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This paper is a draft submission to the

Inclusive Growth in Africa: Measurement, Causes, and Consequences

20–21 September 2013 Helsinki, Finland

This is a draft version of a conference paper submitted for presentation at UNU-WIDER's conference, held in Helsinki on 20–21 September 2013. This is not a formal publication of UNU-WIDER and may reflect work-in-progress.

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**The Effects of Globalization on Income Inequality in LDCs: Panel data analysis
for the period 1995-2010**

Ana Catarina Kaizeler (PhD Student)- SOCIUS, Research Centre in Economic and
Organizational Sociology

Horácio C. Faustino (PhD Supervisor)- ISEG, Technical University of Lisbon and
SOCIUS

Correspondence:

Ana Catarina Kaizeler (corresponding author)

Email: catarinakaizeler@gmail.com

ABSTRACT

This paper analyses the effects of globalization on income inequality in the 35 least developed countries over the period from 1995 to 2010. Different measures of globalization were applied, and specifically: trade openness, foreign direct investment (FDI) inflows and the KOF globalization index. The panel data analysis findings indicate that globalization measured by trade openness reduces income inequality, whereas FDI is positively linked to inequality. When applying the global KOF index, our results find that globalization increases income inequality in these countries. We furthermore also test the Kuznets (1955) hypothesis about an inverted U relationship between Gini index and per-capita GDP.

Jel Classification: C23, O15, O57

Key Words: Globalization, Income Inequality, Lesser Developed Countries, Kuznets Hypothesis.

2. Introduction

The effects of globalization on the division of incomes and the poverty prevailing in the least developing countries (LDCs) have been widely studied even while the conclusions reached have remained contradictory. While on the one hand, there are authors defending how globalization drives a reduction in the inequalities existing in these countries (Celik and Basdas, 2010; Zhou, Biswas, Bowles and Saunders, 2011; Hesmati and Lee, 2010; Tayebi and Ohadi, 2009; Sala-i-Martin and Pinkovskiy, 2010; Bergh and Nilsson, 2010), other studies report the opposite empirical conclusions testifying to a rise in levels of inequality (Goldberg and Pavcnik, 2007; Dreher and Gaston, 2006; Majeed and McDonald, 2010). Furthermore, there are also studies that report that globalization holds no significant effect over the division of national incomes (Bussmann, Soysa and Oneal, 2005; Solimano, 2001).

This diversity of conclusions stems from the different empirical models adopted alongside their respective parameters, variables and disparate databases, which, in turn, draws due attention to the difficulties inherent to measuring both globalization and inequality. Compounding such issues, the groups of countries and the periods under analysis vary from study to study with some authors analysing the effects of globalization on inequality in developed countries (see, for example, Faustino and Vali, 2013), while others study its effects on inequality in developing countries (see, for example, Goldberg and Pavcnik, 2007; Sala-i-Martin and Pinkovsky, 2010; Majeed and Macdonald, 2010).

Some researchers focus on the specific details generated by case studies and including, for example, Hussain, Chaudhry and Mahmood-ul-Hasan (2009) who analyse the effects of globalization on inequality in Pakistan between 1972 and 2005, and Daumal (2010) who studies the effect of opening up trade on the regional inequalities prevailing in India and Brazil. In Portugal, trends in inequality and the break down in earnings in society have been studied by Pereirinha (1988) and widely researched in terms of poverty by Rodrigues (2008).

Furthermore, the literature contains studies deploying simple variables for globalization, reflecting the degree of economic openness or the flows in foreign direct investment (FDI) while still others apply more complex variables reaching beyond the economic dimension to globalization to incorporate the political, social and cultural facets, through recourse to composite indicators such as the KOF index (see, for example, Dreher, Gaston and Martens, 2008; Kearney, 2003). The survey of theoretical and empirical studies does justify the utilization of other variables for explaining inequality in the division of incomes. Variables for factors such as population demographics (growth and ageing), corruption, literacy, levels of education, inflation, the redistributory role of the state, the unemployment rate, international aid, etcetera, should also be included within the scope of empirical studies.

This current study estimates the effects of globalization on income inequalities in 35 developing countries identified by the World Bank as the states with the lowest incomes over the period between 1995 and 2010. We first consider the traditional measures of globalization – the level of economic openness and foreign direct investment flows –

and then move onto the KOF composite indices. The objective involves testing whether or not the different measurements of globalization do or do not result in significantly different conclusions. The estimates are carried out through recourse to panel data and a fixed effect estimator.

