Scientific Annals of Economics and Business
73 (X), 2026, 1-
DOI: 10.47743/saeb-2026-0011

The Impact of Aid for Trade on Income Inequality: The Case of Developing Countries

Ayşe Arı*, Jørgen T. Lauridsen**

Abstract: AfT (Aid for Trade) in developing and less developed countries can help reduce income inequality while promoting exports. The present study analyses the effect of AfT on income inequality for 32 countries using the Driscoll-Kraay estimator for fixed effect and random effect models over the period 2003-2021. The results indicated that total Aft has negative impact on income inequality. Regarding specific AfT components, AfT inflows to built production and develop trade policies had no significant effect on income inequality. However, AfT funds for the improvement of infrastructure significantly reduced income inequality. This suggests that directing AfT funds related with transport and storage, communications, and energy generation and supply can also make the income distribution more equitable in middle-income and low income countries. The panel quantile regression method was also applied. The results demonstrated that infrastructure-oriented AfT or total AfT contributes to a reduction in income inequality, and this effect is stronger in countries with high income inequality.

Keywords: Aid for Trade; Income Inequality; Foreign Aid.

JEL classification: O10; F35; P45.

* Department of Economics, Faculty of Economics and Administrative Sciences, Mersin University, Mersin, Türkiye; e-mail: *ayseari@mersin.edu.tr* (corresponding author).
** Department of Economics, Faculty of Business and Social Science, University of Southern Denmark, Odense, Denmark; e-mail: *jtl@sam.sdu.dk*.

Article history: Received 11 February 2026 | Accepted 18 March 2026 | Published online 3 April 2026

To cite this article: Arı, A., Lauridsen, J. T. (2026). The Impact of Aid for Trade on Income Inequality: The Case of Developing Countries. *Scientific Annals of Economics and Business*, 73(X), 1-27. https://doi.org/10.47743/saeb-2026-0011.

1. INTRODUCTION

Developing countries seeking to achieve sustainable development and reduce poverty rely significantly on foreign aid (Garrett and Wanner, 2017). To rebuild their economies in the aftermath of World War II, Western European countries received foreign aid, termed Official Development Assistance (ODA), via the Marshall Plan. Since then, similar forms of support have been extended to developing and less developed countries facing economic crises or natural disasters. During the 1990s, however, the effectiveness of foreign aid was increasingly called into question, given the continued high poverty rates in many of these countries. Meanwhile, there was also increasing recognition that economic growth also depended on openness and exports. Hence, donor countries began requiring aid-receiving countries to reduce import restrictions and liberalize their trade policies. Meanwhile, to maximize the benefits of foreign trade for these countries, donors introduced aid for trade (AfT) initiatives, which combined foreign aid and trade strategies with the aim of raising living standards (Van Der Sluis and Durowah, 2018; Lee and Oh, 2022; Sardar *et al.*, 2022). As Gnangnon (2020b) puts it, AfT refers to foreign aid that aims to expand developing countries' participation in international trade.

AfT was launched in 2005 at the World Trade Organization's (WTO) Hong Kong Ministerial Conference, although the WTO had already noted that trade is an important, but neglected, economic development tool. For example, the WTO argued during the 1986-93 Uruguay WTO negotiations that developing countries' needs were being ignored. Likewise, the WTO claimed during the 2001 Doha Development Round that developing countries were not gaining much from international trade. The AfT initiative is thus a response to these debates, which aims to reshape foreign aid to focus on international trade. Currently, this approach is supported by many developed countries, such as the USA, Australia, Germany, and Japan (European Commission, 2020).

Developing and less developed countries can particularly benefit from AfT given their inadequate production capacity and the difficulties and costs they face in integrating into international markets due to long procedures and insufficient infrastructure and institutions. These factors hinder their ability to compete internationally (Berrittella and Zhang, 2014; Alonso, 2016). AfT enables these countries to eliminate trade barriers, improve infrastructure, and negotiate bilateral commercial agreements. AfT also promotes private sector participation in international trade (Ghimire *et al.*, 2016; European Commission, 2020), thereby supporting sustainable economic development (Garrett and Wanner, 2017). Although the United Nations' 2030 sustainable development goals lack an explicit trade target, a number of other targets interrelate with trade (Lammersen and Hynes, 2016).

Total AfT has grown from 556.4 billion dollars in 2006 to 48.7 billion dollars in 2020, to become a key financial resource for low- and middle-income countries (OECD/WTO, 2022). At $30 billion annually, AfT currently represents about 30% of developing countries' financial ODA, although the level is rising (de Melo and Wagner, 2015). The leading donors are European Union (EU) member states, which together provided 13.5 billion Euros in 2018, or about 30% of total AfT funding (European Commission, 2020). African, Asian, and South American countries are the largest AfT recipients (Berrittella and Zhang, 2014).

A number of studies have evaluated whether AfT inflows achieve their aim of increasing developing and less developed countries' foreign trade volume (Mowlaei, 2017; Gnangnon, 2019; Nathoo *et al.*, 2021) and reducing poverty (Menon and Meléndez, 2020; Gnangnon,

2020a). However, to the best of our knowledge, only one study (Gnangnon, 2020b), has directly assessed whether AfT inflows reduce income inequality. For 65 countries, Gnangnon (2020b) found that AfT inflows were associated with lower wage inequality. Furthermore, this reduction was associated with higher exports of labour-intensive manufacturing products. Given that, for many people, wages represent either their total income or most of it, one can assume that wage inequality can closely proxy for income inequality (Urata and Narjoko, 2017; Siddique, 2021). Indeed, empirical studies generally measure income inequality using either the Gini coefficient or wage inequality. Unlike Gnangnon's (2020b) study, which addresses AfT-income inequality and consider wage inequality as an indicator of income inequality, the present study applies the Gini coefficient to examine the effect of AfT on income inequality. Therefore, to our knowledge, this study is the first to investigate the issue of AfT-income inequality using the Gini coefficient. This study aims to fill this gap in the literature from this perspective. On the other hand, various studies investigating the causes of income inequality can be cited in the literature e.g. (Jauch and Watzka, 2016; Siami-Namini and Hudson, 2019; Gimba *et al.*, 2021; Roy-Mukherjee and Udeogu, 2021; Villanthenkodath *et al.*, 2024). These studies generally focus on the relationship between income inequality and macroeconomic variables such as economic growth, financial development, globalisation, inflation, unemployment, and financial development. This study, however, investigates the impact of AfT on income inequality and differs from the aforementioned studies in this respect. Income inequality is a significant problem, particularly in developing countries. Therefore, identifying factors that will reduce income inequality could also serve as a guide for the policies to be implemented (Uche *et al.*, 2024). In this context, determining that AfT reduces income inequality could be an important policy tool for policymakers.

High income inequality has many negative effects, including societal disruption and conflict, political and economic instability, poor governance, limited access to healthcare, rising criminality, and lower economic growth and labour productivity (Fang and Qamruzzaman, 2021; Siddique, 2021; Levin *et al.*, 2022). Hence, a critical goal of sustainable development is addressing income inequality (Urata and Narjoko, 2017), which in turn requires identification of its causes, as reflected in the large amount of empirical research in this area. According to the 10th goal, 'reducing income disparities between and within countries' is important by 2030 (Cojocaru *et al.*, 2022). In order to be successful in reducing inequalities, it is important to involve all political, social and economic units in the process (Uche *et al.*, 2024). Moreover, reducing inequalities will contribute not only to Goal 10 but also to the achievement of other sustainable development goals (Szymańska, 2021). Identifying the income-reducing effect of AfT could guide policymakers in their policy choices. If AfT can reduce income inequality, this will indicate an additional benefit beyond its main function of raising export volumes in recipient countries. This in turn could suggest that donor countries aiming to support developing countries should provide foreign aid mostly as AfT. On the other hand, one of the world's major problems is the current increase in income inequality in both developing and developed countries (Huang *et al.*, 2022).

