

Income inequality and FDI nexus in South Africa: A time Series analysis

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This paper examines the extent to which Foreign Direct Investment (FDI) and other variables influence income inequality in South Africa for the period 1970 - 2012. The study employs Auto Regressive Distributed Lag (ARDL) model which is suitable for small samples. The findings indicate a long run cointegration relationship among the observed variables. A positive and a statistically significant relationship is observed between FDI and income inequality in both the short and the long run. This implies that FDI increases income inequality in South Africa. Also found to have a positive effect on income inequality is inflation and trade openness, however, the effect of inflation is not significant while trade openness is statistically significant (at 5%). GDP per capita reduces income inequality in the long run and is significant at 10% level.

JEL classification: B22, P45, O15

Key words: FDI, income inequality, ARDL, GDP per capita, Cointegration

1. INTRODUCTION

Foreign direct investment (FDI) is widely viewed as a crucial engine for economic growth in the host country, particularly in developing economies. FDI is the prominent component of globalization, and (OCED, 2005) define globalization as an extensive process of economic integration which improves international mobility of factors of production, thus increasing interdependency between countries. Globalization saw countries open their economies to integrate with the world, with certainty that economic growth would be improved and ultimately socio-economic problems such as poverty, inequality and unemployment would be addressed. Nonetheless, empirical literature is ambiguous about the economic growth effects of FDI, with studies suggesting that a country must first reach a certain stage of economic development for FDI inflows to be observed, (Nunnenkamp, Schweickert, & Wiebelt, 1997).

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In light of the above, FDI attraction is a vital component for the achievement of both macroeconomic objectives and development strategies in South Africa; the motive behind more inward FDI attraction emerged from the expectation of an overall positive impact of inward FDI spillover effects such as productivity increases, technology transfers, better production techniques, etc. FDI is also significant especially for countries with insufficient domestic savings like South Africa where foreign capital becomes a major source of revenue for funding domestic needs in the host country. As a result, South Africa attracts more FDI than its Southern African regional counterparts.

While FDI is seen as a global phenomenon for economic growth and development particularly in developing countries; literature points out that the mobility of factors of production inspired by the presence of Transnational Companies (TNC) in the host country affects income distribution, (Figini & Gorg, 1999). Empirical evidence is however, still indistinct regarding the extent to which FDI impacts income inequality in the host country. Two competing arguments regarding the effect of FDI on income inequality in the host country are identified, FDI on one hand, reduces income inequality when implemented in sectors that utilize low-income unskilled labour, (Deardorff & Stern, 1994) or when capital, whether domestic or foreign enhances economic growth and its benefits ultimately spread all over the whole economy, (Tsai, 1995). On the other hand, (Chase-Dunn & Bornschier, 1985) argue that FDI inflows may negatively impact on income distribution due to wage spillovers as TNC normally pay higher wages compared to their local counterparts. Out of desperation for more employees to work with the new technology, TNC capitalize on their surplus and offer higher wages so as to attract more workers, particularly skilled employees into their companies.

Thus, this paper argues that it is possible that the presence of TNC in the host country reduces the market share of local businesses, thus forcing local businesses to reduce their costs by lowering wage levels as well as the number of workers local companies can hire. As a result, some people are left unemployed especially the unskilled workers, this widens the income inequality gap.

Interestingly, (Cingano, 2014) argues that income inequality is a driver of economic growth and development, it does this through competition, encourages hard work and innovation, which ultimately leads to growth and prosperity, meanwhile (Ostry, Berg , & Tsangarides, 2014) argue that income inequality destabilizes economic growth, and only countries with lower income inequalities have managed to achieve higher growth rates.

In line with the above, this paper argues that empirical evidence is still ambiguous regarding the effect of FDI on income inequality, particularly for developing African countries. It also triggers a question,

which this paper seeks to answer; does encouraging FDI into a developing country improve income distribution?

This paper proceeds from the premise that there is a correlation between progressive change in FDI and income inequality. The paper shows that under conditions of high inward FDI income inequality is undermined

Understanding the link between FDI and income inequality is important for two reasons, firstly, when merged with evidence on the relationship between FDI and economic growth, it can indicate the impact of FDI on poverty. For instance, if FDI raises economic growth, but has no effect on income distribution then one can confidently say FDI reduces income inequality. Secondly, it would stimulate the implementation of FDI-increasing policies.

Evidence on the distributional consequences of FDI inflows is scarce particularly in the South African context; this is due to the fact that researchers focused more on the efficiency outcomes of FDI such as economic growth (Asafo-Adjei, 2007; Adams, 2007; Masipa , 2014; Matjekana & Masipa, 2015; Nchoe, 2016). With the exception of (Msweli, 2015), little attention has been devoted to consider the distributional effects of FDI in the context of economic transformations that transpired in South Africa after 1994. This is somewhat surprising as the public concerns about the widening gap between the rich and the poor feature highly in current political and economic discourse in South Africa, and it this is the motive behind this case study. According to UNCTAD (2016) South Africa attracts more FDI than its regional counterparts; meanwhile it is amongst the top when it comes to income inequality and it is extremely high and persistent. Accordingly, South African social indicators are closer to those of lower-middle income or even low income countries even though it is an upper-middle income country, (Van de Berg, 2010). Additionally, the international advocacy group called Oxfam, confirms that income inequality is exploding in South Africa with the rich getting richer and the poor getting poorer. The Oxfam report further states that, “while economic growth is often seen as the solution to the problem of income inequality, the questions should be asked what is happening with regards to growth while this explosion in inequality is continuing”.

Again, the question is, are we encouraging inward FDI for growth and developmental purposes at the expense of income inequality?

