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THE RELATIONSHIP BETWEEN FDI, ECONOMIC GROWTH AND CO_2 EMISSION OF SAARC COUNTRIES: EVIDENCE FROM REGRESSION ANALYSIS

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ABSTRACT

This paper examines the relationship between FDI, CO_2 Emission, and economic growth in SAARC countries using time series data during the period from 2000 to 2015. In this study applied Simple and Semi log linear regression approach to check Trend analysis. I have also applied Correlation and Simple Linear Regression model approach to check the relationship between FDI, Economic Growth and CO_2 Emission of the variables. Results also show that the estimated coefficients of emissions have positive and significant impacts on GDP in the long run. These results will help the environmental authorities to understand the effects of economic growth on environment for degradation and manage the environmental problems using macroeconomic methods.

KEY WORDS: *FDI, Economic Growth and CO_2, Emission, degradation*

1. INTRODUCTION

The inflow of Foreign Direct Investment (FDI) has increased rapidly during the late1980s and 1990s in almost every region of the world revitalizing the long and Contentious debate about the costs and benefits of FDI inflows. The positive benefits of FDI to the receiving host country include capital, skill and technology transfer, market access and export promotion[1]. This paper examines the two and arguably the most important benefits and costs of foreign direct investment in the SAARC context: GDP growth and the environmental degradation. Some studies observe a positive impact of FDI on economic growth, others detect a negative relationship between these two variables (Aitkin and Harrison (1999), Djankov and Hoekman (2000), Damijan *et al.* (2001), Konings (2001), Castellani and Zanfei (2002a, 2002b), and Zukowska-Gagemann (2002)). FDI can encourage the adoption of new technology in the production process through capital spillovers. FDI may stimulate knowledge transfers, both in terms of labour training and skill acquisition and by introducing alternative management practices and better organizational arrangements[2].

The other concern of this paper is the impact of FDI inflow in India on its environment. The relationship between FDI inflow and the environment is not simple either. On the one hand, the much-debated capital flight and pollution heaven hypotheses (PHH) talk about FDI being attracted into the countries that have relatively lax environmental regulations or lower environmental taxes. Survey papers by Beghin (1996) and Jaffe (1995) have dealt with the industrial flight and the pollution heaven hypotheses. In this case, regarding the relocation of industries, the popular argument is that the relatively low environmental standards in developed countries compared to the industrialized nations leads to "dirty industries" shifting their operations to these countries. In addition, the general apprehension is that the developing countries may purposely undervalue the environment in order to attract new investment. These capital flight and PHH, if true, imply that pollution level of a country will increase due to FDI-led expansion of economic activities in the dirty industries. Even if we

reject these hypotheses, there can still be significant environmental damages that can be caused by FDI. Environmental damages, in the long run arise through the growth[3].

Various attempts have been made in the literature to determine the connection between economic growth and the quality of environment. Few studies such as Vincent (1997), Holtz- Eakin & Seldon (1992) found that higher economic growth leads to higher pollution since it is associated with more use of natural resources, more production of waste and pollution. The optimist, however, argued that growth is the panacea for all economic evils- poverty, unemployment, overpopulation, inequality etc.- all can be solved through economic growth. Relying on growth in this way might be fine if the global economy existed in a void but it does not (Daly 2005). Similarly, Grossman and Krueger (1991), Shafik and Bandopadhyay (1992), Panayoutou (1992) provide an optimistic view that environmental degradation can be solved through economic growth. This view has been named Environmental Kuznets Curve hypothesis which purports that with ongoing growth in Gross Domestic Product, pollution at first increases, reaches a maximum and then declines[4].

The present study investigates the dynamic relation between economic growth and CO2 emissions using the time series data of SAARC countries covering a period of data from 2000 to 2015. Due to data limitations, data of SAARC countries has been used in the study.