Income inequality is a multifactorial problem, including demographic, political and institutional, economic and financial, globalization and technological elements. Some argue that the quadrupling of international trade since 2000 is a key cause of growing income inequality (Huang *et al.*, 2022), which in turn raises the question of the effect of AfT on income inequality. According to Berrittella and Zhang (2014), AfT can help reduce both poverty and inequality through its main function of increasing developing and less developed

countries' human, institutional, and physical capacity so that they can participate in foreign trade. That is, despite not directly aiming to reduce income inequality, AfT can help do so by helping these countries to expand exports specifically and grow the economy more generally. Our study tests this claim by analysing middle-income and low income countries using the Driscoll and Kraay (1998) estimator for fixed effect and random effect models. The analysed period covers 2003 to 2021.

The rest of this paper is organized as follows. Section 2 discusses the relationship between AfT, foreign trade, and income inequality while Section 3 reviews the relevant literature. Section 4 presents the method and data set while Section 5 reports the analysis results. Section 6 concludes the paper.

2. THEORETICAL FRAMEWORK: AFT, FOREIGN TRADE, AND INCOME INEQUALITY

As already outlined, by addressing poverty, AfT can potentially reduce income inequality via several direct or indirect channels. For example, OECD statistics for 2009 showed that AfT can bring poor people into the market system by minimizing supply-side restrictions and trade costs while increasing exports (de Melo and Wagner, 2015; Gnangnon, 2020a; Sardar *et al.*, 2022). That is, growth in foreign trade and the economy can decrease poverty and inequality. However, while there is broad agreement that developing and less developed countries with inadequate domestic markets can grow their economies more quickly by liberalizing foreign trade, there is disagreement regarding international trade's effects on income inequality in these countries. More specifically, AfT will not do this unless trade-led growth occurs in those sectors that have the most low-income employees. When it does, it can indeed reduce income inequality (de Melo and Wagner, 2015; Durowah, 2017).

The relationship between foreign trade and income inequality is usually explained in terms of the Heckscher-Ohlin and Stolper-Samuelson theories. According to the Heckscher-Ohlin theory, each country has a comparative advantage in certain products, so it should specialize in exporting these. According to the Stolper-Samuelson theory, developing and less developed countries should also consider both product and factor prices. In particular, because these countries have more labour, their export efforts should be focused on labour-intensive products. The resulting international trade will then raise labour employment and wages, thereby reducing income inequality within the country.

As already noted, the integration of developing countries into the global market through trade reforms has helped increase their economic growth. Yet, it has also worsened income inequality in many cases (United Nations (UN), 2019), particularly since 1990. This simultaneous increase in income inequality and trade needs explanation because it contradicts the predictions of the Stolper-Samuelson model (Lin and Fu, 2016). Gnangnon (2020b), for example, suggests that the wage gap between skilled and unskilled workers is widening because the growing trade in technologically advanced products has increased demand for skilled workers. Similarly, Borrs and Knauth (2021) conclude that the demand for skilled labour, and hence wage inequality, has grown since China and Eastern Europe countries joined the international market system. They suggest that trade can explain about 15% of this rise in wage inequality.

Another explanation for growing income inequality is that the large companies that currently dominate international trade have successfully kept profits to themselves (United

Nations (UN), 2019). A further factor may be that skills and technology development have become increasingly important, thereby reducing subcontracted, unskilled workers' bargaining power and wages (Dorn *et al.*, 2021).

A more recent approach to theorizing these relationships is the Kuznets (1955) inverted U curve hypothesis. This predicts that participating in international trade will initially increase income inequality in less developed countries due to the focus on high-income sectors. Later, however, income inequality will fall as these societies become more equal, democratic, and economically advanced (Huang *et al.*, 2022). In short, foreign trade may have unexpected effects on income inequality that may occur via various channels (United Nations (UN), 2019). In general, even if foreign trade does not decrease poverty directly, it may do so indirectly by reducing poverty through the higher employment and wages resulting from economic growth (Page, 2007; Lammersen and Hynes, 2016; Fang and Qamruzzaman, 2021). Another indirect influence may occur through beneficial structural changes, such as the shift in many East Asian countries from predominantly agricultural to manufacturing economies. This has led to a burgeoning middle-income class (United Nations (UN), 2019). AfT can also reduce income inequality indirectly by funding the development of productive capacities, particularly in agriculture, such as for training, irrigation, energy sources, and fertilizers (de Melo and Wagner, 2015). Such initiatives can have significant effects on family incomes given the importance of agriculture to developing countries' GDP (Lammersen and Hynes, 2016).

Another poverty-alleviating effect of AfT in developing countries occurs through its support for small and medium-sized enterprises to make them more competitive internationally. These enterprises can provide new income streams for otherwise underemployed or unemployed workers (Gnangnon, 2020b). Given that women tend to own smaller businesses than men, this focus of AfT can also reduce gender-based income inequality specifically by empowering women to increase their incomes by participating in international markets (Lammersen and Hynes, 2016; OECD/WTO, 2022). In short, AfT can indirectly alleviate poverty by encouraging foreign trade strategies supportive of women and young people (Gnangnon, 2020a).

Gnangnon (2020a) demonstrated that AfT can also reduce poverty by increasing the diversity of a country's exports. AfT funding can enable these countries to develop the necessary economic infrastructure to easily access up-to-date technology and global communication networks. This is important because countries with more diversified exports tend to have more sustainable growth and create more employment opportunities (UNCTAD, 2018). Furthermore, products tend to be more complex in those countries with more advanced institutions and a skilled, well-unionized workforce that consequently has strong collective bargaining power. However, the diversity of export products may have varying effects on income inequality depending on whether it differentially affects skilled and unskilled workers' wages (Gnangnon, 2020b). Le *et al.* (2020), for instance, reported an inverted-U relationship between export product diversity and income inequality for 90 countries between 2002 and -2014.

Finally, AfT can attract more foreign direct investment (FDI) to less developed countries (Nguyen *et al.*, 2023), particularly for infrastructure projects. By stimulating economic growth and technology and knowledge transfers, FDI can help these countries' local companies become more productive and internationally competitive. This in turn, can help reduce income inequality (Hayashikawa, 2009).

In conclusion, although the direction of AfT's impact on income inequality is uncertain, we can formulate the following hypothesis (de Melo and Wagner, 2015; Gnangnon, 2020a, 2020b; Sardar *et al.*, 2022):

***H**: Higher levels of AfT are expected to reduce income inequality.*

3. LITERATURE REVIEW

There has been extensive research into the effect of foreign aid on poverty and income inequality (Younsi *et al.*, 2019; Maqbool and Ali, 2022; Wang *et al.*, 2024). In contrast, research regarding the specific effect of AfT on poverty is rare. Van Der Sluis and Durowah (2018), for example, reported that AfT reduced poverty in 91 countries, although the effects varied as a result of regression analysis covering the 2000-2014 period. Specifically, they were largest in less developed countries; they were larger if AfT was used for infrastructure or new trade policies; and were larger if the recipient country's economy relied less on agriculture. For Rwanda, Diop *et al.* (2005) found that reducing transportation costs was associated with rising export product prices and lower poverty. From their literature review, de Melo and Wagner (2015) concluded that AfT can increase productivity in agriculture, which is a major employer of poorer people. More specifically, such people can increase their incomes if AfT is used for road construction and other infrastructure to connect rural regions to major markets. Analyzing countries in South and East Asia, Africa, and the Pacific, Ashenafi and Dong (2023) concluded in their fixed-effects method based study covering the period 2006-2020 that reducing tariffs stimulates agricultural production, which in turn raises unskilled workers' incomes. Finally, focusing on six South Asian countries (Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka) and the 2005-2019-time period, Sardar *et al.* (2022) conducted an analysis using the pooled mean group-autoregressive distributed lag (PMG-ARDL) model. The analysis found that AfT has improved human development.