We structure the paper as follows: following our introduction, in the next section, we set out the concept of globalization and across its different measurements - simple and composite; the third section presents the concepts surrounding inequality in the division of earnings and their different measurements before the fourth section details the explanatory hypotheses, specifies the econometric models and provides analysis of the results while the fifth and final section contains the main conclusions. In annex, we enclose the table listing the group of countries subject to analysis.

3. Globalization

3.1 Concept

Globalization is a process only susceptible to definition by recourse to various of the different fields making up the social sciences. In the case of economics, the phenomenon gets contextualized by the interactions ongoing in terms of commercial relations and international investment. However, globalization actually takes effect across various different dimensions, whether economic, political, social or cultural. As such, globalization results from a historical process of change in the relations between societies and individuals across all levels, sustained by technological developments in communications and transports, and enabling an acceleration in the spread and flow of information and the mobility of both labour and capital.

The debate has broadly focused on the theoretical and real costs and benefits of economic globalization to lesser developed countries and the effects on the inequality and poverty of nations. According to the proponents of economic liberalization, globalization has contributed towards cutting down poverty and inequality in recent years due to greater levels of economic integration that have driven greater efficiencies in resource utilization at the global level as countries and regions are better able to specialize themselves in accordance with their respective comparative advantages. In contrast, the anti-globalization argument assumes that the richer and more prosperous countries hold little interest in equity and, far from falling, poverty and inequality have been on the increase in recent decades and in large part very much due to the forces released by globalization (Wade, 2004).

International institutions such as the World Bank (WB), the International Monetary Fund (IMF) and the World Trade Organization (WTO), as well as other multilateral economic organizations are among the entities deemed actors in globalization related processes even while their roles and performance have frequently been criticized for overly defending the interests of more developed countries to the detriment of their lesser developed peers (Stiglitz, 2003; Singer, 2004).

3.2 Simple Globalization Indicators: Trade Liberalization and Foreign Direct Investment

Various authors focus their analysis on the effects of globalization exclusively in terms of the economic facet: trade and FDI (Bussmann, Soysa and Oneal, 2005; Goldberg and Pavcnik, 2007; Celik and Basdas, 2010; Hussain, Chaudhry and Mahmood-ul-Hasan, 2009).

According to the Hecksher-Ohlin (HO) model and the Stolper-Samuelson (S-S) theorem, trade liberalization represents an opportunity to developing countries. According to the HO model, countries hold comparative advantages and will therefore export those goods that draw intensively upon the factors of relative abundance in the country. Furthermore, the S-S theorem defends how free trade leads onto increases in nominal and real remunerations in the factors of relative abundance in the country and lower nominal and real remunerations in scarce factors. As developing countries are relatively abundant in labour, free trade will lead to an increase in the nominal and real remuneration of the factor of labour and lower the nominal and real remuneration of the scarce factor (the factor of capital). This leads to a downturn in the level of inequality prevailing in these poorer countries.

Hence, we may expect that developing countries engaging in greater economic openness to trade cuts down on the inequality in earnings in effect in this set of countries.

Both the HO model and the S-S theorem assume that technology is identical in every country even though that does not actually happen in reality with the positive effects of trade liberalization also depending on technological transfers between countries. Furthermore, this spread of technology also relies on the work of specialist labour, which drives a greater level of wage inequalities.

Feenstra and Hanson (1997) defend how the development of technologies and communications leads multinationals to fragment their operations, that is, to transfer the non-qualified labour intensive stages of production to countries with an abundance of this factor while production processes based on qualified labour go to other countries. This thereby raises the real salaries of qualified labour and cuts those of non-qualified workers and, consequently, boosts the disparities in the division of income.

With the introduction of the fragmentation of production concept, in which the trade in goods becomes broadly replaced by a trade in tasks (intermediary goods and services), some economists such as Grossman and Rossi-Hansberg (2006) and Baldwin and Robert-Nicoud, (2010) propose the idea of a new phase in the globalization process, in which the international trade theories, based on the free trade in goods and on the effects on real salaries, are simply not appropriate to the realities prevailing within the framework of contemporary international trade.

As regards the economic theory on foreign direct investment (FDI), Mundell (1957) argues that the increase in FDI to developing countries brings about a reduction in the inequality in the division of income as those flows lead to an increase in the capital stock of the recipient countries, with positive effects on the marginal productivity of labour (providing more capital per worker) that drives an increase in the employment salaries in these countries. Furthermore, the new technologies introduced by the

multinational firms constitute an enormous benefit to the destination countries, benefiting all workers even those with less qualifications given that they foster learning and adaptation processes enabling the qualitative evolution of all economic actors.

In order to sustain this theoretical position, we may expect that the FDI flows heading into the countries under analysis tend to lower the level of inequality over the period in question. However, and in accordance with dependence theory, the very opposite may also come about and instead forcing an increase in inequality given that developing countries become dependent on trade and FDI and for this reason are extremely vulnerable to the purely business based interests of multinational corporations (Stringer, 2006).

