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Impact of Economic Development on Environmental Degradation

by

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To my beloved parents, to my brother and sisters

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY

ISLAMABAD

CERTIFICATE OF APPROVAL

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Abstract

This study examines the relationship between economic development and environmental degradation for a global panel of 120 countries over the period 1990- 2016. We apply the Fixed Effect Model (FEM) to evaluate the environmental impact of economic development.This study makes an attempt to bring about the econometric weaknesses of the Environmental Kuznets Curve (EKC) addressed by the Stern (2004). Although, our results were not consistent with the Environmental Kuznets Curve (EKC) theory that shows that economic development brings about the decline in the environmental degradation when the level of economic growth increases beyond some threshold point. The findings suggest that GDP growth rate, Research and Development (R&D), Energy Use (EU) and Oil rents have significant impacts on CO2 emissions. The findings also reveal that FDI inflows are insignificant in explaining the levels of environmental quality.

Key words: Economic Development, CO2 Emissions, Environmental degradation

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Chapter 1

Introduction

Environmental degradation is already being observed through rising temperature by CO2 emissions. Human activities such as fossils fuels usage, deforestation and industries cause greenhouse gas (GHG) emissions that ultimately lead to environmental degradation (OECD, 2007). If an appropriate policy is not devised for significant reduction of CO2 emissions below current levels within the next few years, the quality of environment will further degrade. This will have a negative effect on human health, ecosystems, and the economy. There is an increasing debate which suggests that an early course of action is required to reduce CO2 emissions at a minimum possible cost so that the benefits exceed the costs. According to the study of OECD, CO2 emissions can be reduced to a large extent comparatively at lowest costs, if the adequate procedures are put into practice. This comprises effective use of market-based instruments internationally to introduce a global price for CO2 emissions that will go along with better incorporation of climate change plans in relevant policy areas such as energy, building, transport, forestry or agriculture including other procedures that increase technological innovation.

Over the past three decades, most developed countries and many developing economies have exercised the relevant environmental degradation policies. The OECD has made an input to the discussion through its systematic efforts on the proposal and implementation of effective climate change policies, besides its

effective evaluation of policy performance in different countries. The Intergovernmental Panel on Climate Change (IPCC) has suggested comparatively low cost estimates for reduction of CO2 emissions through extensive utilization of economically effective market based approaches, for example, carbon expenses and outflows exchanging, and comprehensive contribution in alleviation efforts throughout the world (OECD, 2007). The probable costs of these actions may grow considerably, but, if countries go for less efficient policies, such as prioritizing the habit of deliberate or controlling instruments or releasing high energy intensity from tax or trade schemes.

If the proportion of CO2 emissions is to be decreased, the scale and combination of fossil fuel use should be changed extensively to decrease the carbon concentration of fuel production and use. One method is to impose a carbon tax on fossil fuels according to amount of carbon containing the fuel. Pearce (1991) has studied the latest literature on the likely effects of carbon taxes. Barker and Lewney (1991) made further essential recent contributions to the macroeconomic modeling of environmental policies, and Sondheimer (1991), especially on the macroeconomic impacts of carbon taxes. Boero, Clarke and Winters (1991) gave a broad review of the long term macroeconomic results of greenhouse gas reduction. However, none of these researches consider the impacts of a carbon tax on prices of non-fuel domestic consumptions, although about half of all CO2 emissions are related with the production of products by industrial activity.

Several policy measures can assist develop a price on CO2 emissions: carbon or energy taxes, the deduction of environmentally risky subsidies, tradable permit schemes and the project-centered flexibility instruments of the Kyoto Protocol to the United Nations Framework Convention on environmental quality (OECD, 2007). Although, all OECD countries have exercised one or other instruments to some degree, but the main concern is to spread their use and connect them in order to deliver a strong and stable price indication across all CO2 emitting activities. Introducing an international carbon price not only decreases the total costs of CO2 emissions, but also aids to equal the playing field between countries, hence addressing issues about the likely impacts on effectiveness of environmental

degradation policies. The OECD countries impose energy taxes to some degree, whereas a few nations levy carbon taxes. Such approach of taxes to reduce CO2 emissions can be predominantly cost effective. However, OECD have time and again decreased their effectiveness by delivering energy tax rebates or relief, generally for the most energy-intensive or polluting sectors where reduction costs are mostly low.

Moreover, there are secondary advantages to the control of greenhouse gas. The two major technological reactions are the exchange of low carbon fuels for high carbon fuels and energy preservation in the sense of cutbacks in the ratio of carbon-created energy to economic activity (Pearce, 1991). Both technological reactions have the influence of decreasing traditional air pollutants i.e. sulfur oxides, nitrogen oxides and other moving particles. Therefore, the advantages of decreased amounts of these contaminants can be totaled in as advantages to CO2 abatement strategies. This arrangement of ambiguity, permanence, expected early low control costs, probable very high impairment costs in the lack of activity, and possibly high mutual advantages from control recommend that the strategy attitude on global warming should be relatively challenging.

International trade results in a geographical split-up of consumers and the pollution produced in the manufacture of consumable things (Peters and Hertwich, 2007). This provides a base for consumers to transfer environmental pollution allied with their consumption to remote areas. For national pollutants this may be considered as a typical choice for consumers, however for international pollutants such as greenhouse gases (GHG), consumers will endure the costs irrespective of where production takes place. As a result, one would anticipate the best policy for international pollutants to think through the consequences of international trade. Many of the discussed matters of the Kyoto Protocol are displayed in international trade costs, effectiveness, carbon emissions, and so on and probably illogically reorganizing international trade may support alleviation and boost sustainable development.

Traditionally, international trade has played an important role in economic development by providing a footing to efficiently allocate resources, generally labor

and capital. But, without completely and regularly assessing externalities, production may take place in areas with inferior environmental performance or with low-standards environmental regulation. This split-up of consumption and production has initiated many studies on the pollution personified in international trade, first and foremost air pollutants. These studies have pointed out the level and strategic significance of pollution personified in trade for specific countries or small set of countries. In spite of this, there is a strong need for more extensive research worldwide to facilitate contribution for climate policy study.

However, a little research has been conducted on how trade may affect climate policy, keeping in view the political pomposity related with trade and effectiveness problems in climate policy. If a country has an enormous portion of its exports in pollution-concentrated production, then there may be huge actual or apparent economic cost allied with contributing in a worldwide climate administration. If the climate administration has insufficient contribution, then there is a threat that production will gradually more transfer to noncontributing countries. Either industries may shut down and transfer to noncontributing countries, or more challenging, extended production may takes place in noncontributing countries as is evidently confirmed by the prompt growth of production in China. Additionally, with progressively more production worldwide, most low cost alleviation preferences may be situated outdoor to the country of consumption. The Kyoto Protocol makes an effort to highlight this subject with the help of Clean Development Mechanism (CDM), however evidence proposes that the CDM has not been competitive to accomplish its objectives.

In the later-Kyoto period, there have been many suggestions for climate policy that address problems for instance, economic costs, equity, elasticity, and environmental competitiveness. Very limited suggestions have considered whether international trade may be emphasizing some of the issues with the Kyoto Protocol. International trade has been argued as a mode to impose climate policy and there is growing concern to apply trade-centered procedures such as border tax revisions.

It is the stage now to look firm at the engineering possibility of transformative technologies that can modify the manner primary energy itself is generated (Hoffert et al., 1998). It is within the choice of climate change and effect estimates that maintenance of atmospheric CO2 at some level below the reference line is essential to alleviate great opposing effects on international economies and environments. In that situation, an immense integration of innovative energy-creating technologies at the required scale could be desired to avoid risky anthropogenic intrusion with the environmental quality. Studies of carbon emissions goals so far have to a certain extent convincingly highlighted market economics theory. Some recommend that market forces single-handedly, possibly accompanied by carbon taxes, are enough to encourage satisfactory levels of innovation in emission-controlling technologies. On the other hand, market inefficiencies may prevent timely improvement of such technologies at the necessary scale.

1.1 Background of the Study

Recently, researchers have examined broadly the greenhouse effect, which suggests that the increase of carbon dioxide (CO2) and other greenhouse gases (GHGs) are likely to create global warming and other important climate changes over the subsequent period. For example, recent study conducted by Bolin, Doos, Jager and Warrick (1986) regarding the environmental quality recommends that up to 2050, the emissions of air pollutants (greenhouse gases), mainly CO2 probably results in foremost and potentially irreversible modifications in climate globally. It appears that a significant rise in the amount of CO2 emissions is expected in the coming period. However, perhaps certain potentials would be present for control the expected rise by applying appropriate cost-effective and technical procedures on international level (e.g. Svennigsson, 1985).

Moreover, the Intergovernmental Panel on Climate Change (IPCC, 1990) and the Second World Climate Conference (October 1990) report that besides the scientific research which have created rising apprehension and calls for radical

limit on the emissions of greenhouse gases. In addition to all aims and commitments, global warming is irrevocable. The findings on costs supports conflicting thoughts, from serious uncertainties over the economic capability of the industrialized world to reduce emissions adequately to avoid probable disasters, to findings that curbs in reality have tolerable rates of return even without totaling the utility of abridged warming (Pearce, 1991). Though, most analysts look satisfied that the early tranche of curbs that may be called for by a global agreement on greenhouse gases could be protected economically. Future tranches would definitely be more costly, mostly when the costs of assisting unindustrialized nation greenhouse gas replacement are included in developed nations costs. Up till now, these appeals to supports for dynamic procedures to decrease greenhouse warming have been made without any thoughtful effort to consider the costs and benefits of climate change or substitute regulator approaches (Nordhaus, 1991). In assessing climate-change strategies, the projections for global warming and the relationship between human deeds and the emissions of greenhouse gases form a major structural unit. As a consequence of the accumulation of a number of greenhouse gases, it is anticipated that substantial climate changes will take place over the subsequent period.

Hoffert et al. (1998) suggests that stabilizing CO2 emissions with persistent economic growth will need innovative, cost effective and zero-carbon-emission technologies that can deliver extra power in the coming period and surely by 2050, even with continuous development in the economic output of primary energy, particularly in emerging countries. However, there is no such competent technology with energy systems today that can generate the prerequisite quantities of zero-carbon power. Some suggest that the solution of the problem may be the combined energy systems constructed on fossil fuels in which CO2 is confiscated in reservoirs sequestered from the atmosphere. Even with likely severe environmental and cost problems, these techniques would permit fossil fuel, progressively more coal, to sustain its historic increase as the main energy source of the subsequent period.

Worldwide environmental issues are described by the environmental impact on each country only reliant on the global combined emissions of some detrimental material, and not characterized by just each country's input to these aggregate

emissions (Hoel, 1989). Environmental issues associated with the CO2 emissions and the worldwide climate is very severe by their nature. In addition, their universal oddity makes them very hard to address. Each country's own input to global emissions is minor, so individually a country's can do a little effort. Therefore, coordinated set of efforts are required worldwide between countries in order to address global environmental hazards, which is hard to exercise unless proper institutions are established that can create and implement global resolutions. Clearly, environmental groups are frequently discouraged by the prisoners dilemma sort of condition which describes worldwide environmental issues. They time and again support that instead of the global attraction of the issue, a country must make individual efforts to decrease its environmentally risky emissions. The argument for such individual efforts is that they give an input in the correct path with their minimum possible struggle, and also that by setting a role model of such kind of attitude one might change the conduct of other nations, and / or increase the likelihoods of accomplishing global contracts of coordinated abatement of risky emissions.

Global communities are trying to reduce the adverse effects of global climate change due to CO2 emissions. This effort is committed to the practical establishment of the global environmental policies following by all the key producers of CO2 emissions. In 1990, CO2 emissions in US and Japan were 19.323 and 8.873 metric tons per capita respectively while in Pakistan, Turkey, South Africa, Mexico and Colombia, the emerging countries of the respective continents, they were 0.637, 2701, 8.692, 3.671 and 1.673 metric tons per capita respectively. By 2007, US and Japanese emissions change to 19.237 and 9.783 metric tons per capita respectively. But, during the recent period these countries have experienced deep physical changes that keep on effecting the development of local CO2 production, with conceivably negative outcomes for international alleviation policies.

1.2 Supporting Theories

1.2.1 Environmental Kuznets Curve (EKC)

The environmental Kuznets curve (EKC) is an assumed relationship between several elements of income per capita and environmental degradation. In the initial phases of economic growth, pollution and degradation rise, but the movement opposites after reaching some optimal degree of GDP and hence economic growth at high levels of income results in the improvement of environment. This suggests that the relationship of income per capita and environment is a U-shaped curve.

Besides, the Environmental Kuznets Curve (EKC) theory has got much importance in academic and strategic level during the most recent decade. Due to long term consequences of the EKC that economic development is worthy for the environment; taking the EKC at fundamental value is fairly striking. Since the discussion have substantial significance for national and global strategies strategy creators wherever has given careful consideration to the advantages and disadvantages of the EKC theory.

