

MOVING TO GREENER PASTURES: UNTANGLING THE EVIDENCE ABOUT FOREIGN DIRECT INVESTMENT AND ENVIRONMENTAL REGULATION IN EU COUNTRIES

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ABSTRACT

This study investigates the impact of environmental regulation on FDI. A panel data set of 18 European countries has been used for a time period of 1995 to 2013. The dependent variable is FDI and the independent variables are total environmental tax revenue, gross domestic product (GDP), gross capital formation (GCF), gross national income (GNI), trade openness and carbon dioxide emissions (CO₂). The following test unit root test, Hausman specification test and a Fixed Effect Robust Model have been used. The empirical result is that total environmental tax revenue are positively related with FDI. Trade openness is coherent with FDI which is in line with Edwards (1990), Demirhan and Masca (2008) and Anyanwu (2011). Gross domestic product and FDI are positively significant and the findings are reliable to the study of Obwona (1999), Mottaleb (2007) and Hakizimana (2015). Gross capital formation and FDI has a positive relationship which is line with Krkoska (2001) and Awan et al. (2014). Gross national income and FDI has a negative relationship which is reliable to the study of Antwi and Zhao (2013) but unreliable to Awan et al. (2014). Nevertheless only carbon dioxide emissions has failed to be in line with the expected outcome. Carbon dioxide and FDI are not coherent.

JEL classification codes: A2, C4, E6, P5

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INTRODUCTION

The previous decade has likewise seen an elevation in the pattern of environmental degradation for instance an increase in the greenhouse gas emissions, loss of biodiversity and deforestation. Such trend has been driven by the expanded economic activities in which FDI, “investment by foreign companies in overseas subsidiaries or joint ventures has a traditional reliance on natural resource use and extraction, particularly agriculture, mineral and fuel production” stated by Mabey and McNally (1999) is considered as a vital contributor of the environmental degradation. Daly (1991) claimed that an incline in economic activity will deteriorate the environmental conditions as large amounts of energy and materials produce large quantities of waste.

In addition to that economic growth can improve the quality of the environment because an increase demand of less material intensive goods and services and economic growth causes policy makers to develop new environmental regulation. The adoption of the regulation are said to improve the quality of the environment. The regulation came in terms of the environmental tax which was widely used as environmental policies. The latter was utilised to evaluate the efficiency of environmental taxes on an economy. Cecil. A (1920), a British Economist was the first person to suggest the idea of environmental tax which was crucial to diminish environmental externalities caused by economic activities. Environmental externalities are referred to the negative impact of production of undesirable commodities where in utmost cases the polluters do not bear the cost of pollution. According to the Environmental Policy Tools and Evaluation (2010), the OECD claimed that environmental policy is a useful tool to lessen pollution. Nonetheless, countries should properly design these policies so that they could prove to be efficient. Additionally, an appropriate technology innovation can likewise support to alleviate environmental issues but for some countries this might prove to be costly. Subsequently, the solution would be the governmental policies in the form of environmental taxes.

The aim of this study is to analyse the impact of environmental regulations on FDI and to depict how much that impact is significant. This objective will be accomplished through the following variables: FDI, total environmental tax revenue, carbon dioxide emission, trade openness and the economic variables gross domestic product, gross national income and gross capital formation. The total environmental tax revenue and carbon dioxide emissions were used as proxies of environmental regulations. Moreover these economic variables were chosen because various literature suggested that these variables have an important impact on FDI which are in line with the study of Antwi and Zhao (2013).

The remainder of this paper is as follows section two the literature review, section three the methodology. Section four is the findings and results of the study and ultimately providing a conclusion and recommendation in section five.

LITERATURE REVIEW

FDI is defined as the source of acquisition of managerial control by a business enterprise of a foreign country over business activity in a host country (Graham, 1982). Furthermore, Foreign direct investment (FDI) is also defined “as an investment involving a long-term relationship and reflecting a lasting interest and control by a resident entity in one economy (foreign direct investor or parent enterprise) in an enterprise resident in an economy other than that of the foreign direct investor (FDI enterprise or affiliate enterprise or foreign affiliate)”.¹

Openness

Singh and Jun (1995) reported that the rising complementarity of trade and FDI flows has been linked to export orientation, which is essential in attracting FDI. A drop in the openness can imply to be in favour of horizontal FDI. The aim is to serve local and regional markets as investing firms might profit from the overseas building production sites by evading trade barriers. Markusen et al. (2002) and Dunning (1993) stated that the impact of trade openness on FDI inflows depends on the motivation for participating in FDI activities. Demirhan and Masca (2008) who investigated the determinants of FDI inflows in developing countries. The following variables: growth rate per capita, labour cost, trade openness, risk and corporate tax rate were used with a sample of 38 developing countries for a time period from 2000 to 2004. Based upon the result of the principal model, it was found that growth rate per capita and trade openness were positively significant with the dependent variable, FDI. Anyanwu (2011) studied the determinants of foreign direct investment inflows to Africa for a lapse of time of 17 years (1980-2007) and the latter used a panel of seven five year non overlapping windows that indicated a positive relationship between trade openness and FDI.