3.3 Composite Globalization Indicators

The literature reveals that beyond these economic dimensions, the social, cultural and political components of globalization also need taking into consideration given that they have their own impacts on inequality and the poverty prevailing in the countries (Dreher and Gaston, 2006; Heshmati and Lee, 2010; Bergh and Nilsson, 2010).

Thus, composite indicators get deployed in efforts to analytically cover all the different dimensions to globalization. The most commonly applied indicators are the Kearney indicator proposed by Kearney (2003) and the KOF Indicator introduced by Dreher (2006) and updated by Dreher, Gaston and Martens (2008).

We do not adopt the Kearney indicator for our model given that it only analyses 72 countries, the majority of them developed states and without any data on the 35 countries under analysis here.

The KOF Indicator groups together three dimensions for analysis: economic globalization, social globalization and political globalization with the first involving the measurement of the flows of goods, capital and services over long distances, hence the current volumes of trade and investment, as well as the restrictions that each country imposes on flows of trade and capital. The social component to the KOF index gauges factors such as levels of telephone traffic, the number of Internet users and the number of IKEA and McDonalds` outlets per capita. The political component to KOF measures the number of embassies, participation in international organizations and in United Nations Security Council missions.

The KOF index converts these observations into a scale running from 1 to 100 with the higher the number indicating a higher level of globalization.

4. Inequality

4.1 Concept

The concept of inequality is closely bound up with that of poverty even though earnings inequality focuses upon the extent of the disparity between the richest and the poorest while poverty refers to an inability to meet one`s basic needs and may be considered as an extreme case of earnings inequality.

Inequality may be analysed from two perspectives between states or within the specific framework of each: national inequality (Solimano, 2001).

In terms of perspectives on inequality between states, we find a further two concepts: international inequality and global inequality. International inequality refers to the inequality between countries due to the differences in their mutual per capita earnings (analysed according to parity of purchasing power and across two facets: each country holds an equal weighting or each country is evaluated according to its level of population). Global inequality takes the world citizen as its unit of analysis and not countries, with the distribution of earnings per world citizen a ratio taking into account the pattern of distribution in his/her home country and the distribution of earnings in this country in relation to other countries.

National inequality measures dispersion in the distribution of earnings within a country and depends on the prices of factors, demographic patterns, macroeconomic cycles, technological change and the utilization of productive resources inside the country.

4.2 Explanatory Factors of Inequality

As the main leverages of globalization are the liberalization (opening up) of economies to external competition and foreign direct investment, associated with the activities of multinational firms, the main explanatory variables (hypotheses) measure the level of this economic openness (exports + imports as a percentage of GDP, or the semi-sum of exports and imports relative to GDP) and net inflows of FDI (as a percentage of GDP).

Economic growth has also been one of the explanatory factors for inequality in the division of income and some authors defend the need for greater economic growth to aid in combating poverty. However, and in accordance with the Kuznets hypothesis (1955), in order to grow, countries first begin by causing inequalities in income and only when they attain a particular level of economic growth does this situation invert. Over time, the relationship between the variables for growth and inequality may be graphically depicted by an inverted U shape.

This hypothesis has long since been subject to testing with the empirical results generated proving controversial due to the different methodologies applied and the different country samples. For example, Dreher and Gaston (2006) Tayebi and Ohadi, (2009) were not able to verify the Kuznets hypothesis while Faustino and Vali (2013) and Majeed and Macdonald (2010) put forward evidence as to its existence.

We shall also test the Kuznets hypothesis for this set of countries.

There are other factors influencing inequality beyond growth and also subject to widespread analysis in the literature. The demographic effect (growing and ageing populations), financial development, the level of urbanization, the active population in ratio to the total population, the unemployment rate, the level of industrialization, the role of the state in redistribution, international aid, corruption, the existence or otherwise of democracy, and the indices for governance and economic freedom are just some of the examples of the simple or composite variables deployed in the empirical analysis of the evolution of inequality (Zhou, Biswas, Bowles and Saunders, 2011;

Bergh and Nilsson, 2010; Faustino and Vali, 2013; Majeed and Macdonald, 2010; Dreher and Gaston, 2006; Rodrigues, 2008; Herzer and Nunnenkamp, 2012).

4.3 Measuring Inequality

There are various indicators for measuring income inequality, including the Gini coefficient, the Theil index, the Atkinson index, the Schutz coefficient, the Hoover index, the Lorenz curve, the decile dispersion ratio as well as the direct measurement ratios such as, and for example, dividing the total earnings percentage by the earnings percentage of the poorest members of society. However, the most commonly applied methodology in empirical studies in this field make recourse to the GINI coefficient.

