

Determinants of Sustainable Development: A Panel Analysis of SAARC Countries



BY

Imran khan

MPhil Student

Supervisor

Dr. Tahir Mahmood

Assistant Professor

School of Economics

Quaid-i-Azam University, Islamabad

Submitted in partial fulfillment of the requirements for the Master of Philosophy
Degree in Economics at the School of Economics, Faculty of Social Sciences,
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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Dedication

This thesis is dedicated to my beloved Parents who always blessed me with the best in every walk of life.

Certificate

This is to certify that the thesis titled “*Determinants of Sustainable Development: A Panel Analysis of SAARC Countries*” submitted by Imran Khan is accepted in its present form by the School of Economics, Quaid-i-Azam University, Islamabad, as satisfying all the necessary requirements for partial fulfillment of the degree of Master of Philosophy in Economics.

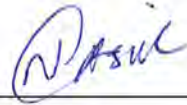
Supervisor:



Dr. Tahir Mahmood

Assistant professor
School of Economics
Quaid-i-Azam University

External Examiner:



Dr. Muhammad Nasir

Senior Research Economist
Pakistan Institute of Development Economics
QAU Campus, Islamabad

Head of the department:



Dr. Muhammad Idrees

Associate professor & Director
School of Economics
Quaid-i-Azam University



Declaration Form

I Imran khan, son of Khayal Muhammad, Registration no: 02091613040, candidate of MPhil Economics at School of Economics, Quaid-i-Azam university Islamabad, do hereby declare that the thesis “*Determinants of Sustainable Development: A Panel Analysis of SAARC Countries*” submitted for the partial fulfillment of Master of Philosophy (MPhil) degree in Economics, is my own work. All the error and omission are lonely goes to me and I also somberly pronounce that it will not be submitted for attaining any other degree in the future from any institution.

Imran khan

Acknowledgement

In the Name of Allah, the Most Merciful, the Most Compassionate all praise is to Allah, the Lord of the worlds; and prayers and peace be upon Mohammad His servant and messenger.

First and foremost, I must acknowledge my limitless thanks to Allah, the Ever-Magnificent; the Ever-Thankful, for His help and bless. I am totally sure that this work would have never become truth, without his guidance.

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Imran khan

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List of Abbreviations

Abbreviation	Name
MDGs	Millennium Development Goals
SDGs	Sustainable Development Goals
SAARC	South Asian Association for Regional Cooperation
BGD	Bangladesh
IND	India
PAK	Pakistan
LKA	Sri Lanka
ARDL	Auto Regressive Distributive Lag
ANS	Adjusted Net Saving
TOT	Terms of Trade
FDI	Foreign Direct Investment
PCGDP	Per Capita GDP
NRP	Natural Resource Productivity
CO2	Carbon Dioxide Emissions
HFCE	Household Final Consumption Expenditure
UE	Unemployment Rate
LLC	Levin-Lin-Chu
ADF	Augmented-Dickey Fuller
WDI	World Development Indicators
WCED	World Commission on Environment and Development

Abstract

The prime objective of the study is to evaluate the macro level determinants of sustainable development in four countries of the SAARC region which are becoming emerging economies. The rising role of these economies contributes in world economies significantly and rests of the world is projecting them as big economies in future. However, global threats to environment and human development-based challenges foster them to achieve sustainable development if they are to compete with existing developed economies. Therefore, it is imperative to trace out such factors which influence sustainable development significantly. For empirical purpose, the study employs the data of four emerging economies such as India, Pakistan, Bangladesh, and Srilanka for the period of sixteen years (i.e. 2000-2016). And adjusted net saving has been taken for sustainable development as its proxy. The results obtained from ARDL for panel data are indicating that Terms of trade, employment rate, per Capita GDP, CO2 emission, and household consumption are found significantly influencing the sustainable development in emerging economies of SAARC region.

Key Words: Sustainable Development, Adjusted Net Saving, SAARC

Chapter 1: INTRODUCTION

1.1 Background of the Study

World Commission on Environment and Development (WCED, 1987) defines sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. The concept of sustainable development seems complex because development encompasses various scales such as geographical and time scales (Munasinghe, 2001). Primarily, an important objective of sustainable development is to achieve economic stabilization, and social and environment sustainability by ensuring prosperity for present and future generations. It is a long-term agenda to sustain the economy and environment through securing and avoiding over-usage of natural resources of the country. Likewise, the fruits of macro level development ought to disaggregate at community level because everybody has right to have safe and clean environment. And the obtained development should be environment friendly despite reducing poverty level, providing good standards of living, and achieving other development-based targets [Ansari et.al (2011); Hatthachan (2014); Panula et.al (2014)].

The reflection of sustainable development comes out from Sustainable Development Goals (SDGs) which have replaced Millennium Development Goals (MDGs) in 2015¹. At the beginning of 2030 agenda of SDGs, global sustainable development starts facing many new challenges. According to UNDP report (2016)², virtually 800 million peoples

¹ UNDP report 2015

<http://www.un.org/millenniumgoals/news.shtml>

² Ministry of Foreign Affairs (2016).

<https://sustainabledevelopment.un.org/?menu=1300>

are still living below the poverty line globally. Apart from this, climate change and environmental degradation are also very serious; by 2050 one-third of the global population are aging, terrorism & regional conflicts are still going on. In such context, the first thing to do is to complete the unfinished MDGs and take the initiative to respond to new challenges of human development. Secondly to successfully deal with the shortcomings of the MDGs, which are the reasons why we need the 2030 agenda for sustainable development. The SDGs are a major improvement to MDGs, which are more comprehensive in objectives, broader and more detailed in overall goals and specific targets [Jeffrey (2012); Kumar *et al* (2016); Fukuda-Parr (2016)].

There were some flaws in the MDGs which invite SDGs to replace it. The study conducted by Fukuda-Parr (2010) analyzes that goal related to reducing inequality within and among countries is missing which are important to determine development of any country. Accordingly, several authors keep focus on political and human rights (Cecchini and Notti (2011)). On the other hand, Ziai (2011) also investigated that the targets of MGDs were presented as a technical problem rather than political. Furthermore, studies of Saith (2006) & Fukuda-Parr (2010) also analyze that MDGs framework leaves issues related to political and human rights unanswered and does not put enough stress on it.

Arguably a handful literature reveals that quality and sustainability of some prime goals are not addressed evidently [Mekonen (2010); Tarabini (2010); Barrett (2011); Lay (2012)]. Another important goal that plays crucial role in MDGs framework is related to Health, wherein only three aspects of Health are targeted: 1) Specific infectious diseases, 2) child mortality, and 3) maternal mortality. These goals are skeptically addressed but

some other health related issues are missed out [James (2006); Miranda & Patel (2007); Magrath (2009)].

The literature, correspondingly, highlights that MDGs agenda pay less heeds over environment related issues [McMichael & Butler (2004); Poku & Whitman (2011)] while some researchers believe that 15 years of time to achieve MDGs and address development has appeared too short (Keyzer and Wesenbeeck, 2006). In addition, the issues of lacking commitment and leadership, and proper monitoring management on pursuance of policies overwhelmingly ignored [Fukuda-Parr (2006); Gonzalez *et al* (2009); Oya (2011)].

Upon reflection, the researchers start paying heed over sustainable development for developing countries [i.e. Hessari and Kazemzadeh (2009); Zen et al. (2012); Farzaneh et al. (2012); Awan (2013); Sun Wei & Fan Jie (2013); Faridah et al. (2015); Kaimuri and Kosimbei (2017)]. Emerging economies like Bangladesh, India, Pakistan and Srilanka are not being classified as a fragile state. As it shows fragile characteristics such as “high level of poverty, low foreign direct investment, high inflation, trade deficit as well as high youth unemployment”. Which if not effectively addressed, might pose threats to the country’s overall growth and stability. Fragility can be attributed to its unsuccessful implementation of development plans, wrong policy implementation.

In addition, such issues may not allow emerging economies to compete with the world economy Akram et.al (2011). Drawing from the background of the study, developing countries can be seen to lag in its achievement of sustainable development. More so, past studies have seen that they fail again and again in the delivery of its promise of equitable

wealth and improvement of livelihoods. In addition, all the problems mentioned above that poses threats to the overall economic growth. Vision 2030 is already started, and development plans have come and gone, but there's still a delinked perspective of what they want to achieve.

On the other hand, what is happening economic growth witnessed in reports is not even growing over the period while the population is increasing. This causes social unrest in the population from the lack of socioeconomic opportunities that may improve their livelihoods Zhu (2017). While, Environmental degradation features highly, especially in urban areas where pollution and conversion of agricultural land and forest areas for human settlements putting a strain on the ecology [Stoller (2010); Shaista (2010)]. In addition, it is desirable to be recognized clearly about key indicators that influence sustainable development.

A wide discussion has been taken place in the previous studies. Different indicators have been used by authors to measure sustainable development. Those indicators may be varying for countries because of the level of economy, region may change the usage of indicators or researchers used different indicators according to their own interest etc. Indicators used in the literature are FDI, domestic saving, terms of trade unemployment level, physical capital. Exchange rate, inflation, human capital etc by [khan and Amjad (2010); Fosu (1996); Mansur and Beatrice (2010); Kiseok and Jong (2010); Tsai (1994); Kowalski (2000)]. These are some of the indicators used in the literature to measure sustainable development. Instead of these the indicators we used "FDI, Terms of trade, GDP per Capita, CO2 emission, resource productivity, unemployment rate and household

consumption” in our study. These variables have always been an important contributor to development of an economy and are used to monitor and estimate dimensions of the development. Some of these indicators are also used in the following studies [Fatima et.al (2007); Akram et.al (2011); Farzana et.al (2012); Kaimuri and Kosimbei (2017)].

1.2 Objective of the study

The prime objective of this study is to evaluate the macro level determinants that might have an impact on sustainable development proxied by adjusted net saving rate (ANS).

1.3 Significance of the Study

Evaluating significant predictors of sustainable development for the SAARC countries will aid in informing policymakers on effective policies, given such predictors, which can be implemented to chase a sustainable development pathway. To achieve sustainability and enjoy prosperity Economic, social and environmental pressure need to be constantly reviewed. The 2030 agenda of sustainable development has now become an important concept, especially for developing countries like Pakistan and rest of developing countries against development plan. Therefore, this begs for an accurate identification of determinants of sustainable development that will inform policymakers and institutions. This study will empirically evaluate the macro level determinants that might have an impact on sustainable development proxied by adjusted net saving rate (ANS).