1.2.2 Pollution Haven Hypothesis

There has been a great deal of discussion regarding the relationship of inward FDI and the quality of the environment. The pollution haven hypothesisis the most well-known hypothesis that supports the connection between inward FDI and environmental quality. According to the pollution haven hypothesis, industrialized countries shift pollution intensive industries to less industrialized nations which have lax environmental controls, and thus it makes a significant contribution of skilled environmental labors in addition to others standards. A lot of studies in the literature consider the importance of environmental pollution and FDI inflows. Although, the exact findings demonstrate that outcomes differ from nation to nation. While a few studies are established in the support of the pollution haven hypothesis, others reflect no supporting confirmation. Thus, emerging

nations move toward becoming more polluted regions and endure high degraded environment.

1.2.3 Pollution Halo Hypothesis

The pollution halo hypothesis is the alternate hypothesis that signifies that global companies shift their efficient, clean and advanced technologies to emerging nations. Consequently, inward FDI may improve the quality of environment.

1.3 Problem statement

Many studies examined the effect of economic development on environmental degradation in different countries. Here, we also made an effort to highlight this issue by studying the relationship in the context of global panel of countries. However, besides the reform process, there is a confirmation of decreasing energy use; it remains uncertain for a significant number of these nations what course economic production will take after, or whether it is conceivable to transform into increasing CO2 emissions in the coming days.

1.4 Research Objective

This study makes an attempt to explore the relationship between economic development and environmental degradation.

1.5 Research Question

The fundamental strategy question for policy makers will be,

Should environmental degradation be a primary concern besides economic development or should countries focus on economic development regardless of the care for environment?

1.6 Significance of the Study

Our study makes an attempt to examine the global environmental problem by studying the relationship between economic development and environmental degradation, though spreading the debate to the global panel of countries including the developing countries such as Pakistan. Pakistan and other developing countries are moving towards industrialization and the world is moving towards global warming. This study makes an attempt to investigate the impact of business proxies on CO2 emission. It is very important we humans want to live on this planet and we, Pakistanis want to live in this area of the planet.

Chapter 2

Literature Review

Over the last few decades, Nicolas Georgescu-Roegen (1971) claimed that the dynamic economic process eventually developed through the entropy law. But, the principal view that should be kept in mind is that the concept of the entropy law is dynamic and generally, the modifications in the concept of economic analysis suggests modifications in the concept of the entropy law, but particularly in the evolutionary economic analysis. According to the classical concept of the entropy law and the economic process (Georgescu-Roegen), the classical concept of the entropy law is related to the economic analysis when this type of study began its journey. The view that the economic systems are dissipative structures has been protracted through the addition of auto catalytic of self-organization. (Foster, 1997; Witt, 1997). Moreover, Foster and Witt said that in complex economic systems, self-organization is the basic process. As compared to the biological systems that quantify less energy, economic systems, indeed, may be thought as knowledge based structures that have the ability to amount more energy. Unlike the traditional economic system that used fire, water and wind, the modern economic systems use fossils fuels and nuclear power especially for the delivery of high quality electrical energy and is therefore has been seen on the move from traditional to modern technology. Hence, the creation of new knowledge in the market results in the growth of structural complexity in the economic systems.

On the other hand, when there is higher economic growth, there will be higher production along with higher utilization activities that will fulfill human needs,

leading to higher levels of pollution, wastage, and burden on environmental assets (Georgescu & Roegen, 1971; Daly, 1977). As a result, economic growth beyond the reasonable limit of the environment is excessive as well as harmful over the longer period to human well-being. It is not remarkable for them to support that unnecessary growth must be reduced in support or a low or adjusted state economy to keep away from future environmental disaster. Most of the researches have given consideration to economic and financial development along with the environmental degradation. All these are considered important factors responsible for the environmental performance.

In an economic climate, in the space of organizational environment, it could be assumed that there is a driver that drives economic system through the acquisition of knowledge due to the fact that the energy usage can be increased by the creation of new knowledge. The principal view is that the growth and development of economic system results in the maximization of energy usage, develops more complicated structures, advent of greater diversity, giving rise to more hierarchal levels, and improvement of knowledge structures and their relative significance. Economic systems are extremely developed ecosystem that has connected a new element-knowledge that empowers them to outspread their structured complexity, and harmoniously, their dissipative potential (Miller, 1999; Potts, 2003). The school of modern evolutionary economists claims that as new knowledge produces, it increases structural complexity that ultimately results in the evolution of economic systems (Raine, Foster and potts, 2006). When creativity and productive cooperation grows, it leads to knowledge which in turn results in economic self-organization (Foster, 1997). Therefore, selection processes determine innovation that has tried to improve energy usage. In evolutionary economics, however, this is the modern concept determined by remarkable increase in knowledge and human population in the last 200 years. This has been subject to the spread of market economies that rely on internationally adopted set of institutions that develop the means to create, produce, distribute and consume goods and services. So, the co-evolution of knowledge and energy transforming structures results in the evolution

of economic systems. In order to overcome energy transformation problems, socio-economic systems explore and apply knowledge to procure innovative solutions. Hence, the increase in the application of knowledge, energy can be transformed that leads to economic self-organization. The development of perception and the design of intellectual representations of reality are highly connected with the development of socio-economic complexity which the people share with each other (Foster, 2005). So, in the development of structural complexity, economic systems are separated by the obvious role of knowledge.

According to Daly (1977), a steady-state economy is preferable to the growth economy. However, such a theoretical alternative is of great importance until and unless there is satisfaction with the normal growth economy. So, in the idea of growth, there is a notion of maturity and abundance, beyond which that point physical accumulation gives rise to physical maintenance, i.e. growth gives rise to steady state. Evidently, it is not possible to get sufficient of a good thing. Growth has some limit beyond which it will not give you fruits as it has its costs. But what is the criterion that determines the optimal point and when will we reach to its limit? This question can be answered by a hypothetical answer from any good economist. When marginal benefits and marginal costs become equal, then growth in GNP stops. However, there is no any such measure that tries to quantify the costs of GNP. In order to protect ourselves from the adverse effects of productions, we use the actual cost of rising GNP by using the defensive expenditure measurements and add these costs to the GNP instead to subtract them and consider actual costs as benefits. In fact, we should manage different accounts of costs and benefits. It should be kept in mind that, at least in the short run, there would be an optimal point for zero growth such an analysis is not convenient to the philosophy of growth which rather contradicts the normal principles of fundamental economics. More accurately, it is in fact a fair strategy to acknowledge the hypothetical presence of such matter in the future. The conceptual causes for this are prominent and are linked with the difficulty of supply of productions in an economy that represents the automatic technology and have the high concentrations of ownership of land and capital. High net investment results in high

collective demand to balance the large savings from concentrated income in order to have full employment with good wages. So, high net investments determine rapid growth.

Contrary, the most prevalent logical reasoning is that we should have high growth in order to be sufficiently rich to bring the level of costs to an affordable level where we can reduce pollution and discover new resources. Economist Neil Jacoby (1970) argues that an increasing GNP will allow a country more easily to afford the costs of reducing pollution. If there is growth in the economy, the environment will also be good if care is taken. It requires a great deal of encouragement and devotion to clean up the environment and make it better place to live rather than make an effort to minimize the resources accessible for productions. If the limiting growth approach is ignored and everybody is allowed to do more, then we will have sufficient resources and perform the environmental job (Wallich and Henry, 1972). Everyone will admit that all our economic difficulties would be easily solved, if we had enough resources and are in fact richer. Yet, again there should be an intersection point of marginal benefits of physical growth and marginal costs beyond which further growth is uneconomic due to the fact that we consider real costs as benefits and rather add these costs to the benefits.

The main reason behind this ordinary point of decrease in marginal benefits is that clever people prefer to fulfill their most demanding wants first, whether in the form of an alternate uses of a single commodity or in the form of alternate uses of income. While the increase in marginal costs indicates that clever people knowingly, first damage the most manageable land and minerals, in a situation where the increase of one activity has to be foregone, clever people will fore go the least significant substitute activities first.

Economic physician induce environmental degradation disease who prescribe unlimited production with an effort to cure the basic illness of unlimited wants (Daly, 1977). However, a disease cannot be cured properly by rather just increase in the dosage for treatment. According to Wallich (1972), growth is an alternative for balance of income, and the growth is connected with the hope that results in large tolerable income. We are dependent on large imbalances in wealth and income that

is why we are dependent on growth. We cannot feed the poor; if we feed them then our future growth will be cut down. Despite of growth we are still poor. It should be kept in mind that growth is a surplus amount being reinvested and only the owners of that surplus amount take that benefit but not the poor. According to Robinson (1972), growth never control even the subjective poverty, rather it increase that absolute poverty. Growth is connected with the technical advancement and technical advancement change the arrangement of labor force, giving more opportunities to educated staff and fewer to uneducated ones and qualifications are reserved for already selected families who may not have technical expertise.

According to Daly (1977), technology is the rock base upon which a growth-men live. It is likely that growth-men should start to provide technology with certain thickness and strength as the base of growth must be strong the thing that increases in quantity. Going some steps further, some economists discover that in fact we can consider technology as a kind of antibody to pollution and depletion germs. Eventually, we can say that as technology grows exponentially, so it can be concluded that depletion and pollution also grow exponentially (Meadows et al., 1972). It is correct that technology grows exponentially with the increase in growth and we should protect ourselves before we may reach at a saturated point. There is no other certain criterion on which this assumption is based. Obviously, however, it is not relevant to rely on the assumption of exponential growth of technology, we should not entirely agree to the limits to growth (Commoner, 1971). Growth economists Beckerman (1974) claims that it is essential that mis allocation of the resource at any period results in unnecessary investment in an attempt to prove that the growth rate is not necessary. Once, man was totally reliant on environment now he is possibly worried about it (Fisher and Peterson, 1976). Apparently, due to technology, man has become gradually free of his environment. However, indeed, technology has just replaced nonrenewable resources with the renewable ones which are an increase in dependence rather than decrease in dependence. A man cannot be independent of his environment without decreasing pollution and depletion; instead he will increase his interdependency. Man and

environment are wholly interdependent on each other and thus cannot be separated from each other. This interdependence will not decrease in the present as well as in the future, irrespective of technology. A non-growth situation can occur in two means, i.e. the inability of a growth economy or as the achievement of a steady-state economy (Daly, 1977). These two situations are considered as day and night. Everyone knows that inability to grow results in unemployment and distress.

There has been a great deal of discussion regarding the relationship of inward FDI and the quality of the environment. Two contradictory hypotheses have been introduced in past research: the pollution haven hypothesis and the halo effect hypothesis. The pollution haven hypothesis is the most well-known hypothesis that supports the connection between inward FDI and environmental quality. According to the pollution haven hypothesis, industrialized countries shift pollution intensive industries to less industrialized nations which have lax environmental controls, and thus it makes a significant contribution of skilled environmental labors in addition to others standards. The pollution haven hypothesis proposes that MNCs will group more into nations where environmental controls are flexible. This approach may damage the environment in the home nation if the issue is not given important consideration. The pollution halo hypothesis is the alternate hypothesis that signifies that global companies shift their efficient, clean and advanced technologies to emerging nations. Consequently, inward FDI may improve the quality of environment. Thus, emerging nations move toward becoming more polluted regions and endure high degraded environment.

Who should assume the essential liability for greenhouse gas emissions? Nations that produces the goods and services or the consume nations? The emerging nations will normally endure environmental degradation when they release CO2. These issues have prompted broad and warmed verbal debates everywhere throughout the world. Presently, research regarding the relationship between economic globalization and environment has concentrated on the assessment of pollution haven hypothesis (PHH) which expects that free trade will lead to the formation of PHH in emerging nations as pollution-demanding companies are shifted

from industrialized nations that charge strict environmental by-laws to emerging nations. Consequently, emerging nations make progress toward becoming more polluted with globalization and FDI inflows. Pao and Tsai (2011) demonstrated a connection among FDI, economic growth and CO2 emissions, and in a linear logarithm quadratic shape, with a perspective of examining the legitimacy of the EKC, and reasoned that there are solid dynamic interrelationships between production, energy use, environmental pollutants and FDI, which need to be examined in the same multivariate context.

The outcomes are both hypothetically and practically combined. Though, there is a lot of indication recommending that remote MNCs have a tendency to move the pollutants firms in emerging nations with less strict environmental controls as opposed to the industrialized nations, where the environmental controls are extremely firm. Subsequently, FDI can originate more emissions in the host nations subject to the idea of and the intentions behind the MNCs. The impact of FDI on GHG emissions specifically has additionally been a matter of discussion in the literature. The past research e.g., Hoffmann et al. (2005) and Hassaballa (2013) have given reasonable explanations to utilizing GHG (especially CO2) emissions as an intermediary for pollution in broad context. According to their analysis, CO2 is a critical basis for global warming, and the variable is exceptionally associated with such familiar pollutants as nitrogen oxide and sulfur dioxide.

This subject has got significantly less consideration from academic researchers related to the comprehensive literature examining the association between economic growth and CO2 emissions and between economic growth and FDI. The recent researches conducted by, for example, those by Smarzynska and Wei (2001), Xing and Kolstad (2002), Eskeland and Harrison (2003), He (2006), and Zhan (2011) report a positive association that keeps running from FDI to pollution emissions in the host nations. It is, nonetheless, important that the majority of the current researches have given considerations to the fundamental impacts from FDI inflows to CO2 emissions. Just limited empirical researches have concentrated on the two-path relationship between FDI and CO2 emissions (Pao and Tsai, 2010). The literature demonstrates that economic growth needs more FDI inflows, in any case,

these FDI inflows may, thus, raise the CO2 emissions and result in environmental degradation. The connections between these factors are very hard to demonstrate, as well as they can also work together and be assessed at the same time.

