EUROPEAN ACADEMIC RESEARCH
Vol. XI, Issue 5/ August 2023

Impact Factor: 3.4546 (UIF)
DRJI Value: 5.9 (B+)

ISSN 2286-4822
www.euacademic.org

The effect of Foreign Direct Investment on Income Inequality: (Evidence from Selected SAARC Countries)

FERDOS JAMAL
School of Economics and Management
Nanjing University of Science and technology, PR China
Email: ferdosjamal@njust.edu.cn
YAN ZHIJUN
School of Economics and Management
Nanjing University of Science and technology, PR China
Email: yanzhijun@njust.edu.cn

Abstract

This paper investigates empirically the effect of foreign direct investment on income inequality for a panel of 4 SAARC countries using unbalanced data for a period of 1980 to 2020. Using FMOLS and DOLS techniques. The result revealed that FDI tends to increases income inequality. GDP and GCEXP have significant positive impact on income inequality. However, TO is found to be statistically significant and negative association with income inequality. While inflation has no effect on income inequality. The study recommends that for encourage of more inward FDI needed policies of well distribution, raise exports and reduce imports at certain level and keep inflation in limit at a specific level for favorable distribution of income.

Keywords: FDI, Gini coefficient, FMOLS, DOLS

INTRODUCTION

Since the last three decades, there have been increasing economic globalization take place; a large number of theoretical and empirical literatures are devoted to studying the numerous effects of foreign direct investment on the host economies. As some authors have pointed out, however, the majority studies have traditionally focused on the ability of FDI, for instance economic growth and productivity, which have largely neglected their distribution effect (Figini and Gorg, 2006). Hence, research on the effect of FDI on income inequality is still comparatively new, scarce and vague and further research is needed on this topic. In addition, the public is increasingly concerned almost the consequences of socio-economic impact on higher-income inequality, particularly after the current worldwide economic crises, which has dominated current political and academic dialogue (Mihaylova, 2015). Since 1970s, the literature shows that income and wages inequality had been increasing in many countries. For developed and developing countries, there is evidence of a rising in inequality (Diwan and Walton, 1997). A key question is whether and what role has played global trade in the change of income distribution? We will be discussing in the following section a varied empirical evidence of the role of FDI in effecting income distribution. The correlation between FDI and income inequality has possibly crucial consequences for economic policies.

There are two contrasting evidences about the influence of FDI on income inequality. One group of researchers argued that FDI can reduce income inequality when capitals are investing in sectors that occupy large numbers of low-income and unskilled workers (Farhan *et al*, 2014). FDI decreases income inequality by promotes the economic growth of the host country which has become a source of income distribution amid the individuals of a country. According to them, foreign direct investment provides capital to host countries because majority of the developing countries are significantly dearth of capital. Their saving level is below their required investment level which causing saving-investment gap. While FDI fill this gap (Tomohara and Takii, 2011). Second argument in favor of FDI is that it transferring new technology to the host country, and native companies also adopt this technology within a limit of foreign forms (Figini *et al*, 2006). Third FDI leading to improved skills for managing production elements in the host country. Fourth FDI increases efficiency and incomes of the workers. These advantages of FDI may not be realized at the cost of the income differences (Herzer and Nunnenkamp, 2011). In addition, Khan and Khan (2011) argued that FDI is key source of economic growth if it is focused to an export oriented sector, instead of import substitution sector, thus FDI plays a positive role in income distribution through the channels of economic growth.

In contrast, other group of scholars believes that foreign direct investment can lead to income inequality in the host country. For example, according to Zulfiu-Alili, (2014), FDI may deteriorate income distribution due to wages spillover as multinational corporations (MNCs) usually pay more wages than their native enterprises. Because they needed more employees to use the innovative technology, they will use their advantage in capital surplus to provide higher wages to attract more skilled and unskilled workforce to work with them. The existence of MNCs may also possible to reduce the market share of domestic companies. As profits are reduced, local companies are enforced to decrease cost by lowering wage levels and the number of labours as they can hire to stay in the market. In the same way, FDI has negative influence on income distribution in the economy, if MNCs are capital intensive and using less labour, it will leading to a worsening of income distribution. Additionally, MNCs invest in those goods which are beneficial only for a specific group of people. These will lead to broaden the gap between wealthy and poor in the host country. Wealthy individuals are benefited because they have greater human capital and skills. Thus they can get more jobs in Multinational corporations and also get well goods from them. In contrast, poor cannot find jobs in Multinational corporations because majority of them are unskilled, lacking human capital and hence unable to access product produced by MNCs. Therefore, FDI has come to be a means of income inequality in the host countries. Jin, (2009) showed that FDI has deteriorate income inequality as they increases the wages of skilled labour against unskilled labor. Foreign direct investment causing income inequality not only through technology as this is useful for trained labor and unfavorable for unskillful labor, but also by capital formation. Because of capital accretion, capital holders get higher than just labor but also generate income disparity in the host countries.