1.4 Organization of the Study

To determine the determinants of sustainable development in SAARC countries the thesis is divided into six chapters. After the description of chapter 1, chapter two offers review of different studies regarding positive, negative and inconclusive impacts of the variables.

Chapter 2: REVIEW OF LITERATURE

2.1 Literature Review

Determining sustainability is a key problem as well as a powerful force for the discussion on sustainable development. Developing tools that consistently measure sustainability is a requirement for recognizing non-sustainable processes notifying design-makers of products' quality and monitoring influences on the social environment.

In September 2000, the leaders of 189 countries gathered at the head quarter of United Nation and adopted historic Millennium Declaration. The Declaration outlines key development challenges and define a series of targets. There are eight broad goals (so-called Millennium Development Goals, or MDGs hereafter) that capture the multidimensional aspect of development and hence integrate themes such as “Eradicate extreme poverty and hunger; Achieve universal primary education; Promote gender equality and empower women; Reduce child mortality; Improve maternal health; Combat HIV/AIDS, malaria and other diseases; Ensure environmental stability and Develop a global partnership for development” [Melamed & Sumner (2011); Sen (1993); Chibba (2011); Jacob (2017); Fukuda-Parr et.al (2013); Gaffey et.al (2015); Shaw (2005); Carant (2017); Garcia et.al (2018); Castello et.al (2010)].

We conducted a multidisciplinary literature review that identifies a variety of reasons about successes and shortfalls in progress towards the MDGs all over the world.

The final MDG report issued by United Nations³ found that 15 years of effort has produced most successful anti-poverty moment in the history. Because poverty level has been decreased from 1.9B-836M worldwide. Primary school enrolment has also shown an impressive improvement i.e. from 83%-91%. Talk about gender equality almost two-third of developing countries have achieved gender parity in primary education. Specifically, in Southern Asia primary school enrolment of girls was 74 for every 100 boys in 1990, that is now increased to 103 girls.

Furthermore, child mortality rate under five and maternal mortality rate has also reduced by half (i.e. 12.7M-6M and by 45% respectively). Apart from these achievements new HIV infections has also reduced by 40% approximately i.e. from an estimated 3.5M-2.1M. Whereas, malaria death has also been averted by 6.2M b/w 2000-2015 in Sub-Saharan Africa. Finally, 91% of the global population is now using an improved drinking water sources, which is increased up from 76% in 1990.

However, several authors criticize the failure of MDGs because of how the goals were designed (more specifically list of targets, indicators and availability of data) are inherently implausible. For example, to eradicate poverty African country would require on average per capita GDP of 7% for next 15 years. If we go 15 years before MDG implementation, 1985-2000, only five countries globally had average per capita GDP growth that high. Secondly, structural causes of discrimination and poverty were not well addressed that restrain development in many countries [Saith (2006); Clemens *et al.* (2007)].

³ UNDP report 2015.

[http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20\(July%2011\).pdf](http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%2011).pdf)

Another controversy has arisen that is the focus of MDGs on quantity rather than quality that is misleading, and perhaps led to negative consequences. According to African Child Policy Forum (ACPF) many Sub Saharan African (SSA) countries will reach, the primary school enrollment and in 2005 it was 66% overall across SSA. However, it may be possible that it was only the quantity not the quality of education, and poor quality of education may affect negatively. Furthermore, in SSA countries the ratio of students to teacher 43:1, it is much higher than the world as a whole which is 25:1. This is because, it is relatively easier to increase school enrolment rather than raise the quality of schooling. And myriad SSA countries are lacking basic infrastructure that is compulsory to deliver quality education [ACPF (2008); Easterly (2009); Mekonen (2010)].

On the other hand, regarding MDG 2 “Achieve universal primary education” there is limited focus on primary education while ignore the importance of secondary education. Education is an important tool used to increases human capital, which is crucial for economic development and reduce poverty in the country. Therefore, it is worth nothing that MDG community emphasis only on primary education and do not focus on secondary education. In simple focusing on short-term targets such as primary education enrolment may neglect the medium and long term secondary education. In addition, MDG 2 specifically fails to ensure availability of teachers, school infrastructure and maintenance [Mekonen, (2010); Tarabini (2010); Lewin (2005); Barrett (2011); Lay, (2012)]. Correspondingly, study conducted by [Johnston (2011); Poku & Whitman, (2011)] concluded that accurate data on school completion are difficult to find. Because attendance and drop outs of the students are often ignored as enrollment data are usually obtained at the beginning of the year. Somehow, if data are available it is not necessarily

comparable across countries because of different use of definition and compilation of methodologies.

Other than MDG 2, Health plays an important role within the framework of MDGs as there are three out of eight goals directly related to Health (MDG 4-6). Study conducted by James (2006) believes that MDGs focusing on only three aspects of health “maternal mortality, child mortality and other specific infectious diseases” is too limited therefore, goal of “freedom from illness” is missing. While some more serious health issues are found to be under recognized like non-communicable diseases⁴, mental health, problems faced by peoples living with disabilities [Magrath (2009); Miranda & Patel (2007); Wolbring (2011)]. Whereas, some authors believe that there is need to emphasize more on “trained health care providers” and “effective health systems” in the list of MDGs [Haines & Cassels (2004); Keyzer & Van Wesenbeeck (2006)].

Authors also criticize the lack of clear guidance on policy changes or how the goals ought to be achieved [Fukuda-Parr (2006); Gonzalez et al. (2009); Oya (2011)]. Whereas, study conducted by (McMichael & Butler, 2004) concluded that there is very “little emphasis on environmental issues” specifically in climate change. While some researchers believe that 15 years of time to achieve MDGs and address development has appeared too short (Keyzer and Wesenbeeck, 2006). Accordingly, several authors keep focus on political and human rights (Cecchini and Notti (2011). On the other hand, Ziai (2011) also investigated that the targets of MGDs were presented as a technical problem rather than

⁴ It is a noninfectious health condition that cannot be spread from person to person. Better known as a chronic disease such as: unhealthy diets, lack of physical activity, smoking and secondhand smoke, excessive use of alcohol.

political. Furthermore, studies of [Saith (2006); Fukuda-Parr 2010)] also analyze that MDGs framework leaves issues related to political and human rights unanswered and does not put enough stress on it. Furthermore, several authors also criticize MDGs as too many dimensions are missing such as gender-based violence, gender equality and quality of education [Mohindra & Nikiema (2010); Vandemoortele (2011); Fukuda-Parr 2010)].

Moreover, achievement of safe drinking water and basic sanitation target remains on course. To reach the target, by current population forecasts more than 785M people around the world will need to have access of clean drinking water sources by 2015. According to this estimates by that time 86% of the total population in developing countries will have gained access to better their sources of water. Although it is very difficult to summarize such complex target in single measurable indicator. However, indicators used to measure such concepts should be considered when determining if goals have been met or not [James (2006); JMP (2008); Waage et al. 2010); Lawn (2010); Dar & khan (2011)].

Upon reflection, the researchers start paying heed over sustainable development for developing countries [i.e. Hessari and Kazemzadeh (2009); Zen et al. (2012); Farzaneh et al. (2012); Awan (2013); Sun Wei & Fan Jie (2013); Faridah et al. (2015); Kaimuri and Kosimbei (2017)]. At the beginning of 2030 agenda of SDGs, global sustainable development starts facing many new challenges. According to UNDP report (2016)⁵, virtually 800 million peoples are still living below the poverty line globally. Apart from this, climate change and environmental degradation are also very serious; by 2050 one-

⁵ Ministry of Foreign Affairs (2016).
<https://sustainabledevelopment.un.org/?menu=1300>



third of the global population are aging, terrorism & regional conflicts are still going on. Furthermore, about 16,000 children die each day before celebrating their fifth birthday. In such context, the first thing to do is to complete the unfinished MDGs and take the initiative to respond to new challenges of human development. Secondly to successfully deal with the shortcomings of the MDGs, which are the reasons why we need the 2030 agenda for sustainable development. [Jeffrey (2012); Kumar *et al* (2016); Fukuda-Parr (2016)].

The study conducted by Nadir *et al.* (2007) analyzes indicators related to Environmental and sustainable development in Lebanon. And concluded with the set of four core categories. The accumulated records form an important database at the public level that will contribute to the population of the national indicator system managed by the LEDO⁶ as well as help future related development activities. Whereas, study conducted by Zen *et al.* (2012) carried out a study in Brazil to examine an indicator related to Sustainability, Energy and Development. They concluded 26 indicators of five different dimensions i.e. environmental, economic, social, territorial and political that may foster development of sustainable energy in cities of Brazil.

Similarly, study conducted by [Fatima *et.al* (2007); Shaista (2010); Awan (2013)] concluded that an increase in industrial and agricultural activities affects the environment inversely. Therefore, to accomplish sustainable development it is necessary that by the passage of time, environmental degradation should be reduced over the time or at least remain constant. Secondly prudent use of environmental resources is necessary.

⁶ Lebanese Environment and Development Observatory.

Whereas, study conducted by Jalil and Mahmud (2009) concluded the existence of an EKC association between Co₂ emissions and income. And energy consumption is another substantial determinant of Co₂ emissions. Hessari and Kazemzadeh (2009) stated that Sustainable development is a crucial aspect for economic growth and it can be accomplished in two distinct ways, first we must preserve and shelter forest and other supplementary parts of the environment and secondly produce more agricultural and industrial goods and careful utilization of natural resources. On the other hand, study conducted by Stoller (2010) suggested that the economic development and geographic location have a highly significant impact on environmental sustainability in 72 developing countries of Africa and Asia.

Another paper presented by Hess (2010) investigated the determinants of the ANS for 52 countries. The results suggested that HDI, financial measure, share of population, natural resources and exports have a significant impact on ANS. But the economic growth appeared insignificant for the ANS. Similarly, paper presented by Akram *et.al* (2011) gave an empirical examination to analyze those factors that determine economic growth in SAARC countries. The study concluded that CPI and FDI have a negative, while domestic investment and total debt have a positive effect on the growth of the economy.

