The Effect of International Trade on Carbon Emissions: Evidence from Pakistan

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Abstract
The relationship between trade openness and environment is highly debated issues since from the expansion of international trade. This paper takes time series data from 1980 to 2010 period to investigate the causal relationship between trade liberalization and Air quality in Pakistan using Granger causality test. The research finds out that causality running from FDI in pollution promoting dirty technology towards CO_2 emissions in Pakistan. Foreign direct investment also cause the scale effect which is the increase in the size of production due to trade expansion and that again cause the CO_2 concentration in the Air which result in the harming the Air quality which ultimately worsen the environment. Bi-directional causality has been also examined among the openness of trade and CO_2 emission, technology effect and foreign direct investment net inflow. The one way causality was analyzed only between FDI and composition effect which indicate that FDI affect the composition effect which is taken from the decomposition of trade effects. This composition also causes by the technology which available due to openness of trade strategy in Pakistan.
Keywords: Trade liberalization ,carbon emissions ,Pairwise causality

Introduction:

The relationship between trade and environment is highly debated issues since from the expansion of international trade. International trade is the important vehicle for the acceleration of economic growth and increase the welfare by satisfying the demands of individuals and governments. Beside from these benefits of international trade it has some negative externalities. Environmental economist do not claim that international trade is bad for the economic growth of an economy but they were in fear for the depletion of natural resources which will ultimately effect the environment quality. Due to expansion of international trade and globalization the issue of the relationship between trade and the environment has raised.

The issue of trade and environment has been brought onto the plan by the major developed countries, particularly the EU with the objective of softening the WTO discipline on trade restriction measures taken for the fortification of environment quality. The argument was that the trade restrictive measures taken by the country in pursuance of multilateral environmental agreement (MEA) should not be constrained by the control of the WTO .The relationship between trade and environment is very complex and highly debated issue since 1991 when international attention was given to trade conflict between Mexican governments when they challenged a United States law that was about banning imports of tuna from Mexico. The U.S. Marine Mammal Protection Act prohibited tuna fishing methods and techniques that killed large numbers of dolphins. And this law was not just for Mexican. They also banned tuna imports from other countries that used such fishing methods. The Mexican government claimed that this U.S. law was in violation of the rules of the General Agreement on Tariffs and Trade (GATT).the principals of trade which were providing the basis for the GATT has restricted the countries from banning the imports except in some special situation such as protection of health of their own citizen. According to GATT panel the countries were not allowed to protect the dolphins outside has border.

In same case in 1999 the U.S could not ban the shrimp imports from countries using fishing methods that kill endangered sea turtles. These conflicts increase the attention of the economist which was in struggle to investigate the relationship between international trade and environment quality. The relationship between environment and trade is fundamental for providing basis for achieving sustainable development. Economists also claimed that the expansion of trade in the international market due to globalization and free trade

agreements not only increases the market share of each country, but also increases competition among nations s a result they try to improve the efficiency by the use of scarce natural resources. Environmental economists claim that the real costs of the expansion of trade between nations are depleting natural resources and environmental quality.

In international free trade the value of all international transactions is drive on the basis of market prices. Number of factors will affect the market price when we are dealing with the international trade involving environment and natural resource commodities. The World Trade meetings in 1999 in Seattle raised the question of whether the increase in international trade is good or bad for the environment on the world stage. Events such as the NAFTA and the completion of the Uruguay Round have raised concern over the impact of trade liberalization on the environment. For over a quarter century, researchers have been aware of the possibility that the increase in trade adversely affect the environment.

Recent researches on the net effect of free international trade on the environment have matured, but there are still many outstanding issues. It has both direct and indirect effects of this free trade but to know only about the direct effects of trade the study is being gone. Direct effects include emissions and environmental damage associated with the physical movement of goods between exporters and importers. This includes emissions from fossil fuel use, oil spills, forest degradation, scarcity of virtual water and emission of sulfur and carbon etc. The first research on how globalization affects the environment tends to do the reverse question: how can environmental impact trade regulation? The prevailing thought was that if trade affects the environment, must be the case that environmental regulation affects trade flows.

Research Question:

Is trade openness good for environment in case of Pakistan?

Research Objectives:

The objective of the research is to investigate the causal relationship between international trade and environment degradation in Pakistan with empirical evidence using Granger causality test.

Importance of the study:

It will be helpful in policy formation for international trade to analyze the impact of trade liberalization on environment quality.