Although, plenty of research is available on FDI and income inequality, there is still a lack of literature investigating the same phenomenon in the SAARC region. For example, Majeed (2015) studied the impact of FDI on income inequality in 65 developing countries. Kaulihowa and Adjasi, (2017) examined the influence of FDI on income inequality in 16 African countries. Tsai (1995) explored the relationship between foreign direct investment and income inequality in 33 developing countries.

Similarly, Basu and Guariglia (2007) carried a study on 119 developing countries and tested the nexus between FDI inflows and income inequality.

To the best of our knowledge, to date, not even a single study has been carried out to analyze empirically the effect of inward FDI on income inequality in case of SAARC countries. Therefore, this study seeks to analyze the relationship between FDI and income inequality within the context of selected Four SAARC countries (Bangladesh, India, Pakistan and Sri Lanka) time spanning of 1981-2016. This study also contributed to the existing pool of knowledge regarding FDI and income inequality that helps to facilitate FDI liberalization policies adopted by SAARC governments for its benefits. In addition, the empirical outcomes will provide practical considerations into the positive and negative effects of FDI on income inequality in South Asian countries. It will also help the readers to get knowledge about FDI and income inequality generally and provide them with empirical evidence regarding their relationship within SAARC countries. It can also lay the foundation for future research on the same topic in numerous other geographical areas and different time periods with different control variables.

2. LITERATURE REVIEW

The views of different researchers as regards to the association between FDI and income inequality are different. Some are the views that FDI inflow has improved the income distribution (i.e.Negative relationship), while others think that FDI has a source of deteriorating income distribution (i.e Positive relationship) in the host countries. A review of literature is as follows:

2.1. FDI has Positive relationship with income inequality

Several researchers (Mihaylova, 2015; Farhan *et al*, 2014; Bankolia, 2017; Song *et al,* 2021) have found positive association between foreign direct investment and income inequality. For example, Song *et al,* (2021) examined the impact of remittances and inward FDI on income inequality in a sample 20 developing countries during a period of 1980-2016 using DOLS estimator. Their finding showed that FDI increase income inequality, while economic growth reduces. Mihaylova, (2015) studied Central and Eastern Europe and explored that FDI has leading to worsened income inequality. Tung (2022) employed the 2-SLS methodology to investigate the relationship between FDI and income inequality in 33 emerging economies for the period 1980 to 2019. The author concluded that FDI and inflation increase income inequality, whereas trade openness decreasing. The same result is found by Le *et al* (2021) in case of Vietnam that FDI inflow and GDP have positive and significant impact on income inequality, however inflation and trade openness have no effect on income inequality. Farhan *et al*, (2014) analyzed the impact of FDI on income distribution in Five ASEAN countries over 1970-2011. Specially, it examine whether FDI inflow is related with a higher income inequality in these countries. The findings base on quantile regression analysis indicates that FDI reducing income inequality in Malaysia, Philippines and Thailand. Whereas, the result for Singapore and Indonesia implies that FDI increases inequality. Khan and Nawaz (2019) studied CIS members countries annual data from the period of 1990-2016, applied System-GMM technique. They found that FDI and Trade have positive and statistically significant effect on income inequality. Whereas, inflation has negative and statistically negative impact on income inequality.

Using a panel dataset of 34 developed countries (OECD) for the time period 1995 to 2015, Bankolia, (2017) argued that FDI has positive relationship with income inequality. Herzer *et al*, (2011) analyzed whether FDI has contributed to widening the inequality in Five Latin American host countries for the period 19980-2000. Used panel co-integration model, results showed that FDI has a significant and positive effect on income inequality. Similarly, Gam *et al,* (2023) used annual data of 36 developing countries for the period of 2008 to 2020, employed Bayesian method. Their findings show that FDI and trade openness has significant positive effect on income inequality. Shi *et al,* (2020) explored the indicators of income inequality in Australia for the years of 1980 to 2014. Their results confirmed that inward FDI, inflation and trade openness have positive significant effect on income inequality. But, per capita income has negative influence on income inequality. In contrast, Osode *et al,* (2020) found that FDI has no impact on income inequality, while trade openness significant negative effect, but economic growth has positive effecting income inequality in 18 SSA countries during 1996-2015.