To examine the associations between trade, investment and sustainable development Farzaneh *et al.* (2012) concluded that sustainable development is an inclusive development that contains all three dimensions i.e. economic, social and environmental. Where Economic Indicators were the dominant aspects of Sustainable Development countries of Pacific, East and West Asian. Similarly, to analyze the relationship between gender equality and sustainable development Gérard (2012) used cross sectional data for

11 countries in Central Africa. His study concluded positive role of gender equality in sustainable development. He also concluded that female population can reduce inequality, poverty & promote economic, social and environmental well-being.

Correspondingly, study conducted by Kaivo *et.al* (2013) tried to examine the relationship between the different measurements of sustainability for 151 countries. They concluded a negative correlation between human and economic development with environmental development. Apart from these studies Sun Wei & Fan Jie (2013) did study to investigate essential reasons for the problems of sustainable development in China. And they concluded that the conflict between the mining cities and the mining enterprises has been incorrectly dealt with for a long time is the primary reason. Moreover, due to the domestic and international competition the development gap between mining and non-mining cities is also becoming more than ever before. Several studies have tried to explore the determinants of Sustainable development in different countries.

A study presented by [Faridah *et al.* (2015); Kaimuri & Kosimbei (2017)] conducted presence of a short and the long run association between the variables with ANS used as a proxy variable to measure sustainable development. Similarly, related to their work Mokhtar & Deng (2015) did a study on a PEST⁷ analysis to determine the key factors that influence sustainable development in Taiwan. They found 9 factors in political, 8 factors in economic, 10 in social and 5 key factors in a technological environment that really influence sustainable development in Taiwan.

⁷ Political, economic, social, technological.

The literature, correspondingly, highlights the determinants of environmental degradation. Study conducted by [Samin (2015); Husain (2016)] concluded that agriculture, manufacturing, service, value added, and gross fixed capital accumulation shows association with Co2 emission only in the long run. Furthermore, is also concluded from the study that industrialization and greenhouse gas are mainly contributing to environmental degradation.

2.2 Analysis of the Reviewed Literature

We have included more than 40 literatures in my research in our study in which it is relevant to the some of the them like, find out various determinants of Sustainable Development in Malaysia and Kenya (see, Faridah et al. 2015; Kaimuri & Kosimbei 2017). As we mentioned in 1st chapter that there is little empirical literature exist that determines sustainable development using variables under the three dimensions collectively, therefore to best of our knowledge this study is the first to empirically determine and assess determinants of sustainable development in Pakistan along with 3 other SAARC countries⁸ i.e. Bangladesh, India and Srilanka from 2000-2016 that will provide guidance to policymakers and development organizations.

⁸ Because of unavailability of data we have selected only 4 countries while excluding Afghanistan, Bhutan, Maldives and Nepal.

Chapter 3: FACTORS AFFECTING SUSTAINABLE DEVELOPMENT

3.1 Introduction

The aim of this research is to observe the determinants of Sustainable development for the selected SAARC countries (Pakistan, India, Bangladesh and Srilanka). This chapter consists of the conceptual framework and factors used in this study that effect sustainable development. Also, to fully evaluate the determinants of Sustainable development each dimension of sustainable development, i.e. Economic, Environmental & Social has a mix of disciplines and different variables are constructed from each dimension.

3.2. Conceptual Framework of The Study

Different variables can be used to measure sustainable development, below is the conceptual framework that shows all those variables used in this study that might have an impact on sustainable development. The Adjusted net savings is used as a proxy to measure dependent variable, i.e. Sustainable development while, household consumption per Capita, unemployment rate, resource productivity, co2 emission, terms of trade, foreign direct investment and real GDP per capita growth are used as independent variables in this study.

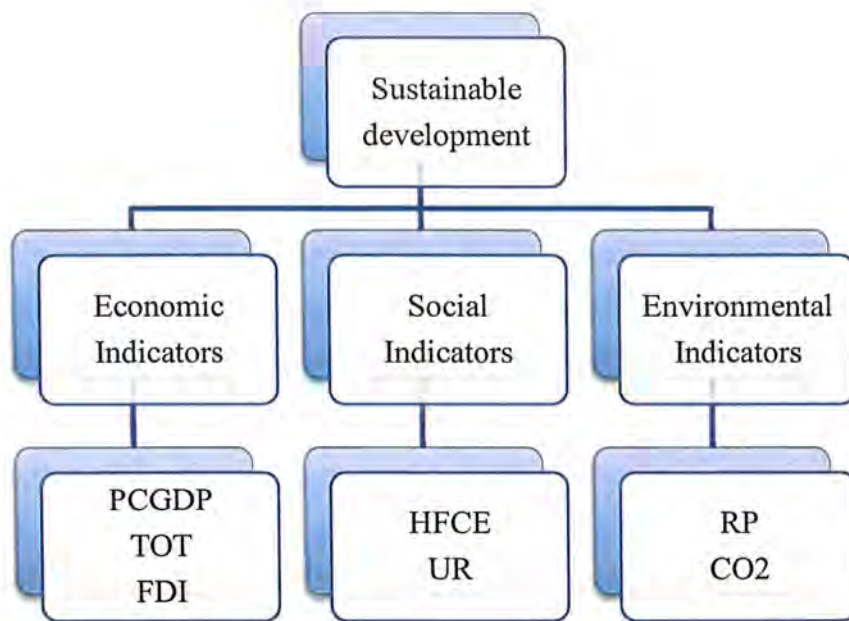


Figure 1: Conceptual Framework (Kaimuri & Kosimbei, 2017)

To discuss above Figure, we need to start the discussion from the idea of sustainable development that was first presented by world commission on Environment and Development in 1987, when researchers and moreover environmentalists started debating on how badly economic growth affects environment of any country. They defined the sustainable development as “Development that meets the needs of the present without compromising the ability of the future generations to meet their own needs” (our common future, 1987).

Further, the definition of Brundtland commission sustainable development was being defined differently, i.e. Economic development that is conducted without depletion of Natural resources or sustainable development is a way for people how to use resources without the resources running out. As everyone wants better education, better health services, better environment to live, better homes and housing whereas some of them

wants good jobs. Whatever the problem in society, they can usually be grouped into three different categories. First healthier environment: that means availability of green open spaces, playing areas, nice gardens, decent housing facilities, lesser noise and pollution. Secondly a healthier economy: that means availability of better jobs, rational and affordable prices, cheaper light and many more. And third is they need Healthier social conditions: that means decent leisure facilities, lots of community groups offering sports and arts, friendly neighbors.

From the above explained scenario, we can say that development is not only seen as its former definition that was linked to economic growth those countries with having a high rate of GDP as the only path to development but as development that meets the “needs of”. This definition brings in the question of exhaustible resources and begets the question, if exhaustible resources are to be conserving, then how can they be exploited today? (Markandya *et al* 2002). However, sustainability doesn't mean that resources may not be exploited; it just means that current generations need to be cautious or careful in the using of natural resources so as not to exhaust for future generations.

While, theoretical interpretations of sustainable development only concentrate on economic and environmental dimensions excluding social dimension like Warford & Pearce (1993) analyzed sustainable development to be observed from an economic perspective as “the development where in the future no generation would be worse off than the present generation”. In this regard Munasinghe (1993, 2000) observed sustainable development from a broader view, i.e. economic, environmental & social dimension. On the other hand, World Bank (2001) development report suggested that focused on quality of growth by considering poverty alleviation over time. So, each

wants good jobs. Whatever the problem in society, they can usually be grouped into three different categories. First healthier environment: that means availability of green open spaces, playing areas, nice gardens, decent housing facilities, lesser noise and pollution. Secondly a healthier economy: that means availability of better jobs, rational and affordable prices, cheaper light and many more. And third is they need Healthier social conditions: that means decent leisure facilities, lots of community groups offering sports and arts, friendly neighbors.

From the above explained scenario, we can say that development is not only seen as its former definition that was linked to economic growth those countries with having a high rate of GDP as the only path to development but as development that meets the “needs of”. This definition brings in the question of exhaustible resources and begets the question, if exhaustible resources are to be conserving, then how can they be exploited today? (Markandya et al 2002). However, sustainability doesn't mean that resources may not be exploited; it just means that current generations need to be cautious or careful in the using of natural resources so as not to exhaust for future generations.

While, theoretical interpretations of sustainable development only concentrate on economic and environmental dimensions excluding social dimension like Warford & Pearce (1993) analyzed sustainable development to be observed from an economic perspective as “the development where in the future no generation would be worse off than the present generation”. In this regard Munasinghe (1993, 2000) observed sustainable development from a broader view, i.e. economic, environmental & social dimension. On the other hand, World Bank (2001) development report suggested that focused on quality of growth by considering poverty alleviation over time. So, each

dimension of sustainable development, i.e. Economic, Environmental & Social has a mix of disciplines and different variables are constructed from each dimension that are shown in the above Figure 1. Further, we are will now explain the theoretical concept of all those variables used in the Figure.

3.2.1. Indicators of Economic Sustainability

This aspect looks at contribution and consumption that the natural resource we have manufacture into production. Pezzey (1992) stated that this can be achieved by maximizing the welfare of all the generations termed as non-declining utility of each representative of the society. In this regard Hartwick also said that if gaining the highest constant per capita consumption is the ultimate objective, then the rents received from the depletion of natural capital should be equal to the investment in man-made capital (Hartwick, 1977) better known as Solow-Hartwick sustainability model.

Pearce & Atkinson (1993) carried out an indicator, i.e. genuine savings (GS) of the Solow-Hartwick sustainability model that indicates that if GS of a country is positive, then it can be said that country is sustainable; however, on the other hand GS also has some flaw like it doesn't capture the impact of trade on sustainability (Martinez-Alier, 1995). And to capture the economic sustainability I take some of the important variables that have some crucial impact on sustainability which are followed.

3.2.1.1. Real GDP per capita

Per capita GDP is a measure of the total economic output of a country that takes the gross domestic product (GDP) and divides it by the number of people in the country also adjusted for inflation. GDP per capita is one of the most important variables among

different determinants that helps any developed or developing country to achieve Economic development. Also, GDP per capita is consistent with the theory of marginal propensity to save (MPS) where savings, expand from the increasing of income attributed by GDP. As a result, an increase in the growth of real GDP per capita results in an increase in the amount of savings that tends to achieve sustainable development.

