THE IMPACT OF FINANCIAL DEVELOPMENT ON CO_2 EMISSION: EVIDENCE FROM SELECTED SOUTH ASIAN COUNTRIES.

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List of Abbreviations

CO_2	**Carbon dioxide emissions**
IPCC	**Intergovernmental panel, on climate change**
EKC	**Environment Kuznets curve**
GHGs	**Green House Gases**
FTA	**Free trade agreements**
FDI	**Foreign direct investment**
ARDL	**Autoregressive-Distributed Lag**
BRIC	**Brazil, Russia, India and China**
ECM	**Error correction model**
VECM	**vector error correction model**
ESI	**Environmental sustainability index**
OECD	**Organization for Economic Co-operation and Development**
FE	**Fixed effect**
RE	**Random effect**
SO2	**Sulfur dioxide**
WDI	**World development indictors**
UNEP	**United Nations Environment Programed**
GDP	**Gross Domestic Product**
TR	**Trade openness**
R&D	**Research and development**
GLS	**Generalized least squares**
D c t p s	**Domestic credit to private sector**

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ABSTRACT

This thesis intends to investigate the link between financial development and CO_2 emission for selected South Asian countries. Furthermore, the study also investigates the validity of environmental Kuznets curve (EKC) in case of carbon dioxide emission. This study has used the Panel Fixed Effect Least Square as well as Random Effect technique over the Period of 1974 to 2013. The study results show that financial development has positive impact on CO_2 emission in selected South Asian countries. Result also shows that that trade openness has negative impact on co2 emission while energy use and GDP per capita have positive impact on CO_2 emission in selected countries. As far, EKC hypothesis is concerned; the result confirms the existence of (EKC) hypothesis in these selected South Asian countries. Interestingly, FDI has insignificant impact, so there is no role of FDI on CO_2 emission in selected south Asian countries.

On the other hand, estimation results based on random effect model show almost the same results that we get with fixed effect model. For example, just like the empirical results based on fixed effect model, random effect model too indicate that financial development has significantly positive impact on co2 emission. In the same manner, energy use and economic growth have positive impact on co2 emission. Finally the results confirm the EKC hypothesis but the coefficient of GDP square is not significant

CHAPTER 1

INTRODUCTION

1.1Background

Financial development refers to the policies, factors, and the institutions that lead to the efficient intermediation and effective financial markets". A strong and effective financial system induces an incentive for risk sharing and better capital allocation opportunities, that leads to efficient investment portfolios with high-returns. Environmental and ambient qualities are being damaged by natural changes and by the anthropogenic activities for more than 200 years. As the world experienced more industrialization, more economic growth and higher population size and growth, environment became declined and injured. Economic growth and industrialization both have been causing air pollution, water pollution, ecosystem degradation and climate change. Larger world population has been causing natural resources depletion, air pollution by higher demand of vehicles, more fossil fuel combustion, more energy consumption and higher demand of industrialized goods and increased water pollution by the same token, so more and more environmental threats and environmental challenges are forecasted. The intensive problems of global warming, climate change, acid rain, health damages, deforestation and desertification are expected to damage human life severely. The influences of global heating on the world economy have been the focus of researchers since the 1990s. World-wide organizations, such as the United Nations, have been trying to decrease the opposing impacts of global warming. The report of IPCC (intergovernmental panel, on climate change, 2007) obviously highpoints that universal warming is chief environmental matter like increasing carbon dioxide emissions. Carbon dioxide emissions rises because of energy consumption, this problem solve to decrease consumption of energy but this procedure will decrease economic growth.

CO_2 emission is the central greenhouse gas which contributes 58.8% of global warming up and climate variation (World Bank, 2007). Development and industrialization over the past periods are the main reasons for the fast increase of CO_2 emission as an outcome of human activates. Greenhouse gases and other environmental pollutants are becoming a main worry for developing nations as these pollutants are the likely outcome because of more energy consumption as to attain their advanced economic development and growth goals.

The discussion on financial development and its nexus with economic growth and its impact on quality of environmental are important due to different reasons. For example, (Farkel and Romer (1999) assert that the foreign direct investment (FDI) and higher degrees of investment is attracted through financial development in a country. This result in raising economic growth and hence affect the dynamics of environmental quality in a country. Financial development may also help customers' credit events, which marks it easier for customers to purchase large voucher things like vehicles, households, iceboxes, washing machines and air conditioners etc. (Frankel and Romer, (1999); Sadorsky, (2010); Dasgupta et al. (2001) and Zhange (2011). On the other hand, (Birdsall and wheeler 1993) and (Frankel and Rose 2002) have argued that the developing countries through financial development, may have access to new environmental friendly technologies that my likely to result in decrease in environmental pollution. Similarly, (Tamazian et al 2009) and Claessens et al (2007) and Feijen (2007) say that impact of financial development may enhance energy productivity and initiatives' performance that may help decrease energy consumption and CO2 emissions.

Economic growth is an international problem in entire world. Several countries inspire external investors for investment to encourage economic growth. But environmental degradation problem too is secreted after this. Global air pollution and climate change problems began by greenhouses gas emissions have turned into main global problem. Co2 emissions are main greenhouse gas responsible for universal warming.

Growth is chief objective of all countries; climate change and global warming also alerts us risks around and thus knowledge of sustainable development have become popular motive in recent days. A number of studies have investigated a phenomena known as *"*Environment Kuznets curve hypothesis' which states that there is an inverted U shaped inverse relationship between economic growth and environmental degradation*"* (Shafik, 1992, ; Dinda and Coondoo, 2006 ;Grossman and Krueger, 1991). In recent years empirical work on Environment Kuznets curve (EKC) theory has been expanded.

1.2 Objective of the Study:

South Asian region is comprised of developing countries and have nearly one-fifth of the total world population (World Bank, 2011). The South Asian region hosts a 1.5billion person which is 20% of total world's population. 4.8% of total land area of world at an average population growth rate of 1.3% per annum (UNEP, 2009).

On global warming threats one of the most vulnerable regions in South Asia. CO_2 sources of South Asia are mainly attributed to increased use of electricity and heat production, as well as to transportation sector. Rapid pace of economic growth in region has enlarged burden on natural resources and environmental quality has been worsened. Industrial pollution is a major source of co2 emission in the region causing a serious health and environmental consequences (UNEP, 2009). Urbanization has been improved in the region significantly causing air pollution in big cities of the selected south Asian countries like (Karachi, Lahore, New Delhi, Dhaka, Kolkata, Chittagong, Khulna, and Colombo etc). Beside other reasons, one of the major factor responsible for increasing investment, production, industrialization and consumer led increase in demand for durable goods is the financial sector development measured as domestic credit as a percentage of GDP. It is apparent form the table below that over time, there has been a rapid increase in private credit to GDP in India and Bangladesh while in case of Pakistan this ratio has been

increase in absolute term but in term of GDP, it has been reduced, while it also have increased in case of Sri Lanka.

Table-1.1 Private credit as a percentage of GDP in South Asian countries				
Year	Bangladesh	India	Pakistan	Sri Lanka
1980	6	20	23	17
1990	17	24	24	20
2000	25	28	22	29
2010	47	50	21	27
2013	48	52	16	30

Source WDI report 2013

Sector wise detail of the private sector credit shows that it has been allocated to manufacturing, electricity, gas & water supply, construction, commerce & trade, transport, storage & communications and other private business, but the sector which has got the major share of private sector credit[1] is the industrial sector.