Literature reveals arguments in favour and against FDI as the closest component to the thriving globalization which has resulted in the world becoming a global village. To this end, the FDI impact is varied, this necessitates expansion on the research topic in order to advance the knowledge body and to

enable developing countries particularly South Africa to make correct decisions when it comes to exploiting the benefits of FDI, thus reducing its negative effects.

To this end, this paper seeks to examine the link between FDI and income inequality, and to examine whether the interaction between inequality and FDI holds in the South African context. This study is different from the study by Msweli 2015 as it uses a different approach, data, and controls for endogeneity of FDI by including in the regression model, variables that were not included in that study.

2. BACKGROUND

2.1 Overview of inward FDI and trends in South Africa

FDI is 'defined as a cross-border investment by a resident entity in one economy, with the objective of obtaining a lasting interest in an enterprise resident in another economy. The foreign must at least attain 10% of the voting power, which represents the influence by the investor, (OECD, 2013). FDI includes everything from reinvestments in businesses, technology and knowledge transfers, mergers and acquisitions as well as construction of new establishments (IMF, 2003).

FDI is diverse; there is vertical and horizontal FDI. Horizontal FDI is undertaken by investors for the purpose of selling to foreign markets, while vertical FDI refers to taking advantage of inter-country differences such as capital and labour costs that would maximize profits, Msweli (2015).

According to (Gelb, 2010) South Africa has a laissez-fair policy framework with regard to the entry of foreign firms into the country. In other words, foreign firms do not need official approval by government to operate in the country, unless it is in the banking sector. This implies that there is trade openness in almost all the sectors in the economy. However, in the literature there is still debate regarding trade openness and income inequality in developing countries; while (HO theory and Feenstra & Hanson, (1997) suggest that trade openness reduces income inequality in developing countries, Robbins , 1996, Wood, 1997 and Robertson, 2000) find the opposite. Meanwhile, (Anderson, 2005) finds FDI to have little effect on overall income inequality.

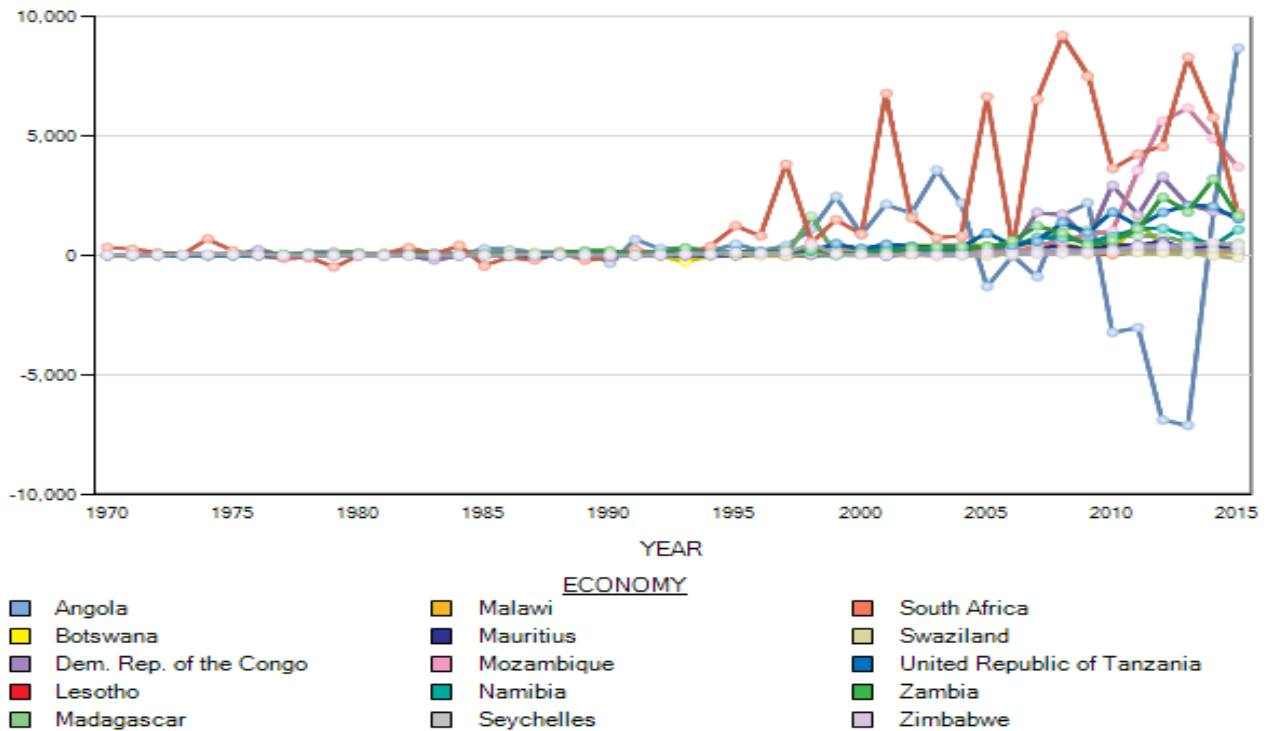
South African laws and regulations apply to both domestic and foreign firms; this may some sometimes give foreign investors advantage over domestic investors. For instance, the mining sector is regulated, thus, all firms must acquire a licence; however, foreign firms buying shares from already existing firms in South Africa are not affected. All firms both domestic and foreign have to comply with the BEE

requirements, however, foreign firms, for instance in the ICT have lobbied for and won franchises on BEE, Gelb (2010).

According to UNCTAD (2017) South Africa’s FDI inflows increased by 38% in 2016; however, the increase was a result of increases in portfolio investments. South Africa’s ability to attract FDI is better than its regional counterparts. Figure 1 below depicts foreign direct investment trends in the SADC region for the period 1970 – 2015.