The direct environmental impact of FDI is generally positive, at least where host-country environmental policies are adequate. There are, however, examples to the contrary, especially in particular industries and sectors. Most importantly, to reap the full environmental benefits of inward FDI, adequate local capacities are needed, as regards environmental practices and the broader techno-logical capabilities of host-country enterprises. The technologies that are transferred to developing countries in connection with foreign direct investment tend to be more modern, and environmentally "cleaner", than what is locally available. Moreover, positive externalities have been observed where local imitation, employment turnover and supply-chain requirements led to more general environmental improvements in the host economy. There have been some instances, however, of MNEs moving equipment deemed environmentally unsuitable in the home country to their affiliates in developing countries (OECD 2012).

Empirical studies have found little support for the assertion that policy makers' efforts to attract FDI may lead to "pollution havens" or a "race to the bottom". The possibility of a "regulatory chill", however, is harder to refute for the lack of a counterfactual scenario. Apparently, the cost of environmental compliance is so limited (and the cost to a firm's reputation of being seen to try to avoid them so great) that most MNEs allocate production to developing countries regardless of these countries' environmental regulations. The evidence supporting this argument seems to depend on the wealth and the degree of environmental concern in the MNEs' other countries of operation (OECD 2012).

2. LITERATURE REVIEW

This study devoted to present a brief review of the earlier works related to the FDI, Economic Growth and CO_2 Emission for SAARC Countries. Economic literature enumerates a number of studies on the various aspects of FDI, Economic Growth and CO_2 Emission. Dinh Hong Linh and Shih-Mo Lin (2015) have used Granger causality test, they find the existence of both short and long-run causality relationships among these variables, and economic growth, FDI, energy consumption and CO2emissions of 12Asian most populous countries. The results also highlight the pollution haven hypothesis, which indicate the less stringent environmental regulations of the host countries have attracted FDI inflows. Dinh Hong Linh and Shin-Mo Lin (2010) have analysed the dynamic relationship among CO_2 emissions, energy consumption, FDI and economic growth for Vietnam during the period from 1980 to 2010. The empirical results do not support the theory in Vietnam. However, the Co integration and Grangegration and Granger Causality test results indicate a dynamic relationship among CO_2 Emissions, energy Consumption, FDI and Economic Growth. The short-run bidirectional relationship between Vietnam's income and FDI inflow simples that the increase in Vietnam's income will attract more capital from overseas. Joysri Acharyya (2009) has find out a statistically significant long run positive, but marginal, impact of FDI inflow on GDP growth in India during 1980-2003. The actual impact on the environment, however, may be larger because CO_2 emission is one of the many pollutants generated by economic activities. Most of the studies have analysed the relationship between Energy Consumption, Economic Growth and CO_2 Emission. Rossazana Ab-Rahim and Teoh Xin-Di (2016), Mohd Abdoh (2016), Anis Omri (2015), Monika Papiez (2013), Jo-Hui Chen and Yu-Fang Huang (2013), Sakib Bin Amin et al. (2012),

Sharif Hossain (2012), Hiroyuki Taguchi and Harutaka Murofushi (2011), Kuishuang Feng and Klaus Hubacek (2009), N.Satyanarayana Murthi and Manoj Panda (2006), Jan Van Heerden and Reyer Gerlagh (2006), Wendy N. Cowan and Rangan Gupta and Suyi Kim their studies analysed the relationship between CO2 Emission, Energy Consumption and Economic Growth. However, the extent of trend and relationship between FDI, Economic Growth and CO_2 emissions in SAARC Countries, have not been studied.

3. METHODOLOGY

The data used in this study consists of total FDI and GDP values are expressed in Million US Dollars observed for the period from 2000 to 2015 and CO_2 values are expressed in Kilotons observed for the period from 2000 to 2013. The data is primarily taken from World Development Indicator (2016). Here the focus is on examination of the relationship between FDI and GDP growth. A first look at the data reveals that there has been a steady annual increase in the total amount of FDI approved over the last decade. Before going into any rigorous econometric exercise, In this study first investigate the time series properties of the FDI and GDP series. In this study FDI and GDP values are converted current price to constant price for the base year 2005 and all the FDI and CO_2 values are change in log form and study the Trend analysis throughout the study period.