Choi (2006) investigates the nexus between FDI and income inequality by using pooled Gini coefficients for 119 countries for period of time 1993-2002. The researcher attempted to whether FDI affect income inequality. Choi found that income inequality rises as FDI increases. Cho and D. Ramirez (2016) discovered the relationship between FDI and income inequality in seven Southeast Asia countries during the time period of 1990 to 2013. Using panel co-integration, their results confirmed the hypothesis that in the short run FDI inflow increase income inequalities but reducing it in the long run. Malla and Pathranarakul (2022) examined the impact of fiscal policy and institutional capacity on income inequality on a smple of 68 developed and developing countries during the period of 2000-2019, applying the system GMM method. Their outcomes showed that GDP per capita has negative impact on income inequality in developed and developing countries. Government expenditures has increases income inequality, however, FDI, inflation, trade openness have no effect on income inequality.

Similarly, Herzer and Nunnenkamp, (2011) observed the impact of FDI on income inequality for ten European countries for the period 1980-2000. Panel co-integration was used for empirical analysis. They found a positive impact of FDI on inequality in short run, in contrast a negative affect was found in the long run in overall sample countries. But in individual country a positive influence of FDI on income inequality was observed in case of two countries. Chordokrak and Chintrakarn, (2011) Analyzed empirically the effect of advance technology and trade on income inequality for 48 US states used panel data during the time period of 1988-2003. Employing fixed effect model for analysis. The results indicate that FDI and trade were deteriorating on income inequality. Whereas, technology was found to be insignificant impact on income inequality. Malindini (2017) examined the income inequality and FDI nexus in South Africa for the period 1970 to 2012. The study results based on ARDL technique which indicates a positive and significant correlation between FDI and income distribution in South Africa and also found a positive effect of inflation and trade openness on income inequality. Although GDP per capita reduces income inequality. Whereas, Triyono *et al,* (2021) studied data on 34 provinces in Indonesia for the period 2015 to 2019. The authors found economic growth has is a positive and significant influence income inequality, however FDI has no effect.

2.2 FDI has Negative relationship with income inequality

A number of empirical researches find the argument to supporting the idea that FDI has helped to reduce income inequality (i.e Negative relationship). For example, study by Jensen and Rosas (2007) analyzed the impact of FDI on income inequality for Mexico for 1990 to 2000 by studying a panel data of 32 states. They used two stage least squares (2SLS) and OLS models. Their finding reveals negative nexus between FDI and income inequality. Nguyen (2020) assessed empirically the relationship between FDI and income inequality for balanced panel data of 37 developing countries over the period 2002 to 2018 analyzed two-step GMM estimators. Their results indicated that FDI has decreased income inequality, while economic growth and Trade have increasing income inequality. Mallick *et al,* (2020) explored the effect of economic globalization income inequality for China and India over the period of 1980 to 2013. They argued that FDI and GDP have reduces income inequality, while inflation give rise income inequality. Hussain *et al*, (2009) explored the relationship between globalization and income distribution in Pakistan for 1972 to 2005. They showed globalization by FDI, remittances and trade openness, used OLS method for analysis. The result indicated that FDI, workers' remittances and trade openness have negative and statistically significant influence on income inequality. They suggested that FDI may decrease the income inequality. In the recent study of Yuldashev *et al,* (2023) found that FDI effect income inequality, economic growth accelerates income inequality. Xu *et al,* (2021) investigated the relationship between trade openness, FDI and income inequality in sub-saharan Africa spanning 2000 to 2015 applying GMM technique. Their finding indicated that FDI and income have a negative significant correlation with income inequality, whereas trade openness has statistically positive relationship with income inequality.