As depicted in the graph below, the trend for inward FDI in South Africa is rising after 1994 relative to those of other countries in the region. Even though a decreasing trend is observed towards 2015, South Africa remains amongst the top in terms of FDI attraction in the region UNCTAD (2016). In 2016, “FDI influx to South Africa increased by 38% compared to 2015, reaching the modest level of USD 2.4 billion” (Santander Trade Portal, 2017). The sectors attracting the most FDI are energy, telecommunication and services

Figure 1: FDI Trends In the SADC region



Source: UNCTAD(2016)

According to UNCTAD 2016, China is one of South Africa's major trading partners. Most Chinese investments in South Africa are in the infrastructure and construction sector. This sector is labour intensive (Agapiou & McCaffer, 1995) it is believed that the motive behind the presence of Chinese firms is to seek cheap labour resources. Therefore, according to Deardorff and Stern, (1994) the implementation of foreign investments in low-income unskilled sectors reduces income inequality between skilled and unskilled workers. China also invests in the mining, automobile, electrical machinery and financial services sectors.

2.2 Overview of Income Inequality

Rye, (2016) defines income inequality as the extent to which incomes are unevenly distributed among the population. Income inequality varies across countries, with gender, level of education as well as with social status. Important drivers are for instance, technological change, financial globalization, changes in labour market institutions and redistributive policies (IMF, 2015).

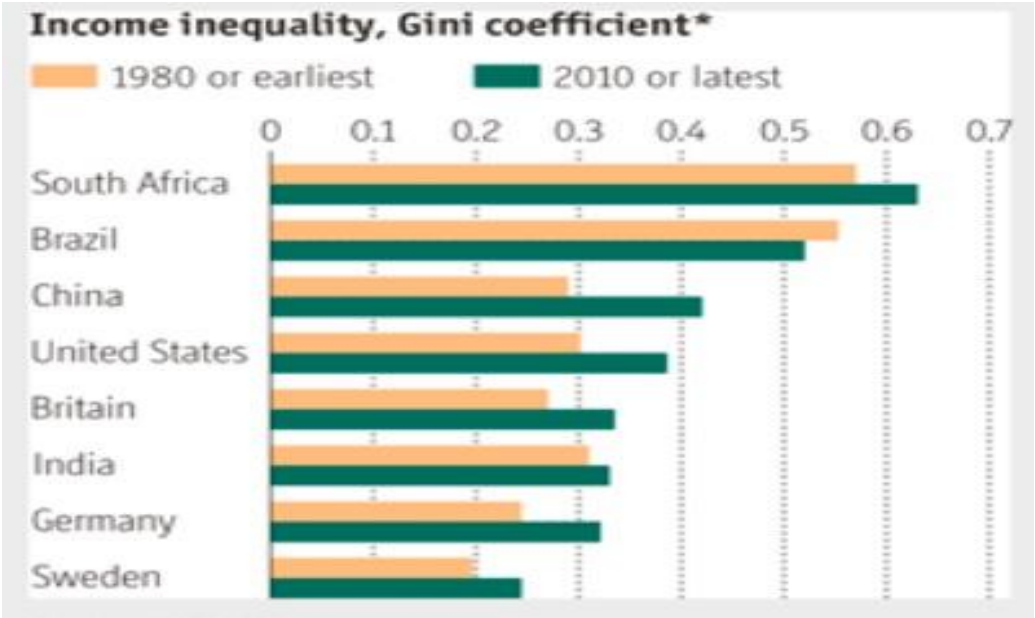
Theory reveals various methods of measuring income inequality, namely, quintiles, deciles, percentile approaches, the Theil index, Kuznets ratio which uses the ratio of total income of the richest 20% with respect to 40% of the poorest population, (Choi, 2006), Lorenz curve which shows the cumulative frequency distribution of a given valuable; and the Gini coefficient, the most popular measure of income inequality is calculated from the Lorenz curve which links cumulative proportions of a population to cumulative proportions of the income they receive. The Gini coefficient ranges from 0 to 1, where 0 indicates absolute equal distribution of incomes and 1 implies unequal distribution of income among citizens. According to a study by (Te Velde, 2003, p. 23) income inequality is triggered by:

- Unequal distribution of land
- Labour inequality
- Human capital and education
- Labour segmentation

South Africa ranks amongst the top when it comes to income inequality; it is extremely large and persistent. Accordingly, South African social indicators are closer to those of lower-middle income or even low income countries even though it is an upper-middle income country, (Van de Berg, 2010: 3). Additionally, the Oxfam report on aid and development charity aimed at alleviating poverty, confirms that income inequality is exploding in South Africa with the rich getting richer and the poor getting

poorer. It is further stated that, " South Africa remains a dual economy with one of the highest inequality rates in the world, perpetuating both inequality and exclusion. According to Statistics South Africa (2016), the Gini coefficient measuring relative wealth reached 0.65 in 2014 based on expenditure data and 0.69 based on income data (including salaries, wages, and social grants). Even after the introduction of social grants to bridge the gap between the rich and the poor, income inequalities are still observed amongst the rich and poor, skilled and unskilled workers, and racial inequalities, (Keeton, 2014). In its report, Stats SA (2016) states that, the poorest 20% of the South African population consume less than 3% of total expenditure, while the wealthiest 20% consume 65%". Additionally, Ostry (2014) confirms that income inequality destabilizes economic growth, and countries that have been able to achieve sustained levels of high growth generally have lower levels of inequality. As a result, aggregate demand declines due to lower quintiles that are trapped in poverty; persistent inequalities in education limit human capacity necessary for economic growth.

Figure 2: Income inequality overview



Source: IMF: OECD

Figure 2 above indicates that between 1980s and 2010 South Africa had the highest income inequality compared to other countries. This is somewhat surprising after so many strides by South African government to address poverty and inequalities through social grants, income inequalities still persist in South Africa along with FDI inflows.