This coefficient varies between 0 and 1, with a score of 0 identifying complete equality with a result of 1 correspondingly representing total inequality. Hence, the extent to which the results vary raises the inequality in the division of earnings in any particular country.

This may be calculated for gross earnings (before taxation and subsidies), net income (after taxation and transfers) as well as through analysis of the costs of consumption. The analytical base may also differ between individuals and family households.

The existing databases are demonstrably non-exact and incomplete in turn conditioning the measuring of inequality and the reliability of the results attained. However, in 2009, Frederick Solt launched the “Standardized World Income Inequality Database (SWIID)” database and purpose designed to overcome the shortcomings in the most commonly applied databases hitherto in empirical analysis (Luxembourg Income Study - LIS and WIID – the World Institute for Development Economics Research, the United Nations University) and incorporating an algorithm enabling standardization and the elimination of statistical discrepancies. We consider SWIID to currently be the most complete database in both geographic and temporal terms given its inclusion of comparable net and gross inequality indices on 173 countries from 1960 onwards.

5. Econometric Model

5.1 Database

We established a 35-country matrix in accordance with the World Bank data on the lowest income countries with data covering the period between 1995 and 2010. The database that served as the foundation was mostly sourced from the World Development Indicators (WDI), published by the World Bank and Gwartney, Hall and Lawson (2011) database run by the Fraser Institute for attributing the Economic Freedom index. We also applied the Gini coefficient to the Solt (2009) database and the KOF globalization index to the Dreher (2006) database updated by Dreher, Gaston and Martens (2008).

5.2 Dependent Variable

We apply the Gini coefficient as the dependent variable in this empirical analysis.

GINIMARKET reflects the inequality coefficient calculated based on gross earnings, prior to taxation and subsidies in accordance with the Solt (2009) and SWIID databases.

5.3 Independent Variables and Hypothesis Formulation

In order to measure globalization, we consider variables defining the extent of trade liberalization, foreign direct investment (FDI) and the KOF composite index.

The level of economic openness (*OPEN*) gets gauged in empirical studies according to two measures: *OPEN1* reflecting the total weighting of exports as a percentage of GDP and *OPEN2*, incorporating the sum of imports and exports in proportion to GDP. We verified that the *OPEN1* variable returned better results in terms of the statistical significance of the variables and hence, while both were theoretically robust, we opted to apply *OPEN1*.

For FDI, we applied the net flows as a percentage of GDP sourced from the FDI item in the World Bank database.

For the composite index, we deploy the global KOF index to the variables of *KOFECON*, *KOFPOL* and *KOFSOC* representing the economic, political and social components of the indicator.

The per capita Gross Domestic Product variable is represented by *GDPPPP* (GDP per capita, purchasing power parity in current US dollars). We additionally introduced the square ($GDPPPP^2$) to test the Kuznets hypothesis.

For education, we applied the *ENROLTER* variable that covers the percentage of persons enrolled in universities out of the group of persons who completed secondary school within the last five years.

The effects of demography and population ageing on inequality are established through *POPGROW* that incorporates the annual population growth rate, and the *OLDPOP* variable that identifies the percentage of persons aged over 65 within the framework of the total population.

In order to assess the impact of employment versus unemployment in the inequality prevailing, we deployed the *LABOURRATE* variable depicting the population percentage aged over 15 and in employment.

The inflation effect on inequality gets tested through the variable *INFGDP*, with inflation measured as a deflator for GDP.

The Fraser Institute economic freedom indicator, developed by Gwartney, Hall and Lawson (2011) (varying between 0 and 10, with scores closer to 10 implying greater levels of freedom), is a composite index incorporating five components: governance,

legal structure and security of property rights, currency stability, freedom of international trade, and the regulation of credits, work and business. We utilized the *EWI* variable to identify this indicator.

RURAL is the variable specifying the percentage of the rural population within the overall total population.

To verify the relationship between international aid and inequality, we attributed the *AID* variable corresponding to net official development aid and official aid donations received (in current US dollars).

Hypothesis Formulation:

H1. The greater the extent of economic globalization measured by degree of economic openness (*OPEN1*), the lesser the level of income inequality prevailing in developing countries.

This hypothesis is based on the HO model and the Stolper-Samuelson theorem according to which the liberalization of trade drives a reduction in income inequality in less developed countries (LDCs). We thus expect the *OPEN1* variable to return a negative coefficient.

H2. The greater the economic globalization measured by FDI, the lesser the level of inequality.