Organization of the study

The research is planned as follow. The chapter 2 describes the literature review. Chapter 3 consists of the model and methodology for the research .In chapter 4 analysis is carried out while in chapter 5 interpretations of the data is done .chapter 6 contains the conclusion and graphs of the effect of international trade on the environment quality.

Theoretical support:

The study done by Grossman and Krueger (1991) for the impact of North American Free Trade Agreement (NAFTA) on environment in which effects of international trade were decompose in three effects. Each will be discussed in turn.

1. Composition effect: Due to openness of trade country will change their composition of economy, which will able a country to produce more of that in which it have comparative advantage. That extra production will be traded for the goods in which a country has no comparative advantage. For example a country with heavy forest will only produce those products in which forest can be utilized due to no openness to international trade. Due to trade, it may also produce for exports which may be harmful or has positive effect the environment. When trade encourages specialization through global level, composition effect arises. That is countries which produce large variety of products to satisfy domestic demand will now specialize in a division of the product range and import the other products. This will result in economic gain due to rise in efficiency and through economies of scale. The net effect on the domestic environment will be positive if growing export sectors are less polluting on normal than contracting import-competing sectors. Since one country exports are another country imports, all countries cannot specialize in the clean technology. International trade will redistribute local pollution issue in the world from country that have a comparative advantage in industries that are naturally less polluting to countries that have a comparative advantage in industries that are naturally more polluting. This effect is also known as structural effect.

2. Scale effect: Openness to trade may increase the economic activity which will make that economic activity more efficient. The increase in economic activity can be positive if it generates more wealth and that wealth used by government or consumer for environment protection. The second effect of trade liberalization on environment is due to scale effect. As we know that pollution is the byproduct of consumption and production, so increase in the scale of these economic activities will affect the environment. With given pollution and composition coefficients of production any economic activity will harm the environment. Economic growth at particular production and composition with known pollution coefficient will therefore always dangerous for the environment.

Journal of Economics and Sustainable Development
www.iiste.org
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.6, No.9, 2015

3. Technique effect: Technique effect may be due to method used or involves in the production with different procedure, with different combination of inputs for production. These inputs have different possibility of degrading the environment. This type of effect can only be due to product own impact on environment which is traded. If spreading of new technology is beneficial for environment like microbial techniques for cleaning up the Oil spills then international trade is positive for environment. On the other hand products which are traded are harmful for environment and increase a country pollution level then it has negative impact on the environment quality.

Literature review:

Numerous studies have been done on the benefit of trade and have suggested that international trade is a vehicle to accelerate the economic growth in the trading countries and especially in the developing countries. But environmentalists claim that this openness to trade not just increase the welfare of the consumers and producers, but also degrade the environment with different trade activities which are mostly happened due to openness to trade.

Grossman & Krueger (November 1991) claim after analyzing the environmental impact of NAFTA that if restrictions are removed from trade then in general environment will be effected. This will be in consequence of increase in the scale of economic activity, change in composition and techniques of production. They used cross-sectional data from urban areas of 42 countries which shown the impact of openness of trade on the environment.

Antweiler, Copland and taylor (2001) made a theoretical research and they contribute to the relevant literature that trade liberalization can affect the pollution concentration in three ways. The first effect of trade liberalization on environment can be due to scale effect. As we know that pollution is the byproduct of consumption and production, so increase in the scale of these economic activities may affect the environment. The second effect may be due to method or technique effect which involves the different procedure of production, with different comparable inputs of production. These inputs have different risk of degrading the environment. Composition effect may happen due to the fact that every good has its own polluting tendency. The composition of goods which are traded can find out the size of pollution in any given economy. They analysis that trade liberalization bring comparatively small changes in pollution when it notify the composition of national output. The empirical outcomes show that trade encourages technique and scale effect brings a net decrease in pollution due to these activities. And according to their analysis free trade is not bad for environment.

According to M.Haris Jonathan (2002) trade in general is economically beneficial because with international trade countries can take gain from pursing their comparative advantage through trade. But it may also be harmful at regional, national and global level. Foreign direct investment (FDI) may also effect the environment in resource base industries like Oil extraction, mining of minerals which can significantly lead to local environmental degradation as noticed in Nigeria, Indonesia and New Guinea.