2.3 Research question

Theory suggests a link between FDI and income inequality, however the link is unclear. Thus, this paper seeks to answer this question: Does FDI affect income inequality in South Africa?

2.4 Objective of the study

- The main objective of this paper is to establish the effect of FDI on income inequality in South Africa.

2.5 Hypothesis Testing

Based on the contradictory evidence presented in literature (Basu & Guariglia, 2007; Byraktar, 2013; Bhandari, 2007; Mottaleb & Kalirajan, , 2010, Te Velde, 2003) on the relationship between FDI and income inequality this study postulates that FDI inflow is positively related to income inequality:

H_0 : Foreign Direct Investment has no effect on income inequality in South Africa.

H_1 : Foreign Direct Investment has an effect on income inequality in South Africa.

3. THEORETICAL REVIEW OF LITERATURE

3.1 Theoretical Links between FDI and Income Inequality

This section elaborates more on the theories that have been used to clarify mechanisms behind FDI and income inequality. There is vast majority of literature that has undertaken the task of clarifying why it is big deal that TNCs choose to invest in foreign countries.

Regarding the effect of FDI on income inequality, theoretical literature advances from the view that TNCs possess firm-specific assets such as technology know-how and management skills, which offer an efficiency advantage over domestic firms. Thus, TNCs are seen as engines for technology transfer and ideas to host countries which make them (TNCs) “role models” for local firms, (Figini & Gorg, 1999). Although local firms (Herzer & Nunnenkamp, 2011) may benefit from “FDI-induced spillovers” absorbing new technology may widen the inequality gap in the short run and narrow it in the long run.

Aghion & Howitt (1998) modeled this transition by referring to Kuznets U-shaped hypothesis of increasing and decreasing inequality. Kuznets (1955) as cited by Keeton (2014) states that in developing countries economic growth initially leads to increasing levels of inequality, whereby rich people save more than poor, so inequality perpetuates the process of capital accumulation in poor countries. However, as economies develop larger shares of their populations move from agriculture into other sectors of the economy and their skills bases expand. Thus, eventually inequality falls. Rich countries, according to Kuznets, should be more equal than poor countries.

Despite the rejection by Piketty, a number of studies support the Kuznets theory (Aghion & Howitt, 1998 , Weede & Tiefenbach, 2013; Muller, 1988; Higgins & Williamson, 1999; Barro, 2000; Bhalla , 2002; Reuveny & Li, 2003; Banerjee & Duflo, 2003, Ucal, Bilgin and Haug 2014). To this end, no study has been found to support Piketty's theory.

Dunning theory

"Eclectic theory seeks to answer questions such as why firms would want to produce in a foreign location instead of exporting or enter into a licensing agreement with a local firm, Lim (2001). According to this theory, there are three factors that determine international activities of multinational activities. Dunning (1998) further identified motives that prompt TNCs to invest abroad; and these are: resource seeking, market seeking efficiency seeking and strategic seeking investments, (Anyawu 2011). This theory suggests three advantages that countries must consider when investing abroad, these are: ownership, locational and internationalization advantages. The use of these comparative advantages in developing countries may result in an increased demand for labour in the host country which is brought about by lower labour costs, thus, attracting more FDI.

HO theory

The theory of comparative advantage advocates that trade is a result of differences in the economic structure of countries. It assumes the use of labour intensive and capital intensive production techniques in developing and developed economies respectively. Given skilled and unskilled labour, this model predicts that factor investment flows to developing countries should be in unskilled labour-intensive sectors; thus increasing the relative demand for unskilled labour. This is line with what has been predicted by North-South models (Feenstra & Hanson, 1997, p. 372) assert that lower labour costs as a result of unskilled labour abundance in poorer host countries stimulate cost-oriented investments (vertical FDI) by TNCs through outsourcing labor-intensive parts of the production process. However,

Robbins (1996), Wood (1997) and Robertson (2000) found different results in Latin America, these authors report that trade openness widens income inequality. Interestingly, Anderson (2005) finds that greater openness has little impact on overall income inequality.

This however, occurs when outsourcing involves activities that are fairly skilled-labour intensive in the host country, even though they may be relatively unskilled-intensive in the host country. In light of the above, (Geishecker, Gorg, & Maioli, 2008), add that international outsourcing result to a shift of the relative demand for labour which has implications for the wage bill and the employment prospects of both high and low-skilled labour. Interestingly, (Feenstra & Hanson, 1997, p. 371) argue that, while economists generally agree that relative-wage changes are due to an increase in the relative demand for skilled labour, there is still a division amongst the economists over the source of the demand shift. Three explanations are on which the debate is based are presented: Firstly, the introduction of advanced technology has resulted into a shift towards production techniques that are biased towards skilled workers, (Davis and Haltiwanger, 1991; Lawrence and Slaughter (1993) as cited by (Feenstra & Hanson, 1997). Secondly, increases in import competition from low-wage countries have shifted resources towards sectors that use skilled labour fairly intensively. Thirdly, capital flows from North to South as well as the corresponding rise in outsourcing by Northern TNCs have contributed to a worldwide increase in the relative demand for skilled labour, (Feenstra & Hanson, 1997) argue that a rise in wage inequality across dissimilar countries is consistent with the third explanation.

These models indicate an intensive literature regarding the effect of FDI on income inequality and each of them has different implications. This illustrates that there is no theoretical assumption that FDI increases or decreases income inequality, poverty and incomes of low-skilled workers; thus, to this end empirical evidence can perhaps clear this ambiguity.

3.2 Empirical Literature

There is a growing literature that supports the contention as much as FDI is a crucial engine for economic growth it has the ability to increase economic growth, (Herzer & Nunnenkamp, 2011) te Velde (2003). This body of literature covers different countries and uses different methodologies.

