), which shows their significance. The current study takes the existing theory into account in setting up the methodology, by determining the selection of control variables in the panel regressions based on the different theoretical aspects. This will be explained in more detail in the section on methodology below.

2. Methodology

2.1. Data

The growth data was calculated from data from Penn World Tables by Robert C. Feenstra et al. (2015), and the income inequality data was imported from the World Inequality Database (Feenstra et al., 2015; World Inequality Database - Data, 2020). The data for control variables from the World Development Indicators of the World Bank (World Bank, 2020).

A large share of the previous research made on the relationship between income inequality and growth in Sub-Saharan Africa tends to decide its variables based on the theoretical aspects investigated in the previous chapter. The aspects included credit-market imperfections, political economy, socio-political stability and investment. For example, Barro (2000) uses a large amount of institutional variables related to democracy index and rule of law (Barro, 2000). Mbabazi et al. (2001) use the average investment share of GDP in their basic equation for GDP per capita growth.

The panel regression generated in this study uses the following control variables: *Gross savings*, *Trade*, *Primary school enrollment*, and *Property rights.* All the control variables are estimated as non-overlapping five-year averages over 1994-2013.

The selection of the control variables was based on the related literature and theory within the topic. *Trade* was measured in terms of CPIA trade rating, and constitutes an unweighted average (World Bank, 2020), contrasting to the measure of openness used in one article from the related literature based on the Sachs-Warner index (Mbabazi et al., 2001). *Gross savings* were estimated using gross savings in current US dollars (World Bank, 2020), and was included with respect to the importance of investment for economic growth according the literature. The impact of human capital on growth is represented through *Primary school enrollment*, defined as the enrollment rates for primary school in percent (World Bank, 2020). The use of human capital as a control variable stems from its appearance in the related literature (Mbabazi et al., 2001). Finally, *Property rights* is measured as an unweighted average of CPIA property rights and rule-based governance rating (World Bank, 2020). This variable was selected as the institutional control variable, whose inclusion is motivated through the use of institutional variables in the related literature (Barro, 2000).

The Gini coefficient will be used to represent income inequality (World Inequality Database, 2020), and constitutes the explanatory variables in the current study, both as the aggregate measure, *Gini*, and divided into different sections. The latter include the ratio of the top 20 percentiles with the highest incomes vs the lowest 40 percentiles of the lowest incomes (*Gini 20/40*), the income share of the middle class defined as the 40^{th}-80^{th} percentiles of the income distribution (*Gini 40-80*), and the top and lowest quintiles of the income distribution respectively (measured as *Gini top 20* and *Gini lowest 20*).

The choice to break up the Gini coefficient in different layers is based on previous work made by Barro (2000) and Hakura et al. (2016). Barro studies how the distribution of incomes in quintiles of the income distribution affect growth rates, using the top and lowest quintiles to account for their impact as well as studying the effect from the middle three quintiles (Barro, 2000). Hakura et al. (2016) use the ratio of the top 20 quintile to the bottom two quintiles, and the third and fourth quintiles which is referred to to as 'the middle class', to study their impact on GDP per capita growth (Hakura et al., 2016).

Furthermore, the growth data was limited by not being available for a few countries in Sub-Saharan Africa: Eritrea, Somalia and South Sudan, but was otherwise quite well preserved. Regarding the explanatory variables of income inequality measured by the Gini coefficient, Cabo Verde and South Sudan lacked data. In total, 44 Sub-Saharan countries where included in the sample for the regional panel regression, with Cabo Verde, Eritrea, Somalia, and South Sudan excluded due to lack of data.

The control variables lacked coverage for *Property rights* for most countries the initial ten years of the period covered in this study. The data for the years not covered in the sets was estimated as constant for the institutional variable, due to its assumed low volatility. Likewise, *Primary school enrollment* also experienced large gaps in the data from Sub-Saharan Africa.

Due to the lack of data for certain countries with respect to the control variables *Property rights* and *Trade*, estimations of these variables for the missing years were made using the constant value found in the earliest year covered in terms of data of the time period 1994-2013. This was done under the assumption that such variables are relatively inert and vary relatively little over time. For the countries who completely lacked data on these variables, such estimations were not made. It is

important to keep this assumption of constant values in mind when drawing conclusions from the estimated results further ahead.

The data regarding the independent variable and control variables was formatted as panel data, with the growth data formed into average GDP per capita growth rates in non-overlapping five-year periods 1994-2013 as the dependent variable. The finished panel data was imported to the software program EViews in order to conduct a panel regression analysis. Regression tables were then created with respect to the results in EViews to illustrate the results.

2.2. Panel regression analysis

Just as explained in the previous section on related literature, panel regressions on panel data are a common method used in the related literature (Barro, 2000; Mbabazi et al., 2001). Similarly, the method in this empirical study consist of panel regression analysis on Sub-Saharan Africa to study the impact of income inequality on growth. The countries are analyzed with average real GDP per capita growth rates over non-overlapping five-year periods over 1994-2013 as the dependent variable. The explanatory variables and the control variables are the specified in the previous section.

The equation for the regression for Sub-Saharan Africa with respect to average GDP per capita growth was formulated the following way:

gy = b0 + b1*gini + b2*d(property rights,1) + b3*d(gross savings,1) + b4*log(primary school enrollment) + b6*d(trade,1) + error term

Several of the variables were transformed by taking the first difference due to non-stationarity, which will be explained in more detail below. The panel regression uses fixed effects with respect to country-specific effects (measured by cross-section effects in EViews) and will simulate the results with fixed effects for the countries. The decision to use fixed effects was based on the theoretical advice to use fixed effects if a random sample from a given population is not present (Dougherty, 2016). In addition, a clear majority of the literature resorts to using fixed effects. Fixed effects with respect to the time period and country-fixed effects appear for the GMM model (Hakura et al., 2016), and to reinforce robustness of the coefficients in panels (Akanbi, 2016). Barro (2000) also uses country-specific effects in his panel regressions, as does Mbabazi et al. (2001).

Guleryuz (2017) does use a random effects model, contrary to the rest of the authors. This study will stick with fixed effects with respect to country, due to the use of them by Barro (2000) who resembles the methodology in this study more closely than the rest of the authors. A comparison of the results using fixed effects for both country and time period will be made.

A Hausman test, comparing the use of random effects versus fixed effects, was carried out for five panel regressions, all including each one of the explanatory variables presented above (Dougherty, 2016). The results of the Hausman test for four out of five of the panel regression with random cross-section effects suggested the use of random effects. However, these results does not change the decision to adopt fixed effects, due to the recommendation made by Dougherty (2016) and the practice of previous research.

2.3. Non-stationary variables

In order to control for non-stationarity in the data, the study conducted panel unit root tests of all the explanatory and control variable in EViews before running the panel regression analysis. The purpose of this was to test the null hypothesis whether a unit root was present in any of the variables (Dougherty, 2016).

The results imply that the null hypothesis of a unit root can be rejected for the explanatory variables *Gini*, *Gini 20/40*, *Gini 40-80*, *Gini top 20,* and *Gini lowest 20* and the control variable *Primary school enrollment*. However, for *Gross* savings, *Property rights*, and *Trade*, the null-hypothesis of the presence of a unit root could not be rejected. A panel unit root test of first difference reject the null hypothesis of a unit root with regards to *Gross Savings*, *Property Rights*, and *Trade*.

Table 2. Methodology used in the related literature. (Sources: Akanbi, 2016; Barro, 2000; Guleryuz, 2017; Hakura et al. 2016; Mbabazi et al., 2001).