The main question that this study attempts to address is that theoretically financial development may have pollution increasing effect through increasing production , investment and increasing consumer demand, but it may also have a pollution reducing effect through access to new technology and environmental friendly techniques. Such as more availability of privates sector credit means, affordability of applying new technology. So it is not sure that which effect dominates, hence this study attempts to take up the issue of financial development and environment in major South Asian countries. In this study we will focus on the following objectives:

[1] Domestic credit to private sector refers to financial resources provided to the private sector, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment.(Boutabba, Mohamed Amine, 2014)

1. To analyze the impact of financial development on CO2emission in selected South Asian countries like Pakistan, India, Bangladesh and Sri Lanka by using panel data.
2. To investigate for the existence of Environmental Kuznets Curve (EKC) hypothesis in South Asia.
3. To give some policy recommendations on the basis of the empirical results.

1.3: Significance of the Study

Financial development, Economic growth, population, foreign direct investment, trade Openness and Energy consumption all have a tendency to development together crossways every point in time as all the countries of the world continue to develop in every region of humanity. A lot of work has been done in the past on impact of financial development on CO2 emission in difference countries. So for no study has been conducted which identifies the financial development impact on CO2 emission on South Asian countries. In this study we will select four countries names are Bangladesh, India, Pakistan and sir Lanka. The study also aims to investigate the role of a number of other variables like Economic growth, foreign direct investment, trade Openness and Energy consumption.

1.4: Research Gap

In existing literature it can be decided that financial sector development might certainly affluence for CO2 emission. However, there are only limited number of empirical evidences on the relations between financial sector developments and CO2emission as argued by Claessens and Feijen (2007). Most of the previous studies have mostly used time series data by focusing on individual countries. This study will focus on selected South Asian countries names are Bangladesh, India, Pakistan and sir Lanka by using panel data.

Chapter 2

Literature Review

The impact of financial development on environmental situations has extended increasing consideration in the latest literature. Jalil et al (2010) examined the impact of economics growth, financial development and energy consumption on Co2 emission in China. To investigate the long run connection between variables, they have used the ARDL approach while using the data over the period 1978-2006. The study shows that financial development tends to reduce air pollution while economic growth, trade openness and energy consumption are responsible for increase Co2 emission in China.

Oztuk et al (2011) discloses the casual relationship between financial development, energy growth, trade openness and the emission of carbon for the period 1960-2007 for Turkey. For estimation purpose, the study has used ARDL approach. The results show that the level of Co2 emission increases initially but at the point of stabilization it fades away. The statement also supports the importance of EKC hypothesis in Turkish economy. Moreover, it shows that financial development has no significant effect on per capita carbon emission in the long run.

Shahbaz et al, (2003) conducted a research work showing the impact of financial development, energy growth and consumption on Co2 emission in Malaysia. For estimation purpose, the study has used ARDL approach while covering a period, 1971 to 2011. The study comes up with the findings that Co2 emission tends to decrease with increasing financial development while other independent variables such as energy consumption and economics growth causes Co2 emission to increase.

Another study for India also using ARDL approach, investigated the long run relationship between financial development and Co2 emission during 1971-2008. The empirical result shows

that financial developments have positive impact on per capita Co2 emission in the long run .Boutabba Mohamed Amine, (2014).

Rafindadi et al (2014) studied the impact of financial development, economic growth and trade openness on energy consumption in African countries for the period 1970-2011 by using ARDL model for analyzing the long run relationship. The result shows that financial development Economic growth and trade openness increase the energy consumption.

Shahbaz (2011) investigate the relationship between financial development, economic growth, trade openness and Co2 emission for Pakistan while using time series data from 1971 to 2008. He did use ARDL model to analyze the long run relationship while, error correction model has been used for short run relationship. The result shows that financial instability has positive impact on Co2 emission but economic growth, increasing population and trade openness have negative impact on Co2 emission.

Tamazian et al (2008) examined the impact of higher economics growth and financial development on Co2 emission for Brazil, Russia, India and China (BRIC) by using Panel data from the year 1992 to 2004 by using random effect method. The findings of the study show that economic growth and financial development have negative impact on environment while trade openness reduced Co2 emission in BRIC countries.

Shahbaz et al (2012) examines the relationship among economic growth, energy consumption, trade openness, financial development and Co2 emission for Indonesia. The study covers a period 1975-2011 while using ARDL approach for estimation purpose. The result shows that energy consumption and economic growth increase Co2 emission while financial development and trade openness tends to result in reduction of Co2 emission.

Yuziang et al (2010) investigated the influence of financial development act on environment for China. The study uses panel data from the year 1996 to 2006 for different provinces of China. It shows a positive association among financial development, industrial

waste water and air pollution. Furthermore, the study shows that FDI and economic growth have positive impact on performance of environment in China.

Feyyaz zaren (2014) investigated the relationship between energy consumption and financial development of 7 newly industrialized countries, by utilizing annual data from period 1971-2010, he used Hacker-Hatemi Granger Causality Test, and the result shows that Energy consumption to financial development has positive as well as negative impact on México and Malaysia. The impact is positive in India, *Turkey* while negative impact in Thailand, Philippines and South Africa. Financial development is better for the using of energy sources to dwindle away the rate of energy consumption.

Abdul jalil et al (2012) studied the financial development and Macroeconomic fluctuation in China and Pakistan. ARDL model was used for the long run fluctuations. The result shows that macro-economic indicator is interrelated with financial development while the growth indicator is negative correlated with financial development. Increase in financial development is related with higher instability in consumption. China and Pakistan are trying to improve financial development so that to reduce the macroeconomic fluctuation.

Shahbaz et al (2011) investigated the financial development impact and the performance of environment, while using annual data from period 1965-2008 of South Africa. ARDL model and ECM were used for log run and short run relationship between the economic growth, coal consumption, trade openness and co2 emission. The result shows that coal consumption and economic growth have positive impact on co2 emission while financial development and trade openness have negative impact on co2 emission in South Africa. Results confirm the existence of EKC hypothesis.

Karim et al (2014) investigated the impact of financial development on Co2 emission in Iran using the period of 1975-2009. The study uses ARDL model for determining the long run relationship among financial development, economic growth and environment. The result shows

that financial development help to reduce Co2 emission and to improve the quality of environment while economic growth increase Co2 emission and decrease the quality of environment in Iran.

Sari and Soytas (2009) examined the long run link among economic growth, energy consumption and emission in turkey. Annual data is used from1960-2000. It shows that granger causality runs from co2 emission to energy consumption. The result shows no relationship at all between income and emission, it also shows that Turkish government can shrink emission with effective growth.

Salahuddin and Ozturk (2012) examine the long run relationship between energy consumption, co2 emission and economic growth in India. Annual data is used from1971-2007, ARDL model is used for long run relationship. The result shows a causal link from energy consumption to growth, growth to energy consumption and energy consumption to emission. Short term change of ECM show that deviations will eliminate in long run, although emissions and energy consumption will converge to equilibrium. It means that if Indian government desires to decrease CO2 emission then they will have sacrifice growth.