The study done by Rudel (1999) has somewhat different findings that international trade is an important factor in the high rate of tropical deforestations. More specifically the trade with developed countries has compelled the Latin America and Southeast Asia to increase the deforestation. In Africa the extermination of valuable animal and plant species is also occur due to trade liberalization. Due to all this trans-boundary problems of international trade the issue of the environmental effects of international trade is very complicated and important on the international level.

The study done in Pakistan by Azhar Usman (2003) finds out that in the case of developing countries the situation is totally different from the developed countries. When dealing with effects of international trade on environment the developing countries are more dependent on agriculture sector and exploitation of natural resources. This all happens due to the fact that to keep balance of payment in surplus or at least in their favor. For this developing countries increase the volume of trade which results in the overexploitation of natural resources which damage the environment in both short and long term. This alls leads to the falling standard of living in real terms.

In the same way another study was carried out by Chou Chien-fu, Melmed-sanjak and Shy oz (March 1991) to investigate the effect of openness to trade on environment degradation. Environmental quality in this research is shaped as a differentiated non-tradable product. The finding of the research indicates that when consumers view consumption and environmental attributes as substitutes and if consumer place comparatively high value on environment quality than on product quality, then openness of trade may reduce the welfare of trading countries. A net welfare loss may occur which will decrease the actual gain from trade or reduce that.

Gamper-Rabindran Shanti and Jha Shreyasi (2003) investigate the effect of trade on environment when trade barriers were removed from FDI in 1991 due to liberalization of trade. To analyze these impacts using industry level dataset among the entire manufacturing sector, they compare the pre and post liberalization period of trade. To examine that Indian local production and exports increase the dirty technology comparatively to clean one or not. They also investigate that is there any increase in pollution intensive sector due to inflow of

FDI. They come with the findings that FDI and exports were increase in more polluting sector than less polluting sector after trade liberalization in India.

Samina khalil and Zeeshan inam argued that Economist claim that the increase in domestic production due to international trade to earn foreign currency not just increase the market share of each currency but also bring efficiency in utilizing scare recourses. But on the other side environmental economist criticized such argument by claiming that the actual or real cost of liberalization of trade is the depletion of natural resources and degradation of environmental quality. Their finding showed that long run relationship exists between international trade and environment .that why policy should be made in favor of environment protection.

Ultimately all this will affect the economic growth as discussed by the Birgit Fried(2011) in his analysis of the carbon impact on economic growth. The finding of his research was that environmental pollution may decrease the output directly and will also decrease the productivity of the man-made capital and labor. This distressfulness and the damage occur due to this environmental pollution in long run can contribute to the distractive effect on human well being and economy. This study was conduct to examine the impact of co2 on economic growth in Asean 8 using data from 1965 to 2010. The study formulates three simultaneous equations for empirical analysis which shows that environmental Kuznets relationship exists in Asean 8.

Mukhopadhya Kakaliy and Debesh Chakraborty (June 2005) also investigate the effect of liberalization of trade on environment in India by testing pollution heaven hypothesis (PHH) and factor endowment hypothesis (FEH). The method used to test PHH and FEH were Input Output method. According to their analysis Indian evidence does not support PHH (pollution heaven hypothesis) wither it checked for trade with the rest of world or only exclusively with European union EU .But it support FEH (factor endowment hypothesis) when exporting more labor concentrated goods which are friendly for environment.

Mccarney Geoff and Adamowicz (August 2006) carried out a research to investigate the effects of international trade on environmental quality. The prediction of their estimated econometric models was that openness of trade affects the organic water pollutants (BOD) and carbon dioxide (CO2) emission. And both models find out that free trade significantly increase emissions which ultimately harm environment quality. They also argue that democracy may improve the relationship between environment and trade because countries were democracy is present then any increase in income level brings decrease in the organic water pollutants (BOD). While in case of autocratic countries any increase in income level does not decrease the organic water pollutants (BOD).

DATA description:

The graph given below indicates that with the passage time, the emissions of carbon dioxide are increases in Pakistan which is harmful for environment quality. The value for CO2 emissions from gaseous fuel consumption (kt) in Pakistan was 67,044 as of 2009. Over the past 49 years this indicator reached a maximum value of 67,044 in 2009 and a minimum value of 1,133 in 1960. According to World resource institute (2003) the CO2 emission in world is 8% and in Pakistan it is 43 % which is very dangerous for the health of the citizen. If we see to graph in which CO2 emission is taken along the y axis, and on horizontal axis years have been taken which shows that's with time the carbon dioxide emission increasing which also granger caused by the scale and composition effect according to results of this research.