Figini and Gorg (2011) studied the impact of FDI on income inequality in more than 100 countries. Their results reveal that the impact of FDI on income inequality was varying with the level of economic development. FDI has enhanced the income distribution (i.e Negative relationship) in the developed countries. Contrary to that FDI has deteriorate income inequality in developing countries. Chintrakarn *et al*, (2010) explored the link between FDI and income inequality in the48 US states during the period 1977-2001. Employed panel co-integration techniques and found that FDI affect a significant and strong negative impact on income inequality in the US. Balcioglu, (2018) studied the effect of inward and outward FDI on income inequality in Turkey and selected Turkic republics during the period of 1992-2012. Established, that inward and outward FDI have negative influence on income inequality in the long run and positive impact in short run.

From the past literature review, it is clear that past researches shed light on the impact of FDI on income inequality in African, Asian, US states and European countries. Moreover, the findings are mixed and inconclusive, while none of the studies reviewed focuses on selected SAARC countries like Bangladesh, India, Pakistan and Sri Lanka. This important gap together with the need to consider the impact of FDI on income inequality motivates this study.

2.3 Research Gap

Previous work about FDI and income inequality carried for the specific region like Africa, Asian, United States and for whole developing economies but this work is a new attempt for selected Five SAARC countries and their economies depend on foreign direct investment. Additionally, the physical structure, life style, rate of economic

growth and population density are the main common characteristics of these selected SAARC countries. Another issue are the lack of using proper econometric methodology estimation. The empirical evidence of this study will provide some valuable policies recommendations particularly to governments of selected SAARC countries to focus on the advantageous sector which comparatively more beneficial and helpful for the distribution effect on income.

3. DATA AND METHODOLOGY

3.1 Data

Panel data has been used in this study during the period of 1980-2020 for the four selected countries; Bangladesh, India, Pakistan and Sri Lanka. While, the remaining countries excluded from the study due unavailability of data. The main reason to select these countries is that majority of the past work has been done on the Asian Countries instead of selecting few of SAARC countries. The data has been retrieved from the Standardized World Income Inequality Database (SWIID, 2020), Version 9.0, developed by (Solt, Frederick, 2020), the World Bank "World Development Indicator". The countries used are unbalanced panel with at least 40 observations on each variable for each country.

3.2 Proposed Model:

The objective of this study is to investigate the impact of FDI on income inequality for Bangladesh, India, Pakistan and Sri Lanka. The model can be written as:

$$lnGini_{it} = \beta_o + \beta_1 lnFDI_{it} + \beta_2 lnTO_{it} + \beta_3 INFL_{it} + \beta_5 GDP_{it} + \beta_6 GEXP_{it} + \varepsilon_{it}$$

Where, $Gini_{it}$ = Gini coefficient (measure of income equality), FDI_{it} = FDI stock a percentage of GDP, TO_{it} = Trade openness (exports plus imports as a percentage of GDP), $GDPC_{it}$= Per Capita GDP in U.S. $ (proxy for economic growth), INF_{it}= Annual inflation rate (consumer price index), GGDP = Government expenditure as a proportion of GDP, ε_{it} = Error term
i = Countries (i = 1, 2, 3, 5), t = Years (1980, 1982, 1983 ….2020)

3.3 Cross-sectional Dependence Test

Cross-sectional dependence is a critical problem in panel data as suggested by Goldin (1966). If ignore it, then will leading to unreliable results and ambiguous information. With similar to the earlier research, it is proved that panel data techniques needed to yield a significant cross-sectional dependence on error terms. The main aim of cross-sectional errors is considered to in terms of various reasons; the omitted common impacts, unobserved factors with spatial effects (Pesaran, 2004). In order to test the cross-sectional dependence amid the variables and to further improve our empirical estimations, we used Bruesch and Pagan (1980) and Pesaran (2004) CD tests.

3.4 Panel Unit Root Test:

Panel Unit root test is used to check stationarity in time series. Generally we used three kinds of models in panel data estimation and analysis i.e Random effect model(REM), Fixed Effect Model (FEM), and Pooled OLS (Gujrati 2003) ; Ani (2013) ; Baldev Raj and Bultagi (1995), Wooldridge (2008) and Green (2007) etc. As our data set contain of 41 observations for 4 selected SAARC countries i.e Pakistan, India, Bangladesh and Sri Lanka on each country, as our data has time series property so we

will apply Panel Unit root test that is suggested by Levin, Lin and Chu (2002) and Im, Pesaran and Shin (2003). The general form of the panel ADF test as:

$$\Delta y_{it} = \alpha y_{it-1} + \Sigma^{pi}_{j=1} \beta ij \, \Delta y_{it-1} + X'_{it} \, \delta + u_{it} \ldots\ldots\ldots\ldots\ldots (2)$$

Where Δy_{it} is panel data series in different terms, $\alpha = \rho - 1$, ρ is the lag order for Δy_{it} that can fall and rising for cross section and X is the explanatory variable in the model.