Hossain (2011) investigate the dynamic relationship between economic growth, energy consumption, trade, urbanization and emission of newly industrial nations. Panel date is used from 1971-2007, while cointegration (Johansen fisher) test is used for best result. The results show cointegration occurs amongst variables. Causality investigation defines that no fundamental relation is there in the long run among variables. However, in the short run causal relation was found among the variables, The results of elasticity's in long run define that energy consumption coefficient on CO2 emission is higher than short run which shows that as time passes, CO2 emission increases more due to energy usage.

Mehrara (2007) study the relationship between per capita energy consumption and per capita GDP of 11 oil exporting nations, using panel data from 1971-2002 while using

cointegration approach for estimation. It shows long run relationship between the variables. Unidirectional causal relation proves economic growth increase energy consumption. This study also recommends that these nations should implement low national oil prices for high exports, by way of any energy preservation policy like that any decrease in energy consumption will not damage growth.

Ang (2008) has considered the longtime affiliation among emissions of pollutants, product and energy consumption in Malaysia. Vector error correction model was used from period 1991-1999. Afterward, long term convergence investigation, casual affiliation of variables is examined by using causality test. Results show that energy consumption and pollution are absolutely correlated to the product in long term and causality of growth and economic growth in energy consumption in long and short term is confirmed.

Eakin et.al (1994) investigated the relationship between economic development and per capita co2 emission for 130 countries. They use panel data from 1951-1981 and use square term of GDP in model for EKC. The result shows that the faster economic growth produced more co2 emission while slow increase in economic growth is the reason of slow co2 emission and advance technology invention also decreases cost and co2 emission.

Moomaw et.al (1997) investigated the relationship among economic growth and co2 emission in different way. 16 countries are divided into three types Type I, Type II and Type III. They used two models; structural model and traditional EKC over the period 1950-1992. This period is divided further into two regimes: 1950-1972 and 1973-1992. In Type I countries the results show the link between GDP and co2 emission. In Type II, countries result shows a positive relationship between GDP and co2 emission whereas in Type III countries, the result observes some irregularities in the behavior regarding their relationship. Structural model in the first regime shows positive relation between GDP and CO2 but the results is significant only for 6 nations with negative signs. The study has also investigated the Environmental Kuznets curve

EKC hypothesis for selected 16 countries, using pooled data from 1950-1992. The empirical results confirm the existence of inverted U shaped EKC.

Soytas et al, (2009) investigated the connection between three variables, economic growth, energy consumption and emissions of CO2 for Turkey. They use variables such as capital, manpower, economic growth and emissions of CO2. Estimation results show that there is a one-sided relationship between energy consumption and emissions of CO2 in Turkey. Though such a affiliation was not established between CO2 emissions and income, it was concluded that CO2 emissions decrease doesn't lead to economic growth reduction in Turkey.

Galeotti and Lanza, (1999) investigated relationship between GDP per capita and co2 per capita for 110 countries in the world over the period from1960-1996. The Gamma and Weibul functional form were used. Estimation models confirmed the existence of EKC. The countries are divided in to two parts: part I containing 30 and II containing 80 countries. They used 2000 to 2020 for the forecasts of co2 emission. It shows that the average global growth rate of co2 emission from 2000 to 2020 will increase by 2.2% per year and average growth rate of CO2 emissions from 2000 to 2020 would increase by 3.3% for part I countries.

Lee et, al. (2005) studied the affiliation among income and environmental sustainability using environmental sustainability index (ESI), for 140 nations in 2003.This study contains 11 indicators out of 21 of Environmental Sustainability Table (2005), 9 indicators linked to economic efficiency and 2 correlated to pollution. The result reports statistically significant and positive impact of land area, civil liberty, GDP and political liberty on environmental sustainability index (ESI). They also found statistically significant and negative impact of income per capita on economic efficiency and positive impact of income per capita on pollution.

Talukdar and Meisner studied in 2001; the impact on carbon emissions of 44 developing nations using data 1987–95. The result shows that the foreign direct investments and domestic

financial capital markets in economy have positive impacts on the environment in 44 developing countries.

Claessens and Feijen, (2007) studied the character of governance in falling CO2 emissions and defined that with the help of more advanced governance firms can lower the growth of co2 emission. They recommended that the strength of financial development motivate the performance of firms due to the implementation of energy effective technologies, which decrease co2 emissions.

Tamazian and Bhaskara Rao, (2010) experienced the role of economic, financial development and institutional developments on degradation of environment within 24 countries for the period from 1993- 2004. The study shows that financial liberalization may be damaging environmental quality if it is not designed in a strong institutional framework. In addition, the findings also confirm the presence of an Environmental Kuznets Curve.

Iwata et al. (2010) analyzed the affiliation among Income and CO2 emissions by including nuclear energy for electricity production of 11 OECD nations the data duration was from 1960 to 2003, used traditional nonlinear specification of income and CO2 relation with squared income term and with nuclear energy for electricity production, also combined trade openness and energy use in model. The result shows energy consumption positively significant on CO2 while trade openness not significant. The coefficient of nuclear energy production significant only in four nations: Japan, Spain, Finland and Korea EKC are also established on the above stated four nations only.

Salim et al. (2008) study long run and short run relationship among energy consumption and output in 6 NON OECD (Bangladesh, Thailand, China, India Malaysia and Pakistan) developing nations. The data from period 1980 to 2005, used vector error correction and for long run Cointegration model. The result shows that show bidirectional causal relation between and income in Malaysia, Unidirectional causal link runs from production to energy consumption in

Thailand and China, energy consumption of production in Pakistan and India, Bangladesh investigated as energy Neutral Economy.

Ziramba (2009) considered the affiliation among disaggregate consumption energy and industrial output in South Africa. Annual data set is used from 1980-2005, using Cointegration method. The study finds the causal relationship among several methods of disaggregate energy consumption and industrial output. The result shows industrial output and employment is found long run forcing variables for consumption of electricity. Toda and Yamamoto Cointegration technique find bidirectional causal relationship among industrial output and oil consumption. The result also shows causal relationship among employment and of electricity consumption, coal consumption to employment.

Sadorsky (2011) estimates the impact of financial development on energy consumption of 9 Central and Eastern European frontier economies are taken from 1996 to 2006, used dynamic panel demand model. This study estimation use different proxies for financial development containing 4 banking segment and 3 stock market variables. The result show statistically significant positive relation between financial development and energy consumption for 1 for stock market and 3 banking sector variable.

Mohammad Bagheri (2010) calculated data of short term and long term correlation between energy consumption, gross domestic production and CO2 emissions in Iran. In order to study the relationship among variables used ARDL method. The estimation results shows that CO2 emissions are tensionless to gross domestic product and also its capacity in long term is more than its capacity in short term. Moreover inverted U-shape of EKC about Iran's situations is not confirmed, yet.

Shahbaz and Lean (2012) study the relationship among financial development, economic growth, energy consumption, industrialization and urbanization in Tunisia. The time period 1971-2008, used ARDL, bounds procedure Cointegration method. The result shows that long run

relationship between financial development, economic growth, energy consumption, industrialization and urbanization is positive and significance.