Olofsdotter (1998) examined 50 industrialized and emerging nations found that growth in FDI positively affects the growth rate just for the nations with a larger amount of established ability. Additionally, Alfaro et al. (2004), demonstrate that FDI positively put an impact on economic growth in more developed economies. Such findings demonstrate that the growth is depended upon the economic and technical situations across home nation. Specifically, it gives the idea that industrialized nations need to achieve a specific level of improvement, in terms of education as well as infrastructure, before they come across potential advantages related with FDI (Hansen and Rand, 2006).

Moreover, there is a large group of studies connecting environmental pollution and foreign direct investment (FDI) across various emerging nations in addition to developed nations (Eskeland and Harrison 1997; Wheeler, 2000; Letchumanan and Kodama, 2000; Beladi et al., 1999; Talukdar and Meisner, 2001; Smarzynska and Wei, 2001). Literature suggests many different economic methods of reasoning that support the association between the inward FDI and the environmental quality. According to Jensen (1996), lax environmental control in a home nation attracts a significant portion of FDI and hence organizations willing to implement expensive regulatory system in host nations. Furthermore, the pollution halo hypothesis exercises widespread environmental regulations which attracts FDI and hence promotes efficient and cleaner technology in home nations (Birdsall and Wheeler, 1993; Zarsky, 1999). Lastly, a scale effect would emerge to the degree that multinational FDI tasks would substantially add to a host country's industrial yield and thus pollution level as a whole (Zarsky, 1999).

The portion of aggregate foreign direct investment (FDI) inflows to less industrialized nations as a portion of aggregate world FDI has grown from 25% in the 1990s to 31% in the 2000s. These inflows have been supported and invited by fewer developing countries as a result of the critical part they play in household economies as a basis of growth and employment creation (Borensztein et

al., 1999). Although, there is a strong need that less developing countries could efficiently destabilize each other's environmental controls to draw in FDI (Elliot and Shimamoto, 2008). This competition in fewer developing countries may bring about these nations getting to be "pollution havens", where multinational companies (MNCs) find tasks to save costs on environment (Grossman and Krueger, 1991; Mani and Wheeler, 1998). In this situation, the MNCs having more to acquire from migrating are located in the most pollution escalated or pollutant industries. Thus, as less developing countries keep on attracting considerable shares of FDI flows, it is essential to make an evaluation of the movement of FDI to less developing countries and determine whether it leads to higher levels of pollution.

FDI inflows create scale effects as well as composition effects when studied under the short run. It is harder to investigate the relationship between inward FDI and pollution due to the scale effect, composition effect and technique effect (Grossman & Krueger, 1995). The scale effect is the process when the pollution emissions and resource depletion starts decreasing and FDI inflows lead to increase in economic growth. Inflows of FDI may grow economic situations in home nations. Emissions of pollution should rise when such economic situation persists. The technique effect may assist decrease pollution and thereby improve the quality of environment. International companies may shift technology that is advanced and safe. Technological exchange adds to enhanced energy proficiency and emissions cut down. The environmental outcomes of composition effect may be good as well as adverse (Jalil & Mahmud, 2009). Lax environmental control in home nations draws in arrival of pollutant capital which results in the growth of polluting sectors. Conversely, the composition effect refers to the modification in polluted products in income per capita. Such effect may happen due to change in a price supporting their production. Income growth may change the demand of comparatively cleaner products may have a positive impact in long run on the environment (Dean, 1999). This leads to the drop of the portion of pollution-intensive products in production, decreasing the pollution emissions. This impact would reduce overall pollution when the scale of the economy is constant and there is no alteration in the emissions

concentration in every industry. The opposing scale effect, at low income and production levels, is by all accounts more conspicuous leading to entire environmental degradation because of inward FDI as showed by the increasing movement of the Environmental Kuznets Curve.

In spite of extensive research, the relationship between FDI and CO2 emissions is unidentified. The relationship has many hypothetical conflicts as well as empirical evidences are indecisive. Many researches analyze several nations, but the nations alter the outcomes. One assumption is that FDI impacts carbon emissions. According to Smarzynska and Wei (2001), inward FDI increase CO2 emissions across home nations. Hence, the pollution haven hypothesis supports such analysis. Pao and Tsai (2011) found that FDI has damaged the environment and that the PHH is acknowledged for these nations after doing analysis on the BRICS nations (i.e., Brazil, Russia, India, China, and South Africa). Using a board co-integration basis for the active associations between CO2 emissions and FDI, Pao and Tsai (2011) found that FDI positively affects CO2 emissions. Al-mulali (2012) employed panel data to shape a model to set up the connection between economic growth, energy use, FDI net inflow, add up to volume of exchange, and carbon emissions in 12 nations of the Middle East, and the conclusion shows that the inflows of FDI into the Middle East increase the region's carbon emissions. Shao et al. (2011) developed an ICE-STIRPAT model to examine the impacts of Shanghai's economic development, investment scale, strength of R&D, energy competence, and energy use structure on carbon emissions after carrying out a robust analysis on the model by developing data on FDI, and found that the increase of FDI adds to China's carbon emissions. The views of Borhan, Hitam and Lee (2013) recommend that FDI lead to increase in pollution and more FDI inflow is associated with high level of CO2 emissions. The study conducted by Acharyya (2009) suggests that FDI positively affect CO2, which supports the pollution haven hypothesis. Another deduction is that there exists a negative link between inward FDI and CO2 emissions. For example, List and Co (2000) observed that FDI is significantly and positively associated with energy productivity and negatively associated with

CO2 emissions. This argument is supported by Tamazian et al, (2009) who advocated that financial development and FDI inflow aid decrease CO2 emissions across BRICS nations. Nonetheless, in a research by Sbia et al. (2014), after doing analysis with time series data discovered that FDI inflows into the UAE would results in lower levels of energy use as well as CO2 emissions. Similarly, Merican et al. (2007) identified the same outcomes. Zhou et al. (2012) show negative relationship between FDI and CO2 emissions, which bolster the Porter theory: Moreover, Lee and Brahmasrene (2013) identified negative relationship between inward FDI and CO2 emissions across Europe. According to the observations of Al-mulali and Tang (2013), FDI inflow reduces carbon emissions in gulf nations, thereby going against the pollution haven hypothesis. After analyzing comparative outcomes in 20 emerging nations, Mielnik and Goldemberg (2002) proposes that there is insignificant relationship between inward FDI and CO2 emissions. This argument is supported by Perkins and Neumayer (2009), who observed that inward FDI puts insignificant impact on CO2 productivity. Also, Hoffmann et al. (2005) found no active connection between inward FDI and CO2 emissions in developed nations. Similarly, Atici (2012) inferred that there is no significant association between FDI inflow and CO2 emissions. Using the panel data of 19 countries, Lee (2013) concludes that FDI is insignificantly related to CO2 emissions. The consequences of Al-mulali and Tang (2013's) research show that energy use and GDP growth are the origin of pollution in the Gulf Cooperation Council (GCC) nations and not the FDI inflows. After conducting an analysis on data in 20 emerging nations within a short time period from 1987 to 1988, Goldemberg and Mielnik (2002) found that the decline of energy quantities is steady with the expansion of FDI. Zhang (2011) used a co-integration test and Granger causality on CO2 emissions, per capita GDP and FDI and make a finding that FDI has a little effect on the environment of China. FDI can lessen CO2 emissions by initiating modern and efficient technology. These differences in the thought regarding the association between inflows of FDI and environment are due to different phases of economic growth as well as different environmental controls. The current literature is restricted to a nation or to a region-specific research and neglects to reveal insight into the structure

dissimilarities of businesses into which FDI inflows. Thus, strategists face greater challenges in defining focused FDI strategies.

One of the essential issues that exist in present work is that, up till now, no particular causality investigation of the common connection between these two factors has been directed. The cause is that adequately lengthy time-frame arrangement essential for applying Granger causality tests are not presently accessible. Although, late hypothetical improvements in strategies of Granger causality resulted in tests utilizing generally brief period arrangement conceivable using panel data (Larrain et al., 1997; Hurlin and Venet, 2001). The present investigation is planned to make application of this new method to conduct a devoted test for both the presence and course of any cause and effect between FDI and pollution.

In the view of some researchers, apart from being risky FDI make significant contributions to environmental safety. With the help of FDI, countries can reduce air pollution by transferring efficient technology for production (Stretesky & Lynch, 2009). In contrast, most of other researchers claim that FDI increase air pollution. In their view, FDI encourages economic growth by increasing efficiency, which ultimately results in higher energy use. Higher energy utilization increase CO2 emissions which eventually cause environmental pollution. Moreover, developed countries may reduce their production costs by choosing to invest in under developed countries having lax environmental regulations, which also cause an increase in the degree of energy use in the nation (Jensen 1996; Acharyya 2009; Lau et al., 2014). Since lax environmental controls allow companies rise the level of carbon emissions, yet it draw in FDI and its extent of inflow. The pollution haven hypothesis supports this association.

There is more comprehensive study in the literature regarding the relationship of carbon emissions, which is the major contributor of greenhouse gas associated with global warming. As claimed by Meadows et al. (1972, 1992), although in the long-rum, it is being a risk to the environment, however, economic growth is by all accounts fundamental to save or enhance the environmental quality, in any event in the short-run. In the context of economic growth and environment,

many researches in the economic literature explore the connection between carbon emissions and GDP. Indeed, knowing the nature of the relationship between CO2 emissions and economic development prompted noteworthy consequences regarding strategists as numerous industrialized nations do not agree decrease their degree of emissions in light of the fact that carrying out such action would steady their economic growth.

The recent research regarding the greenhouse effect belongs to William Cline (1992) due to his significant contribution to the discussion of the public policy. Cline claims realistically that unlike conventional models that used a short term view, the phenomenon of greenhouse effect, however, needs a broader perspective as it results in the increase of more warming as well as more loss. It can be deduced that in this fashion, economically it is possible that the analysis of costs and benefits permit a global resolution for pollution reduction. But, the economic possibility does not convert into political possibility although the economic analyses put forward by Cline are complete. The economics of global warming is no doubt an addition to the current discussion; however this phenomenon also determines the basic requirement for a disciplinary attitude across the globe in an effort to combine global as well as national policymakers in a clear and a systematic way.

Most of the empirical analysis of the greenhouse effect has paid much attention to the benchmark doubling which is the imaginary percentage of environmental CO2 emissions. The double concentration of industrial carbon dioxide that emits into the atmosphere is called Benchmark doubling and causes a temperature increase of almost 2.5 degree Celsius. If it increases in such a fashion, benchmark doubling is probably to happen after 10 to 20 years. Due to comparatively higher cost of controlling such an increase, majority of the empirical research suggests no effective action in decreasing environmental pollution.

According to Cline (1992), the application of benchmark doubling was unable to address long-term costs, biasing costs and benefits results in indecision regarding decrease in CO2 emissions thereby making reduction very expensive as compared to the possible gains. Although, there is comparatively a novelty in the view of Cline, it is hardly applicable. In fact, if the global warming is a reality, then most of

the conventional environmentalists stick to a conclusion, cost and benefit analyses related to pollution reduction is ambiguous and must be revised. At present, it is completely a different question as to how many such future benefits the people will value. The interesting section of Cline's research is the review of discounting even though it is normally a non-exciting debate for most people. Cline argues that public investment project studies normally use a discount rate of 5 to 10 percent which are simply not suitable to study the greenhouse effect due to the fact that they result in more disastrous economic losses in future seem minor in current time, hence skewing strategy on the way to indecision. His debate evaluates the works of many economists. According to the conclusion of the economics of global warming, untiring reduction effort is acceptable economically. Such consequence has apparent strategy suggestions. A great deal of global collaboration should be required in order to reduce greenhouse gases.

Policy suggestions of Cline are not achievable due to free-rider problem. The total percentage of CO2 emissions by the world's top economies such as the US, Russia, and China are 40 percent, and possess above 60 percent coal reserves of the world. Such countries signify the leading economies as well as markets of the world, if they want to stay in polluting the world; it would not be feasible for trade agreements by developing nations to be effective against these developed nations. Although Cline does a remarkable work of addressing some significant problems, especially agriculture, he remains other underdeveloped. Global warming damages the economy for last 300 years so perhaps attention should be paid to study costs and benefits as well as discount rate. Though, Cline highlights such issue however, he is not able to extend it adequately due to the fact that politician are dedicated to short term priorities and do not pay attention to the Cline's long-term recommendations.