However Pärletun (2008) looked at the determinants of FDI in Belarus using a sample of 16 neighbouring countries for the year from 2002 to 2006. The dependent variable inward FDI and the independent variables annual corruption perception, education index, GDP and trade openness were used to estimate the multi regression. The result was that GDP had a positive significant relation and trade openness had a positive but insignificant relation with FDI whereas the other variables were incoherent with FDI. Schmitz and Bieri (1972) investigated on the European Economic Community and US direct investment using series data for the period of 1952 to 1966 and found that FDI and openness of trade were weakly positively related.

Function of Environmental Regulation on FDI

The influence mechanism of FDI upon the environment was first put forward by Grossman and Kruege (1991) in their research on North America free trade zone, by considering structure and technology spill over effects. Technique spillage effect refers to the environmental influence brought by FDI technical proliferation. Opportunities are provided by FDI to solve a particular ecosystem problem through the proliferations of environmental techniques and services in the world. Lecchumanan and Kodama (2000) affirmed that the benefits of FDI is not only restricted to a country's technical progress, but it also helps in raising country's environmental welfare by developing, in a friendly way the environmental technologies and ensuring efficient management technique. Eskeland and Harrison (2002) acknowledged that environmental friendly type of producing and harnessing pollution techniques will be adopted by the business enterprises of intensively polluted industry and that they would monitor closely the environmental standard of host country than local enterprises, raise the environmental quality of host country and promote the sustained environmental management of developing countries.

According to Grossman and Krueger (1991) the term structure effect implies that the regional distribution and that the industrial composition of FDI would influence local environment. There can be both positive and negative environmental impacts which are caused by the escalation of economic structure. Natural resources exploitation and heavy chemical engineering industry are the main investment industries of FDI when a country is in the stage of industrialization. This will however, result in non-sustained accelerated exhaustion to resources. Therefore, the structure effect is negative. Positive effect of technology spill over has to rely on certain aspects notably on the rise of economic development level, perfection of environmental infrastructure, and the development of technology itself. Furthermore, the extension of market, and the improvement of incentive mechanism also influences it as these factors can promote competition by adopting and inventing advanced techniques. Satisfactory

systematic policy circumstances yet another key factor. Xing and Kolstad (2002) examined how environmental regulations affected the U.S FDI by using statistical test. The outcome was that determinant of the U.S FDI is coherent with laxity of environmental regulations in host country and incoherent with heavily polluting enterprises. Pollution haven hypothesis was indirectly supported by their analysis. Nevertheless, care should be taken with the reliability of their results because data of small size and imperfect coverage of sulphur emissions were used.

Proxies of This Study

The environmental proxies will be the environmental tax and the CO2 Emissions and the economical proxies will be GDP, GCF and GNI.

Environmental Tax

Organisation for Economic Cooperation and Development (2005) defined environmental tax as “A tax whose tax base is a physical unit that has a proven specific negative impact on the environment”. Smith (2012) from the government of UK interpreted environmental tax in three principles:

1. Tax should solely be related with government’s environmental aims.
2. Tax should inspire positive behaviour change towards the environment.
3. Tax should be organised in connection to environmental objectives.

Environmental tax is considered as a vital tool to support and stimulate pro-environmental attitudes and behaviours. Pearce (1976) and Turner et al. (1994) noted that environmental tax are widely used as environmental policy that enables countries to strengthen their belief that regulations create a less robust incentives than taxes. There are three main reasons in implementing the environmental taxes and they are:

1. According to Pearson and Smith (1990) government profits by the income produced through these taxes.
2. Verbeke and Coeke (1997) noted that environmental taxes give a constant motivating force to develop less polluting products.
3. Intended to spur individuals towards pro- environmental behaviour.

Daly (1991) claimed that the environmental quality was degraded because the extraction of natural resources were on a rise resulting in an accumulation of pollutants and wastes in our environment. The author explained that the apparent trade-off between economic growth and environmental degradation gave rise to a significant relationship between economic growth and environmental regulation. Therefore, an incline in economic activity will deteriorate the environmental conditions as large amounts of energy and materials produced large quantities of waste.