Munir and Khan (2012) investigated the impact of energy consumption on CO2 Emission in Pakistan. The data from period 1980 to 2010, used Johansen (Cointegration, test) for long run relationship and VECM for the short run, inverted u shaped EKC occurs in Pakistan. The result shows trade, Investment, income, population and export and industry output positive impact on co2 emission while financial development and import negative impact on co2 emission.

Kaufmann et al. (1998) study the impact of income on sulfur dioxide (SO2) and economic activity index on sulfur dioxide (SO2) 23 countries. Used Fixed effect (FE) and random effect (RE) models period from 1974 to 1989. The result shows EK curve occur both cases for income and spatial intensity of economic action, Sulfur dioxide (SO2) decrease more in the case of economic action index than income which deliver new measurement for policy forecaster.

Liu (2005) examine the effect of CO2 Emission excluding control variables on GDP, impact of GDP and energy consumption on CO2 Emission 24 OECD countries, time period select 1975 to 1990 and used three stages least square technique for estimation. The result shows that GDP has negative effect on co2 emission when consumption of energy included in model whilest other control variable as positive effect on co2 emission.

Schmalensee et.al (1997) investigated the connection among CO2 and income using fossil fuel consumption for CO2 as it is 80 percent of CO2 in reduced form model used data from 1950 – 1990 for 47 countries. Bunker fuels and Gas flaring are absent from their influence to CO2 emissions. With the help of this paper they forecasted CO2 emissions by 2050. CO2 emissions and GDP presented that developing nations perceive increasing trend between CO2 and income whereas developed nations have inverted U-shaped relations among CO2 and GDP.

The model was also estimated for energy consumption to be dependent variable. The authors found CO2 emissions and energy consumption both have inverted U-shaped curve.

2.2: Summary and Conclusion

All the assessment discloses the intimate association of financial development with CO2emission. Only a few studies related to financial development and CO2 emission have used time series approach. Overall there is no clear cut idea that what type of effect dominates whether financial development improves or worsen the performance of environmental indicators such as CO2 emission. Furthermore, most of the studies have focused on individual level countries. The present study contributes to the literature in the sense that we use an empirical study by focusing on major South Asian countries while using panel data approach.

CHAPTER 3

Data, variable and Methodology

3.1: Introduction

In this section we are going to discuss how to tackle the research problem. This section is comprised of two sections. In first section, discuss the data and variable construction. While in the second section, we use the methodology to cope with the research problems by applying a theoretical and an econometric model.

3.2: Data Description and Sources

In this section, we are trying to depict the detail of data descriptions and variable. The sample consists of four selected Asian countries (Bangladesh, India, Pakistan and Sri Lanka). These four countries are developing countries. Dependent variable is co_2 emission while independent variables are financial development, GDP growth, trade openness, foreign direct investment and energy consumption. The data for all these variables is of annual frequency and have been taken from the world development indictors (WDI). The time period for the study is selected from 1974 to 2013. The complete explanation of variables with data sources has been shown in this Table.

TABLE 3.1: definition of variables and Data source

Variable	Definition	Source	Expected sign
CO_2	Metric tons per capita	WDI	Dependent variable
Financial development	Domestic credit to private sector % of GDP	WDI	_ Expected sign
GDP per capita	(Constant 2005 US$)	WDI	+ Expected sign
Trade openness	Exports + Imports/GDP	WDI	May be positive or negativ
Foreign direct investment	net inflows (% of GDP)	WDI	May be positive or negativ
Energy consumption	kg of oil equivalent per capita	WDI	+ expected sign

3.3: Variables Description

3.3.1: Carbon Dioxide (CO2):

"Carbon dioxide emissions are the gases which stem from the burning of fossil fuels and during manufacturing of cement etc. It includes carbon dioxide, produced during consumption of solid, liquid, and gas fuels and gas flaring". Broadly speaking, co_2 is a dependent variable used as a proxy to help us know the environmental performance. It is a main pollutant which causes global warming and it consists of more than 75% of GHG emission which, is measured in metric tons per capita.

3.3.2: Financial development:

For the financial development, we use a proxy----lending to the private[2] sector by financial corporations and banks etc. It includes loans, purchases of non-equity securities, and

[2] There are many proxies used in literature to show financial development. For example, the monetary aggregate M2 as a ratio of nominal GDP is used in measuring financial deepening. However, the availability of foreign funds in the financial system makes the monetary

trade credits and other accounts receivable, which establish a claim for repayment, and for some countries including the claim of credit to public enterprises. These financial corporations include monetary establishments and deposit money banks, as well as other financial companies. Financial development may have negative as well as positive impact on environmental pollution.

3.3.3: Gross Domestic Product per Capita (GDP)

Gross Domestic Product (GDP) is an amount of income and wealth of a country. It basically adds with the economy of the country, dignified as a matter of wealth and public welfare. It means that the total value of goods and services produced in a country during a particular period of time (World Bank, 2011). The income level rises due to industrialization and environmental performance start increasing firstly and then decreasing down after a thresh hold level i.e. turning point (Grossman and Krueger 1995). The square of GDP per capita income (US$2005) term is used to check the environment Kuznets curve (EKC).

3.3.4: Trade openness (TR)

TR is generally termed as the sum up of the export and import over GDP. Trade may result in transfer of more environmental friendly technologies that may cause environmental performance to improve rather than worsening it. Furthermore, to be involved in international trade with other countries, companies usually tend to follow environmental standards and regulation in order to keeps itself in the market. For this reason trade in general is supposed to help improve environmental performance.

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aggregate an inappropriate measure of financial development. Another Commonly used variable is the ratio of deposit liabilities to nominal GDP, which captures the broad money stock excluding currency in circulation. But, this measure doesn't take into account the allocation of capital. Several studies have also employed the ratio of commercial bank assets divided by commercial bank plus central bank assets which measures the importance of the commercial banks in the financial system. In this study, we use the domestic credit to private sector as a percentage of GDP, which constitutes the most common variable used in the literature to represent financial development. In fact, this measure represents more accurately the role of financial intermediaries in channeling funds to private markets participant.(Boutabba, Mohamed Amine, 2014)

3.3.5: Foreign direct investment (FDI)

The data of FDI is collected from WDI; it is measured as the total net foreign direct investment (FDI) in US dollars divided by the GDP. This variable tries to estimate the impact of FDI's. Its Impacts on pollutions in the context of trade liberalization is obviously very well known as FDI generally tend to flow from rich countries and highly developed countries to developing countries. These developed countries shift their polluting industries to poor countries because of the fact that governments of rich countries have kept their own environmental standards very strict as a results these firms; for the purpose to take the advantage of the less stringent regulations and standard of the developing countries tend to move their investment to developing countries. Whereas, the developing countries usually are short of public savings, so they are in search of bringing investment use to welcome these industries which result in more pollution in developing countries. Hence FDI is supposed to result in increase in pollution.

3.3.6: Energy consumption:

Domestic energy consumption is the amount of energy that is spent on the various appliances used within housing. The amount of energy used per household varies widely depend on the standard of living of the country, climate, and the age and type of residence. Energy plays a major role in residential, industrial needs, transportation, and electricity needs. The burning of fossil fuel is necessary in every region, as it is used for the production of goods and services. Hence more energy consumption means more co_2 emission.