4. FDI, ECONOMIC GROWTH AND CO_2 EMISSION

4.1. Introduction:

One of the advantages of FDI is that it will stimulate growth process and help to achieve a higher rate of growth. However FDI does not guarantee growth uniformly in all the countries and at all points of time. Many factors influence the effect of FDI on growth in an economy. The other concern of this paper is the impact of FDI in SAARC Countries on its environment. The relationship between FDI inflow and the environment is not simple either. On the one hand, the much debated capital flight and pollution heaven hypothesis (PHH) talk about FDI being attracted into the countries that have relatively lax environment relations or lower environmental taxes. Hence in this paper an attempt is made to study the relationship between FDI, Economic growth and Co_2 Emission through correlation and regression analysis.

4.2. Correlation Analysis:

Correlation analysis generally helps to study the degree and directions of relationship between two variables. If FDI stimulates the growth process and a higher growth rate is achieved, there will be a strong positive correlation between FDI and GDP. If the growth of FDI does not yield adequate growth, the correlation will be low or insignificant. The FDI inflows and pollution heaven hypothesis imply that pollution level of a country will increase due to FDI. Let expansion of economic activities in the dirty industries. Even if reject these hypotheses, there can still be significant environmental damages that can be caused by FDI. Environmental damages, in the long run arise through the growth impact of FDI [Joysri Acharya (2009)].

To study the correlation between FDI, GDP and Co_2 Emission the time period taken for analysis is two different periods. The correlation between FDI and GDP during the period from 2000 to 2015 and the correlation between FDI and Co_2 Emission during the period from 2000 to 2013. The Karl Pearson's correlation coefficient is calculated for these two periods, for the SAARC countries taken for analysis, depending on the availability of data.

The correlation coefficients are tested against the null hypothesis that their value is equal to zero using the t test. A positive and significant correlation implies a high degree of association between FDI and GDP; FDI and Co_2.

4.2. FDI and Economic Growth Results Of The Correlation Analysis:

The correlation worked out for the SAARC countries during the periods from 2000 to 2015 are given in table 8.2. During the period from 2000 to 2015, the correlation coefficient between FDI and GDP is not significant for Afghanistan, Bhutan and Pakistan. Even through the actual values of correlation coefficient for these three countries exceed 0.05, they do not indicate a statistically significant association between FDI and economic growth in these cases.

Table:-4.2. FDI and Economic Growth Results Of The Correlation Analysis.

Sl.No	Countries	n	Correlation coefficients
1	Afghanistan	16	0.05 (0.87)
2	Bangladesh	16	-0.77 (0.00)
3	Bhutan	16	0.24 (0.36)
4	India	16	0.60 (0.01)
5	Maldives	16	0.89 (0.00)
6	Nepal	16	0.59 (0.02)
7	Pakistan	16	0.08 (0.78)
8	Sri Lanka	16	0.52 (0.02)

The correlation coefficient is significant at 5 per cent level for Srilanka. The significant correlation indicates that FDI has been an instruments factor in promoting economic growth, in this country.

However, in the case of Bangladesh, India, Maldives and Nepal the correlation coefficients are significant at one per cent level. Hence FDI has stimulated the growth process significantly in these countries.

The highest correlation coefficient is recorded by Maldives in this period. The value is 0.29 for India, it is 0.60, for Nepal it is 0.59 and for Bangladesh -0.77.

Hence, in Maldives, India, and Nepal, FDI has very strongly influenced the growth process in this period.

4.3. FDI and CO_2 Emission Results Of The Correlation Analysis:

The correlation coefficient is tested against the null hypothesis that their value is equal to zero using the t test. A positive and significant correlation implies a high degree of association between FDI and GDP; FDI and Co_2.

