Annals of Social Sciences and Perspective

ISSN (Print): 2707-7063, ISSN (Online): 2788-8797
Volume 5, Number 2, July-December 2024, Pages 287-301
Journal homepage: http://assap.wum.edu.pk/index.php/ojs

Interplay of Foreign Direct Investment, Remittances, and Economic Growth: Insights from SAARC Countries

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ARTICLE DETAILS

History:

Received: May 29, 2024
Accepted: September 10, 2024

Keywords:

Foreign Direct Investment
Remittances
Growth
PARDL

DOI:

10.52700/assap.v5i2.376

ABSTRACT

The current study focuses on finding and analyzing the nexus between remittances, foreign direct investment, and economic growth in SAARC countries. This study uses secondary balanced data of selected SAARC countries for the years 2000 to 2019. This study uses gross domestic product i.e., GDP, which serves as the proxy of economic growth, as the dependent variable. The core independent variables of this study include (FDI) foreign direct investment and remittances (RMTN). Additionally, gross capital formation (GCF) and carbon dioxide emissions (CO2) are the other two independent variables in this study. For the proxy for environmental degradation the study uses data of CO2 emissions. The data is collected from the world development indicators, WDI. The study focuses on how all the independent variables affect the growth of economy in selected SAARC countries which include Pakistan, India, Bangladesh, Sri Lanka, and Nepal. The study applies cross sectional dependence test, panel cointegration test, unit root tests, and PARDL (panel auto regressive distributed lag model), also called pooled mean group methodology, to obtain empirical estimates. The results of PARDL show that FDI, RMTN, and GCF are all positively and significantly related to GDP. This means that GDP or alternatively economic growth, is improving with rise in FDI, RMTN, and GCF in selected SAARC countries. The results show that CO2 emissions have a negative significant impact on GDP i.e., increase in pollution levels is harmful for the growth of the selected economies.

1. Introduction

A country's growth, progress, and development can be measured by looking at the GDP of that country. GDP is short for gross domestic product. GDP is undoubtedly the most discussed topic in economics and rightfully so. Basically, gross domestic product indicates the total monetary value of final gods that are produced by people living in a country over a time of a year. The definition is itself explanatory of how GDP is indicative of a growth of an economy because in very simpler terms we can narrow it down and say that GDP simply reflects the level of economic activity in a country. So if a country is engaging in more activities then it means it is producing more, earning more, consuming more, and spending

more; all three things that indicate a working economy. So if the level of these activities is higher a country is a developed country and if the GDP of a country is not much at larger or higher levels, then that country is a developing country. If a country's GDP is very low then it is an under-developed country. The data of GDP of different countries give us a better understanding of this phenomenon.

According to World Bank the GDP of top six countries in the world i.e., United States, China, Japan, Germany, United Kingdom, and India is $20.89 trillion, $14.72 trillion, $5.06 trillion, $3.85 trillion, $2.67 trillion, and $2.66 trillion respectively. Let's compare these huge GDP figures with the data of countries that we are going to study in this paper. The GDP according to World Bank in Bangladesh, Bhutan, Nepal, Pakistan, Sri Lanka, Maldives, and Afghanistan is $460.2 billion, $2.768 billion, $40.83 billion, $374.7 billion, $74.4 billion, $6.171 billion, and $14.27 billion respectively. It is evident form the data of GDP that the countries that are leading the world right now have humongous GDP while those countries that are not performing so good economically or even are struggling a lot, all have low levels of GDP as compared to the leading nations.

Over the past few decades, international transfers of money from developed countries to developing countries have expanded dramatically, these transfers are called remittances. Remittances turn out to be the most important source of international currency revenue in developing countries, even surpassing export receipts, FDI, aid and other insider capital flows. As a result, remittances have become a reasonably attractive source of foreign currency for less developed countries. Many policy makers view remittances as an unrestricted private flow of money that stimulates investment and consumption. Remittances are sometimes compared to foreign direct investment (FDI) and other private global capital flows. Hence, it is clear that remittances impact economic growth in the similar manner as the influx of other types of grand investments by foreign bodies.

Remittances are the flow of foreign currency sent by migrant workers to their country from the foreign country they have migrated to. In the process of global economic integration, remittances have been noted as a rapidly growing source of earnings in other currencies for many developing nations. Remittance inflows often increase migrant individuals' standard of living, and as such, the migrant specific group's community can change by obtaining major advantages. Remittance transfers also give senders and recipients a chance to play a part in increasing social and financial inclusion by having access to financial services.