Figure 1
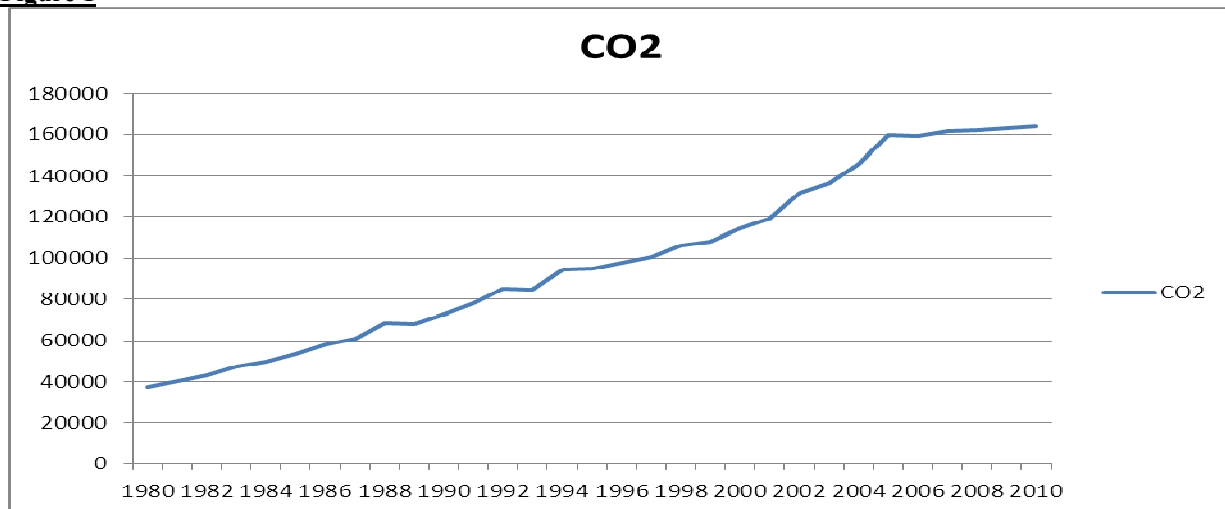
From figure 2 it is clear that FDI fluctuates in the 1990s and then in 21 century rise due to openness to trade and its trade strategies. The reasons for low investment in Pakistan in 1990 were due to bad infrastructure of Pakistan which was not liked by the foreign investors. Numerous adjustments in rules governing customs,

taxes and tariffs compose investment opportunities doubtful and thus less attractive for investors. The prices of the important production inputs like gas and electricity are not stable which also not attract the foreign investors. Political instability, war on Terror and rapid climate changes problem also the key reasons which increase the uncertainty and risk for investors.

Figure 2
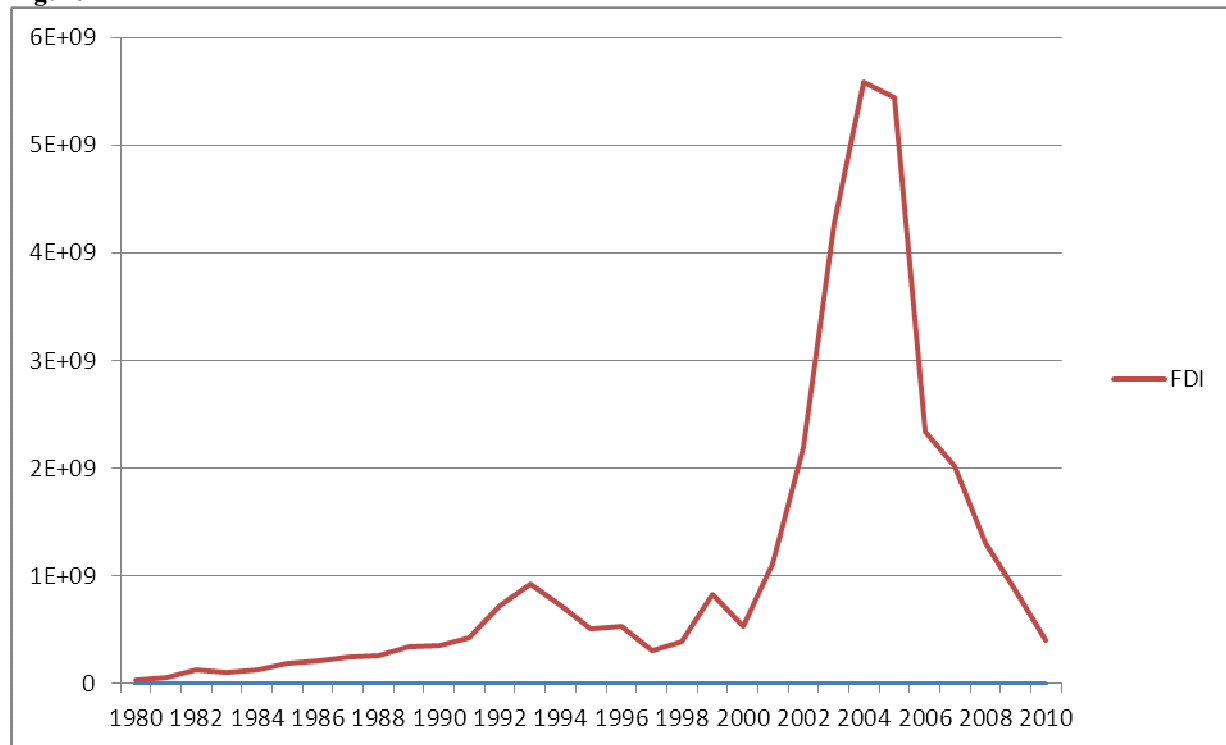
Scale, technology and composition effect increase with time as shown in graph in Appendix. The graph 2 shows the net inflow of FDI in Pakistan with respect to time. In 2000 the FDI was high with comparison to the past value due to removing barriers of trade to capture the global market.

