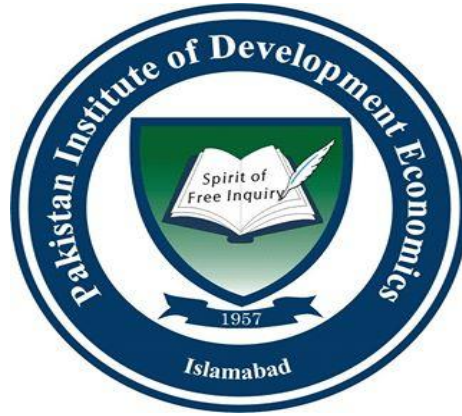


**The Impact of Foreign Aid and FDI on Sustainable Development:
A Panel Analysis of Developing World**



By

Hassan Sardar

Registration no. PIDE/2015/F-M.Phil/ECO-06

Supervised by

Dr. Shujaat Farooq

Additional Director General, BISP

Department of Economics

Pakistan Institute of Development Economics, Islamabad.

2018



Pakistan Institute of Development Economics

CERTIFICATE

This is to certify that this thesis entitled: “**The Impact of Foreign Aid and FDI on Sustainable Development: A Panel Analysis of Developing World**” submitted by Mr. Hassan Sardar is accepted in its present form by the Department of Economics, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree of **Master of Philosophy in Economics**.

External Examiner:

Dr. Sabahat Subhan
Assistant Professor
NUML University
Islamabad

Internal Examiner:

Dr. Karim Khan
Associate Professor
PIDE, University
Islamabad

Supervisor:

Dr. Shujaat Farooq
Additional Director General
BISP, Islamabad

Head, Department of Economics:

Dr. Attiya Y. Javid
Professor/Head
Department of Economics
PIDE, Islamabad

DEDICATION

I dedicate my thesis work to my family.

A special feeling of gratitude to my loving parents, *Mr. Sardar Khan & Mrs. Taj Bibi* whose words of encouragement and push for tenacity ring in my ears.

ACKNOWLEDGEMENTS

In the name of Allah, the Most Gracious and the Most Merciful

I would like to express my deepest gratitude to my Almighty Allah because without his blessings I would have not been able to complete this thesis. After that I am thankful to my supervisor, Dr. Shujaat Farooq for his intellectual advice, guidance, and encouragement. The regular discussions from proposal writing till the final composition were very valuable and inspiring at every step of this research. I am thankful to him from the core of my heart.

Sincere thanks to all my friends especially Muhammad Zaman, Muhammad Mujahid, Muhammad Kashif, Naeem Khan, Saqlain Raza, Taqi Raza, Saud Ahmad and Mohsin Kiyani for their continues support in the completion of this research. I also want to appreciate kindness and moral support of other friends during my study as well as research work. Thanks for the friendship and memories.

Last but not the least, my deepest gratitude goes to my beloved parents and also to my sisters for their endless love, prayers and encouragement. My brother has been my best friend throughout my life and I love him dearly and thank him for all his advice, love, care and support. A bundle of thanks to My life partner Dr. Maryam Tariq for her continues support and encouragement in this research work. To those who indirectly contributed in this research, your kindness means a lot to me.

HASSAN SARDAR

Table of Contents

LIST OF TABLES.....	VII
LIST OF FIGURES.....	VII
LIST OF ACRONYMS.....	VIII
ABSTRACT	IX
CHAPTER 1	1
1.1. BACKGROUND AND INTRODUCTION.....	1
1.2. MOTIVATION OF THE STUDY	5
1.3. CONTRIBUTION OF THE STUDY.....	6
1.4. OBJECTIVES OF THE STUDY	7
1.5. ORGANIZATION OF STUDY	7
CHAPTER 2	8
2. LITERATURE REVIEW	8
2.1. FOREIGN AID	8
2.1.1. Foreign Aid and Human Development.....	10
2.1.2. Foreign Aid and Environment	11
2.1.3. Foreign Aid and Sustainable Development	14
2.2. LITERATURE ON FDI	16
2.2.1. FDI and Environment	18
2.2.2. FDI and Human Development.....	19
2.3. TRENDS OF FOREIGN AID AND FDI IN DEVELOPING WORLD	20
CHAPTER 3	23
3. THEORETICAL FRAMEWORK AND EMPIRICAL METHODOLOGY.....	23
3.1. THEORETICAL FRAMEWORK	23
3.1.1. Foreign Aid and Development.....	23
3.1.2. Foreign Aid and Environment	24
3.1.3. Foreign Aid and Sustainable Development	26
3.1.4. FDI and Sustainable Development	27
3.2. EMPIRICAL METHODOLOGY	29
3.2.1. Model Specification.....	29
3.2.2. Description of Variables and Data Sources	30
3.2.2.1. Sustainable Development	30
3.2.2.2. CO ₂ Emissions.....	32
3.2.2.3. Permanent Crop Land.....	32
3.2.2.4. Natural Resource Depletion	33
3.2.2.5. Foreign Aid.....	33
3.2.2.6. Foreign Direct Investment (FDI).....	33

3.2.2.7. Industrialization.....	34
3.2.2.8. Gross Capital Formation.....	34
3.2.2.9. Urbanization	34
3.2.2.10. Institutional Quality.....	35
3.2.2.11. Financial Development.....	35
3.2.2.12. Trade Openness	35
3.2.3. Sample Selection	36
3.2.5. Estimation Technique	37
3.2.5.1. Im, Pesaran and Shin (IPS) test	38
3.2.5.2. Kao Co-integration test.....	40
3.2.5.3. Fully Modified Ordinary Least Square.....	42
3.2.5.4. Vector Error Correction Mechanism	43
CHAPTER 4	45
4. RESULTS AND DISCUSSION.....	45
4.1. DESCRIPTIVE STATISTICS	45
4.2. EMPIRICAL RESULTS	50
4.2.1. Results of Im, Pesaran and Shin Panel Unit Root Test.....	50
4.2.2. Results of Kao-Cointegration Test	52
4.2.3. Results of Fully Modified Ordinary Least Square.....	55
4.2.4. Results of Vector Error Correction Mechanism	64
CHAPTER 5	72
5. CONCLUSION AND POLICY RECOMMENDATION	72
5.1. CONCLUSION	72
5.2. POLICY RECOMMENDATIONS	74
REFERENCES	76
APPENDIX	82

List of Tables

Table 1: Top Recipient and Donor of Foreign Aid in 2015.....	4
Table 2: Data Sources and Unit of Measurement	36
Table 3: Descriptive Statistics of Low Income Countries	45
Table 4: Descriptive Statistics of Lower Middle-Income Countries	46
Table 5: Descriptive Statistics of Upper Middle-Income Countries.....	46
Table 6: Results of Panel Unit Root Test for Low Income Countries	50
Table 7: Results of Panel Unit Root Test for Lower Middle-Income Countries	51
Table 8: Results of Panel Unit Root Test for Upper Middle-Income Countries	52
Table 9: Results of Co-Integration Test for Low Income Countries	53
Table 10: Results of Co-Integration Test for Lower-Middle Income Countries	53
Table 11: Results of Co-Integration Test for Upper-Middle Income Countries.....	54
Table 12: Results of FM-OLS for Low Income Countries	55
Table 13: Results of FM-OLS for Lower-Middle Income Countries	56
Table 14: Results of FM-OLS for Upper-Middle Income Countries	57
Table 15: Results of VECM for Low Income Countries	65
Table 16: Results of VECM for Lower-Middle Income Countries	66
Table 17: Results of VECM for Upper-Middle Income Countries.....	67

List of Figures

Figure 1: Trends of Foreign Aid in Developing World	21
Figure 2:Trends of FDI in Developing World	22

List of Acronyms

ADF	Augmented Dicky Fuller tests
CDIAC	Carbon Dioxide Information Analysis Center
DAC	Development Assistant Committee
DOLS	Dynamic Ordinary Least Square
EKC	Environmental Kuznets Curve
FDI	Foreign Direct Investment
FEM	Fixed Effects model
FM-OLS	Fully Modified OLS
GEF	Global Environment Facility
GMM	Generalized Method of Moments
GNI	Gross National Income
HDI	Human Development Index
ODA	Official Development Assistance
OECD	Organization of Economic Co-Operation and Development
OLS	Ordinary Least Square
REM	Random Effects model
SHDI	Sustainability Adjusted Human Development Index
UN	United Nations
UNDP	United Nations Development Program
VECM	Vector Error Correction Mechanism
WDI	World Development Indicators

ABSTRACT

The Development Assistant Committee (DAC) has been providing huge amount of foreign aid to developing economies for achieving the sustainable development, both economic and environment. Beside foreign aid, foreign direct investment (FDI) has also the potential for contribution in development and social welfare of recipient countries. The present study has analyzed the impact of foreign aid and FDI on sustainable development for developing countries where these countries have been divided into three categories: low income, lower middle income and upper middle-income countries. An indicator of sustainable development is constructed by managing both the environmental and Human Development Index (HDI) variables. A loss function is attached to this HDI value based on CO₂ emissions, natural resource depletion and permanent crop land. Panel data estimation technique is applied on data ranging from 1990-2015. Kao (2000) co-integration test confirmed the presence of long run relationship among sustainable development and explanatory variables used in the study.¹ Fully Modified Ordinary Least Square (FM-OLS) is applied to estimate the long run estimates which states that both foreign aid and FDI have positive and significant contribution in sustainable development. The short run estimates and speed of adjustment is obtained by applying Vector Error Correction Mechanism. VECM results state that foreign aid has a significant positive contribution in sustainable development of low income and upper middle-income countries. In lower middle-income countries foreign aid is less significant for its contribution in sustainable development. FDI contributes positively and significantly in sustainable development of low income and lower middle-income countries in the short run.

¹ Explanatory variables of study are foreign aid, foreign direct investment, industrialization, gross capital formation, institutional quality, urbanization, financial development, population growth and trade openness.

CHAPTER 1

1.1. Background and Introduction

In this era of globalization, objective of every nation is to raise the standard of living of its public. Therefore, development is the key to improve the standards of living of masses. The concept of development was originated in the 19th century and severely recognized in 1950s by the end of World War II when most of the world faced huge human and infrastructure loses. At that time development was traditionally interpreted as economic growth, which was measured by per capita income and annual growth of national income. In 1970s, the idea of development was changed from growth to basic needs by incorporating education, health, nutrition, sanitation, and employment (Cobbinah et al., 2011). The first human development report by United Nations (UN) in 1990 recognized the deficiencies in existing measures of development. It further stated that development goes beyond the expansion of income and wealth, and focused on the welfare of people. The report presented the Human Development Index (HDI) as an alternative to GDP because it integrated economic as well as social dimension including health and education (Pineda, 2012).

In 2000, the global debate on development was influenced by human development as well as protection of natural environment which is termed as sustainable development. The situation of many developing countries at present shows that high growth performance does not necessarily bring about high levels of development. That's why the concept of sustainable development has become a major concerning area among policy makers. The concept of sustainable development has been introduced in the wake of growing awareness of global linkages between environmental problems and socio-economic conditions i.e.

provision of health and education facilities. Therefore, it creates a justified link between environment and socio-economic conditions (Hopwood, 2005). Sustainable development is presented as a new approach to development which advocates inclusive development but also responds to the growing environmental crises. Moreover, this concept meets the needs of present generation without compromising the ability of future generation to meet their own needs (Huang and Quibria, 2015).

It is argued that economic growth alone cannot be regarded as a tool to bring human development (Costantini and Monni, 2005). Over the last two decades, most of the world has been facing problems related to environmental degradation and situation is more vulnerable in developing countries, especially in low-income economies. The developing countries produced about the three-fourth of the total CO₂ emissions in 2012. These countries need assistance from the developed economies and multinational organizations to support the prevention of environmental degradation which is the important component of sustainable development (Huang and Quibria, 2015). In this regard, a huge amount of financial assistance from the developed countries in shape of foreign aid has been transferred to the developing nations. On the other hand, developed countries produce 37 percent of total CO₂ emissions where USA is a major contributor in CO₂ emissions and its share in total world emissions is 13 percent. While in the developing countries China contributes 23 percent of the worlds CO₂ emissions.²

Foreign aid as defined by Organization of Economic Co-Operation and Development (OECD) is that amount which includes 25 percent as grant element and provided to

² <https://www.cgdev.org/media/developing-countries-are-responsible-63-percent-current-carbon-emissions>

developing countries for the purpose of welfare and economic development.³ Foreign aid was immediately started after the World War II, at that time aid was donated for rehabilitation of war affected people (Huang and Quibria, 2015). Since that time, the purpose of aid was to encourage economic development in developing world.

In current era, the environmental degradation has reached to an alarming situation. Thus, the basic purpose of aid is changed from economic development to sustainable development which include environment, health, poverty, woman's right, etc. The World Conference in 1992, on the issue of Development and Environment, took the initiative to provide the financial assistance for environment which was named as the Global Environment Facility (GEF). The basic aim of Green Growth Strategy announced by OECD in 2009 was to include the problems of developing countries such as to achieve sustained economic growth, environmental protection, reduce income inequality and job creation (Huang and Quibria, 2015).

The statistics from OECD reports highlights that a huge amount of foreign aid is provided to developing countries and till 2011 it has an increasing trend. UN defined the criteria of 0.7 percent of Gross National Income (GNI) to be donated as foreign aid. In 2016 there is 10.6 percent annual increment in foreign aid is reported by OECD and it has also showed the record peak of 144.9 billion US\$ (OECD Database).⁴ There is a long list of aid recipient countries which include low income, middle-income and upper middle-income economies. Low income countries are dependent on foreign aid as the large share in their GNI is being contributed by foreign aid. Table 1 shows that there are few countries (Sweden, UAE,

³ <https://data.oecd.org/oda/net-oda.htm>

⁴ <https://data.oecd.org/oda/net-oda.htm#indicator-chat>

Luxemburg and Norway) which are contributing more than the targeted aid (0.7 percent of GNI). On the recipient side, the top recipient of foreign aid from different categories of countries are low income countries (includes Central African Republic, Somalia, Sierra Leone, Malawi, and Rwanda), lower middle-income countries (includes Solomon island, Bhutan, Zambia, and Pakistan) and upper middle-income countries (Samoa, Albania and Lebanon) are also in the list of aid recipient economies. The following table will show the percentage share of foreign aid in GNI of different countries (Table 1).

Table 1: Top Recipient and Donor of Foreign Aid in 2015

Net aid donated		Net aid received	
Countries	Percentage of GNI	Countries	Percentage of GNI
Sweden	1.4	Central African Republic	32.2
UAE	1.2	Somalia	22.8
Luxemburg	1.0	Sierra Leone	21.5
Norway	1.0	Malawi	16.5
Germany	0.7	Rwanda	13.6
Netherlands	0.7	Solomon Island	16.4
United Kingdom	0.7	Bhutan	5.2
Finland	0.6	Zambia	3.9
Denmark	0.5	Pakistan	1.3
Switzerland	0.5	Samoa	12.7
Turkey	0.5	Albania	2.9
Austria	0.4	Lebanon	2.0

Source: OECD Database

Beside foreign aid, foreign direct investment (FDI) has also the potential for contribution in development and social welfare of host country. It makes the contribution by fulfilling the resource shortage gap of developing economies (Lehnert et al., 2013). Over the last decade FDI has shown a rising trend in developing economies, both in low and lower-middle income countries. It led research interest both for policy makers and researchers to find the environmental consequences of these investment. The 21st century which is

considered as era of globalization, has bring significant foreign investment in developing economies (Blanco et al., 2013). There is a continued speedy growth of FDI in developing countries, which increased by 183 percent since 2010.⁵

Carbon Dioxide Information Analysis Center (CDIAC) reported that during last two decades carbon dioxide emissions become more than doubled in lower income countries as compared to developed countries. It reveals that with the increase of FDI in developing economies the carbon emissions also increased by significant amount (Pao and Tsai, 2011). Therefore, it is required to incorporate FDI along with foreign aid for analyzing their role in sustainable development (which includes human development and environment).

1.2. Motivation of the Study

Global environment is being polluted by the whole world but the victim of growing environmental crises are the developing countries as the major share in CO₂ emissions is contributed by these economies. These developing economies are already facing the shortage of capital to combat environment related issues. To fulfil such purposes, these countries require foreign aid (Pineda, 2012). The Development Assistant Committee (DAC) has been already providing official development assistance (ODA) to developing economies for achieving sustainable development by 2030 (OECD Database). These countries also require FDI to fulfil the requirement of capital. Along foreign aid there is an increasing trend of FDI in developing world. Over the last two decades, foreign aid is used as a financing tool to deal with the environment related issues and promote sustainable development. This phenomenon provides, the basis to conduct a study in case of

⁵ United Nations Conference on Trade and Development (UNCTAD), 2011.

developing world to determine the relative effectiveness of these variables on sustainable development.