Author	Dependent variable(s)	Countries	Time periods	Inequality measurements	Use of fixed effects
Akanbi 2016	Income inequality, real GDP growth	South African provinces	Five-year periods for inequality index, 1995-2012	Gini, school completion rate, population share with access to land etc.	Panel fixed effect model
Barro 2000	Real GDP per capita growth, investment	Sub-Saharan Africa, Latin America, OECD, et al.	Overlapping five-year periods, 1965-1995	Gini coefficients and quintile shares	Country fixed effects
Guleryuz 2017	GDP per capita growth rate	MENA and Africa	1996-2014	Initial land inequality	None
Hakura et al. 2016	Real GDP per capita growth, change in net gini,	Sub-Saharan Africa, Latin America, Caribbean, ASEAN	Non-overlapping five-year periods, 1995-2014	Gini, top income shares vs bottom income shares, initial income share middle class etc.	Country- and time period fixed effects
Mbabazi et al. 2001	GDP per capita growth	Sub-Saharan Africa & other countries	Five-year periods, 1970-1994	Initial value of Gini index	Fixed effects models for panel regressions

The panel unit root tests imply that there exist non-stationarity in the variable *GDP per capita*, and the control variables *Gross Savings*, *Property rights*, and *Trade* at the same level. Similarly, stationarity is present for all the explanatory Gini variables, and for the control variable *Primary School Enrollment* at the same level.

In a panel regression, the dependent variable as well as the independent variables should be integrated in the same order, in other words they should all be stationary or non-stationary (Dougherty, 2016). Therefore, the first difference is taken for the control variables *Gross Savings*, *Property rights*, and *Trade* since they do not become stationary until taking the first difference with respect to the panel unit root test.

It is important to note that the dependent variable in the panel regressions for this regional study below, the average growth rate of GDP per capita, has not been tested for non-stationarity due to

the inability of the test to be carried out in the software. This study assumes that average GDP per capita growth is stationary, with respect to neo-classical growth theory which asserts that growth rates converge to a steady state in the long run (Jones-Vollrath, 2013). It is important to remember this assumption when drawing conclusions from the panel regressions.

Table 3. Control for non-stationarity in the variables in the panel regression. (Sources: Feenstra et al., 2015; World Inequality Database – Data, 2020; World Bank, 2020).

Variables	Panel unit root test - Level	Panel unit root test - First difference
Gini	-5,1010***	
	(0,0000)	
Gini 20/40	-36,2959***	
	(0,0000)	
Gini 40-80	-2,2381**	
	(0,0126)	
Gini top 20	-5,0277***	
	(0,0000)	
Gini lowest 20	-2,4090***	
	(0,0080)	
Property rights	4,6193	-7,0300***
	(1,0000)	(0,0000)
Gross savings	-0,7155	-25,1523***
	(0,2372)	(0,0000)
Primary school enrollment	-6,4361***	
	(0,0000)	
Trade	1,9547	-6,4800***
	(0,9747)	(0,0000)

2.4. Hypotheses and expected results

With respect to previous results, this study has set out to test the following hypotheses for the regional study and case study respectively:

H1: Does income inequality have a significant negative impact on GDP per capita growth in Sub-Saharan Africa?

H2: Does income inequality have a significant negative impact on GDP per capita growth in South Africa?

The hypotheses will be tested with respect to the concentration of incomes in top and lower ends of the income distribution, as well as the ratio of the top 20 percentiles to the lowest 40 percentiles. In addition, income shares ranging between the 40^{th} and 80^{th} percentiles will also be taken into account. All these layers of the Gini coefficient will act as explanatory variables on average GDP per capita growth in Sub-Saharan African and in South Africa.

For the regional study the selection of Sub-Saharan Africa as the overall sample and previous results, the expected regional results are the existence of a significant negative impact of income inequality on GDP per capita growth. These expected results are based on previous results of a negative effect of income inequality on growth, especially in developing countries (Barro, 2000; Hakura et al., 2016).

Moreover, the expected results of a negative impact of income inequality on GDP per capita growth are believed to be accompanied by different impacts with respect to the part of the income distribution being used as the explanatory variable. This draws on previous research which has concluded that there exists a positive impact of income inequality on economic growth when it is occurring at the top income shares in the distribution, and a negative effect when the inequality is measured among low-income shares (Voitchovsky, 2005).

However, given the selection of a relatively poor region and the results from Barro (2000) that developing countries are more hurt by income inequality with respect to growth, the panel regressions are expected to generate an overall negative impact of income inequality on growth. Higher inequality in the top income shares will be expected to inhibit growth, not strengthen it.

3. Results and discussion: Regional study on Sub-Saharan Africa

3.1. Results

The results of the first three panel regressions are listed in Table 4 below, with the use of fixed effects with respect to countries for Sub-Saharan Africa. The first panel regressions shows a negative effect of *Gini* on average GDP per capita growth. However, the p-value indicates that this result is not significant regarding the five percent level of significance.

Furthermore, the panel regression for the ratio of the top 20 percentiles and the bottom 40 percentiles of the income distribution of the countries in the region also received insignificant results with respect to the explanatory variable *Gini 20/40*. The estimated coefficient was negative just as for *Gini*.

The third panel regression with respect to the second and third quintiles of the income distribution received results that suggested a positive impact of the size of the second and third percentiles on average GDP per capita growth. Yet, although receiving lower p-values, these results do not pass the level of significance, making the impact of the income inequality regarding the income distribution for the middle class insignificant.

The second table of panel regressions is represented by Table 5, where the top and lowest quintiles of the income distribution are included as explanatory variables. The panel regression for the top quintile of the income distribution does not carry a significant impact on average GDP per capita growth in Sub-Saharan Africa. Neither does the lowest quintile of the income distribution, achieving a p-value that lies high above the level of significance of five percent.

While the different explanatory variables of the Gini coefficient remain reasonably, the R-squared and Adjusted R-squared values observed in Table 4 and 5 range at relatively high values. This is an aspect that will be analyzed in more detail in the discussion section.

Table 4. The first three panel regressions for Sub-Saharan Africa, with fixed effects with respect to country. Dependent variable is average GDP per capita growth rates, 1994-2013. (Sources: Feenstra et al., 2015; World Inequality Database - Data, 2020; World Bank, 2020).

Variables	Panel regression, country fixed, Gini	Panel regression, country fixed, Gini 20/40	Panel regression, country fixed, Gini 40-80
Gini	-34,0313		
	(0,1736)		
Gini 20/40		-0,8534	
		(0,1918)	
Gini 40-80			65,1928
			(0,0990)
Property rights	4,3771	4,1904	4,0981
	(0,5645)	(0,5816)	(0,5813)
Gross savings	4,74E-11	4,58E-11	5,02E-11
	(0,7157)	(0,7255)	(0.6950)
log Primary school enrollment	8,0657	0,1228	8,2134
	(0,0836)	(0,0321)	(0,0709)
Trade	-3,0421	-3,4322	-2,7730
	(0,3728)	(0,3127)	(0,4098)
R-squared	0,7842	0,7830	0,7915
Adjusted R-squared	0,5353	0,5326	0,5509

Table 5. The second panel regression for Sub-Saharan Africa. Dependent variable is average GDP per capita growth rates 1994-2013. (Sources: Feenstra et al., 2015; World Inequality Database - Data, 2020; World Bank, 2020).

Variables	Panel regression, country fixed, Gini Top 20	Panel regression, country fixed, Gini Lowest 20
Gini top 20	-38,9318	
	(0,1460)	
Gini lowest 20		112,4795
		(0,5796)
Property rights	4,4071	3,9223
	(0,5596)	(0,6206)
Gross savings	4,79E-11	4,56E-11
	(0,7112)	(0,7341)
log Primary school enrollment	8,1512	8,7418
	(0,0776)	(0,0722)
Trade	-2,9377	-3,5764
	(0,3877)	(0,3071)
R-squared	0,7864	0,7708
Adjusted R-squared	0,5400	0,5063

The panel regression using fixed effects both for countries and time periods are illustrated by Table 6. Once again, the results yielded are statistically insignificant with respect to the level of significance of five percent. The results registered lower p-values than the panel regressions who

only used fixed effects with respect to countries. In addition to the lower p-values, the R-squared values are higher along with the Adjusted R-squared values.

