Reducing Inequality through Foreign Aid
– An Econometric Analysis

Jeena Akhtar

Supervisor: Johanna Palmberg
Södertörn University | Institution for Social Sciences
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Abstract

Global initiatives have caused renewed interest in the efficiency of aid and its impact on poverty. Whilst growth effects of foreign aid have extensively been analyzed, less attention has been paid to the distributional effect of aid. This paper aims to investigate the potential moderating effects of foreign aid on within-country income inequality using econometric analysis. Employing unbalanced panel data on 42 countries in the period 1990–2017, and conducting a multivariate regression analysis, this study finds no robust empirical support for the positive effects of foreign aid on income inequality.

Key words: Income Inequality, Foreign Aid, Regression Analysis, Fixed-Effects Model

Abstrakt

Globala initiativ har i allt större utsträckning ökat intresset för biståndets effektivitet i relation till fattigdom. Där biståndets effekt på den ekonomiska tillväxten har utforskats i hög grad, har mindre uppmärksamhet riktats mot dess effekt på inkomstfördelningen i landet. Denna uppsats ämnar till att undersöka om bistånd kan leda till en jämnare inkomstfördelning genom tillämpning av ekonometrisk metod. Genom att använda en obalanserad panel data för 42 länder över perioden 1990-2017, och utföra en multivariat regressionsanalys, finner denna studie inget robust samband mellan biståndet och inkomstfördelningen i mottagarlandet.

Nyckelord: Inkomstojämlikhet, Bistånd, Regressions Analys, Fixed-Effects Modell

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1. **Introduction**

1.1 **Background**

In 1970 the United Nations (UN) General Assembly adopted a Resolution which included a goal stating "[e]ach economically advanced country will progressively increase its official development assistance to the developing countries and will exert its best efforts to reach a minimum net amount of 0.7% of its gross national product […]." (OECD, 2011) Since then, the target gained acceptance amongst most member states and has repeatedly been re-endorsed down to the present day. Specifically, members of the Organization for Economic Co-operation and Development (OECD's) Development Assistance Committee (DAC) have publicly committed to this pledge in order to achieve the DACs main objective of creating "a future in which no country will depend on aid". (OECD, 2016)

However, only five DAC countries (Denmark, Luxembourg, Norway, Sweden and the United Kingdom) have exceeded the target 0.7% of GNI in aid allocations. The figures in 2017 showed that the DAC as a collective contributed 0.31% of GNI in aid; less than half of their intended target. Viewed in conjunction with the 2030 Agenda, adopted by all UN member states in 2015, present-day aid disbursements are not deemed sufficient to bankroll the Sustainable Development Goals (SDGs) or build the envisioned future of DAC in which no country will be dependent on aid. (OECD, 2018).

In line with this, the discourse surrounding international aid in the last few decades has been focused on the efficiency of aid. The Paris Declaration on Aid Effectiveness (2005) and the Accra Agenda for Action (2008) reflect the interest and growing concern on this topic. A literature review also reflects this interest in aid from a growth theory perspective (Schabbel 2007, p. 9–10). Such research is grounded on the underlying assumption that aid adds to national savings and increases investment levels, which causes economic growth. The gains of economic growth accrued by the rich 'trickle down to the poor' and subsequently alleviate poverty and counteract economic stagnation. Research, however, has proven inconclusive in regard to this assumption. Easterly (1999), for example, did not find any theoretical and empirical justification for the assumption that aid proportionally affects investment levels and causes growth. Burnside and Dollar (2000), on the other hand, found that aid has a positive effect on growth if it is coupled with good institutions and policies. Such mixed results highlight the necessity of continued research on aid effectiveness.

However, as claimed by Chong et al. (2009), the issue with exclusively investigating the effectiveness of foreign aid from a growth theory perspective is that the gains from possible distributional effects of foreign aid are overlooked. A popular claim of modern position is that there is an inherent trade-off between inequality and growth which causes measures directed towards certain areas to result in reduction of economic activity in other areas (Schabbel 2007, p. 200). If measures towards poorer regions are prioritized, economic growth would be expected to rise in these regions and decline in others. On the basis that the loss would compensate for the gain, the overall *growth* effect on the economy could result in a net zero effect. However, the *distributional* effect would not reflect this outcome. Contrary, the distributive outcome favoring the poor would not only help alleviate poverty but also influence the distribution of income on the aggregate level (Schabbel 2007, p. 203).

This illustrates the importance of investigating inequality in relation to foreign aid. A growth-perspective on aid might prove aid as ineffective, whilst an inequality-perspective might prove aid to be effectual. It is therefore necessary to study the aid – inequality nexus alongside the aid – growth nexus.

1.2 **Study Objective**

This thesis aims to explore the possibility of using aid as a foreign policy tool to moderate within-country inequality. On the basis that aid can help to foster development in regions displaying the least growth and sectors typified by poverty, this study hypothesizes that aid decreases inequality. The main question sought to be answered in this study is:

- Is foreign aid an effective tool in combating income inequality in recipient countries?

1.3 **Methodology**

This study will be based on a theoretical framework provided by previous theoretical and empirical literature, but overall take an econometric approach to explore the relationship between aid and inequality. A multivariate linear regression model will be developed to predict and quantify the studied relationship in later sections. Inequality, the economic phenomenon being studied, will be treated as the dependent variable of the model, with foreign aid as the main independent variable. The data itself will consist of secondary data, collected from the World Bank Open Database and Standardized World Income Inequality Database.