1.3. Contribution of the Study

Currently, most of the world is facing problems related to environmental degradation and situation is more vulnerable in developing countries. These countries produce about three-fourth of the total CO₂ emissions but do not have enough resources to deal with this problem and for that purpose these countries need financial assistance. In this regard, a huge amount of financial assistance from the developed countries has been transferred to the developing nations in shape of foreign aid (Huang and Quibria, 2015). Likewise, FDI also have the potential for contribution in development and social welfare of host country but on the other hand it also has some consequences for environment. (Lehnert et al., 2013). There is lot of literature on foreign inflows (both foreign aid and FDI) but in context of their relationship with sustainable development studies are fewer, because the primary focus of many studies is on aid, economic growth, and human development context. There are few studies on foreign aid and sustainable development relationship such as Constantine and Monni (2005); Nourry (2008); Alam, et al. (2011) and Hunag and Quibria (2015). In the case of literature on FDI there are studies regarding the relationship of FDI and environment such as Pao and Tsai (2011); Blanco, et al. (2013); Chandran and Tang (2013). There are few studies on FDI and its effect on Human development which includes Reiter and Steesma (2010) and Lehnert, et al. (2013). In the case of FDI and sustainable development, the literature has a paucity. However, to the best of our knowledge there is hardly any study determining the role of foreign aid and FDI in contribution to sustainable development by using the panel co-integration techniques for developing world. The basic

reason is that there is no specific indicator to measure sustainable development because it has many dimensions. The present study has constructed an index for sustainable development by mixing HDI with environmental indicators. The current study will contribute in literature by incorporating FDI and foreign aid to determine their relative effectiveness on sustainable development by using the panel co-integration technique. The previous studies have used a single panel of countries which can cause heterogeneity as each country has different characteristics. Current study will contribute in literature by minimizing the problem of heterogeneity in countries by dividing the developing world in three different panels of the countries, low income, lower-middle income, and upper middle-income countries.

1.4. Objectives of the Study

The objectives of the study are as follows:

- 1) To measure the impact of foreign aid on sustainable development for low income, lower-middle and upper-middle income countries.
- 2) To measure the impact of foreign direct investment on sustainable development for low income, lower-middle and upper-middle income countries.

1.5. Organization of Study

The scheme of study is as follows: the next chapter includes the relevant literature which is divided into two parts. The first part of literature review deals with studies on foreign aid and second part of literature review consists of relevant studies on FDI. Theoretical framework and empirical methodology is discussed in chapter 3. Chapter 4 discuss the main results of study. Finally, chapter 5 concludes the study and discuss the policy recommendations and limitations.

CHAPTER 2

2. Literature Review

The present chapter has presented the literature on foreign aid, FDI and sustainable development. Section 2.1 of this chapter discussed the literature on foreign aid and human development, the succeeding section 2.2 has presented literature on foreign aid and environment and the last section 2.3 (of foreign aid) has debated the studies on foreign aid and sustainable development. The literature on FDI is started from section 2.4 which presented the overview of studies on FDI and environment and section 2.5 which is the last segment of literature review has debated the research on FDI and human development.

2.1. Foreign Aid

The assistance provided to developing countries is comprises of many types which includes financial assistance, technical assistance, multilateral aid and humanitarian support, etc. But in current study the focus is on foreign aid. Foreign aid has many definitions as reported in previous literature. Administrative expenditures of development agencies and their local effort to advocate in favor of more support are counted as aid. Debt forgiveness on concessional loans are also calculated as foreign aid. Emergency assistance and food aid is also defined as aid. These are the types of assistance which do not contribute much in the development of the recipient country (Kharas, 2015). Beyond these definitions of foreign aid, a comprehensive definition is given by OECD which is: the aid granted to promote welfare and economic development of recipient country. OECD named it as ODA and loans provided for military purposes are not part of this grant. This type of aid is either directly provided by the donor or transmitted through multilateral organizations such as World Bank or UN. Aid provided in shape of grants, technical assistance and soft loans

with a condition of at least 25 percent is grant element. This definition of foreign aid is incorporated in the current study.

In the earlier studies as, economic growth was being considered as an indicator for development and many studies of foreign aid has given attention to this concept. So current part of literature review provides a summary of aid growth relationship. Foreign aid seems to be a controversial issue due to its relationship with economic growth because some studies such as (Stiglitz, 2003; Dalggaard et al., 2004; Sachs, 2006) are in the favor of aid and found its positive relationship with economic growth through the channel of technological advances. Some studies have also focused on the issue of foreign aid and Dutch disease, as Lar et al., (2016) supports the results of proponents of aid. Foreign aid also has its opponents which states that it is harmful for the economic growth and leads to inefficiency of recipient govt. such as Friedman, (1995), Rajan and Subramanian, (2008) and Easterly, (2009). Other studies supporting that aid is ineffective in promoting economic growth and causes Dutch disease are Younger (1992), Rajan and Subramanian (2011) by exchange rate appreciation, which brings unfavorable situation for the tradeable sector of aid recipient economies. In case of Pakistan there is a study supporting the strong presence of Dutch disease as foreign financing is concerned has been completed by Vos (1998). In the short run, foreign aid is cause of strong Dutch disease but in medium term the problem of Dutch disease is being tackled by fiscal adjustment and crowd in of private investment. The problem of Dutch diseases and unfavorable trade balance (caused by foreign aid) can be tackled with the tight monetary policy, while expansionary policies do not produce favorable results (Tressel and Prati, 2006). The study of Fielding and Gibson (2012) found that aid causes Dutch disease in many of sub-Saharan economies.

There is an ambiguity in the literature about the relationship of foreign aid and FDI that whether these two are compliments or substitutes in contributing the development of less developed countries. In order to clear this misconception, a study conducted by Kosack and Tobin (2006) proved theoretically as well as empirically that these two are different. The study has utilized Generalized Method of Moments (GMM) technique to deal with the problem of endogeneity and reported that FDI did not affect the growth and human development. Foreign aid also has the same result when the level of human capital is very low but when reached subsistence level aid contributes more aggressively in economic growth and human development.

2.1.1. Foreign Aid and Human Development

Besides the aid-growth relationship there is immense literature on the effectiveness of foreign aid in the context of human development. The main focus of foreign aid in final decade of 20th century and in the beginning of new era was to bring human development in the developing countries. Aid effect the human development via the growth channels and it can also contribute in social indicators in the form of different projects from multinational organizations. Some studies have contributed in the literature and found the positive relationship of foreign aid in the context of human development which includes (Fielding et al., (2007); Wolf, (2007); Anwar and Aman (2010); and Gillanders (2011)). A few empirical evidences such as McGillivray and Noorbakhsh (2007) and Williamson (2008)) have concluded the confused results and said that aid is inconclusive in contribution to human development. Some of the studies in literature reported the negative relationship of foreign aid with human development which includes (Simplice, 2014).

2.1.2. Foreign Aid and Environment

Chao and Yu (1999) has examined the effect of tied aid on environment by incorporating the general equilibrium model based on the assumptions that consumption patterns are same and there is no transboundary pollution in two countries (donor and recipient). The study has incorporated two types of tied aid; project tied (aid provided for specific type of expenditure) and policy tied (where the funds are transferred so that recipient will made certain policy changes). The conclusion was drawn that tied has positive effects on the environment, as it leads to cleaner environment. There is positive effect of tied aid on welfare of both economies for recipient it increases the cleanliness of environment and for donor the improvement of terms of trade.

General equilibrium model of Chao and Yu (1999) for two countries and two goods has also been used by Naito (2003). They study has extended the model by incorporating the untied and to determine the effect of such transfer on the pollution of the world. The results of the model explained that untied aid also leads to Pareto improvement in both countries (donor and recipient). Another conclusion from the model is drawn that if the marginal propensity of consumption of polluting good is higher in the donor as compare to recipient than aid is fruitful for environment.

The study of Pfaff *et al.*, (2004) has attempted to explore the link between the quality of environment and economic growth when the rich countries provide the aid to less developed economies to be used for the purpose of clean environment. The authors have incorporated the subsidies and transfers for clean goods as the indicator of environment aid. The analysis has shown that when both countries rich and poor degrade the global environment in such case the rich countries decrease the subsidies and transfers to poor

countries. The study reported that by doing such act donors push the recipient to use clean goods. They have drawn a conclusion that as development is taking place the demand of clean goods is increasing and large portion of population is using cleanest goods.

There seem to be a link between foreign aid and environment regardless of its nature whether it is favorable or not. Arvin *et al.*, (2006) has tried to empirically find a causal relationship between foreign assistance and environment of developing countries. The first part of the study has utilized the Granger causality technique on a sample period of 40 years and found the mixed results, in some countries the causal relationship exists but in other economies there is not strong evidence of causality. In the second part, the authors have used the error-correction mechanism to determine the results of causality for individual countries and same results are drawn.

Arvin *et al.*, (2009) empirically investigated the effect of environmental aid on economic development in case of developing countries (ranges from larger to smaller economies i.e. China to Fiji). The study has utilized the data set of project level aid database⁶ for two different decades 1980s and 1990s. Their two stage least square test reported that top recipient of environmental aid are those economies which have problems of water pollution and more industrialized. Higher level of globalization brings economic development and environmental aid also contributes in it positively, while population growth and democracy does not contribute in development of poor countries.

There are number of studies concerning about the aid and welfare relationship, an empirical investigation in case of developing countries has been completed by Kumler (2007). The study has incorporated the data set for 87 developing countries which includes low and

⁶ 6 Based on data of credit reporting system of OECD and 50 bilateral and multilateral organizations

medium Human Development economies (as defined by United Nations Development Program (UNDP)). The author has utilized the two stage least square method to control for endogeneity in ODA. The study controlled the pro poor public expenditure (on health, education and social services) by including the data from World Development Indicators (WDI) and from past studies. The results of study reported that foreign aid does not have fruitful outcomes for HDI (which was used for aggregate measure of welfare) by controlling the pro poor expenditure from Govt. Another result drawn from empirical analysis is that when controlling for pro-poor expenditure and per capita income macroeconomic policies based on budget surpluses, inflation and trade openness are insignificant in influencing the human development.

The empirical study of Cao and tamer (2013) was based on theoretical assumptions that aid is fungible, recipient govt. use this aid for provision of private goods and public goods and finally the public expenditure improves the environmental quality. They have applied two estimation techniques, ordinary least square (OLS) and fixed effect by incorporating that data from 1990 to 2005. The study has utilized the SO₂, CO₂ and PM10 for the measurement of pollution. The empirical model of the study has reported that foreign aid is beneficial in reducing the pollution. They suggested that foreign aid should be used for the provision of public goods because such goods are environment friendly.

Lim et al., (2015) has completed an empirical analysis for 88 developing countries for the period of 1980 to 2005. The study has analyzed the paradoxical interaction of aid and globalization flows by using the dynamic panel estimation. The authors have found an adverse interaction effect between foreign aid and globalization flows (measured by FDI inflows and exports). The study suggested that when globalization flows are lower, foreign

aid has positive effect on environmental protection and in case of increased globalization aid flows have unfavorable results for environment protection.

2.1.3. Foreign Aid and Sustainable Development

Costantini and Monni (2005) have built a Sustainability Adjusted Human Development Index (SHDI) by incorporating environmental protection and long-term sustainability in HDI. The study has empirically analyzed the data set of 37 European countries starting from 1992 to 2002 and tried to build ranking of countries on different indicators which are GDP, HDI and SHDI. Nordics have showed exceptional performance in the ranking of SHDIs. The transition economies have occupied the lower positions in the ranking of SHDI due to recessions of 1990. There was a significant drop in positions of Spain and France which are penalized from unemployment and environmental problem.

A Time series analysis for France by incorporating different measures of sustainable development completed by Nourry (2008). The basics for incorporating different measures is that no single indicator is perfect and policies cannot be suggested on the basis of a single indicator. The indicators for sustainability are green net national product, ecological footprints and genuine savings, for the measurement of national welfare four different indicators were involved which are, genuine progress indicator, greening of human development index and splitting into two different indices (pollution sensitive and sustainable human development index) and indicator for sustainable economic welfare. The data from 1990-2000 has been extracted from different national and international sources. The results from different measures are also different but collectively the study has concluded that there was economic development in France during the period of analysis.

Alam *et al.*, (2011) has conducted a time series study on Pakistan economy and have tried to investigate the long run relationship among sustainable development, trade liberalization and environment. The empirical analysis has also incorporated urbanization, industrialization, human development and fertilizer consumption. Vector autoregressive and Johanssen maximum likelihood co-integration tests are applied on the data set ranging from 1971-2006. On the basis of findings, the study has concluded that human development and liberalization of trade have positive effect on environment while industries, rapid urbanization and agriculture have adverse effect on environment. On the other hand, industries along with agriculture and trade liberalization are profitable for sustainable development, while urbanization has negative effect on sustainable development of the country.

Pineda (2012) conducted a study to determine the over exploitation of environment and its effect on ranking of human development index. Their results proposed that environment dimension should also be incorporated in HDI. The analysis has included 185 countries of the world of which 90 countries have per capita emissions above the prescribed level. The results also showed that when adjusted for sustainability 19 countries lose one point in their HDI ranking. However, there are big names which are also violating the limits of environmental degradation, United States has experienced largest drop of 102 positions in HDI ranking, China 37 positions and Russia dropped down by 22 positions. For these three countries, the penalty is more than 5% the United States have 27.2%, China 23.9%, and the Russia 7.3%.

The study of Huang and Quibria (2015) had a main focus on foreign aid in exploring its role for global partnership for sustainable development. The research started with a

comprehensive theoretical model which is based on traditional Solow model. The research investigated three channels of foreign aid and sustainable development which are energy intensity, economic growth and natural resource exploitation. Sustainable development was being measured by sustainable human development index, genuine savings and ecological footprint/ bio-capacity ratio. The study included data set of 70 countries from 1985 to 2010. Two estimation techniques instrumental variable and GMM are applied. The results of tests reported that foreign aid contributes positively in sustainable development. The study suggests that to enhance the pace of global sustainability there is need to increase the global partnership in enhancing investment, foreign aid, governance, trade and internal migration.

Institutions play a vital role in the context of sustainable development. There are different views on this aspect by different people. As sanders have a believe that corruption is hurdle in way of development but the greasers said that corruption increases development. Aidt (2009) supported the view of greasers that corruption is negatively co related with measures of sustainable development. The empirical evidence in the debate of institutions and development was provided by Acemoglu et al., (2014). The OLS estimates of the study reported that institutions and human capital have a positive effect on long run development.

2.2. Literature on FDI

FDI is considered as a major source of finance for the developing countries and these countries are relying on such kind of external investment. There are also arguments in favor of FDI that it is less volatile and it contributes in growth by providing capital and modern technology to host countries (Nunnenkamp and Spatz, 2003). But in the literature, there is not a consensus on the outcomes of FDI. Because there are some strong evidences of

positive contribution of FDI and also a bulk of literature on its negative consequences. Aitken and Harrison (1999) have used a comprehensive data set of 4000 plants in Venezuela to determine the effect of FDI on the productivity of domestic firms. The study benefited from weighted least square estimation and concluded that there is a slight positive contribution of FDI in the production of domestically owned firms.

The study of Lartey (2007) tried to estimate dynamic panel data model of real exchange rate in sub-Saharan countries by capturing the effect of foreign inflows. The result of the study concluded that increase in FDI inflows is the main reason for real exchange rate appreciation. Foreign inflows can cause Dutch disease under fixed nominal exchange rate regime, (Lartey, 2008). But the effects of Dutch disease can be removed when monetary policy has a Tylor rule for interest rate. In such a case interest rate reacts to fluctuations in exchange rate. There is consensus among policy makers that a well-managed financial system provides the assist to manage the capital inflows. In order to give an empirical evidence on the issue Saborowski (2009) have used panel data of 85 countries and implied dynamic panel data estimation technique. The study has provided favorable results for the economies which have deep financial sector and an active stock market such economies can tackle with Dutch disease caused by large capital inflows.

FDI can also cause the Dutch disease and brings the unfavorable outcomes in sectors where this investment is not brought up. A case study in case of Colombia is being done by Botta et al., (2016) to determine the presence of Dutch disease. The research has reported that the mining sector has a rapid growth while the other sector of economy such as manufacturing posits a negative growth. The exchange rate was also appreciating due to massive inflow of FDI which gives the clear picture of Dutch disease.

2.2.1. FDI and Environment

There is immense literature on the issue of FDI and environmental degradation. A panel study considering the issue of FDI and environmental degradation by incorporating the variable of economic growth has been completed by Pao and Tsai (2011). The research has estimated the relationship between CO₂ emissions, FDI, economic growth and energy consumption for the BRICs. The panel co-integration econometric technique has been applied on data from 1980 to 2007 and reported that CO₂ emissions, FDI, economic growth and energy consumption have long run relationships. CO₂ emissions seems to be elastic with GDP and energy consumption and inelastic in case of FDI. The results of study also support the hypothesis of EKC.

The study of Blanco et al., (2013) also tried to link FDI with CO₂ emissions which is considered to be main variable of environmental degradation. The authors have applied Granger causality test on panel data of eighteen Latin American economies from 1980-2007. The results of econometric model reported that there is causality from FDI to CO₂ emissions in pollution Intensive industries. The limitation of study is that it does not explain whether domestic firms contributes more in pollution or FDI.

Chandran and Tang (2013) have conducted a study on the issue of FDI and environment by adding the variables of energy consumption of transport sector and income. The sample of research has incorporated five ASEAN countries in the analysis. For the purpose of determining the causal relationship Granger causality test and for long run relationship Johnson Co-integration technique are applied. The results of study reported that energy consumption and income significantly contribute in CO₂ emissions but FDI has not any

significant contribution in CO₂ emissions. The results also reported that EKC is not applicable in selected countries.

2.2.2. FDI and Human Development

Host economies depend on FDI to improve the development of their sectors (economic as well as social) and make them competitive in the global setting. In this way FDI plays a vital role in human development of host countries. Many researchers have tried to answer the question that whether the FDI contributes in development of host economies or not. A comprehensive study in this regard has been conducted by Lehnert et al., (2013) and used the data set of 175 countries. The researchers have used HDI as indicator of welfare and concluded that FDI has a positive contribution in the welfare of host countries. The study also assessed the mediating effect of host country governance in the relationship of FDI and welfare, which contributes positively in this regard.