Research Methodology:

Variables:

1. **EM** is the carbon dioxide emission which will be used as a proxy for Air pollution.
2. **OT** is openness of trade or trade intensity.
3. **CO** is the composition effect which will be generated as K/L.
4. **SC** is scale effect which will be generated as RGDP/Area.
5. **TE** is the technique effect which will be RGNP.
6. **FDI** is the foreign direct investment.

Operational definitions of variables:

The model used in this analysis was also used by the Antweiler in his research.

Trade intensity or openness of trade is generated from the combination of three variables exports in time (t) plus imports divided by gross domestic product (GDP) in that same year.

The composition effect (CE) is consists of capital (K) and labor (L) which is generated as K_t/L_t. For capital gross fixed capital is used as a proxy in the model and for labor total labor force is used.

To capture the economic activity size the gross domestic product divided by Area is used which generate the composition variable for the model. For Technical effect (TE) gross national income (GNI) is used as a proxy.

For foreign direct investment net FDI inflow is used as a proxy.

Data:

The data used in all analysis will be time series. Secondary yearly data from 1980 to 2010 will be taken from the Economic survey and World Bank site. The sample is consists of 31 samples which will be analyzed to capture the effect of trade liberalization on environment quality in Pakistan.

Analysis and Econometric process:

Model and Methodology:

The most common method to test the causality or causal relationship between two variables is by Granger causality which is given by Granger in 1969. The test of Granger causality concerned with the estimating of simple Vector auto regression which is known as (VAR).Granger causality means that the lagged value of (Y_t)

influence the value of (X_t) in equation 1.while in equation 2 it shows that the lagged value of X_t is causing Y_t. And It is assumed that (e_t) and (u_t) uncorrelated. While in some cases the researchers check the estimated value of the coefficient that wither its different from zero with the F statistic or not. The Granger causality test is very easily carried out and is able to apply many empirical studies. When test reject the null hypothesis indicate that causal relationship exists between the variables.

Model:

For instance, in case of two equation model having p lags, (Xt)is not Granger caused by (Yt) if and only if all the co efficient of A2l (L) are equal to zero. Therefore, if the forecasting performance of (Xt) is not caused by (Yt) then the latter does not Granger cause the former. Granger causality hunts for the phenomenon whether the lag values of (Yt) affect the current values of (Xt). The book further argues that if all the variables in the Vector auto regression are stationary, standard F test may be used to test for Granger causality. The following unrestricted equation is estimated assuming a specific lag length p;

$$\Rightarrow x_i = \alpha_0 + \sum \alpha_i x_{t-i} + \sum \beta_j Y_{t-j} + e_i \quad \dots\dots\dots\dots\dots (1)$$

$$\Rightarrow y_t = a_0 + \sum a_i x_{t-i} + \sum b_j y_{t-j} + u_t \dots\dots\dots\dots\dots (2)$$

Hypothesis:

The null hypothesis of Granger causality can be formulated as:

(1) H0: Y does not Granger cause X.