The prevalent statement is that, in developing countries, free trade will raise environmental degradation (Birdsall and Wheeler, 1993). In developing countries, there are three main causes to assume increased pollution strength. Firstly, environmental facilities are ordinary goods; demand for clean water and air are higher

due to higher income in the developed countries. In the same way, at higher discount rates and lower income levels, health and other costs of pollution may be less valued than income additions and employments. Secondly, in developing countries, the comparative costs of reviewing and implementing pollution principles are higher, with a lack of qualified staffs, problems in getting advanced equipment, and the high marginal costs of committing any new administrative action when the main strategy focus is to reduce fiscal problems. Thirdly, in developing countries, growth is associated with a conversion from agriculture to industry with fast urban growth and heavy investment in urban infrastructure; this more seemingly determines increase in the levels of pollution for each unit of production. On the other hand, in developed countries, growth is linked with a conversion from industry to services, and so results in low levels of pollution for each unit of production. These variations in structure are consistent with variations in comparative advantage and would be protected by free trade. Therefore, increasing pollution strength in developing countries may simply determine variances across countries in terms of comparative advantage costs of various combinations of pollution activities. Many economists contribute to this interpretation, claiming that although free trade and increased openness raise environmental difficulties in developing countries, even then it should not be resisted. However, there are two problems with this approach. First, if the social costs associated with pollution are not properly revealed in current environmental standards in developing countries, then free trade results in the increase of those social costs, probably even concealing the conventional economic additions of openness. While the secondary measurements to report the pollution problem could be deliberated, the inability to apply such measurements admits that they could not be easily designed or implemented. Moreover, entire world pollution may increase. Eventually, this would levy further costs on developed countries if some activities of pollution have adverse effects on environment. Second, the proposition that free trade and more open economies will result in more degraded environment, may not be correct. From a strategic point of view, off course, this would mean that main assumption is being ignored in favor of more openness and that probability of happiness for

environmentalists and economists is being minimized.

Alternatively, in developing countries, labor is comparatively more abundant; there is also a proof that pollution-intensive industries are normally capital-intensive sectors. Frequently, as compared to the manufacturing country, exports often meet higher product standards. For some industries, an export-focus economy will have the cleaner methods. Hence, cleaner products require cleaner techniques. Wherever, any foreign investors invest, they may simply levy a common international emission standard. Investment in the latest technology will be increased as a result of openness and resulting competitive pressure due to the fact that the cleaner technologies will be imported from other countries with higher pollution standards. Such technology will make the overall productivity more efficient. The use of modern and most efficient technology represents cleaner techniques; this will lead to the reduction of overall emissions. If for new investments, the costs are low in order to be clean, then increase in overall growth rate seems to encourage cleaner techniques.

Everlasting and recyclable natural assets serve as inputs into the manufacture of many goods and services (Grossman & Krueger, 1995). If the structure of output and the methods of manufacturing were irreversible, then loss to the environment would be intimately connected to the scale of worldwide economic activity. However, considerable evidence advocates that development results to a structural transformation in what an economy operates (Syrquin, 1989). And communities have revealed significant skill in connecting new technologies to preserve limited resources. In general, the determinants resulting to change in the arrangement and methods of production may be adequately strong to more than balance the negative impacts of greater economic movement on the environment. The study on the probable environmental effects of a North American Free Trade Agreement Grossman and Krueger (1993) examine the practical relationship between national income and indicators of environmental quality. Selten and Song (1992) and Holtz-Eakin and Selden (1992) also used the same techniques to compare the indicators of income per capita and the expected rates of many air pollutants emissions. The World Bank Development Report (1992) also discusses evidence

on the relationship between national income per capita levels and several measures of environmental quality. These researches try an attempt to identify that income and environmental degradation are in the shape of U-curve relationship; with at low levels of income pollution is rising and declining with high income levels.

The central problem of the research that is under consideration is the relationship between economic growth and quality of environment. For a very long time, there has been a great debate regarding the relationship of economic growth and environmental quality. At one side there has been a concept that higher economic growth expectably results in environmental degradation and eventually to likely economic and environmental breakdown. On the other side is the concept that as a result of economic growth, those environmental issues of great significance will be resolved more or less automatically. Due to the absence of significant empirical evidence on how environmental quality varies at different levels of income, the prolonged existence and craving of this debate has captured much more attention. The lack of data has inhibited gathering of such evidence for a large numbers of countries.

In the context of economic growth and environmental degradation, Stern (2004) discusses the important historical aspects of the EKC. According to his analysis, econometric does not support the assumptions of EKC put forward by classical economists and thereby does not form strong foundations for the arguments of EKC. He highlighted the key flaws related to the econometric valuations such as omitted variables bias, heteroskedasticity, and other significant problems associated with co-integration analysis.

The environmental Kuznets curve (EKC) is an assumed relationship between several elements of income per capita and environmental degradation. In the initial phases of economic growth, pollution and degradation rise, but the movement opposites after reaching some optimal level of income per capita, and hence economic growth at high income proportions results in the improvement of environment. This suggests that there exists a U-shaped relationship between income per capita and environment. In the view of recent evidence, there exists a U-shaped

or Kuznets relationship of at least some types of pollution and economic development (Selden and Song, 1993). At first, industrialization and advanced agricultural techniques may result in the rise of pollution, at least for some pollutants; other factors may result in an ultimate reverse movement. The development path for pollution is probably to determine both market forces and alterations in government bylaw. As a consequence, it is judicious to believe that economies would follow through phases of development in which at least some facets of environmental quality first worsen and then develop. The EKC is named after Kuznets (1955) who proposed that as economic development continues income disparity first increases and then decreases. Grossman and Krueger (1991) were the first who introduced the concept of the EKC in the early 1990s, and came with the study of the potential impacts of NAFTA and the popularization concept through the 1992 World Bank Development Report (IBRD, 1992). If the EKC assumption were correct, economic growth would be the key determinant for the improvement of the environment, than being a risk to the environment instead, as the environmental movement and related economists claimed in the past (i.e., Meadows, Meadows, Randers, & Behrens, 1972). This revolution in concept was already started in the evolving thinking of sustainable economic development spread by the World Commission on Environment and Development (1987) in Our Common Future.

The EKC is basically a practical process, however econometrically most literature of the EKC is not strong. Specially, little or no consideration has been given to the statistical characteristics of the data used. There is no existence of the EKC after diagnostic statistics and specification tests were taken into account and proper methods were used (Perman & Stern, 2003). Instead, we capture a more convincing view of the impacts of economic growth and technological alterations on environmental quality. It is likely that as income increases, emissions of most pollutants and flows of waste are also increasing monotonically with income and income elasticity is not a simple function of just income although it is less than one. At all income levels, income-indicators, time-related effects decrease impacts of

environment in countries. Developing countries are too poor to be green (Martinez-Alier, 1995), the new (post-Brundtland) conventional sense is, itself, lacking sense. On the other hand, the scale effect overcomes the time effect by increasing pollution and other degradation. In developing countries, pollution reduction struggles can control the scale effect due to slower growth. The obvious EKC effect starts from this starting point. Contemporary evidence supports the econometric results that, indeed, developing countries are addressing and remedying pollution problems (e.g., Dasgupra, Laplante, Wang, & Wheeler, 2002). Development with delegation of economic activity is also essential for concentrations of pollutants (Stern et al., 1996). Deforestation also results in environmental degradation. Advanced technology is needed for more and efficient replanting, selective cutting, etc. which may minimize deforestation with an attempt to reduce stock pollutants.

Carbon emissions were applied as a measure of the quality of environment for many reasons. Now, carbon emissions are supposed a major contributor of air pollution and the main cause for the problem of global warming, once believed to be a useful by-product of combustion (IPCC, 1996). Controlling and reviewing carbon emissions from several activities have considered a major problem in the current cooperation for aglobal agreement on global warming (Cline, 1992; IPCC, 1996; Revkin, 2000; UN, 1992). In addition, while doing collective analysis at a country level, the latitude of its three-dimensional effect makes CO2 pollution more appropriate. Similarly, the most other existing researches in the EKC history, we also consider that our model show incorporates a lot of related indicators for cross country CO2 variation. Moreover, as compare to the future, the strategy suggestions pointed out in this study seems to be costly-effective when economic and financial improvements are more innovative in countries under discussion.

There are certain reasons to discuss the connection between economic growth and environmental quality. However, the utmost noticeable cause is the financial liberalization as well as growth which may draw in Foreign Direct Investment (FDI) and awesome arrangement of Research and Development (R&D) investments which ultimately results in the improvement of economic growth (Frankel and Romer, 1999, XIA, 1999) and therefore influences the environmental performance. The second

cause is that financial development allows emerging nations to work with an intention and the prospect to employ modern technology, assist them with more secure and friendly environmental production, and subsequently enhance worldwide environment as a whole and improve regional development maintainability (Birdsall and Wheeler, 1993; Frankel and Rose, 2002). According to Jensen (1996) and World Bank (2000), the other important cause is that financial development enhances economic growth in addition to the fact that it brings about higher levels of polluted industries as well as more degraded environment.

Economic development may assume a huge part in the presentation of the environment. Kumbaroglu, Karali and Arikan (2008) claimed that reduction of emissions considerably upset economic and financial related frameworks while encourage to innovative modifications in the energy supply mix. They identify that as a result of real changes in the technical structure of the energy framework, economic costs are incurred. They pointed out that the outcomes suggest new technical investments; money related help and focused procedures that are expected to sustain the development of the energy sector.

Energy use and economic development are the two key variables that are related with environmental degradation that a nation considers at the cost of the environment. However, this has led to the findings of the factors environmental degradation; most of the research restricts their examination by just relating the economic growth and energy use to environmental quality, mainly CO2 emissions. Economic growth and energy consumption single-handedly may not describe CO2 emissions. Though, it is also usual that in order to relate energy consumption to CO2 emissions, majority of the past research addresses the kind of energy use and examine its association with CO2 emissions. Moreover, Lean and Smith (2010) made a strong suggestion that coming studies have to investigate a wide range of energy usage and CO2 emissions. Particularly, automobiles and carriage segment makes a significant contribution to the increasing level of emissions.

There is no motive to consider that the process is automatic, especially for those

qualities of environment dimensions where growth is likely connected with the betterment of social welfare. In general, as countries develop, the quality of environment may also improve automatically as a result; if they replace cleaner and safer technologies with the dirtier ones, or if there is a very prominent consequence on pollution of the typical trends of structural transformation. The developed countries will have the capacity to have comparatively cleaner atmosphere and comparatively cleaner water facility. In addition to, they will also have comparatively more inflexible environmental standards and harsher execution of their environmental laws as compared to the developing and poorer countries, which have many environmental issues that are still remain unaddressed. Also, it is promising that opposite movement and inverted U-shaped trend might happen due to the fact that, as countries develop, they stop to manufacture many pollution-concentrated goods, and start to import these goods from other countries as an alternative with less inflexible environmental protection laws. If this is the whole story for the ultimate opposite relationship between a pollution and income of a country, then future development may not repeat those trends of the past. It will not always be necessary for the developing countries to search for poorer countries assist them in the manufacture of pollution-concentrated products. Although, some environmental problems arise due to the global trend of international trade, but the size of such trade is possibly too small to be responsible for the decreased pollution that has been identified in many relevant studies of economic growth. Lastly, it should be kept in mind that the relationships observed in the past may not be predictable in the future. These trends demonstrate the economic, political, and technological conditions that were present at the time. The poor countries have a sole opportunity to avoid some of the mistakes of previous growth experiences and thereby learn from this critical history. We might expect to see the poor countries divert their consideration to protection of the environment at initial phases of development as compared to the past, due to the improved knowledge of environmental threats and the development in present years of modern technologies that are safer than ever before.

On the other hand, there is an increasing distress regarding the negative outcomes

of economic growth on the environment (Blondell, 1996; Grove, 1992). Such distress leads to great deal of investigation regarding the concept of environmental viable economic growth finding the exchange between economic development and the environmental pollution (Anderson, 1992; World Bank, 1992). It is not the matter of surprise that there is a traditional exchange between the economic growth and the quality of environment. Indeed, it is possible to reduce to an extraordinary arrangement or even inverse the tradeoff through appropriate procedure involvements (Angle and Heidebrink, 1995; Grossman and Krueger, 1995; Selden and Song, 1994; Shafik, 1994). This issue is prevalently essential for emerging countries which under stress to attain speedier economic expansion confront the danger of accepting economic procedures that exhibit contradicting views against the goal of extended periodenvironmental maintainability (Serageldin and Steer, 1994).

Empirically, the research look for the influence of economic development on the nature of the environment seems to be determined by features of different pollutants (Grossman and Krueger, 1991; Shafik and Bandyopadhyay, 1992; Hettige, Lucas and Wheeler, 1992; Birdsall and Wheeler, 1992; Diwan and Shafik, 1992). That is, some air pollutions, which have comparatively important wellbeing and environmental quality impacts, make a U-shaped association with economic growth, for example, floating particles in air, carbon monoxide, sulfur dioxide and nitrogen oxides. Selden and Song (1994) have observed diverse air pollutions and identify the same outcomes associated with EKC. In any case, the intonation points were significantly dissimilar crosswise over examinations. In this context, Holtz-Eakin and Selden (1995) have observed that CO2 emissions did not take after the similar EKC trend. Rather, Shafik and Bandyopadhyay (1992) confirm that the CO2 emissions have been seen to rise monotonically with per capita GDP.

Moreover,it is difficult to establish a relationship between income and the relevant costs and benefits related with the different levels of environmental quality as it functions through a number of various networks, i.e. economic arrangement, technology, and preferences (Shafik, 1994). Changes in income change the composition of output, which in turns determines the categories of environmental degradation.