Population changes and urbanization growth causes efficiency of the production process. The way of producing and using energy carriers in different segments of consumers is the effective factors of polluting the environment in local, territorial and on the international scale.

3.4: Empirical Model:

In order to determine the impact of financial development on environmental degradation we use economic growth, financial development indicators, energy consumption as independent while environmental pollution as dependent variables in our in our empirical model. Additionally, following (Halicioglu, 2009; Ang, 2008a, 2009), we include trade openness in the model to change our closed-economy model into an open-economy model. Hence, the functional form of the model is as follows:

$$\mathbf{LnCO2}_{it} = \beta_0 + \beta_1 \mathbf{lnFD}_{it} + \beta_2 \mathbf{lnGDP}_{it} + \beta_3 \mathbf{lnFDI}_{it} + \beta_4 \mathbf{lnTR}_{it} + \beta_5 \mathbf{lnENC}_{it} + \mu_i + \varepsilon_{it} \quad \ldots. (1)$$

The variables such as trade openness (TR), foreign direct investment (FDI), GDP growth and energy consumption (ENC) are used as control variables. These control variables are expected to impact on co_2 emission.

The present study also intends to investigate for the existence of Environmental Kuznets curve phenomena; we therefore add a squared term of GDP per capita. Hence following Talukdar and Meisner (2001) Jalil and Feridun, 2011, Tamazian et al. (2009), we use the following model:

$$\mathbf{LnCO2}_{it} = \beta_0 + \beta_1 \mathbf{lnFD}_{it} + \beta_2 \mathbf{lnGDP}_{it} + \beta_2 \mathbf{lnGDP}_{it}^2 + \beta_3 \mathbf{lnFDI}_{it} + \beta_4 \mathbf{lnTR}_{it} + \beta_5 \mathbf{lnENC}_{it} + \mu_i + \varepsilon_{it} \ldots (2)$$

μi and ε_{it} indicate the country specific random effect and random error term respectively, whereas, FD, GDP FDI, TR, and ENC indicate financial development, gross domestic product, financial development, trade openness and energy consumption as well. While μi and ε_{it} indicate the country specific effect and random error term respectively.

3.5: Estimation Methodology

For empirical purpose, panel data estimation techniques are used According to Johnston and Dinardo (1997), there are numerous advantages of using panel data technique over cross section and time series analysis. Longitudinal or panel data set to follow a given sample of

individuals over the time and thus provides multiple observations for each individual in the sample. The panel data technique usually gives researchers a large number of data points, increasing the degree of freedom and reducing the co-linearity among the regressors and hence it improves the efficiency of econometric estimates. In a sharp contrast to single cross section analysis, the panel data technique provides the dynamics of individual country behavior and consistent estimation, where unobserved individual heterogeneity is assumed to be distributed independently of regressors. In general, in the empirical literature, different studies rely on different econometric approaches to investigate the relationship between environmental degradation, financial development, economic growth and other variables. These approaches include the i) the pooled ordinary least square method (POLS), ii) the Least Square Dummy variable or Fixed effect approach and iii) the Random effect method (Baltagi 2001).

Though we tend to use both fixed effect and random effect approaches in our study, nevertheless the fixed effect model is more preferable to us as compared to random effect model. In fixed effect approach it is generally assumed that for all individuals, the slope of equation is the same, but in case of intercepts for all individuals, it is specific. On the other hand, as far random effect model is concerned, it requires that the variables included in the right hand side must not be correlated in any way with omitted variables, whereas in reality it does not seem sound, in particular in our case. But fixed effects method permits the estimation of panel data even in the case where explanatory variable and cross section error term are correlated. (Asterio & Hall 2007) (Gujrati, 2003). Random effect method is a GLS estimator whereas fixed effects method is a limited case of random effects method. In random effects method, cross section differences are captured in error term whereas this difference in fixed effects method is captured by intercept. Random effects method is used when the explanatory variable and the cross section error term are uncorrelated.

In order to decide between fixed effect approach and random effect approach, we apply Hausman test to test under the null hypothesis that random effects approach is reliable and effective against the alternative that random effect approach is not a suitable or reliable approach. The Hausman test statistics follows chi square distribution and can test statistics using the following formulation:

$$\mathrm{H} = (\Omega\mathrm{FE} - \Omega\mathrm{RF})[\mathrm{Var}(\Omega\mathrm{FE}) - \mathrm{Var}(\Omega\mathrm{RF})] - 1(\Omega\mathrm{FE} + \Omega\mathrm{RF}) \sim \chi 2$$

Ω is a vector of slope coefficients. If the difference among the parameters existence estimated by random effect and fixed effect technique is extraordinary then the value of Hausman test statistics will be high expressively. Big worth of test statistic offers indication in contradiction of the null hypothesis while small value denotes to the rejection of alternative hypothesis.

Chapter 4

RESULTS AND DISCUSSIONS

This chapter discusses the results which are divided into two sections. The first section deals with descriptive statistic and second section show interpretation of the estimation results.

4.1: Descriptive Statistics

Descriptive statistics are presented in the appendixA1. Descriptive statistics is accompanied by some sort of numerical characteristics of data in the thesis. The descriptive statistics are reported in table 4.1 which includes measures of central tendency i.e. mean and median. To check the maximum and minimum values, a measure of statically dispersion is also examined by the standard deviation in the descriptive statistics, It is quite easy to be realized from the statistics that India is the top emitter of CO_2 among selected countries with a mean value of 0.9310 metric tons per capita .The second highest emitter of CO_2 emissions is Pakistan with a mean value of 0.6362 metric tons per capita. Sri Lanka is at third place with a mean value of 0.3839 metric tons per capita. Bangladesh is the lowest co2 emitter with a mean value of 0.1889 metric tons per capita. This table also shows that India is the most populous country in the region and its share of domestic credit to private sector is 28.823 (% of GDP), followed by Bangladesh, Sri Lanka and Pakistan.

4.2: The Hausman Test for penal data

Table 4.2: Test summary of Hausman test

Test summary	Chi-sq. statistic	Prob.
Cross-section random	13.76	0.0172

H0: random effect model is appropriate.

H_A: Fixed effect model is appropriate.

The Hausman test presented in table 4.2 indicates that the fixed effects (FE) model is a more appropriate model for estimation as compared to the random effects (RE) model. Hence, we conclude that the FE estimates are efficient and consistent as compared to RE estimates. This result leads us to conclude that fixed effect approached is an appropriate approach to be used here. Nevertheless, for robustness of our results, we will also use the random effect model.

4.3: Estimation Results:

The empirical results showing the impact of financial development on CO_2 emission are presented in table 4.3. The results reported in this table are based on fixed effect model. The empirical results show that the sign of (DCTPs) coefficient is positive. This positive sign shows that when the domestic credits to private sector increase by one percent, the CO_2 emission will increase by 2 percent. This finding can be attributed to weak and less stringent environmental policies existing in developing countries like South Asia. As far the impact of trade openness is concerned, it tends to have negative impact on CO_2 emission. This finding is also according to the theory as the firms that are involved in free trade are presumed to use more environmental friendly technologies and methods because of competition in the international markets; as a result CO_2 emission tends to reduce. This finding supports the results of Shahbaz (2011). As far the impact of FDI on CO_2 emission is concerned, it shows that FDI has positive but insignificant impact on co2 emission. Though its impact is insignificant but its sign is according to the theory.