Reiter and Steensma (2010) said that the association among FDI, economic growth and human development is tenuous and their study has tried to address this issue. The study incorporated the panel data of 1980 to 2005 for forty-nine developing economies. FDI and the host country's policy for FDI are being utilized to better determine its role for human development. The analysis reported that FDI contribute in human development both directly (provision of capital and employment) and indirectly (technological spillovers). Conclusion of study was that when corruption is high FDI does not contribute in human development.

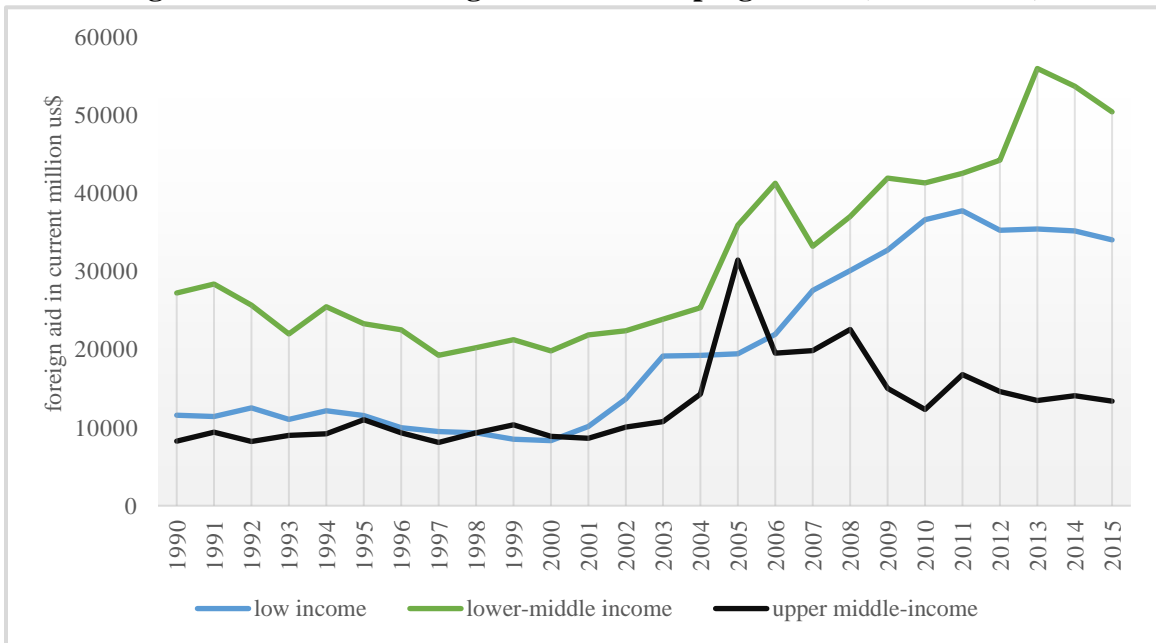
The above explained studies were conducted in the context of foreign aid and sustainable development and different proxies were used for gauging the sustainable development. As for as the literature on FDI is concerned there are extensive literature on FDI in determining

its role for environment and human development. The previous literature both in the case of foreign aid and FDI in the context of sustainable development is limited. The basic reason is non-availability of a specific indicator for sustainable development. The current research by following the studies of Pineda (2012) and Huang and Quibria (2015) to has constructed the sustainable human development index (which includes human development and a loss function attached to it based on environment variables). The SHDI which was constructed by Pineda (2012) and utilized by Huang and Quibria (2015) to measure the effect of foreign aid on sustainable development. But in the case of FDI and sustainable development the literature has a paucity. Previous studies have used foreign aid and missed FDI which is an important component of foreign capital inflow, it can cause omitted variable bias and results can be biased. The current study will fulfil the literature gap by incorporating the FDI and foreign aid to measure their impact on sustainable development in case of three different panels of developing countries. The study will also contribute by utilizing the updated spam of data.

2.3. Trends of Foreign Aid and FDI in Developing World

The current part of chapter discusses the trends of foreign aid and FDI in developing world. Both the following figures no. 1 and 2 show the trends in low income, lower middle-income and upper middle-income countries. Figure 1 presents the trends of foreign aid (current million US\$) in low income, lower middle-income and upper middle-income countries. It shows the historic picture of foreign aid in these countries starting from 1990 to 2015.

Figure 1: Trends of Foreign Aid in Developing World (Million US\$)



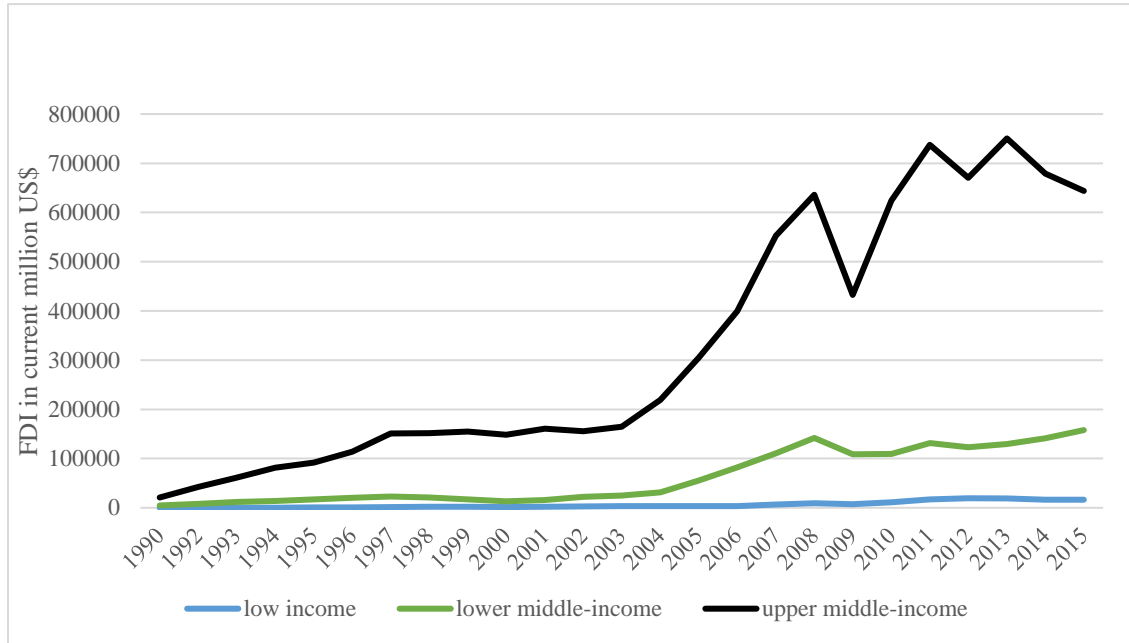
Source: Author's calculation and Data extracted form OECD

Figure 1 indicates that lower middle-income countries receive more foreign aid than other two categories of countries. The low-income countries are at 2nd number and upper middle-income have lowest position in aid recipient category. On average there is an increasing trend in foreign aid of lower middle-income countries except 2007-08 and after the 2013. In 2007-08 the amount of foreign is decreased due to financial crises. After 2013 there is slight decrease due to increase in refugees in developed countries. In case of low income countries there seems an increasing trend in foreign aid throughout the period under consideration. In period of financial crises there was slight decrease in foreign of low income countries but less than the lower middle-income countries. In upper middle-income countries there was a moderate trend in foreign aid till 2004. After that was a rise in amount of foreign aid in next two years which then decreased due to financial crises.

Figure 2 presents the picture of FDI in low income, lower middle-income and upper middle-income countries. Upper middle-income countries are topper in the category of FDI

recipient as these countries have the capacity to absorb this huge capital inflow. Overall there is an increasing trend in FDI of upper middle-income countries except the time of financial crises of 2008.

Figure 2: Trends of FDI in Developing World (Million US\$)



Source: Author's calculation and data extracted from WDI.

The above figure shows that there is much difference in countries in matter of FDI recipient. The lower middle-income countries are in the second place in case of FDI inflow. There seems a smooth upward trend in FDI inflow in lower middle-income countries except the period of 2008-2010. Low income countries receive less FDI as compare to other two categories.

CHAPTER 3

3. Theoretical Framework and Empirical Methodology

The current chapter of study has discussed the theoretical framework and empirical methodology. First part of chapter will define the possible theoretical linkages and the second part of chapter will discuss the econometric model of the study.

3.1. Theoretical Framework

The previous literature has provided theoretical foundations through which we can determine the possible channel between the dependent and explanatory of the study.

3.1.1. Foreign Aid and Development

The two-gap model of Chenery and Strout (1966) provided the theoretical basis for the study. The model has presented that developing countries had faced the problems of these two gaps due to weak financial conditions. Developing countries have lower domestic savings (that caused to lower capital investment) and less exports (the main reason for trade deficit), which leads to problem of budget deficit (Govt. revenue is less than its expenditure), that's why these countries do not have enough resources to finance the development projects. To fulfill these gaps developing economies need financial assistance and foreign aid plays an important to bridge the gap. In this way, foreign aid is positively associated with development by fulfilling the scarce resources (which are required for sustained growth) of developing economies.

Foreign aid is uncritically provided to the developing countries and it is found to be the important component in the transition of development. This type of assistance is donated to upsurge the domestic resources of less developed countries (Todaro, 1981). Foreign aid directly affects human development via the channel of government spending and in

countries where the governments have high preferences for human development, aid contributes more aggressively because it enhances the financial resources of that government to be spend on human development (Kosack and Tobin, 2006). Based on above explained theoretical link, it can be said that foreign aid contributes positively in human development via the channel of public spending on human development activities. The above explained two gap model has been utilized by many researchers such as Asongu (2012) and Min and Sanidas (2011) and reported that foreign aid is positively associated with the development.

Foreign aid can also have negative effect on development as reported by (Simplice, 2014). Foreign aid has negative contribution in HDI due to misappropriation of funds. These funds are not used for development purpose rather being utilized by the govt. officials. With the increase of foreign aid there is appreciation in real exchange rate that is increase in relative price of tradeable commodities. Foreign aid also leads to decrease in relative share of tradeable commodities due to exchange rate appreciation. This effect of foreign aid is harmful for economic growth and development of aid recipient economy (Rajan and Subramanian, 2011).

3.1.2. Foreign Aid and Environment

Environment is being exaggerated by factors which cause any type of pollution and this type of dilemma exists in most of the developing economies. Foreign assistance is being donated by the developed countries to deal with the environment related issues of these developing economies. If the main purpose of foreign aid is to protect the environment then it can contribute positively in the environmental protection (Chao and Yu, 1999).

Environmental Kuznets Curve (EKC) concept was being popularized by Grossman and Krueger in the start of final decade of 20th century and by World Bank in the World Development Report of 1992. The EKC stressed that capital is the essential requirement for the process of sustainable development. As the level of economic activity rises the environment problems also increased due to obsolete technology and less investment. When the resources for investment are increased the environmental quality is also improved (Stern et al., 1996). The problem of low investment exists in less developed countries because these economies have less resources to finance for investment. The financial assistance provided by developed countries play an important role in creation of resources for investment.

The study of Huang and Quibria (2015) has utilized EKC in modeling foreign aid for sustainable development. The study has drawn a conclusion that the environmental emissions should be reduced by technological innovations or applying abatement for pollution creators. The results of study reported that ODA plays an important role in both cases which then leads to sustainable development in the recipient economy. From the above explained theoretical link and empirical evidence it can be said that foreign aid will play a positive role for environment degradation.

Sometimes, foreign aid is unfavorable for environment. At low level of development and when foreign aid is provided to countries to boost economic growth and finance development projects in such cases clean environment is not a governmental priority. In fact, by encouraging economic development, foreign aid may create incentives for growth of polluting industries. In this way foreign can contribute negatively in environment of recipient country (Lim et al, 2015).

3.1.3. Foreign Aid and Sustainable Development

Foreign aid is described as the financial assistance provided to the developing countries to fulfil their financial needs and promote sustainable development. It is explained as development that fulfils the needs of current generation without effecting the consumption pattern of forthcoming generation or the living of future generation (means the development should not affect the environment which can make worst living for future generations). As explained above that foreign aid plays an important role in the environment protection by pollution abatement and by providing the finance for technological advancements and thus it contributes positively in sustainable development. Foreign aid also contributes positively in sustainable development via the channel of growth and human development. In the above theoretical channel of foreign aid and human development it is being explained that financial assistance provided by the developed countries contributes positively in the human development of the recipient nations by fulfilling the scarce resources provided for investment in social sector. Foreign aid reduces the saving investment gap and provide useful resources for investment, when this gap is reduced their will be resources available for investment in education and health services which bring positive change in human development and growth will be sustained. That sustained growth and positive change in human development bring positive change in sustainable development of recipient nation. The study of Huang and Quibria (2015) has incorporated foreign aid in their balanced growth equation to testify its impact on sustainable development and study reported that foreign aid contributes positively in sustainable development of the recipient economies. From the above explained theoretical channel and empirical evidences it can be said that foreign aid has a positive contribution

in the context of sustainable development of low income, lower-middle and upper middle-income countries.

3.1.4. FDI and Sustainable Development

This part of theoretical framework of study links FDI with sustainable development by the channel of environment and human development (which are both indicators of sustainable development index). FDI is considered as important factor in the context of environment, studies show that in some cases it has useful consequences for environment and in other cases it is harmful for environment of the host country. FDI has significant contribution in environmental protection through augmenting the economic growth (Pao and Tsai, 2011). Financial development in developing economies (especially through FDI) motivate and provide opportunity to use latest technologies that are environment friendly that will ultimately improve the environment scenario of host country and contribute in regional sustainable development (Birdsall and Wheeler, 1993). According to the PH environmental regulations may encourage enterprises to innovate, leading to technology upgrading, which may offset the negative pollution effect of FDI (Zheng and Sheng, 2017).

FDI also have harmful effects on environment when the developed economies transfer the obsolete technology to developing countries which cause environmental problems (Blanco et al., 2013). Frankel and Romer (1999) also reported that economic development and financial liberalization attract the FDI and increase investment in R&D, which leads to speedy economic growth and ultimately affect the environment. The competitive advantage theory explains that, FDI may be devoted to comparative advantage market of host country and in such way FDI leads to expansion of the host country's production scale and changes its production structure, which is called scale effect and structure effect, respectively. More

economic production brings greater energy consumption and environmental pollution at the same time (Zheng and Sheng, 2017). “No fire with no smog” a statement given by Färe et al., (2007) which means that there will not be any economic production, with no environmental pollution. Antweiler et al., (2008) also concluded that production expansion has a negative effect on the natural environment.

FDI is assumed to be the major contributor in the capital formation and welfare of the developing economies. It enhances the welfare of the developing economies through increased education, life expectancy and purchasing power parity, which is termed as the spillover effect of FDI (Lehnert et al., 2013). Countries that have open their FDI have significantly improve UNDP, s HDI ranking (Reiter and Steensma, 2010). Both studies of Lehnert et al., (2013) and Reiter and Steensma (2010) have drawn the results that FDI contributes in the human development of the host countries.

From the above explained theoretical and empirical evidences it can be said that FDI contributes positively in sustainable development of low income, lower middle and upper middle-income countries by contributing in environmental protection and human development. Beyond these two main explanatory variables (foreign aid and FDI) there are also some control variables included in the model. These control variables are Urbanization financial development, institutional quality, industrialization, gross capital formation, population growth and trade openness. The study of Huang and Quibria (2015) have used Polity IV as institutional variable and also considered it as endogenous. So, this study has used Polity IV as proxy for institutional variable and controlled its effect on sustainable development. Ridzuan (2017) has introduced trade openness and financial development in determining the effect of FDI on sustainable development. Their study stated these are the

potential drivers of sustainable development. Arvin et al., (2009) used population growth as control variable in finding the effect of foreign aid and economic development. The study of Huang and Quibria (2015) has controlled for financial development, population growth and trade openness in modeling the sustainable development. Afawubo and Ntouko, (2016) found a positive effect of urbanization on CO₂ emissions and by following this study the effect of urbanization is controlled in the model. Urbanization and industrialization are incorporated by Li and Lin (2015) and found their positive relationship with CO₂ emissions. The study of Cherniwchan (2012) found a positive relation of industrialization with environment and the study of Huang and Quibria (2013) incorporated this variable as control in their model. So, industrialization is included as a control variable in current study by following these two studies. Gross capital formation is known as an important variable for its contribution in environment. It is included in the model by following the study of Soyatas and Sari (2009).

3.2. Empirical Methodology

There are two objectives of the study and in order to fulfil these objectives a suitable econometric technique and data is required. The current part of chapter will present the model specification followed by description of variables, sample selection, data sources and estimation technique.

3.2.1. Model Specification

The current study has used the sustainable development as a dependent variable for analysis. In the light of stated objectives, the baseline model of the study is specified by following the Huang and Quibria (2015) methodology. The dependent variable along with the explanatory variables of the study are listed below.

$$SD_{it} = \beta_0 + \beta_1 FA_{it} + \beta_2 UB_{it} + \beta_3 FD + \beta_4 IQ_{it} + \beta_5 IND_{it} + \beta_6 GCF_{it} + \beta_7 PG_{it} + \beta_8 TO_{it} + \mu_{it} \dots (1)$$

SD = Sustainable development, FA = Foreign aid, UB = Urbanization, FD = Financial development, IQ = Institutional quality, IND = Industrialization, GCF = Gross Capital formation, PG = Population growth, TO = Trade openness, μ_{it} = error term, where i and t stands for country and time/years.