Several other studies have investigated how AfT influences international trade volumes. Vijil and Wagner (2012), for example, reported that AfT that is focused on infrastructure, trade policies, and regulations was associated with higher total exports. The author's study covered the period 2002-2008 and is based on ordinary least squares (OLS) and 2SLS methods. Lee and Oh (2022) analysed a sample of 143 countries between the years 2003 to 2018 by employing fixed effect and two stage least squares methods. From their analysis, Lee and Oh (2022) found that AfT to reform foreign trade policies and regulations had a positive effect on exports in Asian countries. The researchers suggested that this was due to government support for liberalizing trade in this region. Finally, Ghimire *et al.* (2016) who analysed 121 developing countries over the period 1995-2010 by applying system-GMM technique, also found a positive association between AfT and export volumes.

Despite the large number of studies into the relationship between foreign trade and income inequality, there is still no consensus. Some studies conclude that international trade reduces income inequality (Calderon and Chong, 2001; Goldberg and Pavcnik, 2007; Jaumotte *et al.*, 2013; Berrittella and Zhang, 2014; Nguyen, 2020; Dorn *et al.*, 2021), whereas others conclude the opposite (Wagle, 2007; Roser and Cuaresma, 2016; Khan *et al.*, 2021) and a third group find no significant relationship (Dabla-Norris *et al.*, 2015; Beaton *et al.*, 2017; Agusalim and Pohan, 2018). The findings can also vary between countries. For instance, from their analysis of 100 countries using 2SLS-IV and OLS models Zhu *et al.* (2023) reported that trade in digital services was associated with income inequality in middle-

and upper-income countries but not in lower-income countries. Another factor is the theoretical model used. Thus, Urata and Narjoko (2017) found that applying certain models indicated that trade liberalization reduced wage inequality whereas other models indicated the opposite. The authors argued that these results critically depended on each country's specific characteristics regarding the labour market, capital inflows, and trade policies. Another factor is system of government, with Lin and Fu (2016) reporting that foreign trade reduces income inequality in autocracies but increases it in democracies. They explained this in terms of export focus, with autocracies focusing on primary goods whereas democracies focus on manufacturing. The authors preferred the OLS and instrumental variables methods and considered the period between 1985 and 2012. Finally, Mumuni and Abille (2023) analyzed the period 2000-2018 using Driscoll and Kraay (1998) augmented fixed and random effects model. They found that trade liberalization in 30 African countries ultimately reduced income inequality, although it initially made it worse.

When we consider the studies focusing on the determinants of income inequality, for example, Bahmani-Oskooee *et al.* (2008) examined 15 least developed countries and the United States and questioned the effect of openness on income inequality using time series analysis. Findings from the error correction model indicate that results vary across countries. Furthermore, very limited evidence was found regarding the validity of the Kuznets inverted-U hypothesis. Siami-Namini and Hudson (2019) observed 24 developed countries and 66 developing countries over the period 1990–2014. Using the Vector Error Correction Model (VECM) approach, the authors found evidence of a U-shaped relationship between inflation and income inequality. Roy-Mukherjee and Udeogu (2021) employed the Feasible Generalized Least Squares method and analyzed OECD and Western Balkan countries for the period 1991 to 2017. The findings provide evidence that globalization has a positive relationship with income inequality. Gimba *et al.* (2021) focused on sub-Saharan African countries and preferred the ARDL method. The analysis results found that unemployment increases income inequality in both the short and long term. Trade globalization is significant in the long term and heightens income inequality. Seabela *et al.* (2024), who focused on South Africa and analyzed the period from 1975 to 2017 using the Vector Error Correction Model (VECM), concluded that economic growth is negatively related to income inequality. In another study, Ahmed and Shadmani (2024) focused on the US economy and analyzed the period 1962-2019 using the SVAR method. The findings show that shocks to male unemployment briefly increase income inequality, whereas shocks to female unemployment reduce it. Villanthenkodath *et al.* (2024) focused on the impact of the components of globalization (economic, trade, and financial globalization) on income inequality. The study preferred the PMG-ARDL method and examined low, middle, and high-income countries, reaching differing conclusions. Simionescu (2025) investigated income inequality for 27 EU countries. Analyzing the 1990–2023-time period using mean group estimators and system generalized method of moments estimators, the author observed that inflation increases income inequality while reducing wealth inequality. Another finding of the study is that trade reduces income inequality. Financial development and government spending, on the other hand, exacerbate income inequality. Abdi *et al.* (2025) investigated the determinants of income inequality in the Somali economy. According to the analysis, which covers the period 1990-2020 and is based on the ARDL method, economic growth and income inequality initially increase, but this effect diminishes as income levels rise. Globalization, unemployment, and inflation increase income inequality in the short and long term.

4. DATA AND MODELS

The present study investigated the effect of AfT on income distribution in countries classified by the World (2024) as middle-income countries and low income countries, i.e., countries with a per capita Gross National Income (GNI) of 1,135 dollars or less for low income countries and 1,136 - 13,845 dollars as middle income countries in 2022. Based on the available data, the following 32 countries were analysed for 2003-2021: Burkina Faso, Mali, Niger, Bangladesh, Benin, Bolivia, India, Egypt, Honduras, Kenya, Kyrgyzstan, Mongolia, Nepal, Philippines, Senegal, Tunisia, Brazil, Vietnam, China, Colombia, Costa Rica, Dominic Republic, Ecuador, El Salvador, Guatamala, Indonesia, Malaysia, Kazakhstan, Moldova, Peru, Thailand and Türkiye. Model (1) was constructed to evaluate the impact of AfT on income inequality. Model (1) is:

$$GINI_{it} = \beta_0 + \beta_1 AfTTOT_{it} + \beta_2 GDP_{it} + \beta_3 ENF_{it} + \beta_4 KOF_{it} + \beta_5 UNEMP_{it} + \varepsilon_{it} \quad (1)$$

Here, income inequality was represented by Gini coefficients ($GINI_{it}$) obtained from Standardized World Income Inequality Database (SWIID) while the OECD database provided data for the AfT disbursements. β , β_0 and ε_{it} denote parameters of the variables, constant term, and error term, respectively. Total AfT disbursements (in terms of per capita) is represented by the variable $AfTTOT_{it}$. GDP_{it}, ENF_{it}, KOF_{it}, $UNEMP_{it}$ were included in the model as control variables representing economic growth, inflation, globalisation and unemployment rate, respectively. Real GDP per capita (constant US $ in 2015) was preferred to represent economic growth, and inflation rate in CPI was preferred to represent inflation. The global KOF index which covers three main components: economic, social and political dimensions was used to reflect globalisation and retrieved from KOF Economic Institute (2024). Data of economic growth, inflation and unemployment data were taken from WB's WDI database. Data for the AfT disbursements were obtained from Creditor Reporting System (CRS) from the OECD database. Information on the variables is summarized in Table no. 1. All variables were transformed into their natural logarithmic forms before being used in the models. (Multicollinearity was checked and not found to be present, results are therefore not reported).

Table no. 1 – Definition of Variables

Variables	Definitions	Sources
GINI	GINI index	Standardized World Income Inequality Database (SWIID)
AfTTOT	Total AfT disbursements(per capita US$)	OECD Creditor Reporting System
AfTINF	AfT for infrastruction (per capita US$)	OECD Creditor Reporting System
AfTPROD	AfT for building productive capacity (per capita US$)	OECD Creditor Reporting System
AfTPOL	AfT for trade policies and regulations (per capita US$)	OECD Creditor Reporting System
GDP	GDP per capita (constant 2015 US$)	World Bank
ENF	Inflation, consumer prices (annual %)	World Bank
KOF	KOF globalisation index	KOF Economic Institute (2024)
UNEMP	Unemployment, total (% of total labor force)	World Bank

The present study also tested whether the components of AfT can explain income inequality, namely infrastructure-focused AfT, production capacity-focused AfT and trade policy-focused AfT. For this purpose we formed Model (2), Model (3) and Model (4). Following Nguyen *et al.* (2023), in Model (2) below, AfT infrastructural funding for improving communication, energy production and supply, storage facilities, and transportation networks is represented by $AfTINF$. In Model (3) below, AfT production capacity funding for improving agriculture, forestry, and fishing, industry, mining, tourism, banking, and financial services are represented by $AfTPROD$. In Model (4), we investigated whether AfT for trade policies and regulations had an effect on income inequality.