The correlation worked out for the SAARC countries for the two periods are given in the table.

Table:- 4.3. FDI and CO_2 Emission Results Of The Correlation Analysis:

Sl.No	Countries	n	Correlation coefficients
1	Afghanistan	14	-0.06 (0.85)
2	Bangladesh	14	-0.53 (0.05)
3	Bhutan	14	-0.73 (0.00)
4	India	14	0.87 (0.00)
5	Maldives	14	0.88 (0.00)
6	Nepal	14	0.77 (0.00)
7	Pakistan	14	-0.30 (0.30)
8	Sri Lanka	14	0.62 (0.02)

5. REGRESSION ANALYSIS

To analyses the relationship between the FDI and GDP; FDI and Co_2 Emission, simple linear regression model is used by taking the FDI as the independent variable and GDP and Co_2 Emission as the dependent variable for during the periods separately. FDI and GDP are measured in millions of US Dollars and Co_2 Emission is measured in kiloton's (kt). The regression coefficient in this case will measure the increases in GDP in millions of US Dollars and Co_2 Emissions in kilo tonnes if the FDI is increased by one million of US Dollars. The regression coefficient is also tested for the null hypothesis that its value is zero. The coefficient of determination, R^2 will measure the ability of the independent variable, FDI to explain the variations in GDP and Co_2 Emissions.

For Afghanistan, during the period from 2000 to 2015, the regression coefficient is 2.02 and this coefficient is not statistically significant. The value of adjusted R^2 is -0.07 and hence FDI could explain only -7 percent of variation in GDP for Afghanistan in this period. Further FDI could not influence the GDP significantly in the period in Afghanistan.

In Bangladesh, during the period from 2000 to 2015, the regression coefficient is -47.50 and this coefficient is statistically significant one per cent level. The value of adjusted R^2 is 0.49 and hence FDI could explain only 49 per cent of variations in GDP for Bangladesh in this period. Hence, GDP decreases by -47.50 millions of US Dollars in Bangladesh, if FDI is increased by one million of US Dollars in this period in Bangladesh.

For Bhutan, the regression coefficient in this period is 4.73 and this coefficient is not statistical significant. The value of adjusted R^2 is -0.01 and hence

FDI could explain only -1 per cent of variations GDP for Bhutan in this period. Further FDI could not influence the GDP significantly in this period in Bhutan.

Inn India, during the period from 2000 to 2015, the regression coefficient is 19.39 and this coefficient is statistically significant at one per cent level. The value of adjusted R^2 is 0.32 and hence FDI could explain only 32 per cent of variations in GDP for India in this period. Further, GDP increases by 19.39 millions of US Dollars in India, if FDI is increased by one million of US Dollars in this period.

In Maldives, the regression coefficient in this period is 5.20 and this is statistically significant at one per cent level. However, FDI is capable of explaining 79 per cent of variations in GDP. Hence, GDP increases, by 5.2 millions of US Dollars in Maldives, if FDI is increased by one million of US Dollars in this period.

For Nepal, during the period from 2000 to 2015, the regression coefficient is 56.20 and this is statistically significant at five per cent level. However, FDI is capable of explaining 30 per cent of variations in GDP. Hence, GDP increases by 56.2 millions of US Dollars in Nepal, if FDI is increased by one million of US Dollars in this period.

For Pakistan, during the period from 2000 to 2015, the regression coefficient is 1.08 and this is not statistically significant. The value of adjusted R^2 is -0.07 and hence FDI could explain only -7 per cent of variations in GDP for Pakistan in this period. Further FDI could not influence the GDP significantly in this period.

In Srilanka, during the period from 2000 to 2015, the regression coefficient is 55.81 and this is statistically significant at five per cent level. However, FDI is capable of explaining 22 per cent of variations in GDP. Hence, GDP increases by 56.2 millions of US Dollars in Srilanka, if FDI is increased by one million of US Dollars in this period.