1.4 **Scope of study**

The analysis will be delimited to countries designated as 'Least Developed Countries' (LDCs) by the UN Committee for Development Policy (CDP). The eligibility of countries to this category is based on three criterions that are reviewed and handled by the CDP. These include poverty, human resource and economic vulnerability. Inclusion into LDC is aimed to give less developed countries exclusive access to support measures such as aid and trade, in hopes of overcoming structural impediments present in these countries (Department of Economic and Social Affairs, 2018). Table 1 below lists countries included in the analysis.

Table 1: List of included LDCs

Afghanistan	DR Congo	Malawi	Solomon Islands
Angola	Djibouti	Mali	Timor-Leste
Bangladesh	Ethiopia	Mauritania	Togo
Benin	Gambia	Mozambique	Tuvalu
Bhutan	Guinea	Myanmar	Uganda
Burkina Faso	Guinea-Bissau	Nepal	United Republic of Tanzania
Burundi	Haiti	Niger	Vanuatu
Cambodia	Laos	Rwanda	Yemen
Central African Republic	Lesotho	São Tomé and Príncipe	Zambia
Chad	Liberia	Senegal	
Comoros	Madagascar	Sierra Leone	

Source: UN Website, updated March 2018

Due to low availability of data and automatic listwise deletion in the software used in this study, only 42 out of 47 LDCs in-between the years 1990–2017 will be covered in the study. LDCs excluded from the analysis are Eritrea, Kiribati, Somalia, Sudan and South Sudan. The list of countries is sourced from the UN website.

This study will also be limited in terms of the type of inequality and aid being studied. Discussed in further detail in Section 2; only within-country income inequality will be investigated in this thesis in relation to foreign aid. The type of aid will be limited to a type of developmental aid called official development assistance (ODA).

1.5 **Thesis Structure**

The thesis is divided into five sections; (i) section one outlines and presents the scope of this study; (ii) section two reviews previous research and literature on the subject and discusses the theoretical foundations of this study; (iii) section three and (iv) four presents the empirical analysis of the chosen variables as well as final results, and section (v) presents the conclusions.

2. **Theoretical Framework**

This section first introduces and defines foreign aid and income inequality, and then presents the results from theoretical and empirical literature review on the subject.

2.1 **Defining Foreign Aid**

Foreign aid, or international aid, refers to the transfer of resources or services from a country or organization to aid the recipient country and its population. The resources can be financial; technical (i.e. advice and training), or material (i.e. food or military equipment). The type of aid is dependent on the its intended purpose: if it is economic, military or emergency humanitarian. (Encyclopaedia Britannica, 2015)

Foreign aid can be used as a foreign policy tool; to foster solidarity between societies, or to pursue strategic and commercial interests of donor countries. For example, by granting or withdrawing aid assistance, donor countries can influence the recipient country's behavior as well as enhance their own security. According to the Swedish founded Nationalencyclopedin (NE) this is not an uncommon use of foreign aid amongst the 'world superpowers'.

The subject of foreign aid is surprisingly very controversial. Advocates of aid programs stress its importance in fostering progress, whilst opponents claim that aid enriches the elites and invites corruption (Todaro & Smith, p. 707). To exemplify one argument *pro* foreign aid, Winnie Byanyima of Oxfam International, states that: "*Governments have considerable policy space to reduce inequality […] and aid, used strategically, can help to build a more human economy. It can help end poverty and fight inequality in poor countries. It has the potential to deliver transformative finance from rich to poor nations, helping close the inequality gap between and within them. If aid needed a renewed calling, the crisis of economic inequality is it*." (OECD, 2018)

Historically, foreign aid has existed in one form or another ever since the 18th century. It has been used as a tool by colonial powers to improve infrastructure and economic output in their colonies; and also as military assistance to help strategically important allies. Amongst other factors, the founding of international organizations – such as the United Nations (UN), the International Monetary Fund (IMF), and the World Bank – has played a major role in the development of the contemporary form of foreign aid. (Encyclopaedia Britannica, 2015)

2.1.1 **Foreign Aid - Measurement**

The most common measure of foreign aid is official development assistance (ODA) which is aid given to promote development and combat poverty in regions that display slow growth. DAC defines its aid measure as "aid that promotes and specifically targets the economic development and welfare of developing countries" (OECD, 2019). ODA either categorizes as i) grants, where financial resources are transferred free of interest and with no repayment in mind or ii) concessional loans, which have to be repaid but with significantly lower interest rates compared to commercial banks. ODA does not cover military aid or financial resources given to fund military activities.