By maintaining the relationship between the local economy's constant growth and its reliance on the global economy, remittances also play a major role in supporting the economy of the recipient's home country. Compared to other internal flows of resources into the economy as a whole, the huge number of remittance inflows plays an active and vital role in macroeconomic considerations in many developing nations. Many studies show that workers' remittances positively influence the growth of a country. The remittances inflows in South Asia reached $176 billion figure in 2022. This figure was enormous as compared to the predicted figure of $13 billion only. The rate of growth of remittance inflows in South Asia was 12.2% in 2022 which was more than double the growth rate in 2021. Remittances proved to be one of the biggest sources of foreign exchange in South Asian countries. Remittances accounted as significant part of GDPs of South Asian countries. In Nepal the remittances were 23.1% of GDP. 7.9% of GDP in Pakistan. In Sri Lanka remittances stood at 5.1% of GDP. While in Bangladesh this figure was 4.7%. Not only do they help raise the average cost of living in underdeveloped countries, but they also contribute to eradicating poverty worldwide. According to a 2017 report by the International Monetary Fund (IMF), cross-border remittances, commonly known as remittances, are the second largest type of finance after foreign direct investment (FDI) in many countries. Remittances are seen as an essential source of finance and economic growth more broadly. For decades, economists have been

debating the determinants of economic development in developed and emerging economies.
Foreign direct investment is a very crucial element when talking about the international money flows in a host country. Foreign direct investment, abbreviated as FDI, means when a foreign entity invests in the recipient country. This foreign entity can be of any kind and the investment can be of any kind as well. This means that if a foreign private investor, foreign government, foreign institutions, foreign companies, foreign firms etc. invest in another country it is called FDI. Similarly the investment type and motive can also vary but it would still be considered FDI. FDI has been found to have positive as well as negative effects on a country. On one hand FDI significantly increases the GDP of a country. The investments made by foreign entities are spent on development and growth projects that lead to the betterment of the country. But on the other hand FDI also increases pollution level in the host country. Most of the time, the developed countries look for such developing countries that do not have strict environmental rules to invest their pollution intensive investment in; that creates the phenomenon of pollution haven hypothesis. Different studies show both perspectives to be proven. The increase in globalization has dramatically increased the amount of foreign direct investment. According to data on FDI provided by the World Bank Indicators the FDI was recorded to be $1.56 billion, $1.34 billion, and $0.9 billion in Bangladesh, Pakistan, and Sri Lanka in 2022.
Gross fixed capital formation also, which is abbreviated as GFCF, indicates how much capital is created in a country in over a year as a result of investments made by the residents of a country, after deducting disposals. The interesting thing here is that these fixed assets can be both tangible as well as intangible assets that result from production processes carried in a country. GFCF is that component of the GDP that shows the extent of new value added in the economy that is invested instead of consumed value added. Whether private households, governments, or businesses gain new assets, it is included in the gross fixed capital formation. It is important to remember that addition in new financial assets is not a part of GFCF. Developed countries have much higher rates of GFCF as compared to developing or under developed countries. Many studies show how gross fixed capital formation positively adds to the growth of an economy. By calculating the algebraic sum of inventory variations and GFCF, we find gross capital formation or GCF. GCF is the variable that will be used in this study.
A country can only be as prosperous as it is environmentally healthy. Meaning if the environmental quality in a country is degrading and deteriorating then no matter how much growth or development that country achieves, it will still meet negative consequences in the long run. Most of the times it is observed that growth in developing nations occurs at the expense of environmental quality. Developing countries carry out cheap production activities without taking into account how much pollution these types of economic activities is creating. Increased production, consumption, spending, etc. often means release of harmful gasses into the air, dumping waste in river and lands, etc. that is why this study is incorporating the variable of CO2 emissions, that is a proxy of environmental degradation, to find out how the CO2 emissions are affecting the selected SAARC countries. In general, poor nations were more affected by remittances than developed countries. As many individuals want jobs in wealthy nations, emigration from developing to developed countries has always been helpful. A lot of residents of developing nations look for jobs in advanced nations like those of Europe, the US, and the Middle East. This study looks at how remittances and foreign direct investment affect economic growth in the SAARC region.

2. Literature Review

Manzoor et al., (2019) explored how foreign remittances effect the household poverty in Pakistan. The aim of the study was to analyze whether foreign remittances play any important

role in reducing the household poverty. The researchers looked at the data from 2018 to 2019 from the Pakistan Social and Living Standard Measurement Survey. The study employed probit regression for empirical analysis. The binary variable used in the study was household poverty with two values: non-poor and poor. The independent variables of the study included foreign remittances, region, family size, and number of employed people in a household. The results highlighted that remittances, region, and number of workers in a household have a significant negative link with household poverty. Thus indicating that these variables reduce the household poverty levels. However the family size has a positive significant relationship with household poverty which means larger families mean more household poverty. The researchers suggested making such migration policies that help increasing the foreign remittances and raising awareness regarding increasing population's negative effects in Pakistan (Ali, Shaheen & Yasmin, 2016).