Table 6. The panel regression for Sub-Saharan Africa, using fixed effects both with respect to country and time period. Dependent variable is average GDP per capita growth rates 1994-2013. (Sources: Feenstra et al., 2015; World Inequality Database - Data, 2020; World Bank, 2020).

Variables	Panel regression, country-and fixed periods, Gini	Panel regression, country-and fixed periods, Gini 20/40	Panel regression, country-and fixed periods, Gini 40-80
Gini	-38,4413		
	(0,1246)		
Gini 20/40		-1,0114	
		(0,1242)	
Gini 40-80			75,4540
			(0,0563)
Property rights	0,3548	0,0475	-0,2213
	(0,9640)	(0,9952)	(0,9769)
Gross savings	3.89E-11	3.90E-11	4.02E-11
	(0,7719)	(0,7709)	(0,7579)
log Primary school enrollment	15,4263	16,43005	16,0370
	(0,0274)	(0,0195)	(0,0191)
Trade	-3,2402	-3,6762	-2,9274
	(0,3373)	(0,2734)	(0,3739)
R-squared	0,8064	0,8065	0,8167
Adjusted R-squared	0,5483	0,5485	0,5724

3.2. Discussion

As was stated earlier, there are claims in the previous literature that the relationship between income inequality and growth in developing countries is deemed to be negative. There are also reservations stating that the causality is not significant or clear and that the relationship is possibly a bidirectional one. These aspects were all set out in the section about expected results.

The results from the regional study illustrate a negative relationship between average GDP per capita growth and income inequality when the latter is measured as the aggregate Gini coefficient, the ratio of the top quintile to the two lowest quintiles, and the top quintile. In contrast, a positive relationship seems to exist between growth and income inequality when the shares of incomes are more concentrated between the 40-80 percentiles and the lowest quintile. These results match the expected ones with respect to the varying impacts of income inequality on growth depending on where the incomes are concentrated along the income distribution.

Furthermore, with not a single panel regression carrying a true, statistically significant explanatory variable, statements of a relationship between income inequality and growth seem faulty, suggesting that the impact of income inequality on average GDP per capita growth is non-existent. The results of the regional study does experience results similar to some authors within the related literature, who suggested that there was no causal relationship between income inequality and growth. However, the expected results consisted of a weak but significant impact of income inequality on growth and they are not matched regarding this.

In terms of the econometric results, potential shifts in the statistical significance between variables may be indicators of the presence of multicollinearity (Mbabazi et al., 2001). Regarding all the panel regressions in Table 4-6, changes in the coefficients of the control variables between each of three panel regressions can be observed here. One example of possible multicollinearity can be seen between the control variable *Primary school enrollment* and the explanatory variables *Gini 20/40* and *Gini 40-80* in Table 4. *Primary school enrollment* where it turns from being statistically insignificant to significant when the explanatory variable *Gini 20/40* is brought in, and turns insignificant again for *Gini 40-80.*

Several variables used for explanation and control in the current study may indicate presence of multicollinearity through a linear relationship between them. Due to a relatively small amount of observations present in the panel regressions of the regional study of Sub-Saharan Africa, this may prove problematic for the panel regressions (Dougherty 2016), and worthwhile to keep in mind when inferring from the estimated results.

One interesting result is that the Gini coefficient measured as the interval between the 40^{th} to the 80^{th} percentiles receives a lower p-value and higher R-squared- and adjusted R-squared values than the aggregate Gini measure. This indicates that a more blunt measure such as the aggregate Gini coefficient may cause some problems for receiving a significant result of its impact on growth. It also states that the breakdown may contribute towards explaining variations in the dependent variable, indicated by the higher R-squared and adjusted R-squared values (Dougherty 2016). It is possible that the panel regression with the aggregate measure as the explanatory variable is slightly poorer at explaining variations in the average GDP per capita growth, than the panel regression that includes an explanatory variable which investigate a breakdown of the Gini coefficient with respect to certain income shares across the distribution. The expected results were matched in terms of the suspicion of that the Gini coefficient, as a measure, may conceal certain relationship between growth and income inequality (Voitchovsky, 2005).

In comparison to the related literature, the estimated coefficients for the explanatory variables of income inequality are considerably larger in absolute terms than the coefficients estimated by Hakura et al. (2016), Mbabazi et al. (2001), and Barro (2000). Potential explanations include a different measure used by the authors, based on initial income inequality levels (Hakura et al. 2016), and inequality at the start of a five-year period (Mbabazi et al., 2001). In addition, in this study the data for the dependent variable average GDP per capita growth was transformed into actual percent before conducting the panel regressions, which does not appear to have been the case for the dependent growth variables used by the authors in the related literature (Mbabazi et al., 2001; Hakura et al., 2016; Barro, 2000).

Since the Gini coefficient ranges between 0 and 1, the interpretation of how much it affects average GDP per capita growth will be made by taking into account the range of the Gini coefficient when interpreting the coefficient. The first coefficient was estimated to approximately -34 (-34.0313). Assuming this is the percent change in average GDP per capita growth over a five year period when

the Gini increases by one unit, this would imply that if the aggregate Gini rises by one hundredth, from 0.50 to 0.51 for example, the average GDP per capita growth will fall by approximately 0.34 percent. In terms of the economic significance, such an effect may prove to be relatively large over a longer time period as small changes in growth rates tend to have large effects on GDP levels in the long run (Hansson, 2020).

Regarding potential bias that may exist in the estimation of the panel regression, omitted variable bias is suspected to be present. This could be represented by variables influencing average GDP per capita growth who may be correlated with the included explanatory and control variables (Dougherty, 2016). Given the many variables that affect economic growth, omitted variable bias is likely to be present (Jones-Vollrath, 2013).

Furthermore, due to the poor data quality for the inequality data for a majority of Sub-Saharan African countries, potential measurement errors may be present for the explanatory Gini variables (Dougherty, 2016; World Inequality Database - World, 2020).

The results proclaimed by Akanbi (2016) mentioned a bidirectional relationship between income inequality and growth. With this result in mind, simultaneous equation bias may also be a potential worry (Dougherty, 2016).

In summary, the results for this panel regression analysis of the impact of income inequality on average GDP per capita growth only match the expectations with respect to the variation between a negative and positive effect depending on the breakdown of the Gini coefficient. The expectations of a weakly significant relationship between income inequality and growth were not met. Therefore, the hypothesis of a significant negative impact of income inequality on growth is rejected.

4. Case study: South Africa

4.1. Background

The purpose of this case study is to explore the relationship between income inequality and economic growth in a selected country. Building on the results from the regional study, the case study aims to explore how rising income inequality levels in South Africa has affected its average GDP per capita growth 1994-2013.

As was mentioned in the introduction to the current study, in 2017 South Africa reportedly experienced a Gini coefficient of 0.74 as the most unequal country in Sub-Saharan Africa in 2017 with respect to incomes. This implies that South Africa carries the most unequally divided income distribution measured across its population in percentiles, strongly motivating the choice of the country for the case study, not least from a policy perspective given its extra-scientific relevance.

South Africa is the only country in Sub-Saharan Africa that has a data quality that is above one out of five ratings according to World Inequality Database. The South African data consists of survey and tax tabulations, with the quality estimated at three out of a maximum five with respect to the ratings (World Inequality Database – Data, 2020). The possibility to gather good data constitutes another factor behind selecting South Africa for this study.

The study will commence with an insight into the existing literature on the relationship between South African income inequality and growth. An examination of the methodology and the data in the case study will be made after the literature section. An overview of the current situation of income inequality in South Africa with respect to wage earnings will then be presented using descriptive statistics. This part is followed by the results of how South Africa's increasing Gini coefficient 1994-2013 has impacted both its average GDP per capita growth rates and its GDP per capita levels. After the results have been presented a discussion of them will commence.

5. Previous research

As mentioned earlier in this paper, the literature on the relationship between income inequality and economic growth is divided in terms of the impact of the former on the latter. Research on how

income inequality in South Africa has been reflected in economic growth is also divided with respect to this relationship.