Most of ODA outflow comes from OECD members belonging to the DAC. In 2017 the net ODA from DAC members was registered to be close to USD 147 billion; which in real terms was a decline from previous year (OECD 2018). The figures reflect total ODA, distributed amongst sectors listed in Table 2:

Table 2: Classification of sectoral distribution of ODA

I. Social infrastructure and services	VII. Actions related to debt
II. Economic infrastructure and services	VIII. Emergency assistance and reconstruction
III. Production sectors	IX. Administrative costs of donors
IV. Multisector assistance	X. Support to NGO's
V. Total sector allocable (I+II+III+IV)	XI. Unallocated/unspecified
VI. Commodity aid /general program assistance	

Source: OECD DAC Statistics

This thesis will utilize the ODA measurement in its objective to investigate the relationship between income inequality and foreign aid. The ODA measurement of foreign aid is deemed suitable because it targets areas typified by poverty and because it intends to reach marginalized groups left out of national development strategies. The objective of ODA is strictly development and welfare, which makes it a relevant measure in a study such as this where the main objective is to explore if aid can help alleviate domestic inequality in recipient countries by fostering economic growth where growth has stalled.

2.2 **Defining Income Inequality**

Income inequality is the disparity in the distribution of income between members of the society (intracountry inequality); between different societies (intercountry inequality); as well as between individuals across national boundaries (global inequality). It is said to be "a major dimension of social stratification and social class, [and] a major determinant of quality of life (…)". The income level of an individual determines whether he/she can meet her basic needs

such as housing, health care and food, and whether he/she has access to productive resources such as land and technology. (Encyclopaedia Britannica, 2016)

A distinction should however be made between income inequality and economic inequality. Economic inequality encompasses many forms of inequality and is more broadly used to describe inequality in 'living conditions' (i.e. wealth, education and nutrition). Income inequality or 'wage inequality' in contrast looks at the disparities in what people earn in the economy (Encyclopaedia Britannica, 2016). It does not explain the differences between people's economic situations or economic value based on ownership of assets (i.e. financial assets or material wealth). Although used interchangeably in other scholarly work, this paper will only address inequality in the income distribution.

2.2.1 **Income Inequality – Measurement**

The most used measures of income inequality is the Gini coefficient. It is derived from the Lorenz curve, which plots cumulative income shares against cumulative percentages of the population, and provides a numerical one-digit index. For example, a 45° upward slanting diagonal Lorenz curve indicates perfect equality; where the bottom 50% earn 50% of total income and the top 50% earn 50% of total income. The Gini coefficient transforms this pictorial representation of the distribution into a numerical value ranging from 0 (perfect equality) to 1 (perfect inequality). Expressed as a percentage it is referred to as Gini index. In the econometric model developed and used later on in this paper, the Gini index will be used as a proxy for income inequality.

2.3 **Foreign Aid – Literature Review**

The notion of foreign aid as an inequality-reducing influence is an intuitive idea. By definition, aid allocation complements the resources a country already has and allows for additional investment in order to foster further development (Perkins et al., p. 501–503). Progress in various development projects is anticipated to raise the country to higher economic levels and correspondingly influence income levels across the distribution (Perkins et al., p. 516–517). In conjunction with reformed systems, institutions and policies in place, income growth is primarily expected to be centered amongst the lower deciles of the population. Hence, with the betterment of their economic position, previously persistent inequalities in societies are expected to naturally balance out.

On the other hand, there are arguments pointing out foreign aid as an inequality-

increasing influence. Most of these arguments are based on the grounds that aid is wasteful and ineffective in achieving the overall goals of aid programs. Explanations range from donors not allocating aid in line with their rhetoric (Todaro & Smith, p. 700) to politicians and elites in recipient countries diverting aid resources for personal benefits (Todaro & Smith, p. 705).

Empirical research on the subject provide inconclusive and mixed results. Chong et. al (2009), for example, examined the direct effect of aid on income distribution and poverty for 111 countries from 1970–2005. They used the Gini coefficient as the dependent variable and three types of aid as main independent variables: ODA, effective development assistance (EDA) and aid commitments. The findings indicated that foreign aid was conductive in reducing inequality, but that the effect was not robust. The team speculated that the 'poor link' could (partly) be attributed to corruption and poor institutions.

Another researcher by the name Muhammed Shafiullah (2011) investigated the efficacy of aid on income inequality by conducting a panel analysis on 94 countries over a time span of 20 years. He also used Gini coefficient as the main dependent variable, but substituted the independent variable for ODA growth rate. In contrast to Chong et. al. he accounted for both fixed effects and random effects and found robust data that supported the notion that aid reduces inequality. Shafiullah concluded that aid has a small but equalizing effect on inequality in recipient countries.

Tim Layton (2008) and Christian Bjørnskov (2010) were amongst the researchers who found a positive relationship between foreign aid and income inequality. Tim Layton (2008) based his work on two hypotheses 1) that foreign aid leads to inequality and 2) that foreign aid causes more inequality in autocracies than democracies. He used two unbalanced panel datasets for 24 countries covering the period of 1975–2002, and a FGLS model to account for autocorrelation and heteroskedasticity. In contrast to the others, he used the newly developed database Project-level Aid Database (PLAID) for his aid data which included bi- and multilateral loans and grants. His findings supported his hypotheses, showing foreign aid worsened income inequality.

Christian Bjørnskov (2010) found similar results as Layton. Using income quintiles for 88 countries over a span of 40 years, and ODA as the indicator for international aid flow, his findings showed that foreign aid in conjunction with democracy lead to a skewness in income distribution in favor of the upper quintile of the population. He speculated that the difference observed between democratic and non-democratic countries could be rationalized to be due to

the implementation of democratic checks and balances; making it more difficult for individuals in the upper quantiles to 'hide' income.