6. FDI ON CO_2 EMISSION: RESULTS OF THE REGRESSION ANALYSIS

For Afghanistan, during the period from 2000 to 2015, the regression coefficient is -5.08 and this coefficient is not statistically significant. The value of adjusted R^2 is -0.08 and hence FDI could explain only -8 per cent of variation in CO_2 for Afghanistan in this period. Further FDI could not influence the CO_2 Significantly in the period in Afghanistan.

For Bangladesh, during the period from 2000 to 2015, the regression coefficient is -0.32 and this coefficient is statistically significant at 5 per cent level. The value of adjusted R^2 is 0.22 and hence FDI could explain only 22 per cent of variation in CO_2 for Bangladesh in this period. Hence CO_2 decrease by -0.32 millions of US Dollars in Bangladesh, if FDI is increased by one million of US Dollars in this period in Bangladesh.

For Bhutan, during the period from 2000 to 2015, the regression coefficient is 4.71 and this coefficient is not statistically significant. The value of adjusted R^2 is 0.14 and hence FDI could explain only 14 per cent of variation in CO_2 for Bhutan in this period. Further FDI could not influence the CO_2 Significantly in the period in Bhutan.

For India, during the period from 2000 to 2015, the regression coefficient is 1.60 and this coefficient is statistically significant at 1 per cent level. The value of adjusted R^2 is 0.73 and hence FDI could explain only 73 per cent of variation in CO_2 for India in this period. Hence CO_2 Increase by 1.60 millions of US Dollars in India, if FDI is increased by one million of US Dollars in this period in India.

For Maldives, during the period from 2000 to 2015, the regression coefficient is 160.20 and this coefficient is statistically significant at 1 per cent level. The value of adjusted R^2 is 0.76 and hence FDI could explain only 76 per cent of variation in CO_2 for Maldives in this period. Hence CO_2 Increase by 160.20 millions of US Dollars in Maldives, if FDI is increased by one million of US Dollars in this period in Maldives.

For Nepal, during the period from 2000 to 2015, the regression coefficient is 13682.43 and this coefficient is statistically significant at 1 per cent level. The value of adjusted R^2 is 0.56 and hence FDI could explain only 56 per cent of variation in CO_2 for Nepal in this period. Hence CO_2 Increase by 13682.43 millions of US Dollars in Nepal, if FDI is increased by one million of US Dollars in this period in Nepal.

For Pakistan, during the period from 2000 to 2015, the regression coefficient is -0.23 and this coefficient is not statistically significant. The value of adjusted R^2 is 0.01 and hence FDI could explain only 1 per cent of variation in CO_2 for Pakistan in this period. Further FDI could not influence the CO_2 Significantly in the period in Pakistan.

For Sri Langa, during the period from 2000 to 2015, the regression coefficient is 12.53 and this coefficient is statistically significant at 5 per cent level. The value of adjusted R^2 is 0.34 and hence FDI could explain only 34 per cent of variation in CO_2 for Sri Langa in this period. Hence CO_2 Increase by 12.53 millions of US Dollars in Sri Langa, if FDI is increased by one million of US Dollars in this period in Sri Langa.

Table: - 5. FDI on Economic Growth: Results of the Regression Analysis:

Sl.No	Year	Country	Model	a	b	SEb	t	sig	R^2	Adj R^2	DW
1	2000-2015	Afghanistan	Simple Linear	8551.77	2.02	12.10	0.17	0.87	0.00	-0.07	0.07
2	2000-2015	Bangladesh	Simple Linear	80859.71	-47.50	12.01	-3.95	0.00	0.53	0.49	0.60
3	2000-2015	Bhutan	Simple Linear	988.38	4.73	5.01	0.94	0.36	0.06	-0.01	0.15
4	2000-2015	India	Simple Linear	757676.30	19.39	6.88	2.82	0.01	0.36	0.32	0.27
5	2000-2015	Maldives	Simple Linear	892.39	5.20	0.70	7.47	0.00	0.80	0.79	1.86
6	2000-2015	Nepal	Simple Linear	8550.92	56.20	20.43	2.75	0.02	0.35	0.30	0.37
7	2000-2015	Pakistan	Simple Linear	126648.53	1.08	3.85	0.28	0.78	0.01	-0.07	0.06
8	2000-2015	Sri Langa	Simple Linear	18113.05	55.81	24.42	2.29	0.04	0.27	0.22	0.38