There are claims that the country's high income inequality acts as a constraint for its growth, especially with respect to how it benefits the poorest segments of the population. The top income earners have received the largest share of the pie that is economic growth in South Africa from 1994 and onwards (Bhorat-van der Westhuizen, 2012; Bhorat-van der Westhuizen-Jacobs, 2009). Other studies argue that the relationship between the income inequality and growth lacks causality (Younsi-Bechtini, 2018). A key factor emerging behind the increasing income inequality in South Africa is wage inequality, motivating the choice of this factor for the overview of modern disparities in South African incomes.

The statements of how South Africa's income inequality has impacted its economic growth are conveyed through an array of different perspectives. These include immigration, education and jobs. Furthermore, another important aspect is how income inequality is located among different ethnical groups in South Africa. This aspect refers partially to the legacy of apartheid in South Africa and how it has molded existing inequalities in the country. However, additional claims mention that further inequality trends exists within ethnical groups such as the black population, and among different South African provinces (Leite-McKinley-Guerreiro, 2006; van der Berg-Louw, 2003).

Most of the literature seems convinced that South Africa's income inequality, in terms of wage earnings inequality within ethnical groups, constitutes an important area of this field. The case study will now turn to provide an overview of the tracks developed by the authors by studying the current situation regarding wage inequality, before the main results of the case study are presented.

6. Methodology and data

6.1. Data

The data for the case study consists of the growth data formatted in the regional study and the GDP per capita data, imported from Penn World Table (Feenstra et al., 2015). The inequality data used in the case study was present in the regional study, imported from World Inequality Database (World Inequality Database – Data, 2020). Finally, in order to estimate the real wage growth

between and within various ethnic groups in South Africa, data from quarterly labor force surveys was retrieved from Statistics South Africa and from Southern Africa Labour & Development Research Unit at the University of Cape Town (Statistics South Africa, 2014; Leibbrandt et al., 2007).

There is reportedly several problems with South African labor statistics. The legacy of apartheid carries a toil on gathered data, partly due to the lack of national censuses over the total population since 1980. In 1994, South Africa the first national survey was conducted in 1994 and although the measures have improved with time, discontinuities still exist (Wittenberg, 2014). This limited availability of data has led this study to use statistics over a limited time span regarding monthly wage earnings by race that covers 2010-2013.

6.2. Calculations

Regarding how income inequality in South Africa is dispersed among ethnical groups was calculated using statistics from Statistics South Africa and Southern Africa Labour & Development Research Unit at the University of Cape Town. This overview was illustrated using descriptive statistics in terms of column charts and line charts. The purpose of this is to illustrate the structure and magnitude of the income inequality in the country with respect to ethnicity.

The method for estimating how much income inequality has affected average GDP per capita growth in South Africa will be based on the estimated coefficient of the variable *Gini* in the panel regression with fixed effects for countries in the regional study, found in Table 4. The impact on the growth rates will be based on how real Gini values relative to a hypothetical constant value of the Gini coefficient in 1994 would affect growth over the period 1994-2013. In addition, comparisons will be made with regard to the initial Gini value at the beginning of each non-overlapping five-year period and the real values in Gini over that period and how this impacts average GDP per capita growth over that five-year period.

Calculation of the impact of the Gini coefficient on the growth rates was made as follows: If the coefficient of *Gini* is interpreted as the change in average GDP per capita growth over a non-overlapping five-year period when the Gini coefficient increases by one unit, multiplying the coefficient with the total change in the Gini coefficient over one observed non-overlapping five-

year period relative to the Gini coefficient in 1994, the impact of the Gini coefficient on average GDP per capita growth can be estimated in terms of percent. By adding the "lost growth" to the real average GDP per capita growth rates, the hypothetical average GDP per capita growth rates can then be achieved at a constant 1994 Gini coefficient in South Africa.

The same calculation was made for the impact of Gini on average growth rates with respect to the initial Gini coefficient at the beginning of each non-overlapping five-year period, by taking the difference in Gini coefficients at the end of each five-year period to the Gini coefficient at the beginning of the same period and multiplying these differences with the coefficient to receive the lost growth. This is done for each five-year period separately.

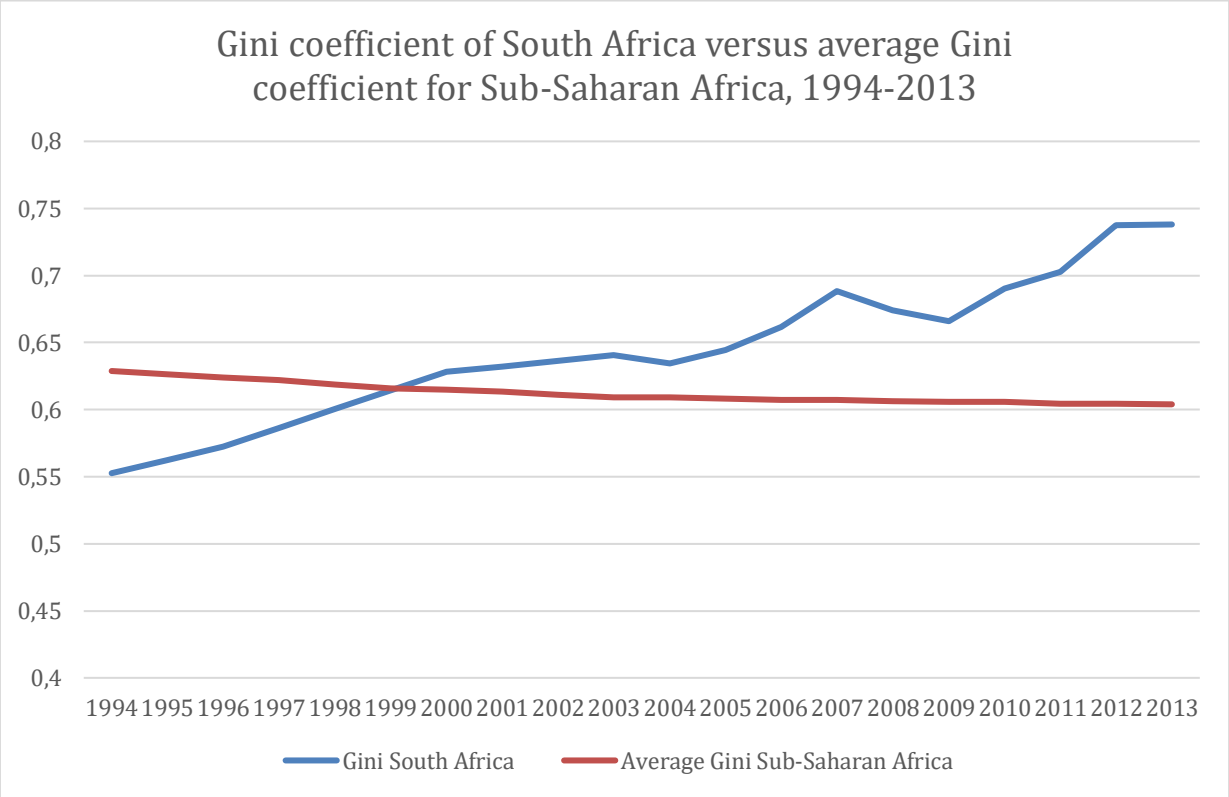
The calculations for the effect from income inequality levels in South Africa on GDP per capita levels 1994-2013 were made in a similar fashion. The calculations of the hypothetical GDP per capita levels were made with respect to a hypothetical constant Gini coefficient in 1994, using the hypothetical GDP per capita growth rates for each five-year period calculated for the previous result based on the constant 1994 Gini value. Multiplying the real GDP per capita levels with this hypothetical average GDP per capita growth rate year by year, the impact of the rise in the Gini coefficient on GDP per capita levels in South Africa 1994-2013 was received.