According to Frankel and Romer (1999), financial development in a country may attract foreign direct investment (FDI) and higher degrees of research and development (R&D). This, in turn can, increase the level of economic growth up to its optimum, and hence, affect the dynamics of environmental performance.

Tables 4.3: Fixed effect Results of Environmental Pollution

Dependent variable			Co2	
Period includes			40	
Cross sections includes			4	
Total penal balance observation			160	
Variable	Coefficient	Std. Error	t-statistic	Prob.
C	-2.435966	.101253	-24.06	0.000
D c t p s	.0203467	.0028215	7.21	0.000
Trade opens	-.0087941	.0027852	-3.16	0.002
Energy use	.002161	.0007058	3.06	0.003
GDP	.0017173	.0005173	3.32	0.001
GDP^2	-6.80e-07	1.96e-07	-3.47	0.001
FDI	8.42e-07	.0308863	0.00	1.000
R-square			0.6705	
Adjusted R-square			0.6519	
F statistic			142.23	
Prob.(F)			0.0000	

❖ Domestic credit to private sector denoted DCTPs

Our results support the findings of Karl et al (2010) and (Talukdar and Meisner, 2001), who report positive impact of FDI on CO_2 emission.

Similarly, the coefficient of GDP and energy use is positive and significant indicating that both have a strong positive impact on CO_2 emission. These findings are in line with the economic theory and support the empirical results of Shahbaz et.al, (2003), Mehrara (2007,Shahbaz et al (2012) and Soytas et al, 2009, (Eakin et.al 1994) and Boopen and Vinesh (2009).

One of the most important results is the impact of square of GDP. The square of GDP is used to investigate the Environmental Kuznets curve hypothesis (EKC) for South Asian countries. The GDP squared sign of the coefficient is according to the theory and our expectations. GDP squared term shows that increase in income beyond a certain level is responsible for decrease in the level of CO_2 emissions. In other words, that higher the incomes level the better will be environmental quality or we can say the lesser will be CO_2 emission. Our empirical results here confirm the EKC hypothesis for South Asian countries. Eakin et.al (1994), Moomaw et.al (1997), Galeotti and Lanza, (1999), Tamazian and Rao, (2010) and Munir and Khan (2012) also confirm the existence of EKC hypothesis

Tables 4.4: Random effect Results of Environmental Pollution

Dependent variable			Co2	
Period includes			40	
Cross sections includes			4	
Total penal balance observation			160	
Variable	Coefficient	Std. Error	z –statistic	Prob.
C	-2.705219	.0703295	-38.46	0.000
D c t p s	.0241403	.0018956	12.73	0.000
Trade opens	-.0100032	.0014675	-6.82	0.000
Energy use	.0050946	.0002499	20.38	0.000
GDP	.0001338	.0004216	0.32	0.751
GDP^2	-1.83e-07	1.75e-07	-1.04	0.296
FDI	-.0431657	.0307211	-1.41	0.160
R-square			0.7349	
Adjusted R-square			0.8957	
Wald chi2(6)			2471.44	
Prob > chi2			0.0000	

- Domestic credit to private sector denoted DCTPs

The empirical results showing the impact of financial development on co2 emission, using Random effect model are given in table 4.4. In table 4.4, the empirical results show that the coefficient sign of domestic credit to private sector (DCTPs) is positive and significant. This positive sign indicates that CO_2 emissions increase by 2 percent when the domestic credit to private sector increases by one percent. This finding shows the weak and less stringent environmental policies existing in the selected South Asian countries. So far the impact of trade openness is concerned; its coefficient sign is negative and significant which

indicate the negative impact of trade openness on the CO_2 emissions. This result is also according to the theory as the firms that are involved in free trade uses more environmental friendly technologies due to the competition in the international market which in turn reduces the CO_2 emissions. So far the impact of FDI on CO_2 emission is concerned, the coefficient sign of FDI is negative and insignificant showing the negative impact of FDI on CO_2 emissions. Its sign is not according to the theory, but it doesn't matter as its impact is insignificant. If we look at the coefficient of energy consumption, then it has positive and significant impact over the CO_2 emissions in the selected South Asian countries. Similarly, the coefficient sign of GDP is positive according to the previous literature, but here it has insignificant impact. To investigate the Environmental Kuznets curve hypothesis, we include the square term of the GDP. The sign of GDP squared is negative according to the theory but is insignificant.

Chapter 5

CONCLUSIONS AND POLICY IMPLICATIONS

5.1: Conclusion

This study was an attempt to investigate the impact of financial development on environmental degradation measured by co_2 emission. For empirical analysis, the study has used a panel of four major South Asian countries, Pakistan, India, Bangladesh and Sri Lanka. The empirical estimation was based on fixed and random effect model. Though the Hausman test recommends applying the fixed effect model, but for the robustness of our results we have used random effect model also. As far the empirical findings of the study are concerned, it shows that the financial development has a significant effect on CO_2 emission. Furthermore, other control variables such as foreign direct investment, economic growth, and energy consumption have expected results according to the theory. In other words these variables tend to have a positive impact on co2 emission in South Asian countries. Whereas, CO_2 emission level tends to decrease with increasing openness of foreign trade. An interesting result of the study is the validity of Environmental Kuznet curve (EKC) hypothesis, which tends to hold in case of the selected South Asian countries.

On the other hand, estimation results based on random effect model show almost the same results that we get with fixed effect model. For example, just like the empirical results based on fixed effect model, random effect model too indicate that financial development has significantly positive impact on CO_2 emission. In the same manner, energy use and economic growth have positive impact on CO_2 emission. Finally the results confirm the EKC hypothesis but the coefficient of GDP square is not significant.

5.2: Policy Implications

According to the empirical results of this thesis, the following policy recommendations are suggested.

1. As financial development (credit to private sector) have positive and a significant impact on CO_2 emission. So the Government of selected countries should adopt some proper policies in order to channelize the financial development in such a way as to minimize its negative impact on environment in acceptable limits.
2. The trade openness has a negative impact on CO_2 emission; therefore Governments are required to persuade policies that are focused on the promotion of trade.
3. The results also shows that GDP growth and credit to private sector is also contributing positively to co2 emission, therefore the Governments should set environmental standards, promote environment friendly technologies or taxes on co2 emission to keep it in limits.
4. There is a need for clean energy resources development like renewable energy (solar) and dependence on energy resources like petrol, coal etc. should be minimized.

5.3: Limitations of the Study:

Because of unavailability of data, we have opted the four South Asian countries namely, Bangladesh, India, Sri lanka and Pakistan. Because one can easily collect the data of this variables like CO_2 emission, financial development, GDP per capita, Trade openness, Foreign Direct Investment etc. of these aforementioned countries. So with a few shortcomings it is much easier for an individual to satisfy others from the tasks which are entrusted to him regarding these four selected countries.