The Mundell (1957) theory underpins this hypothesis stating that we may expect increasing flows of FDI and the introduction of new multinational technologies, benefitting LDCs employees leading to an increase in capital with positive effects on the marginal productivity of labour driving increases in earnings and qualifications (over the medium and long term) of these workers.

Hence, we correspondingly expect the *FDI* coefficient variable to be negative. However, there is another theoretical argument that runs in the counter direction (for example, Stringer, 2006) and accordingly, the theoretical signal expected from this variable might be either negative (declining inequality) or positive (rising inequality).

H3. The greater the level of globalization as measured by the KOF indicator, the lesser the level of inequality.

For globalization measured through KOF and its respective components, we are unable to attain certainty over the results expected from this hypothesis given that the past empirical studies making recourse to this indicator have returned contradictory conclusions. Tayebi and Ohadi (2009) conclude that globalization does prove beneficial and reduces inequality. However, Dreher and Gaston (2006), analysing the economic, political and social components, reach the conclusion that globalization raises the level of inequality.

H4. The relationship between inequality measured by the GINI index and per capita GDP returns an inverted U shape.

This supposition seeks to verify the validity of the Kuznets hypothesis (1955) that holds there is a short term positive correlation between inequality and economic growth and hence from the outset we expect a positive result from the GDP per capita coefficient variable in countries with low incomes. This situation inverts when these countries attain a specific level of GDP per capita and GDP growth becomes beneficial to reducing earnings inequality. Testing the Kuznets hypothesis implies the specification of a quadratic function, hence, the *GDPPPP* variable and the square of this variable. We expect a positive result from *GDPPPP* coefficient variable while the $(GDPPPP)^2$ returns a negative result, reflecting a concave parabola in relation to the origin (inverted U).

H5. When the numbers attending tertiary education in developing countries rise, inequality in income distribution also rises.

Mamoon and Murshed (2012) suggest that developing country education policies tend to benefit those attaining higher levels of education to the detriment of primary school education, which suggests that the higher the levels of education in LDCs, the greater the rise in income inequality. We therefore expect the *ENROLTER* variable to return a positive coefficient.

H6. Population growth leads to a rise in the level of earnings inequality.

Majeed and Macdonald (2010) apply the population growth factor as an explanatory variable for inequality in their econometric model and we also opt to test this hypothesis in expectation of returning a positive value for the *POPGROW* variable.

H7. Population ageing induces a rise in income inequalities.

Various authors suggest that population ageing provokes inequalities in incomes through the correspondent reduction in the percentage of the active population within the overall total population (Bergh and Nilsson, 2010) and we hence experimentally test this relationship in the expectation of a positive result from the *OLDPOP* variable.

H8. A rising percentage of the population aged over 15 in active employment reduces the level of inequality.

Faustino and Vali (2013) test the hypothesis that higher unemployment levels means higher levels of inequality. In this article, we test this hypothesis that an increase in the numbers in employment serves to lower inequality as any increase in the earnings of those who were formerly unemployed will certainly reflect in a lowering of the Gini index.

H9. A rise in the inflation rate increases inequalities in the division of income.

We test this hypothesis in accordance with that suggested by various authors including Faustino and Vali (2013), and Albanesi (2007) and, within this framework, we expect the *INFGDP* variable to return a positive correlation with inequality.

H10. The greater the extent of economic freedom, the lower the level of inequality.

Bergh and Nilsson (2010) tested this hypothesis for a set of countries different to those incorporated into our sample here and hence we shall verify whether an increase in the Fraser Institute economic freedom composite indicator *EFW* lessens the indices for inequality in these 35 developing countries and expecting a negative coefficient from the variable in question.

H11. The greater the percentage of the rural population within the overall population, the greater the levels of inequality.

Some authors conclude that the dichotomy between the urban and rural populations impacts on inequality and the greater the extent of the rural population, the greater the levels of inequality (Bergh and Nilsson, 2010; Zhou, Biswas, Bowles and Saunders, 2011). We expect a positive coefficient from the *RURAL* variable.

H12. Rising levels of international aid mean rising levels of developing country inequality.

Nunnemkamp and Herzer (2012) conclude that international aid drives inequality due to the interests of local elites and the diversion of resources to their own benefits. We test this hypothesis for this group of countries and expect a positive correlation between the *AID* variable and *GINIMARKET*.