7. Results and discussion

7.1. South African income inequality in Gini and wages

According to Diagram 1, South Africa's Gini coefficient has been on the rise during the majority of the period 1994-2013 and has passed from lying below the regional average to increase above it. The regional average Gini coefficient appears to be characterized by a negative trend over the period, possibly contributing to the overreach of South Africa's income inequality levels.

Diagram 1. The development of the aggregate Gini coefficient for South Africa compared to the average Gini coefficient for Sub-Saharan Africa, 1994-2013. (Source: World Inequality Database – Data, 2020)



Furthermore, with respect to wage earnings between ethnical groups of the population there exist some clear inequalities. Firstly, according to the press release for the International Labor Organization's (ILO) Global Wage Report 2014/2015, there may be a relationship by increasing inequality and real wage growth in South Africa. The report with respect to Africa is centered only on South Africa simply due to limited available data (ILO). The following was stated in the press release: "In South Africa, the rise in inequality between 2007-11 occurred because the income growth of the top 10 percent of bottom households stagnated in real terms, while that of the top percent of households continued to increase at about the same rate as in the earlier period."(ILO, 2014-12-05).

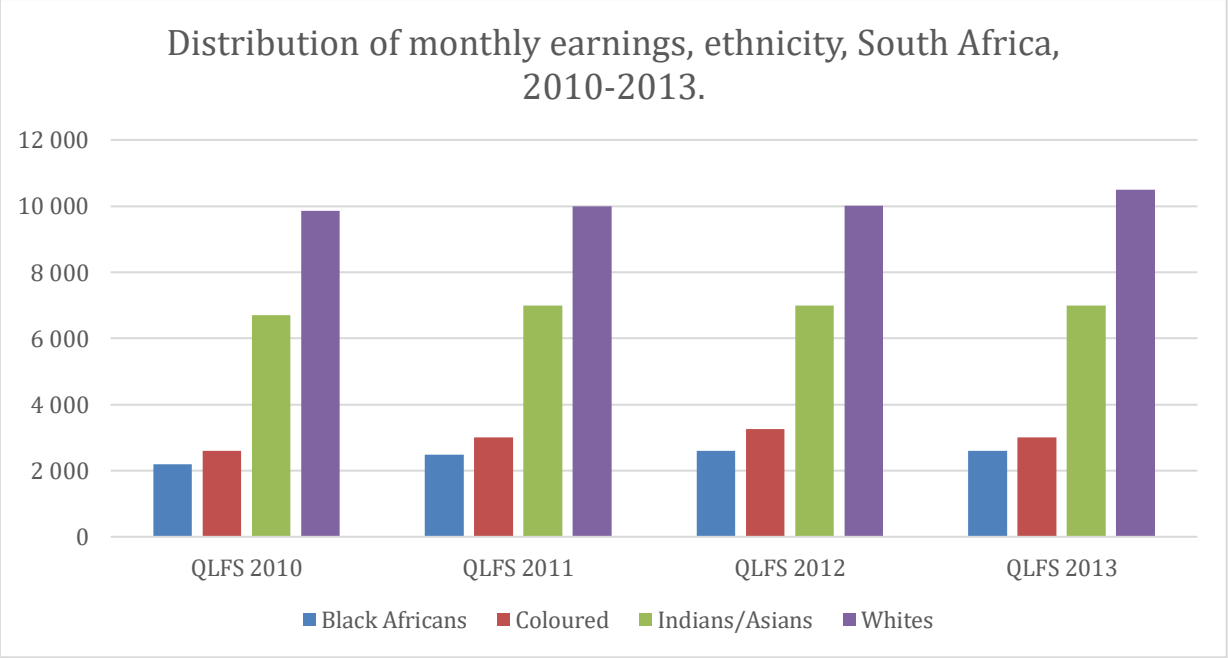
The income inequalities that exist between ethnical groups are presented in Chart 2. "Black Africans" and "Coloured" are clearly the most disadvantaged groups with respect to average

monthly wage earnings. Indian/Asians receive a clearly higher monthly earnings value while being exceeded by white employees.

It is important to remember that this is a short time-span for the wage earnings and longer trends may therefore be concealed, which is imperative to remember when drawing conclusions from the descriptive statistics above. However, despite these short-comings, the reported faults in South African labor statistics closer to 1994, and the purpose of simply producing an overview of the current situation of income inequalities in the country make these results more relevant for this case study (Wittenberg, 2014).

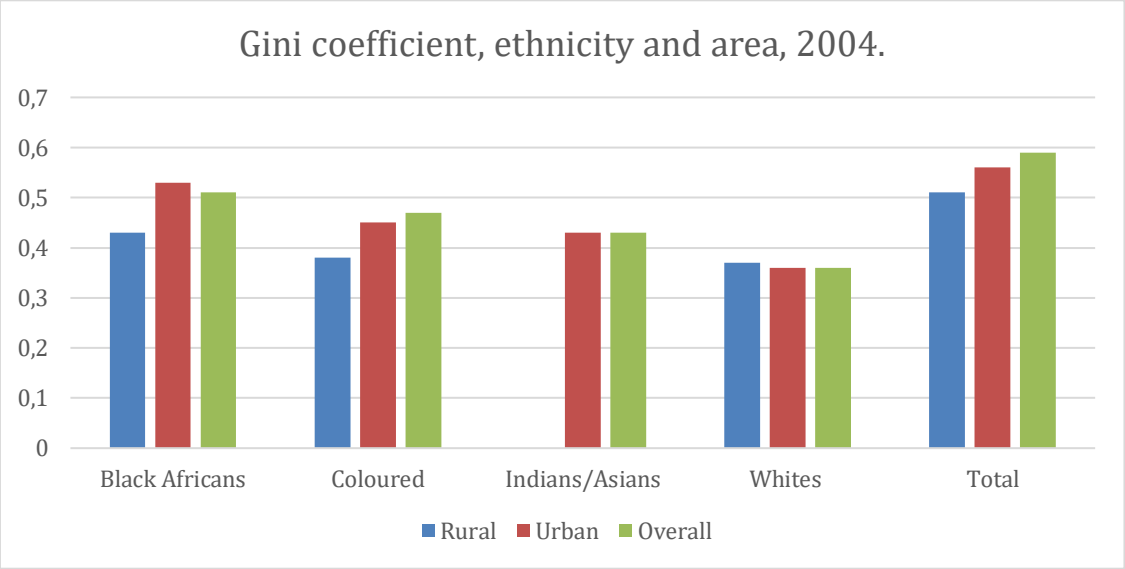
Another form of income inequality in South Africa that receives attention in the related literature was income inequality within ethnical groups, in contrast to between them. Chart 3 displays a bar chart over the Gini coefficients over different population groups in 2004. The total Gini coefficients regarding the table made by Leibbrandt et al. (2007) slightly differ compared to the data sets mainly used in the case study from World Inequality Database. It appears that the Gini coefficient is the highest within the group 'Black Africans' and lowest within the white population group.

Chart 2. Distribution of monthly earnings between ethnical groups in South Africa, 2010-2013. (Source: Statistics South Africa, 2014).



Although these results concern only a single year of the time period 1994-2013, they provide the income inequalities existing in South Africa in a different light compared to Chart 2. These are interesting results that deserve more attention with respect to trends over the entire time period, but they will only be used for providing an overview of the situation for income inequality in South Africa.

Chart 3. The Gini coefficients within ethnical groups in South Africa in 2004. The data was collected from the calculations of Leibbrandt et al. (2007).



7.2. Impact of income inequality on average GDP per capita growth, 1994-2013.

Based on the estimated coefficient from the regional panel regression, the results regarding the impact of income inequality on average GDP per capita growth in South Africa yield a clear negative effect. The impact varies between the two versions of calculating the impact of income inequality on growth:

For the version using a constant 1994 Gini noted high inhibiting effects on average GDP per capita growth particularly during 2004-2008 and 2009-2013. For example, the hypothetical average GDP per capita growth rate missed out on for South Africa between 2009-2013 was approximately 7,9 percent, approximately 6,3 percent higher than real average GDP per capita growth rate of 1,6 percent.