P. P. (2019) observed the effects of remittance inflows and FDI. The study focused on developing Asian countries that have been receiving huge amounts of FDI and remittance inflows in the past years. The aim of this study was to carry on a comparative dynamic panel study to find out how foreign exchange rates and GDP in selected countries is affected by remittances and FDI. The study used data from 1981 to 2015. The dynamic panel GMM methodology was used in this study. According to the results FDI and remittances have a significant positive relationship with GDP and exchange rate in observed countries. This means that remittances and FDI are adding to the growth in these selected countries.

Barua (2019) examined which factors accelerate the economic growth in south Asian countries. To find out the drivers of economic growth in south Asian economies the study used data ranging from 1975 to 2016. The technical methodologies used included one-step GMM as well as panel corrected standard error technique. The economic growth was the dependent variable in the study. Remittances, government expenditure, energy use, FDI, trade, and gross capital formation were the independent variables of the study. The findings proved that gross capital formation, remittances, and energy use were the main drivers of economic growth in south Asian countries as they had a significant positive effect on GDP. The other independent variables were not found to have significant impact on GDP.

Sharma (2020) aimed to understand which factors drive FDI in SAARC countries and what is the causal nexus between these determining factors and FDI. 6 SAARC countries namely Bhutan, Nepal, Pakistan, India, Sri Lanka, and Bangladesh were studies for this research. The data of 19 years i.e., from 2001 to 2018 was gathered. The determining factors of FDI like economic growth, market size, openness of the economy, inflation rate, political stability, infrastructure development, corporate tax, and labor productivity were studied. According to results FDI inflow has a long run causal relationship with market size, political stability, infrastructure development, openness of the economy and corporate tax. Corporate tax showed bidirectional long run short run and strong joint causality with FDI inflows. The study concluded that SAARC countries must improve their infrastructure, and lower the corporate tax so that they can attract higher FDI inflows.

Sahoo and Sethi (2020) determined what kind of a relationship existed between financial globalization, economic growth, and trade openness. Data of selected south Asian countries was analyzed for the time of 1990 to 2017. The stationarity of the used variables was determined by IPS and LLC tests. Fisher, pedroni, and kao conitegration tests confirmed that the variables are in fact linked and related to each other in the long-run. A unidirectional causal relationship between growth and FDI is also confirmed by granger causality test. The study then applied DOLS and FMOLS techniques for estimation. The results confirmed that the effect of financial globalization and trade openness was significantly positive on the growth of the economy. The study suggested that selected south Asian countries must focus on creating robust and strict international financial system and domestic financial system so

that they can avail the gains form financial globalization and trade openness.

Jena and Sethi (2020) investigated regarding the effects of foreign aid reflected on the growth of the economy. For this purpose the researchers studies south Asian countries. Data was collected for the years 1996 to 2017. The researchers studied 8 south Asian countries for this research. Several econometric techniques like panel cointegration tests, panel FMOLS, and panel DOLS were used. The independent variables of the study were foreign aid, price stability, investment, trade openness, and financial deepening. The dependent variable of the study was economic growth. The results revealed that there exists a short run and long run relationship among the observed variables. It was also found that both in the short run and long run, foreign aid has a positive unidirectional causality running to economic growth.

Abduvaliev (2020) investigated the effect of remittances on growth of economy and reduction of poverty. The researchers focused on 10 of the former post soviet republics known as CIS (commonwealth of independent states). The effect that remittances create on economic growth was examined in comparison with other capital sources such as FDI and foreign aid. Different estimates of poverty like poverty headcount, poverty severity, and poverty gap were used. The econometric panel data analysis revealed that remittances helped reducing poverty severity and remittances also helped increasing the level of GDP in selected countries. Thus remittances were improving the growth of selected countries while also reducing poverty by smoothing consumption levels and increasing income (Ali, Bajwa & Shaheen, 2016).

Raza et al., (2021) studied the foreign investment and welfare nexus in low income countries. The study focused on how greenfield investment impacts the low income countries. Since low income countries are rich in natural minerals they attract a lot of foreign investment that uplift their economy. The study used data of 14 low income countries for the years 1998 to 2017. The stationarity of variables is checked by IPS test. The one-step system GMM methodology is used to perform the detailed analysis. The study used following variables: greenfield investment, remittances, inflation, health, welfare, education, economic growth, and population. The findings of analysis revealed that remittances and greenfield investment (a type of foreign investment), have a positive impact on health, economic growth, welfare, and education in low income countries. However foreign investment in the form of aid has negative implications. The study suggests creating such policies that attract more greenfield investment.

Oguntomi & Igbinedion (2021) studies how the performance of health sector and remittance volatility is linked in case of Nigeria. Secondary data was collected from 1981 to 2018. To measure the performance of health sector the researchers used the variable life expectancy at birth as a proxy. Other independent variables besides remittance volatility included public health expenditure, education level, and income were also used. The study employed ECM and FMOLS or fully modified ordinary least squares techniques to reach results. According to the results remittance volatility significantly and negatively affects the life expectancy in the long run. In short run the relationship is positive but insignificant. Other independent variables were also found to have a great effect on life expectancy in case of Nigeria. Since remittance volatility occurs due to external factors that are not in the hands of policy makers of the recipient country, the study suggests making such policies that successfully tackle internal shocks so that there can be enough room to tackle random and unexpected external shocks.