Carbon Dioxide Emissions (CO2) and FDI

Yanchun (2010) investigated about the impact of FDI on carbon dioxide emissions in China using data from 1978 to 2008. The variables FDI, GDP, export, agriculture, domestic investment and CO2 were used in the author study. Ordinary Least Square (OLS) regression and stationary test were used to find out the result of the impact of FDI on CO2. It was concluded that FDI inflows ease the pressure of CO2 emissions in China. The main reason was due to the technology spill over effect which eventually improved their environmental problems. Mahmood and Chaudhary (2012) examined the effect of FDI on CO2 emissions in Pakistan for the years 1972 to 2005. The writers used FDI, CO2, manufacturing value added and population density as their main variables. The following test were conducted: stationary test, ARDL cointegration and its error correction model. The result was that FDI had a positive impact on CO2.

Nevertheless, Shaari et al. (2014) studied the impact of FDI on economic growth and CO2 emissions for a time period from 1992 to 2012 for 15 developing countries. The Johansen co-integration, Fully Modified Ordinary Least Square (FMOLS) and Granger causality test were carried out using FDI, CO2 and GDP as variables. The result was that both in long run and short run FDI did not have a significant relationship with CO2.

GDP and FDI

Obwona (1999) who investigated the relationship of FDI growth linkage and institutional constraint using Uganda as a case study where the author took into consideration the vital aspects that inspires foreign investors in investing in Sub Saharan African countries. FDI was used as dependent variable. GDP, trade balance, annual growth rate of GDP, inflation rate, domestic saving rate and public expenditure to GDP were the independent variables. Interviews

and surveys were carried out to gather information about the variables and a regression was carried out. The result was that GDP growth, public expenditure to GDP and domestic saving rate had a positive impact on FDI whereas trade balance and inflation rate had an inverse relation with FDI. The concluding remarks were that Uganda is a problematic location for business operation due to their poor infrastructure, poor labour and market access.

Mottaleb (2007) explored the determinants of FDI and its consequences on GDP in developing countries by analysing a panel data of 60 low income and lower middle income from 2003 to 2005 from three continents namely Africa, Asia and Latin America. They tried to look for the prominent factors and socio economic of the chosen sample. Three models were used to support the two hypotheses:

1. Countries with large GDP size and high GDP growth are more likely to attract FDI.
2. FDI positively affects economic growth.

The variables were: FDI, GDP, Annual growth rate, Industrial value added, Internet User, Time, and Corruption index. The following test were carried out: Pooled OLS, Hausman specification and a random-effects generalised least square (GLS) regression. The outcome was that the year 2005 proved to be the more efficient year and it was also noticed that GDP or GDP growth rate elevates with the maintaining of abundant updated infrastructural facilities. This eventually encouraged and attracted more FDI inflows in these particular countries.

Likewise in the study where Hakizimana (2015) examined the relationship between FDI and GDP in Rwanda. A data set for the year from 2008 to 2012 was utilised for the two variables FDI and GDP per capita. A correlation test and a simple regression was carried out where the findings revealed that there is a strong positive relation between FDI and GDP per capita in Rwanda. This meant that an increase in FDI inwards led to an incline in GDP per capita.

GCF, GNI and FDI

Krkoska (2001) examined the relationship between FDI and GCF by looking at the different sources of capital formation in transitional countries. The author used an annual data of 25 countries for a time period of 11 years from 1989 to 2000. The method of estimation employed was the seemingly unrelated regression and the result was that GCF is positively linked with FDI.

Antwi and Zhao (2013) studied the effect of FDI and economic growth in Ghana using a time series data for the period from 1980 to 2010. The variables FDI, GDP and GNI were used. The following test were carried out: ordinary least square, cointegration and vector autoregressive and Granger causality test. The result was that FDI and GNI have a positive negative relationship in the long run.

Awan et al. (2014) investigated on the factors affecting FDI using a data set from 1988 to 2012 in Pakistan. The variables FDI, GCF, GNI, import and export were utilised. A multiple linear regression was carried out and the outcome was that GCF and GNI are positively significant and positively affects FDI inflows in Pakistan.

METHODOLOGY

Foreign Direct Investment (FDI)

According to World Bank (2016) FDI Inward flows represent “transactions that increase the investment that foreign investors have in enterprises resident in the reporting economy less transactions that decrease the investment of foreign investors in resident enterprises” and it is measured in U.S dollar.

Gross Domestic Product (GDP)

GDP measured in U.S dollar is defined as “the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.” (World Bank 2016). Various studies and evidence has found that FDI and GDP is positively related.

Trade Openness (OPEN)

Trade openness is the total amount of service exports and imports divided by the value of GDP which is measured in U.S dollar. According to Hausmann and Fernandez-Arias (2004) intense literature it can be said that the more a country is open towards worldwide trade the more will be the FDI inflows. Thus trade openness and FDI do have a positive relationship.