When calculating the effect from the change in the Gini coefficient from the beginning to the end of each five-year period, the largest amount of lost growth occurs between 1994-1998 and 2009-2013. If South Africa had not seen an increase in their Gini coefficient from 1994 to 1998, their hypothetical average GDP per capita growth rates would have increased by approximately 1,6 percent to 3,2 percent compared to the real observed growth rate of 1,6 percent.

The negative growth effect from income inequality is clearly larger for each period when calculating the effect assuming a constant 1994 Gini coefficient, compared to when the Gini coefficient at the start of each five-year period is assumed constant. This is expected, due to the higher difference received for the Gini coefficient when keeping it fixed at the 1994 level and subtracting that level from the observed level for each final year of each five-year period.

Chart 4. The estimated effect of the rise of South Africa's Gini coefficient on average GDP per capita growth, 1994-2013, assuming constant 1994 Gini. (Source: Feenstra, 2015; World Inequality Database – Data, 2020).

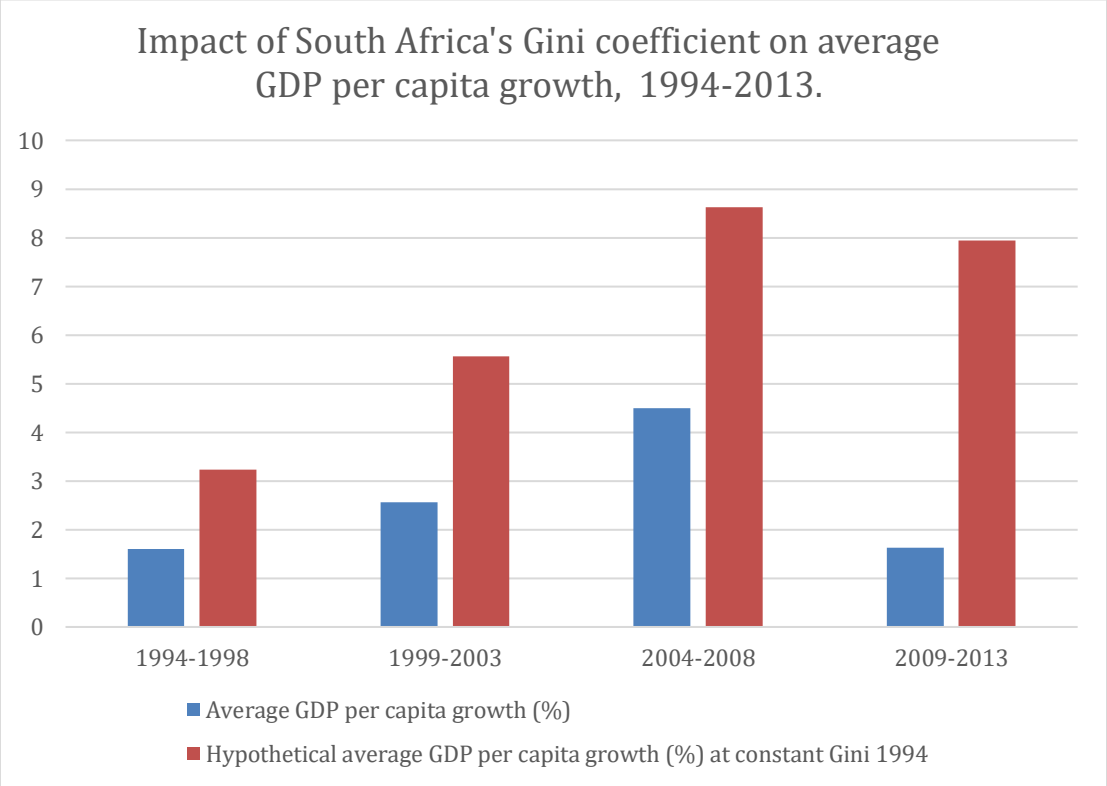
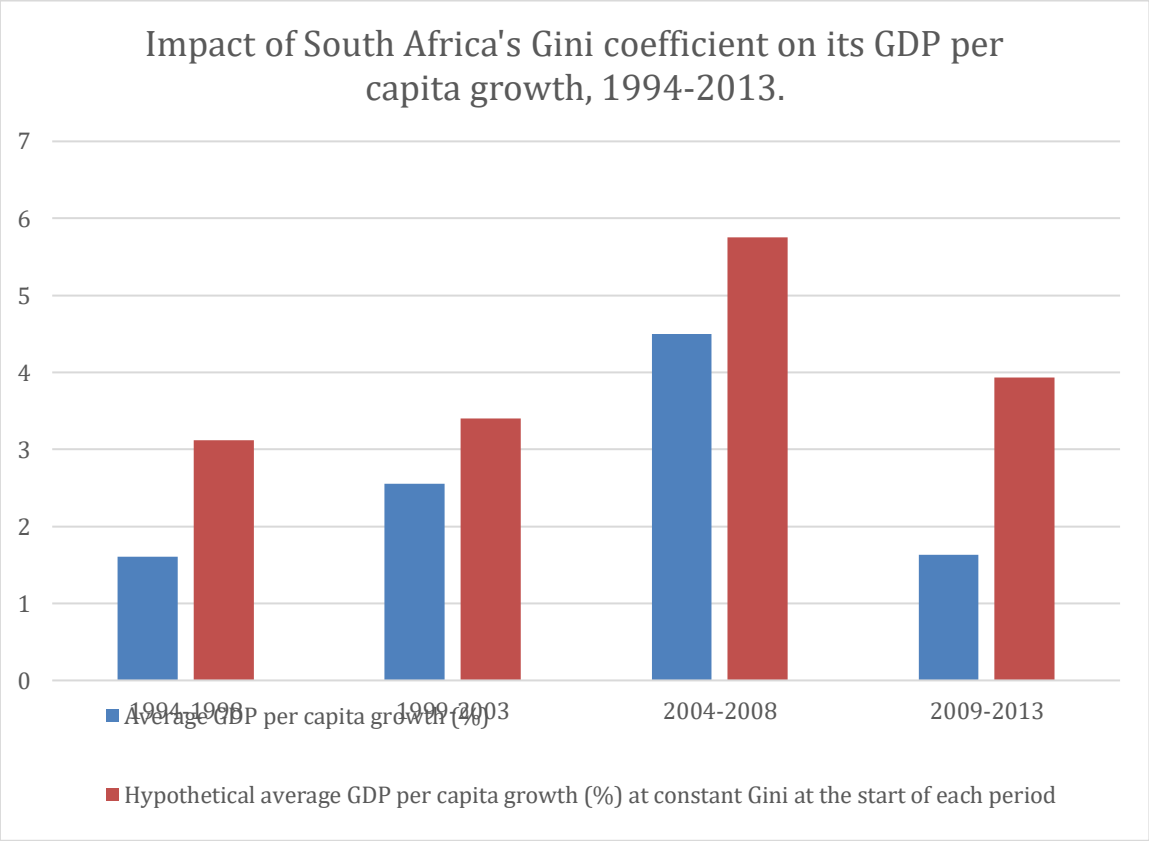


Chart 5. The estimated effect of the rise in South Africa's Gini coefficent on average GDP per capita growth, 1994-2013, assuming constant Gini at the start of each period. (Source: Feenstra, 2015; World Inequality Database – Data, 2020).