5.4 Econometric Model Specifications

In order to analyse the effects of globalization on inequality, we formulated the following equations:

1st Equation– applying simple globalization indicators: liberalization of trade and FDI

$$\begin{aligned} GINIMARKET_{it} = & \alpha_0 + \alpha_1 OPEN1_{it} + \alpha_2 FDI_{it} + \alpha_3 GDPPPP_{it} + \alpha_4 GDPPPP^2_{it} \\ & + \alpha_5 ENROLTER_{it} + \alpha_6 POPGROW_{it} + \alpha_7 LABOURRATE_{it} + \alpha_8 INFGDP_{it} + u_{it} \end{aligned}$$

In which $U_{it} = \eta_i + V_{it}$; $E(V_{it}) = 0$; $Var(V_{it}) = \sigma^2$

i= country and t= period of time

2nd Equation - applying composite globalization indicators: KOF

$$GINIMARKET_{it} = \alpha_0 + \alpha_1 KOFECON_{it} + \alpha_2 KOFPOL_{it} + \alpha_3 KOFSOC_{it} + \alpha_4 GDPPPP_{it} + \alpha_5 GDPPPP^2_{it} \\ + \alpha_6 ENROLTER_{it} + \alpha_7 POPGROW_{it} + \alpha_8 LABOURRATE_{it} + \alpha_9 INFGDP_{it} + u_{it}$$

3rd Equation - applying simple and composite globalization indicators: liberalization of trade and FDI

$$GINIMARKET_{it} = \alpha_0 + \alpha_1 OPEN1_{it} + \alpha_2 FDI_{it} + \alpha_3 GDPPPP_{it} + \alpha_4 GDPPPP^2_{it} \\ + \alpha_5 OLDPOP_{it} + \alpha_6 EWF_{it} + \alpha_7 RURAL_{it} + \alpha_8 AID_{it} + u_{it}$$

4th Equation - applying composite globalization indicators: KOF

$$GINIMARKET_{it} = \alpha_0 + \alpha_1 KOF_{it} + \alpha_2 GDPPPP_{it} + \alpha_3 GDPPPP^2_{it} \\ + \alpha_4 OLDPOP_{it} + \alpha_5 EWF_{it} + \alpha_6 RURAL_{it} + \alpha_7 AID_{it} + u_{it}$$

In the specification of the econometric model, the random residual term, U_{it} , summarized a set of effects that are not explicitly considered as explanatory variables. When we have observations for a set of countries (generically, for a set of individual statistics) and for various years, we consider the most appropriate option being to divide the random residual term into two components in which the factors impact differently in each country over the course of time (fixed effects in time but different from country to country) are reflected in the term η_i .

Dependent on whether these effects are converted into a set of unknown constants (parameters) or into a set of random variables, we then adopt either a fixed effects (FE) model or a random effects (RE) model. Even considering that the fixed effects are random, recourse to the Hausman test enables the decision over the best and most appropriate estimator to be applied. Under the null hypothesis both are consistent but only the RE estimator is asymptotically efficient (Ho: RE vs FE).

The four econometric equations analysed were subject to the Hausman test and we concluded as to the rejection of the null hypothesis in all the tests run, thus opting for the fixed effects estimator, assuming that all explanatory variables are exogenous and independent of their random residual term throughout every i and t .

5.5 Analysis of Results

Through recourse to the descriptive statistics, we may analyse some important characteristics of the variables in our model, such as the number of observations, the average, the median, the maximum, the minimum and the standard deviation.

In table 1, we find that there are very few observations for the three variables in contrast to the others. For the dependent variable, *GINIMARKET*, we find only 268 observations out of a universe of 560, with this shortage of observations also impacting on the explanatory variables *ENROLTER* and *EFW*, with 294 and 252 observations, respectively.

In comparing the average with the median, we encounter a majority of explanatory variables reporting a positive asymmetry, hence, the distribution is biased towards the left (average greater than the median), nevertheless, the *KOFECON*, *POPGROW*, *LABOURRATE*, *EFW* and *RURAL* variables display a different pattern of results with a negative asymmetry and a right-sided bias to their distribution (average lower than the median).

Table 1. Descriptive Statistics

Variable	OBS	Average	Median	Maximum	Minimum	Stan. Devia.
GINIMARKET	268	0.444402	0.441430	0.637954	0.295229	0.067128
OPEN1	489	22.96865	20.15342	98.76220	0.182969	14.19054
FDI	498	3.358623	1.589813	91.00733	-8289210	8.778505
KOF	482	35.20075	34.94322	58.74143	9.631883	8.558198
KOFECON	405	38.05744	38.20911	64.04031	10.27587	10.79095
KOFPOL	512	51.81052	50.07866	85.27245	11.09392	16.68540
KOFSOC	482	21.41877	20.91643	54.09542	6.984449	7.460231
GDPPPP	489	873.8884	812.6798	2260.717	82.07873	387.3962
ENROLTER	294	5.173064	2.409820	50.83947	0.297520	8.535288
POPGROW	560	2.405603	2.591489	9.770495	-1.392364	1.111977
OLDPOP	560	3.234840	3.024052	9.505045	1.886591	1.074662
LABOURRATE	560	73.55429	76.80000	89.60000	48.40000	10.61773
INFGDP	514	23.68264	7.037426	3789.209	-27.04865	175.3375
EFW	252	5.571947	5.717221	7.407402	2.881779	0.967232
RURAL	560	71.81581	72.08150	92.78900	39.79000	11.45829
AID	560	5.85E+08	3.51E+08	6.43E+09	13480000	7.63E+08