The increase in the levels of income is frequently connected with the growth of various pollutants such as the expansion of large industry however, economies with large service sector may produce less pollution. There is a concept that increasing incomes suggest that the cost of environmental degradation is higher due to the fact that salaries used to value the opportunity cost of sickness or work days lost are higher. This would suggest a rise in marginal benefits as incomes increases. However, the poor are frequently the most unprotected and susceptible to the health and production damages connected with a degraded environment. Certain environmental issues may cause a major threat to even the survival. Here, the level of income per capita only disturbs the ability, not the readiness, to pay and the readiness to pay to prevent loss is close to perpetuity. When others environmental problems are addressed, most of the expenses are external (i.e. global climate change or transnational pollution) and the personal profits of avoiding loss are minimum. It is also essential to think through the fundamental values of some natural resources. There is a common view that as income increases, the comparative desire of vigilance about facilities such as biodiversity and sceneries. However, many people place a very high value on conservation due to very low incomes, such as tribal peoples (Davis, 1992). So, it is not essentially a problem of different preferences between the rich and the poor, but somewhat one of different budget restrictions.

At a hypothetical level, it is not conceivable to forecast how environmental quality will go forward with changes in per capita incomes, mostly where public products are involved. The question is more manageable practically where we detect some clear trends. According to the evidence, as there is no predictable trend of environmental transformation with respect to economic growth at a collective level, the relationships between specific environmental indicators and incomes per capita are obvious. Although environmental quality directly shakes human wellbeing, higher incomes have a tendency to be allied with less degradation. However, the situation where the costs of environmental loss can be externalized, economic growth likely leads in a steady decline or environmental quality.

It is commonly acknowledged that an absence of proper monitoring and implementation has reduced the effectiveness in regulating pollution emissions, however, environmental procedures have been implemented now for almost 3 decades (Dasgupta, Laplante and Mamingi, 2001). It is normally observed that resources dedicated to the monitoring of environmental guidelines have been considered as scarce. Furthermore, it is accepted that fines and penalties cannot be used as effective constraints, when submission to the standards is identified to be missing. Due to weak application of environmental procedures, it is in fact usually understood that companies in the emerging economies are not encouraged to take part to control pollution. According to this argument, the environmental regulator is the only legal body that can punish firms missing pollution control struggle. Contemporary study designates that local authorities may employ substantial leverage to force companies to improve their environmental performance. The logical reasoning also overlooks that the declaration of worse environmental events (such as spills, violation of permits, objections, and court activities) may generate negative signals to the capital markets while the declaration of superior environmental performance may generate positive signals to the capital markets. The estimated costs connected with poor environmental performance may be considerably undervalued, when using accounting merely for controllers' fines and punishments and disregarding the costs that may be executed by societies and markets. Therefore, in developing countries, formal institutions are unable to deliver encouragements for pollution control struggle through the conventional network of fines and punishments may not be as severe an impairment to pollution control as is normally claimed. If societies and capital markets are appropriately given knowledge, they may deliver the proper reputational and financial encouragements. The research has usually revealed that the announcement of worse environmental news results in the suffering of firms facing from the decline in market value. The effect of company-specific environmental news on market value may operate through various sources: a high degree of pollution strength may give a sign to the investors regarding the inefficient production process of a firm; it may ask severer inspection by environmental authorities; or it may cause the loss of goodwill, like, and

reputation. In contrast, the declaration of a good environmental presentation or of the investment in the advanced and safer technologies may have the different result: minor inspection by controllers and societies and greater entrance to global markets in addition to other things.

There are main benefits of a carbon tax over the common substitute of controlling emissions through traditional knowledge and regulator procedures. Although most taxes misrepresent inducements, an environmental tax adjusts a misrepresentation, specifically the externalities arising from the unnecessary practice of environmental amenities. A carbon tax would be imposed on the basis of the quantities of carbon containing the fossil fuels. Keeping in view the extensive use of these fuels, any tax would certainly be revenue rising, although the tax performs well if it is controlled through the development of low or zero-carbon technologies. Administrations may then approve an economically unbiased approach on the carbon tax, using revenues to fund cutbacks in inducement, changing taxes such as income tax, or corporation tax. This dual dividend character of a pollution tax is of central significance in the political discussion regarding the resources of preserving a carbon agreement. Industry will not allow any new tax. Politicians are reasonably worried about announcing such taxes. However the commercial and public satisfactoriness of such a tax is significantly improved if the tax is announced as portion of a bundle of economically unbiased procedures. From a public perspective, the dual dividend character is also essential.

The dual dividend character of a carbon tax could be exceptionally significant in the international framework. Two comprehensive situations are probable. Either different nations will be allowed to define their own procedures to attain the goal, or some team spirit in the practice of policy mechanisms will be pursued. The previous is more probable, in keeping with customary objections about nation-wide independence. However the last has some fascinations in the framework of either carbon taxes or tradable licenses. Some procedure will have to be set up for encouraging at least the developing countries to enter into any agreement. However, limited countries are probably to make an agreement, keeping in view the widespread use of fossil fuels and their important role in the development process.

Logically, if the net benefits associated with the global warming are favorable, they will then act in the desired manner. But this situation may be genuine only for few countries. While for other countries the perception will be real or imaginary in the sense that the costs are very high. Therefore, developed countries will have to make some sort of side payments if the developing countries are likely to participate in the agreement. Considered their rates of growth of energy use, their collaboration is extremely significant especially within the first decade. A carbon tax that is imposed internationally has the ability to increase revenues which could be compensated on the basis of some standards of distinction. The views of such an international tax are possibly distant, keeping in view the uncertainties which state governments will have of any such new organization developing with revenue raising authorities. The revenues of the new Global Environmental Facility at the World Bank are unconnected to energy use and its payments are for preservation investments in general, although it delivers an uncertain pattern. No state will sacrifice independence to a new organization to increase such taxes, if carbon taxes are sufficiently high to encourage behavioral change. If they are sufficiently low to encourage the submission of independence, they will not have the preferred inducement effects.

Environmental taxes have the ability to reduce compliance costs for industry, and henceforth for consumers who will tolerate some percentage of the tax. This decrease in the cost outcome arises from the notion that a tax shared to all polluters will lead to variable rates of reduction reflected by separate marginal costs of pollution reduction. Consequently, Polluters with high marginal cost will not reduce the cost rather than paying the tax, focusing reduction procedures in low cost polluters. Ultimately, the inclusive effect, then, will be to minimize control costs (Baumol and Oates, 1971, 1988). Models recommend that practice of taxes (or tradable permits) can decrease compliance costs up to 50% or more (Tietenberg, 1990).

Carbon taxes work as a persistent inducement to employ ever cleaner technology and energy preservation. Attempts have to be made to employ technology- based standards, and consequently inspire technology shifts to the level that meet the

criteria as suggested by the regulator. However, standards have to be constantly revisited and be kept marginally above the standard technology that is being exercised today; otherwise there will be no inducement for the polluter to move beyond the standard. Conversely, a tax will always be present given that carbon based fuels are used. According to evidence, it is suggested that this dynamic productivity feature of environmental taxes is essential (Tietenberg, 1990). In the framework of CO2, dynamic productivity takes on an additional aspect for the reason that, as compared to, say, sulfur, CO2 is harder to dispense with even if it is isolated from mass gases. Suggestions consist of adding the seized CO2 in gas or oil fields, or to the vast ocean. Inducements to introduce disposal technologies are thus of specific significance.

Carbon taxes can be effortlessly adapted as new information comes to knowledge. In contrast, regulations are very hard to modify in an effortless fashion. Yet again, the specific state of affairs of the greenhouse effect is pertinent here. We should therefore pursue a policy mechanism competent of responding to continuous modifications of data and science as the science is modifying quickly. The understanding of the Montreal Protocol is pertinent here; the magnitude of the risk from chlorofluorocarbons has been altered upwards a number of times. The international community has changed the Protocol quite quickly; however alterations are easier for an agreement containing action by comparatively limited countries. For a more comprehensive carbon treaty, the refinement of the policy mechanism will be important.

The debate of Stern (2006) and the Intergovernmental Panel on Climate Change (IPCC) are two late milestone researches conducted so far that have made a uplifted feeling of mindfulness and concern over the outcomes of global warming. While the subtle elements behind the investigation of the two analyses are different, however, the two reports arrive at similar fundamental results economic growth in terms of fossil fuels in the form of CO2 emissions are the primary contributor of global warming. If proper consideration is not given, the consistent arrival of CO2 into the air will prompt disastrous results that will influence all parts of society.

Energy use in all structures is a noteworthy driver behind financial development and booming of economic situation. As nations develop and show economic growth their request for energy rises too. As indicated by the International Energy Agency (2006), essential world interest for energy is anticipated to develop by half in the vicinity of 2004 and 2030. The expense for meeting such increment is expected to be approximately $20 trillion dollars. Since so much cash should be spent on interest in energy framework in the coming years, this displays an open door to extend the sustainable power source part.

The worldwide group has now come to a situation when future energy needs should be adjusted with future financial and environmental requirements. Expanded worry over issues identified with energy safety and a worldwide temperature alteration recommends that in the coming days, there will be a more noteworthy dependence on the utilization of sustainable power source. At present, inexhaustible energy makes up a generally little part of the general energy combination in majority of nations.

While the present offer of sustainable power source in the contribution of energy combination is reasonably minute, the utilization of sustainable power source has been quickly growing the previous ten years. The expanded enthusiasm for sustainable power source is likewise being reflected in the investment group. The atmosphere of investment, which considers future development desires, for sustainable power source has never been improved. Though the factors behind various kinds of non-sustainable power source utilization have been well examined, comparatively little or no attention has been paid to the drivers behind sustainable power source utilization. The objective for this study is to broaden the current energy utilization literature to sustainable power source. A more profound knowledge of sustainable energy utilization is critical for a few reasons. Firstly, expanded worry over issues identified with energy protection and global warming proposes that in the coming days there will be a more prominent dependence on the utilization of sustainable power source. Second, a more profound knowledge of sustainable power source utilization is essential inside the setting of the current literature considering the connection between specialized effectiveness and sustainable power source.

Many different empirical studies have investigated the impact of economic growth on the environmental quality in different emerging countries and discussed the various problems and arguments associated with that relationship in the literature. Similarly, our study also makes an attempt to examine this environmental problem by studying the relationship between economic development and environmental degradation, though spreading the debate to the global panel of countries including the developing countries such as Pakistan. Pakistan and other developing countries are moving towards industrialization and the world is moving towards global warming. We want to see the impact of business proxies on CO2 emission. It is very important we humans want to live on this planet and we, Pakistanis want to live in this area of the planet.

2.1 Theoretical Framework

2.1.1 Economic Development

In the context of economic development, the recent research conducted by Azomahou et al. (2006) came with the notion that acknowledges a constant relationship between CO2 emissions per capita and GDP per capita over time. In CO2 emission forecasting, GDP rates should be used (Sun, 2006). But, other factors also describe the economic development in addition to GDP rate. Among those variables, the industry share is one of the main determinants of production and industrialized actions. A sustainable energy bases are required for fast industrial development, transportation systems and other infrastructure needs. The significance of transformation in economic structure and consequently the industry significance are well supported by the different researches conducted by Grossman and Krueger (1991, 1995), Howarth et al., (1991), Torvanger (1991), Westbrook (1995), Hettiage et al. (1998), Suri and Chapman (1998), Panayotou (1998) and Talukdar & Meisner (2001).

Moreover, Grossman and Krueger (1991 & 1995), Seldon and Song (1994), Holtz-Eakin and Seldon (1995), Hettiage et al. (1998) and Panayotou (1998) claim that

growth rate of population is the major factor in defining environmental degradation. As GDP growth rate increases, the size of population becomes twice and higher per capita income results in an increased demand and, as a consequence, an increased energy use. According to Hamilton and Turton (2002), population growth and income per capita are considered the key determinants responsible for the increase of environmental degradation in OECD countries.

The literature reveals a great deal of acknowledgment regarding the significance of effect of FDI on environmental quality (Rock, 1996; Stern, 1998; Chua, 1999). But, FDI effect on the environmental quality is under discussion. The evidence suggested by Eskel and and Harrison (2003) slightly supports the pollution haven hypothesis. Moreover, they identify overseas machineries are considerably higher energy productive and consume safer kinds of energy as compared to local machineries. Moreover, Wang and Jin (2002) observed the same results while conducting a research that examines pollution emissions of company level in most of the Chinese companies. According to the suggestion of Liang (2006), the whole impact of FDI can be advantageous to the environmental quality after finding a negative relationship between FDI and CO2 emissions. This result supports the logical reasoning that in emerging economies FDI can considerably to act as subjective cause for developed, cleaner, and safer, environmental technologies. In contrast, Kolstad and Xing (2002) mention a significant relationship between inward FDI in US and the quantity of SO2 emissions locally in deeply polluted productions.

2.1.2 Control Variables

At last, the discrete impacts of energy imports as well as exports were evaluated with energy use through the decomposition of net energy imports. The main reason was that energy imports play a role of dual-advantage effect on energy use (Grossman & Kreuger, 1991; Shafik & Bhandopadhaya, 1992; Suri & Champman, 1998 and Chapman, 1999). If the goods are manufactured locally which utilize high energy levels and are used to substitute the industrial goods then a rise in energy imports will drop the energy use. Hence, the manufactured goods that are

imported from abroad are when used for the replacement of the local production would decline the energy use. On the other hand, if the capital intensive goods production use energy imports it results in the growth of energy use and thus making an addition to the current levels of production. Therefore, the final result in the rise of energy imports can be both good and bad. In addition to, total energy exports is also included due to the fact that developing economies are mostly involved in the production of energy that are utilized for exports purposes leading to increase of energy use.