2.4 **Income Inequality – Literature Review**

There are various factors thought to influence income inequality aside from foreign aid. To conduct an econometric analysis on empirical data, all influences must be taken into consideration. Otherwise we risk unrepresentative and misleading results due to exaggerated or understated effect values. In the following segment, different factors of income inequality will be systematized and reviewed based on previous research.

2.4.1 **Economic factors**

Level of economic development

Since the publication of Simon Kuznets's (1955) hypothesis about the existence of an inverted-U relationship, a lot of attention has been paid to the relationship between income inequality and economic growth. Kuznets claimed that equality in income distribution tended to worsen in the early stages of economic growth before improving in later stages. His hypothesis was based on a process of industrialization, in which a country shifted from a traditional economy to a modern economy and the labour force moved from agriculture to industry. He conjectured that because of a natural inequality between sectors as well as within sectors, a movement from a 'more equal' sector to a 'less equal' one would result in inequality increasing (discussed further in subsection 2.4.2). This inequality was expected to decline as processes associated with industrialization took hold. For instance, Kuznets argued that with time poor people would start to exert political and legal pressure on the government to reduce inequality and redistribute wealth accumulation. This commitment to equality, along with other factors brought on by economic growth, would work to reduce the buildup of capital accumulation resting in the hands of the rich and create a shift of direction toward less inequality.

Empirical research on Kuznets's inverted U relationship however prove contradictory results. Researchers have both found data that support the hypothesis (e.g. Brueckner & Lederman, 2015; Bhandari et al, 2010; Galor & Zeira, 1993) and data that refute it (e.g. Forbes, 2000; Squire & Deininger, 1998; Alberto & Rodrik, 1994; Clarke, 1995). Hence, the verdict on whether the relationship between income inequality and economic growth conforms to Kuznets's non-linear trajectory is inconclusive.

Technological development

Another economic factor that is thought to influence inequality is technological development. The rationale is that technological development, intended to improve productivity and efficiency, can exacerbate income inequality by influencing the wage stability of workers (Kharlamova et al, 2018). That is to say, as technology progresses gains in relative productivity increase the demand for skilled workers, resulting correspondingly in their earnings increasing whilst the wages of unskilled workers remain on the same level or even decrease. With more extensive changes, technological progress could cause a shift in direction towards automation, which would result in workers potentially losing their jobs to automated systems.

However, empirical research and data on the relationship is severely lacking due to there not being any commonly used indicators for technological development.

2.4.2 **Demographic factors**

Income inequality is also said to have demographical determinants, such as urbanization, population growth and factors related to education. These factors, similar to the economic factors, have been widely discussed in concerned literature.

Urbanization

Urbanization, to start with, entails a shift in population living in rural areas to urban areas. The process is often associated with industrialization in developing countries, whereby people seek the benefits from rising productivities in the other sector and move there to work. Due to this movement between sectors, it is thought that urbanization induces the level of domestic income inequality. Kuznets (1955) for one conjectured that rural areas or areas associated with primary economic activity experienced less inequality in comparison to areas typified by secondary economic activity. Thus, an increased migration to a less equal sector would result in overall inequality increasing.

Theoretical and empirical evidence is shown to support this notion. A study by Bergh and Bjørnskov (2013), investigating the relationship between income equality and social trust, showed that countries with larger urban populations had greater inequality in income distribution. Similarly, a study by Nielsen and Alderson (1997) investigating the determinants of inequality in U.S counties, found a positive correlation between urbanization and inequality.

Population growth

Population growth is also hypothesized to influence income inequality, particularly in

developing countries. One explanation offered is that population growth affects the age structure and, consequently, the dependency ratio in a society (Todaro & Smith, p. 62–64). The argument is based on the assumption that birth rates are higher in low-income households whose share in national income can be considered fixed due to low upward mobility. For these groups, the implication of additional births entails that income per family member decreases. Subsequently, this further aggravates within-country inequality.

Empirical research on the topic show somewhat unclear results but generally support the notion that population growth increases inequality (Nielsen & Alderson, 1995; Shafiullah, 2011).

Educational attainment

Finally, the last demographic factor of inequality often discussed in the subject literature is inequality in educational attainment. That is to say, the highest degree of education an individual has completed. The notion is rather intuitive; a higher educational level is thought to ensure higher income by improving skills and productivity of the individual. Subsequently, inequality in the distribution of educational attainment is thought to directly correlate to inequality in income distribution. Numerous studies show compelling evidence in favor of this (Gregorio & Lee, 2003; Ceci & Williams, 1997; Ehrlich, 1975).

2.4.3 **Political factors**

Aside from economic and demographic factors, there are also political factors that are presumed to influence income inequality. These factors include government size and expenditure, level of democratization, as well as level of corruption in a society.

Government size and expenditure

Simplified, there are two assumed mechanisms through which the government influences income inequality. The first mechanism is based on the fact that the government plays an equalizing function in the society through its redistributive polices and welfare spending (Todaro & Smith, p. 242). The second mechanism through which the government influences inequality is through its role as an employer (Gustafsson & Johansson, 1997). This is based on the assumption that there is less income disparity in the public sector compared to the private sector. Thus, the greater the size of the public sector in relation to the private sector, the lower the income inequality in a society.