$$GINI_{it} = \beta_0 + \beta_1 AfTINF_{it} + \beta_2 GDP_{it} + \beta_3 ENF_{it} + \beta_5 KOF_{it} + \beta_4 UNEMP_{it} + \varepsilon_{it} \quad (2)$$

$$GINI_{it} = \beta_0 + \beta_1 AfTPROD_{it} + \beta_2 GDP_{it} + \beta_3 ENF_{it} + \beta_5 KOF_{it} + \beta_4 UNEMP_{it} + \varepsilon_{it} \quad (3)$$

$$GINI_{it} = \beta_0 + \beta_1 AfTPOL_{it} + \beta_2 GDP_{it} + \beta_3 ENF_{it} + \beta_5 KOF_{it} + \beta_4 UNEMP_{it} + \varepsilon_{it} \quad (4)$$

5. EMPİRİCAL RESULTS

In the study, we firstly investigated the effect of AfT on income inequality with fixed effect and random effect models. According to the F test, the fixed effect model is more appropriate than the classical model (Pooled OLS). On the other hand, the random effects model is preferred over the classical model since the probability values of the Breusch and Pagan Lagrangian multiplier test (LM) for random effects are less than 0.05. Later, Hausman (1978) test can enable us to make a choice between random effect and fixed effect models. As a result of the Hausman test of all the four models, the fxed effect estimator is more efficient than the random effect estimator since the probability value is less than 0.05. In summary, F test, LM test and Hausman test results show that the suitable model is the fixed effect model. However, random effect model results are also reported in the tables for comparison and robustness check purposes. The RE models support the coefficients and significanse levels indicated by the FE models and thus serve a robustness check purpose.

It is necessary to test the validity of the assumptions in the fixed and random effect models. For this purpose, the presence of heteroskedasticity, autocorrelation and cross-sectional dependence problems were investigated. Modified Wald test was employed to test heteroskedasticity and heteroskedasticity in the fixed effects model. For the autocorrelation test, the Durbin-Watson test developed by Bhargava *et al.* (1982) and the LBI test developed by Baltagi and Wu (1999) were applied. According to these tests, if the test statistic results are less than 2, it is concluded that there is autocorrelation. In relation with the random effect model, the heteroscedasticity problem was investigated with the Levene-Brown-Forsthe test (Levene, 1960; Brown and Forsythe, 1974). For the autocorrelation test, Baltagi and Wu (1999) and the Durbin Watson test were employed (Given that our results are convincing, we did not apply further tests like Wooldridge and White). The testing of the cross section dependency in the models was carried out with the Pesaran (2004) test since this test provides consistent estimates so long as the cross-sectional dimension greater than the time dimension.

According to the findings obtained from Model (1), Model (2), Model (3) and Model (4), the test statistics of Baltagi and Wu (1999) and Durbin Watson test are less than 2 indicating the existence of the autocorrelation problem in all of the models. Similarly, the heteroscedasticity test results suggests the acceptance of alternative hypothesis, which denotes that there is heteroscedasticity. In addition, according to the results of Pesaran CD test, the basic hypothesis of no cross-section dependency is rejected indicating that the model is characterized by cross-sectional dependency.

As a result, it was determined that fixed effect and random effect models contain all three problems of autocorrelation, heteroscedasticity and cross-sectional dependence. Therefore, the estimation of the fixed effect and random effect models will be inconsistent suggesting the usage of robust estimators.

If the model consists of both heteroscedasticity and autocorrelation Newey and West (1987) estimator can be used as robust estimator. However, if there exists cross-sectional dependence in addition to heteroskedasticity and autocorrelation, Driscoll and Kraay (1998) should be preferred as a robust estimator for fixed and random effects models. Parks's (2009) study, can be considered as the first study that considers heteroscedasticity, autocorrelation and cross-sectional dependence. Kmenta (1986) later contributed to this study. However, Parks-Kmenta method is valid in the case of T>N. As a robust estimator, the panel-corrected standard errors (PCSE) estimator proposed by Beck and Katz (1995) can also be preferred. However, if cross-sectional dimension is larger than the time dimension, the estimates of this method are rather poor (Driscoll and Kraay, 1998; Hoechle, 2007).

The Driscoll and Kraay estimator was developed as an alternative to the Parks-Kmenta or PCSE approaches. Driscoll and Kraay estimator performs standard heteroskedasticity and autocorrelation consistent covariance matrix estimation, similar to the Newey and West (1987) or Andrews (1991) method, and the results are consistent to any value of N (Driscoll and Kraay, 1998; Hoechle, 2007).

In summary, since the results of fixed and random effects models for Model (1), Model (2), Model (3) and Model (4) will be biased, it is appropriate to use the Driscoll and Kraay estimator. Therefore, the estimates for these 4 models were performed utilizing the Driscoll and Kraay estimator. The results of Model (1) from Driscoll-Kraay (fixed effects) standard error estimator in Table no. 2 show that the effect of total AfTTOT disbursements on income inequality is negative and statistically significant. This result coincides with the results of Driscoll-Kraay(random effects) estimator. Thus, we can conclude that total AfT provided to developing countries makes income distribution more equitable. These findings can also be interpreted as being in line with previous studies reporting that AfT reduces poverty (Van Der Sluis and Durowah, 2018; Ashenafi and Dong, 2023). Because poverty and income distribution are closely related. The distribution of resources in the country is the fundamental determinant of poverty (Cojocaru *et al.*, 2022). The advantages of AfT may stem from its ability to reduce income inequality, lower foreign trade costs, facilitate foreign trade and, in particular, ease access to international markets for sectors employing low-income workers, stimulate economic growth, and enhance the international competitiveness of small and medium-sized enterprises (de Melo and Wagner, 2015; Gnangnon, 2020a, 2020b; Sardar *et al.*, 2022).

Table no. 2 – Driscoll-Kraay Regression Results for Model (1) and Model (2)

	Model (1)		Model (2)	
	Fixed Effects	**Random Effects**	**Fixed Effects**	**Random Effects**
AfTTOT	-.0065305 (0.018)	-.0081247 (0.014)		
AfTINF			-.0080842 (0.003)	-.0090238 (0.008)
GDP	-.1040644 (0.000)	-.0860537 (0.000)	-.1009964 (0.000)	-.083663 (0.000)
ENF	.0012856 (0.001)	.001427 (0.003)	.0011749 (0.001)	.0013025 (0.002)
KOF	-.0798608 (0.000)	-.0948386 (0.022)	-.066838 (0.000)	-.0820915 (0.077)
UNEMP	.0036905 (0.666)	.0064511 (0.408)	.003008 (0.721)	.0056244 (0.467)
C	4.856872 (0.000)	4.773685 (0.000)	4.777422 (0.000)	4.69898 (0.000)
Diagnostic tests				
	F test: 238.56 (0.000) Hausman: 30.76 (0.000) Modified Wald : 26259.93 (0.000)	LM test: 4097.55 (0.000) W0: 17.069229 (0.0000) W50: 11.190392 (0.0000) W10: 16.555437 (0.0000)	F test: 232.34 (0.000) Hausman: 28.05 (0.000) Modified Wald: 16655.42 (0.000)	LM: 4072.35 (0.000) W0: 17.069229 (0.0000) W50: 11.190392 (0.0000) W10: 16.555437 (0.0000)
	Durbin–Watson: .10764448 Baltagi–Wu LBI: .32532366 Pesaran CD:2.696 (0.0070)	Durbin–Watson : .10764448 Baltagi–Wu LBI: .32532366 Pesaran CD: 3.542 (0.0004)	Durbin–Watson: .12869066 Baltagi–Wu LBI: .3472836 Pesaran CD:2.554 (0.0107)	Durbin–Watson: .12869066 Baltagi–Wu LBI: .3472836 Pesaran CD: 3.472(0.0005)

According to Model (1), both economic growth and globalization affect income inequality at the 5 % significance level, with negative coefficients. This result indicates that as global integration and per capita income increases, income inequality falls. Our finding about economic growth in line with Akpa *et al.* (2024) and, Seabela *et al.* (2024). On the other hand Paweenawat and McNown (2014), Wu *et al.* (2024) and Dossou (2023) determined an inverted U shaped relationship between economic growth and income inequality. The findings showing a negative relationship between globalization and income inequality supports the findings of Tabash *et al.* (2024) and Sethi *et al.* (2021). However, the increase in inflation have a detrimental effect on inequality due to the positive relationship between inflation and income inequality coincide with the study of Beck *et al.* (2007). On the other hand, the effect of unemployment on income inequality is statistically insignificant.