Table: - 6. FDI on CO_2 Emission: Results of the Regression Analysis:

Sl.No	Year	Country	Model	a	b	SEb	t	sig	R^2	Adj R^2	DW
1	2000-2013	Afghanistan	Simple Linear	6377.01	-5.08	25.72	-0.20	0.85	0.00	-0.08	0.14
2	2000-2013	Bangladesh	Simple Linear	570.34	-0.32	0.15	-2.15	0.05	0.28	0.22	0.60
3	2000-2013	Bhutan	Simple Linear	665.85	4.71	2.67	1.77	0.10	0.21	0.14	0.44
4	2000-201	India	Simple Linear	119351.61	1.60	0.27	5.99	0.00	0.75	0.73	1.14
5	2000-2013	Maldives	Simple Linear	30203.95	160.20	24.59	6.52	0.00	0.78	0.76	2.18
6	2000-2013	Nepal	Simple Linear	1231576.52	13682.43	3246.32	4.22	0.00	0.60	0.56	0.89
7	2000-2013	Pakistan	Simple Linear	4241.76	-0.23	0.21	-1.08	0.30	0.09	0.01	0.15
8	2000-2013	Sri Langa	Simple Linear	9066.59	12.53	4.56	2.75	0.02	0.39	0.34	0.73

7. CONCLUSION

The Growth analysis implies that there may continue increasing in FDI trends during 2000-2015. Out of Seven countries only two countries (India and Maldives) have a continuing trend value. The countries like Pakistan, Bangladesh, Sri Lanka, Bhutan and Nepal have inconsistency in trend. Its start increasing certain points and its start decline trend.

The Growth analysis implies that there may continue increasing in CO_2 emission. There has been a continually increase in CO_2 emission in India and Pakistan. Both countries had over emission from 2000-2015. And Nepal had variation in CO_2 emission. Other countries like Afghanistan, Bhutan, Maldives and Sri Lanka these countries had the stable trend line.

The trend analysis states that there is a perfect relationship between FDI and GDP (Economic Growth) in Following Countries like India, Nepal, Maldives and Sri Lanka. In Afghanistan, Bhutan and Pakistan had insignificant trend which means there is no relationship between FDI and economic growth.

Also this paper analysis the relationship between the FDI and CO_2. The result shows that there is a perfect relationship between foreign direct investment and CO2 in all SAARC countries which means if FDI has increased CO_2 emission also increased.

This paper also analyzed the correlation and Simple linear regression model for the check the relationship between FDI, GDP and CO_2. In the correlation analysis FDI consider as the independent variable and GDP as a dependent variable. During the analysis period Sri lanka had the perfectly related at five per cent level of significant. Bangladesh, India, Maldives and Nepal thesis countries also had the relationship at one per cent level of significant. And also countries like Afghanistan, Bhutan and Pakistan had insignificant which means there is no relationship between FDI and economic Growth.

The relationship between FDI and CO_2 were find out the country like Bangladesh and Sri Lanka, had the perfect relationship which means FDI has been an instrument factor in promoting CO_2. And Bhutan, India, Maldives and Nepal had the one per cent level of Significant and there is no relationship between Afghanistan and Pakistan. Finally If a Country developed in an Economic way but the environment has affected day by day and the each development. I need to develop but the same time we need to protect the Ecosystem for the better future.

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