Rahman (2021) studied the ever changing and ever evolving relationship that exists between international trade, consumption of energy, and growth of economy. The study looked at this dynamic nexus in BRICS and ASEAN countries. The dependent variable of the study was economic growth while FDI, international trade, energy consumption, and capital were used as independent variables. The time duration for data collection was 1990 to 2017. Several

statistical methodologies and tests were used for analytical purposes, these included panel cointegration test, panel quantile regression method, impulse response function, and heterogeneous panel causality test. According to results of empirical analysis the growth in the selected countries is affected positively and significantly by FDI, trade, energy use, and capital. The study also found proof of bidirectional causality existing between economic growth and energy consumption while a unidirectional link was also found running from economic growth to FDI.

Sethi (2021) examined the impact of foreign capital on the economic growth of south Asian countries. The study utilized data of 8 south Asian countries from year 1990 to 2017. The variables used to show foreign capital were remittances, FDI, and foreign aid. Various econometric methodologies like panel FMOLS, johansen-fisher panel conintegration test, and PDOLS are used in the study to find out the association between the selected variables. The results declared that there is both a long-run and a short run relationship between economic growth, remittances, foreign aid and other macroeconomic variables. The results obtained from the granger causality framework also revealed a unidirectional causality between FDI inflows to economic growth. However in short run there is no causality between remittances to economic growth (Ali, Sharif & Hameed, 2018).

Murshed et al., (2021) examined how environmental regulations, environmental stability, and economic growth are linked. The study took into consideration the reducing effect that environmental patents have on ecological footprints. The researchers focused on south Asian countries for this study. Four major fossil fuel dependent countries i.e., India, Bangladesh, Sri Lanka, and Pakistan were studied using secondary panel data over a period of time. Technical methodologies applied involved slope heterogeneity, cross sectional dependency, and structural break. The variables studied in this research were renewable energy, non-renewable energy, FDI, economic growth, environmental regulations, and ecological footprints. According to the results it was obvious that environmental regulations played a direct as well as indirect significant role in reducing ecological footprint in selected south Asian countries. Non-renewable energy, as shown by the results of the study, increases ecological footprint while renewable energy decreases ecological footprint. It was evident that environmental regulations and renewable energy have a joint effect in reducing ecological footprint. The study also found that the EKC as well as PHH were both valid in these selected countries in south asia.

Bansal et al., (2021) examined the linkages between social, economic and environmental factors with growth in South Asia. The data was collected from 1990 to 2017. The study applied panel data estimation and other econometric approaches. The study utilized dependent variable of economic growth. The used independent variables of the study were financial development, energy use, human development index, biological capacity, and income inequality. The findings revealed that all independent variables except energy use have a positive effect on growth of economy, while energy use has a negative impact. The study concluded that by improving all the positively affecting independent variables the south Asian countries can reduce ecological footprint and income equality and improve and maintain economic growth.

Murshed et al., (2021) empirically argued why the use of renewable energy must be increased in selected south Asian countries. The 4 south Asian countries selected for research were India, Pakistan, Sri Lanka, and Bangladesh. The study focused on improving foreign capital flows and trade in order to stimulate more use of renewable energy in selected south Asian countries. The conclusions reached through econometric analysis state that increase in the inflows of foreign currency and higher level of trade openness play an undeniably important role in increasing the size of renewable energy use in total energy use.

Imran et al., (2021) explored the nexus that exists between economic growth and foreign

remittances in south Asian countries. The growth indicators used in the study were export, inflation, employment, etc. the paper specifically focused on SAARC countries. Panel data from 1994 to 2017 was collected. The model was estimated using random effect model and fixed effect model. Hausman specification test was also employed. According to the results remittances were found to have a positive significant effect on economic growth thus improving the growth in SAARC countries. Employment and export also showed a positive significant link with economic growth. The results also revealed that inflation does not have a significant relationship with GDP.

Islam (2022) studied how the economy's growth and energy use nexus in south Asian countries is impacted by globalization and other critical politico-administrative factors. It is obvious that energy consumption is linked with economic growth in south Asian countries but this study focused on analyzing how this nexus is influenced by country risk indicators and globalization. The study utilized data of 4 south Asian countries from 1980 to 2018. Pooled mean group method of estimation was employed. According to the findings the energy and growth nexus is positively affected by globalization when looked at long run results and negatively according to the short run findings. The politico administrative factors have a negative effect on this nexus in the long run, however its effect in short run is insignificant. The study also applied dynamic ordinary least squares through which it remained robust. The study suggested that the selected countries must improve their institutional quality to effectively tackle the politico administrative problems, post covid-19 issues, and globalization so that they can maintain the energy-growth nexus running.