Gross Capital formation (GCF)

Gross capital formation (GCF) measured in U.S dollar which was previously known as gross domestic investment signifies the expenditures on the supplements to the fixed assets of a country. It includes land improvements, plant, machinery, equipment purchases and infrastructures as well as the net acquisitions of valuables. Libor Krkoska (2001) concluded that FDI and GCF has a positive relationship.

Total Environmental Tax Revenue (TETAX)

An environmental tax is a tax enacted on something that has been affirmed of having a specific negative repercussion on the environment. Total environmental tax revenue (TETAX) refers to the total revenue accumulated from energy taxes, transport taxes, pollution taxes and resources taxes. Energy tax comprising of Carbon dioxide taxes is the total revenue arising out of the tax imposed on energy products that sets an end goal to boost the energy efficiency and consumption of more environmentally friendly products. Transport tax is related to the primary source of greenhouse gas emissions which makes it essential to impose a tax on vehicles in order to discourage their utilisation.

Carbon Dioxide Emission (CO2) metric ton per capita

Carbon dioxide emissions are those stemming from burning of fossil fuels and manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid and gas fuels and gas flaring. The expected result is that FDI and CO2 should have a positive relation as stated by Mahmood and Chaudhary (2012).

Gross National Income (GNI)

Gross national income (GNI) represents “the total domestic and foreign output claimed by residents of a country, consisting of gross domestic product (GDP) plus factor incomes earned by foreign residents, minus income earned in the domestic economy by non-residents” (World Bank, 2016).

Model Specification

$$\text{LNFDI}_{it} = \beta_0 + \beta_1 \text{LNTETAX}_{it} + \beta_2 \text{LNGDP}_{it} + \beta_3 \text{LNOPEN}_{it} + \beta_4 \text{LNGCF}_{it} + \beta_5 \text{LNGNI}_{it} + \beta_6 \text{LN CO2}_{it} + \varepsilon_{it}$$

FDI is Foreign Direct Investment inflows and it is the dependent variable; TETAX denotes the total environmental tax revenue; GDP is the gross domestic product; GCF is the gross capital formation; GNI is the gross national income; CO2 refers to the carbon dioxide emission. β_0 is the intercept of the model. Coefficient $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are the coefficient of LNTETAX, LNGDP, LNOPEN, LNGCF, LNGNI, LNCO2. ε denotes the error term. The subscript i is the country and t is the time period from 1995 to 2013. Natural Logarithm (LN) is used so as to help the variable to best fit the model. Furthermore FDI and all the independent variable are measured in U.S dollar except the CO2 variable which is measured in metric ton per capita.

ANALYSIS

Correlation Matrix

Please refer to appendix 1 for the result of the correlation matrix.

This segment shows the correlation matrix between the independent variable. A +1 value known as a perfect positive correlation means that there is perfect correlation between the independent variables. Moreover if there is any adjustment in the estimation of one variable, the estimation of the other variable is changed in a fixed proportion.

Hausman Specification Test

Hausman specification test was performed so as to decide which model is appropriate between fixed effect model

and random effect model and based upon the Chi-Square statistics of 77.66 and a probability of 0.000 was acquired and the fixed effect model was chosen.

Unit root test

The unit root test was carried out using the Im-Pesaran-Shin unit-root test and Fisher type conducted augmented Dickey Fuller unit root test. Furthermore it was conducted to determine whether the variables were stationary or not. For the variables which were not stationary, their first order differences were taken and the test was run again.

Autocorrelation

Autocorrelation is when errors are dependent on each other and it is present when regression errors are correlated across observation. It was concluded that the data does not have first order autocorrelation by using the Wooldridge test for autocorrelation.

Heteroskedasticity

Heteroskedasticity is liable to result in panel data as the large values are not any more prone to have large errors than the small values of the dependent variable. A modified Wald test is used to detect the presence of heteroskedasticity and concluded the presence of heteroskedasticity. Therefore, for our purpose of correcting for both serial correlation and heteroskedasticity in a fixed effect model, the FE robust is used and considered.