In model (1) foreign aid is included as the main explanatory variable with some other control variables. The study of Huang and Quibria (2015) has missed an important variable of foreign direct investment (FDI). The current study incorporated FDI in the below model.

$$SD_{it} = \beta_0 + \beta_1 FA_{it} + \beta_2 UB_{it} + \beta_3 FD + \beta_4 IQ_{it} + \beta_5 IND_{it} + \beta_6 GCF_{it} + \beta_7 PG_{it} + \beta_8 TO_{it} + \beta_9 FDI_{it} + \mu_{it} \dots (2)$$

The studies of Burnside and Dollar (2000), and Dalgaard et al., (2004) revealed that foreign aid has non-linear relationship with economic growth. It has positive but diminishing returns to GDP growth. To capture the nonlinear effect of aid, by following the Dalgaard et al., (2004), current study incorporated square of aid in the following model.

$$SD_{it} = \beta_0 + \beta_1 FA_{it} + \beta_2 UB_{it} + \beta_3 FD + \beta_4 IQ_{it} + \beta_5 IND_{it} + \beta_6 GCF_{it} + \beta_7 PG_{it} + \beta_8 TO_{it} + \beta_9 FDI_{it} + \beta_{10} FA^2_{it} + \mu_{it} \dots (3)$$

3.2.2. Description of Variables and Data Sources

This part of chapter will define the variables incorporated in the study based on the previous literature. A brief definition of variables is given below followed by a table number 2 which provides information about data sources and measurement unit.

3.2.2.1. Sustainable Development

Sustainable development is that kind of development process in which present generation fulfil their needs without effecting the living of forthcoming generations (Huang and

Quibria, 2015). Sustainable development is the main focused variable of the study, there are many proxies being used for sustainable development as mentioned above in literature review chapter. The current study has followed the Pineda (2012) and, Huang and Quibria (2015) by constructing a SHDI which is being used as an indicator of sustainable development.

The most widely accepted and used measure of human progress is HDI of UNDP, it is a comprehensive indicator which covers wide dimensions of social as well as economic factors. HDI covers social dimension of human progress by incorporating indicators of health and education, and in economic prospectus it covers standard of living (UNDP 2011). A loss function is attached to HDI for building SHDI which is being used as an indicator of sustainable development, which is further comprised of two things, one is the fare share for environment use and other is worldwide responsibility. Following is the calculation of indicator of sustainable development and the loss function:

$$SD = (1 - G^i) * HDI^i$$

Where G represents the loss function and i represents the country, value of G lies between 0 and 1, if value of loss is zero its means the country has contributed less in environment than the fare share. If a country exceeds the maximum limit of fare share by large amount than the value of loss is one.

$$G^i = \frac{1}{p} \sum_{j=1}^p G_j^i$$

Where j represents the environmental indicators (j = 1,2, 3..., p)

$$G_j^i = \min \left\{ 1, \frac{n}{N-n} * \frac{[S_j^i - \bar{S}_j]_+}{\bar{S}_j} \right\}$$

Where G_j^i is the loss function of country i for indicator j , it includes two components the fair share of environmental usage and the worldwide responsibility. N is the world population and n denotes the population for country i . The first part in the loss function G_j^i determines the global responsibility of a country that is based on its population. As the function show, greater populated country has larger responsibility for environmental usage. The other part of loss function includes $[x]_+ = \max[x, 0]$. S_j^i is the environmental usage of indicator j by country i and \bar{S}_j represents worldwide planetary limit for environmental factor j . The 2nd part of multiplication captures the fair portion of the environmental term, which apprehensions the situation of a country when its environmental consumption surpasses its fair share. The calculation of SD is based on the loss function, as following the studies of Pineda (2012) and Huang and Quibria (2015) we used three environmental variables to figure SHDI including CO₂ emissions per capita, share of permanent cropland and natural resource depletion.

3.2.2.2. CO₂ Emissions

Carbon dioxide emissions is in important component from environment perspective and incorporated in our study to build the loss being created by it in sustainable development. Emissions which are produced during manufacturing of cement and burn of fossil fuel are included in CO₂ emissions data recorded by world bank. Carbon emissions stem during consumption of gas fuels, solid, gas flaring and liquid are also included in this series. The measurement scale of this variable is metric tons per capita.

3.2.2.3. Permanent Crop Land

The crops of rubber, cocoa and coffee take a long time for harvest after plantation and after harvesting these cannot be replanted. The part of land that is occupied by such crops is

known as permanent cropland. This includes land occupied by fruit trees, vines, flowering shrubs and nut trees. That part of land which is occupied by trees used for wood is excluded. The variable included in the study has data of permanent cropland as percent of total land area of a country.

3.2.2.4. Natural Resource Depletion

It is the sum of net mineral, forest and energy depletion, mineral depletion is defined as ratio of the quantity of mineral resources over the lifetime (covered at 25 years) of remaining reserve. It includes phosphate, tin, bauxite, copper, gold, silver, zinc, nickel and lead. Net reduction of the forest is the one-off rental price per unit above the surplus of round wood harvest compared to natural growth. The calculation of energy reduction is also same as for mineral exhaustion. It includes natural gas, coal and crude oil.

3.2.2.5. Foreign Aid

The main independent variable of study is foreign aid and defined by OECD as the aid granted to promote welfare and economic development of recipient country. OECD named it as ODA and loans provided for military purposes are not part of this grant. This type of aid is either directly provided by the donor or transmitted through multilateral organizations such as World Bank or UN. Aid provided in shape of grants, technical assistance and soft loans with a condition of at least 25 percent is grant element. There is also a standing order to donor countries to donate 0.7 percent of their GNI as foreign aid. In the analysis the data on this variable is taken as million current U.S dollars.

3.2.2.6. Foreign Direct Investment (FDI)

FDI is the investment that is directly flown in the host country. It is the amount of equity capital, short term and long-term capital, and reinvestment of profits of foreign firms

recorded in balance of payments. It is also that investment which is being made to get control of management of an entity which is not in the same country of investor. In current study net inflows of FDI in current U.S million dollars is included which is the new inflow of foreign investment minus disinvestment.

3.2.2.7. Industrialization

The variable is to gauge for industrialization is industry value added as percentage of GDP. Value added is calculated by adding up final outputs of a sector and subtracting its transitional inputs. In calculation no deductions are made for depreciation or depletion of natural resource. Industrial value added includes value added in construction, manufacturing, water, mining, electricity and gas sector of economy.

3.2.2.8. Gross Capital Formation

The percentage share of Gross capital formation in GDP is included as a proxy to control for physical capital in all the three models of study. Gross capital formation is defined as the expenditure incurred on fixed assets which brings some addition to these assets plus net change in inventories. Fixed assets comprise of land improvements, equipment purchase, machinery, construction of roads, schools, hospitals, railways, commercial buildings, offices, plant and private residential lodgings. While the inventories include that stock of goods that is kept by entities to deal with unpredicted variations in their sale.

3.2.2.9. Urbanization

To control for urbanization in the regression model by following the study of Huang and Quibria (2015) urban population as percent of total population is incorporated. Whereas urban population is defined as people residing in urban area of a country (WDI, 2017).

3.2.2.10. Institutional Quality

The variable included for institutional quality is polity 2 from Polity IV which is a project and database created by Marshall and Jaggers (2012). This variable also included by Huang and Quibria (2015) to control for institutional quality. Polity variable is based on several indicators which are balance of executives, freedom of suffrage, respect for civil liberties, operational constraints and basic political rights. The value of polity indicator varies between -10 to 10. The value from -10 to -6 describes anocracy, -5 to 0 presents closed anocracy. The value on positive side from 1 to 5 explains the open anocracy, 6 to 9 democracy and 10 defines full democracy.

3.2.2.11. Financial Development

Broad money as a ratio of GDP is included as a proxy for financial development. Broad money (M2) is defined as currency of a country outside banks which includes demand deposits (excluding government deposits), time deposits, savings and deposits by resident of a country in foreign currency (excluding government). It also includes traveler cheque and other securities.

3.2.2.12. Trade Openness

Trade is considered as important sector of economy and it is necessary to control for trade openness. Previous studies have also incorporated the trade openness for controlling the sustainable development. It is defined as quantity of exports plus imports both in goods and services. This trade is then taken as a percent of GDP which is the series included for trade openness.

Table 2: Data Sources and Unit of Measurement

Variables	Unit	Data Source
HDI	Valued between 0-1	UNDP
C02 Emissions	Metric tons per capita	WDI
Natural Resource Depletion	Percentage of GNI	WDI
Permanent Crop Land	Percent of land area (1000 hector)	WDI
Foreign Aid	Current million U.S dollar	OECD ⁷
Population Growth	Annual percentage	WDI
Trade Openness	Trade percent of GDP	WDI
Urbanization	Urban population percent of total population	WDI
Financial Development	Ratio of M2 and GDP	WDI
Institutional Quality	Valued between -10 to 10	INSCR ⁸
Industrialization	Industry value added percent of GDP	WDI
Gross Capital Formation	Percentage of GDP	WDI
Foreign Direct Investment	Current million U.S dollar	WDI

Note: The data set for these variables is used from 1990-2015.

3.2.3. Sample Selection

The study used the panel data of different countries divided in three separate panels, as the first sample includes countries from low income category, second has lower middle-income economies and third sample incorporates countries from upper-middle income class. The country selection criteria is followed from the study of Behera and Dash (2017). The selection is based on UN criteria of GNI per capita (indicator being used as a measure of development). UN and World bank has defined four categories of countries but the study incorporated only three as the fourth category is of high income countries which did not receive foreign aid rather donate. Countries which have GNI per capita of 1035\$ or less are considered as low income, economies having GNI per capita between 1036\$ and 4085\$ are lower middle-income countries and those countries which have GNI per capita from

⁷ Net ODA from Development Assistance Committee available at <http://stats.oecd.org/>

⁸ Integrated Network for Societal Conflict Research (INSCR) is a data set of Center for Systematic peace

4086\$ to 12,615\$ are in the group of upper middle-income economies. The details and list of countries is shown in appendix.

The dataset for these panels used form the period 1990-2015. There are some advantages of panel data usage over the other methods of data collection such as time series and cross-section. It includes a large no of observations (combination of both time series and cross sections), so degree of freedom is sufficient in panel data. It also reduces the chances of problem of multicollinearity among the independent variables. Hence panel data brings efficient parameters estimates (Hsiao, 2003). Furthermore, the consequences of inestimable and unobservable factors can be controlled.

3.2.5. Estimation Technique

The study is based on panel data and for analysis we incorporated the sustainable development as a dependent variable along with explanatory variables in the model to determine their effect. There are some suitable econometric techniques for panel data analysis such as fixed effects model and random effects model which are being applied by many researchers as mentioned in literature. Along with these two fixed effects and random effects, GMM, panel cointegration and panel ARDL are also being utilized by some studies.

The conventional and most popular methods in panel data estimation are (a) FEM and (b) REM. The FEM deals with each cross section's unobserved heterogeneity by preserving it in intercept and this method set a dummy for these cross sections. The intercept in FEM is different for each cross section and also time invariant. REM allow the unobserved heterogeneity of cross sections to be in ignorance zone i.e. error term. Hausman test specifies the selection between FEM and REM. These methods are applicable when the

data being used in study is stationary, because both FEM and REM neglect the problem of unit root, (in time series analysis) and, heterogeneity (when the data is cross sectional) (Asteriou and Hall, 2007).

In order to apply Panel data estimation techniques, the initial step of analysis is to check the unit root properties of variables. There are three famous tests for checking stationarity/non-stationarity (unit root properties) of variables in panel data studies, which includes Levin and Lin (1993) (LL), Maddala and Wu (1999), and Im, Pesaran and shin (IPS), (2003).

3.2.5.1. Im, Pesaran and Shin (IPS) test

A well-known test for checking stationarity/non-stationarity of variables is IPS, (2003) test and applied on panel data. The IPS test has advantage over LL test because it has more power and does not restrict the ρ to be homogeneous in all cross sections. IPS test is basically the addition to LL test which permits heterogeneity of coefficient ρ of lagged value of level dependent variable. The procedure of test is based on well-known Dicky Fuller test of stationarity (Asteriou and Hall, 2007). The current study uses the IPS test to check the order of integration of variables. The model of IPS test is as follows:

$$\Delta Y_{it} = \alpha_i + \rho_i Y_{i,t-1} + \sum_{j=1}^n \beta_{ij} \Delta Y_{i,t-j} + \mu_{it}$$

Where i represents countries and t stands for years, ΔY_{it} is the dependent variable of study in autoregressive form. On the right side of equation α_i is drift parameter for all cross sections. $Y_{i,t-1}$ is lag of dependent variable at level and its coefficient ρ_i gives the inference about presence of unit root. To control the problem of autocorrelation in detecting unit root, lags of dependent variable are included which are $\Delta Y_{i,t-j}$ and β_{ij} is the parameters of these

lags which vary across countries. μ_{it} is white noise error term. The Hypothesis formed by test are as follow;

$H_0: \rho_i = 0$ for all i.

$H_1: \rho_i < 0$ for at least one i.

H_0 the null hypothesis describes that panel series are non-stationary, while H_1 the alternative hypothesis defines that a section of panel series is stationary. IPS test practice separate unit root test for each cross-section unit. A limiting assumption of IPS is that time period should be same for all countries to compute \bar{t} test statistic. So, the \bar{t} statistic in IPS test is just the mean of individual Augmented Dicky Fuller tests (ADF) test statistics for computing the $\rho_i = 0$ for all cross sections (denoted by t_{ρ_i}):

$$\bar{t} = \frac{1}{N} \sum_{i=1}^N t_{\rho_i}$$

t_{ρ_i} converge to statistic t_{iT} under definite assumptions. The IPS test statistic for computing stationarity in panel data is given by:

$$t_{IPS} = \frac{\sqrt{N} (\bar{t} - 1/N \sum_{i=1}^N E[t_{iT} | \rho_i = 0])}{\sqrt{Var[t_{iT} | \rho_i = 0]}}$$

IPS (2003) stated that t_{IPS} follows the standard normal distribution as $T \rightarrow \infty$ and $N \rightarrow \infty$. If the tests for stationarity shows the existence of unit root, then the conventional estimation techniques FEM and REM will not be applied. These will produce the biased results because the main assumption of these two methods is the stationarity of variables. If the variables are non-stationary then the problem of spurious regression rises because it gives the association between two non-stationary variables. On the other side, if all variables are non-stationary and integrated of same order. Then the co-integration solves the problem

and gives the long run estimates of the regression but on the condition that the error term of regression is stationary (Asteriou and Hall, 2007).

After the application of proper unit root test, to get the long run relationship between variables co-integration is applied. In panel data setting there are three famous tests for co-integration, Johansen-fisher co-integration test, Pedroni (2004) test for Co-integration and Kao (2000) Co-integration test.

3.2.5.2. Kao Co-integration test

The study applied Kao (2000) test of cointegration to get the long run relationship between sustainable development and explanatory variables. Kao presented co-integration test for panel data setting in (2000) which is also known as residual based test for checking co-integration among variables. It has a resemblance with Dicky-fuller and ADF of co-integration. The advanced and commonly used test of co-integration is Kao as compared to Pedroni and Johansen-fisher. The basic methodology for checking co-integration is same in both tests of Kao and Pedroni but Kao test has advantage for imposing the homogeneity in coefficients of AR model and co-integrating vectors. The main reason for applying the Kao test is that Pedroni incorporates just seven regressor in co-integration equation but Kao test includes more than seven regressors in co-integrating equation (Asteriou and Hall, 2007). In our study the regressors in all three models are more than seven that's why we applied the Kao test for checking co-integration. The general form of Kao (2000) test is as follows:

$$Y_{it} = \alpha_i + \beta X_{it} + \hat{\mu}_{it}$$

For

$$Y_{it} = Y_{it-1} + \mu_{i,t}$$

$$X_{it} = X_{it-1} + \epsilon_{i,t}$$

In the above written Kao's equation i and t stands for countries and years equations where Y_{it} represents the dependent variable which is the sustainable development in our study. α_i is the intercept of equation and the restriction imposed on it to be heterogeneous among cross sections. β denotes the coefficient of explanatory variables and allowed to be homogeneous among cross sections. X_{it} represents the vector of independent variables of the study. μ_{it} is white noise error term.

$$\hat{\mu}_{it} = e\hat{\mu}_{it-1} + v_{it}$$

It is the auxiliary regression of Kao test in which $\hat{\mu}_{it}$ is the estimated residual form the first equation of the test. The estimated results of OLS for ρ is presented by following equation:

$$\hat{\rho} = \frac{\sum_{i=1}^N \sum_{t=2}^T \hat{\mu}_{it} \hat{\mu}_{it-1}}{\sum_{i=1}^N \sum_{t=1}^T \hat{\mu}_{it}^2}$$

and the equivalent t statistic of this estimated ρ is given by:

$$t_{\rho} = \frac{(\hat{\rho} - 1) \sqrt{\sum_{i=1}^N \sum_{t=2}^T \hat{\mu}_{it}^2}}{1/(NT) \sum_{i=1}^N \sum_{t=2}^T (\hat{\mu}_{it} - \hat{\mu}_{it-1})^2}$$

Kao co-integration test also gives the estimates of ADF type test and for that purpose following regression is needed to be run:

$$\mu_{i,t} = \rho\mu_{i,t-1} + \sum_{j=1}^n \phi_j \Delta\mu_{i,t-j} + v_{it}$$

The null and alternative hypothesis for Kao test and the ADF estimates given by this test is as follows:

Ho: No co-integration

H1: Existence of Co-integration

The estimates of ADF test is calculated by Kao in the below written equation:

$$ADF = \frac{t_{ADF} + \sqrt{6N}\hat{\sigma}_v / (2\hat{\sigma}_{0v})}{\sqrt{\hat{\sigma}_{0v}^2 / 2\hat{\sigma}_{0v}^2 + 3\hat{\sigma}_v^2 / (10\hat{\sigma}_{0v}^2)}}$$

Kao (2000) co-integration test gives the information about existence of long run relationship among variables but it does not provide the long run estimates. OLS provides the super-consistent estimates in co-integrating regression if there is no-endogeneity and no serial correlation. When the explanatory variables are endogenous and the problem of serial correlation also exists then OLS gives the biased estimates. In order to deal with such issues several modifications to OLS has been made by Phillips and Hansen in (1990) and presented Fully Modified OLS (FM-OLS) and in 2000 Kao and Chiang have also done several changes to OLS and give Dynamic Ordinary Least Square.