Hasan et al., (2022) studied the existence of a link between emissions, economic growth, energy consumption, and FDI in case of Bangladesh. The variables studied in the research were GDP, FDI, greenhouse gas emissions, and energy consumption. The study aimed to find whether environmental Kuznets curve was valid or invalid in Bangladesh. The study applied VECM and granger causality test for empirical analysis. The environmental Kuznets curve was proven to be positive by results in case of Bangladesh. The results showed a bidirectional causality running from energy use to GDP and FDI in short run.

Ahmed et al., (2022) delved deeper into understanding the relationship present between energy consumption and financial development. The study analyzed data of FDI, economic growth, and urbanization in 136 countries. The time period was 1990 to 2019. The system GMM technique was used for estimating the model. The results revealed that overall financial development negatively and significantly affected energy consumption. FDI and urbanization also have a significant effect on energy consumption. The findings also showed that energy consumption is positively affected by economic growth.

Umair and Yusuf (2022) evaluated the asymmetric as well as symmetric effects caused by international capital flows and fossil fuel energy consumption on environmental sustainability. The researchers selected south Asian countries for their analysis purpose. The dependent variable used in the study is CO2 emissions. The independent variables of the study included economic growth, fossil fuel energy use, and international capital inflows i.e., remittances and FDI. The data was collected for the years 1975 to 2020. The symmetrical and asymmetrical relationship among the variables is estimated by applying ARDL and NARDL models. The results obtained by ARDL methodology showed that in the long run FDI and remittances decrease CO2 emissions while fossil fuel usage and economic growth increase CO2 emissions. The NARDL results revealed the negative FDI shock and positive remittances shock reduce CO2. The positive fossil fuel energy use shock, as well as the negative shock, leads to an increase in CO2. And positive economic shock increases CO2. The study concluded by suggesting policymakers to regard FDI and remittances as critical instruments in long term policies and strategies related to environmental quality.

Saha et al., (2022) observed how economic growth in south Asian countries s affected by

remittances. Data was collected for the years 1977 to 2020 of Sri Lanka, Bangladesh, Pakistan and India. The goal was to investigate the monetary increases in selected south Asian countries as a result of workers remittances. The study applied pooled OLS methodology. According to results remittances had a negative effect on monetary boom in Pakistan, Bangladesh and Sri Lanka while remittances proved to be beneficial for monetary boom in India.

Biyase et al., (2022) observed the consequences remittances have on the economic growth in South Africa. The study took a detailed approach by analyzing data of 50 years i.e., from 1970 to 2019. The study used economic growth as a dependent variable while the independent variables used were remittances, domestic credit to private sector, domestic savings, gross capital formation, broad money, etc. the study utilized ARDL methodology to get short run and long run estimates. According to the long run results remittances have a significant and negative relationship with economic growth in South Africa. All other independent variables have the similar significant and negative effect on economic growth except for domestic credit which has an insignificant positive effect in the long run.

Bucevska (2022) studied the impact that remittances had on economic growth. The study was based on the empirical analysis of south-east European countries. Data was collected from the years 2008 to 2020. The six SEE countries studied included Croatia, Albania, the republic of north Macedonia, Montenegro, and Bosnia and Herzegovina. The study utilized panel regression with fixed effect model to gain empirical estimates. The results revealed that remittances indeed have a significant positive impact on GDP of selected countries. Thus remittances are increasing the growth of selected economies.

Chowdhury et al., (2022) studied the effect that remittances have on economic progress. The empirical evidence was based on 3 low-income Asian frontier countries. These included Vietnam, Bangladesh, and Sri Lanka. The data was collected from 1990 to 2019. The study applied random effect models, POLS, and fixed effect models on the collected data. Country specific effects were also analyzed using granger causality and VECM. According to the results the remittances show a negative effect on the progress of selected countries. No short run or long run link between remittances and economic progress was found in Bangladesh. In Vietnam only short run association was found. In Sri Lanka there was short causality running from GDP to remittances and also from remittances to GDP. The study stated that the negative link of remittances with economic progress is a result of excessive consumption and investing in unproductive sectors.

3. Data and Methodology

The study examines the effects that are a result of FDI and remittances mainly, and GCF and CO2 emissions additionally, on the economic growth from 2000 to 2019 using panel data. The data is collected for gross domestic product, i.e., the dependent variable here, and remittances, foreign direct investment, gross capital formation, and CO2 emissions, which are the independent variables here. Cross sectional dependence test, panel unit root tests for stationarity, and panel cointegration tests are all applied to determine the methodology of choice. After the results of these tests it is confirmed that we can apply pooled mean group or panel ARDL technique to estimate our model.

3.1. Time Period

The panel data used in this study ranges from 2000 to 2019. This is done to investigate how worker remittances boost economic growth. This period is used to examine the current influence of exogenous factors on dependent variable.