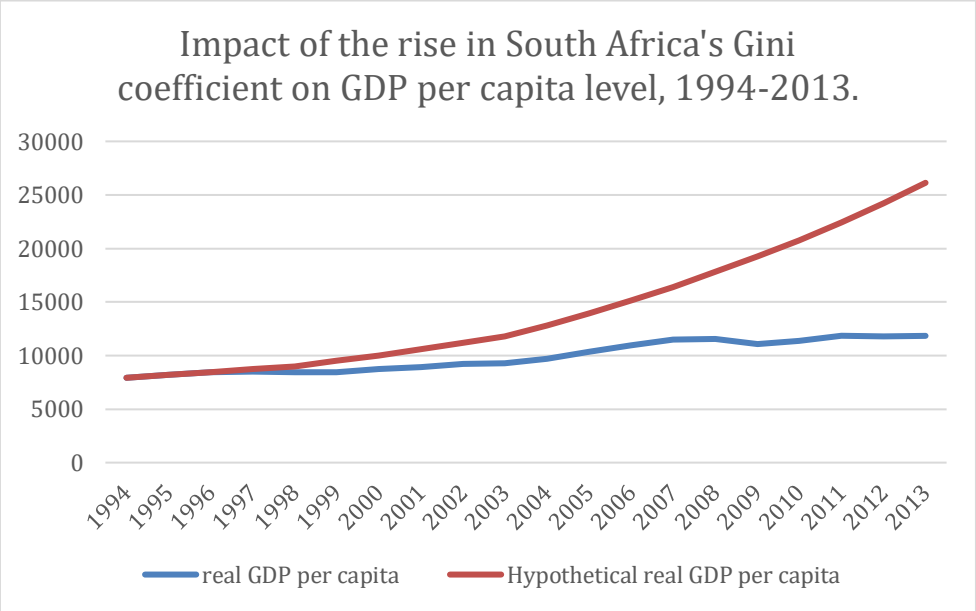
7.3. Income inequality and GDP per capita levels, 1994-2013.

The case study also set out to test the relationship between income inequality and GDP per capita levels in South Africa. For this study, the use of the previous, hypothetical growth rates for South Africa with a constant 1994 Gini coefficient generated the hypothetical GDP per capita levels in South Africa 1994-2013 assuming that 1994 income inequality level remained constant throughout the entire period.

The results illustrate a large impact of a rising Gini coefficient on South African GDP per capita levels from 1994 and onwards to 2013. For example, had the Gini coefficient remained at the 1994 level, South Africa would have experienced a hypothetical 2013 GDP per capita level of approximately 26'132 dollars compared to the actual 2013 GDP per capita level of approximately

11’836 dollars. The gap between the two growth paths also increases over time. For comparison to the hypothetical and real levels in 2013, in 1998 the hypothetical real GDP per capita level was estimated to approximately 8895 dollars compared to the real level of 8442 dollars. This would imply that the effect of rising income inequality levels in South Africa has a relatively large effect on GDP per capita levels over time, with a relatively small effect at the start that expands over time.

Diagram 2. The estimated effect of the rise in South Africa’s Gini coefficient on GDP per capita levels. (Source: Feenstra, 2015; World Inequality Database – Data, 2020)



7.4. Discussion

The purpose of this entire study was to investigate the relationship between income inequality and growth. In the regional study, we found that the impact of income inequality on growth appears to negative, albeit the results were statistically insignificant.

The case study was focused on studying how income inequality has impacted economic growth in South Africa in terms of economic growth, followed by an estimation of how the impact on growth may affected GDP per capita levels. The estimations, based on the results in the first panel regression in the regional study, indicate a negative impact of a rising Gini coefficient on South African average GDP per capita growth, 1994-2013. Consequently, the effect on GDP per capita

levels is also negative. However, these results are based on the panel regression from the regional study which received an insignificant effect of the Gini coefficient on average GDP per capita growth.

This result is not consistent with several results of the related literature on the relationship between income inequality and economic growth in South Africa who stated that the former has inhibited the latter (Bhorat-van der Westhuizen, 2012; Bhorat et al., 2009). These differences may be due to different methodology used to explore the relationship, as well as the data. This study is based on the use of panel regressions and panel data to estimate the impact of income inequality on average GDP per capita growth. The studies in favor of a negative relationship between these two variables are based on data from surveys and methods that estimate aggregated incomes over certain years as well as providing an overall view of the inequality and poverty in South Africa (Bhorat et al., 2009; Bhorat-van der Westhuizen, 2012)

The results from the literature on South Africa contrasts with previous results suggesting that the relationship may be positive for developed countries according some of the literature on the relationship between income inequality and growth (Barro, 2000; Forbes, 2000). South Africa is a member of the OECD and is included in the BRICS-countries as an emerging economy since 2010 (Government of South Africa). Therefore, the literature seems divided on whether to agree or not agree with this study's estimated negative impact of income inequality on average GDP per capita growth in South Africa.

The results of the case study concerning income inequality's effect on growth in South Africa are based on a regional panel regression that points to a statistically insignificant impact. This estimated result points in the same direction as the claims of the lack of a causal relationship between income inequality and growth in South Africa (Younsi-Bechtini, 2018). However, it is important to keep in mind that these results are generated through different methods, with this study conducting panel regression analysis and the other authors using Pooled OLS and GMM estimators (Younsi-Bechtini, 2018)

As stated earlier, the economic impact of the rise in income inequality for South Africa 1994-2013 appears increasingly large both with respect to growth rates and GDP per capita levels, when you compare the Gini coefficient in 1994 to its later values. However, these results must be interpreted

carefully, as they are based on a panel regression that lacked statistical significance for the Gini coefficient's impact on growth.

Regarding the econometric aspects for the case study, it is important to remember that these results on South Africa are generated via panel regression on a regional study of Sub-Saharan Africa. Many of the potential problems with regard to bias in this study can therefore be suspected to carry over to the case study. Similarly to former claims of a bidirectional relationship between income inequality and growth, simultaneous equation bias is a potential that can cause bias (Dougherty, 2016).

In addition, potential measurement errors, or errors-in-variables bias in the Gini coefficient as the explanatory variable were also mentioned. However, the quality on data for income inequality is much more reliable for South African data in contrast to typical Sub-Saharan African data, which should reduce the impact of this form of bias in the estimated results in the case study (Dougherty, 2016; World Inequality Database – World, 2020).

The hypothesis of a significant negative impact of income inequality on growth in South Africa only holds true for the fact that it appears to be negative. Yet, due to the lack of statistical significance in the panel regressions generated in the regional study on Sub-Saharan Africa, and the use of those estimations in calculating the effect of the Gini coefficient and growth in South Africa, the hypothesis is rejected.

8. Concluding remarks

The thesis set out with the purpose to investigate the impact of income inequality on economic growth in Sub-Saharan Africa. The structure was conducted through a regional study, followed by a case study of a country in the sample: South Africa, which has seen relatively high income inequality levels 1994-2013. The methodology was founded in the use of panel regression analysis to estimate the impact of income inequality on growth, based on transformed raw data on growth, inequality and control variables into panel data.

The final results of the study concluded the following: The impact of income inequality on economic growth appears to be statistically insignificant. This means that ultimately, the

hypotheses for the regional- and case study of a significant negative impact of income inequality on economic growth in Sub-Saharan African as well as in South Africa were both rejected.

Previous research within this field has been divided regarding the character of the impact of income inequality on growth as well as the actual significance of this effect. Some have argued that a causal relationship between the two variables does not exist, while some claim that income inequality does indeed affect growth significantly in Sub-Saharan Africa. The results from this study indicate that a significant relationship does not exist between income inequality and economic growth. Such findings would be prove adherent to some previous results and contrary to others.

Keeping the statistical insignificance in mind, the results indicate a negative effect of the countries in the sample, both for the regional study and the case study. A negative effect was expected based on the related literature's findings of an overall negative impact of income inequality on growth in developing countries. It can be argued that some of the countries in the region, such as South Africa, may not be classified as a typical developing country and that the results may not be representative for how South Africa. However, the study was confined to the estimations of the panel regression on the entire region of Sub-Saharan Africa, one of the poorest regions in the world. Thus, a negative relationship between the Gini coefficient and average GDP per capita growth does match the expected results.