Chapter 3

METHODOLOGY

3.1 Data Description

The current study aims to explore the relationship between economic growth and the increase in environmental degradation in a global panel of countries. The sample period is taken for a period starting from 1990 to 2016. Panel data of global countries is taken from World Bank, UN Statistics and other sources.

3.2 Sample

We initially selected 260 countries across the world. But, there was a problem with the data collection of some countries. Either the data was not available or the data of most of the variables was missing. There were almost 100 countries in the list that were facing this problem, so we removed those countries and thus 160 countries were left out. Moreover, in the first stage of our data collection, we took 12 variables, but the data of the 4 variables was missing. So, we skipped those variables. In the second stage, the data of the 40 countries was not available, so we removed those 40 countries from the list and finally we were left with 120 countries and 8 variables.

3.3 Econometric Methodology

This study measures the impact of economic growth on environmental degradation. Thus, our empirical specification is defined as follows (Chousa et al., 2009):

$CO_{2it} = \alpha + \beta_1(\Delta GDP_{it}) + \beta_2(IS_{it}) + \beta_3(R\&D_{it}) + \beta_4(FDI_{it}) + \beta_5(EI_{it}) + \beta_6(OR_{it}) + \beta_7(EU_{it}) + V_i + \varepsilon_{it}$

Where

CO_{2it} = CO2 emission per capita in country i at time t

ΔGDP_{it}= the GDP per capita growth rate in country i at time t

IS_{it} = the industry share as percentage of GDP in country i at time t

$R\&D_{it}$ = the gross domestic expenditure in research and development as percentage of GDP in country i at time t

These sets of variables are conforming the economic development. Moreover,

FDI_{it} = the degree of foreign direct investment in country i at time t

EI_{it} = defines the energy imports in country iat time t

OR_{it} = the oil rents in country i at time t

EU_{it} = the energy use in country i at time t are the control variables

i and it indicate the country specific random effect and random error term, respectively.

$CO_{2it} = \alpha + \beta_1(\Delta GDP_{it}) + \beta_2(\Delta GDP_{it})^2 + \beta_3(IS_{it}) + \beta_4(R\&D_{it}) + \beta_5(FDI_{it}) + \beta_6(EI_{it}) + \beta_7(OR_{it}) + \beta_8(EU_{it}) + V_i + \varepsilon_{it}$

Where, the meanings of the factors are similar that for the main equation. We just made an addition of square in Gross domestic product (GDP) for the validity of inverted U-shaped relationship between CO2 and economic growth.

For data analyzes, following econometric approaches are used.

- Pooled OLS Regression Model
- The Fixed Effect Model

- Random Effect Model
- Hausman's Test
- Summary statistics approach
- Correlation Matrix approach

3.3.1 Pooled OLS Regression Model

Pooled OLS Regression Model basically explains the pooling of all observations and finds the grand regression thereby overlooking the cross-section and time series nature of the data, in any case the error term reflects the whole thing. This model masks the heterogeneity or individual impact that exists between the variables due to the combined pooling of all observations.

3.3.2 The Fixed Effect Model

The Fixed Effects Model may be the best choice when there are omitted variables and these omitted variables have a correlation with the variables in the model, thus this model will control omitted variable bias. The main idea behind the Fixed Effect Model is that the omitted variable will have the same effect on the subject at any point of time e.g. whether it is the time 1 or time 4 and so on; therefore the effects of omitted variables will be constant or fixed. But, this concept will only be true when the omitted variables have time-invariant values with time-invariant effects.

The Fixed Effect Model controls all the dissimilarities between the individuals, as the time related characteristics are omitted consequently the expected coefficients of the fixed effects models cannot be biased. Stock and Watson (2003) presented the idea that if the unnoticed variable does not vary over time then any variations in the dependent variable should be as a result of impacts except the fixed characteristics. A central assumption on which the fixed effect is based is that time-invariant characteristics is individual specific and must not be correlated

with other characteristics of person. Each individual is dissimilar hence there must be no correlation of individuals error term and the constant with the others. The fixed effect is not appropriate if there is correlation between the error terms.

3.3.3 Random Effect Model

A Random Effects Model is possibly better choice when there are no omitted variables or when there are no correlation between the omitted variables and the explanatory variables in the model. It will create unbiased estimations of the coefficients, form the lowest standard errors and apply all the available data. There is likelihood, however, that omitted variables will form to some extent little bias in the estimations.

The logic behind Random Effects Model is that the entity-specific effect or changes across individuals is supposed to be a random variable that is uncorrelated with the predictor/explanatory variables. A benefit of random effects is that you can include time invariant variables such as gender, as compare to fixed effect, where the intercept absorbs all the time invariant variables. As there is no correlation between the predictors and the entitys error term, consequently it permits time invariant variables to play a role as explanatory variables.

3.3.4 Hausman's Test

Hausmans Test is applied to find the inconsistencies in the Random Effect Model by comparing the Fixed Effect Model with the Random Effect Model. On the basis of Hausmans Test we will decide whether the Random Effects Model is appropriate or the Fixed Effects Model.

3.3.5 Summary Statistics

Summary statistics explains the statistical behavior by using Mean, Median, minimum and maximum value in the data. For values in data, the values in Skewness,

Kurtosis and variance along with Jarque-Bera are considered. Kurtosis represents the flatness or peakness of the data and JarqueBera reports.

3.3.6 Correlation Matrix

Correlation matrix basically tells us about correlation among the independent variables. It may be positive, negative or not correlated. Higher correlation may leads to multi colinarity in the data.

Chapter 4

RESULTS AND DISCUSSION

4.1 Summary Statistics

The statistical behavior of the data is explained by using summary statistics.

Table 4.1: Summary Statistics

Variable	Mean	Std.Dev.	Min	Max	Obs
CO_2 overall	5.557186	7.08416	0.0107325	70.13564	N = 2963
Between		6.940759	0.0304335	52.99044	n = 120
Within		1.582249	-22.71952	22.70239	T = 24.6917
FDI overall	4.546216	15.4371	-58.32288	451.7155	N = 3076
Between		7.433651	0.1636103	68.0703	n = 119
Within		13.63735	-91.00765	388.1915	T = 25.8487
GDP overall	2.076623	5.320674	-64.99631	53.94384	N = 3174
Between		1.628537	-2.156759	8.789274	n = 120
Within		5.069788	-68.83645	50.1037	T = 26.45
IS overall	31.2501	13.0773	2.594866	213.6904	N = 2902
Between		1.628537	-2.156759	8.789274	n = 120
Within		5.069788	-68.83645	50.1037	T = 26.45
R&D overall	1.054664	0.9673128	0.00544	4.40546	N = 1369
Between		0.8796651	0.0237833	3.87622	n = 105
Within		0.2245208	-0.223066	2.372411	T = 13.0381
EI overall	-35.84174	193.343	-1942.003	100	N = 2946
Between		184.911	-1147.898	99.77144	n = 117
Within		59.52247	-829.9472	647.4972	T = 25.1795
Log (EU) overall	7.278639	1.043405	4.749074	9.996952	N = 2953
Between		1.032339	5.042617	9.773055	n = 119
Within		0.165768	5.392564	8.346945	T = 24.8151
Log (OR) overall	-0.4965514	3.000967	-10.9164	4.163669	N = 2044
Between		3.1535	-9.765736	3.721008	n = 86
Within		0.6833386	-4.158865	2.971339	T = 23.7674

Table 4.1 reports the results of summary statistics of annual CO2 emissions and Economic Development Indicators by using mean, standard deviation, minimum and maximum values during the period 1990 to 2016.

4.2 Correlation Matrix

Table 4.2 reports the results of correlation analysis among the Economic Development indicators. Table 4.2 shows the correlation among the FDI, GDP growth rate,

Table 4.2: Correlation Matrix

	FDI	GDP	$(GDP)^2$	IS	R&D	EI	log (EU)	log (Oil Rents)
FDI	1							
GDP	0.2314	1						
$(GDP)^2$	0.239	0.57	1					
IS	0.0656	0.2495	0.301	1				
R&D	-0.1046	-0.2122	-0.1678	-0.3268	1			
EI	-0.0396	-0.0015	-0.0531	-0.5236	0.2124	1		
Log (EU)	0.0174	-0.1894	-0.0747	0.055	0.5763	-0.1087	1	
Log (Oil Rents)	0.0841	0.1589	0.177	0.4823	-0.5325	-0.5632	-0.22	1

IS (Industry Share), R&D (Research and Development), EI (Energy Imports), EU (Energy Use) and Oil rents. Some variables are positively correlated while others are negatively correlated. The above table shows that there is a correlation of 23% between GDP and FDI. Similarly, IS (Industry Share) is positively correlated with FDI and GDP at 6%, and 24% respectively. Moreover, R&D is negatively correlated with FDI, GDP and IS at 10%, 21% and 32% respectively. Also, EI is negatively correlated with FDI, GDP and IS at 3%, 0.01% and 52%respectively but positively correlated with R&D at 21%. Also, EU is positively correlated with FDI, IS and R&D at 1%, 5% and 57% respectively but negatively correlated with GDP and EI at 18% and 10% respectively. While Oil rents is positively correlated with FDI, GDP and IS at 8%, 15% 48% respectively, but negatively correlated with R&D, EI and EU at 53%, 56% and 22% respectively.

4.3 Pooled OLS Model vs The Fixed Effect Model vs Random Effect Model

The comparison between the Pooled OLS Regression Model, The Fixed Effect Model and the Random Effect Model is shown in table 4.3. According to the Hausman's Test we will use the Fixed Effect Model because its results are consistent under null hypothesis (H_0) and alternative hypothesis (H_a) as shown in table 4.4.

TABLE 4.3: Results of per capita CO2 equation function

VARIABLES	**Pooled OLS**	**GLOBAL PANEL Fixed Effect**	**Random Effect**
	Model	**Model**	**Model**
FDI Stock	0.000209	0.00262	0.00254
	-0.0122	(0.00608	-0.00607
GDP Growth Rate	-0.00644	0.0149*	0.0133
	-0.025	-0.00818	-0.0083
GDP Growth Rate Squared	-0.00325*	-0.000698	-0.000742
	-0.00181	-0.000551	-0.000558
Industry Share in GDP	0.0427***	0.00659	0.0102
	-0.0113	-0.0227	-0.0228
R&D Expenditure	0.133	-0.651*	-0.677**
	-0.123	-0.334	-0.327
Energy Imports	-0.00111	-0.000874	-0.000947
	-0.000772	-0.00252	-0.00247
Log (Energy Use)	5.000***	6.606***	6.547***
	-0.128	-0.847	-0.74
Log (Oil Rents)	0.112***	-0.0831*	-0.0653
	-0.0378	-0.0474	-0.0466
Constant	-32.74***	-43.37***	-42.13***
	-0.899	-6.196	-5.32
Observations	899	899	899
R-squared	0.763	0.618	
Number of Country		70	70

4.3.1 Empirical results

In this section, we present the empirical results and estimates of per capita CO2 emissions equation function across the countries. First, we deliberate the results by pooling all observations and estimating the grand regression for CO2 emission versus FDI, Industry Share, Research and Development (R&D), Energy Imports, Energy use and Oil rents variables in the Pooled OLS Regression Model (as shown in table 4.3; model 1). After that we illustrate the correlation between the omitted variables and the explanatory variables in the model by applying the Fixed Effect Model (see table 4.3; model 2). Then we discuss the entity-specific effect or changes across individuals with a random variable that is uncorrelated with the explanatory variables by using Random Effect Model.

The empirical results of Fixed Effect Model and Random Effect Model indicate that GDP growth rate, R&D expenditure, Energy use and Oil rents are significantly associated with CO2 emissions. The GDP growth rate has significant and positive impact on per capita CO2 emissions. It means when there is a rise of 1% in GDP growth rate then there will be an increase of 0.01% in CO2 emissions. Similarly every 1% increase in energy use will bring about an increase of 6.6% in CO2 emissions. It was also found that 1% increase in Research and Development expenditure results in decrease of 0.6% in CO2 emissions. It means that when there is higher degree of Research & Development expenditure, there will be lower levels of per capita CO2 emissions, which suggests that higher levels of Research and Development expenditure improve the environmental quality. The statistical significance as well as interpretation of these findings stay sun changed in the Fixed Effect Model as well as Random Effect Model as shown in table 4.3.

There has been a great deal of debate regarding the relationship of FDI inflows and environmental quality. Some researchers suggest that FDI entries result in the increase of environmental degradation (Jorgenson, 2007; Ren et al., 2014; Kivyiro & Arminen, 2014). While other studies indicate that increase in FDI inflows lead to decrease in per capita CO2 emissions (List and Co, 2000; He, 2002; Soysa & Neumayer, 2004 and Liang, 2006). However, our results show no significant relationship between FDI inflows and environmental quality. These

findings are consistent with Linh and Lin (2015), Atici (2011), Mutafoglu (2012), Aminu (2005), Hoffmann et al. (2005) and Blanco, Gonzalez & Ruiz (2013) who also confirm that inward FDI has insignificant impact on per capita CO2 emissions.