Fixed Effect Robust Model

TABLE 1. RESULTS FROM FIXED EFFECT ROBUST

$$\text{LNFDI}_{it} = \beta_0 + \beta_1 \text{LNTETAX}_{it} + \beta_2 \text{LNGDP}_{it} + \beta_3 \text{LNOPEN}_{it} + \beta_4 \text{LNGCF}_{it} + \beta_5 \text{LNGNI}_{it} + \beta_6 \text{LN CO2}_{it} + \varepsilon_{it}$$

	β_0	β_1	β_2	β_3	β_4	β_5	β_6
Coefficient	1.771	0.813	7.889	1.166	1.299	-9.265	0.539
Robust Std Error	6.943	0.451	4.232	0.554	0.633	4.503	0.646
t-statistics	0.26	1.80	1.86	2.11	2.05	-2.06	0.83
p-value	0.802	0.088*	0.079*	0.050**	0.055*	0.054*	0.415

R-squared:

Within=0.1849

Between=0.6363

Overall=0.4785

TETAX and FDI

According to table 1 it can be noted that there is a significant positive relationship between TETAX and FDI. An increase in 1 % of TETAX will lead to an increase of 0.813% in FDI. A rise in FDI will result in a more influx of infrastructures, technology diffusion and development in the home country. Thullen (1996) stated that these

developments in terms of road and hotels destroyed the dunes and beaches producing a negative impact on the environmental such as erosion. Consequently progress in these countries will firstly increase the level of pollution and this can be explained by an example, a hotel construction from a FDI. The latter will boost the economic growth as the FDI will have to pay more taxes on transport, energy, pollution and resources. The home country will benefit from an influx of more revenue through the environmental taxes. Therefore it can be concluded that an increase in construction will increase the level of pollution as discussed by Gray (2016) that the construction industry is responsible for almost 4 % of particulate emissions making the industry a major source of pollution leading to an increase of revenue from tax payment.

Moreover Verbeke and Coeke (1997) analysed the presence of environmental tax in businesses that allow firm managers to make the choice in either paying the taxes to compensate their costs of pollution or to avoid the payment of environmental taxes by reducing their level of pollution. This means that if a company increase their level of pollution they will have to compensate it in terms of money through environmental taxes.

However an incline in economic activity required dynamically bigger measures of inputs of energy and materials while creating bigger amounts of waste, consequently bringing about environmental degradation. The objective of environmental tax was to reduce the polluting activities in these countries which has not be achieved because an increase in FDI resulted in an increase in environmental revenue.

GDP and FDI

As per the above table, there is a significant positive relationship between GDP and FDI. More precisely related to the coefficient, an increase of 1 % in GDP causes an increase of 7.889 % in FDI. The development of an economy relies on increasing assets, investments and infrastructure which can be achieved by FDI inflows. The outcome is quite genuine since an expansion in GDP would hence prompt an increment in FDI depicting that there is a good trend of foreign investment in these countries. Since GDP captures the market size of an economy it is quite normal that larger markets draw in more FDI inflows. This additional FDI inflows will ultimately improve the economic performance of the countries thus promoting a better financial environment for the upcoming global investments.

This result is reliable with the study carried out by Obwona (1999) who investigated the relationship of FDI growth linkage and institutional constraint using Uganda as a case study where the author took into consideration the vital aspects that inspires foreign investors in investing in Sub Saharan African countries. The result was that FDI had a positive impact on GDP growth in Uganda. Mottaleb (2007) investigated on the determinants of FDI and its consequences with GDP in developing countries by analysing a panel data from 60 low income and lower middle income. The writers found that as GDP or GDP growth rate elevates with the maintaining of ample updated infrastructural facilities. This eventually encourage and attracts more FDI inflows in these particular countries. Agrawal et al. (2011) studied the impact of FDI on GDP with a comparative study of China and India. The latter concluded that there is positive relation between FDI and GDP. The outcome was that 1% increase in FDI would lead to an increment of 0.07 % in GDP of China and 0.02 % in GDP of India.

OPEN and FDI

It is depicted in table 1 that OPEN is positively related to FDI. The coefficient is 1.166 which means that an increase of 1 % in OPEN will lead to an increase of 1.166 % in FDI. A more favourable FDI Inflows are easily attracted by a higher degree of trade openness. Markusen et al. (2002) and Dunning (1993) stated that the impact of trade openness on FDI inflows depends on the motivation for participating in FDI activities as openness to trade is the influx of foreign capital, technologies and managerial skills in the home country. It also encouraged monetary development of countries through the reduction of the compulsory constraint to permit the increment of competition to augment the import of goods and capital thus improving the economy's efficiency, exploitation of economics of scale and stimulate the dissemination of know-how and skills.

The result is reliable and is in line with Demirhan and Masca (2008) who investigated the determinants of FDI inflows in developing countries. A sample of 38 developing countries were used for a time period from 2000 to 2004 where FDI was the dependent variable. Edwards (1990) looked at the impact of capital flows, FDI and debt equity swaps in developing countries and stated that Trade openness and FDI are strongly coherent. The outcome was that FDI and OPEN are positively and statistically coherent. Anyanwu (2011) studied the determinants of foreign direct investment inflows to Africa for a lapse of time of 17 years (1980-2007) and the latter used a panel of seven five year non overlapping windows that indicated a positive relationship between trade openness and FDI.