Appendices-A

Descriptive Statistics of selected south Asian countries

A-1 Bangladesh

	CO2 emissions	Domestic cred	GDP	GDP 2	Foreign direct investment	Trade	Energy use
Mean	0.188962	21.7991	336.9355	125744.9	0.350616	29.49682	135.0869
Median	0.161621	16.65563	288.7550	83387.83	0.053753	23.37723	124.4889
Maximum	0.371564	49.41993	617.6700	381516.2	1.28684	55.29305	204.7203
Minimum	0.067388	1.91712	226.5000	51302.20	-0.051392	10.99563	93.08831
Std. Dev.	0.094277	13.97446	111.9505	90176.18	0.463568	12.1475	34.90671

A-2 India

	CO2 emissions	Domestic cred	GDP	GDP 2	Foreign direct investment	Trade	Energy use
Mean	0.931079	28.8231	535.8482	354865.1	0.653411	25.0326	404.0119
Median	0.90285	24.3798	434.5300	188917.8	0.242961	19.52248	384.2027
Maximum	1.666209	51.82494	1166.670	136111.9	3.545983	54.73235	613.7189
Minimum	0.381565	12.69123	263.6300	69498.43	-0.02917	10.66486	281.8676
Std. Dev.	0.375604	11.00792	263.5668	357355.9	0.849737	14.36719	100.373

A-3 Pakistan

	CO2 emissions	Domestic cred	GDP	GDP 2	Foreign direct investment	Trade	Energy use
Mean	0.636864	24.2184	558.2855	331309.4	0.830615	33.81177	398.6459
Median	0.648248	24.21806	563.9200	318007.8	0.568544	34.01173	409.1575
Maximum	0.969294	29.78608	845.6500	715123.9	3.668323	38.90949	509.6017
Minimum	0.32371	16.89992	340.7600	116115.3	0.045594	27.71982	292.9991
Std. Dev.	0.205215	2.899457	141.8775	164313.8	0.853622	2.79817	69.89242

A-4 Sri Lanka

	CO2 emissions	Domestic credit	GDP	GDP 2	Foreign direct investment	Trade	Energy use
Mean	0.38396	22.96877	928.9875	1026844	0.994063	69.95153	371.8287
Median	0.306955	22.2127	815.9450	666038.8	1.079838	69.93385	328.8814
Maximum	0.627425	33.97362	1903.340	3622703	2.849577	88.63646	499.3383
Minimum	0.198093	8.821201	439.9200	193533	-0.02969	49.14914	293.839
Std. Dev.	0.166024	7.416904	409.9104	921729.8	0.617704	9.582766	66.23065

References

Ang, J. B. (2007). CO 2 emissions, energy consumption, and output in France. *Energy Policy*, *35*(10), 4772-4778.

Ang, J. B. (2008). Economic development, pollutant emissions and energy consumption in Malaysia. *Journal of Policy Modeling*, *30*(2), 271-278.

Asterio & Hall 2007, "Applied Econometrics, A modern approach using Eviews and Microfit", *Revised Edition*, Plagrave macmillan

Birdsall, N., & 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.

Boutabba Mohamed Amin (2014).The impact of financial development, income,energy and trade on carbon emissions:Evidence from the Indian economy.'*Economic Modelling* 40,33-41

Claessens, S., & Feijen, E. (2007). *Financial sector development and the millennium development goals* (No. 89). World Bank Publications.

Claessens, S., Demirgüç-Kunt, A., & Huizinga, H. (2001). How does foreign entry affect domestic banking markets?. *Journal of Banking & Finance*, *25(5),* 891-911.

Dasgupta, S., Laplante, B., Mamingi, N., 2001. Pollution and capital markets in developing countries. *Journal of Environmental Economics and Management*, *42 (3),* 310–335.

Dasgupta, S., Hong, J. H., Laplante, B., & Mamingi, N. (2006). Disclosure of environmental violations and stock market in the Republic of Korea. *Ecological Economics*, *58*(4), 759-777.

Dasgupta, S., Laplante, B., Wang, H., & Wheeler, D. (2002). Confronting the environmental Kuznets curve. *Journal of economic perspectives*, 147-168.

Demetriades, P.O., Hussein, K.A., 1996. Does financial development cause economic growth? Time series evidence from16 countries. *Journal of Development Economics 51,* 387–411.

Dinda, S., 2004. Environmental Kuznets Curve hypothesis: *a survey. Ecological Economics 49,* 431–455.

Dinda, S., Coondoo, D., 2006. Income and emission: a panel data-based cointegration analysis. *Ecological Economics 57,* 167–181.

Ekins, P., 1997. The Kuznets curve for the environment and economic growth: examining the evidence. *Environment and Planning A 29 (5),* 805–830.

Eakin, D. H. & Selden, T.M., (1995), "Stocking the fires? CO2 emissions and economic growth" *Journal of Public Economics*, 57, pp 85 – 110

Gujrati, Damondar N, (2003), "*Basic Econometrics*" 4th edition

Feridun, M., Ayadi, F. S., & Balouga, J. (2006). Impact of Trade Liberalization on the Environment in Developing Countries the Case of Nigeria. *Journal of Developing Societies, 22*(1), 39-56.

Friedl, B., Getzner, M., 2003. Determinants of CO2 emissions in a small open economy. *Ecological Economics 45 (1),* 133–148.

Grossman, G., & Krueger, A. (1995). Economic environment and the economic growth. *Quarterly Journal of Economics, 110*(2), 353-377.

Halicioglu, F., 2009. An econometric study of CO2 emissions, energy consumption, income and foreign trade in Turkey. *Energy Policy 37 (3),* 1156–1164.

He, J. (2002). The foreign direct investment and air pollution in China: the case of SO2 concentration in Chinese cities. In *Better air quality in Asian and Pacific Rim cities conference, Hong Kong*.

He, J., 2006. Pollution haven hypothesis and environmental impacts of foreign direct investment: the case of industrial emission of sulfur dioxide (SO2) in Chinese provinces. *Ecological Economics 60 (2006),* 228–245.

Heil, M.T., Selden, T.M., 1999. Panel stationary with structural breaks: carbon emissions and GDP. *Applied Economic Letters 6,* 223–225.

Holtz-Eakin, D., Selden, T.M., 1995. Stoking the fires? CO2 emissions and economic growth. *Journal of Public Economics 57,* 85–101.

Huang, Y. (2005). What determines financial development?.

Iwata, H., Okada, K. & Samreth, S. (2009), "Empirical Study on the Environmental Kuznets Curve for CO_2 in France: *The Role of Nuclear Energy".* MPRA Paper No. 18997.

Iwata H., and Okada K. and Samreth S., (2010), "Empirical study on environmental Kuznets curve for CO_2 in France: the role of nuclear energy". *Energy Policy,* 38, 4057–4063.

IPCC, 2007. Climate Change 2007: Synthesis Report. Cambridge University Press, Cambridge, UK and New York, USA.

Jalil, A., Mahmud, S.F., 2009. Environment Kuznets curve for CO2 emissions: a cointegration analysis for China. *Energy Policy 37,* 5167–5172.

Jalil, A., Feridun, M., & Ma, Y. (2010). Finance-growth nexus in China revisited: New evidence from principal components and ARDL bounds tests. *International Review of Economics & Finance*, *19*(2), 189-195..

Hossain, M.S., 2012. Multivariate Granger causality between economic growths, electricity consumption, exports and remittance for the panel of three SAARC countries. *Glob. J. Manage. Bus. Res.,* 12, 40–54

Lanoie, P., Laplante, B., Roy, M., 1998. Can capital markets create incentives for pollution control? *Ecological Economics 26,* 31–41.