3.2.5.3. Fully Modified Ordinary Least Square

FM-OLS is the extension of conventional OLS method but it has advantage of dealing with problems of endogeneity and heterogeneity. FM-OLS was first developed by Phillips and Hansen in (1990) by providing the estimates of co-integrated panel data regression. Further modification to this technique are being made by Pedroni in 1996 and 2001. The current study has used FM-OLS developed by Pedroni (2001) to get the long run estimates. The β pooled OLS in case of panel data is given by:

$$\hat{\beta}_{NT} = \left(\sum_{i=1}^N \sum_{t=1}^T (x_{i,t} - \bar{x}_i)^2 \right)^{-1} \sum_{i=1}^N \sum_{t=1}^T (x_{i,t} - \bar{x}) (y_{i,t} - \bar{y}_i)$$

Modification to this conventional OLS is known as FM-OLS, the β of FM-OLS is given by the following equation:

$$\hat{\beta}_{FM} = \left(\sum_{i=1}^N \hat{L}_{22i}^{-1} \sum_{t=1}^T (x_{i,t} - \bar{x}_i)^2 \right)^{-1} \sum_{i=1}^N \hat{L}_{11i}^{-1} \hat{L}_{22i}^{-1} \left(\sum_{t=1}^T (x_{i,t} - \bar{x}) y_{i,t}^* - T \hat{\delta}_i \right)$$

Where $x_{i,t}$ defined as a vector of independent variables included in study. $y_{i,t}^* = (y_{i,t} - \bar{y}) - \left(\frac{\hat{L}_{21i}}{\hat{L}_{22i}}\right) \Delta x_{i,t} \left(\frac{\hat{L}_{21i} - \hat{L}_{22i}}{\hat{L}_{22i}}\right) \beta (x_{i,t} - \bar{x})$, $y_{i,t}$ is dependent variable and in current study it is sustainable development. $\hat{\delta}_i \equiv \hat{\Gamma}_{21i} + \hat{\Omega}_{21i}^0 - \left(\frac{\hat{L}_{21i}}{\hat{L}_{22i}}\right) (\hat{\Gamma}_{22i} + \hat{\Omega}_{22i}^0)$. Ω_i is defined to be the covariance matrix of regression and its partition is given as:

$$\Omega_i = \begin{bmatrix} \Omega_{11i} & \Omega_{12i} \\ \Omega_{21i} & \Omega_{22i} \end{bmatrix}$$

The long run variance of error term is presented by Ω_{11i} , while covariance matrix of error term in long run is Ω_{22i} . Pedroni also decomposed the Ω_i into two parts:

$$\Omega_i = \Omega_i^0 + \Gamma_i + \Gamma_i'$$

In the above equation Ω_i^0 is the contemporaneous co-variance and $\Gamma_i + \Gamma_i'$ define the dynamic co-variance. In addition to this decomposition a triangularization of covariance matrix (Ω_i) is being done by Pedroni. In this triangularization process L_i is the lower matrix which is partitioned as:

$$L_i = \begin{bmatrix} L_{11i} & L_{12i} \\ L_{21i} & L_{22i} \end{bmatrix}$$

Pedroni (2001) provided that in estimation of dynamic co-integrated panel data, main problem of concern is heterogeneity. The FM-OLS defined above deals with the issue of heterogeneity as well as endogeneity by incorporating individual specific intercepts in regression and allow the serial correlation properties of the error-term to differ across individual cross sections of the panel.

3.2.5.4. Vector Error Correction Mechanism

The long run relationship of Sustainable development and explanatory variables is determined through co-integration. For getting the short run impact of these explanatory

variables in the context of sustainable development of defined panels Vector Error Correction Mechanism (VECM) technique is used. The VECM methodology is based on the Wester Lund (2007). In modeling the VECM an error correction term is included in the model. This error correction term will depict the time taken by dependent variable to be at its original equilibrium, when it is deviated by an external shock. VECM model for the current study is given in following equation:

$$\Delta SD_{i,t} = \alpha_i + \beta v_{i,t-1} + \sum_{k=1}^K \omega_i \Delta SD_{i,t-k} + \sum_{l=1}^L \sum_{k=1}^K \delta l_i \Delta X_{i,t-k}$$

In the above equation i equals the cross sections, which are different in all three panels, t defines the time period which is same in all three panels, $t = 1, 2, \dots, 26$. The equation of VECM gives the short run dynamics $(\Delta SD, \Delta X)$ and an error correction term also $v_{i,t-1}$. $\Delta SD_{i,t-k}$ is a vector of lags of regressand and ω_i is its co-efficient. The matrix of co-efficient of short run variables is δ whereas l is defined as quantity of short run variables, $l = 1, 2, \dots, L$ and k presents lags the independent variables of study which are included here as short run variables. β is the co-efficient of error correction term of the study. It explains the time required for sustainable development to be at its original equilibrium, when its equilibrium is disturbed by any shock on the variables of independent side. Error term is derived from following equation:

$$v_{it} = \Delta SD_{i,t} - \alpha_i - \sum_{k=1}^K \omega_i \Delta SD_{i,t-k} - \sum_{l=1}^L \sum_{k=1}^K \delta l_i \Delta X_{i,t-k}$$

In the above equation error term is regressed on sustainable development and its lags as well as lags of independent variables of study. The above equation will give the estimated value of v_{it} which is also known as the parameter of speed of adjustment.

Chapter 4

4. Results and Discussion

The current chapter has discussed the results and followed by a brief discussion. The first part of chapter elaborated the descriptive statistics of three different panels of country and their brief explanation. The second part of chapter presents the empirical results of the study which includes the results of IPS test, Kao co-integration test, FMOLS test and VECM test.

4.1. Descriptive Statistics

The following three tables no. 3, 4 and 5 elaborate the descriptive statistics of all variables being used in the study. Descriptive statistics include the mean, median, maximum, minimum and standard deviation of the variables.

Table 3: Descriptive Statistics of Low Income Countries

Variables and Unit of Measurement	Mean	Median	Minimum	Maximum	Std. Deviation
Sustainable Development (Index calculated and Valued between 0-1)	37.5	37.9	19.4	55.6	7.5
Foreign Aid (Current million U.S dollar)	676.8	447.7	34.4	5526.5	689.0
FDI (Current million U.S dollar)	460.0	286.5	171.2	2987.3	453.4
Urbanization (Urban population percent of total population)	28.7	30.9	5.4	59.6	12.4
Gross Capital Formation (Percentage of GDP)	19.1	18.9	-2.4	55.4	8.4
Institutional Quality (Valued between -10 to 10)	1.2	0.0	-9.0	8.0	4.9
Trade Openness (Trade percent of GDP)	54.5	53.2	19.7	131.5	17.9
Financial Development (Ratio of M2 and GDP)	24.3	21.5	1.1	98.3	13.5
Population Growth (Annual percentage)	2.6	2.2	-6.2	7.9	1.2
Industrialization (Industry value added percent of GDP)	19.9	18.3	4.6	44.8	7.0

Source: Author's own calculation

Note: The data set included for this table has a range from 1990-2015. The countries included in low income sample are 18 so no. of observations are (18*26) 468.

Table 4: Descriptive Statistics of Lower Middle-Income Countries

Variables and Unit of Measurement	Mean	Median	Minimum	Maximum	Std. Deviation
Sustainable Development (Index calculated and Valued between 0-1)	50.7	49.4	35.5	74.3	8.8
Foreign Aid (Current million U.S dollar)	571.8	394.1	85.9	2030.7	436.9
FDI (Current million U.S dollar)	840.8	655.4	212.2	2619.8	444.1
Urbanization (Urban population percent of total population)	33.2	31.6	13.7	67.4	13.9
Gross Capital Formation (Percentage of GDP)	21.2	19.1	1.6	61.5	9.1
Institutional Quality (Valued between -10 to 10)	0.9	1.0	-9.0	8.0	5.3
Trade Openness (Trade percent of GDP)	76.2	74.1	18.9	199.7	32.6
Financial Development (Ratio of M2 and GDP)	27.2	24.0	3.8	79.9	14.5
Population Growth (Annual percentage)	2.0	2.2	-2.4	5.1	1.2
Industrialization (Industry value added percent of GDP)	28.0	26.7	5.0	52.0	10.0

Source: Author's own calculation

Note: The data set included for this table has a range from 1990-2015. The countries included in lower middle-income sample are 11, that's why no. of observations are (11*26) 286.

Table 5: Descriptive Statistics of Upper Middle-Income Countries

Variables and Unit of Measurement	Mean	Median	Minimum	Maximum	Std. Deviation
Sustainable Development (Index calculated and Valued between 0-1)	65.1	65.7	48.0	76.4	5.9
Foreign Aid (Current million U.S dollar)	299.1	142.4	7.5	1457.7	271.4
FDI (Current million U.S dollar)	1278.8	173.3	-33.2	16208.7	2987.3
Urbanization (Urban population percent of total population)	25.2	25.2	6.3	50.9	9.1
Gross Capital Formation (Percentage of GDP)	23.0	21.6	5.2	52.5	6.6
Institutional Quality (Valued between -10 to 10)	5.2	6.0	-7.0	9.0	3.4
Trade Openness (Trade percent of GDP)	108.3	108.1	32.7	280.4	48.5
Financial Development (Ratio of M2 and GDP)	50.8	49.4	11.5	97.4	18.2
Population Growth (Annual percentage)	1.1	1.0	-1.0	4.7	1.3
Industrialization (Industry value added percent of GDP)	47.2	45.6	25.6	76.4	15.5

Source: Author's own calculation

Note: The data set included for this table has a range from 1990-2015. The countries included in upper middle-income sample are 8 and no. of observations is (8*26) 208.

Table no. 3 in the analysis explains descriptive statistics of low income countries, followed by middle income and finally the last table elaborates the upper middle-income statistics. The first variable is of sustainable development in all three tables which is calculated by multiplying a loss function to HDI of UNDP. The value of sustainable index in this study ranges from 0-100 where the value near to zero means under development and as the value approaches 100, the country is considered as developed. As in the case of HDI a country which has value near zero considered as less developed. On the other hand, if a country has value near 1 is considered as developed.

The mean value of sustainable development index for low income countries is 37.5 whereas minimum and maximum values are 19.4 and 55.6. The value of standard deviation for current sample is 7.5 which is not high. The low value of standard deviation explains that most of the values of sustainable development index lies around its mean value. The average value of sustainable development index for lower middle-income countries is 50.7 but minimum and maximum values has vast distance as minimum value 35.5 is while maximum is 74.3. Standard deviation of this index for lower middle-income group is 8.8 which is slightly high than the low-income countries, which explains that the dispersion of the values of index is quite high in lower middle-income economies.

The sample of upper middle-income countries have the highest mean value of sustainable development index which is 65.1. In all the three samples of countries this group is considered as developed due to high average value of its sustainable development index. The maximum and minimum values of index for current group are 76.4 and 48.0 which seems to be quite different but the standard deviation is 5.9 which explains that dispersion in values is small.

Foreign aid has an average value of 676.8 million U.S dollars for low income countries included in the study. The maximum value for selected sample is 5526.5 while the minimum is 34.4 which identifies a huge difference. Standard deviation of foreign aid is 689.0 explaining the reason of heterogeneity in this series. The average foreign aid received by selected lower middle-income countries during 1990-2015 is 571.8 million U.S dollars which is quite low than low income economies. Data of foreign aid for this sample also has a high heterogeneity as the minimum value is just 85.94 while the maximum is 2030.7 and standard deviation is 436.9.

The minimum average value of foreign aid in all three samples is 299.1 million US dollars which is for upper-middle income economies. These countries have GNI per capita between 4086\$ to 12,615\$ that's why the average value of foreign aid is low for this sample. The dispersion of series is heterogeneous as the minimum value is 7.5 and maximum approaches 1457.7 while the standard deviation is 271.4.

The investment that is directly flown into a country from foreign investors is FDI. In the selected samples of current study upper middle-income countries have received on average high FDI as compare to low and lower-income countries. Upper middle-income countries have maximum 16208.7 million US dollars FDI in a single year, while in low income and lower middle income 2987.3 and 2619.8 million US dollars respectively. Standard deviation in case of FDI is minimum in lower-middle income category 444.1, low income has a quite high 453.4 but upper middle income has maximum 2987.3 value of standard deviation.

In urbanization variable share of urban population in total population is included. In all the three sample lower middle income has on average high urban population which is 33.2

percent of total population. On the scale of maximum urban population lower-middle income countries surpasses the other two categories included in analysis. Upper middle-income countries have maximum average value of gross capital formation as compare to other two samples included in research. Low and lower middle-income groups have their minimum value of gross capital formation in negatives but upper middle-income group have positive value of gross capital formation.

Institutional quality is better in upper middle-income countries and on average most of these countries has democratic government. Neither of the countries included in analysis have complete democracy as the maximum value of polity 2 indicator is 9. Upper middle-income economies have very high average value of trade openness which is 108.3 it explains that on average the trade sector of these countries have more than 100 percent of their GDP. On the other hand, the maximum value of trade openness for low income category of countries is 131.5.

The highest value of average financial development is 50.8 in all the three samples of study and it is for upper middle-income countries. Population growth is considered as an important factor in development of a country. Low income group of countries has the maximum average value of population growth which is 2.6. The lowest minimum value of population growth is -6.2 which is the minimum value in low income countries. Industrial sector is considered as major contributor in environment of a country. As the statistics in table 4 explains, on average the industrial share in GDP is quite high in upper middle-income economies which is 47.2. The minimum value of industrial share in this group of countries is 25.6 which is higher than the average value of low income category which is 19.9 percent of their GDP.

4.2. Empirical Results

The estimated results of study are presented in following sub-sections. The first part elaborates the unit root test results, followed by co-integration results and final part of current chapter discusses the estimates of both the short and long run relationship.

4.2.1. Results of Im, Pesaran and Shin Panel Unit Root Test

The current part of study highlights the results of unit root tests. IPS (2003) is common test of unit root in panel data. The study has benefited from IPS (2003) test to obtain the order of integration of variables. The following table number 6 and 7 explain the results of unit root test for low income and lower middle-income countries respectively.

Table 6: Results of Panel Unit Root Test for Low Income Countries

At level			At First difference		
Variable Name	t-Statistics	P-values	t-Statistics	P-values	Order of integration
SD	-0.946	0.172	-8.776*	0.000	I (1)
FA	-0.690	0.245	-16.545*	0.000	I (1)
FDI	-0.730	0.233	-13.491*	0.000	I (1)
GCF	-1.346	0.089	-15.838*	0.000	I (1)
IND	-0.039	0.398	-9.282*	0.000	I (1)
IQ	-0.764	0.222	-10.583*	0.000	I (1)
PG	0.964	0.833	-11.191*	0.000	I (1)
TO	-1.310	0.095	-11.640*	0.000	I (1)
UB	6.320	1.000	-4.480*	0.000	I (1)
FD	2.314	0.989	-14.340*	0.000	I (1)

Note: level of significance is presented by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

(a) The optimal lag length is nominated by using the automatic criteria of Schwarz info.

(b) All the variables are examined by unit root test with intercept and trend.

Table 7: Results of Panel Unit Root Test for Lower Middle-Income Countries

At level			At First difference		
Variable name	t-Statistics	P-values	t-Statistics	P-values	Order of integration
SD	2.703	0.997	-4.750*	0.000	I (1)
FA	0.970	0.834	-11.444*	0.000	I (1)
FDI	0.277	0.609	-14.540*	0.000	I (1)
GCF	-1.520	0.064	-13.482*	0.000	I (1)
IND	-1.086	0.139	-10.803*	0.000	I (1)
IQ	-1.498	0.067	-7.641*	0.000	I (1)
PG	-1.280	0.100	-8.537*	0.000	I (1)
TO	0.628	0.735	-9.267*	0.000	I (1)
UB	6.666	1.000	-6.608*	0.000	I (1)
FD	-0.041	0.484	-13.189*	0.000	I (1)

Note: level of significance is presented by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

(a) The optimal lag length is nominated by using the automatic criteria of Schwarz info.

(b) All the variables are examined by unit root test with intercept and trend.

The IPS (2003) test is applied at level and first difference to check the unit root characteristics of variables. The results of test at level shows the presence of unit root in all variables. The t statistics and p values explains that all variables are insignificant at level. The result of unit root test at first difference are different and shows that after taking the first difference the variables are stationary. The test statistics from table 5 and 6 confirms that the order of integration of all variables is 1.

The same test of unit root is applied on data of upper middle-income countries and results are reported in table number 8 (presented at following page). The IPS (2003) test is applied on all variables included in upper middle-income group at level. The results show that none of variables is stationary at level. After taking the first difference, the same test is applied

and all variables are stationary. The statistics from table 7 also confirms that all variables are integrated of order (1).