Table no. 2 also presents the results of the Driscoll-Kraay regression results for Model (2). According to these findings, the effect of AfT for infrastructure on income inequality is negative and significant at the 5% significance level. Therefore this implies that that AfT related with transport and storage, communications, and energy generation and supply contributes to reducing income inequality. Regarding infrastructure-focused AfT funding, our findings consistent with de Melo and Wagner (2015), and Van Der Sluis and Durowah (2018)

conclusion that such funding can reduce poverty. This result indicates that particularly poor people may benefit from development of infrastructural sectors such as transportation, communication, energy and informatics due to connecting rural areas to international markets through road constructions and global communication networks. Beside, building infrastructure makes easy to reach new technology which in turn enabling economic growth and thus employment. In addition, AfT may attract mostly foreign direct investment for infrastructural sectors leading to new job opportunities as denoted by Nguyen *et al.* (2023). Infrastructure sectors have become increasingly prominent in recent years and represent areas where investment and employment are expanding. In particular, the energy, communication, and transportation sectors can be considered key drivers of economic growth. The influence of economic growth, inflation, globalization and unemployment on income inequality are coincide with the findings in Model (1).

Table no. 3 – Driscoll-Kraay Regression Results for Model 3 and Model 4

	Model 3		**Model 4**	
	Fixed Effects	**Random Effects**	**Fixed Effects**	**Random Effects**
AfTPROD	.0030319 (0.237)	.0018071 (0.521)		
AfTPOL			.0008071 (0.374)	.0008745 (0.374)
GDP	-.1036713 (0.000)	-.0847299 (0.000)	-.1029868 (0.000)	-.0830865 (0.000)
ENF	.0013187 (0.003)	.0014937 (0.007)	.0013665 (0.002)	.0015387 (0.004)
KOF	-.1131092 (0.000)	-.1313704 (0.002)	-.1102612 (0.000)	-.1336308 (0.000)
UNEMP	.003814 (0.648)	.006953 (0.367)	.0046467 (0.570)	.0077856 (0.306)
C	4.97348 (0.000)	4.893737 (0.000)	4.9603 (0.000)	4.892802 (0.000)
Diagnostic tests				
	F test: 244.35 (0.000) Hausman:38.37 (0.000) Modified Wald : 120442.97(0.000) Durbin–Watson: .10575283 Baltagi–Wu LBI : .31898834 Pesaran CD: 3.213 (0.0013)	LM: 3985.73 (0.000) W0: 17.069229 (0.0000) W50: 11.190392 (0.0000) W10: 16.555437 (0.0000) Durbin–Watson: .10575283 Baltagi–Wu LBI: .31898834 Pesaran CD: 4.145(0.000)	F test: 238.26 (0.000) Hausman:36.94 (0.000) Modified Wald :58693.97(0.000) Durbin–Watson: .10721488 Baltagi–Wu LBI: .3237646 Pesaran CD: 3.088(.0020)	LM: 3814.73 (0.000) W0:17.069229 (0.000) W50:11.190392 (0.000) W10:16.555437 (0.000) Durbin–Watson: .10721488 Baltagi–Wu LBI: .3237646 Pesaran CD: 4.057(0.000)

Table no. 3 summarizes the results of Driscoll-Kraay regressions for Model (3). According to the findings here, AfT inflows for building productive capacity have no impact on income inequality. Therefore we expect no impact of Aft disbursements for agriculture,

forestry, fishing, industry, mineral resources and mining, tourism, banking and financial services, business and other services on income inequality in developing and less developed countries. Regarding the impact of AfT for production capacity, we may contradict with de Melo and Wagner (2015), who reported that poverty can be reduced by focusing AfT funding on agriculture. AfT inflows for building productive capacity have no impact on income inequality, which may be due to the fact that the production activities in question do not account for a significant share of GDP in developing countries. Therefore, AfT to these sectors may be relatively small. On the other hand, in recipient countries, such inflows may not be used for its intended purpose due to the reasons mentioned above or political preferences, and may be diverted to other sectors. Moreover, the impact of production-oriented activities is likely to materialize only in the long run, whereas the relatively short time horizon considered in this study may be insufficient to capture their distributional effects. According to the findings of Calì and te Velde (2011), AfT reduces trade costs and generally has a positive effect on exports. However, this effect is entirely driven by aid directed toward economic infrastructure, while aid aimed at productive capacity does not have a significant impact on exports. This may be due to the fact that AfT is disproportionately allocated to well-performing sectors. Furthermore, in developing or less-developed countries, infrastructure often constitutes a major constraint. Therefore improvements in infrastructure can substantially promote economic growth, enhance trade, and ultimately benefit individuals.

Driscoll-Kraay results for Model (4) are also reported in Table no. 3. The focus here is on the impact of AfT for policy regulations and trade-related adjustment on income inequality. According to the findings, AfT related with trade policies and regulations have no impact on income. This can be related with the same reasons mentioned for AfT for production. As with the first 3 models, there is an negative relationship between economic growth and income inequality. Similarly globalization and income inequality has negative relationship. Beside there is no impact of unemployment on income inequality.

Table no. 4 reports the results obtained from the estimation of Model (1), Model (2), Model (3) and Model (4) without control variables. In other words, the effect of total AfT, AfT for infrastructure investments, AfT for production, and AfT for trade policies on income inequality was tested without control variables. According to these results, the effect of total AfT and AfT for infrastructure on income inequality is negative and statistically significant. Thus, AfT for infrastructure investments and total AfT have a reducing effect on income inequality. The effect of AfT for production and trade policies on income inequality is statistically insignificant. These results are consistent with those reported in Tables no. 2 and no. 3, which include control variables in Models (1), (2), (3) and (4). Thus, we can conclude that the AfT-income inequality relationship is robust.

Finally, the panel quantile regression method developed by Koenker (2004) was applied. Quentile regressions firstly developed by Koenker and Bassett (1978) and aim to estimate the conditional median functions and minimize asymmetrically weighted absolute residuals. Quantile regression estimates yield more effective results when outliers are present (Buhai, 2005). We applied to the panel quantile regression to test the robustness of the results obtained. Additionally, it will be possible to examine how AfT affects countries with different levels of income inequality. The results obtained from the panel quantile regression models are presented in Table no. 5.

Table no. 4 – Driscoll-Kraay Regression Results for Model (1), Model (2), Model (3) and Model (4)

	Model 1		Model 2		Model 3		Model 4	
	Fixed Effects	Random Effects	Fixed Effects	Random Effects	Fixed Effects	Random Effects	Fixed Effects	Random Effects
AfTTOT	-.020247 (0.001)	-.020330 (0.002)						
AfTINF			-.016362 (0.000)	-.016536 (0.001)				
AfTPROD					-.004253 (0.393)	-.004454 (0.383)		
AfTPOL							-.001124 (0.737)	-.001258 (0.679)
Constant	3.74685 (0.000)	3.74701 (0.000)	3.72598 (0.000)	3.72617 (0.000)	3.71270 (0.000)	3.71289 (0.000)	3.70533 (0.000)	3.70494 (0.000)

Table no. 5 – Quantile Regression Results for Model (1), Model (2), Model (3) and Model (4)

Variables	0.1	0.3	0.5	0.7	0.9
AfTTOT	-.0151486 (0.002)	-.0171261 (0.000)	-.0202681 (0.000)	-.0231417 (0.000)	-.0259077 (0.000)
AfTINF	-.0126577 (0.000)	-.014244 (0.000)	-.0164167 (0.000)	-.0182281 (0.000)	-.0203766 (0.000)
AfTPROD	.0030282 (0.612)	.0004407 (0.922)	-.0037629 (0.390)	-.0082945 (0.244)	-.012452 (0.235)
AfTPOL	.0040573 (0.944)	.0020738 (0.790)	-.000821 (0.994)	-.0039902 (0.984)	-.0067514 (0.982)

According to the estimates in Table no. 5, total AfT and AfT for infrastructure have a negative and statistically significant effect on income inequality. This effect is greater at higher quantiles. In this case, we can denote that infrastructure-oriented AfT or total AfT contributes to a reduction in income inequality, and that this effect is stronger in countries with high income inequality. In other words, the income inequality-reducing effect of AfT is larger in countries with high income inequality. The coefficients of AfTPROD and AfTPOL are statistically insignificant. Therefore, it can be claimed that AfT targeting production and trade policies has no effect on income inequality. In conclusion, the results of Driscoll-Kraay and panel quantile regression are consistent. AfT aimed at infrastructure benefits the poor and helps reduce income inequality.