For instance, (Feenstra & Hanson, 1997) looked at the effect of FDI on income inequality in Mexico over a period 1975 – 1988 and found that FDI accounts for over 50% of the increase in the labour wage share of total wages. This is in line with Mundell (1957) who argued that an increase in inward FDI in developing countries leads to a reduction in income inequality. This is highly possible given that inward FDI stimulates capital, thus leading to labour marginal productivity increases which ultimately lead to an

increase in both nominal and real wages. Thus, an increase in wages decreases income inequality. Still in Mexico, (Borraz, & López-Córdova, 2007) find that states which are more closely integrated with the rest of the world have more equal distribution of incomes and have exhibited larger declines in inequality because of increasing wages for women. Additionally, (Hanson, & Harrison, 1999) find that states in Mexico which have higher exposure to globalization have experienced larger increase in incomes.

Velde (2003) in a study in Latin American countries found that at macro-level, FDI tends to reduce income inequality; while micro evidence indicates that TNCs compensate their employees more than their local counterparts even after controlling for the market size, location and industry; L Jensen (1999) and (Jenkins & Sen, 2003) support this view.

For developing countries, (Gopinath and Chen, 2003) conducted a study for 15 advanced and 11 developing countries. They found that FDI inflows are linked to higher labour shares of GNP in both samples, however, F-test indicates significant differences in FDI effects between the two samples. It is further reported that FDI enhances the income gap between skilled and unskilled workers in developing countries. Similar findings are reported by (Figini & Gorg, 2006) who state that wage inequality decreases with FDI stocks in developed countries, while in developing countries, wage inequality increases with FDI stock, however, the effect is said to lessen as FDI further increases.

Marjit, Chakrabart, & Beladi (2004) analyze the impact of trade on income inequality. The analysis focuses on the gap between skilled and unskilled labour in a small developing economy. The analysis suggests a strong decline in the relative income of unskilled labour following an improvement in the terms of trade.

Choi, (2006) analyses the relationship between FDI and income inequality within countries using pooled Gini coefficients for 119 countries from 1993 to 2002. The author attempts to determine whether FDI affects domestic income inequality. The study finds that income inequality increases as FDI stocks (as a percentage of GDP) increase.

Bhandari (2006) developed a model predicting that FDI reduces income inequality. The findings provide evidence supporting that total FDI reduces income inequality overall for the U.S. which is a developed country. The model was tested in 19 transitional economies, however, the study found no evidence to support the claim. Similar findings have been found by Bloginen and Slaughter (2001).

Jensen & Rosas (2007) investigated the link between investments of multinational corporations and income inequality in Mexico. Using an instrumental variable approach, the study finds that inward FDI increases are associated with a decrease in income inequality within the 32 states in Mexico.

Adams (2007) investigated the effect of economic globalization on income inequality for a cross section of sixty two developing countries over a period of seventeen years. The study found that globalization explains only 15 percent of the variance in income inequality. These results suggest that globalization has both costs and benefits and that the opportunity for economic gains can be realized within an environment that supports and promotes sound and credible government institutions, education and technological development.

Blostrom and Kokko (2007) acknowledged the probability that FDI impacts on income inequality. They argued that, from a development perspective, there is usually a mismatch between initial human capital capacity and the technology requirements of TNCs investing in a host country. It is further argued that this mismatch could perpetuate the income inequality as new technology is introduced by foreign investors in the host country.

Bircan (2007) investigates the effects of FDI on the manufacturing sector in terms of wages and productivity, models are estimated in order to demonstrate the impact of plant-level foreign equity participation on wages. The results imply that “foreign plants pay on average higher wages to their workers, and both production and non-production workers benefit from foreign ownership,” which might be interpreted as more FDI participation increasing the wage inequality within the plants, as well as across them.

Herzer & Nunnenkamp (2011) examined the link between FDI and income inequality for a sample of ten European countries over the period 1980 to 2000 using a panel co-integration and causality techniques that are robust to omitted variables, slopes heterogeneity and endogenous regressors. They find that FDI has positive short run effects on income inequality; the effect of FDI on income inequality in the long run is found to be negative. Long run causality runs in both directions, which implies that a rise in inward FDI reduces income inequality, and in turn, higher income inequality leads to lower FDI inflows.

Ogunyomi, Daisi and Oluwashikemi (2013) examined the impact of economic globalisation on income inequality and economic growth in Nigeria for the period 1986-2010. Using a Static Econometric Model, the study finds that economic globalisation widens income inequality and reduces economic growth in the Nigerian economy.

Ucal, Bilgin and Haug (2014) explored the impact of FDI on income inequality in Turkey for the period 1970- 2008. Using ARDL modelling approach, the study finds that FDI increases income inequality in the

short and the effect disappears in the long run. These results are in line with the Kuznets (1955) hypothesis. Similar findings were found by (Aghion & Howitt, 1998; Aghion & Howitt, 1998; Barnejee and Duflo 2003; and Dahan and Tsiddon, 1980).

Im & McLaren, (2015) investigated the effects of inward FDI on income distribution and poverty rates in developing countries using a panel data. To address the FDI endogenous problem, they use time-varying instruments to cater for shocks to the attractiveness of investments in neighbouring countries. In their findings without time-varying instruments, FDI seems to have no effect on income inequality and a small positive effect on poverty. However, with instruments, they find that FDI decreases both income inequality and poverty in the host country.

Msweli (2015) examined the relationship between income inequality and FDI in South Africa for the period 1956- 2011. The study found a negative relationship between the variables over the observed period. These findings imply that FDI reduces income inequality in South Africa. This paper argues Msweli (2015) did not control for trade openness, inflation and literacy rates which are highlighted in the literature as contributing factors to income inequality. Thus, this paper advances from this study by controlling for the omitted variables and using a different data set.