3.2.1.2. Terms of Trade

Terms of trade is one of the important variable in defining economic policy that usually affects income distribution between countries. When we talk about an increase in terms of trade it implies that a specific amount of exports will exchange for massive amount of imports. Terms of trade can inform about the welfare changes in the country, although if it doesn't directly tell about it, and whenever prices of exports increase in the country while prices of imports remain constant, then a country is said to be better off in terms of welfare since at a certain level of import the country has exchanged less exports and thus the country's real national income also increases. So that maybe one of the reasons that we can use terms of trade as a measure of how much a country has been benefited from the trade.

3.2.1.3. Foreign Direct Investment

According to the International Monetary Fund, FDI refers to an investment made to acquire lasting or long-term interest in enterprises operating outside of the economy. "The investment is direct because the investor, which could be a foreign person, company or group of entities, is seeking to control, manage, or have significant influence over the foreign enterprise. It is a major source of external finance, which means that countries

with limited amounts of capital can receive finance beyond national borders from wealthier countries that could help any country to achieve sustainable development. However, FDI may have a positive and a negative effect with economic development that depends on the environment conditions of a country like Raghavedra & Shakunthala (2014) stated that investment such as FDI accelerate development efforts while, Basnet & Pradhan (2014) concluded that FDI doesn't not play significant role in promoting economic growth in SAARC countries.

3.2.2. Indicators of Environmental Sustainability

Environmental sustainability has always been considered as a strong sustainability model where natural capital is always maintained at some specific level while keeping the safe minimum standards (SMS) rule which was accepted by Wantrup (1952) and postulated by Bishop (1978). SMS rule determines that natural capital levels are only violated when the opportunity cost of not utilizing the resources is fully high. However, there is no description on how opportunity cost is determined and exploited only those resources that are significant for the development of an economy.

Daly (1990) proposed an alternative theorem for this non-declining natural capital, i.e. operational principles (Ops) which is categorized under some rules: 1. Management of resources, where exploitation of the resources should not exceed the regeneration or restoration rate of those resources. 2. Both natural & men-made capital to be maintained at optimal levels. 3. More focus should be given to technology that is not resource intensive.

3.2.2.1. Resource Productivity

Resource productivity is key concepts in measurement of sustainability that defines the ecological and economical willingness. We can also define total resource productivity⁹ as the direct connection between resource use by minimizing consumption of resources as well as reducing the environmental degradation. Malenbaum (1978) stated that resource demand is determined by demand for the final goods produced in any country, therefore income is a significant factor in resource consumption.

3.2.2.2. Carbon dioxide emission

Other than many macroeconomic variables global warming and climate change are now also key issues in measuring sustainable development. Countries must be able to understand and know how to manage Greenhouse gas (GHG) and Carbon dioxide (CO₂) emission risks if they want to ensure long term success in the future. As many countries are now taking major steps to reduce GHG emissions through national policies, i.e. introduction of emissions' trading programs, taxes related carbon and energy and standards of efficiency of the energy and emissions. Following studies also concluded that there is an inverse relationship between CO₂ emission and economic growth that can badly affect the development of a country [Yuan *et.al* (2017) and Alshehrya and Belloumi (2015)].

3.3.3. Indicators of Social Sustainability

World Bank (2006) stated in their report that social sustainability is viewed as communication of economic actors and how they are ordered or arranged to drive

⁹ Total natural resources rents are “the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents”.

economic development given different endowments of human, physical and natural capital. Where Koning (2001) specify that as sustainability implies a focus on the future, a society with satisfactory quality of life and without social exclusion is said to be equal or socially sustainable both in present and future. Related to this study Wacoss (2002) suggests some of the principles that can be used to conduct or can lead to social sustainability, which includes quality of life, democracy, equity and inter-connectedness.

3.3.3.1. Household Consumption per capita

Life cycle theory and permanent income theory states that households who are risk-averse would prefer their consumption based on permanent income rather than on current income due to the high volatility nature of current income [Modigliani (1955); Friedman (1957)]. However, it is not necessary that all households can achieve smooth consumption flow, which leads to consumption inequality that arises due to changes in permanent income that further leads to income inequality. Though, the increase in income inequality is greater than an increase in consumption inequality, thus this change and trend in household consumption per capita gives us a general idea of income inequality in the country that badly effects the economy level of any country. Pardi et al. (2015) and Phim (2014) also show the importance of savings over consumption to achieve sustainable development in their study.

3.3.3.2. Natural unemployment rate

The natural rate of unemployment and the equilibrium unemployment rate determine the labor market medium run equilibrium. While having common assumption the equilibrium unemployment rate is determined by the supply side variables Layard et al. (1991). Other

studies also suggest that productivity that critically builds capital stock doesn't affect the equilibrium unemployment rate, therefore, an inverse association exists between savings, investment and the unemployment rate [Bande & Karanassou (2010); Bande & Karanassou (2010)].

Chapter 4: DATA AND METHODOLOGY

4.1 Introduction

This chapter provides information about data, data source and research methodology used in this research through which empirical investigation conducted. Also, to fully assess the determinants of Sustainable development, a model with dependent and independent variables to be estimated is specified, techniques of estimation and methods of data analysis are all treated in this chapter. More frequently, this chapter focuses on different sections i.e. Section one consists of the introduction which contain the summary of the overall chapter. Section two discusses about data and data source, section third discusses the estimation technique which was used to estimate the model specified in the study. The final section of this chapter focuses on the specification of the model used for the study.

4.2 Data & and Data Source

Secondary data are used in the study. The study used panel data of four selected countries of SAARC for the period 2000 – 2016 obtained from published sources. The major source of data included World Bank's World Development Indicators and Annual Report State bank of Pakistan. All estimations as well as the various econometric tests were carried out using the Eviews 9 econometric software.

4.3 Description of the Variables

All the variables used in the study as a determinant of sustainable development are based on existing literature, economic theory, the availability of the data & whether or not they fit in the model used in this study or not. A compact description of all the variables used in the study is provided below.

HC: HC is household final consumption per capita is used to measure of reduced poverty.

UER: UER is unemployment rate that is used as a measure of labor productivity.

NRP: NRP is natural resource productivity that is measured by total natural resource rents % of GDP used as a measure of resource richness.

CO2: CO2 is carbon dioxide emission that is used to measure global warming and climate change.

RGDP: RGDP is real GDP growth per capita that is used to measure economic growth.

TOT: TOT is term of trade that is used to measure trade.

ANS: To measure sustainable development, Adjusted Net Savings Rate (ANS) is used as a proxy. ANS is found by dividing adjusted net savings (ANS) with GNI. ANS is used in this study because it describes the true economic sustainability of a country. If net saving of any country is positive, economic theory indicates that the wellbeing of that country is also increasing, since “it allows wealth to grow over time, thus it makes sure that future generations will enjoy at least as many opportunities as current generations are enjoying in the present time” (World Bank, 2012). However, low amounts, or negative amounts of ANS may not be clear in the short run, but in the long run, these changes can be seen through a decrease in wealth and general well-being of a country.

ANS is found by equation 1 below:

$$\text{ANS} = \text{Net National Savings} + \text{Education Expenditure} - \text{Energy \& Mineral Depletion} - \text{Net Forest Depletion} - \text{Carbon Dioxide Emissions Damage}$$

Where, Net National Savings is found by deducting Consumption of Fixed Capital from Gross National Saving.

4.4 Adjusted Net Saving as a Proxy to Measure Sustainable Development

The traditional indicator for economic development initiated from Solow Growth Model. It has the assumption of a production function with the property of diminishing returns while, technological development is observed as growing output (Solow, 1956). Related to this theory Romer (1990) established the “Endogenous Growth Theory” which states that technological variation is an important strength that sustain economic growth. Further Solow (1973) also suggests possible ways to sustain development progress by arguing on the traditional concept of gross domestic product with inter-generational equity distribution theory. Relevant to this Hartwick (1977) proposed model with basic sustainable development conditions that was proposed more relevant to determine nominal wealth among cohorts.

World bank (1993) recommends using the index of adjusted net saving to capture the joint determination of the impact of both human and capital, which further extended by Pearce et al. (1993), by introducing the method of calculating adjusted net saving rate to gauge sustainable growth. Blanchet et al. (2009) stated that the adjusted net saving rate is among the most commonly used indicator by the economics scholars. The reason is that it

has a unique property of enhancing the disposable national savings rate measuring by counting investment in human capital development (public expenditures made on education) and removing depletion of natural resources along with environmental degradation. The saving index is a calculation that probably analyses between a true level of output and consumption for a nation. In this regard Barbier et al. (1990) stated that since environmental damages and resource reduction do not appear in standard national accounts.

Therefore, ANS also solves these problems by determining the change in a specified set of asset value excluding capital gains. Barbier et al. (1990) Also mentioned that according to Economic theory, if net saving of a country is positive, then present value of well-being is increasing. While, if net saving is negative it indicates that an economy of a country is on an unmaintainable path. Therefore, to maintain sustainable path an economy should maintain a positive value of the ANS. Further, the method of calculation for ANS is depicted in below Figure.

$$ANS = \frac{GNS - Dh + CSE - \sum Rn, i - CD}{GNI}$$

Where:

ANS = Adjusted Net Saving; *GNS* = Gross National Saving

Dh = Depreciation of produced capital; *CSE* = Current (non-fixed-capital) expenditure on education; *Rn, i* = Rent from depletion of natural capital *i*;

CD = Damages from carbon dioxide emissions; *GNI* = Gross National Income at Market Prices

4.5 Econometric Model

Adjusted net saving is the dependent variable in this study. Therefore, it is postulated that ANS is a function of equation (1) below: -

$$ANS = f(PCGDP, TOT, FDI, NRR, CO2, HFCE, UR) \quad \text{-----} \quad \text{Eq. (1)}$$

In equation (1), adjusted net saving (as a percentage of GNI) is supposed as a function of per capita Gross domestic product (PCGDP is used as a percentage of GDP), terms of trade (TOT is used as an index), foreign direct investment (FDI is used as a percentage of GDP), total natural resource rents (NRR is used as a percentage of gross domestic product), carbon-dioxide emission (CO2 is used as annual growth), Household final consumption expenditure per capita (HFCE is used as percentage of GDP). Unemployment rate (UR is used as a percentage of total labor force). Therefore, equation (1) can be written as the following equation (2) as to formulate sustainable development; which shows the non-lag form of our model. However, Eq. (2) further transformed into lag form i.e. Eq. (3), because of the interpretation of values into elasticity form and to get least coefficient values of variables.