GCF and FDI

The result in table 1 shows that there is a significant positive relationship between GCF and FDI. The coefficient of GCF is 1.299. This shows that as GCF increases by 1% FDI also rises by 1.299%. The outcome can be marked to be rational since the expectation from GCF is to bring more facilities and innovation in an economy thus this will give rise to FDI inflows. This is verified by the results whereby an increase in GCF leads to an increase in the level of FDI. GCF usually attracts investors and promote improvement in a country through infrastructural development. The result can be considered to be coherent as this is in line with Krkoska (2001) who examined the relationship between FDI and GCF by looking at different sources of capital formation in transitional countries and the result was that GCF is positively linked with FDI.

GNI and FDI

It can be noted from the table above that GNI is negatively related with FDI. The coefficient of that variable is - 9.265 which means that an increase of 1 % in GNI will lead to a decrease of 9.265 % in FDI. The coefficient in spite of the fact that demonstrated a negative sign was highly statistically significant at 5% level of significance. This outcome proposes that there is an inverse relationship between GNI and FDI. Antwi and Zhao (2013) studied the effect of FDI and economic growth in Ghana using a time series data for the period from 1980 to 2010. The result was that FDI and GNI have a negative relationship in the long run. On the contrary this study is not in line with the study of Awan et al. (2014) who investigated on the factors affecting FDI using a data set from 1988 to 2012 in Pakistan. It was found that FDI and GNI are coherent.

CO2 and FDI

According to table 1, the p-value for this variable is 0.415 which is more than 5% and indicates that there is no significant relationship between CO2 and FDI. This result is in line with Shaari et al. (2014) who studied the impact of FDI on economic growth and CO2 emissions for a time period from 1992 to 2012 for 15 developing countries. The result was that both in long run and short run FDI did not have a significant relationship with CO2. The outcome is quite incoherent as CO2 and FDI should have a significant relationship. CO2 is expected to escalate as FDI inflows will bring along more innovation, technology and better infrastructure in the countries. More developments in a country will result in burning of more fossil fuel, deforestation and industrial process that had been depicted by Le Quéré, C. et al. (2013) which should lead to an increase in the CO2 emissions. This can be explained by an example that a rise in electricity production will result in an incline of carbon dioxide emissions. Besides the result is inconsistent with the study of Mahmood and Chaudhary (2012) who examined the effect of FDI on CO2 emissions in Pakistan for the years 1972 to 2005. The result was that FDI had a positive impact on CO2.

CONCLUSION

This study investigated the impact of environmental regulation on FDI. It has employed a panel data set of 18 European countries over a time period of 1995 to 2013. There were several continuous argument to determine the relation between FDI and Environmental Regulation. This research study has given more transparency in understanding this bond. A Fixed Effect Robust model was utilised to determine the relationship between the dependent variable foreign direct investment and the independent variables total environmental tax revenue, gross domestic product, gross capital formation, trade openness, gross national income and carbon dioxide emissions. The main objective of this study was to find out whether environmental regulation had any impact on FDI and based upon the empirical results of this study it has been found that there is a positive relation foreign direct investment and total environmental tax revenue. The relation between trade openness and FDI was found to be positive which is in line with Edwards (1990), Demirhan and Masca (2008) and Anyanwu (2011) depicted that trade openness do attract FDI. Additionally the economic variables, gross domestic product and gross capital formation were proven to be the vital elements for economic growth. It was also noted that FDI and gross national income had an inverse relationship which is reliable with Antwi and Zhao (2013) but unreliable to Awan et al. (2014). Nevertheless only carbon dioxide emissions has failed to be in line with the expected outcome and depicted that FDI and CO2 were not coherent.

The main limitation of this study was that data collection of the variables could not be expanded over a longer time period. If a larger panel set of countries were used the result would have been more accurate. More environmental variables like environmental degradation could be added to this study.

Policy Recommendation

The results of this study can be a guideline and provide insight to the government.