Research on the topic reveals contradictory results on the inequality-reducing influence of government expenditures. Blejer and Guerrero (1990) for instance find that inequality in income distribution tends to worsen with increasing government expenditures, whilst Clarke et al., (2003) show that income inequality is lower in countries with higher government expenditures. On the other hand, research on the size of government as inequality-reducing factor shows compelling and consistent results. Amongst other, Giuranno (2005) and Gustafsson and Johansson (1997) show that larger public sectors are associated with lower income inequality.

Democratization

Democratization is also hypothesized to be an inequality-reducing factor. The process of democratization is generally defined as the introduction of liberal-democratic reforms in a society (Heywood 2017, p. 39-40). The 'liberal' features include protection of human and civil rights as well as political freedom for all people, whilst the 'democratic' features include the formation of a political system that allows for accountability and the enactment of majority rule. These very elements of democracies are what supposedly reduce inequality in societies. It is reasoned that as the level of democracy increases, politicians become more responsive to the needs of the people and are more likely to adopt policies that win the favor of the citizens. Accordingly, in communities with high income inequality, redistributive policies are expected to be favored.

The influence of democratization on inequality has been studied by many researchers with ambiguous results. Li et al. (1998) specifically studied how improvement of civil liberties affected income inequality and found a negative relationship between the two. Similarly, Gradstein and Milanovic (2004) concluded in their study on the link between democracy and inequality that there were indications of a positive relationship. Dreher and Gaston (2006), on the other hand, found no such relationship. Instead, the opposite relationship was observed; greater democracy was shown to have increased inequality. Thus, it is unclear if democratization has an impact on inequality and whether it is inverse as theory predicts.

Corruption

Lastly, corruption is also viewed as a possible determinant of income inequality. Interlinked with the two previous mentioned factors, corruption is thought to exacerbate inequality by allowing certain groups in a society to exploit and take advantage of existing systems to acquire

illicit benefits. In a study conducted by Gupta et al (2002) the results from a cross-country regression analysis showed that a higher level of corruption leads to worsened income inequality. This was also observed in a study by Mauro (1997) and in another by Dincer and Gunalp (2008).

2.4.4 **Macroeconomic factors**

Factors of macroeconomic nature hypothesized to affect income inequality include inflation, trade openness and degree of foreign investments.

Inflation

Inflation is defined as the gradual increase in price level of goods and services; alternately, a gradual decrease in the purchasing power of a currency relative to prior periods. One of the many hypothesized pathways through which inflation is thought to affect inequality is through its influence on the wage stability of workers. More specifically, it is thought that workers whose wages are protected against price level changes benefit significantly from inflationary trends relative to workers whose wages are not inflation accounted (Bulír, 1998). Hence, as rising inflation devaluates fixed nominal incomes it is argued that it negatively affects some groups in the society more compared to others, resulting in worsened inequality.

Unfortunately, empirical research and evidence on the influence of inflation on inequality provide mixed results. Studies that disclose a positive relationship between inflation and inequality include Blejer and Guerrero (1990) as well as Albanesi (2007). Opposing results are found by Gustafsson and Johansson (1997) and Jäntti (1994).

Trade openness and foreign investments

Lastly, trade openness and foreign investments are argued to affect inequality. Trade openness refers to the ratio of trade to a country's total output, whilst foreign direct investments (FDI) refer to the act of investing and acquiring ownership in foreign businesses.

The Heckscher-Ohlin model of international trade is often used to understand patterns of international trade. The model postulates that countries tend to specialize in producing goods based on their relative factor endowments (Todaro & Smith, p. 577). That is to say, countries export commodities that use their abundant and cheap factors of production and import commodities for which the factors of production are locally scarce. Consequently, if one distinguishes the factors of production by 'skilled labor' and 'unskilled labour', the model

predicts that in countries well-endowed with skilled labor, unskilled laborers will suffer from increased trade openness. The price of commodities produced by unskilled laborers will decline as the demand shifts toward the latter type of commodities, and subsequently, with the return to skilled labor increasing relative to unskilled labor, increased trade will result in exacerbated inequality.

FDI is in a similar way thought to increase income inequality. One proposed explanation is that FDI influences the wage gap between skilled and unskilled laborers by being directed toward skill-intensive sectors in the host economy (Velde, 2003). The expansion of the skill-intensive sectors relative to less skill-intensive sectors in a society is thought to improve the relative position of skilled laborers to unskilled laborers and consequently also their relative earnings.

Empirical research on the inequality-increasing influence of trade openness provide mixed results. A study by Litwin (1998) demonstrated that trade openness in general worsened income distribution. Similarly, Gustafsson and Johansson (1997) found a positive correlation between income inequality and share of import in their analysis of OECD countries. Chakrabarti (2000), however, found a significant inverse relationship between trade and inequality, concluding that trade reduces inequality in income distribution. This conclusion was shared by Jaumotte et al. (2013) and by Lim and McNelis (2014).

Empirical research on FDI's influence generally support the models that predict greater inequality. Amongst others, Suanes (2016), Bornschier et al. (1978) and Choi (2006) provide empirical evidence that demonstrate this.

3. **Empirical Analysis**

Following is the presentation of the empirical model used in this study, as well as a description of the data chosen. The section is then concluded with the regression results.