3.2. Source of Data

Data is obtained from World Development Indicators (WDI) to analyze the impact of remittance inflows on the growth of economic activity in selected countries.

3.3. Model Specification:

The association between remittances and economic growth in particular states is the study's fundamental tenet. But the study also incorporates other key independent variables that have a lot of influence on the growth of a country. The model to be estimated in this study is as follows:

$$GDP=f\ (FDI, RMTN, CO2, GCF)$$

Remittances appear as independent variable in the model mentioned above, along with Gross Capital Formation (GCF), CO2 emissions, and Foreign Direct Investment (FDI). The dependent variable is GDP (economic growth). The model above shows that Rem, GCF, FDI, and CO2 all make changes in and affect the GDP. To get better results, we now construct a log model to represent the link that is present between the dependent and independent variables.

$$Log(GDP) = f\ [log(FDI), log(RMTN), log(CO2), log(GCF)]$$

We now set up the model to identify long-term relationships between variables.

$$Log(GDP) = \beta0 + \beta1log(FDI) + \beta2log(RMTN) + \beta3log\ (CO2) + \beta4log(GCF) + \varepsilon$$

The meaning of the terms in equation is as follows:

$\beta0$ = intercept
$\beta1, \beta2, \beta3, \beta4$ = slope
Log (GDP) = log of gross domestic product
Log (FDI) = log of foreign direct investment
Log (RMTN) = log of remittances
Log (CO2) = log of carbon dioxide emissions
Log (GCF) = log of gross capital formation
ε = error term

In this study, we examine the long-term association between remittances and GDP growth using the panel ARDL technique.

Table 1: Variables and Data Sources

Variables	Data Sources
Dependent Variable Economic Growth (GDP)	World Development Indicators(WDI)
Independent Variables Personal Remittances (RMTN)	World Development Indicators(WDI)
Gross capital formation (GCF)	World Development Indicators(WDI)
Foreign direct investment (FDI)	World Development Indicators (WDI)
Environmental Degradation (CO2 emissions)	World Development Indicators (WDI)

4. Results and Interpretation

The study applies different econometric techniques to reach empirical estimates. The interdependence of cross sections is checked through cross section dependence tests. Panel conintegration test is applied to confirm the existence of a long-run relationship that is present between variables. The stationarity of the variables is checked. Then pooled mean group or panel ARDL methodology is applied to obtain short run and long run estimates of the model.

Table 2: Cross Sectional Dependence Test

TEST	GDP	FDI	RMTN	CO2	GCF

Breusch-Pagan LM	200.0526***	79.96148***	206.1842***	102.6364***	191.9323***
Pesaran scaled LM	41.37902***	14.52583***	42.75008***	19.59610***	39.56326***
Bias-Corrected scale LM	41.25997***	14.40678***	42.63103***	19.47705***	39.44422***
Pesaran CD	14.13435***	7.710862***	14.35767***	4.100193***	13.84453***

Source: Specific estimation of researcher by using E-views 9.

Notes: 1%, 5%, and 10% levels of significance are indicated, respectively, by ***, **, and *.

This table shows how all of the variables' cross-sectional dependencies. At 1%, all variables are significant. We thus reject our null hypothesis that there is no dependency between cross sections. And accept the alternate hypothesis that the cross sections in this study are dependent on each other. This means that any good or negative happenings in any of the cross section will have spillover effects on all other cross sections as well.

4.1. Analysis of Panel Data

The gross domestic product of certain SAARC states is impacted by remittances. The impact of this is observed using the Panel ARDL approach. Panel unit root, panel co-integration, panel ARDL, are all components of panel data analysis.

4.2. Panel Unit Root Test

Panel unit root test helps in checking if included research variables are stationary at level, first difference, or second difference. If the data used for analysis is not stationer then the results obtained will be spurious. Moreover, the combination of level of integration of all variables indicates which methodology is applicable on the data. If all variables are stationer at level i.e., I(0) then OLS is to be used, if the variables are stationer at a combination of I(0) and I(1), then panel ARDL can be used.

Table 3: Unit Root Tests Results

Variables		At Level		At 1st Difference		Conclusion
		Individual Intercept	Individual Intercept and Trend	Individual Intercept	Individual Intercept and Trend	
Log GDP	LL & C	-1.82949 (0.0337)	0.87822 (0.8101)	-4.34894 (0.0000)	–	I(1)
	IPS	0.75056 (0.7735)	1.49519 (0.9326)	-3.67404 (0.0001)	–	
Log FDI	LL & C	-4.46821 (0.0000)	–	–	–	I(0)
	IPS	-3.40176 (0.0003)	–	–	–	
Log RMTN	LL & C	-5.46113 (0.0000)	–	–	–	I(0)
	IPS	-3.39736 (0.0003)	–	–	–	
Log CO2	LL & C	-1.04946 (0.1470)	-0.27071 (0.3933)	-2.62257 (0.0044)	–	I(1)
	IPS	0.73842 (0.7699)	-0.05299 (0.4789)	-3.71575 (0.0001)	–	

Log GCF	LL & C	-0.66923 (0.2517)	-0.16825 (0.4332)	-3.08084 (0.0010)	–	I(1)
	IPS	0.94096 (0.8266)	-0.24466 (0.4034)	-3.48919 (0.0002)	–	

Source: Specific estimation of researcher by using E-views 9.