1. Based upon the empirical result, an increase in FDI will lead to an increase of total environmental tax revenue. This may help the government to control the environment quality of their country. This can be achieved by monitoring FDI inflows. A decrease in FDI inflow in the country will result in a less polluting environment.
2. An incline in FDI will result in a rise of total environmental tax revenue. This shows that this revenue can boost up the economic growth but that will be at the expense of the environment. Government should come up with proper contract with the foreign investors in which it must be stated that use of green technology to decrease carbon dioxide emission and use of more environmentally friendly means of transport so that pollution in these countries could be alleviated.
3. From the above result it was found that gross national income are negatively related. In order to increase the inflow of FDI government should try to implement policies to discourage local investors to make investment in their countries. This will eventually attract FDI to invest in these countries.
4. Government should also try to establish policies with FDI in such a way that there is both an influx of capital in the country and the environment quality is maintained. The possible solution is that motivate FDI to move towards less polluting technologies by providing them grants and subsidies which will encourage them to use more environmentally friendly products. In short, policies should be initiated in order to attain sustainable growth.
5. Based upon the analysis it can be noted that gross domestic product have a positive impact on FDI. Establishing a well-shaped and structured financial system will boost more foreign capital into the economy but that will be at the expense of the environment.
6. Government benefit from the positive relationship between FDI and trade openness in such a way that increasing trade openness will attract more FDI to the country which will eventually make a positive impact on the country's economy.

Further Research

Further research can be carried out using time series data and concentrating their research only on a specific country. Researchers may use monthly, quarterly or semi-annual data as a substitute of annual data. This study can further be analysed in other economies such as Asia and Africa.

APPENDIX

TABLE 1. RESULTS FROM CORRELATION MATRIX

	LNTETAX	LNGCF	LNGNI	LNCO2	LNOPEN	LNGDP
LNTETAX	1.000					
LNGCF	0.9671	1.0000				
LNGNI	0.5794	0.6939	1.0000			
LNCO2	0.1305	0.0864	0.0691	1.0000		
LNOPEN	-0.5097	-0.4881	-0.4968	0.2704	1.0000	
LNGDP	0.6789	0.7542	0.6997	0.0727	-0.4995	1.0000

Source: Computed

From the above table it can clearly be noted that there is a high correlation of 0.9671 between environmental tax revenue and gross capital formation. There is a relatively strong correlation between LNTETAX and LNGNI, LNTETAX and LNGDP, LNGCF and LNGNI, LNGCF and LNGDP, LNGNI and LNGDP with the values 0.5794, 0.6789, 0.6939, 0.7542 and 0.6997 respectively. For the regression result to be consistent there should be an absence of strong relationship between each independent variable. This is because if variables are highly correlated small change in one variable will lead to a huge change in the other one. Cooper and Schindler (2009) stated that correlation less than 0.8 should not be a problem of multicollinearity. The results reveal absence of strong correlation between these variables because almost all does not exceed 0.8 except LNTETAX and LNGCF which

has a correlation of 0.9671.

ENDNOTES

¹ This general definition of FDI is based on OECD, Detailed Benchmark Definition of Foreign Direct Investment, third edition (OECD, 1996), and International Monetary Fund, Balance of Payments Manual, fifth edition (IMF, 1993).