3.5 Panel Cointegration test

To check the long run relationship we used the Pedroni's (1999, 2004) co-integration tests. This test is chosen on other co-integration methods among its class because it controls the country's size bias and resolving heterogeneity problem through parameters that may differ among individuals. Pedroni (2004) introduces seven statistics of two sets of co-integration tests. The first set contains four panel statistics and consist of v-statistic, rho-statistic, PP-statistic and ADF-statistic. These statistics are categorized on within dimension and take common autoregressive coefficient through the countries. The second set involves three group statistics and comprises rho-statistic, PP-statistic and ADF statistic. These statistics are categorized between-dimension and established on the individual autoregressive coefficients for every country in the panel. The null hypothesis is that there is no co-integration ($H_0 : \rho_i = 1$), while the alternative hypothesis of co-integration between variables. Panel co-integration tests of Pedroni (1999, 2004) are undertaking the residual of Eq (1). The residuals model is as the following form:

$$\hat{e}_{it} = \lambda_i \grave{\varepsilon}_{it-1} + \mu_{it} \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

3.6 FMOLS and DOLS techniques

Though OLS statistics of the co-integrated vectors are super convergent, their distribution is asymptotical biased and influenced by residual parameters related with the existence of serial correlation in the data (Pedroni,2001), Kao and Chiang (2001). Such usual issue in time series literature also down sitting for panel data and subject to be exist even in the existence of heterogeneity (Kao and Chiang, 2001). To perform tests on the co-integrated vectors, it is resultantly important to employ models for effective estimation. From numerous existing approaches, we will only mention two- Fully Modified OLS regression was originally (Philips and Hansen, 1990) used to provide optimal results of cointegrating regressions. The method modifies least squares to account for serial correlation effects and for the results from the existence of a cointegrating correlation. Dynamic OLS was proposed by Saikkonen (1991), Stock and Watson (1993) is a parametric methodology in which lags and leads are introduced to handle the problem regardless of the order of integration and the existence or absence of co-integration. In the case of panel data, OLS estimator suffers from small sample bias and endogeneity bias (Phillips and Moon, 1999).

3.6.1 FMOLS estimator

Pedroni (2001) used FMOLS technique to solve the issue of endogeneity between independent variables. Then he proposed the following equation;

$$\acute{Y}_{i,t} = \alpha_i + \beta_i X_{i,t} + \grave{\varepsilon}_{i,t} \ldots\ldots\ldots\ldots\ldots (5)$$

He suggested that $\acute{Y}_{i,t}$ and $X_{i,t}$ are cointegarted with slopes β_i , where β_i may or may not be homogeneous across i . in another way he proposed eq; (5) as following:

$$\acute{Y}_{i,t} = \alpha_i + \beta_i X_{i,t} + \sum_{k=-ki}^{ki} \omega_{i,k} \Delta X_{i,t-k} + \grave{\varepsilon}_{i,t} \ldots\ldots\ldots\ldots\ldots (6)$$

Thus the FMOLS estimator can be written is;

$$\beta^*_{FMOLS} = \frac{1}{N}\sum_{i=1}^{N} \quad [(\Sigma_{t=1}^{T}(X_{i,t} - \bar{X}_i)^2)^{-1} \ (\Sigma_{t=1}^{T}(X_{i,t} - \bar{X}_i)\ W^*_{i,t} - T\lambda_i)] \ \ldots\ldots\ldots\ldots(6)$$

3.6.2 DOLS estimator

The DOLS approach was first introduced by Saikkonen (1991) for the time series case, and then adopted by Kao and Chiang (2001) and Mark and Sul () for panel date case. This method contains to include advance and lag values of $\Delta X_{i,t}$ in the co-integrated association in order to finish the association between independent variables and noise terms.