4. Methodology

This is an exploratory case study approach which aims to quantitatively examine the effect of FDI on income inequality in South Africa for the period 1970 – 2012.

4.1 Model specification

Income inequality is relatively high in South Africa when compared to other African countries. The FDI-income inequality link is multidimensional. This study examines the link in the South African context. FDI is used as the main explanatory variable. A linear model is developed to test the hypothesis of causality and a long run relationship. This paper examines the effects of the following variables on income inequality in South Africa: FDI, inflation (INF), trade openness (TOP), and GDP per capita (GDPPC).

The model is specified as follows:

$$IncomeInequality = f (FDI, INF, TOP, GDPPC).....(1)$$

Where:

Inequality is measured by the estimated household income inequality (EHII), inward *FDI* is measured as a percentage of GDP, *INF* is annual inflation measured by consumer price index, and *TOPEN* is the sum of exports and imports, and GDP per capita is measured as a percentage of GDP.

4.2 Econometric Procedure

This paper examines the short and long term relationship between income inequality and inward FDI by estimating the Auto-Regressive Distributed Lag (ARDL) approach to cointegration. Firstly the time-series properties of the data are examined before the model of income inequality can be estimated. In South Africa there is no long run time-series data for the Gini coefficient which is a popular measure of income inequality, where it is available there are gaps, which makes it inappropriate for a time series analysis. Thus, this paper uses annual data drawn from the University of Texas Estimated Household Income inequality database from 1970 to 2012 for income inequality and for explanatory variables; data is obtained from the World development indicators database.

According to Gujarati (2009) the presence of a unit root implies that the time series under investigation is non-stationary; while the absence of a unit root shows that the stochastic process is stationary. The stationarity of the macroeconomic time series is considered and the data are analyzed for a unit root at levels and at first difference using the Augmented Dickey Fuller test (ADF) and the Phillips Perron test.

After testing for a unit root in the time series, the paper examines the long run relationship of income inequality with its explanatory variables. Cointegration tests based on residuals are sensitive to the specification of the test regression and the results can lead to contradictory results, particularly when there are than two *I(1)* variables in the analysis, (Gujarati 2009). Thus, the income inequality model is estimated within the econometric methodologies, particularly cointegration analysis and error correction models which allow for the estimation of both short and long run dynamics. To this end, in order to estimate a long run relationship, the study uses Auto-Regressive Distributed Lag (ARDL) approach to cointegration. This model is preferred for its ability to produce reliable estimates small samples and also provides a cross-check for the robustness of the results, (Gujarati, 2009). It is worth noting that the model can be applied irrespective of whether the variables are *I(0)* or *I(1)*.

To this end, the study considers the following general ARDL model:

$$\Delta Y_i = \beta_0 + \pi_{yy} y_{t-1} + \pi_{yx} X_{t-1} + \sum_{i=1}^p \theta_i \Delta y_{t-1} + \sum_{j=0}^{m-1} \phi_j \Delta x_{t-j} + \theta w_t + e_t \dots\dots\dots(2)$$

Where:

π_{yy} and π_{yx} are long run multipliers; β_0 Intercept of the relationship in the model or a constant.

θw_t is a vector of exogenous components. Lagged values of ΔY_t and Δx_{t-j} are used to model the short run dynamics of the variables, e_t is the Error term.

Thus, the income inequality model is specified as follows:

$$IncomeInequality_t = \beta_0 + \beta_1 FDI_t + \beta_2 Inf_t + \beta_3 Topen_t + \beta_4 GDPPC_t + e_t \dots\dots\dots(3)$$

After testing for unit root, equation (2) is estimated to examine if there is a long run relationship among selected the variables by carrying out an F-test. If the F-statistic exceeds the upper critical value, the null hypothesis of no long run relationship is rejected irrespective of whether the time series are integrated of the same order. And we fail to reject the null hypothesis if the opposite happens. Secondly, if a long run relationship is detected among the variables, there is an error correction representation, thus the next step of the analysis estimates the error correction model (ECM version of ARDL). This model measures the speed of adjustment back to the long run equilibrium after a short run shock.

4.3 Variable Description

Concept being measured	Variable and Description
Foreign Direct Investment	Inward FDI as a proxy for Foreign Direct Investment which is measured as a percentage of GDP. Kuznets hypothesis predicts a U-shaped relationship between FDI and income inequality for developing countries. Since South Africa is a developing country, a positive relationship between income inequality and FDI is expected.
Macroeconomic stability	Inflation is used as a proxy for macroeconomic stability and is measured as a percentage of consumer price index. Ghossoub and Reed, (2017) state that as the financial system of an economy grows income inequality gap tends to widen as people become richer while others remain poor. Thus, a positive relationship is expected.

Trade openness	The summation of exports and imports measured as a percentage of GDP is used as a proxy for trade openness. A positive relationship between income inequality and FDI is expected as literature suggests that trade liberalization widens income inequality.
Market size	GDP per capita is used to measure the market size. Literature suggests that market size is a significant determinant of FDI particularly in developing countries. A negative relationship is expected between income inequality and GDP per capita, as the market size expands more job opportunities are created and thus inequalities decline.

4.5 Data and Sources

This paper uses annual data in estimating the model is annual and covers the period 1980- 2012, but was not available for the entire period for income inequality variable and extrapolation was done only for this variable. The study period was chosen due to data limitations. Data for control variables was obtained from the World Development Indicators.

As much as the Gini coefficient is the most popular measure of income inequality across the world, however, annual and continuous income inequality data is scarce and when it is available it has gaps. Thus, using the Gini coefficient limits the time series analysis and the number of observations for the econometric model tested in this study due to intervals. Therefore, income inequality data is obtained from the Estimated Household Income Inequality (EHII) database produced by the University of Texas inequality project (available at <http://uti.gov.utexas.edu/data.html>). The major advantage of the EHII source is that are fully comparable across space. This data set combines information from the United Nations Industrial Development Organisation (UNIDO) with information from the Deininger and Squire data set; it also uses other relevant information, such as the ratio of manufacturing employment to total population, the degree of urbanization and population growth.