$$ANS = \alpha_0 + \beta_1 PCGDP + \beta_2 TOT + \beta_3 FDI + \beta_4 NRR + \beta_5 Co2 + \beta_6 HFCE + \beta_7 UR + \varepsilon \quad \text{-----} \quad \text{Eq. (2)}$$

$$\ln ANS = \alpha_0 + \beta_1 \ln PCGDP + \beta_2 \ln TOT + \beta_3 \ln FDI + \beta_4 \ln NRR + \beta_5 \ln Co2, \beta_6 \ln HFCE + \beta_7 \ln UR + \varepsilon \quad \text{-----} \quad \text{Eq. (3)}$$

Functional Form Of ARDL

Here, we apply the Auto Regressive Distributive Lag (ARDL) bound test, it is generally used to analyze the long relationship between the variables, irrespective of their order of integration (Pesaran, 2001).

$$\begin{aligned} \Delta \ln \text{ANS} = & \alpha_0 + \sum_{j=1}^n \alpha_{1j} \Delta \ln \text{ANS}_{it-j} + \sum_{j=1}^n \alpha_{2j} \Delta \ln \text{PCGDP}_{it-j} + \sum_{j=1}^n \alpha_{3j} \Delta \ln \text{TOT}_{it-j} \\ & + \sum_{j=1}^n \alpha_{4j} \Delta \ln \text{FDI}_{it-j} + \sum_{j=1}^n \alpha_{5j} \Delta \ln \text{NRR}_{it-j} + \sum_{j=1}^n \alpha_{6j} \Delta \ln \text{CO2}_{it-j} + \sum_{j=1}^n \alpha_{7j} \Delta \ln \text{HFCE} \\ & \text{it-j} + \sum_{j=1}^n \alpha_{8j} \Delta \ln \text{UR}_{it-j} + \varphi_1 \ln \text{ANS}_{it-1} + \varphi_2 \ln \text{PCGDP}_{it-1} + \varphi_3 \ln \text{TOT}_{it-1} + \varphi_4 \ln \text{FDI}_{it-1} + \\ & \varphi_5 \ln \text{NRR}_{it-1} + \varphi_6 \ln \text{CO2}_{it-1} + \varphi_7 \ln \text{HFCE}_{it-1} + \varphi_8 \ln \text{UR}_{it-1} + \varepsilon_{it} \end{aligned} \quad \text{Eq. (4)}$$

The left-hand side is the Adjusted net saving rate. Terminologies with the summation sign ($\alpha_1 - \alpha_8$) represent the short-run dynamics of the model. While the remaining ($\varphi_1 - \varphi_8$) on the right-hand side correspond to the long-run relationship.

The hypothesis of no co-integration in Eq. (4) is the alternative hypothesis. $H_0 = \varphi_1 + \varphi_2 + \varphi_3 + \varphi_4 + \varphi_5 + \varphi_6 + \varphi_7 + \varphi_8 = 0$. If Cointegration occurs, we estimate conditional ARDL long-run model.

$$\begin{aligned} \ln \text{ANSR} = & \alpha_0 + \beta_1 \ln \text{PCGDP}, \quad \beta_2 \ln \text{TOT}, \quad \beta_3 \ln \text{FDI}, \quad \beta_4 \ln \text{NRR}, \\ & \beta_5 \ln \text{Co2}, \quad \beta_6 \ln \text{HFCE}, \quad \beta_7 \ln \text{UR} + \varepsilon \end{aligned}$$

In the next stage, to obtain short-run dynamic parameters we will use following error correction model (ECM) which associated with the long-run estimates, therefore equation (3) in the ARDL version of the ECM can be expressed as an equation (4): The EC version of ARDL model relating to the variables in the equation (3) is as follows:

$$\begin{aligned}
\Delta \ln \text{ANS} = & \alpha_0 + \sum_{j=1}^n \alpha_1 \Delta \ln \text{ANS}_{it-j} + \sum_{j=1}^n \alpha_2 \Delta \ln \text{PCGDP}_{it-j} + \sum_{j=1}^n \alpha_3 \Delta \ln \text{TOT}_{it-j} \\
& + \sum_{j=1}^n \alpha_4 \Delta \ln \text{FDI}_{it-j} + \sum_{j=1}^n \alpha_5 \Delta \ln \text{NRR}_{it-j} + \sum_{j=1}^n \alpha_6 \Delta \ln \text{CO2}_{it-j} + \sum_{j=1}^n \alpha_7 \Delta \ln \text{HFCE}_{it-j} \\
& + \sum_{j=1}^n \alpha_8 \Delta \ln \text{UR}_{it-j} + \lambda \text{EC}_{it-1} + \varepsilon_{it} \quad \text{-----} \quad \text{Eq. (5)}
\end{aligned}$$

Where λ is the speed of adjustment parameter and EC is the residuals that are obtained from the estimated Cointegration model of equation (4).



Chapter 5: RESULTS AND DISCUSSION

5.1 Introduction

To analyze the determinants of sustainable development in SARRC countries different test and methodology is applied. This section consists of unit root test to check the stationarity of the variables used in this study, result based on descriptive statistics and the result of panel ARDL model to check the short and long run relationship.

5.2 Results based on Descriptive and Graphical Analysis

To get close result to reality as an inappropriate form of data lead us to an inappropriate result. Therefore, precise form of data is very important to get results for every empirical research. Descriptive analysis allows the researcher to extract an information from the data. If the data set is organized precisely and scientifically, then the sample of this study can be generalized for the population.

Table 5.1 Descriptive Statistics

	ADNS	UR	NRR	FDI	HFCE	TOT	PCGDP	CO2
Mean	2.87	1.57	0.03	0.07	4.23	4.41	1.34	-0.33
Median	2.94	1.49	0.46	0.11	4.28	4.45	1.54	-0.22
Maximum	3.33	2.10	2.01	1.29	4.41	4.77	2.17	0.69
Minimum	1.63	1.09	-2.26	-2.34	3.94	3.97	-0.49	-1.55
Std. Dev.	0.35	0.26	1.21	0.63	0.12	0.22	0.58	0.54
Observations	68	68	68	68	68	68	68	68

Source: Authors own calculation.

The descriptive statistics in the table show mean value of all variables used in the study. E.g. the table show that average adjusted net saving value of the selected SAARC countries is 2.87 whereas, on average unemployment rate is 1.5 and so on. By looking at the frequency i.e. Maximum and Minimum values in the table we can see the highest value of each variable, like the maximum adjusted net saving of SAARC countries is 3.3 while, the least ever increase in the value of adjusted net saving is 1.63.

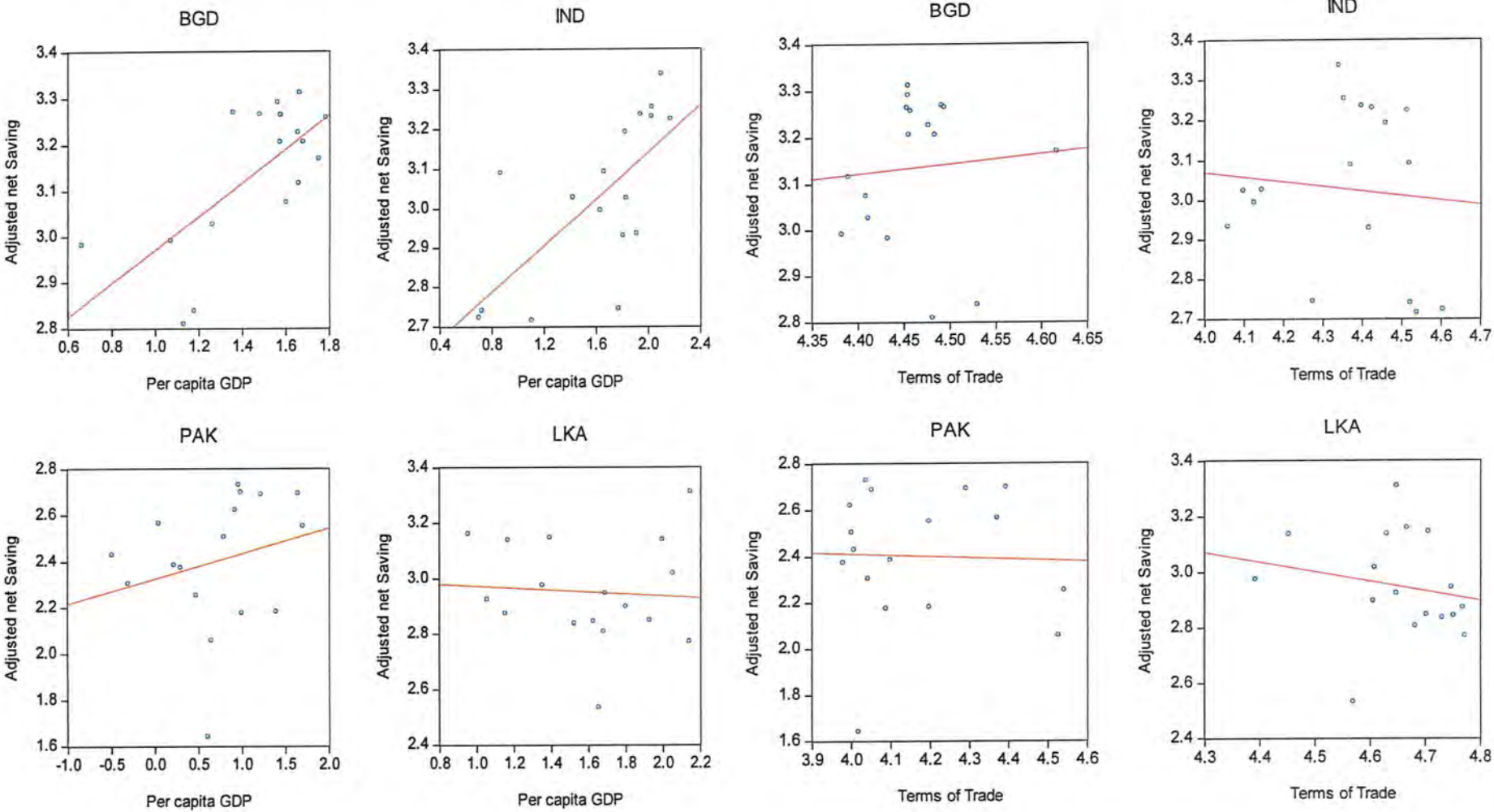
Table 5.2 Average Change in SAARC Countries