Furthermore, another result that was yielded was that the measurement of income inequality plays a role. The Gini coefficient may be imprecise as an aggregate measure, and breaking it down into segments can shed light on its relationship with growth more clearly. Results appeared less insignificant when based on explanatory variables consisting of different shares of the income distribution, rather than when using the full measure, as well as changing from negative to positive coefficients. Therefore, it is important to take note of the apparent skewed nature of the Gini coefficient when studying the impact on growth. This is also consistent with previous and expected results on how the structure of the income distribution may affect growth in different ways.

The results of this study imply that policy-makers should not concentrate their efforts of public policy adjusting the levels of income inequality when assessing strategies for economic growth. The relationship between high disparities among income earners, and growth is unclear by nature, and its effect seems to shift depending on the structure of the income distribution.

Problems with the approach in this thesis include the choice of region, data and the use of panel regression analysis from a regional study on a case study of a single country. The choice to focus on Sub-Saharan Africa as a region comes with challenges for data. Future studies should be aware of the constraints for reliable data regarding inequality and relevant control variables in Sub-Saharan Africa. One solution to this problem would be to choose a later time period where more information is possible. Again, this poses the problem of limiting the number of available years to conduct a growth study on.

In addition, a different region with better data on income inequality could mitigate the effects of poor data quality. However, this would mean discarding Sub-Saharan Africa as an area of study.

The study was carried out by conducting a panel regression analysis in a regional study on Sub-Saharan Africa, followed by its application in a case study on a single country in the region. A problem with this is that the impact of income inequality levels on South African growth and GDP per capita levels are estimated through a regional panel regression, which may not fit South Africa that well with respect to the relationship between the country's high inequality levels and economic growth. This leaves the relationship between income inequality and growth South Africa somewhat mistreated, leaving some questions to be answered in future works.

References

Africa, Government of South Africa. *South African Government.* [Online]
Available at: https://www.gov.za/about-government/brics-brazil-russia-india-china-south-africa-1
[Accessed 22 May 2020].

Africa, S. S., 2014. *Statistics South Africa.* [Online]
Available at: http://beta2.statssa.gov.za/publications/Report-02-11-02/Report-02-11-022013.pdf
[Accessed 25 May 2020].

Africa, U. N. D. P. R. B. f. A., 2017. *United Nations Development Programme.* [Online]
Available at: https://www.undp.org/content/dam/rba/docs/Reports/undp-rba_Income%20Inequality%20in%20SSA_Infographic%20Booklet_EN.pdf
[Accessed 23 May 2020].

Akanbi, O. A., 2016. The growth, poverty and inequality nexus in South Africa: Cointegration and causality analysis. *Development Southern Africa,* 33(2), pp. 166-169, 170-172, 174, 181-182.

Bank, World., 2019. *The World Bank.* [Online]
Available at: https://www.worldbank.org/en/country/southafrica/overview
[Accessed 23 May 2020].

Bank, World., 2020. *World Development Indicators.* [Online]
Available at: https://databank.worldbank.org/source/world-development-indicators
[Accessed 9 April 2020].

Barro, R. J., 2000. Inequality and Growth in a Panel of Countries. *Journal of Economic Growth,* Volume 5, pp. 5-6, 7, 8, 10-24, 29.

Charles I. Jones, Dietrich Vollrath., 2013. *Introduction to Economic Growth.* 3rd ed. New York: W.W. Norton.

Dalia Hakura, M. H. M. N. V. T. F. Y., 2016. *International Monetary Fund.* [Online]
Available at: https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Inequality-Gender-Gaps-and-Economic-Growth-Comparative-Evidence-for-Sub-Saharan-Africa-43946
[Accessed 24 April 2020].

Dani Rodrik, A. A., 1994. Distributive Politics and Economic Growth. *The Quarterly Journal of Economics,* 109(No. 2), pp. 465-468.

Database, W. I., 2020. *World Inequality Database.* [Online]
Available at: https://wid.world/data/
[Accessed 23 May 2020].

Database, W. I., 2020. *World Inequality Database - World.* [Online]
Available at: https://wid.world/world/#sptinc_p99p100_z/US;FR;DE;CN;ZA;GB;WO/last/eu/k/p/yearly/s/false/5.11/30/curve/false/country
[Accessed 27 May 2020].

Dougherty, C., 2016. *Introduction to Econometrics.* Fifth ed. Oxford: Oxford University Press.

Forbes, K. J., 2000. A Reassessment of the Relationship Between Inequality and Growth. *American Economic Review,* 90(4), pp. 872-873, 884-886.

Guido Tabellini, T. P., 1994. Is Inequality Harmful for Growth?. *American Economic Review,* 84(No. 3 (Jun., 1994)), pp. 600-601.

Guleryuz, E. H., 2017. Growth Performance of MENA and African Countries: Impacts of the Variations in Land and Natural Resource Ownership. *Eurasian Journal of Economics and Finance,* 5(4), pp. 76-78, 79, 80-81.
Hansson, P., 2020. *Kompletterande Kompendium Ekonomisk Tillväxt.* [Online]
Available at: www.canvas.education.lu.se
[Accessed 27 May 2020].
Haroon Bhorat, C. v. d. W., 2012. *University of Cape Town, Development Policy Research Unit.* [Online]
Available at:
http://www.dpru.uct.ac.za/sites/default/files/image_tool/images/36/DPRU%20WP12-151.pdf
[Accessed 11 May 2020].
Haroon Bhorat, C. v. d. W. T. J., 2009. *University of Cape Town, Development Policy Research Unit.* [Online]
Available at:
http://www.dpru.uct.ac.za/sites/default/files/image_tool/images/36/DPRU%20WP09-138.pdf
[Accessed 11 May 2020].
Jennifer Mbabazi, O. M. C. M., 2001. *Are Inequality and Trade Liberalization Influences on Growth and Poverty?.* Helsinki, United Nations University, World Institute for Development Economics Research.
Moheddine Younsi, M. B., 2018. *Munich Personal RePec Archive.* [Online]
Available at: https://mpra.ub.uni-muenchen.de/85182/1/MPRA_paper_85181.pdf
[Accessed 11 May 2020].
Murray Leibbrandt, I. W. &. C. W., 2007. *International Policy Centre for Inclusive Growth.* [Online]
Available at:
https://ipcig.org/conference/ems/papers/ENG/Leibbrandt_Woolard_Woolard_ENG.pdf
[Accessed 26 May 2020].
Organization, I. L., 2014. *International Labour Organization Docs.* [Online]
Available at: https://www.ilo.org/global/docs/WCMS_326425/lang--en/index.htm
[Accessed 26 May 2020].
Organization, I. L., 2014. *www.ilo.org.* [Online]
Available at: https://www.ilo.org/global/docs/WCMS_326425/lang--en/index.htm
[Accessed 19 May 2020].
Philippe G. Leite, T. M. R. G. O., 2006. *International Policy Centre for Inclusive Growth.* [Online]
Available at: https://ipcig.org/pub/IPCWorkingPaper32.pdf
[Accessed 11 May 2020].
Robert C. Feenstra, R. I. M. P. T., 2015. "The Next Generation of the Penn World Table#. *American Economic Review,* 105(10), pp. 3150-3182.
Roberto Perotti, A. A., 1996. Income distribution, political instability, and investment. *European Economic Review,* 40(1996), pp. 1203-1205.
Servaa van der Berg, M. L., 2003. *Stellenbosch University, Department of Economics.* [Online]
Available at: https://www.ekon.sun.ac.za/wpapers/2003/wp022003/wp-02-2003.pdf
[Accessed 11 May 2020].

Wittenberg, M., 2014. *International Labour Organization.* [Online]
Available at: https://www.ilo.org/public/libdoc/ilo/2014/114B09_23_engl.pdf
[Accessed 26 May 2020].
Voitchovsky, S., 2005. Does the Profile of Income Inequality Matter for Economic Growth?. *Journal of Economic Growth,* Volume 10, pp. 273-275.