The DOLS estimator is the following;

$$\beta^*_{DOLS} = \frac{1}{N}\sum_{i=1}^{N} \quad [(\Sigma_{t=1}^{T} Z_{i,t}\, Z'_{i,t})^{-1} \ (\Sigma_{t=1}^{T} Z_{i,t}\, \grave{W}_{i,t})] \ \ldots\ldots\ldots\ldots(6)$$

where $Z_{i,t} = [X_{i,t} - \bar{X}_i, \Delta X_{i,t-k}, \ldots\ldots, \Delta X_{i,t} + k_i]$ is the vector of explanatory variables, and $\grave{W}_{i,t} = W_{i,t} - \bar{W}$.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Table 1 displays the descriptive statistics which summarizes the average, maximum value, minimum value and standard deviation of the data used in the analysis. Table 1 indicates that lnGini coefficient of selected sample countries during the study period ranging from the maximum and minimum of 3.8897 and 3.37073 respectively with a mean of 3.653132 and standard deviation of 0.15779. Similarly, the average foreign direct investment as a percent of GDP is 0.838374, and the maximum and minimum values are 1.29973 and -7.05702 respectively. Trade openness was observed to be 3.68437, and the maximum and minimum values are 22.57921 and 2.503014 respectively. In the same way, the average value of inflation is 1.96446 of selected sample countries during the study period of 1980 to 2020. the maximum and minimum values of inflation are 3.26367 and 0.392839 correspondingly. The maximum and minimum values of Per Capita GDP in U.S. $ (proxy for economic growth) are 8.386675 and 5.264809, while the mean value is 6.447320. Finally, the average value of general government consumption expenditures is 2.18905, and the maximum and minimum values are 2.868530 and 1.399519 respectively.

Table 1: Descriptive Statistics

	LGINI	LFDI	LTO	LINF	LGDP	LGCEXP
Mean	3.653132	0.838374	3.684375	1.964461	6.447320	2.189050
Median	3.711130	-0.267094	3.556996	2.024976	6.193232	2.332973
Maximum	3.889777	1.299735	22.57921	3.263674	8.386675	2.868530
Minimum	3.370738	-7.057022	2.503014	0.392839	5.264809	1.399519
Std. Dev.	0.157799	1.667537	1.603863	0.517036	0.758263	0.364296
Skewness	-0.084820	-1.538439	10.62627	-0.309924	0.817941	-0.789792
Kurtosis	1.636954	4.851421	125.9163	3.058172	2.860217	2.525020
Jarque-Bera	12.18477	83.27979	100492.3	2.503222	17.40940	17.57112
Probability	0.002260	0.000000	0.000000	0.286044	0.000166	0.000153
Sum	566.2355	-129.9480	571.0782	304.4915	999.3346	339.3027
Sum Sq Dev.	3.834692	428.2245	396.1457	41.16822	88.54426	20.43755
Observations	**155**	**155**	**155**	**155**	**155**	**155**

Source: Author's estimation

4.2 Correlation Matrix

Table 2 represents the correlation matrix results between dependent and independent variables. FDI has positive relationship with Gini coefficient, which suggests that increasing in FDI will raise income inequality. Similarly, GDP and GCEXP have a positive relationship with Gini coefficient, confirming that economic growth and general government consumption expenditures can raise income inequality. On the other hand, trade openness and inflation have negative effect on Gini coefficient, which implies that effective trade policies and inflation can reduce income inequality in the sample countries during the study period.

Table 2: Correlation Matrix

	LGINI	LFDI	LTO	LINF	LGDP	LGCEXP
LGINI	1.000000					
LFDI	0.437520	1.000000				
LTO	- 0.170458	0.209494	1.000000			
LINF	-0.142257	0.115506	-0.166416	1.000000		
LGDP	0.512649	0.615800	0.090477	-0.170767	1.000000	
LGCEXP	0.638368	0.435086	0.100597	0.229407	0.248344	1.000000

Source: Author's own estimation

4.3: Panel Unit root tests

Table 3 presents the result of Leven *et al*, (2002) and Im *et al,* (2003) panel unit root tests of each variable. The null hypothesis investigates non-stationary. Our result showed that there exist unit root at level in all series. This implies that each variable is integrated of order one, *I*(1).