5. ESTIMATION RESULTS

This section presents empirical results on the relationship of income inequality and FDI, INFL, TOP, GDPPC in South Africa.

5.1 Unit Root Test Results

In order to test for stationarity among the selected variables both the Augmented Dickey Fuller (ADF) and Phillips Perron were performed. Both tests indicate that except for FDI the variables were non-stationary at levels but became stationary after first difference. Even though the variables are not integrated of the same order, the model will not be affected as it is not sensitive to the order of integration.

5.2 ARDL Model Results

The ARDL analysis begins with testing for a long run relationship. This approach encompasses the comparison of the F-statistic against the critical values, as stated in (Pesaran, Shin, and Smith, 2001) These authors report two sets of critical values that provide critical bounds for all classifications of the regressors into I(1), purely I(0) or mutually cointegrated. According to the L.M test, the F-statistic with income inequality as the dependent variable is $F = 4.7$. The upper bound critical value was calculated with stochastic simulations as 3.49 at 5% level of significance and 3.09 at 10% level of significance. This leads to the rejection of the null hypothesis of no cointegration. In the analysis, a maximum of four lags were used to estimate the ARDL model which was chosen by both AIC and SBC.

Table 1: Bound Test

Test Statistic	Value	k
F-statistic	12.37781	4

Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.2	3.09
5%	2.56	3.49
2.5%	2.88	3.87
1%	3.29	4.37

Thus, the results for the long run model estimated through the use of ARDL are presented in Table 1 above.

Table 2: Estimated Long run Coefficients

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDI	0.008030	0.001572	5.107731	0.0000
LINFL	0.003681	0.004335	0.849163	0.4049
TOP	0.001287	0.000474	2.715661	0.0126
GDP_PER_CAPITA	-0.000010	0.000006	-1.806774	0.0845
C	-0.001348	0.017825	-0.075629	0.9404

Table 2 presents estimated coefficients of the long run relationship among the observed variables. The results for the long run model estimated using ARDL indicate that FDI has a positive effect on income inequality in the long run, this is shown by a positive coefficient (0.008030) and this effect is statistically significant indicated by a p-value of (0.0000). These results are consistent with the priori expectation based on theoretical links between FDI and income inequality, which states rising FDI inflows could positively influence income distribution particularly in developing countries. The Kuznets hypothesis of increasing and decreasing income inequality, states that, in developing countries economic growth initially leads to widening income inequalities, however, as the economy develops further income inequality narrows as more people move from the unskilled labour intensive agricultural sector to better paying jobs in other sectors. This seems to be the case in South Africa, where most of FDI inflows particularly from China go to the manufacturing sector which is capital intensive, thus more skilled workers are demanded while the demand for unskilled workers deteriorates, thereby widening the gap between skilled and unskilled workers. This contradicts the HO theory which assumes labour intensive and capital intensive production techniques in developing and developed countries respectively. These findings are consistent with (Ucal, Bilgin, and Haug, (2014) in Turkey; Ogunyomi, Daisi and Oluwashikemi (2013) in Nigeria; Choi, (2006); Gopinath and Chen (2003); Feenstra & Hanson, (1997) in developing countries.

To this end, the null hypothesis that FDI has no effect on income inequality is rejected.

Inflation and trade openness positively influence income inequality in the long run; this is indicated by positive coefficients for both variables. However, the effect of inflation is not statistically significant while trade openness is statistically significant at 5 % level with a p-value of (0.0126). This implies that a 1% rise in trade openness widens the inequality gap in South Africa. For instance, local firms initially

benefit from FDI-induced spill overs such as technology; however, as competition intensifies due to an increase in the number of MNEs, domestic firms can no longer compete with firms from well-resourced countries. Consequently, they shut down which leaves many unemployed while skilled workers on the other hand are in demand. He, Hao, and Zhang (2014) confirm that, South Africa's income inequality gap widened after it joined the World Trade Organisation (WTO).

Furthermore, GDP per capita has a negative coefficient which implies an inverse relationship between income inequality and GDP per capita even though it is not statistically significant. These results are as expected on the basis of economic theory. As people move from unskilled labour intensive agricultural sector to more skilled labour intensive sectors, their per capita incomes also rise thereby narrowing the inequality gap.

Table 3: Estimated Short run coefficients

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINCOME_INEQUALITY(-1))	0.341640	0.131877	2.590592	0.0167
D(FDI)	0.006532	0.001489	4.387289	0.0002
D(FDI(-1))	-0.004183	0.001763	-2.372261	0.0268
D(LINFL)	0.005227	0.004808	1.086970	0.2888
D(TOP)	-0.001759	0.000563	-3.127505	0.0049
D(TOP(-1))	-0.003449	0.000629	-5.486687	0.0000
D(TOP(-2))	0.000473	0.000551	0.858760	0.3997
D(TOP(-3))	-0.001985	0.000540	-3.676763	0.0013
D(GDP_PER_CAPITA)	-0.000027	0.000016	-1.683609	0.1064
D(GDP_PER_CAPITA(-1))	0.000021	0.000018	1.168569	0.2551
D(GDP_PER_CAPITA(-2))	-0.000088	0.000018	-4.792783	0.0001
D(GDP_PER_CAPITA(-3))	-0.000054	0.000020	-2.776249	0.0110
CointEq(-1)	-1.905278	0.200573	-9.499167	0.0000

Figure 3 presents the short coefficient estimates obtained from the Error Correction Model (ECM) version of the ARDL. These coefficients indicate the speed of adjustment back to equilibrium after a short run shock. According to (Gujarati & Porter, 2009) when the error correction term is significant and the sign of the coefficient is negative, a conclusion can be drawn that there exist a long run causality running from explanatory to the dependent variable. In table 3, the error correction term is negative (-

1.905278) and is statistically significant. This implies that there is a short run relationship between income inequality and the explanatory variables.