HI: Y does Granger cause X.

(2) H0: X does not Granger cause Y.

HI: Y does Granger cause X.

As per the definition of Granger causality, Y does not cause X if,

$$\alpha_1 = \alpha_2 + \alpha_3 + \alpha_{t-i} + \dots\dots\alpha_j = 0 \quad \dots\dots \quad (1)$$

And

X does not cause Y if,

$$\beta_1 = \beta_2 + \beta_3 + \beta_{t-i} + \dots\dots\beta_j = 0 \quad \dots\dots (2)$$

Granger causality can be interpreted as Y is Granger caused by X if current value of Y can be forecasted with the help of past values of X. The direction of Granger causality can be analyzed as follows.

If equation (1) holds true and equation (2) comes out to be false then;

 -Y is Granger caused by X;   (X→Y)

If equation (1) holds true and equation (2) comes out to be false then;

  -X is Granger caused by Y;   (Y→X)

If both equation (1) and equation (2) comes out to be false then;

   -X and Y are independent which means they are no causal relationship between these two variables.

If both the equations are true then;

-X is Granger caused by Y and Y is Granger caused by X; that is written as (X↔Y)

Results discussion:

Table 1 Pairwise Granger Causality Tests

Null hypothesis	Observation	F- Statistic	Probability
SC does not Granger cause OT	29	1.73690	0.19747
TO does not Granger cause SC		1.24653	0.30546
TE does not Granger cause OT	29	5.59422	0.01013
OT does not Granger cause TE		5.07709	0.01449
FDI does not Granger cause OT	29	1.01398	0.03913
OT does not Granger cause FDI		1.62864	0.021654
CO_2 does not Granger cause OT	29	2.59898	0.042984
OT does not Granger cause CO_2		1.32093	0.003217
CO does not Granger cause OT	29	2.71844	0.08627
OT does not Granger cause CO		1.25272	0.07349
TE does not Granger cause SC	29	4.00971	0.03145
SC does not Granger cause TE		3.23543	0.04231
FDI does not Granger cause SC	29	3.92568	0.03350
SC does not Granger cause FDI		1.09151	0.03981
CO_2 does not Granger cause SC	29	2.01937	0.00319
SC does not Granger cause CO_2		1.30921	0.03423
CO does not Granger cause SC	29	0.01324	0.87193
SC does not Granger cause CO		0.02312	0.92101
FDI does not Granger cause TE	29	4.7294	0.01733
TE does not Granger cause FDI		0.80194	0.41910
CO does not Granger cause CO_2	29	3.05674	0.06568
CO_2 does not Granger cause CO		1.42883	0.25911
CO_2 does not Granger cause FDI	29	0.75459	0.48103
FDI does not Granger cause CO_2		6.1774	0.00685
CO does not Granger cause TE	29	0.60379	0.55483
TE does not Granger cause CO		10.8198	0.00045
CO does not Granger Cause FDI	29	0.27817	0.75958
FDI does not Granger Cause CO		6.54765	0.00538
CO2 does not Granger Cause TE	29	1.21073	0.31554
TE does not Granger Cause CO_2		3.05865	0.06558

Interpretation:

The above table is the outcome of the Pairwise Granger cause test which analyzes the causal relationship

between the variables. From table we can examine the causality that either its one way causality or two way causality. The Granger casualty has been checked which shows that technique effect is caused by the trade intensity and trade intensity is significantly cased by the technique effect. Which indicate that trade openness cause technology which is transfer from one nation to another as a result of liberalization of trade.

Carbon dioxide emissions cause the trade openness while in case of the composition effect which is the taking and expanding their comparative advantage due to trade is significant. Technique effect granger cause the economic activity scale and scale cause the technique effect which is the transfer of technology due to liberalization of trade.

Foreign direct investment cause the size of economic activity which is the scale effect due to trade liberalization .while scale effect does not cause FDI. Scale effect which is the expanding of economic activity cause the composition of trading goods which is sometime referred as structural effect due to trade liberalization.FDI also case the technique effect which is measured in the term of real GDP.fdi also cause the composition which cause the carbon dioxide concentration.

Technique effects cause the carbon dioxide emission in Pakistan. Technique effect causes the composition effect while composition effects not cause the technique effect. While foreign direct investment is caused the concentration of carbon emission in Pakistan. Graph was also given at the end with respect to time for analyzing rise in variable with time.