REFERENCES

- Abbas, Q, Akbar, S, Nasir, A, Ullah, H, and Naseem, M, 2011, *Impact of Foreign Direct Investment on Gross Domestic Product*. [Online] Available from: https://globaljournals.org/GJMBR_Volume11/5-Impact-of-Foreign-Direct-Investment-on-Gross-Domestic-Product.pdf . [7 Nov. 2015].
- Antwi, S, and Zhao, X, 2013, Impact of Foreign Direct Investment and Economic Growth in Ghana: A Cointegration Analysis. *IBR*, 6(3).
- Anyanwu, J, 2011, *Determinants of Foreign Direct Investment Inflows to Africa, 1980-2007*. [Online] Available from: <http://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/WORKING%20136%20Determinants%20Of%20Foreign%20Direct%20Investment%20Inflows%20To%20Africa%201980-2007%20AS.pdf>. [7 Jan. 2016].
- Awan, A, Ahmad, W, Shahid, P and, Hassan, J, 2014, Factors Affecting Foreign Direct Investment In Pakistan. *International Journal of Business and Management Review*. Vol.2, No.4, pp.21-35.
- Cecil, A, 1920, *The Economics of Welfare*. Available from: <https://archive.org/details/economicsofwelfa00pigouoft> [25 February 2016].
- Daly, H, 1991, Elements of environmental macroeconomics Costanza, R. (Ed). *Ecological Economics. The Science and Management of Sustainability*, New York, pp. 32-46.
- Demirhan, E, and Masca, M, 2008, Determinants of foreign direct investment flows to developing countries: a cross-sectional analysis. *Prague Economic Papers*, 17(4), pp.356-369.
- Dunning, J, H, 1993, *Multinational Enterprises and the Global Economy*. Harlow, Essex: Addison Wesley publishing Co.
- Edwards, S, 1990, Capital Flows, Foreign Direct Investment, and Debt-Equity Swaps in Developing Countries. National Bureau of Economic Research (Cambridge, M. A.), Working Paper No. 3497.
- Eskeland GS, Harrison AE, 2003, Moving to Greener Pastures? Multinationals and the pollution haven hypothesis. *J Dev Econ* 70:1–23.
- Graham, Edward M, 1982, FDI: In Douglas G. *Encyclopedia of Economics*. McGrahill Book Co.
- GRAY, J, 2016, *Pollution from Construction*. Available from: <http://www.sustainablebuild.co.uk/pollutionfromconstruction.html>. [20 March 2016].
- Grossman, G, and Krueger, B, 1991, Environmental impacts of a North American Free Trade Agreement. *National Bureau of Economic Research Working Paper* 3914, NBER, Cambridge MA.
- Hakizimana, J, 2015, The Relationship between Foreign Direct Investment (FDI) and GDP Per Capita in Rwanda. *SSRN Electronic Journal*.
- Krskosk, A, 2001, Foreign direct investment financing of capital formation in central and eastern Europe.
- Le Quéré, C, Jain, M, Raupach, J, Schwinger, S, Sitch, B, Stocker, N, Viovy, S, Zaehle, C, Huntingford, P, Friedlingstein, R, Andres, T, Boden, C, Jourdain, T, Conway, R, Houghton, J, House, G, Marland, G, Peters, G, Van Der Werf, A, Ahlström, R, Andrew, L, Bopp, J, Canadell, E, Kato, P, Ciais, S, Doney, C, Enright, N, Zeng, R, Keeling, K, Klein Goldewijk, S, Levis, P, Levy, M, Lomas, and B. Poulter, 2012, "The global carbon budget 1959–2011." *Earth System Science Data Discussions* 5, no. 2: 1107-1157.
- Letchumanan, R, and Kodama, F, 2000, Reconciling the conflict between the pollution-havens hypothesis and an emerging trajectory of international technology transfer, *Research Policy*, 29:59–79.
- Mabey, N, and McNally, R, 1999, *Foreign Direct Investment and the Environment: From Pollution Havens to Sustainable Development*.
- Mahmood, H, and Chaudhary, A, 2012, FDI, Population Density and Carbon Dioxide Emissions: A Case Study of Pakistan: *Iranica Journal of Energy & Environment* 3 (4): 355-361.
- Markusen, J.R, and Zhang, K.H, 1999, Vertical multinationals and host-country characteristics. *Journal of Development Economics*, 59, 233–253.
- Mottaleb, A, 2007, Determinants of Foreign Direct Investment and Its Impact on Economic Growth in Developing Countries.
- Obwona, M, 1999, Foreign Direct Investments Growth Linkage and Institutional Constraints in Sub-Saharan Africa:

- A Case of Uganda. *African Review of Money, Finance and Banking*.
- OECD: *Definition of Environmental Tax*, 2005. Available from: <https://stats.oecd.org/glossary/detail.asp?ID=6437>. [24 March 2016].
- Pärletun, J, 2008, The Determinants of Foreign Direct Investment: A Regional Analysis with Focus on Belarus. Available from: <http://biblioteket.ehl.lu.se/olle/papers/0002948.pdf>. [24 November 2015].
- Pearce, D, W, 1976, *Environmental Economics*, New York.
- Pearson, M, and Smith, S, 1990, *Taxation and Environmental Policy: Some Initial Evidence*, IFS Commentary no.19.
- Schmitz, A, and J. Bieri, 1972, EEC Tariffs and U S. Direct Investment, *European Economic Review* 3:259-270.
- Shaari, M., Hussain, N, Hussin, A, And Kamil, S, 2014, Relationship among Foreign Direct Investment, Economic Growth and Co2 Emission: A Panel Data Analysis. *International Journal of Energy Economics and Policy*. Vol 4 No 4.
- Singh, H, And Jun, K.W, 1995, Some New Evidence on Determinants of Foreign Direct Investment in Developing Countries. *Policy Research Working Paper* No.1531, the World Bank.
- Smith, C, 2012, *Definition of environmental tax*. Available from: <https://www.gov.uk/government/news/definition-of-environmental-tax-published>. [26 March 2016].
- Turner, R, K, D.W, Pearce, and I. Bateman, 1994, *Environmental Economics*, Hemell Hempstead.
- Verbeke, A, and Coeke, C, 1997, Environmental taxation: green stick or green carrot for corporate social performance? *Managerial and Decision Economics*. 18(6), 507-516.
- Xing, Y, And Kolstad,C, 2002, *Do lax Environmental Regulations Attract Foreign Investment*. Available from: <http://www.econ.ucsb.edu/~kolstad/laxenv8.pdf>. [10 December 2015].
- Yanchun, Y, 2010, FDI and China's Carbon Dioxide Emissions: 1978–2008.