5.3 Diagnostic Tests

Diagnostic tests for serial correlation, heteroscedasticity, and normality test were run, and all the tests support the ECM model as specified in table 2. The model is normally distributed with no serial correlation and heteroscedasticity. Additionally, a cumulative sum (CUSUM) of the standardized recursive residual of the ARDL regression for analyzing the stability of the model was also used.

Figure 3: CUSUM

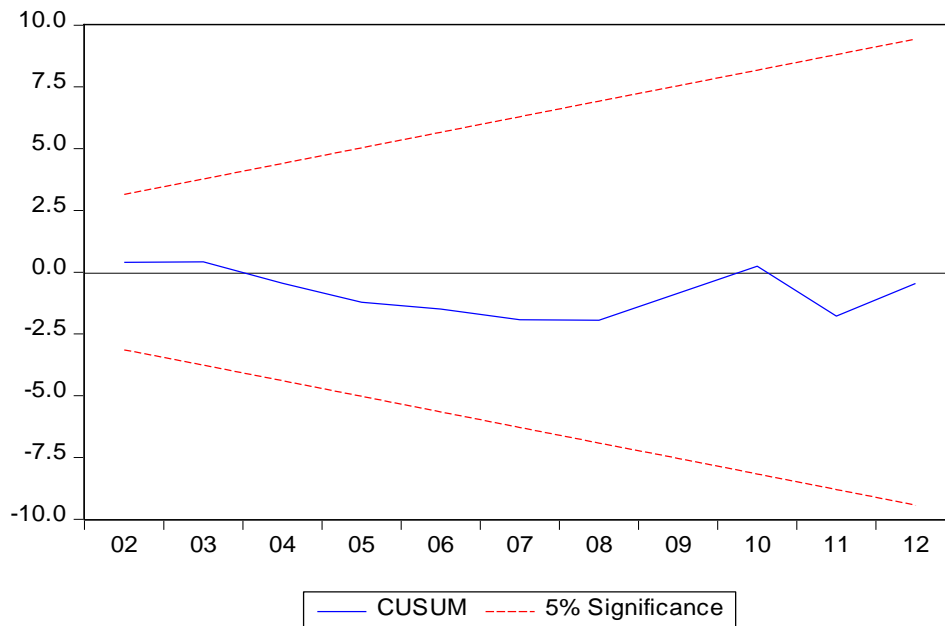


Figure 3 indicates that the CUSUM is within the 95% confidence band and thus this confirms the stability of the ARDL model coefficients for income inequality in South Africa.

6. Conclusion and Recommendations

This study examined the impact of FDI on income inequality in the South African context. The ARDL model is applied to examine the long run relationship between income inequality and FDI using an error correction version of the ARDL. The model suggested a long run as well as a short association between income inequality and the explanatory variable. FDI positively influence income inequality in South Africa and it is statistically significant. Since FDI is the main explanatory variable, these results imply that variations in income inequality can be explained by FDI. Inflation and Trade openness also have a

positive effect on income inequality though it is not significant for inflation; While GDP per capita is inversely related to income inequality but statistically insignificant.

These results are very crucial for the South African economy which is still in its industrializing stages. On one hand, in order for the South African economy to develop, economic growth is a prerequisite. According to the theory, economic growth is a result of economic globalization, whereby countries are encouraged to open their economies to trade with other countries. On the other hand, as much as FDI is good for growth in the host country, the results indicate that it has detrimental effects on income inequality in the host country.

To this end, in order for South Africa to achieve sustainable and inclusive growth, policies aimed at attracting vertical FDI should be encouraged and implemented. Not only will these bring about sustainable economic growth but income inequality gap will also be narrowed as more people will have sustainable jobs. However, this type of FDI is sensitive to policy uncertainty in the host country, thus more stability in terms of policies is recommended.

Alternatively, South Africa should encourage an export-led economic growth. This strategy would address the current high rate of unemployment, poverty and inequality.

A future study could be done using firm level database to determine sectoral income inequality.

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8. Appendix 1

Descriptive Statistics

	LINCOME_INE QUALITY	FDI	LINFL	TOP	GDP_PER_CA PITA
Mean	0.003205	0.754684	0.007896	51.57456	6353.777
Median	0.003517	0.399067	0.028570	51.41980	6247.285
Maximum	0.057664	5.983032	0.897594	72.86539	7546.814
Minimum	-0.047668	-0.840538	-1.442000	37.48746	5517.513
Std. Dev.	0.018981	1.245811	0.361524	7.418529	551.3391
Skewness	0.012785	2.159423	-1.225376	0.284573	0.699014
Kurtosis	4.684548	8.852086	7.964901	3.255999	2.772024
Jarque-Bera Probability	4.967123 0.083446	92.57386 0.000000	53.64876 0.000000	0.681559 0.711216	3.511301 0.172795
Sum	0.134599	31.69672	0.331622	2166.132	266858.6
Sum Sq. Dev.	0.014771	63.63380	5.358683	2256.418	12462966
Observations	42	42	42	42	42

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.355605	Prob. F(4,7)	0.8327
Obs*R-squared	6.248737	Prob. Chi-Square(4)	0.1813

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.753121	Prob. F(25,11)	0.7331
Obs*R-squared	23.35511	Prob. Chi-Square(25)	0.5568
Scaled explained SS	2.239628	Prob. Chi-Square(25)	1.0000