Table 8: Results of Panel Unit Root Test for Upper Middle-Income Countries

Variable name	At level		At First difference		
	t-Statistics	P-values	t-Statistics	P-values	Order of integration
SD	0.193	0.580	-6.516*	0.000	I (1)
FA	-0.618	0.268	-8.360*	0.000	I (1)
FDI	-0.152	0.439	-8.452*	0.000	I (1)
GCF	-0.990	0.159	-7.723*	0.000	I (1)
IND	2.986	0.998	-6.150*	0.000	I (1)
IQ	-0.971	0.161	-6.756*	0.000	I (1)
PG	-1.280	0.100	-8.537*	0.000	I (1)
TO	-1.102	0.131	-8.480*	0.000	I (1)
UB	-0.770	0.222	-12.051*	0.000	I (1)
FD	0.473	0.618	-9.011*	0.000	I (1)

Note: level of significance is presented by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

(a) The optimal lag length is nominated by using the automatic criteria of Schwarz info.

(b) All the variables are examined by unit root test with intercept and trend.

The unit root test results of all three panels concluded that all variables are integrated of order (1) and consistent with previous studies of Song et al., (2008), Alam et al., (2011), Pao and Tsai (2011) and Chandran and Tang (2013).

4.2.2. Results of Kao-Cointegration Test

The result of IPS (2003) concludes that all variables of study has a unit root problem. The next step in the analysis is to check the long run relationship between variables and to fulfil this purpose the study applied Kao (2000) test of co-integration. The Kao (2000) test is applied on all the three models of study. The following tables 9, 10 and 11 elaborate the

results of co-integration for low income, lower middle-income and upper middle-income respectively. The H_0 for Kao test is no-cointegration and it is rejected in all the three panels. The estimates of the test suggest that there exists long run relationship between sustainable development, foreign aid, FDI and other explanatory variables in all three samples of countries included in the study.

Table 9: Results of Co-Integration Test for Low Income Countries

ADF	Model 1		Model 2		Model 3	
	t-stat	P-value	t-stat	P-value	t-stat	P-value
	-2.334**	0.009	2.522**	0.005	-2.751**	0.002
Residual variance	0.000048		0.000047		0.000048	

Augmented Dicky Fuller Test Equation

Variable	Model 1	Model 2	Model 3
	Resid (-1)	Resid (-1)	Resid (-1)
Co-efficient	-0.118*	-0.112*	-0.131*
Standard Error	0.022	0.023	0.024
t-Stat.	-5.039	-4.969	-5.475
p-value	0.000	0.000	0.000

Note: level of significance is denoted by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

(a) The optimal lag length is nominated by using the automatic criteria of Schwarz info.

(b) Cointegration test is applied by incorporating intercept and trend.

Table 10: Results of Co-Integration Test for Lower-Middle Income Countries

ADF	Model 1		Model 2		Model 3	
	t-stat	P-value	t-stat	P-value	t-stat	P-value
	-2.672**	0.003	-3.243*	0.000	-2.786**	0.002
Residual variance	0.0000419		0.0000419		0.0000419	

Augmented Dicky Fuller Test Equation

Variable	Model 1	Model 2	Model 3
	Resid (-1)	Resid (-1)	Resid (-1)
Co-efficient	-0.160*	-0.234*	-0.161*
Standard Error	0.033	0.044	0.031
t-Stat.	-4.912	-5.326	-5.179
p-value	0.000	0.000	0.000

Note: level of significance is denoted by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

(a) The optimal lag length is nominated by using the automatic criteria of Schwarz info.

(b) cointegration test is applied by incorporating intercept and trend.

Table 11: Results of Co-Integration Test for Upper-Middle Income Countries

ADF	Model 1		Model 2		Model 3	
	t-stat	P-value	t-stat	P-value	t-stat	P-value
	-5.272*	0.000	-5.243*	0.000	-5.381*	0.000
Residual variance	0.000028		0.000027		0.000026	

Augmented Dicky Fuller Test Equation

Variable	Model 1	Model 2	Model 3
	Resid (-1)	Resid (-1)	Resid (-1)
Co-efficient	-0.302*	-0.315*	-0.317*
Standard Error	0.045	0.045	0.045
t-Stat.	-6.765	-6.943	-6.965
p-value	0.000	0.000	0.000

Note: level of significance is denoted by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

(a) The optimal lag length is nominated by using the automatic criteria of Schwarz info.

(b) Cointegration test is applied by incorporating intercept and trend.

The estimates of Kao co-integration test and ADF test equation confirms the existence of long run relation in all three models of study. Co-integration results of research are similar

as in previous studies of Arvin et al., (2006), Song et al., (2008), Alam et al., (2011), Pao and Tsai (2011) and Chandran and Tang (2013).

4.2.3. Results of Fully Modified Ordinary Least Square

The long run relationship between sustainable development and explanatory variables of study is confirmed by Kao-cointegration test but it does not provide the long run estimates.

To meet the stated objectives and get long run estimates current study applied FM-OLS and results of test are shown in following tables.

Table 12: Results of FM-OLS for Low Income Countries

Variables	Model 1		Model 2		Model 3	
	Co-efficient	t-stat	Co-efficient	t-stat	Co-efficient	t-stat
FA	0.001*	3.157	0.0006***	1.648	0.004*	4.004
UB	0.643*	7.460	0.690*	9.024	0.638*	8.211
FD	0.113*	4.692	0.104*	4.598	0.101*	4.892
IQ	0.403*	7.805	0.399*	8.676	0.371*	8.419
IND	0.060**	2.201	0.026***	1.952	0.047***	1.912
GCF	0.141*	5.109	0.127*	5.214	0.109*	4.558
PG	-0.089	-1.108	-0.043	-1.569	-0.063***	-1.876
TO	-0.011***	-1.746	-0.035**	-2.736	-0.034**	-2.418
FDI	-	-	0.001*	4.139	0.002*	4.271
FA^2	-	-	-	-	-0.0000007*	-4.635
R^2	0.847		0.858		0.857	
Adj. R^2	0.839		0.850		0.847	
S.E of Regression	2.993		2.890		2.908	
Long run variance	19.752		17.892		18.324	
Sum squared Resid.	3799.469		3534.105		3569.016	

Note: level of significance is represented by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

Table 13: Results of FM-OLS for Lower-Middle Income Countries

Variables	Model 1		Model 2		Model 3	
	Co-efficient	t-stat	Co-efficient	t-stat	Co-efficient	t-stat
FA	0.004*	5.722	0.003*	5.410	0.012*	6.649
UB	0.604*	7.999	0.419*	5.599	0.428*	6.221
FD	0.212*	9.383	0.123*	5.211	0.109*	4.996
IQ	0.093***	1.656	0.097***	1.931	0.026	0.529
IND	-0.061***	-1.752	-0.040	-1.160	-0.060***	-1.905
GCF	0.203*	7.292	0.096*	3.803	0.076*	3.286
PG	-0.438***	-1.823	-0.836***	-1.680	-0.691	-1.517
TO	-0.031*	3.707	-0.032*	-3.902	-0.025*	-3.527
FDI	-	-	0.006*	11.918	0.005*	12.408
FA^2	-	-	-	-	-0.000005*	-6.001
R^2	0.879		0.906		0.913	
Adj. R^2	0.869		0.897		0.904	
S.E of Regression	3.269		2.891		2.787	
Long run variance	20.261		14.665		14.009	
Sum squared Resid.	2202.012		1713.440		1584.968	

Note: level of significance is represented by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

FM-OLS is applied on the data set of low income, lower middle-income and upper middle-income countries. The above presented two tables number 12 and 13 explains the results of FM-OLS for low income and lower middle-income countries, while the following table number 14 elaborates the long run estimates for upper middle-income countries.

Table 14: Results of FM-OLS for Upper-Middle Income Countries

Variables	Model 1		Model 2		Model 3	
	Co-efficient	t-stat	Co-efficient	t-stat	Co-efficient	t-stat
FA	0.007*	5.040	0.004*	2.035	0.009***	1.658
UB	-0.131*	-4.068	-0.128*	-4.177	-0.131*	-4.241
FD	0.114*	6.810	0.105*	6.374	0.104*	6.279
IQ	0.372*	4.931	0.358*	4.958	0.371*	5.077
IND	-0.081**	-2.490	0.095*	-3.012	-0.094**	-2.971
GCF	0.563*	9.332	0.577*	9.992	0.569*	9.673
PG	0.307***	1.909	0.343	1.059	0.348***	1.690
TO	-0.017***	-1.723	-0.018***	-1.736	-0.019***	-1.711
FDI		-	0.0002**	2.528	0.0003**	2.640
FA^2	-	-	-	-	-0.000006	-1.051
R^2	0.943		0.949		0.949	
Adj. R^2	0.937		0.944		0.944	
S.E of Regression	1.364		1.27		1.297	
Long run variance	5.069		4.617		4.620	
Sum squared Resid.	295.747		266.102		264.117	

Note: level of significance is represented by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

The results of FM-OLS include three separate models for each of selected sample of countries. As model 1 incorporates foreign aid along with explanatory variables, model 2 incorporates foreign aid and FDI. Finally model 3 is incorporated to determine the non-linear relationship of foreign aid and sustainable development by following the Dalgaard et al., (2004). Foreign aid has significant and positive contribution in sustainable

development of low income countries as reported in table 12. The value of co-efficient is 0.001 which explains that one million dollars increase in foreign aid bring 0.001 points positive change in sustainable development of low income countries. When FDI is incorporated in the model the co-efficient value of foreign aid is decreased to 0.0006 but still it has a positive and significant contribution in sustainable development of low income economies. In the third model of low income countries non-linear relationship of foreign aid with sustainable development is consistent with Dalgaard et al., (2004).

The positive and significant relationship of foreign aid and sustainable is found in case of lower middle-income countries as presented in table 13. The value of co-efficient is 0.004 which interprets that a million dollar increase in foreign aid has 0.004 units increase in sustainable development. When FDI is incorporated in the model both FDI and foreign aid has positive contribution in sustainable development. In the third model of lower middle-income countries non-linearity hypothesis is confirmed but the value of co-efficient is quite low which is -0.000005. This low value of estimate explains that even if foreign aid has negative effect on sustainable development its magnitude is very minimum. This negative sign explains that if foreign aid is increased beyond a level then it will have negative contribution and it is - 0.000005 against one million increases in foreign aid.

The results of foreign aid for sustainable development are same for upper middle-income countries. Co-efficient in this case has value of 0.007 explains that one million dollars increase in foreign aid for upper middle-income countries has positive contribution of this value in sustainable development. The results of foreign aid in third model is same in this case. The coefficient value of squared term of foreign aid is -0.000006 explaining the non-linear relationship but the value is quite low. Foreign aid contributes positively in

sustainable development of developing economies by making contribution in human development and providing resources for clean environment Huang and Quibria (2015). Foreign aid has beneficial outcomes for an economy under good policy environment but up to a point because after that it creates unfavorable effects, Collier, (1999). The results of study in case of foreign aid are like previous studies of Fielding et al., (2007); Wolf, (2007); Anwar and Aman (2010); Gillanders, (2011) and Huang and Quibria (2015).

FDI is also the important variable of study and included in 2nd and 3rd model of all three samples. FDI has a positive contribution in sustainable development of low income countries as reported in table 12. The value of co-efficient is 0.001 and 0.002 in 2nd and 3rd model respectively and significant in both models. The positive co-efficient value reports that 1 million dollars increase in FDI in low income countries has 0.001-unit positive contribution in sustainable development. To determine the non-linear relationship of FDI and sustainable development for low income countries a square term of FDI is included in the model. There exists a non-linear relationship between FDI and sustainable development for low income countries but the value of co-efficient is quite low which does not contribute anything to sustainable development. For details of these estimates see appendix table A5. The results of FM-OLS in case of FDI for lower middle-income countries are reported in Table 13. The co-efficient of FDI in this case is 0.006 and significant at 1 % level of significance. The high t stat value suggests that FDI has greater contribution in sustainable development of lower middle-income countries. The results of study for FDI are in line with Lehnert et al., (2013) which reported that it has greater positive influence on welfare of middle-income economies than the low-income countries. These economies have high absorption capacity for FDI as compare to low income countries. In the case of lower

middle-income countries, the non-linearity of FDI and sustainable development is also determined and the results are same as for low income countries. The co-efficient value is -0.000001 which stated that its negative contribution in sustainable development is much low that is negligible. The estimates of this model are shown in table A7 of appendix.

FDI also contributes positively and significantly in sustainable development of upper middle-income countries. In this category of countries, the co-efficient for determining the non-linearity of FDI is positive which shows that FDI contributes positively in sustainable development of upper middle-income countries⁹. FDI contributes positively in sustainable development of host economies through providing resources for investment. It has a positive effect on welfare of host countries by providing resources to invest in health, education, and standard of living (Lehnert et al., 2013). FDI does not contribute in pollution of host economies. Foreign owned industries have reasonable structure and advanced technology that's why these are not source of pollution (Xuehua and Nini, 2011). Based on results of FM-OLS it can be concluded that FDI has a positive contribution in sustainable development of low income, lower-middle income and upper income economies and result are in line with previous studies of Akiyama (2006), Reiter and Steensma (2010), and Ridzuan (2017).

Beyond these two main explanatory variables the control variables are also included in the study. The control variables incorporated are urbanization, financial development, institutional quality, industrialization, gross capital formation, population growth and trade openness. Urbanization contributes positively and significantly in sustainable development of low income and lower middle-income countries. The coefficient value is 0.643 and

⁹ For details see appendix table A9.

0.604 for low income and lower middle-income respectively. The co-efficient value interprets that a 1 percent increase in urban population of low income countries have 0.643-unit positive contribution in sustainable development. Urban area provides better opportunities for employment, innovation and economic growth. In these economies urban population enjoys better facilities of education, health, access to water, electricity and sanitation. That's why urbanization contributes positively in sustainable development of these economies (Huang and Quibria, 2013). In the case of upper middle-income countries urbanization contributes negatively and significantly in sustainable development. In upper middle-income countries rural population also enjoys better social services. So, increase in urbanization will have more burden on cities in upper middle-income countries (Li and Lin, 2015). Countries which have higher level of income and urbanization contribute more in CO₂ emissions (Liao and Cao, 2013).

Financial development is considered as an important factor for sustainable development. Ratio of M2 to GDP is included to control for financial development in all the three samples. The co-efficient of financial development has value of 0.113 in case of low income countries as reported in table 12. It states that one percent increase in ratio of m2 to GDP will increase sustainable development by 0.113 units. The co-efficient value is positive and statistically significant in all the three income groups. Financial development contributes positively in sustainable development of low income, lower middle-income and upper middle-income countries. It can contribute positively in sustainable development by providing resources to firms for utilization of environment friendly technology (Ridzuan, 2017). Financial development gauges the extent to which financial mediators convert the saving into investment, influence the corporate governance, undertake risk management

and monitor firms. It implies that higher financial development leads to equal access of financial services and contributes positively in sustainable development (Huang and Quibria, 2013).

Institutional quality is measured by polity IV indicator and it is being used by studies of Huang and Quibria, (2013) and Kosack and Tobin, (2006). It measures the level of democracy in a country. The contribution of institutional quality is positive and statistically significant in low income, lower middle-income and upper middle-income countries. The value of co-efficient is positive and statistically significant in all the three samples. The 0.403 co-efficient value in case of low income countries explains that 1 unit increase in institutional quality (means a stronger democracy) contributes 0.403 units positively in sustainable development of these economies.

Industrialization is incorporated in all the three models of study and considered as an important component in sustainable development. It has significant negative contribution in sustainable development of lower middle-income and upper middle-income countries. The value of co-efficient is -0.061 for lower middle-income countries which states that 1 percent increase in industry value added lowers the sustainable development by 0.061 points. The industrialization contributes negatively in sustainable development through contribution in emissions (Cherniwchan, 2012). In industrialized countries over the time the CO₂ emissions are increased which contributes negatively in environment (Hossain, 2011). The co-efficient value of industrialization for low income countries is positive and statistically significant which describes that in these economies industrialization contributes positively in sustainable development. The industrial share in GDP is quite low for these economies as the industrialization increase it provides employment and a source

of income which increases the livelihoods of people and thus contributes positively in sustainable development. Industrialization poses a significant effect on human development of Kenya which is also a low-income country. The indicators of human development are income, employment, skill formation, entrepreneurship, gender parity and improved livelihoods (UNDP, 2005).

The value of gross capital formation capital's co-efficient for low income countries is 0.141. This value explains that 1 percent increase in gross capital formation as a percent of GDP contributes 0.141 units positively in sustainable development. The value of co-efficient is positive for all the three samples. Gross capital formation contributes positively and significantly in sustainable development of developing world as categorized in low income, lower middle-income and upper middle-income countries. Gross capital formation is the expenditure incurred on fixed assets such as building of schools, hospitals improvements of land, equipment purchase, machinery, construction of roads, railways, commercial buildings, offices, plant and private residential lodgings. Capital formation generates employment opportunities which have direct effect on income of people. A sustained level of economic growth cannot be achieved without high growth rate of capital formation which is the essential for sustainable development. Primary cause of underdevelopment in developing world is deficiency of capital. (Shuaib and Ndidi, 2015). Population growth has significant negative contribution in sustainable development of low income and lower middle-income countries. The value of co-efficient for these two samples is negative in all three models. The co-efficient value for low income countries is -0.063 which states if 1 percent increase in population of these economies, sustainable development will be decreased by 0.063 units. in the case of upper middle-income

countries population growth has positive contribution in sustainable development. The co-efficient value for upper middle-income countries is 0.307 which explains that there is 1 percent increase in population of these economies it will have 0.307 units increase in sustainable development.