After analyzing the energy use control variables, we find that higher levels of per capita CO2 emissions are associated with higher levels in energy use. The net energy imports show a positive relationship with per capita CO2 emissions. The main reason is that higher energy imports become more concentrated in most of the developing countries of the world. It is statistically significant at 95% confidence interval. Moreover, we find that if there is 1% increase in Oil rents, there will be 0.08% decrease in per capita CO2 emissions (see model 2, table 4.3). It means that when Oil rents increases it will bring about decrease in per capita CO2 emissions. The industrialized countries consume more than 70% of oil use in the world annually.

Moreover, the relationship between GDP growth rate squared and per capita CO2 emissions is statistically insignificant. These results are not aligned with the EKC theory which shows that as a country develops, the levels of pollution first rises, but when the increasing income reaches to a point of saturation, the level of pollution starts to decrease. Our results are not consistent with Kraft and Kraft (1978), Grossman and Krueger (1992 and 1995) who suggested reversed U-shaped association between the size of income and pollution. Therefore, when a country develops in terms of research and development, it leads to the improvement of energy associated efficiencies and this ultimately decreases the levels of energy use and thus decline CO2 emissions (see table 4.3). These findings suggest that there is a further need to improve the degree of economic development across the world with an effort to decrease CO2 emissions and thus to attain lower environmental degradation.

4.4 Hausman's Test

TABLE 4.4: Hausman's Test

	Coefficients			
VARIABLES	Fixed Effect Model (b)	Random Effect Model (B)	Difference (b - B)	$\sqrt{diaq(Vb - VB)}$ SE
FDI Stock	0.002625	0.0025421	0.0000829	——
GDP	0.0149286	0.0133298	0.0015987	——
GDP Squared	-0.0006976	-0.0007418	0.0000442	——
Industry Share	0.0065917	0.0101895	-0.0035978	0.0007916
R&D	-0.6507857	-0.6774696	0.0266839	0.014399
Energy Imports	-0.0008739	-0.0009473	0.0000733	0.0000957
Log (Energy Use)	6.605556	6.546946	0.0586096	0.0692193
Log (Oil Rents)	-0.0831318	-0.065282	-0.0178498	0.0074829

b = consistent under Ho and Ha : obtained from xtreg

B = inconsistent under Ha , efficient under Ho : obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi 2 (8) = (b-B) , [(Vb - VB) $\hat{}$(-1)] (b-B)

= 22.91

Prob¿ chi 2 = 0.0035

(Vb-VB is not positive definite)

According to the Hausmans Test we will use the Fixed Effect Model as shown in table 4.4.

Chapter 5

Conclusion & Recommendations

5.1 Conclusion

Despite the fact that majority of empirical studies have given considerations to the effect of economic development on the performance of the environment, similarly this study also made an attempt to highlight the effect of economic development on the quality of environment. We studied the global panel of countries and test these countries for the impact of increasing levels of economic development on rising CO2 per capita emissions. Energy use and energy imports as well as oil rents are used as control variables. Our study makes an effort to bring about the econometric weaknesses of the Environmental Kuznets Curves (EKC) theory presented by Stern in 2004. However, our results are not consistent with the Environmental Kuznets Curve (EKC) theory that shows that as the level of economic growth rises beyond a threshold, economic development results in lower environmental degradation.

Our results show that there is no significant relationship between FDI and CO2 emissions. Some researches demonstrate that FDI inflows prompt an expansion in CO2 emissions. While others admit that FDI inflow results in the decline of CO2 emissions. However, our findings show an insignificant impact of FDI inflow on the environmental quality which is supported by the recent vision of researchers who proposes that inward FDI has no effect on CO2 emissions. For instance, Perkins

and Neumayer (2009) observed that FDI inflows have no impact on CO2 productivity. Hoffmann et al. (2005) found that no causal connection between FDI and CO2 emissions exists in high income nations. Atici (2011) inferred that FDI has no effect on CO2 emissions. Lee (2013) researched commitments of internal FDI to CO2 emissions utilizing the panel data of 19 countries of the G20. The findings demonstrated that FDI inflows are insignificantly related with CO2 emissions.

5.2 Recommendations

Based on the empirical results, there are some important policy recommendations.

- There is a strong need to implement strategies focused on to invite rising degrees of research and development-based foreign direct investment.
- A great deal of research is needed to study the relationship between FDI inflows and CO2 emissions in more detail.
- Introducing global price for oil consumption will increase the oil rents globally and consequently it will not only decrease the CO2 emissions to some extent but will also address the issues about the likely impact of effectiveness of global environmental degradation policies. Highlighting these problems may result in growing energy efficiencies and hence reduce the environmental degradation.

Bibliography

Acharyya J. FDI, growth and the environment: evidence from India on CO2 emission during the last two decades. Journal of Economic Development 2009; 34(1):43”58.

Aitken, B., and A. Harrison (1999), ”Do Domestic Firms Benefit from Direct Foreign Investment” Evidence from Venezuela,” American Economic Review, 89(3), 605-618.

Alfaro, L., Chanda, A., Kalem li-Ozcan, S., & Sayek, S. (2004). FDI and economic growth: The role of local financial markets. Journal of International Economics, 64(1), 89”112.

Aliyu, M. A. (2005). Foreign direct investment and the environment: Pollution haven hypothesis revisited. In Eighth Annual Conference on Global Economic Analysis, Leck, Germany.

Al-mulali U, Foon Tang C. Investigating the validity of pollution haven hypothesis in the gulf cooperation council (GCC) countries. Energy Policy 2013; 60:813”9.

Al-mulali U. Factors affecting CO2 emission in the Middle East: a panel data analysis. Energy 2012; 44(1):564”9.

Anderson, D L. 1994. The sub lithospheric mantle as the source of continental flood basalts: the case against the continental lithosphere and plume head reservoirs, Earth and Planetary Science Letters, 123, pp. 269”280

Antle, J.M. and G. Heidebrink (1995). Environment and development: Theory and International Evidence. Economic Development and Cultural Changes 43: 603-625

Atici C. Carbon emissions, trade liberalization, and the Japan"ASEAN interaction: a group-wise examination. Journal of International Economics 2012; 26(1):167"78.

Azomahou, Theophile & Laisney, Francois & Nguyen Van, Phu, 2006. "Economic development and CO2 emissions: A nonparametric panel approach," Journal of Public Economics, Elsevier, vol. 90(6-7), pages 1347-1363

Balasub ramanyam, V.N., M. Salisu, and D. Sapsford (1996), "Foreign Direct Investment and Growth in EP and IS Countries," Economic Journal, 106(434), 92-105.

Barbier, Edward. 1997. "Rural Poverty and Natural Resource Degradation." In Rural Poverty in Latin America. ed. Ramn Lpez and Alberto Valds. Washington: The World Bank

Barker, T. and Lewney, R. (1991), "A green scenario for the UK economy", in T. Barker (ed.),

Beck, Thorsten and Al-Hussainy, Ed., (2006): Financial Structure Dataset. (Available at: http://econ.worldbank.org/staff/tbeck)

Beck, Thorsten, Asli Demirg-Kunt and Ross Levine (2000): "A New Database on Financial Development and Structure," World Bank Economic Review, 14, 597-605.

Beckerman, Wilfred. In Defense of Economic Growth London: Jonathan Cape, 1974.

Beckerman, W. 1992. Economic growth and the environment: Whose growth" Whose environment". World Development 20 (1992), pp. 481"496.

Beijer Institute, Royal Swedish Academy of Sciences.

Bengochea-Morancho, A., Hign-Tamarit, F., & Martnez-Zarzoso, I. (2001). Economic growth and CO2 emissions in the European Union. Environmental and Resource Economics, 19(2),165"172.

Birds all, Nancy, and David Wheeler, 1993. "Trade Policy and Industrial Pollution in Latin America: Where are the Pollution Havens" Journal of Environment and Development, 2, 1, pp.

Blanco, L., F. Gonzalez, and I. Ruiz. 2013. "The Impact of FDI on CO2 Emissions in Latin America." Oxford Development Studies 41 (1): 104"121.

Blomstrom, M., R.E. Lipsey, and M. Zejan (1994), "What Explains Developing Country Growth," NBER Working Paper, 4132, Cambridge, MA: National Bureau of Economic Research.

Blondell, J. (1996). Pollution could slow Asia's growth. Asian Business Review(August) 60"61

Bolin, BB, Ds, BR, Jger, J, Warrick, RA, eds. 1986 The Greenhouse Effect, Climate Change. And Ecosystems (29). John Wiley & Sons, Chichester

Borensztein, E., De Gregorio, J. & Lee, J. W. (1999) How does foreign direct investment affect growth" Journal of International Economics, 45(1), pp. 143"169.

Castellani, D., and A. Zanfei (2002a), Multinational Companies and Productivity Spillovers: Is There a Specialization Error "" Mimeo, Urbino: University of Urbino.Copeland BR, Taylor MS. North-south trade and the environment. QJ Econ 1994; 109(3):755"87.

Chua. S., 1999. Economic growth, liberalization and the environment: a review of the economic evidence. Annual Review of Energy and the Environment 24, pp. 391"430.

Cline, W. (1992). The Economics of Global Warming, Washington DC: Institute for International Economics

Cole, M. A. and Elliot, R. J. R.: 2005, FDI and the capital intensity of "dirty" sectors: A missing piece of the pollution haven puzzle, Review of Development Economics 9(4),530 -548

Commoner, Bany. The Closing Circle. New York: Knopf, 1971a.

Commoner, Barry. "Power Consumption and Human Welfare." Paper presented to the AAAS Convention, Philadelphia, December 1971b.

Daly HE. 1977. Steady-State Economics. San Francisco: W. H. Freeman

Damijan, J.P., B. Majcen, B.M. Knell, and M. Rojec (2001), The Role of FDI, Absorptive Capacity and Trade in Transferring Technology to Transition Countries: Evidence from Firm Panel Data for Eight Transition Countries, Mimeo, Geneva: UN Economic Commission for Europe.

Dasgupta, S., Laplante, B., and Mamingi, N. (2001), Pollution and Capital Markets in Developing Countries, Journal of Environmental Economics and Management, vol. 42,issue 3, pages 310-335.

Dean, J. (1999), "Testing the Impact of Trade Liberalization on the Environment: Theory and Evidence," in P.G. Fred riksson, ed., Trade, Global Policy, and the Environment, World Bank Discussion Paper, 402, World Bank. development Center Technical Paper No. 124.

Diwan, I., and Shafik, N., 1992, "Investment, Technology and the Global Environment:Towards International Agreement in a World of Disparities", in Low, P. (Ed.),International Trade and the Environment, World Bank, Washington, DC

Djankov, S., and B. Hoekman (2000), "Foreign Investment and Productivity Growth in Czeck Enterprises," The World Bank Economic Review, 14(1), 49-64.

Duerksen, C., & Leonard, H.J. (1980). Environmental regulations and the location of industries:An international perspective. Columbia Journal of World Business, 15(2), 52"58.

Economics, 60, 228"245.Hitam MB, Borhan HB. FDI, growth and the environment: impact on quality of life in Malaysia. Procedia-Soc Behavioral Science, 2012; 50:333"42.

Elliot, R. J. R. & Shimamoto, K. (2008) Are ASEAN countries havens for Japanese pollution intensive industry" World Economy, 31(2), pp. 236"254.

Eskel and, G. & A. Harrison, 2003. Moving to greener pastures" Multinationals and the pollution haven hypothesis. Journal of Development Economics 70: 1-23

Feridun, Mete, 2006. Impact of Trade Liberalization on the Environment in Developing Countries: The Case of Nigeria, MPRA Paper No. 731, posted 07. November 2007.

for Economic Growth: Britain in 2010, Cambridge: Cambridge Econometrics

Foster, J., 1997. The analytical foundations of evolutionary economics: from biological analogy to economic self-organization. Structure Change Economic Dynamics. 8, 427"451.

Foster, J., 2005. From simplistic to complex systems in economics. Cambridge Journal of Economics 29, 873"892.

Frankel, J., and D. Romer. (1999). "Does Trade Cause Growth"," American Economic Review 89,379-399.

Frankel, Jeffrey, and Andrew Rose. 2002. An Estimate of the Effect of Common Currencies on Trade and Income. Quarterly Journal of Economics (May) 437-66

Georges cu-Roegen, N. 1971. The Entropy Law and the Economic Process. Cambridge,MA: Harvard University Press. [chc]Green Futures for Economic Growth: Britain in 2010, Cambridge: Cambridge Econometrics.

Grossman, G. and Krueger, A., (1992): Environmental Impacts of a North American Free Trade Agreement. WPS: c158, WW School of Public & International Affairs,Princeton.

Grossman, G. and Krueger, A., (1995): "Economic Growth and the Environment,"Quarterly Journal of Economics, 110, 352"377.

Grove T. L, R.J. Kinzler & W.B. Bryan, 1992. Fractionation of mid-ocean ridge basalts,American Geophysical Union, Geophysical Monograph, 71, pp. 281"310.

Grkan, Kumbaroglu, Nihan, Karali, Yildiz Arikan (2008): "CO2, GDP and RET: An aggregate economic equilibrium analysis for Turkey," Energy Policy, forthcoming.