3.1 **Empirical Model**

The model used to examine the relationships among the variables is the OLS multivariate regression model. The OLS model is chosen due to its simplicity in estimating underlying correlations between dependent and independent variables, and suitability as an estimator in the econometric software STATA. It is not an uncommon method used in research surrounding either foreign aid or income inequality.

To estimate the parameters of the regression model, the study will focus on panel data analysis. The advantage of using panel data, or cross-sectional time-series data, is that the sample size becomes larger and covers many observations; thereby ensuring higher degrees of freedom (df) for analysis. On the other hand, a drawback of analyzing multiple entities over many time-periods is the increased risk of heteroscedasticity. To account for the possibility of heteroscedastic data and violation of the homoscedasticity assumption, robust standard errors will be applied to the regression.

Furthermore, taking into consideration the possible existence of unobserved heterogeneity between countries, a fixed-effects (FE) approach is thought suitable as to avoid any omitted biases and to control for any individual-specific characteristics. This is in accordance with the results from a Hausman test and a Breusch-Pagan Lagrange Multiplier (LM) test.

Lastly, to meet the assumptions for OLS regression on time series data, tests for stationarity and cointegration are deemed necessary to look for spurious correlation amongst the variables and rule out overstated significance values in the results (Studenmund 2016, s. 376; s. 488-489). However, due to the complexity of these tests on panel data series this study fails to assess whether the variables are stationary or cointegrated. Arguably, this is a possible weakness of the model which should be taken into consideration when analyzing the regression results.

3.2 **Model Specification**

The following regression equation (1) has been formulated based on aforementioned theoretical considerations. The equation specifies which variables are included in the complete regression model used for analysis.

$$GINI_{it} = \beta_0 + \beta_1 ODA_{it} + \beta_2 GDP_{it} + \beta_3 \log(RUR)_{it} + \beta_4 INF_{it} + \beta_5 POP_{it} + \beta_6 EXP_{it} + \beta_7 Trade_{it} + \beta_8 FDI_{it} + \alpha_i + \varepsilon_{it} \quad (1)$$

On the left-hand side, $GINI_{it}$ represents the dependent variable for country i, at time period t. On the right-hand side, β_0 represents the intercept term; β_{1-8} the slope coefficients of the explanatory variables; α_i the fixed effect specific for country i; and ε_{it} the error term, which describes the variance that is not explained by the regressors.

As can be noted from the equation, seven control variables are tested alongside the main independent variable, ODA. This is to ensure that the impact from these variables are separated from the impact of foreign aid, and subsequently to lower the risk of inflated or deflated estimates. The variable RUR, used as a proxy for the proportion of population living in rural areas, is logarithmized to assure that linearity exists amongst the variables and that the model is in accordance with the core classical assumptions of linear regression.

3.3 **Variable Specification**

3.3.1 *Dependent variable*

The dependent variable of the model is the GINI Index. The measure is used as a gauge of income inequality, using the income distribution of a nation as the basis. The index ranges from 0 (perfect equality) to 100 (perfect inequality), and is sourced from the Standardized World Income Inequality Database (SWIID) which collects and standardizes observations from several datasets. The database itself is chosen due to its broad coverage of countries and years in terms of inequality data, and therefore its suitability when it comes to cross-national research.

3.3.2 *Independent variables*

The main independent variable is ODA; used as the proxy for total inflow of foreign aid. The data on ODA is sourced from the World Bank, and is measured in per capita figures in constant US dollars.

Variables for level of economic development (GDP), proportion of the population living

in rural areas (RUR), inflation (INF), population growth (POP), government expenditure (EXP), trade openness (TRADE) and foreign direct investment (FDI), are the incorporated control variables used to distinguish the predictive effects of aid on inequality. In line with previous theoretical and empirical work, the coefficients for inflation, population growth and FDI are expected to be positive. In contrast, the variable for rural population is expected to be negative. For level of economic development, government expenditure and trade openness, previous research has provided mixed results, making the anticipated sign unclear. As with ODA, the data is sourced from the World Bank.

Table 3 provides an overview on the explanatory variables and their expected signs of influence.

Table 3: Hypothetical signs of influence

Variable Label	Variable Name	Format	Expected sign
Official Development Assistance	ODA (per capita)	Constant US$	(+/-)
Level of Economic Development	GDP (per capita)	Constant US$	(+/-)
Rural Population	RUR	% of Total Population	-
Inflation, GDP Deflator	INF	Annual %	+
Population Growth	POP	Annual %	+
Government Expenditure	EXP	% of GDP	(+/-)
Trade Openness	TRADE	% of GDP	(+/-)
Net FDI Inflow	FDI	% of GDP	+

Table 4 displays a correlation matrix on the variables, indicating lack of multicollinearity.

Table 4: Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) GINI	1.000								
(2) ODA	-0.092	1.000							
(3) GDP	-0.028	0.440	1.000						
(4) RUR	-0.299	-0.002	-0.299	1.000					
(5) INF	0.207	-0.076	-0.045	-0.233	1.000				
(6) POP	0.209	0.044	-0.120	-0.387	0.150	1.000			
(7) EXP	0.251	0.356	0.155	0.031	0.075	-0.064	1.000		
(8) TRADE	-0.039	0.425	0.339	-0.351	0.053	0.042	0.215	1.000	
(9) FDI	-0.027	0.221	-0.078	-0.309	0.078	0.162	-0.014	0.267	1.000

3.3.3 *Selection of variables*

Due to a combination of lack of data and an inability to manipulate data as needed for analysis, some possible explanatory variables have been left out from this study. These include technological development, educational attainment, government size, democratization and corruption. These factors has been discussed in detail in Section 4, with both theoretical and

empirical predictions presented. Failing to incorporate these factors in the regression risks bias in the model, and must therefore be considered when interpreting the results.