In the case of lower income countries (both low income and lower middle income) the growth rate of population is higher than resource generation which has negative effect on per capita income. In higher population growth region there is high demand for health and education facilities but these economies do not have sufficient resources. In this way population growth have negative effect on human development which is a component of our sustainable development value. However, in the economies which have high GNI per capita their population growth is slower as compare to resource generation, which high further positive effect on per capita income. In such economies the consumption patterns are also environment friendly which also contributes positively in sustainable development (Li and Lin, 2015).

The final control variable included in the study is trade openness which is found to have a negative contribution in sustainable development. The co-efficient of trade openness has a negative sign in all the three samples included in the study. The negative relationship might be due the reason that developing economies imports the goods which are not environment friendly. The developed economies give the obsolete technologies to developing world which have harmful consequences for environment of these economies.

4.2.4. Results of Vector Error Correction Mechanism

The long run estimates of study are given by FM-OLS and the next step in analysis is to present the short run estimates. For the purpose of obtaining the short run estimates of study

VECM is applied on all three models. VECM test is applied on data set of all three samples.

Table 15 presents the short run results of low income countries followed by table 16 which explains the co-efficients for lower middle-income countries and table 17 shows short run results for upper middle- countries.

Table 15: Results of VECM for Low Income Countries

Variables	Model 1		Model 2		Model 3	
	Co-efficient	t-stat	Co-efficient	t-stat	Co-efficient	t-stat
D (FA (-1))	0.00005	0.721	0.0001***	1.725	0.0002**	2.319
D (UB (-1))	0.304	0.916	0.177	0.547	0.327	1.001
D (FD (-1))	0.017**	1.952	0.019**	2.239	0.017**	1.976
D (IQ (-1))	0.016	1.548	0.020***	1.817	0.018***	1.729
D (IND (-1))	0.00008	0.008	-0.0017	-0.169	0.0012	0.121
D (GCF (-1))	0.021*	3.243	0.015**	2.493	0.018**	2.932
D (PG (-1))	0.442*	3.381	0.397*	3.679	0.616*	4.632
D (TO (-1))	0.008**	2.453	0.005***	1.656	0.007***	1.953
D (FDI (-1))	-	-	0.0002	1.538	0.0003***	1.799
D (FA ² (-1))	-	-	-	-	-0.0000004	-1.132
$\mu_{i,t-1}$	-0.104*	-3.726	-0.115*	-4.938	-0.111*	-4.798
F-Statistics	8.173		8.358		8.462	
S.E of Regression	0.526		0.521		0.516	
Sum squared Resid.	108.9614		106.575		104.	

Note: level of significance is represented by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

Foreign aid has positive contribution in sustainable development of low income countries in short-term as reported in table 15. The co-efficient value for model 2 is 0.0001 which

explains that in short run 1 million dollar increase in foreign aid will bring 0.0001 units positive change in sustainable development of low income countries. Model 3 which is incorporated to explain the diminishing returns of foreign aid for sustainable development and it confirms the hypothesis. The negative value of co-efficient of FA^2 states that when foreign aid is provided beyond a limit it has unfavorable consequences.

Table 16: Results of VECM for Lower-Middle Income Countries

Variables	Model 1		Model 2		Model 3	
	Co-efficient	t-stat	Co-efficient	t-stat	Co-efficient	t-stat
D (FA (-1))	0.00003	-0.250	0.00005	0.433	0.0001	0.247
D (UB (-1))	0.309*	3.564	0.299*	4.004	0.189**	2.286
D (FD (-1))	0.020*	3.574	0.021*	3.833	0.020*	3.342
D (IQ (-1))	0.003	0.630	0.004	0.251	0.007	0.555
D (IND (-1))	0.011	1.135	0.010	1.134	0.007	0.708
D (GCF (-1))	0.006	1.073	0.003	0.549	0.003	0.428
D (PG (-1))	0.876*	4.993	0.922*	5.296	0.614*	3.421
D (TO (-1))	0.0001	0.077	0.0001	0.002	0.002	0.718
D (FDI (-1))	-	-	0.00005	0.491	0.0002***	1.908
D (FA^2 (-1))	-	-	-	-	0.0000002	0.834
$\mu_{i,t-1}$	-0.130*	-4.039	-0.260*	-6.968	0.328*	-3.192
F-Statistics	21.451		23.023		15.431	
S.E of Regression	0.485		0.477		0.511	
Sum squared Resid.	59.496		57.562		15.431	

Note: level of significance is represented by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

The co-efficient of foreign aid is positive in table 16 but statistically insignificant. In lower middle-income countries foreign aid does not contribute anything in sustainable development in shorter period of time. In the case of upper middle-income countries foreign aid has positive significant contribution in sustainable development as highlighted

in table 17. In model 3 of table 17 the co-efficient of FA^2 has negative sign which is consistent with previous results of non-linearity of foreign aid.

Table 17: Results of VECM for Upper-Middle Income Countries

Variables	Model 1		Model 2		Model 3	
	Co-efficient	t-stat	Co-efficient	t-stat	Co-efficient	t-stat
D (FA (-1))	0.0002	0.570	0.0007**	2.387	0.0012	1.544
D (UB (-1))	-0.001	-0.123	-0.003	-0.306	-0.001	-0.149
D (FD (-1))	0.014**	2.451	0.011**	2.018	0.009	1.620
D (IQ (-1))	0.005	0.234	0.012	0.564	0.015	0.697
D (IND (-1))	0.543	1.466	0.232*	3.425	0.200**	2.919
D (GCF (-1))	0.003	0.365	0.018**	2.755	0.019**	2.768
D (PG (-1))	-0.010	-0.245	0.045	0.981	0.020	0.426
D (TO (-1))	-0.0004	-0.210	-0.003***	-1.659	-0.003***	-1.647
D (FDI (-1))	-	-	-0.0001	-1.365	-0.00006	-0.722
D (FA^2 (-1))	-	-	-	-	0.0000005	-0.749
$\mu_{i,t-1}$	-0.236*	-3.046	-0.152*	-6.101	-0.170*	-5.279
F-Statistics	7.686		16.138		13.454	
S.E of Regression	0.377		0.379		0.388	
Sum squared Resid.	23.351		25.789		26.930	

Note: level of significance is represented by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

The co-efficient of FDI is positive and statistically significant for low income countries in model 3 of table 15. The value of co-efficient is 0.0003 which interprets that 1 million dollars increase in FDI will bring 0.0003 units increase in sustainable development of low income countries in short run. In case of lower middle-income economies FDI also has

positive contribution in sustainable development as displayed in table 16. FDI contributes positively in sustainable development of host economies through providing resources for investment. It has a positive effect on welfare of host countries by providing resources to invest in health, education, and standard of living (Lehnert et al., 2013). FDI has insignificant contribution for sustainable development in upper middle-income countries in short run.

In table 12 and 13 it is reported that urbanization has positive contribution in sustainable development of low and lower middle-income countries in long run. The results of urbanization for short run are also familiar with long run estimates. In short run urbanization has positive contribution for low income countries sustainable development but statistically insignificant. In case of lower middle-income countries urbanization contributes positively in short term sustainable development. For upper middle-income countries in short run the variable of urbanization has same sign as in the long run but here it is insignificant.

The co-efficient value financial development is positive and statistically significant in all the three models table 15, 16 and 17. The co-efficient value for low income countries is 0.017. this value interprets that a 1 percent increase in ratio of M2 to GDP will increase sustainable development by 0.017 units. Financial development has positive and significant contribution in sustainable development of developing world categorized by low, lower and upper middle-income countries. Results for financial development in short run are similar to long run estimates as explained above.

Institutional quality is also included in the model to determine the short run effect of democracy on sustainable development. In low income countries democracy plays a

positive role in contribution to sustainable development. The co-efficient value of institutional quality for low income countries in model 2 is 0.020. This given value explains that a unit increase in polity IV index of low income countries will bring 0.020 positive change in sustainable development in short run. In the case of lower middle and upper middle-income countries institutional quality has same sign but statistically insignificant. That might be due to the reason that in these economies democracy takes some time to bring good environment for sustainable development because in long run it has a significant contribution.

The co-efficient value of industrialization for upper middle-income countries is positive and statistically significant in short run. For these economies industrialization has negative consequences for sustainable development in long run by damaging the environment. In short run the reason for positive co-efficient is that it increases the employment opportunities and generate income. Gross capital formation has positive and statistically significant contribution in sustainable development of low income and upper middle-income countries in short run. The estimates for gross capital formation in short run are like those in long run explained in above discussion. The co-efficient value for low income countries in model 1 is 0.021 which elaborates that 1 percent increase in gross capital formation as percent of GDP has 0.021 units positive change in sustainable development in short run.

Population growth has positive and statistically significant contribution in sustainable development of low and lower middle-income countries. In these economies the long run estimates for population growth are different than short run results. In long run population growth have unfavorable effects for sustainable development in these economies due to

slow rate of resource generation. In upper middle-income countries population growth has positive contribution in sustainable development both in short run and long run but in short run it is less significant. trade openness also has mixed results for sustainable development in developing world. In low income countries trade openness has positive contribution on sustainable development in short run. For these economies the obsolete technology transferred by developed world through trade has some positive effect through increase in productivity and providing employment in short run. But in the long run this obsolete technology has unfavorable effect for environment through which trade openness contributes negatively in sustainable development. For upper middle-income economies trade openness has same negative effects both in short run and long run.

The last and important thing in short run analysis is the co-efficient value of error term which is also known as speed of adjustment. The co-efficient value is significant at 1 percent and sign is correct in all the three models of table 15, 16 and 17. The value of co-efficient in first model for low income countries is -0.104. This value explains that if there is disequilibrium in sustainable development of low income countries due to any shock on independent side that will be settled by 10.4 percent in first year. The coefficient value is increased to -0.115 when FDI is incorporated in the model means that speed of adjustment is increased due to inclusion of this variable. In the 3rd model of low income countries the value of co-efficient is -0.111 which explains that which is higher than 1st model but lower than 2nd.

The co-efficient of co-integration equation in case of lower middle-income countries in model 1 is -0.13 which is higher than low income countries. The speed of adjustment is high in lower middle-income countries as compare to low income economies. If there is

any shock on independent side of model in lower middle-income countries and equilibrium of sustainable development is disturbed that will be quickly settled than low income economies. The value of this co-efficient is increased to 0.260 when FDI is incorporated in the model. The speed of adjustment against the disequilibrium of dependent side variable is high in upper middle-income countries in all three samples of study. In model 1 the co-efficient value for upper middle-income countries is -0.236 which is decreased to -0.152 with inclusion of FDI in model. Finally, it can be concluded that there exists a short run relationship between the variables included in the study although magnitude and signs are different according to circumstances of countries.

CHAPTER 5

5. Conclusion and Policy Recommendation

The current chapter of study elaborates the conclusion of study discussed in section 5.1. Following the conclusion section 5.2 and 5.3 discuss the possible policy recommendations and limitations of study respectively.

5.1. Conclusion

The study has analyzed the impact of foreign aid and FDI on sustainable development in case of developing world. The developing world is segregated into three categories low income, lower middle income and upper middle-income countries. The data set includes time period ranging from 1990-2015. A sustainable development index is constructed by incorporating environmental variables with HDI of UNDP. A loss function is attached to this HDI value based on CO₂ emissions, natural resource depletion and permanent crop land. The study estimated both long run and short run coefficients of variables. For the long run analysis first step is to check unit root properties of variables and for that purpose IPS (2003) test is applied. All variables are integrated of order 1 in all three samples. After that Kao (2000) co-integration test is applied to check the presence of long run relationship among variables. In panel data analysis co-integration test just give the surety of presence of long run relationship and does not provide the long run estimates. To get the long run estimates FM-OLS developed by Pedroni (2001) is applied. Final part of analysis includes the results of short run and speed of adjustment obtained by VECM of Westerlund (2007). The results of Kao (2000) test and Augmented Dickey Fuller Test Equation confirms the presence of long run relationship between sustainable development and explanatory variables of the study. There is issue of endogeneity in the model and to deal with the

problem FM-OLS is applied which gives the main estimates of the study. Foreign aid and FDI both main variables of the study have significant positive contribution in sustainable development of low income countries. FDI is more statistically significant than foreign aid in these countries. A squared term of foreign aid is also included to determine the non-linear relationship which is statistically significant and has negative sign. The co-efficient value for squared term is -0.0000007 which states that foreign aid if provided beyond a level has negative effects but this negative effect is quite low.

In lower middle-income countries foreign aid and FDI both have positive and statistically significant coefficient. In this sample FDI is also more significant than foreign aid for contribution in sustainable development. The squared term of foreign aid is incorporated in the 3rd model to capture the diminishing returns phenomena. The significant and negative value states that if foreign aid is provided beyond a level it will have unfavorable effects for sustainable development but the co-efficient value is quite low. Foreign aid and FDI contribute positively in sustainable development of upper middle-income countries in long run. The results suggest that foreign aid contributes positively in sustainable development of developing economies by making contribution in human development and providing resources for clean environment.

FDI contributes positively in sustainable development of developing world through providing resources for investment. Foreign owned industries have reasonable structure and advanced technology that's why these are not source of pollution (Xuehua and Nini, 2011). It has a positive effect on welfare of host countries by providing resources to invest in health, education, and standard of living (Lehnert et al., 2013). Beyond these two explanatory variables a number of control variables are also included in the analysis which

are urbanization, financial development, institutional quality, industrialization, gross capital formation, population growth and trade openness. These variables have significant contribution in sustainable development of developing world.

VECM results state that foreign aid has significant positive contribution in sustainable development of low income and upper middle-income countries. While in lower middle-income countries it is less significant. FDI contribute positively and significantly in sustainable development of low income and lower middle-income countries in short run as reported by VECM. In case of upper middle-income countries, it seems to be less significant for contribution in sustainable development. The speed of adjustment for all three samples is different. In low income countries is 10.4 percent, 11.5 percent and 11.1 percent in all three models respectively. Whereas in lower middle-income countries the speed of adjustment is quite high than low income countries, it is 13.0 percent, 26.0 percent and 32.0 percent in all three models. In case of upper middle-income countries, the speed of adjustment in 1st model is quite high and 23.6 percent, while in 2nd and 3rd model is less than lower middle-income countries which is 15.2 percent and 17.0 percent respectively.

5.2. Policy Recommendations

The contribution of foreign aid for sustainable development of developing world is positive in the long run but up to certain point after that it has negative effect and negative value of co-efficient is quite low that is considered to be negligible so it is recommended that foreign should be provided to developing world to protect environment and for contribution in sustainable development.

Foreign direct investment has significantly positive contribution in sustainable development of developing world. Foreign owned industries have reasonable structure and

advanced technology that's why these does not contribute in environmental degradation. Foreign direct investment should be promoted to increase the pace development and environment friendly technology used by these firms which are essential components of sustainable development.

Policies should be formed according to level of development of countries for countries at low level of development, the attention of policy maker should be on building small towns, by improving rural productivity, which will release the rural labor and drive the development of industrial sectors. As income levels increase, policy maker should prioritize the development of industries and guide urbanization toward energy saving measures.

References

- Acemoglu, D., Gallego, F. A., and Robinson, J. A. (2014). Institutions, human capital, and development. *Annu. Rev. Econ.*, 6(1), 875-912.
- Afawubo, K., and Ntouko, C. N. (2016). Are urbanization, industrialization and CO2 emissions cointegrated?. *Environmental and Resource Economics* (CNRS2)
- Aidt, T. S. (2009). Corruption, institutions, and economic development. *Oxford Review of Economic Policy*, 25(2), 271-291.
- Aitken, B. J., and Harrison, A. E. (1999). Do domestic firms benefit from direct foreign investment? Evidence from Venezuela. *American economic review*, 605-618.
- Akiyama, K. (2006). FDI and Sustainable Development. *商経論叢*, 41(2), 107-114.
- Alam, S., Rehman, S., and Butt, M. S. (2011). Trade liberalization, environmental degradation and sustainable development in Pakistan. *European Journal of Social Sciences*, 19(1), 84-96.
- Antweiler, W., Copeland, B. R., and Taylor, M. S. (2001). Is free trade good for the environment?. *American Economic Review*, 91(4), 877-908.
- Anwar, M., and Aman, S. (2010). Aid effectiveness in the education sector of Pakistan. *Pakistan Journal of Social Sciences*, 30(2), 355-371.
- Arvin, B. M., Dabir-Alai, P., and Lew, B. (2006). Does foreign aid affect the environment in developing economies? *Journal of Economic Development*, 31(1), 63.
- Arvin, B. M., Kayani, Z., and Scigliano, M. A. (2009). Environmental aid and economic development in the third world. *International Journal of Applied Econometrics and Quantitative Studies*, 9(1), 5-16.
- Asongu, S. A. (2012). Development thresholds of foreign aid effectiveness in Africa. *African governance and development institute A G D I*.
- Asteriou, D. and Hall, S. G. (2007), *Applied Econometrics: A Modern Approach* (2nd ed.). New York: Palgrave Macmillan. America. *Oxford Development Studies*, 41(1), 104-121.
- Behera, S. R., and Dash, D. P. (2017). The effect of urbanization, energy consumption, and foreign direct investment on the carbon dioxide emission in the SSEA (South and Southeast Asian) region. *Renewable and Sustainable Energy Reviews*, 70, 96-106.
- Birdsall, N., and Wheeler, D. (1993). Trade policy and industrial pollution in Latin America: where are the pollution havens?. *The Journal of Environment & Development*, 2(1), 137-149.
- Blanco, L., Gonzalez, F., and Ruiz, I. (2013). The impact of FDI on CO2 emissions in Latin America. *Oxford Development Studies*, 41(1), 104-121.