Lee, C. C. (2005). Energy consumption and GDP in developing countries: a cointegrated panel analysis. *Energy Economics*, *27*(3), 415-427.

Lee, C. C., & Chang, C. P. (2008). Energy consumption and economic growth in Asian economies: a more comprehensive analysis using panel data.*Resource and Energy*

Economics, 30(1), 50-65.

Lee, C. C., & Chang, C. P. (2008). Energy consumption and economic growth in Asian economies: a more comprehensive analysis using panel data.*Resource and Energy Economics, 30*(1), 50-65.

List, J.A., Co, C.Y., 2000. The effect of environmental regulation on foreign direct investment. *Journal of Environmental Economics and Management 40,* 1–40.

Liu, X., 2005. Explaining the relationship between CO2 emissions and national income — the role of energy consumption. *Economics Letters 87,* 325–328.

Ma, Y., & Jalil, A. (2008). Financial development, economic growth and adaptive efficiency: A comparison between China and Pakistan. *China & World Economy*, *16*(6), 97-111.

Mohammad Bagheri, A. (2010). "Examining Short & Long Term Relationships between Internal Impure Outcome, Energy Consumption and Carbon Dioxide in Iran", *Energy Economy Studies Quarterly*, 27: 101-129 (In Persian).

Kaufmann, R. K., Davidsdottir, B., Garnham, S., and Pauly, P., 1998. The determinants of

atmospheric SO2 concentrations: reconsidering the environmental Kuznets curve. *Ecological Economics 25(2),* 209-220.

Ozturk, I. (2010). A literature survey on energy–growth nexus. *Energy policy*,*38*(1), 340-349.

Ozturk, I., & Acaravci, A. (2013). The long-run and causal analysis of energy, growth, openness and financial development on carbon emissions in Turkey.*Energy Economics, 36*, 262-267.

Ozturk, I., & Salah Uddin, G. (2012). Causality among carbon emissions, energy consumption and growth in India. *Ekonomska istraživanja*, *25*(3), 752-775.

Parry, M. L. (Ed.). (2007). *Climate Change 2007: impacts, adaptation and vulnerability: contribution of Working Group II to the fourth assessment report of the Intergovernmental Panel on Climate Change* (Vol. 4). Cambridge University Press.

Rock, M.T., 1996. Toward more sustainable development: the environment and industrial policy in Taiwan. *Development Policy Review 14*, 255–272.

Rojas-Suarez, L., Weisbrod S.R., 1996. Building stability in Latin American financial markets. Inter-American Development Bank, Office of the Chief Economist, *Working Paper No. 320.*

Shahbaz, M. 2010. Bounds test approach to cointegration and impact of financial development on energy consumption for Pakistan. *In Conference Paper* (pp. 43-1).

Sadorsky, P., 2010. The impact of financial development on energy consumption in emerging economies. *Energy Policy 38*, 2528–2535.

Salim, R. A., Rafiq, S., & Hassan, A. F. M. (2008). Causality and dynamics of energy consumption and output: evidence from Non-OECD Asian countries. *Journal of Economic Development*, *33*(2), 1-26.

Shahbaz, M., Lean, H.H., Shabbir, M.S., 2012. Environmental Kuznets curve hypothesis in Pakistan: cointegration and Granger causality. Renew. *Sust. Energ. Rev. 16 (5*), 2947–2953.

Shahbaz, M., Lean, H. H., 2012a. Does financial development increase energy consumption? The role of industrialization and urbanization in Tunisia. *Energy Policy 40*, 473-479.

Soytas, U., Sari, R., (2003): "Energy consumption and GDP: causality relationship in G-7 countries and emerging markets". *Energy Economics,* 25, 33–37.

Soytas, U., Sari, R. and Ewing, T. (2007), "Energy consumption, income, and carbon emissions in the United States". *Ecological Economics,* 62, 482-489.

Soytas, U., Sari, R., (2009), "Energy consumption, economic growth, and carbon emissions: challenges faced by an EU candidate member". *Ecological Economics,* 68, 1667–1675.

Shahbaz, M. (2013). Does financial instability increase environmental degradation? Fresh evidence from Pakistan. *Economic Modelling*, *33*, 537-544.

Muhammad, S., Faridul, I., & Muhammad Sabihuddin, B. (2011). Financial development, energy consumption and CO2 emissions: Evidence from ARDL approach for Pakistan.

Schmalensee, R., Stoker, T. M., & Judson, R. A. (1998). World carbon dioxide emissions: 1950–2050. *Review of Economics and Statistics*, *80*(1), 15-27.

Selden, T. M., & Song, D. (1994). Environmental quality and development: is there a Kuznets curve for air pollution emissions?. *Journal of Environmental Economics and management*, *27*(2), 147-162.

Shafik, N. (1994). Economic development and environmental quality: an econometric analysis. *Oxford economic papers*, 757-773.

Stern, D. I. (1998). Progress on the environmental Kuznets curve?. *Environment and development economics*, *3*(02), 173-196.

Stern, D. I., Common, M. S., & Barbier, E. B. (1996). Economic growth and environmental degradation: the environmental Kuznets curve and sustainable development. *World development*, *24*(7), 1151-1160.

Talukdar, D., & Meisner, C. M. (2001). Does the private sector help or hurt the environment? Evidence from carbon dioxide pollution in developing countries. *World Development*, *29*(5), 827-840.

Tamazian, A., & Rao, B. B. (2010). Do economic, financial and institutional developments matter for environmental degradation? Evidence from transitional economies. *Energy Economics*, *32*(1), 137-145.

Tamazian, A., Chousa, J. P., & Vadlamannati, K. C. (2009). Does higher economic and financial development lead to environmental degradation: evidence from BRIC countries. *Energy policy*, *37*(1), 246-253.

Tiwari, A. K. (2010), "On the dynamics of energy consumption and employment in public and private sector". *Australian Journal of Basic and Applied Sciences*, 4, 12, 6525-6533.

Tiwari, A. K. (2011), "Energy Consumption, CO2 Emissions and Economic Growth: Evidences From India". *Journal of International Business and Economy*, 12, 1, 85-122

Tiwari, A. K. (2011), "Energy consumption, CO2 emission and economic growth: A revisit of the evidence from India." *Applied Econometrics and International Development,* 11, 2.

Taskin, F., & Zaim, O. (2000). Searching for a Kuznets curve in environmental efficiency using kernel estimation. *Economics letters*, *68*(2), 217-223.

Wang, H., & Jin, Y. (2007). Industrial ownership and environmental performance: evidence from China. *Environmental and Resource Economics*, *36*(3), 255-273.

World Development Indicators, www.worldbank.org

Yuxiang, K., Chen, Z., 2011. Financial development and environmental performance: evidence from China. *Environ. Dev. Econ*. 16, 1–19.

Zhang, Y. J. (2011). The impact of financial development on carbon emissions: An empirical analysis in China. *Energy Policy*, *39*(4), 2197-2203.

Ziramba, E. (2009). Disaggregate energy consumption and industrial production in South Africa. *Energy Policy*, *37*(6), 2214-2220.