6. CONCLUSION

While foreign aid primarily aims to promote economic development in developing and less developed countries, ultimately, it also aims to reduce poverty. Given research showing that such aid in the form of ODA has not been so effective in achieving this latter aim, it has been suggested that the promotion of foreign trade in these countries could be more effective. Proponents argue that by combining foreign aid and trade policies, AfT can better stimulate recipient countries' economic growth through exports. In particular, increasing exports can create new job opportunities and raise wages. Hence, AfT may be an important financial tool for reducing poverty and income inequality.

Using Driscoll-Kraay fixed effect and random effect models the present study analysed the impact of AfT on income inequality for middle-income and low income countries between

2003 and 2021. The analysis indicated that total AfT disbursements had statistically significant effect on income inequality in these countries. However, three specific AfT components (infrastructural-focused, productive capacity-focused and trade policy- focused) had differential effects on income inequality. More specifically, the former component significantly reduced income inequality whereas the latters had no significant impact on income inequality. The results also supported a negative relationship between economic growth and income inequality, and globalization and income inequality.

The panel quantile regression method was also utilized in the study. The findings here support the results obtained through the Driscoll-Kraay method. In other words, while total AfT and AfT for infrastructure reduces income inequality, AfT for production and trade policy has no statistically significant effect on income inequality. Furthermore, according to the panel quantile regression method, in countries with high income inequality, total AfT and AfT for infrastructure has a stronger income inequality-reducing effect. In other words, as countries' income distribution becomes more equitable, the impact of AFT on income inequality diminishes.

In conclusion, the present findings show that AfT inflows can reduce income inequality in developing and less developed countries, but only if they aim to improve infrastructure. In another word, infrastructure-focused AfT funding (e.g., for energy production, transportation and communication) will have noticeable effect on income inequality. This situation can be explained by ensuring that the poor have access to infrastructure, as stated by Nguyen *et al.* (2023). As is well known, in developing countries, the technology, energy, and transportation sectors are underdeveloped, and regional disparities exist. The poor, when they have access to infrastructure such as technology, energy, and transportation, are better able to improve their skills and seize improved employment opportunities. In sum, countries should increase AfT disbursements for infrastructure so that the poor or women living in rural areas can benefit. AfT's ability to reduce income inequality in addition to trade is emerging as an extra tool that policymakers in developing and less developed countries can use to reduce income inequality. Thus, with increased AfT for infrastructure, reducing income inequality could facilitate the achievement of the United Nations development goals, particularly Goal 10.

Overall, our analysis indicates that policymakers should aim to accelerate economic growth and integrate into international markets in developing and less developed countries in order to make income distribution more equitable. Additionally, the proper monetary and fiscal policies should be preferred to ensure a low inflation. Meanwhile, donor countries should increase AfT funding for projects related to recipient countries' infrastructure investments.

The availability of AfT data only from 2002 onwards does not allow for the use of panel cointegration or time series analyses in examining the impact of AfT on income inequality. Consequently, only a limited number of methods can be employed in the analyses. In the coming years, an increase in the time span of AfT data will remove this constraint and allow for the use of different methods. Studies investigating AfT and income inequality can investigate the transmission channels in detail, or the effect of the interaction of various macroeconomic variables with AfT on income inequality can be examined. While the Driscoll–Kraay estimator addresses certain econometric concerns, the potential endogeneity between AfT and inequality is not fully explored. This limitation is acknowledged in the paper. Accordingly, future research may consider employing instrumental variable approaches to address this issue.

ORCID

Ayşe Arı http://orcid.org/0000-0002-8485-5932
Jørgen T. Lauridsen http://orcid.org/0000-0001-9889-6236

References

Abdi, A. H., Mohamed, A. A., Mohamed, A. A., & Mohamed, A. A. (2025). Do globalization, foreign direct investment, and inflation drive income inequality? evidence from somalia within the Kuznets curve hypothesis. *Research in Globalization, 11*, 1–14. http://dx.doi.org/10.1016/j.resglo.2025.100301

Agusalim, L., & Pohan, F. S. (2018). Trade openness effect on income inequality: Empirical evidence from Indonesia. *Signifikan: Jurnal Ilmu Ekonomi, 7*(1), 1–14. http://dx.doi.org/10.15408/sjie.v7i1.5527

Ahmed, H. A., & Shadmani, H. (2024). Income inequality, unemployment, and government transfer: What do their dynamics tell us. *Journal of Economic Development, 26*(4), 274–289. http://dx.doi.org/10.1108/JED-10-2023-0195

Akpa, A. F., Okafor, V. I., Osabuohien, E., & Bowale, E. F. (2024). Financial development and income inequality: Direct and indirect transmission mechanisms in Sub-Saharan Africa. *Transnational Corporations Review, 16*(3), 1–10. http://dx.doi.org/10.1016/j.tncr.2024.200048

Alonso, J. A. (2016). *Aid for Trade: Building Productive and Trade Capacities in LDCs* (1). Retrieved from

Andrews, D. W. K. (1991). Heteroskedasticity and autocorrelation consistent covariance matrix estimation. *Econometrica, 59*(3), 817–858. http://dx.doi.org/10.2307/2938229

Ashenafi, B. B., & Dong, Y. (2023). Financial sector development, trade and income inequality: Regional perspectives using evidence from macro and firm-specific data. *Journal of Economic Studies (Glasgow, Scotland), 50*(6), 1260–1280. http://dx.doi.org/10.1108/JES-05-2022-0311

Bahmani-Oskooee, M., Hegerty, S. W., & Wilmeth, H. (2008). Short-run and long-run determinants of income inequality: Evidence from 16 countries. *Journal of Post Keynesian Economics, 30*(3), 463–484. http://dx.doi.org/10.2753/PKE0160-3477300308

Baltagi, B. H., & Wu, P. X. (1999). Unequally Spaced Panel Data Regressions with Ar (1) Disturbances. *Econometric Theory, 15*(6), 814–823. http://dx.doi.org/10.1017/S0266466699156020

Beaton, K., Cebotari, A., & Komaromi, A. (2017). Revisiting the link between trade, growth and ınequality: Lessons for Latin America and the Caribbean. *IMF Working Paper, 17*(46), 1–42. http://dx.doi.org/10.5089/9781475585551.001

Beck, N., & Katz, J. N. (1995). What to Do (and Not Do) with Time-Series Criss-Section Data. *The American Political Science Review, 89*(3), 634–647. http://dx.doi.org/10.2307/2082979

Beck, T., Demirgüc-Kunt, A., & Levine, R. (2007). Finance, inequality and the poor. *Journal of Economic Growth, 12*(1), 27–49. http://dx.doi.org/10.1007/s10887-007-9010-6

Berrittella, M., & Zhang, J. (2014). A Global perspective on effectiveness of aid for trade. *Open Economies Review, 25*(2), 1–21. http://dx.doi.org/10.1007/s11079-013-9278-4

Bhargava, A., Franzini, L., & Narendranathan, W. (1982). Serial Correlation and the Fixed Effects Model. *The Review of Economic Studies, 49*(4), 533–549. http://dx.doi.org/10.2307/2297285

Borrs, L., & Knauth, F. (2021). Trade, technology, and the channels of wage inequality. *European Economic Review, 131*, 1–28. http://dx.doi.org/10.1016/j.euroecorev.2020.103607

Brown, M. B., & Forsythe, A. B. (1974). Robust Tests for the Equality of Variances. *Journal of the American Statistical Association, 69*(346), 364–367. http://dx.doi.org/10.1080/01621459.1974.10482955

Buhai, S. (2005). Quantile Regression: Overview and Selected Applications. *Ad Astra. A journal on Romanian science, 4*, 1–17.