Table 3: LLC & IPS Stationary tests

	Leven, Lin & Chu test				Im, Pesaran and Shin test			
Variables			Level	First difference	Level	First difference		
	I	I&T	I	I&T	I	I&T	I	I&T
lnGini	-1.08225	1.60514*	-3.02092***	-3.6522***	-0.58582	2.31575	-3.12173***	-3.5248***
lnFDI	-1.06589	-1.29896*	-7.67275***	-5.3217***	-1.04931	-1.203457	-9.74215***	-6.7154***
lnTo	-0.66108	1.08829	-6.33682***	-5.81922***	-1.19226	-0.84044	-7.27608***	-6.1059***
lninf	0.34619	8.10000	-9.90318***	-9.06739***	-1.03593	-1.20815	-9.75641***	-8.7555***
lnGDP	3.02809	0.40123	-2.32722***	-2.54056***	5.93179	2.02255	-4.12301***	-4.2557***
lnGCEXP	0.73738	1.45196	-1.87512**	-1.53418**	-0.82236	-0.37727	-5.00517***	-3.8543***

Note: *,**,*** indicate significant at 10%,5% and 1% level respectively

4.4 Cross-sectional Dependence test

Result of cross-sectional dependent test is shown by table 4. The findings of three tests reject the null hypothesis of no cross-sectional among the countries. This suggests that the shock in one country will affect other countries because of development like as free trade, technological development and globalization. In such situation may cause inter-country correlation, which is cross-sectional dependence (Menyah *et al,* 2014).

Table 4: CD tests

Variable	Breusch-Pagan LM	Pesaran scaled LM	Pesaran CD
lnGini	93.42054 (0.0000)	25.23614 (0.0000)	9.141090 (0.0000)
lnFDI	185.2418 (0.0000)	51.74265 (0.0000)	13.58931 (0.0000)
lnTO	45.78607 (0.0000)	11.48525 (0.0000)	8.34561 (0.0000)
Lninflation	32.56584 (0.0000)	7.668897 (0.0000)	2.654420 (0.0000)
lnGDP	219.6241 (0.0000)	61.66795 (0.0000)	14.81665 (0.0000)
lnGCEXP	24.69756 (0.0000)	5.397521 (0.0000)	-1.892234 (0.0585)

Null hypothesis is No-cross-section dependence (correlation)

4.4 Cointegration tests results

After confirming the stationarity the variables, we proceed to identify the possibilities of long run relationship between the variables by using the cointegration test. We employed two different co-integration tests Kao cointegration and Pedroni cointegration tests. Table 4 indicates the variables are cointegrated and have a valid long run relationship because the results leading to the rejection of null hypothesis of no cointegration at 1% and 5% significant levels. The Pedroni test results indicate that out of seven statistics four of them are significant at 1% and 5% levels respectively. While the Kao co-integration technique shows significant at 5% level.

Table 4 shows the results of Kao and Pedroni cointegration tests

Series: lngini lnfdi lnto lninf lngdp lngcexp				
Kao cointegration test				
	t-statistics	**Prob**		
ADF	-2.47430	0.04811**		
Residual variance	0.0000551			
HAC variance	0.000122			
Alternative hypothesis: common AR coefs. (within-dimension) **Null Hypothesis:** No co-integration				
			Weighted	
	Statistic	Prob.	Statistic	Prob.
Panel v-Statistic	-2.413258	0.9921	-2.435431	0.9926
Panel rho-Statistic	-0.642531	0.2603	-1.412620	0.0789**
Panel PP-Statistic	-1.936544	0.0264***	-3.080524	0.0010***
Panel ADF-Statistic	-2.145834	0.0159***	-3.127942	0.0009***
Alternative hypothesis: individual AR coefs. (between-dimension)				
	Statistic	Prob.		
Group rho-Statistic	-0.599699	0.2744		
Group PP-Statistic	-2.833450	0.0023***		
Group ADF-Statistic	-3.485783	0.0002***		

*** Outline significant at 1% level

4.5 Long run relationship

After confirming the possibilities of a long-run relation between Gini coefficient, foreign direct investment, trade openness, inflation, gross domestic product and general government consumption expenditures, we continue to estimate the FMOLS and DOLS estimation. The result of OLS, FMOLS and DOLS models shows in table 5. Coefficients of all the variables with regard to significant, magnitude and sign are not very different. Result of both FMOLS and DOLS estimations show that FDI has positive and statistically significant effect on income inequality. This implies that increasing FDI may exacerbate income inequality. This outcomes support the Kuznets hypothesis that higher income inequality is caused by the initial increase in economic growth. This may be ascribed to the fact the bulk of FDI that flows into the economy are focused to few sectors such as oil, gas, banking and telecommunications and those employed in these sectors ordinarily earn more than the wages of those engaged in other sectors which attract less FDI such as education, transportation, agriculture, manufacturing etc. The outcome supports evidence from previous research for instance (Song *et al,* 2021). This establish that FDI positive influence on income inequality.