3.4 **Overview - Descriptive statistics**

Table 5 describes the arithmetic mean, standard deviation, and the min. and max. values for the variables in the dataset. Furthermore, it provides information about the number of observations used to compute the statistics for each variable. The number of observations range from 256 to 901 due to missing data for some of the analyzed variables. This reflects the unbalanced nature of the dataset.

Table 5: Descriptive statistics

Variable	Mean	Std. Dev.	Min.	Max.	Obs.
GINI-Index	41.33732	6.297168	26.63036	56.19122	901
Official Development Assistance	81.9788	157.4019	0.2343906	1698.964	901
Level of Economic Development	614.271	633.4881	58.00942	5879.7	881
Rural Population	71.72046	14.77832	22.352	95.012	901
Inflation, GDP Deflator	13.12833	24.11566	-22.45221	418.019	861
Population Growth	2.492277	1.034926	-6.766223	8.117928	901
Government Expenditure	17.93011	8.910375	5.609886	59.48478	256
Trade Openness	60.9705	32.6895	0.1750032	311.3541	757
Net FDI Inflow	3.585603	7.959737	-28.62426	103.3374	853

3.5 **Regression Results**

In the regression output below, estimates of the parameters $\{\beta_1, \beta_2, \ldots \beta_8\}$ can be observed with their respective predictive sign. The values displayed in parenthesis directly below the estimates reflect the adjusted standard errors. The regression output itself is divided into 8 columns, displaying how the estimates change with the addition of each control variable. Additionally, the superscripted stars indicate the significance of each variable at threshold 1%, 5% and 10%.

Table 6: Regression Results

Variable		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Constant	β_0	41.802 (0.234)	42.208 (0.295)	50.112 (3.890)	62.634 (5.100)	57.433 (5.201)	55.264 (10.523)	60.465 (14.437)	60.760 (15.318)
ODA	β_1	-0.006*** (0.001)	-0.004*** (0.002)	-0.005*** (0.002)	-0.005*** (0.002)	-0.005*** (0.002)	-0.027*** (0.002)	-0.008 (0.006)	-0.005 (0.006)
GDP	β_2		-0.001** (0.001)	-0.001*** (0.001)	-0.001*** (0.001)	-0.001*** (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
RUR	β_3			-2.721*** (0.895)	-4.798*** (1.168)	-4.781*** (1.168)	-2.010 (2.350)	-13.045*** (3.120)	-14.828*** (3.395)
INF	β_4				0.030** (0.011)	0.030** (0.011)	0.043* (0.025)	0.032 (0.023)	0.032 (0.023)
POP	β_5					0.034 (0.210)	0.532 (0.401)	0.576 (0.422)	0.527 (0.422)
EXP	β_6						0.476*** (0.051)	0.297*** (0.057)	0.287*** (0.057)
TRADE	β_7							-0.026** (0.011)	-0.024** (0.011)
FDI	β_8								-0.058 (0.378)
F-statistic (Prob)		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R^2		0.0198	0.0249	0.0351	0.0543	0.0543	0.2967	0.2427	0.2514
Adjusted R^2		0.0187	0.0227	0.0318	0.0499	0.0488	0.2796	0.2166	0.2217
Total observations		901	899	879	859	859	254	211	211

$* \boldsymbol{p < .1}$ $** \boldsymbol{p < .05}$ $*** \boldsymbol{p < .01}$

4. Analysis

The results from the regression seem to be in line with previous empirical research. With the exception of FDI, the predictive signs of the parameter estimates reflect findings from research presented in Section 2. The model is also shown to be statistically significant, as shown by the F-test (Studenmund, p. 144). This implies that we can reject the null hypothesis that the regression coefficients are equal to zero with more than 99% confidence.

The coefficient of determinant R^2 increases from approx. 2% to 25% with the inclusion of all the control variables, indicating that the complete model accounts for a quarter of the total variance in the dependent variable. The adjusted R^2 estimate similarly increases from almost 2% to 22%, with the lower value attributed to loss of degrees of freedom (Studenmund, p. 53). In particular, the addition of the variable TRADE to the model is shown to cause a sudden drop in the adjusted R^2 estimate, from approx. 28% to 22%, indicating that the marginal cost exceeds the marginal benefit of including this variable in the model (Studenmund, p. 54). This suggests that TRADE worsens the quality of fit of the configured regression line to the sample data.

Table 6 also shows how total number of observations decline with the addition of the control variables. This is because STATA automatically drops observations if there are missing values for any variables. The complete model is thus based on a total of 211 observations, even though data on the main dependent and independent variable encompass 901 and 899 observations respectively.

When it comes to the magnitude and significance of the variables, only three variables in the complete model are statistically significant at 0.05 level and 0.01 level respectively. These include variables RUR, EXP and TRADE.