Calderon, C., & Chong, A. (2001). External sector and income inequality in interdependent economies using a dynamic panel data approach. *Economics Letters, 71*(2), 225–231. http://dx.doi.org/10.1016/S0165-1765(01)00374-3

Calì, M., & te Velde, D. W. (2011). Does aid for trade really ımprove trade performance? *World Development, 39*(5), 725–740. http://dx.doi.org/10.1016/j.worlddev.2010.09.018

Cojocaru, T. M., Ionescu, G. H., Firoiu, D., Cismas, L. M., Otil, M. D., & Toma, O. (2022). Reducing inequalities within and among eu countries—Assessing the achievement of the 2030 agenda for sustainable development targets (sdg 10). *Sustainability (Basel), 14*(13), 1–22. http://dx.doi.org/10.3390/su14137706

Dabla-Norris, M. E., Kochhar, M. K., Suphaphiphat, M. N., Ricka, M. F., & Tsounta, E. (2015). *Causes and Consequences of Income Inequality: A Global Perspective*. Retrieved from

de Melo, J., & Wagner, L. (2015). *Aid For Trade as finance for the Poor* (125). Retrieved from https://EconPapers.repec.org/RePEc:fdi:wpaper:2081

Diop, N., Brenton, P., & Asarkaya, Y. (2005). *Trade costs, export development, and poverty in Rwanda* (3784). Retrieved from

Dorn, F., Fuest, C., & Potrafke, N. (2021). Trade openness and income inequality: New empirical Evidence. *Economic Inquiry, 60*(1), 202–223. http://dx.doi.org/10.1111/ecin.13018

Dossou, T. A. M. (2023). Income inequality in Africa: Exploring the interaction between urbanization and governance quality. *Social Indicators Research, 167*(1), 421–450. http://dx.doi.org/10.1007/s11205-023-03120-x

Driscoll, J. C., & Kraay, A. C. (1998). Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data. *The Review of Economics and Statistics, 80*(4), 549–560. http://dx.doi.org/10.1162/003465398557825

Durowah, O. (2017). *The Role of aid for trade and foreign direct investment in poverty reduction: a panel data analysis of 91 developing countries.* (Electronic Theses and Dissertations), South Dakota State University. Retrieved from https://openprairie.sdstate.edu/etd/1187 (1187)

European Commission. (2020). *EU aid for trade progress report 2020*: European Commission.

Fang, L., & Qamruzzaman, M. (2021). An Asymmetric Investigation of Remittance and Trade Openness Impact on Inequality: Evidence From Selected South Asian Countries. *Frontiers in Psychology, 12*. http://dx.doi.org/10.3389/fpsyg.2021.720887

Garrett, B., & Wanner, T. (2017). Aid for trade and ecologically sustainable development in Australia's international aid program. *Australian Journal of International Affairs, 71*(6), 661–677. http://dx.doi.org/10.1080/10357718.2017.1334757

Ghimire, S., Mukherjee, D., & Alvi, E. (2016). Aid for-trade and export performance of developıng countrıes. *Applied Econometrics and International Development, 16*(1), 23–34.

Gimba, O. J., Seraj, M., & Ozdeser, H. (2021). What drives income inequality in sub-Saharan Africa and its sub-regions? An examination of long-run and short-run effects. *African Development Review, 33*(4), 729–741. http://dx.doi.org/10.1111/1467-8268.12603

Gnangnon, S. K. (2019). Aid for trade and export diversification in recipient-countries. *World Economy, 42*(2), 396–418. http://dx.doi.org/10.1111/twec.12711

Gnangnon, S. K. (2020a). *Aid for trade flows and poverty reduction in recipient-countries* (213807). Retrieved from Kiel, Hamburg: https://hdl.handle.net/10419/213807

Gnangnon, S. K. (2020b). Aid for trade flows and wage ınequality in the manufacturing sector of recipient countries. *Journal of Economic Integration, 35*(4), 643–683. http://dx.doi.org/10.11130/jei.2020.35.4.643

Goldberg, P. K., & Pavcnik, N. (2007). Distributional effects of globalization in developing countries. *Journal of Economic Literature, 45*(1), 39–82. http://dx.doi.org/10.1257/jel.45.1.39

Hausman, J. A. (1978). Specification Tests in Econometrics. *Econometrica, 46*(6), 1251–1271. http://dx.doi.org/10.2307/1913827

Hayashikawa, M. (2009). Trading out of Poverty: How Aid for Trade Can Help. *OECD Journal on Development, 10*(2), 7–41.

Hoechle, D. (2007). Robust standard errors for panel regressions with cross-sectional dependence. *The Stata Journal, 7*(3), 281–312. http://dx.doi.org/10.1177/1536867X0700700301

Huang, K., Yan, W., Sim, N., Guo, Y., & Xie, F. (2022). Can trade explain the rising trends in income inequality? Insights from 40 years of empirical studies. *Economic Modelling, 107*, 1–14. http://dx.doi.org/10.1016/j.econmod.2021.105725

Jauch, S., & Watzka, S. (2016). Financial development and income inequality: A panel data approach. *Empirical Economics, 51*, 291–314. http://dx.doi.org/10.1007/s00181-015-1008-x

Jaumotte, F., Lall, S., & Papageorgiou, C. (2013). Rising income inequality: Technology, or trade and financial globalization? *IMF Economic Review, 61*(2), 271–309. http://dx.doi.org/10.1057/imfer.2013.7

Khan, M. A., Walmsley, T., & Mukhopadhyay, K. (2021). Trade liberalization and income inequality: The case for Pakistan. *Journal of Asian Economics, 74*, 1–31. http://dx.doi.org/10.1016/j.asieco.2021.101310

Kmenta, J. (1986). *Elements of Econometrics,* (2nd ed.): Macmillan Publishing Co.

Koenker, R. (2004). Quantile Regression for Longitudinal Data. *Journal of Multivariate Analysis, 91*(1), 74–89. http://dx.doi.org/10.1016/j.jmva.2004.05.006

Koenker, R., & Bassett, G. (1978). Regression quantiles. *Econometrica, 46*(1), 33–50. http://dx.doi.org/10.2307/1913643

KOF Economic Institute. (2024). KOF Globalisation Index.

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

Lammersen, F., & Hynes, W. (2016). *Aid for trade and the sustainable development agenda: Strengthening synergies* (5). Retrieved from Paris:

Le, T. H., Nguyen, C. P., Su, T. D., & Tran-Nam, B. (2020). The Kuznets curve for export diversification and income inequality: Evidence from a global sample. *Economic Analysis and Policy, 65*, 21–39. http://dx.doi.org/10.1016/j.eap.2019.11.004

Lee, Y., & Oh, J. (2022). Is aid-for-trade working? Evidence from Southeast Asian countries. *27*(2), 137–144. http://dx.doi.org/10.1016/j.apmrv.2021.06.003

Levene, H. (1960). Robust tests for equality of variances. In I. Olkin (Ed.), *Contributions to Probability and Statistics* (pp. 278–292). Palo Alto, CA: Stanford University Press.