The coefficient of trade openness is negative and statically significant at 5%. This suggest that trade openness reduce income inequality. Conceptually one expect that trade openness allows the SAARC countries to take full advantage of its factor endowment and comparative advantages, which promote economic growth and in turn reduces income inequality (Osode *et al,* 2020).

The coefficient inflation is negative and insignificant at 5%, this implies that inflation has no effect on income inequality. This result is surprising because it was

assumed that inflation would increases the assets hold by wealthy, and reduce the purchasing power of the poor, who spends a lot of their income on the consumption of important items, like as food are badly effected by price hike due to inflation. Simultaneously, a price hike essentially transferred a significant percentage of the income of poor to rich therefore increasing income inequality (Rezk *et al,* 2022; *Deyshappriya*, 2017; Jantti and Jenkins, 2001).

Next, the outcome of economic growth has positive relationship with income inequality in all the models. This finding is suggesting that higher economic growth experienced in selected SAARC countries can increase income inequality. Additionally, the coefficient of GDP can be interpreted as that when economic growth rises by 1 % leads to increases income inequality by 0.9 %, 0.2% and 0.3 % correspondingly. This result is same to the previous studies of (Rubin and Segal, 2015; Malindini, 2017; Fazalla, 2019). Rubin and Segal (2015) found that the positive relationship between economic growth and income inequality can be caused by the large proportion got by highest income shares in the countries and this situation is beneficial to economic growth reasonably than worker's wages.

Finally, general government consumption expenditures have a positive with income inequality. This finding suggests that 1 percent increases in government expenditures raises income inequality by 23%, 9% and 8% respectively. The surprising positive impact of government spending on income inequality implies that government expenditures may benefit high income families and individuals larger than lower income individuals. Additionally, the positive relationship may be owing to a little benefits cover and lack of target to the poor for the few services and transfer that Asian countries provide (Claus *et al,* 2012).

Table 5 Panel OLS, FMOLS and DOLS results

Variables	OLS		FMOLS		DOLS	
	coef	t-stat	Coef	t-stat	Coef	t-stat
lnFDI	0.011761	-1.609430	0.007936	2.221545**	0.003935	1.916207**
lnTO	0.012096	2.165592**	-0.00681	-2.353563**	-0.01404	-2.269427**
lninf	0.041179	2.165592	-0.01512	-1.606784	-0.00055	0.032755
lnGDP	0.097561	6.45813***	0.026998	3.41967***	0.037658	3.267517***
lnGCXP	0.230743	8.68855***	0.093004	3.42219***	0.086479	2.236962**
	R-square	0.566164	R-square	0.964765	R-square	0.983444

Notes: ***& ** shows significant at level of 1% and 5% respectively.

CONCLUSION

This study empirically examined the effect of foreign direct investment on income inequality for a panel of 4 SAARC countries using time series data during the period of 1980 to 2020. We employed various panel co-integration approaches which proved the existence of a long run association between the variables. The findings of FMOLS and DOLS indicated that FDI has a positive significant effect on income inequality based on analysis. The long run elasticities results showed that economic growth and government expenditures have significant and positive influence on income inequality. Whereas, trade openness has statistically significant and negative link with income inequality.

The governments of these countries need to focus not only on specific sectors but also on other sectors such as education, transportation, agriculture, manufacturing etc. Additionally, policy makers did not have scared that access to technology and foreign knowledge is get at the cost of expanding the economic and social inequality where multinational firms located. Countries should not create barriers that detaining

the inflow of FDI. Such barriers would bring no benefits and might even impede economic growth and can further widening income inequality. Favorable for income inequality, governments of these countries should try to increase imports and exports at certain levels. Economic growth has beneficial for the people of a country if there distribution policies are favorable. If economic growth is higher but its distribution in not good, then it is not advantageous for the poor. So, economic growth can be made better for income distribution through the of system progressive taxation. Governments of these countries should keep inflation within a certain limit and it should reimburse the poor against inflation. Regarding to government expenditures, governments need to assess their policy, not only concerning where to spend the money, but also which societies who need it the most.

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