Hamilton, C., Denniss, R. & Turton, H. (2002). Taxes and charges for environmental protection, Discussion Paper 46, The Australia Institute, Canberra.

Hansen, H., & Rand, J. (2006). On the causal links between FDI and growth in developing countries. World Economy, 29(1), 21”41.

Hassaballa H. Environment and foreign direct investment: policy implications for developing countries. Journal of Emerging Issues Economics Finance Bank 2013; 1: 75e106.

He J. Pollution haven hypothesis and environmental impacts of foreign direct investment: the case of industrial emission of sulfur dioxide (SO2) in Chinese provinces. Ecological Economics2006; 60(1):228”45.

He, Jie, 2002. ”The Foreign Direct Investment and Air Pollution in China: the Case of SO2 Concentration in Chinese Cities”, Better Air Quality in Asian and Pacific Rim Cities Conference, Hong Kong

Hettige, H., R.E.B. Lucas, and D. Wheeler [1992], ”The Toxic Intensity of Industrial Production: Global Patterns, Trends, and Trade Policy,” American Economic Review,82; pp. 478-481.

Hoffert, M. I.; Caldeira, K.; Jain, A. K.; Haites, E. F.; Harveyk, L.D. D.; Potter, S. D.; Schlesinger, M. E.; Schneider, S. H.; G. Watts, I. R.;Wigley, T. L.; J. Wuebbles, D. Energy implications of future stabilization of atmospheric CO2 content. Nature 1998, 395, 881-884.

Hoffmann R, Lee C, Ramasamy B, Yeung M. FDI and pollution: a granger causality test using panel data. Journal of International Development, 2005; 17(3):311”7.

Holtz-Eakin, D. and Seldon, T.M 1995. ”Stoking the fires” CO2 emissions and economic growth”, Journal of Public Economics 57, 86-10

Howarth R. W. (1991). Nutrient limitation of net primary production in marine ecosystems. A. Rev. Ecol. Syst. 19: 89-110

Hua Wang & Yan hong Jin, 2002. ”Industrial ownership and environmental performance: evidence from China,” Policy Research Working Paper, World Bank.

Hurlin C, Venet B. 2001. Granger causality tests in panel data models with fixed coefficients.

IPCC (2007): "Climate Change 2007: Physical Science Basis," Contribution of Working Group 4th Report of Intergovernmental Panel on Climate Change, Paris.

Jacoby, Neil. "The Environmental Crisis," Center Magazine, November/December 1970.

Jalil A, Mahmud SF. Environment Kuznets curve for CO2 emissions: a co-integration analysis for China. Energy Policy, 2009; 37(12):5167"72.

Javorcik, B.S., & Wei, S-J. (2004). Pollution havens and foreign direct investment: Dirty secret or popular myth" Contributions to Economic Analysis and Policy, 3(2), Article 8.

Jeffrey A. Frankel; David Romer, 1999. Does Trade Cause Growth", The American Economic Review, Vol. 89, No. 3. pp. 379-399

Jensen F.B., 1996. Uptake, elimination and effects of nitrite and nitrate in fresh water crayfish (Astacus astacus). Aquat. Toxicol. 18, pp. 51"60.

Jensen, V.M. 1996. Trade and Environment: The Pollution Haven Hypothesis and the Industrial Flight Hypothesis; Some Perspectives on Theory and Empirics. Norway: University of Oslo,Center for Development and the Environment.

Kim MH, Adilov N. The lesser of two evils: an empirical investigation of foreign direct investment-pollution trade off. Applied Economics, 2012; 44(20):2597"606.

Konings, J. (2001), "The Effect of Foreign Direct Investment on Domestic Firms: Evidence from firm Level Panel Data in Emerging Economies," Economics of Transition, 9(3), 619-633.

Larrain G, Reisen H, Maltzan J. 1997. Emerging market risk and sovereign credit ratings. OCED

Lau, L.S., C.K. Choong, and Y.K. Eng. 2014. "Investigation of the Environmental Kuznets Curve for Carbon Emissions in Malaysia: Do Foreign Direct Investment and Trade Matter" " Energy Policy, 68: 490"497.

Lean HH, Smyth R. CO2 emissions, electricity consumption and output in ASEAN. Applied Energy, 2010; 87:1858"64.

Lee CG. Foreign direct investment, pollution and economic growth: evidence from Malaysia.Applied Economics 2009; 41(13):1709”16.

Lee JW, Brahma srene T. Investigating the influence of tourism on economic growth and carbon emissions: evidence from panel analysis of the European Union. Tour Management, 2013;38:69”76.

Lee, W.J., 2013. The contribution of foreign direct investment to clean energy use, carbon emissions and economic growth. Energy Policy, 55, 483”489.

Let chumanan, R., & Kodama, F. (2000). Reconciling the conflict between the ”pollution haven” hypothesis and an emerging trajectory of international technology transfer. Research Policy,29(1), 59”79.

Liang, Guoyong 2006, ”International business and industry life cycle: theory, empirical evidence and policy implications”. Paper accepted for presentation at the Annual Conference on Corporate Strategy, Berlin, 19-20 May.

Linh, D.H., and S.M. Lin. 2015. ”Dynamic Causal Relationships Among CO2 Emissions, Energy Consumption, Economic Growth and FDI in the Most Populous Asian Countries.” Advances in Management and Applied Economics 5 (1): 69”88.

List, J. A. and C. Y. Co, 2000, The Effect of Environmental Regulation on Foreign Direct Investment, Journal of Environmental Economics and Management, Vol. 40, pp.1-40

M. Hoel, Efficient international agreements for reducing emissions of CO2, Energy J. 12, 93-107 (1991).

Meadows, D.H., Meadows, D.L., Randers, J., 1972. Beyond the Limits: Global Collapse or a Sustainable Future. Earth scan, London.

Meadows, D.H., Meadows, D.L., Randers, J., Behrens, W., 1992. The Limits to Growth. Universe Books, New York.

Merican Y. Foreign direct investment and the pollution in five ASEAN nations. International Journal of Economic Management, 2007; 1(2):245”61.

Mielnik O, Gold emberg J. Foreign direct investment and decoupling between energy and gross domestic product in developing countries. Energy Policy, 2002; 30(2):87"9.

Miller, G., 1999. Waste is good. Prospect 2, 18"23.Potts, J., 2003. Toward an evolutionary theory of homo economicus: the concept of universal nomadism. In: Laurent, J. (Ed.), Evolutionary Economics and Human Nature. Edward Elgar, Cheltenham.

Mutafoglu, T.H. 2012. "Foreign direct investment, Pollution, and Economic Growth Evidence from Turkey." Journal of Developing Societies 28 (3): 281"297

Nordhaus, W.D.: 1991, "To slow or not to slow: The economics of the greenhouse effect", Economics. Journal101, 920"937.

Olofsdotter, K. (1998). Foreign direct investment, country capabilities and economic growth.Welt wirts chaft liches Archive, 134(3), 534"547.

Panayotou, T. 1998, Instruments of Change. Motivating and Financing Sustainable Development, London, United Nations Environment Programme (UNEP), EarthscanPublications Ltd.

Pao H, Tsai C. Multivariate granger causality between CO2 emissions, energy consumption, FDI(foreign direct investment) and GDP (gross domestic product): evidence from a panel of BRIC(Brazil, Russian Federation, India, and China) countries. Energy 2011; 36(1):685"93.

Pearce, D. (1991), "The role of carbon taxes in adjusting to global warming", Economic Journal,

Perkins R, Neumayer E. Transnational linkages and the spillover of environment-efficiency into developing countries. Global Environmental Change, 2009; 19(3):375"83.

Raine, A., Foster, J., Potts, J., 2006. The new entropy law and the economic process. Ecological Complexity 3, 354"360.

Revkin, Andrew. 2000. "A Plunge in Use of Food Stamps Causes Concern," New York Times, February 25

Robinson, Joan. "The Second Crisis of Economic Theory," American Economic Review, May 1972, 1-10.

Rock, M. T. (1996) "Toward More Sustainable Development: The Environment and Industrial Policy in Taiwan", Development Policy Review 14: 255"272.

Sbia R, Shahbaz M, Hamdi H. A contribution of foreign direct investment, clean energy, trade openness, carbon emissions and economic growth to energy demand in UAE. Economic Model2014; 36:191"7.

Selden T. M. and D. Song (1994). Environmental Quality and Development: Is there aKuznets Curve for Air Pollution Emission" Journal of Environmental Economics and Management 27: 147-162

Serageld in I., A. Steer (eds.) 1994: Making Development Sustainable, from Concept to Action, World Bank, ESD, Environmentally Sustainable Development Occasional Paper Series No. 2, Washington, USA

Shafik, N., Bandyopadhyay, S., (1992): Economic Growth and Environmental Quality:Time-Series & Cross-Country Evidence. Background Paper - World Development Report 1992.

Shafik, N.T. 1994. Economic Development and Environmental Quality: An Econometric Analysis. Oxford Economic Papers 46, pp. 757-73

Shahbaz M, Ozturk I, Afza T, Ali A. Revisiting the environmental Kuznets curve in a global economy. Renew Sustain Energy Review 2013; 25:494"502.

Shao, S., Yang, L.-L., Yu, M. -B., Yu, M.-L., 2011. Estimation, characteristics, and determinants of energy related industrial CO2 emissions in Shanghai (China), 1994"2009. Energy Policy 39,6476"6494.

Smarzynska BK, Wei S. Pollution havens and foreign direct investment: dirty secret or popular myth" Massachusetts Avenue, Cambridge MA: National Bureau of Economic Research; 2001.

Sondheimer, J. (1991), "Macro-economic effects of a carbon tax", in T. Barker (ed.), Green Futures

Soysa. Indra de & Eric Neumayer, 2004. "False Prophet, or Genuine Savior" Assessing the Effects of Economic Openness on Sustainable Development, 1980"1999,"International Trade 0409001, EconWPA, 13 Oct.

Stern, D. I., (2002): "Explaining changes in global sulfur emissions: An econometric decomposition approach," Ecological Economics, 42, 201"220.

Stern, D., I., (2004): "The Rise and Fall of the Environmental Kuznets Curve," World Development, 32, 1419-1439.

Stretesky, P.B., and M.J. Lynch. 2009. "A Cross-National Study of the Association Between per Capita Carbon Dioxide Emissions and Exports to the United States." Social Science Research 38(1): 239"250.

Sun, J.W. (2006) An alternative viewpoint on the forecasting of energy-related CO2emissions in the OECD countries, Energy Policy, 34, 377-382.

Suri, V., Chapman, D., (1998): "Economic Growth, Trade and Energy: Implications for Environmental Kuznets Curve," Ecological Economics, 25, 195"208.

Susan Creane & Rishi Goyal & A. Mushfiq Mobarak & Randa Sab, 2006. "Measuring Financial Development in the Middle East and North Africa: A New Database," IMFStaff Papers, International Monetary Fund, vol. 53(3), pages 7

Svennigsson, P. (1985), Energy Strategies and Atmospheric CO2 Concentrations, Stockholm:

Talukdar, D. and C.M. Meisner, 2001. Does the private sector help or hurt theenvironment" Evidence from carbon dioxide pollution in developing countries, WorldDevelopment 29(5), 827-840

Tamazian A, Chousa JP, Vadlamannati KC. Does higher economic and financial development lead to environmental degradation: evidence from BRIC countries. Energy Policy 2009;37(1):246"53.

UN Framework Convention on Climate Change (2007): Protocol Background documents (available at: http://unfccc.int/kyoto_protocol/background)

UNCED 1992. Report of the United Nations Conference on Environment and Development. A/CONF.151/26 (Vol. I).vol. 101, pp. 938"48.

Wallich, Henry C. "Zero Growth," Newsweek, January 24, 1972, p. 62.

Walter I, Ugelow JL Environmental policies in developing countries. Ambio, 1979:102"9.Working Paper. EURIsCO, Universite Paris IX Dauphin.

Westbrook, R. (1995). "Action research: a new paradigm for research in production and operations management." International Journal of Operations & Production Management 15(12): 6-20.

Witt, U., 1997. Self-organization and economics "what is new" Structure Change Economic Dynamics 8, 489"507.

World Development Indicators (2006): World Bank, Washington D.C.

Xing, Yuquing and Kolstad, C. D. (2002): "Do Lax Environmental Regulations Attract Foreign Investment", Environmental and Resource Economics, 21(1), 1-22.

Yuquing Xing & Charles Kolstad, 2002. "Do Lax Environmental Regulations Attract Foreign Investment"," Environmental & Resource Economics, European Association of Environmental and Resource Economists, vol. 21(1), pages 1-22

Zarsky L. 1999. Havens, halos and spaghetti: untangling the evidence about foreign direct investment and the environment. OECD conference on foreign direct investment and the environment.

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

Zhidong, L., (2003): An econometric study on China's economy, energy and environment to the year 2030, Energy Policy 31 (2003), pp. 1137"1150

Zhou, X. -Y., Zhang, J., Li, J. -P., 2012. Industrial structural transformation and carbon dioxide emissions in China. Energy Policy, 57, 43"51.

Zukowska-Gagelmann, K. (2002), "Productivity Spillovers from Foreign Direct Investment in Poland," Economic Systems, 24(3), 223-256.