- Botta, A., Godin, A., and Missaglia, M. (2016). Finance, foreign (direct) investment and Dutch disease: the case of Colombia. *Economia Politica*, 33(2), 265-289.
- Burnside, C., and Dollar, D. (2000). Aid, policies, and growth. *American economic review*, 90(4), 847-868.
- Cao, X., and Tamer, N. B. (2013). Foreign Aid and the Environment: Still A Curse? <http://www.personal.psu.edu/xuc11/blogs/x/home/research/research.html>
- Chandran, V. G. R., and Tang, C. F. (2013). The impacts of transport energy consumption, foreign direct investment and income on CO2 emissions in ASEAN-5 economies. *Renewable and Sustainable Energy Reviews*, 24, 445-453.
- Chao, C. C., and Yu, E. S. (1999). Foreign aid, the environment, and welfare. *Journal of Development Economics*, 59(2), 553-564.
- Chenery, H. B., and Strout, A. M. (1966). Foreign Assistance and Economic Development. *American Economic Review*, 56, 679-733.
- Cherniwchan, J. (2012). Economic growth, industrialization, and the environment. *Resource and Energy Economics*, 34(4), 442-467.
- Cobbinah, P. B., Black, R., and Thwaites, R. (2011). Reflections on six decades of the concept of development: Evaluation and future research. *Journal of Sustainable Development in Africa*, 13(7), 134-149.
- Collier, P. (1999). Aid 'dependency': a critique. *Journal of African Economies*, 8(4), 528-545.
- Costantini, V., and Monni, S. (2005). Sustainable human development for European countries. *Journal of Human Development*, 6(3), 329-351.
- Dalgaard, C. J., Hansen, H., and Tarp, F. (2004). On the empirics of foreign aid and growth. *The Economic Journal*, 114(496), F191-F216.
- Easterly, W. (2009). Can the West Save Africa? *Journal of Economic Literature*, 47(2), 373-447.
- Färe, R., Grosskopf, S., and Pasurka Jr, C. A. (2007). Pollution abatement activities and traditional productivity. *Ecological Economics*, 62(3-4), 673-682.
- Fielding, D., and Gibson, F. (2012). Aid and Dutch Disease in Sub-Saharan Africa. *Journal of African Economies*, 22(1), 1-21
- Fielding, D., McGillivray, M., and Torres, S. (2007). A wider approach to aid effectiveness: Correlated impacts on health, wealth, fertility and education. In *Advancing Development* (pp. 183-196). Palgrave Macmillan UK.
- Frankel, J. A., and Romer, D. (1999). Does trade cause growth? *American economic review*, 379-399.
- Friedman, M. (1995). *Foreign economic aid: means and objectives* (No. 60). Hoover Press.

- Gillanders, R. (2011). The effects of foreign aid in sub-Saharan Africa. *UCD Centre for Economic Research, Working Paper Series* (No. 11/16).
- Hopwood, B., Mellor, M., and O'Brien, G. (2005). Sustainable development: mapping different approaches. *Sustainable development*, 13(1), 38-52.
- Hossain, M. S. (2011). Panel estimation for CO2 emissions, energy consumption, economic growth, trade openness and urbanization of newly industrialized countries. *Energy Policy*, 39(11), 6991-6999.
- Hsiao, C. (2003). Analysis of panel data (Vol. 34). *Econometric Society Monographs*.
- Huang, Y., and Quibria, M. G. (2013). The global partnership for inclusive growth. *WIDER Working Paper* (No. 2013/059).
- Huang, Y., and Quibria, M. G. (2015, August). The global partnership for sustainable development. In *Natural Resources Forum* (Vol. 39, No. 3-4, pp. 157-174).
- Im, K. S., Pesaran, M. H., and Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115(1), 53-74.
- Kao, C., and Chiang, M. H. (2000). On the estimation and inference of a cointegrated regression in panel data. In B. (Ed.), *Nonstationary Panels, Panel Cointegration, and Dynamic Panels, Advances in Econometrics*, (15), 161-178.
- Kharas, H. (2007). Trends and Issues in Development Aid. *Wolfensohn Centre for Development, Brookings Institution, Working Paper 1* (November).
- Kosack, S., and Tobin, J. (2006). Funding self-sustaining development: The role of aid, FDI and government in economic success. *International organization*, 60(01), 205-243
- Kumler, T. J. (2007). The Impact of Foreign Aid on Development and Aggregate Welfare in Developing Countries. *Honors Projects*, Paper 19
- Lar, N., Taguchi, H., and Sakurai, H. (2016). Does Foreign Aid Cause “Dutch Disease”? Case of Cambodia, Lao PDR, Myanmar and Vietnam. *Journal of Reviews on Global Economics*, 5, 180-189.
- Lartey, E. K. (2007). Capital inflows and the real exchange rate: An empirical study of sub-Saharan Africa. *The Journal of International Trade and Economic Development*, 16(3), 337-357.
- Lartey, E. K. (2008). Capital inflows, Dutch disease effects, and monetary policy in a small open economy. *Review of international economics*, 16(5), 971-989.
- Lehnert, K., Benmamoun, M., and Zhao, H. (2013). FDI Inflow and Human Development: Analysis of FDI's Impact on Host Countries' Social Welfare and Infrastructure. *Thunderbird International Business Review*, 55(3), 285-298.

- Levin, A. T., and Lin, C. F. (1993). Unit root tests in panel data: new results. *University of California at San Diego, Economics Working Paper Series*.
- Li, K., and Lin, B. (2015). Impacts of urbanization and industrialization on energy consumption/CO2 emissions: does the level of development matter?. *Renewable and Sustainable Energy Reviews*, 52, 1107-1122.
- Liao, H., and Cao, H. S. (2013). How does carbon dioxide emission change with the economic development? Statistical experiences from 132 countries. *Global Environmental Change*, 23(5), 1073-1082.
- Lim, S., Menaldo, V., and Prakash, A. (2015). Foreign aid, economic globalization, and pollution. *Policy Sciences*, 48(2), 181-205.
- Maddala, G. S., and Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and statistics*, 61(S1), 631-652
- Marshall, M.G., Jaggers, K., 2012. *The Polity IV Project: Political Regime Characteristics and Transitions, 1800-2010*. Vienna, VA: Center for Systematic Peace.
- McGillivray, M., and Noorbakhsh, F. *Aid, Conflict and Human Development*. Business School-Economics, University of Glasgow.
- Min, K., and Sanidas, E. (2011). The Impact of Foreign Aid's 7 Functional Categories on Economic Development in Recipient Countries. *Korea and the World Economy* 12(1), 117-179.
- Naito, T. (2003). Pareto-improving untied aid with environmental externalities. *Journal of Economics*, 80(2), 161-169.
- Nourry, M. (2008). Measuring sustainable development: Some empirical evidence for France from eight alternative indicators. *Ecological economics*, 67(3), 441-456.
- Nunnenkamp, P., and Spatz, J. (2003). Foreign direct investment and economic growth in developing countries: how relevant are host-country and industry characteristics? *Kiel Working Paper*. (No. 1176).
- Pao, H. T., and Tsai, C. M. (2011). Multivariate Granger causality between CO 2 emissions, energy consumption, FDI and GDP: evidence from a panel of BRIC (Brazil, Russian Federation, India, and China) countries. *Energy*, 36(1), 685-693.
- Pedroni, P. (1996). Fully modified OLS for heterogeneous cointegrated panels and the case of purchasing power parity. *Manuscript, Department of Economics, Indiana University*.
- Pedroni, P. (2001). Fully modified OLS for heterogeneous cointegrated panels. In *Nonstationary panels, panel cointegration, and dynamic panels* (pp. 93-130). Emerald Group Publishing Limited.
- Pedroni, P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric theory*, 20(03), 597-625

- Pfaff, A., Barelli, P., and Chaudhuri, S. (2004). Aid, economic growth and environmental sustainability: rich-poor interactions and environmental choices in developing countries. *International journal of global environmental issues*, 4(1-3), 139-159.
- Phillips, P. C., and Hansen, B. E. (1990). Statistical inference in instrumental variables regression with I (1) processes. *The Review of Economic Studies*, 57(1), 99-125.
- Pineda, J. (2012). Sustainability and Human Development: A Proposal for a Sustainability Adjusted Human Development Index. *Theoretical and Practical Research in Economic Fields (TPREF)*, (2 (6)), 71-98.
- Rajan, R. G., and Subramanian, A. (2011). Aid, Dutch disease, and manufacturing growth. *Journal of Development Economics*, 94(1), 106-118.
- Rajan, R.G., Subramanian, A., 2008. Aid and growth: What does the cross-country evidence really show? *Review of Economics and Statistics*, 90(4): 643-665.
- Reiter, S. L., and Steensma, H. K. (2010). Human development and foreign direct investment in developing countries: the influence of FDI policy and corruption. *World development*, 38(12), 1678-1691.
- Ridzuan, A. R., Ismail, N. A., and Che Hamat, A. F. (2017). Does Foreign Direct Investment Successfully Lead to Sustainable Development in Singapore?. *Economies*, 5(3), 29.
- Saborowski, C. (2009). Capital Inflows and the Real Exchange Rate; Can Financial Development Cure the Dutch Disease? *International Monetary Fund*. (No. 09/20).
- Sachs, J., 2006. *The End of Poverty: Economic Possibilities for Our Time*. New York: Penguin Books.
- Shuaib, I. M., and Ndidi, N. D. E. (2015). Capital formation: impact on the economic development of Nigeria 1960-2013. *European Journal of Business, Economics and Accountancy*, 3(3), 23-40.
- Simplice, A. (2014). Development thresholds of foreign aid effectiveness in Africa. *International Journal of Social Economics*, 41(11), 1131-1155.
- Song, T., Zheng, T., and Tong, L. (2008). An empirical test of the environmental Kuznets curve in China: A panel cointegration approach. *China Economic Review*, 19(3), 381-392
- Soytas, U., and Sari, R. (2009). Energy consumption, economic growth, and carbon emissions: challenges faced by an EU candidate member. *Ecological economics*, 68(6), 1667-1675
- Stern, D. I., Common, M. S., and Barbier, E. B. (1996). Economic growth and environmental degradation: the environmental Kuznets curve and sustainable development. *World development*, 24(7), 1151-1160.
- Stiglitz, J.E., 2003. *Globalization and Its Discontents*. New York: W. W. Norton & Company.
- Todaro, M. P. (1981). *Economic development in the Third World*: Longman Publishing Group.

- Tressel, T., and Prati, A. (2006). Aid Volatility and Dutch Disease: Is There a Role for Macroeconomic Policies?. *IMF Working Papers*, 6145(200), 1-65.
- UNDP, (2011). Human Development Report, 2011: *Sustainability and Equity: A Better Future for All*. New York: UNDP
- UNDP. (2005). Linking Industrialization with Human Development. Fourth Kenya Human Development Report 2005. www.ke.undp.org/undp_4thkhdr.pdf
- Vos, R. (1998). Aid flows and “Dutch Disease” in a General Equilibrium framework for Pakistan. *Journal of Policy Modeling*, 20(1), 77-109.
- Westerlund, J. (2007). Testing for error correction in panel data. *Oxford Bulletin of Economics and statistics*, 69(6), 709-748.
- Williamson, C. R. (2008). Foreign aid and human development: The impact of foreign aid to the health sector. *Southern Economic Journal*, 188-207.
- Wolf, S. (2007). Does aid improve public service delivery? *Review of world economics*, 143(4), 650-672.
- Xuehua, W., and Nini, L. (2011). Impact analysis of the foreign investment on environmental quality of Shandong. *Energy Procedia*, 5, 1143-1147.
- Younger, S. D. (1992). Aid and the Dutch disease: macroeconomic management when everybody loves you. *World Development*, 20(11), 1587-1597.
- Zheng, J., and Sheng, P. (2017). The Impact of Foreign Direct Investment (FDI) on the Environment: Market Perspectives and Evidence from China. *Economies*, 5(1), 8.

APPENDIX

Table A1: List of Countries Included in Low Income Category

S.NO	Countries	S.NO	Countries
1	Benin	10	Mozambique
2	Burundi	11	Nepal
3	Central African Republic	12	Niger
4	Congo, Dem. Rep.	13	Rwanda
5	Gambia, The	14	Senegal
6	Guinea	15	Sierra Leone
7	Haiti	16	Tanzania
8	Malawi	17	Togo
9	Mali	18	Uganda

Table A2: List of Countries Included in Lower Middle-Income Category

S.NO	Countries	S.NO	Countries
1	Armenia	7	Pakistan
2	Bangladesh	8	Solomon Islands
3	Cambodia	9	Tajikistan
4	Kyrgyz Republic	10	Yemen, Rep.
5	Lao PDR	11	Zambia
6	Mauritania		

Table A3: List of Countries Included in Upper Middle-Income Category

S.NO	Countries	S.NO	Countries
1	Albania	5	Guyana
2	Belize	6	Maldives
3	Colombia	7	Namibia
4	Fiji	8	Ukraine

Table A4: Results of Kao Co-Integration Test Including Non-Linearity of FDI for Low Income Countries

ADF	t-Statistic	Prob.
	-2.528*	0.006
Residual variance	0.497	

Augmented Dicky Fuller Test Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.136	0.027	-5.116	0.000

Note: level of significance is denoted by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

(a) The optimal lag length is nominated by using the automatic criteria of Schwarz info.

(b) Cointegration test is applied by incorporating intercept and trend.

Table A5: Results Of FM-OLS Including Non-Linearity of FDI For Low Income Countries

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FA	0.002**	0.001	2.205	0.028
UB	0.631*	0.075	8.463	0.000
FD	0.103*	0.019	5.351	0.000
IQ	0.336*	0.041	8.278	0.000
IND	0.030	0.022	1.367	0.173
GCF	0.109*	0.022	4.898	0.000
PG	-0.050	0.065	-0.770	0.442
TO	-0.038**	0.013	-2.813	0.005
FDI	0.005*	0.001	7.984	0.000
FA^2	-0.0000006*	0.000	-3.520	0.001
FDI^2	-0.0000008*	0.000	-6.573	0.000
R-squared	0.863	Mean dependent var.		37.728
Adjusted R-squared	0.854	S.D. dependent var.		7.452
S.E. of regression	2.844	Sum squared resid.		3405.218
Long-run variance	17.073			

Note: level of significance is represented by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

Table A6: Results of Kao Co-Integration Test Including Non-Linearity of FDI for Lower-Middle Income Countries

ADF	t-Statistic	Prob.
	-3.284*	0.000
Residual variance	0.419	

Augmented Dicky Fuller Test Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.247*	0.045	-5.492	0.000

Note: level of significance is denoted by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

(a) The optimal lag length is nominated by using the automatic criteria of Schwarz info.

(b) Cointegration test is applied by incorporating intercept and trend.

Table A7: Results of FM-OLS Including Non-Linearity of FDI for Lower -Middle Income Countries

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FA	0.012*	0.002	6.849	0.000
UB	0.421*	0.066	6.402	0.000
FD	0.101*	0.021	4.862	0.000
IQ	0.035	0.047	0.751	0.453
IND	-0.059***	0.030	-1.945	0.053
GCF	0.067*	0.024	2.834	0.005
PG	-0.809***	0.433	-1.868	0.063
TO	-0.025*	0.007	-3.804	0.000
FDI	0.009*	0.002	5.533	0.000
FA^2	-0.000004*	0.000	-6.047	0.000
FDI^2	-0.000001**	0.000	-2.587	0.010
R-squared	0.914	Mean dependent var		51.685
Adjusted R-squared	0.905	S.D. dependent var		9.033
S.E. of regression	2.785	Sum squared resid		1574.684
Long-run variance	13.859			

Note: level of significance is represented by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

Table A8: Results of Co-Integration Test Including Non-Linearity of FDI for Upper-Middle Income Countries

ADF	t-Statistic	Prob.
	-5.284*	0.000
Residual variance	0.264	

Augmented Dicky Fuller Test Equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.328*	0.0465	-7.065	0.000

Note: level of significance is denoted by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.

(a) The optimal lag length is nominated by using the automatic criteria of Schwarz info.

(b) Cointegration test is applied by incorporating intercept and trend.

Table A9: Results of FM-OLS Including Non-Linearity of FDI for Upper-Middle Income Countries

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FA	0.010***	0.006	1.699	0.091
UB	-0.136*	0.032	-4.294	0.000
FD	0.106*	0.017	6.301	0.000
IQ	0.371*	0.073	5.073	0.000
IND	-0.095**	0.032	-2.986	0.003
GCF	0.570*	0.059	9.672	0.000
PG	0.362	0.326	1.111	0.268
TO	-0.018***	0.011	-1.634	0.104
FDI	0.0001	0.0003	0.422	0.675
FA^2	-0.000006	0.0000	-1.063	0.290
FDI^2	0.00000001	0.0000	0.689	0.492
R-squared	0.949	Mean dependent var		66.189
Adjusted R-squared	0.943	S.D. dependent var		5.470
S.E. of regression	1.303	Sum squared resid		284.822
Long-run variance	4.597			

Note: level of significance is represented by (*) (**) ***, 1 percent, 5 percent and 10 percent respectively and without any * shows that the statistics is insignificant.