The results of panel unit root test help in determining whether the variables are stationer and even when they are stationer what is the order of integration of all variables. Looking at the results from the table above, it is evident that the dependent variable, GDP is stationer at 1st difference with individual intercept so it is integrated at order 1 or I(1); the probability values for LL&C and IPS tests are (0.0000) and (0.0001) respectively. After that the results of independent variables are shown. FDI is stationer at level with individual intercept with probability values (0.0000) and (0.0003) for LL&C and IPS tests. So it is integrated at level or I(0). Then there is the variable of remittances, RMTN, which is also integrated or stationer at level i.e., I(0) and its values of probability for LL&C and IPS tests are (0.0000) and (0.0003) respectively. The remaining two independent variables CO2 and GCF are both stationer at 1st difference i.e., I(1) with individual intercept. CO2 has probability values (0.0044) and (0.0001) for LL&C and IPS tests. The probability values for LL&C and IPS tests of GCF are (0.0010) and (0.0002).

These results make it abundantly clear that the variables in this study are stationer with a combination of I(0) and I(1), with this combination we are have to apply the pooled mean group or panel ARDL techniques for estimation.

4.3. Panel Co-Integration Test

Panel cointegration test is applied on the panel data to ensure that the variables being used for research are actually relevant to each other in the long run. This means it basically shows if a long run relationship exists between the selected variables or not. When the variables have relationship in long run it means the estimation and results will actually be meaningful and useful and thus we are working on the correct model. Here we apply the Pedroni cointegration to confirm long run relation between the variables.

Table 4: Pedroni Cointegration Test

Test Type: Pedroni Cointegration Test			
Test	Individual Intercept and Individual Trend	No Intercept or Trend	Individual Intercept
Panel v-Statistic	-0.329341 (0.6291)		-0.615573 (0.7309)
Panel rho-Statistic	0.705197 (0.7597)		0.680037 (0.7518)
Panel PP-Statistic	-1.578442* (0.0572)		-1.238020 (0.1079)
Panel ADF-Statistic	-1.736150** (0.0413)		-1.393621* (0.0817)
Group rho-Statistic	1.484122 (0.9311)		1.101123 (0.8646)

Group PP-Statistic	-1.489288* (0.0682)	-3.269490*** (0.0005)
Group ADF-Statistic	-3.219607*** (0.0006)	-3.304377*** (0.0005)

Source: Specific estimation of researcher by using E-views 9.

Notes: 1%, 5%, and 10% levels of significance are denoted, respectively, by ***, **, and*. Probability values are shown in bracketed numbers. There are 5 panel associates, or nations, and 20 time periods. Using the Akaike information criterion (AIC), lags are repeatedly selected.

The first column depicts seven statistical categories or tests. The second and third columns show that these tests are estimated with individual intercept and individual trend and then with no intercept or trend one by one. This test's null hypothesis demonstrates the absence of co-integration between the variables. According to the co-integration analysis's results, 4 out of 7 null hypotheses are ruled out at a 1%, 5%, and 10% level of significance. As a result, co-integration between dimensions and inside the dimension model is present. In specific SAARC nations, there is evidence of a long-standing connection between the explanatory factors and the dependent variable.

4.4. Panel ARDL Technique

To determine the contribution of personal remittances to the economic development of specific SAARC states, the Panel ARDL technique is utilized. This method shows a link between the explanatory variables and dependent variable throughout the long and short terms. Short-run relationships between variables are found using the error correction model (ECM) approach, which also aids in maintaining long-run relationships between independent and dependent model variables. The following table shows long-term results: -

Table 5: Results of Long Run Analysis through Panel ARDL Procedure
Dependent Variable = GDP

Long Run Equation Variable	Coefficient	Std. Error	t-Statistic	Probability
Log FDI	0.077300	0.029583	2.612960	0.0109
Log RMTN	0.215869	0.107645	2.005381	0.0487
Log CO2	-0.286287	0.106516	-2.687729	0.0089
Log GCF	0.697197	0.106972	6.517580	0.0000

Source: Specific estimation of researcher by using E-views 9.

This table explains the long-term relationships between the gross domestic product (GDP) and all explanatory variables that were estimated using a panel auto regressive distributed lag technique.