From Table it's clear that there is by direction casualty between the Technique effect and openness to trade at 5% of significance level. By-directional casual relationship means that both cause or affect each other. Most of the variables have two way casual relationships which mean both causes their lagged values at 5% of significance and some have casual relationship at 10% of significance level.

As shown from table there is by directional or two way causality between foreign direct investment and openness to trade. Carbon emission and openness to trade have also by directional affect same with the composition effect and openness to trade. TE and SC, FDI and SC, CO2 and SC and CO and SC have also directional causality. Some variables have uni-directional causality like FDI and TE, FDI and CO_2, TE and CO, FDI and CO and TE and CO.

Table 2

Statistical Description:

	OT	SC	TE	FDI	CO2	CO
Mean	0.333780	52753.69	8.14E+10	1.08E+09	90752.35	249.5952
Median	0.330091	49907.56	6.24E+10	5.06E+08	84839.71	260.0769
Maximum	0.385433	107986.7	2.15E+11	5.59E+09	171212.6	597.3847
Minimum	0.278891	8204.758	2.87E+10	29457027	32067.92	17.10476
Std. Dev.	0.029168	28044.82	5.49E+10	1.48E+09	41836.12	160.2400
Skewness	0.037702	0.211085	1.167780	2.112868	0.381730	0.123401
Kurtosis	2.030077	1.961415	3.189830	6.447376	2.035228	2.589467
Jarque-Bera	1.222480	1.623478	7.092380	38.41578	1.955140	0.296370
Probability	0.542678	0.444085	0.028834	0.000000	0.376224	0.862272
Sum	10.34717	1635364.	2.52E+12	3.34E+10	2813323.	7737.451
Sum Sq. Dev.	0.025523	2.36E+10	9.06E+22	6.55E+19	5.25E+10	770305.3

Interpretation:

The statistical information given below tells about the data that in which pattern they are exist.

The mean and median of all the variables are much closed. All the data are positively skewed because it's greater than zero. TE and FDI kurtosis indicate Leptokurtic and the other variables

CO_2, SC, CO and OT are platykurtic. The mean and median for CO_2 and OT are close.

Conclusion:

The purpose of the paper was to investigate the causal relationship among the carbon dioxide emission and international trade .In which international trade is decompose as scale effect, structural effect and technique effect. Trade can have several sorts of effects on the environment. In this short paper, we have modeled the effect of trade on the environment in Pakistan. Empirical investigation of the causation between openness to trade and carbon emission shows that FDI cause the scale effect which is the expanding in the economic activity and also cause the CO_2 concentration in the air. By directional causality were examine among most of variable of the study which indicate that openness in case of Pakistan is dangerous for good environment quality .Foreign direct investment influence the carbon dioxide and technology which comes in term of dirty industry .Another uni directional relationship between technology and composition effect exists which indicate that technical effect influence the composition of the products which is due to taking gain of the comparative advantage.

Policy recommendation:

In case of Pakistan trade liberalization encourage FDI which affect technology and that technology cause the carbon emission. Government should need to focus on the technology that either its environment friendly or not which come to Pakistan as result of trade openness. Due to lose environmental policies to attract the traders and investors the openness of trade causes the co_2 which making the situation bad as World recourse institute announced (2008) that in Pakistan carbon dioxide emission is 43%. Pakistan needs to formulate such a policy for environment protection which not allows the investors to invest in that sectors whose technology are bad for environment quality.

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Appendix

After checking the unit root problem in the detail it has been seen that all variables after taking first difference have no unit problem .All variables were found integrated of order one that's I(1).

Figure 1

Null Hypothesis: D(CO2) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic based on SIC)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-5.411299	0.0001
Test critical values:	1% level		-3.6793223	
	5% level		-2.9677673	
	10% level		-2.6229892	

Figure 2

Null Hypothesis: D(CO) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-4.118879	0.0034056
Test critical values:	1% level		-3.679322	
	5% level		-2.96776	
	10% level		-2.62298	

Null Hypothesis: D(SC) has a unit root				
Exogenous: Constant				
Lag Length: 1 (Automatic based on SIC, MAXLAG=7)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-5.934681	3.4819672
Test critical values:	1% level		-3.689193	
	5% level		-2.971853	
	10% level		-2.625120	