Table 2. Estimated Equations GINIMARKET

Independent Variables	1	2	3	4
OPEN1	-0.001231** (-2.038.497)		0.001090 (1.109.137)	
FDI	-6.60E-05 (-0.041418)		0.001981* (1.810.390)	
KOF				0.002425*** (3.671.234)
KOFECON		-0.000639 (-1.504.406)		
KOFPOL		0.001990*** (3.867.637)		
KOFSOC		0.003837*** (2.692.301)		
GDPPPP	-0.000191*** (-3.136.654)	0.000513*** (1.766.821)	0.000296*** (2.739.505)	5.36E-05 (0.746703)
(GDPPP) ²	1.73E-07*** (6.373.540)	1.87E-07*** (5.625.883)	-9.30E-08* (-1.759.690)	-3.45E-08 (-0.980252)
ENROLTER	-0.016376*** (-1.042.274)	-0.016784*** (-9.645.887)		
POPGROW	-0.007620*** (-2.482.995)	-0.005980* (-1.811.161)		
OLDPOP			0.308974*** (2.697.008)	0.264475*** (1.399.777)
LABOURRATE	-0.010295** (-2.321.449)	-0.014169*** (-2.832.072)		
INFGDP	0.000399*** (8.009.805)	0.000513* (1.766.821)		
EWF			-0.018793*** (-2.970.558)	-0.007587* (-1.910.829)
RURAL			0.006988** (2.139.363)	0.005196*** (2.817.357)
AID			1.75E-11** (2.177.249)	2.02E-11*** (3.636.863)
C	1.365.408*** (4.089.977)	159.0497*** (4.161.825)	-1.127.185*** (-3.590.227)	-0.821404*** (-4.187.152)
ADJUSTED R ²	0.682946	0.669238	0.785376	0.970879
N	170	162	110	114

***/**/* , Statistically significant at 1%, 5% and 10%, respectively..
t-statistics, heteroskedasticity corrected are in round brackets..

1st Equation – The only variable that returns no statistical significance is FDI, and hence we were correspondingly not able to ascertain any conclusions about the effects of FDI on inequality. Globalization via the liberalization of trade does cut down on inequality in the division of earnings as is theoretically forecast by international trade

theory (the HO model and the S–S theorem). As regards the Kuznets hypothesis and the existence of an inverted U shaped relationship between the Gini index and GDP per capita, our results point to a completely different relationship even while still parabolic: the relationship is U shaped but not an inverted U shaped, and hence inequality decreases when GDP per capita rises up to a certain point while for levels of GDP greater than that level drive an increase in inequality. Contrary to that expected for the *ENROLTER* and *POPGROW* variables, they do not generate the theoretically expected results. Thus, our results suggest that the greater the number of people attending tertiary education, the lower the level of inequality. Similarly, population growth, rather than increasing the level of inequality, brings about its decrease. The coefficients estimated for the *LABOURRATE* and *INFGDP* variables confirm the hypotheses formulated. Thus, an increase in the employment rate drives down inequality while upwards movements in the inflation rate lead to rising inequality levels.

2nd Equation – This equation differs from the first in the replacement of the simple *OPENI* and *FDI* globalization indices with composite variables that in this specific case contain the three KOF components. We are not able to reach conclusions as regards the KOF economic dimension on the Gini index as this variable proved statistically non-significant. However, the political and social dimensions to globalization did demonstrate a positive correlation with the inequality contrary to that expected during the course of the formulation of our hypotheses. Hence, increases in *KOFPOL* (the political facet to globalization) and in *KOFSOC* (the social dimension) cause rises to inequality. Furthermore, this regression does not fully confirm the Kuznets hypothesis even though the relationship is no longer portrayed with the U format returned by the first equation given that the $(GDPPPP)^2$ variable returns a positive result and thereby meaning that growth in GDP per capita raises levels of inequality whatever the respective level of GDP per capita. In addition, all the remaining variables are statistically significant with the coefficient results estimated equal to those returned by the first equation.