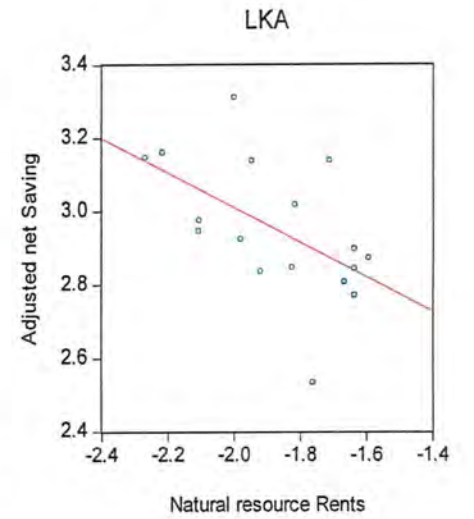
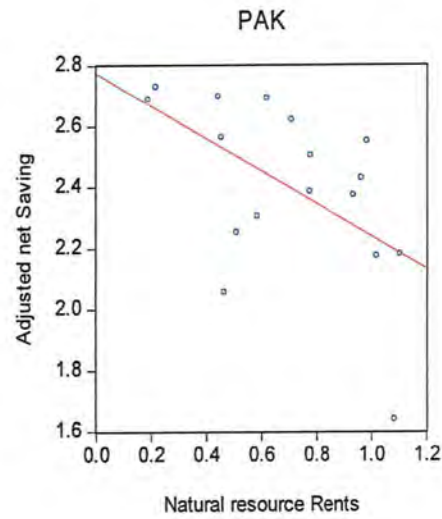
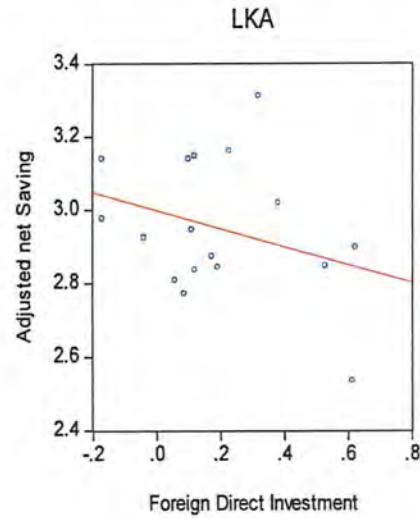
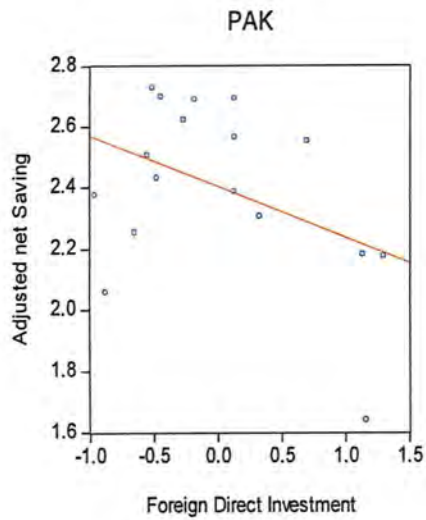
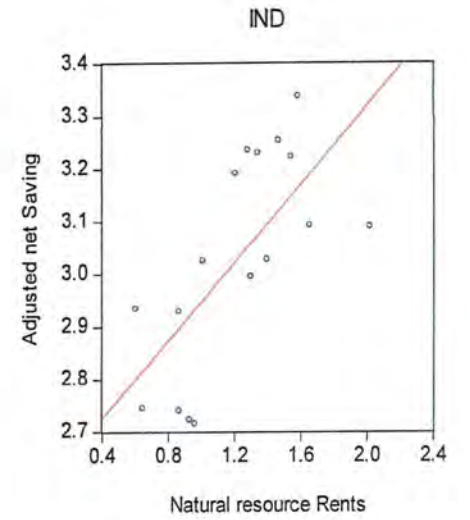
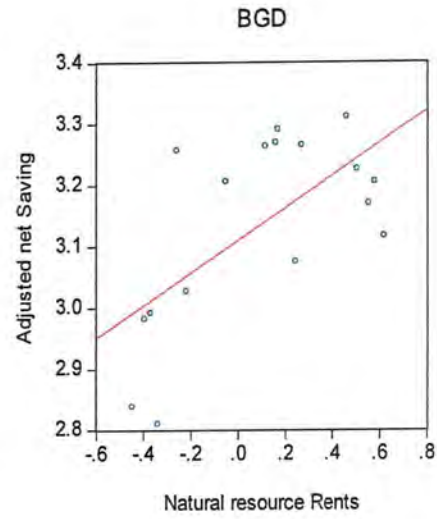
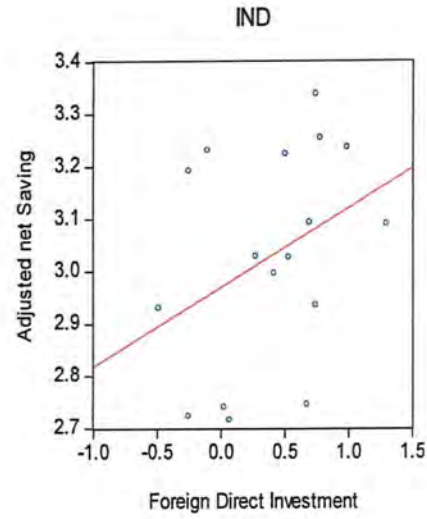
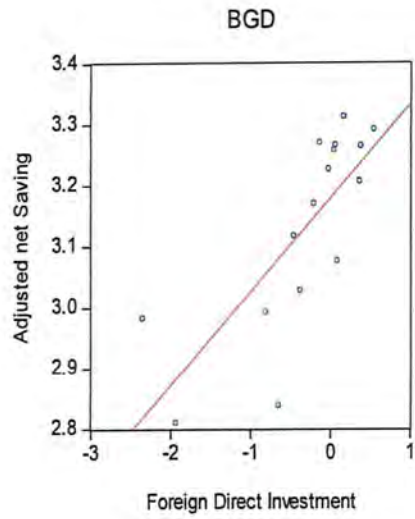
Countries	Years	ADNS	Economic Determinants			Environmental Determinants		Social Determinants	
			TOT	FDI	PCGDP	NRR	CO2	UR	HFCE
BGD	2000-2008	3.02	4.45	-0.69	1.32	0.02	-1.31	1.33	4.31
BGD	2009-2016	3.26	4.46	0.18	1.59	0.17	-0.84	1.48	4.29
IND	2000-2008	3.02	4.44	0.20	1.46	1.17	0.06	1.45	4.04
IND	2009-2016	3.03	4.26	0.60	1.79	1.24	0.48	1.26	4.03
PAK	2000-2008	2.31	4.29	0.28	0.94	0.74	-0.08	1.78	4.38
PAK	2009-2016	2.50	4.02	-0.31	0.45	0.64	-0.15	1.89	4.33
LKA	2000-2008	2.81	4.70	0.27	1.68	-1.75	-0.52	1.93	4.25
LKA	2009-2016	3.10	4.59	0.09	1.51	-2.00	-0.20	1.44	4.21