Null Hypothesis: D(FDI) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-3.377449	0.0202921
Test critical values:	1% level		-3.679322	
	5% level		-2.967767	
	10% level		-2.62298	

Null Hypothesis: D(TE) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-3.556370	0.01339
Test critical values:	1% level		-3.67932	
	5% level		-2.96776	
	10% level		-2.62298	

Null Hypothesis: D(OT) has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-6.878053	3.0432040
Test critical values:	1% level		-3.679328	
	5% level		-2.967767	
	10% level		-2.62298	

Figure 4
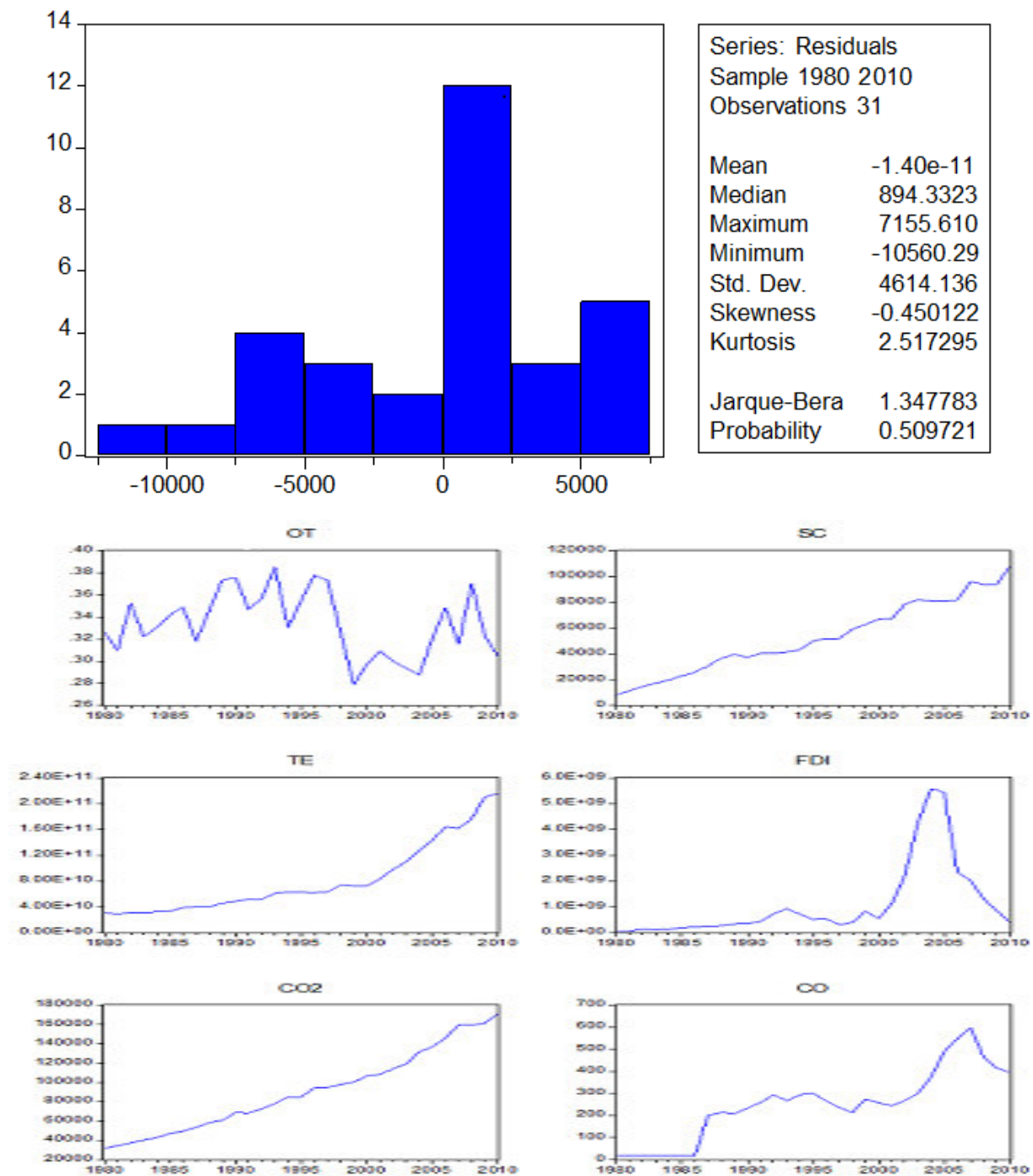
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