Levin, K., Boehm, S., & Carter, R. (2022). 6 Big findings from the IPCC 2022 report on climate impacts, adaptation and vulnerability. *World Resources Institute.* Retrieved from https://www.wri.org/insights/ipcc-report-2022-climate-impacts-adaptation-vulnerability

Lin, F., & Fu, D. (2016). Trade, institution quality and income inequality. *World Development, 77*, 129–142. http://dx.doi.org/10.1016/j.worlddev.2015.08.017

Maqbool, S., & Ali, M. (2022). The relationship between foreign aid and income inequality and the role of corruption. *Journal of Public Affairs, 22*(4), 1–13. http://dx.doi.org/10.1002/pa.2687

Menon, J., & Meléndez, A. (2020). *When Does Trade Reduce Poverty? Revisiting the Evidence for East Asia* (2020-04). Retrieved from

Mowlaei, M. (2017). The Impact of AFT on export performance of selected Asian developing countries. *5*(4), 253–261. http://dx.doi.org/10.18488/journal.107.2017.54.253.261

Mumuni, S., & Abille, A. B. (2023). Do trade liberalization and external debt offset income inequality? New evidence from selected African countries. Cogent Economics &amp. *Cogent Economics & Finance, 11*(2). http://dx.doi.org/10.1080/23322039.2023.2241228

Nathoo, R., Salim, R., Ancharaz, V., & Kabir, M. (2021). Does aid for trade diversify sub-Saharan Africa's exports at the intensive and extensive margins?. *Applied Economics, 53*(55), 6412–6425. http://dx.doi.org/10.1080/00036846.2021.1940084

Newey, W. K., & West, K. D. (1987). A Simple, Positive Semi- Definite, Heteroskedasticity and Autocorrelation Consistent Covari- ance Matrix. *Econometrica, 55*(3), 703–708. http://dx.doi.org/10.2307/1913610

Nguyen, H. H. (2020). Impact of foreign direct investment and international trade on economic growth: Empirical study in Vietnam. *The Journal of Asian Finance, Economics and Business, 7*(3), 323–331. http://dx.doi.org/10.13106/jafeb.2020.vol7.no3.323

Nguyen, T. P. T., Nguyen, V. A., & Ly-My, D. (2023). Does aid for trade affect the quality of the environment? Evidence from aid for trade recipient countries. *Journal of International Development, 35*(8), 2465–2484. http://dx.doi.org/10.1002/jid.3780

OECD/WTO. (2022). *Aid for trade at a glance 2022: empowering connected, sustainable trade*: OECD Publishing. http://dx.doi.org/10.1787/9ce2b7ba-en

Page, S. (2007). *The potential impact of the aid for trade initiative* (45). Retrieved from

Park, H. M. (2009). *Linear regression models for panel data using SAS, Stata, LIMDEP, and SPSS. Working Paper*. Retrieved from https://hdl.handle.net/2022/19739

Paweenawat, S. W., & McNown, R. (2014). The determinants of income inequality in Thailand: A synthetic cohort analysis. *Journal of Asian Economics, 31-32*, 10–21. http://dx.doi.org/10.1016/j.asieco.2014.02.001

Pesaran, M. H. (2004). *General diagnostic tests for cross-section dependence in panels* (1240). Retrieved from

Roser, M., & Cuaresma, J. C. (2016). Why is income inequality increasing in the developed world? *Review of Income and Wealth, 62*(1), 1–27. http://dx.doi.org/10.1111/roiw.12153

Roy-Mukherjee, S., & Udeogu, E. (2021). Neo-liberal globalization and income inequality: Panel data evidence from oecd and western balkan countries. *Journal of Balkan & Near Eastern Studies, 23*(1), 15–39. http://dx.doi.org/10.1080/19448953.2020.1852004

Sardar, S., Khan, D., Khan, A., & Magda, R. (2022). The Influence of aid for trade on human development in South Asia. *Sustainability (Basel), 14*(19), 1–12. http://dx.doi.org/10.3390/su141912169

Seabela, M., Ogujiuba, K., & Eggink, M. (2024). Determinants of Income Inequality in South Africa: A Vector Error Correction Model Approach. *Economies (Basel), 12*(7), 1–17. http://dx.doi.org/10.3390/economies12070169

Sethi, P., Bhattacharjee, S., Chakrabarti, D., & Tiwari, C. (2021). The impact of globalization and financial development on India's income inequality. *Journal of Policy Modeling, 43*(3), 639–656. http://dx.doi.org/10.1016/j.jpolmod.2021.01.002

Siami-Namini, S., & Hudson, D. (2019). Inflation and income inequality in developed and developing countries. *Journal of Economic Studies (Glasgow, Scotland), 46*(3), 611–632. http://dx.doi.org/10.1108/JES-02-2018-0045

Siddique, A. B. (2021). Impact of trade on ınequality: New evidence of what, when, and where. *CESifo Economic Studies, 67*(4), 405–439. http://dx.doi.org/10.1093/cesifo/ifab005

Simionescu, M. (2025). Inflation, financial development, and income/wealth inequality in the European Union. *Economic Systems, 49*(4), 1–15. http://dx.doi.org/10.1016/j.ecosys.2025.101316

Szymańska, A. (2021). Reducing Socioeconomic Inequalities in the European Union in the Context of the 2030 Agenda for Sustainable Development. *Sustainability (Basel), 13*(13), 1–28. http://dx.doi.org/10.3390/su13137409

Tabash, M. I., Elsantil, Y., Hamadi, A., & Drachal, K. (2024). Globalization and Income Inequality in Developing Economies: A Comprehensive Analysis. *Economies (Basel), 12*(1), 1–16. http://dx.doi.org/10.3390/economies12010023

Uche, E., Ngepah, N., Onwe, J. C., Zaman, U., & Odhiambo, N. M. (2024). A question for sustainable development goal 10: How relevant is innovation patenting receipts to income distributions? *Technological Forecasting and Social Change, 206*, 1–21. http://dx.doi.org/10.1016/j.techfore.2024.123506

UNCTAD. (2018). *Exports diversification and employment in Africa* (UNCTAD/ALDC/2018/3). Retrieved from Geneva, Switzerland.:

United Nations (UN). (2019). *Trade policies and their impact on inequalities*. Retrieved from

Urata, S., & Narjoko, D. A. (2017). *International trade and inequality* (675). Retrieved from

Van Der Sluis, E., & Durowah, O. (2018). *Aid for trade and foreign direct investment: effects on poverty reduction.* Paper presented at the Proceedings of the International Association of Agricultural Economists Conference,, Canada.

Vijil, M., & Wagner, L. (2012). Does aid for trade enhance export performance, Investigating the Infrastructure channel. *World Economy, 35*(7), 838–868. http://dx.doi.org/10.1111/j.1467-9701.2012.01437.x

Villanthenkodath, M. A., Pal, S., & Mahalik, M. K. (2024). Income inequality in globalization context: Evidence from global data. *Journal of the Knowledge Economy, 15*(1), 3872–3902. http://dx.doi.org/10.1007/s13132-023-01342-5

Wagle, U. R. (2007). Are economic liberalization and equality compatible? Evidence from South Asia. *World Development, 35*(11), 1836–1857. http://dx.doi.org/10.1016/j.worlddev.2007.01.007

Wang, X., Wang, Y., Lin, P. C., & Huang, H. C. (2024). Foreign aid and income inequality: A quasi-experimental evidence. *Applied Economics Letters, 31*(21), 2256–2260. http://dx.doi.org/10.1080/13504851.2023.2217557

World, B. (2024). World Bank Country and Lending Groups.

Wu, R., Alvarado, R., Mendez, P., & Tillaguango, B. (2024). Impact of informational and cultural globalization, R&D, and urbanization on inequality *Journal of the Knowledge Economy* (Vol. 15, pp. 1666–1702): Springer US. http://dx.doi.org/10.1007/s13132-023-01146-7

Younsi, M., Khemili, M., & Bechtini, M. (2019). Does foreign aid help alleviate income inequality? New evidence from African countries. *International Journal of Social Economics, 46*(4), 549–561. http://dx.doi.org/10.1108/IJSE-06-2018-0319

Zhu, W., Li, X., Wang, H., & Sun, B. (2023). Digital service trade and income inequality: a panel data analysis for 100 countries. *Applied Economics Letters, 30*(11), 1457–1461. http://dx.doi.org/10.1080/13504851.2022.2061895