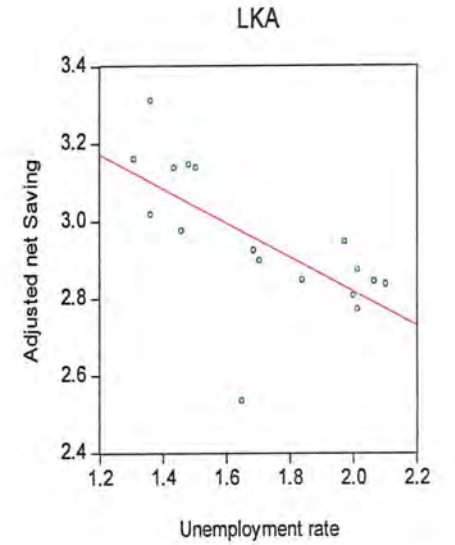
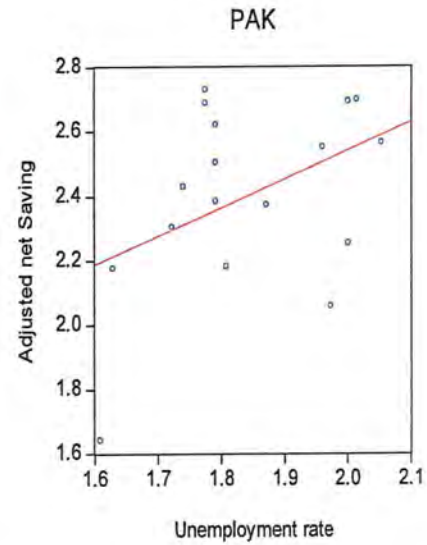
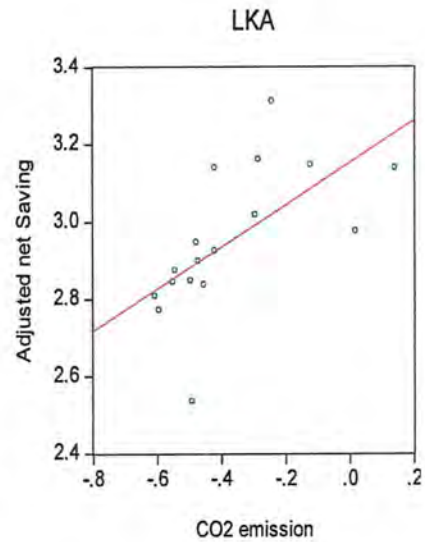
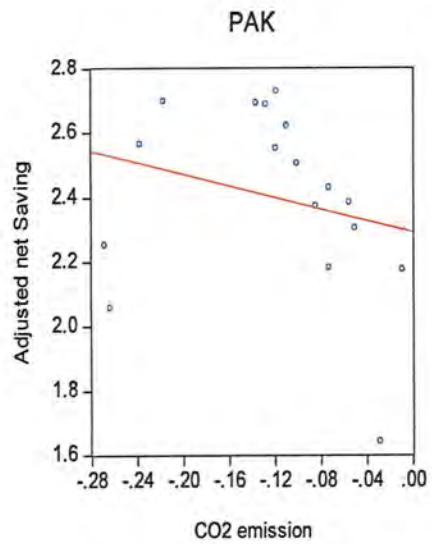
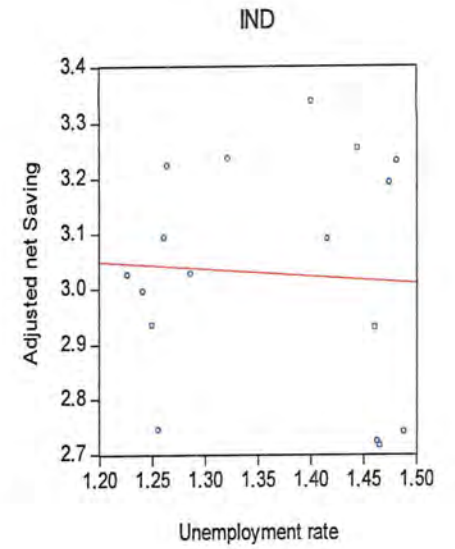
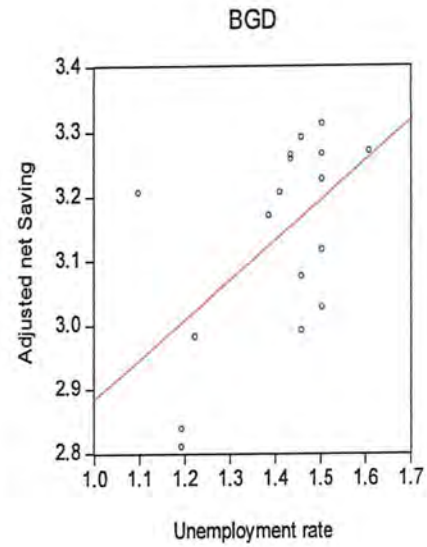
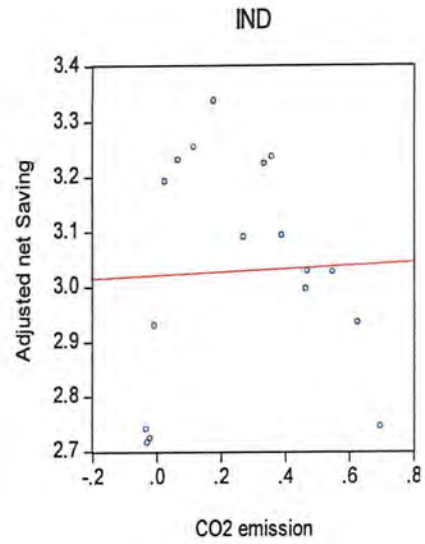
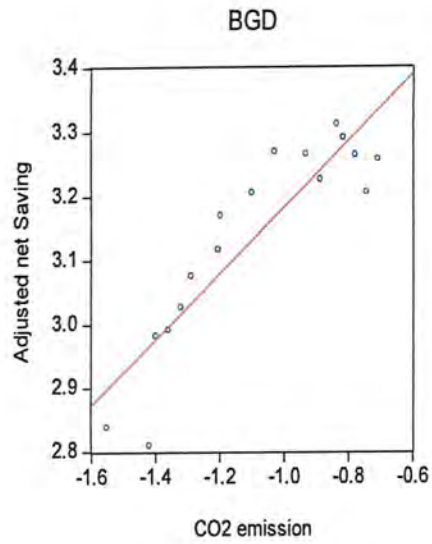
Source: Authors own calculation through MS Excel.

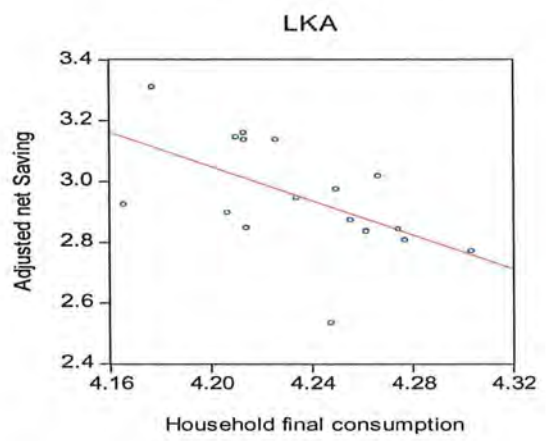
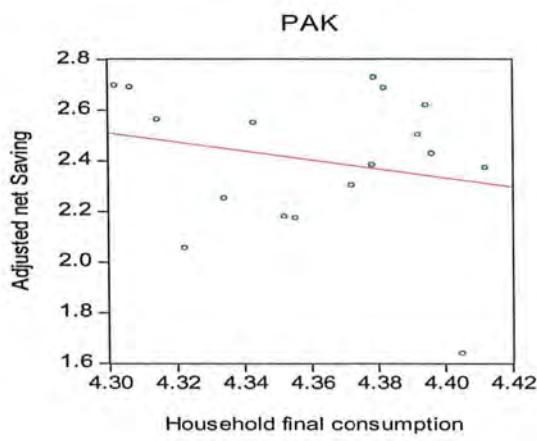
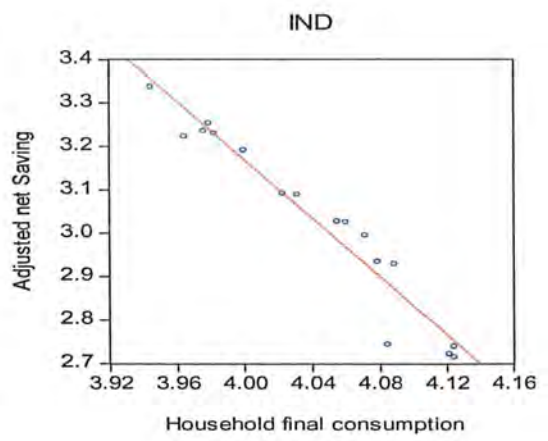
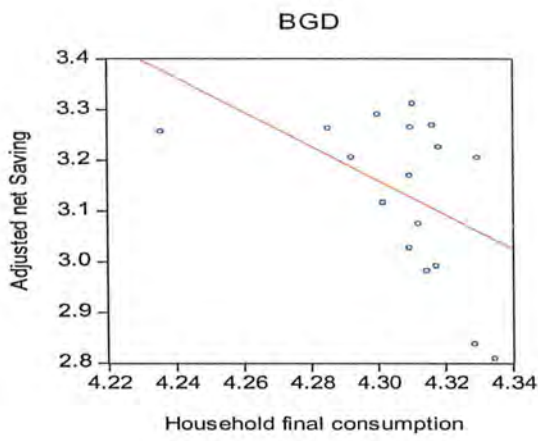
Tables 5.2 report the average change in adjusted net saving and all the independent variables in SAARC countries over the period 2000-2016. Variables exhibit different result for each country in the above table. Whereas, the relationship between adjusted net saving and independent variables are represented in figure 2. By comparing results of table and figure we conclude both positive and negative pattern between variables. Furthermore, we will test the above observations in detail with the help of econometric modeling.

Figure 2: Relationship Between Variables









Source: Authors own calculation through Eviews 9.

5.3 Unit Root Test

Economic data often contain unit root (i.e. non-stationary). Therefore, this may be one of the reasons we are resulting in 'spurious' regression when data are not stationary at levels. Upon reflection, it is necessary for the estimation of Cointegrating models to conduct a unit root test before proceeding. The result of unit root test is given in below Table. Levin, Lin & Chu t^* (LLC), Augmented-Dickey Fuller (ADF) and Fisher Chi-square (PP) test of stationarity were absorbed and it is found that all the variables containing unit root (non-stationary) and becoming stationary at their first difference except GDP and TOT which are stationary at level by accepting more than 10% level of significance.

Table 5.3: Results for Panel unit root tests

Variables	Description of variables	Level			1 st Difference		
		LLC	ADF	PP	LLC	ADF	PP
LnANS	Adjusted net saving	-1.63 (0.05)	9.28 (0.31)	12.62 (0.12)	-7.43 (0.00) ***	42.19 (0.00) ***	43.51 (0.00) ***
LnGDP	GDP per capita	-2.16 (0.01) ***	17.59 (0.02) ***	21.40 (0.00) ***			
LnTOT	Terms of Trade	-3.11 (0.00) ***	13.53 (0.08) ***	15.31 (0.05) ***			
LnFDI	Foreign Direct Investment	-3.00 (0.00)	16.83 (0.03)	8.84 (0.35)	-5.77 (0.00) ***	35.62 (0.00) ***	29.89 (0.00) ***
LnNRR	Natural Resource Rents	-0.99 (0.16)	7.93 (0.43)	5.49 (0.70)	-6.25 (0.00) ***	32.32 (0.00) ***	29.89 (0.00) ***
LnCO2	CO2 Emission	0.12 (0.54)	11.59 (0.17)	3.22 (0.91)	-3.42 (0.00) ***	20.02 (0.01) ***	32.03 (0.00) ***
LnHFCE	Household final consumption expenditure	-0.66 (0.25)	8.70 (0.36)	8.55 (0.28)	-6.55 (0.00) ***	41.57 (0.00) ***	54.54 (0.00) ***
LnUR	Unemployment Rate	-0.51 (0.30)	8.15 (0.41)	9.13 (0.33)	-6.29 (0.00) ***	33.38 (0.00) ***	40.11 (0.00) ***

Source: Authors own calculations. ***, **, * indicates level of significance at 1%, 5% & 10% respectively. Where, LnANS = log of adjusted net saving, LnGDP = log of GDP per capita, LnTOT = log of terms of trade, LnFDI = log of foreign direct investment, LnNRR = log of natural resource productivity, LnCO2 = log of carbon dioxide emission, LnHFCE = log of household final consumption expenditure, LnUR = log of unemployment rate.