RUR, to start with, is used to represent the ratio of rural to total population and is expected to be negatively predictive of the dependent variable based on previous research. The results displayed above are shown to support this, with 1% increase in rural population resulting in approx. 15/100-units decrease in the GINI index. In other words, 1% decrease in urban population results in inequality decreasing by 0.15%.

In contrast, EXP is shown to positively correlate to the dependent variable. Representing the ratio of government expenditure to total output, a 1% increase in EXP results in approx. 0.3% increase in the GINI index. Although in line with previous findings, these results contradict the theoretical assumptions presented in subsection 2.4.3. According to theory, the

government is supposed to serve an equalizing function in the society. Meaning that it, through transfers and subsidies, helps the less well-off members of the society. An explanation as for why this is not reflected in the empirical results, could be that the governments fail to serve this function in society. That, for example, corruption permeates the systems and therefore might be a cause for the opposite relationship being observed.

TRADE is the last variable in the complete model shown to have significant explanatory power on the dependent variable. TRADE represents the sum of exports and imports relative to total GDP and is used as a proxy for trade openness. The results indicate that 1% increase in trade openness results in less than 1% decrease in domestic inequality. Albeit small, the predictive effect is in accordance with theoretical explanations presented in subsection 2.4.4. On the assumption that LDC's are characterized with more unskilled labor than skilled labor, increased trade openness is assumed to improve the relative position of unskilled workers in comparison to skilled workers; consequently reducing income inequality.

The variables ODA and INF were shown to be significant at 0.01 level and 0.1 level respectively before the addition of TRADE and FDI to the model.

ODA in particular was shown to maintain high significance in the incomplete model comprising of the control variables GDP, RUR, INF, POP and EXP, before decreasing almost 30% in magnitude and becoming statistically insignificant in the complete model. This indicates that ODA must have pick-up on the effect exerted by TRADE on inequality before the inclusion. The fact that ODA, our main independent variable representing the inflow of foreign aid, fails to credibly explain the variance in the dependent variable is surprising to say the least. Possible explanation for this poor link could be attributed to the exclusion of the institutional factors such as corruption, democracy or government size in the model. Corruption, for instance, could impact the allocation of aid resources and cause the opposite effect of aid on inequality. The predictive sign of the estimate is however in line with the hypothesized relationship. It indicates that a dollar increase in ODA per capita inflow results in a 0.005-unit decrease in the GINI Index.

INF, on the other hand, indicates the opposite correlation. Throughout the incomplete model and in the complete model, inflation is shown to be a positive predictor of the dependent variable, in line with theoretical predictions. It is however insignificant; indicating that it is not an important factor in predicting inequality in this model.

GDP per capita, used as the proxy for level of economic development, and FDI, used to represent the ratio of net inflow of foreign investment to GDP, are similarly concluded to be insignificant. In the case of the former, the negative sign indicates that higher economic levels are associated with lower inequality. This contradicts Kuznets's hypothesis presented in subsection 2.4.1, in which inequality rises in the initial stages of economic development, but overall is in line with previous empirical findings. An explanation for why Kuznets' hypothesis does not hold is that Kuznets wrongfully assumed that development within states mirrored one another and resulted in similar distribution patterns. His hypothesis, for instance, didn't consider the influence of different economic policies being administered in the countries and thus the different distributional outcomes due to this.

Lastly, POP representing the annual population growth rate is also shown to be insignificant in predicting or explaining differences in the dependent variable. However, the sign of the estimated parameter does reflect theoretical predictions; with an increase in population growth indicating an increase in inequality.

5. **Conclusions**

In this study, we have examined the nature of the effect of foreign aid on income inequality using regression analysis on panel data. Data has been employed for 42 LDC-designated countries over the period 1990–2017, with the regression results reflecting that foreign aid is not a significant explanatory variable for changes in income inequality in the investigated countries. Although, the sign of the parameter estimate for foreign aid does confirm theoretical predictions, an attempt to answer the research question posed in this thesis cannot be done. As the relationship observed does not provide convincing statistical evidence to claim that this relationship is anything other than chance, a deduction based on these results would be misleading.

Additionally, even though findings of this study indicate that the degree of economic development, foreign direct investment, the inflation rate and population growth rate are correlated to income inequality, these observed relationships cannot be claimed be proven in this study. The relationship observed between the dependent variable and the collective set of independent variables is according to the results mainly driven by the share of rural population, level of government expenditure and trade openness. This is deduced from the statistical significance of these variables.

However, special care should be taken in the interpretation of these results. Due to the fact that this study failed to test for stationarity and cointegration amongst the variables, there is a possibility of spurious correlation indicating interactions between variables where there is none. Additionally, omitted variables such as the ones listed in subsection 3.3.3 can also be reason for bias in the results. This is because correlated variables tend to pick up influences that otherwise belongs to the omitted variables; thereby showing inflated or deflated parameter estimates.

To sum up, the findings of this study are inconclusive regarding the true effect of foreign aid on income inequality. The hypothesis can neither be proven correct or incorrect, and is therefore left unanswered. This emphasizes the need to further the research on income inequality and foreign aid, and add to the understanding of the relationship between the two. For future studies, it could be relevant to use more inclusive models for analysis and put higher priority on testing for possible violations of model assumptions. Correcting for these issues might allow for more reliable estimates and more representative results.

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