An explanatory variable, foreign direct investment has a probability value of 0.0109 and a coefficient value of 0.077300. This result specifically states that a one percent increase in foreign direct investment results in an increase of 0.077300 percent in GDP. Thus FDI has a positive and significant impact on GDP in SAARC countries. Since the sign of the coefficient is positive it means that FDI and GDP have a direct relationship and both move in the same direction. [M. M. Rahman (2021) and A. Sharma (2020)].

Personal remittances have a coefficient value of 0.215869 and a probability value of 0.0487, indicating a significant positive relationship with GDP. The values show that a 1% increase in the RMTN would result in a 0.215869% increase in GDP. Thus our results confirm that remittances positively affect the GDP in SAARC countries. RMTN and GDP have a direct relationship. [P. P. (2019), S. Barua (2019), and Abduvaliev. M (2020)].

The link existing between gross capital formation (GCF) and GDP is considerable and positive, with a coefficient value of 0.697197 and probability of GFCF of 0.0000. According

to this finding, a 1% increase in GFCF results in 0.697197% economic growth. So GCF significantly and positively impacts GDP in SAARC countries i.e., it increases GDP. [M. M. Rahman (2021) and S. Barua (2019)].

The coefficient of CO2 is -0.286287, and the probability value is 0.0089. Since the probability value is significant it shows that CO2 has a significant impact on GDP. The negative sign with the value of coefficient depicts that CO2 has a negative relationship with GDP in case of SAARC countries and thus CO2 and GDP move in opposite directions. So a 1% increase in CO2 emissions decrease the GDP by 0.286287%, showing how harmful environmental degradation is for the development and growth of a country.

Therefore, the overall findings of the Panel Auto Regressive Distributed Lag (PARDL) approach's long-run analysis reveal a significant impact of personal remittance on the GDP development of specific SAARC nations. FDI and GCF also have significant positive relation with GDP. While CO2 has significant negative relation with GDP.

Table 6: Results of Short Run Analysis through Panel ARDL Procedure

Variable	Coefficient	Std. Error	t-Statistic	Probability
COINTEQ01	-0.213860	0.104889	-2.038914	0.0451
LOG FDI	0.008990	0.024437	0.367860	0.7141
LOG RMTN	0.166283	0.101672	1.635479	0.1063
LOG CO2	-0.003982	0.110054	-0.036181	0.9712
LOG GCF	0.341297	0.165284	2.064915	0.0425
C	0.312648	0.110591	2.827065	0.0061

Source: Specific estimation of researcher by using E-views 9.

This table shows the results of a short run study using the Panel Auto Regressive Distributed Lag (PARDL) approach. The results of short-run research show the connection between remittance inflow and the economic development of certain SAARC states. The results of the short-run analysis show general significance with a co integration value of -0.213860 and a probability value of 0.0451. This value of the cointegration equation shows that there is 0.213860% adjustment towards equilibrium in our estimated model with the probability value being significant. In the short run FDI and RMTN have positive insignificant impact on GDP. GCF has a positive significant impact on GDP. CO2 has a negative insignificant relationship with GDP. These are all short run results and they differ from the long run results to a degree because the short run estimates do not show the complete picture. The short run estimates do not capture and calculate the complete detailed effect of independent variables on the dependent variable thus the true matured impact is not reflected.

5. Conclusion and Policy Suggestions

The study's findings are helpful for influencing policy to increase remittance efficiency and boost the SAARC nations' economies. Policies are proposed for this sector since there are

several economic elements that drive remittances. As a result of complying with our study' findings, several predictions are crucial. For this reason, there are suggestions for putting into practice a number of policies to enhance the growth of the economy in particular SAARC states through remittances, gross capital formation, foreign direct investment, and reduction of environmental degradation. The following measures are advised in this regard:

1. Selected developing nations should transfer labor to technologically sophisticated and developed nations, that way their labors will be able to earn higher salaries which they can send in the form of remittances back to their countries.
2. SAARC countries observed in this study must also enhance the education and training of employees so that they are highly qualified and trained to be posted on better paying jobs in foreign countries.
3. The selected SAARC countries must create fast and easy channels to get the remittances transferred from foreign countries. Reducing the cost of remittance transfers is the key.
4. SAARC governments must ensure to provide fruitful and attractive incentives for people to invest and use the remittances they have received in better ways that add to the growth and development of the country.
5. More FDI must be attracted by attracting foreign investors with attractive investment packages and profit incentives.
6. The FDI must be spent on development projects and there must be a proper law to keep a check on the way FDI is spent so it is not wasted in useless projects.
7. The governments of the selected SAARC nations should devise ways to boost gross capital formation (GCF) for the rapid advancement of economic growth.
8. It is crucial for governments to stop carrying out pollution intensive production, consumption, expenditure, and investment activities in order to reduce CO2 emissions. Strict environmental rules must be created and acted upon to save the environment form degradation. These states must also raise awareness regarding environment protection and impose fines on people and investors who carry environmentally harmful activities.

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