5.4 Panel Autoregressive Distributive Lag Model

Whenever, we talk about panel data 1st thing comes in our mind is whether unobserved heterogeneity exist across countries, if it does exist then we must tackle it. Hausman test can be used to test whether we must apply fixed effect model or random effect model to handle unobserved heterogeneity. However, we are not interested to find out that unobserved heterogeneity because, the prime objective of our study is to evaluate the macro level determinants of sustainable development and how the relationship between them. Therefore, we have used Auto Regressive Distributive Lag (ARDL) model in our study.

Auto Regressive Distributive Lag (ARDL) is generally used to analyze the long relationship between the variables, irrespective of their order of integration (Pesaran, 2001). We have used Panel Auto regressive distributive lag (ARDL) model because the data specification doesn't allow us to use any other estimation technique as some of our variables were stationary at level and some were stationary at 1st difference that leads us to use Panel ARDL model.

Table 5.4: Panel Autoregressive Distributive Lag Model

Long and short run results for SAARC countries				
Log of Adjusted net saving LnANS	Model: $ANS = f(TOT, FDI, PCGDP, NRR, CO2, HFCE, UR)$			
Variables		Long run		Short run
Terms of Trade	LnTOT(-1)	-0.16 (0.04) **	Δ LnTOT(-1)	-0.68 (0.28)
Foreign Direct Investment	LnFDI(-1)	-0.39 (0.40)	Δ LnFDI(-1)	-0.01 (0.94)
GDP per capita	LnPGDP(-1)	0.75 (0.09) *	Δ LnPGDP(-1)	0.17 (0.06) **
Natural Resource Rents	LnNRR(-1)	0.07 (0.35)	Δ LnNRR(-1)	0.42 (0.08) *
CO2 emissions	LnCO2(-1)	-0.33 (0.02) ***	Δ LnCO2(-1)	-0.57 (0.06) **
Household final consumption expenditure	LnHFCE(-1)	-1.70 (0.00) ***	Δ LnHFCE(-1)	-5.77 (0.01) ***
Unemployment Rate	LnUER(-1)	-0.27 (0.05) **	Δ LnUER(-1)	-0.27 (0.59)
Constant	C	-5.77 (0.36)	CointEq. (-1)	-0.05 (0.08) *

Note: ARDL (1,1,1,1,1,1,1) selected based on AIC lag length criteria. ***, **, * indicates significance at 1%, 5% & 10% level of significance.

Determinants of Adjusted Net Saving in Long-Run

Since cointegration are found among the variables, therefore, the study proceeds to estimate the long-run relationship between Adjusted net saving (ANS) and its determinants i.e. TOT, FDI, PGDP, NRP, CO₂, HFCE and UER. Therefore, this study used Panel Autoregressive distributed lag (ARDL) model to estimate the short and long-run relationship between variables in SAARC countries for the period of 2000-2016. The results obtained from ARDL for panel data are indicating that terms of trade (LNTOT) have significant impact on adjusted net saving. Upon reflection, by comparing this result with Table 5.2 and Figure 2 we concluded that SAARC countries are facing trade deficit. While, this maybe because of high rate of inflation which makes exports less competitive in the foreign market as compared to imports. On the other hand, country may not provide enough goods to meet the needs due to rapidly increase in population. Results show consistency with study conducted by [Hassan (2000); Chen (2017)] that an increase in terms of trade will lead to a decrease in savings.

In addition, FDI also indicating an insignificant impact towards adjusted net saving, which is consistent with the results of [Turan and Naraliyeva (2016); Basnet and Pradhan (2014); Nurudeen and Zaini (2016)]. They concluded that FDI doesn't not play significant role in promoting economic development in SAARC countries. The main reasons behind its failure can be political instability, law and order situation may not be good enough and technological advancement also is an important factor that cause FDI.

While per capita GDP (LNPGDP) indicating positive impact i.e. one percent increase in values of real GDP per capita (LNPGDP) results in an increase in adjusted net savings rate by 0.75 percentage points, which is consistent with the theory of marginal propensity

to save where savings expand from the increasing of income attributed by GDP. As a result, an increase in the growth of real GDP per capita results in an increase in the amount of savings [Carroll (1994); Najarzadeh *et al* (2014); Brueckne *et al* (2014)]. On the other hand, the natural resource productivity (LNRP) shows positively and insignificantly impact with adjusted net savings (LNANS). Estimated result is consistent with study conducted by (Malenbaum, 1978). He concluded that Kenya is at its nascent stage of resource use.

Further, the values of Carbon dioxide emission (CO₂) show inverse relation towards adjusted net savings rate (LNANS), i.e. one percent increase in the values of Carbon dioxide emission tends to decrease the adjusted net savings rate by 0.33 percent, which is consistent with the study of [Yuan *et al* (2017); Alshehrya and Belloumi (2015)] that show an inverse relationship between CO₂ emission and economic growth. While, household final consumption expenditure (LNHFCE) indicates positive and significant effect on adjusted net savings rates. Therefore, one percent increase in household consumption per capita (LNHC) results to a decrease adjusted net savings rate by 1.70 percent. This result is consistent with studies conducted by [Pardi *et al* (2015); Phim (2014)]. They concluded the importance of savings over consumption to achieve sustainable development. The reason behind this maybe because as consumption by households start increasing they will save less.

Furthermore, unemployment rate (LNUR) indicates negatively relationship with adjusted net savings (LNANS). Thus, a one percent increase in unemployment rate will tends to decrease adjusted net savings by -0.27 percent. The estimated result shows consistency

with the study conducted by (Bande and Karanassou, 2010). They conclude an inverse relationship between savings and unemployment rate.

In addition, we introduce time dummies in Fixed effect model to evaluate the time effect of the determinants. The only objective of evaluating the time effect is to compare the results of long run coefficients of panel ARDL model. We believe that determinants of sustainable development vary over the time because of different factors such as changes in government policies, technological changes and other such factors. The results we get by estimating fixed effect model is approximately similar to panel ARDL model in terms of significance level. However, the results we get by introducing time dummies in fixed effect model is somehow different. For example, while discussing the long run value of natural resource productivity in panel ARDL model, we conclude that emerging countries are at its nascent stage of resource use which is the main reason that it doesn't play a significant role in sustainable development. The results of time effect indicate that natural resource productivity may have a significant and positive impact on sustainable development. For further see (Appendix: A).

Determinants of Adjusted Net Saving in Short-Run

Another important thing need to be discussed in this study is to determine whether short-run relationship exists between ANS rate and independent variables. If coefficient sign of CointEq. (-1) term is negative and significance, it indicates that long run relationship will exist between dependent and independent variables. Furthermore, this indicates that model converges towards equilibrium with an adjustment speed of 5% per annum. Four out of seven variables indicate a short-run impact on ANS (i.e. GDP per Capita, natural

resource productivity, CO2 emission and household consumption expenditure). While rest of the variables do not have significant impact on adjusted net saving in short run.

CHAPTER 6: CONCLUSION

6.1 Summary of Empirical finding

The aim of this study was to investigate economic, Social and environmental determinants of sustainable development in SAARC countries for the for the period of 2000-2016. Furthermore, to what extent those variables can be used to determine sustainable development. A Panel ARDL model of short and long-run between household consumption, unemployment rate, resource productivity, carbon dioxide, real GDP, terms of trade, foreign direct investment and adjusted net saving rate (ANS) which is used as proxy variable to measure sustainable development have been estimated. World bank proposed ANS rate as a proxy variable to measure sustainable development since 1990s which is a main variable of interest used in this study. The result of ADF test indicate that some variables were stationary at level and some were stationary at 1st difference therefore, it doesn't allow us to use any other estimation technique but to use Panel ARDL model.

Results of panel ARDL shows that terms of trade and foreign direct investment have insignificant impact on adjusted net saving both in short and in long run. While GDP has insignificant impact in short run but have positive impact in long run. Result of CO₂ and household consumption expenditure indicates negative and significant impact both in short and in long run. Natural resource productivity shows positive and significant impact in short run but have insignificant impact in the long run. The only variable that have significant impact in both short and in long run is household consumption. And finally

result of unemployment rate indicates negative and significant result in the long run but have insignificant result in the short run. Further, time dummies were introduced in Fixed effect model to evaluate the time effect of the determinants to compare it with panel ARDL model. We believed that determinants of sustainable development vary over the time due to different factors. The results we got by introducing time dummies in fixed effect model was different. Which means that time effect may have a significant impact on sustainable development.

6.2 Limitations of the Study

Manifold proxies are suggested by literature to measure sustainable development. Therefore, the results are sensitive to measuring proxies because every proxy comprises different indicators and dimensions which may represent sustainable development. There is no appropriate measure of sustainability as it is a concept and a theory of development. The study employs adjusted Net Saving (ANS) because of its easy availability and limited scope of the study.

A further study can be conducted by computing the index of sustainable development with the help of recommended indicators such as environmental and socioeconomic indicators. Secondly, optimum level of the sustainable development for each country can be evaluated by extended this study.

6.3 Policy Recommendations

The SAARC countries have recognized the key development challenges they want to achieve in framework of SDGs. However, to achieve sustainable development first they need to deal with some issues.

To achieve the special development goals, developing countries like Pakistan with rest of other SAARC countries can get rid of trade deficit with the help of supply side policies which can improve the productivity and competitiveness of the economy, by making their exports more competitive and attractive. Secondly, this problem can also be fixed by adopting the deflationary fiscal policy. Which involves higher tax and lower government spending. Consumers disposable income will tend to decline by imposing higher tax which lead decrease in consumer spending on imports. Also, the deflationary fiscal policy helps reduce inflation and thereby improve the competitiveness of exports. Furthermore, import quotas may also reduce value of imports.

Policy makers should develop and plans best policies regarding FDI. In case of Pakistan law and order situation need to be tackle before expending FDI. The policy makers should focus mainly on these areas to improve FDI; to assure political stability, to improve law and order situation, and to have good enough and technological advancement.

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APPENDIX: A

	FIXED EFFECT	TIME DUMMIES EFFECT
	(ANS)	(ANS)
TOT	-0.177 (-0.71)	0.306 (1.37)
FDI	-0.009 (-0.18)	-0.097 (-0.02)
PCGDP	0.1737 (2.74)	0.0382 (0.72)
NRR	0.0717 (0.93)	0.286* (2.57)
CO2	-0.338* (2.50)	-0.643** (-2.95)
HFCE	-2.707*** (-4.54)	-2.502*** (-4.03)
UR	-0.270 (-2.06)*	-0.0282 (-0.17)