3rd Equation – This equation sought to provide analysis on the sensitivity of the first equation. Hence, maintaining the explanatory variables that reflect the hypotheses subject to greatest testing - *OPENI*, *FDI*, *GDPPPP* and $(GDPPPP)^2$ – and introduce other control variables, for example *OLDPOP* (the percentage of the population aged over 65), *EFW* (Fraser Institute economic freedom indicator), *RURAL* (percentage of the rural population within the total population), *AID* (official development aid). The results of this third equation identify the statistical significance of the *FDI* variable and suggest that an increase in FDI actually contributes to increasing inequality in recipient countries contrary to the theoretical position assumed by Mundell (1957). The estimates for this equation do not enable any conclusions to be reached as regards the effect of economic openness given that this variable does not prove statistically significant. We do verify the Kuznets hypothesis and the inverted U relationship between growth in GDP per capita and inequality. Furthermore, the coefficients estimated for the *OLDPOP*, *EFW*, *AID* and *RURAL* variables do confirm the theoretically posited expectations.

4th Equation – This equation replaces the simple globalization *OPENI* and *FDI* indices in the previous equation with the global *KOF* composite globalization variable. The findings conclude to the contrary of that expected and that globalization measured

by this indicator actually increase inequality, which enables us to conclude that there are other dimensions beyond the economic factors that influence inequality. It did not prove possible to test the Kuznets hypothesis in this regression given that the $GDPPPP$ and $(GDPPPP)^2$ did not attain statistical significance. The conclusions in relation to the other explanatory factors for inequality included into the equation were identical to those in the prior equation.

6. Conclusion

This study analysed the effects of globalization on the inequality in earnings in the 35 poorest developing countries while also considering different measures of globalization. The results of this study corroborate earlier conclusions while confirming the doubts posed by other studies and also raising new questions.

Hence, the conclusions point to the liberalization of these economies generating a positive effect on inequality (reducing its extent). Therefore, the rise in economic globalization measured by the level of economic openness corresponds to a reduction in inequality in the distribution of incomes in lesser developed countries. This result confirms the results returned by earlier studies by other researchers.

As regards the effect of foreign direct investment on inequality, our results do not confirm the theory of Mundell (1957) positing a negative correlation with inequality. On the contrary, the analytical results deploying either FDI or the global composite KOF index point to increases in levels of FDI contributing to rises in the Gini index (thus, rising inequality). This does not mean that over the long term such a situation does not invert and thus foreign direct investment should also always be analysed while deferred in time as its effects are not immediate. The spread effects of the technology transfers carried out by multinational corporations are similarly non-immediate and also incur implementation costs.

The KOF indicator was calculated in terms of both its global facet and its specific economic, political and social components. The results suggest that globalization measured in global terms leads to a rise in inequality in the division of incomes and contrary to the expectations prevailing. The results furthermore suggest that beyond the economic facet, the political and social dimensions to globalization hold influences over inequality. Rises to both the political dimension to globalization, $KOFPOL$, and the social aspects of globalization, $KOFSOC$, bring about higher levels of inequality.

Concerning the Kuznets (1955) hypothesis about an inverted U relationship between the Gini index and per-capita GDP, the results are contradictory depending on the specific equation. The results either suggest a relationship as an inverted U format or as a normal U format, or even as a positive correlation. A positive correlation most likely characterizes the earlier stages in the growth of LDCs.

We also tested other hypotheses potentially explicative of inequality beyond globalization. The results would indicate that rising inflation, population ageing, international aid and any increase in the rural population as a percentage of the total population all contribute to increasing inequality in the distribution of earnings in these

countries. Furthermore, any increase in the percentage of the population aged 15 years or over engaged in active employment and greater economic freedom result in a reduction of inequality.

However, there are explanatory variables where the coefficients estimated return results contrary to those expected. The greater the number of persons attending tertiary education, the lower the level of inequality (when an increase was expected) and growth in the population rather than raising inequality actually decreases it.

Some of the analytical questions still remain open. Firstly, there are other explanatory factors for inequality that were not taken into consideration by the model specifications, such as, and for example, taxation on earnings, the redistributive role of the state and corruption. Secondly, in this study all of the variables subject to study are exogenous. Certain variables may also display endogeneity and this factor needs taking into account in future studies.

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Annex 1: Countries

Afghanistan	Kyrgyz Republic
Bangladesh	Liberia
Benin	Madagascar
Burkina Faso	Malawi
Burundi	Mali
Cambodia	Mozambique
Central African Republic	Myanmar
Chad	Nepal
Comoros	Niger
Congo, Dem. Rep.	Rwanda
Eritrea	Sierra Leone
Ethiopia	Somalia
Gambia, The	Tajikistan
Guinea	Tanzania
Guinea-Bissau	Togo
Haiti	Uganda
Kenya	Zimbabwe
Korea, Dem. Rep.	