Impact of Environmental policy stringency on FDI: A global perspective

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Abstract
One of the prime factor that attracts allure direct investment to a particular country is its investor friendly atmosphere. The FDI to a particular country is depended upon the county’s take on environmental regulations. So this paper evaluates the impact of Environmental policy stringency on FDI. For evaluating the environmental regulation prevailing in a country, its environmental policy stringency index (ESI) is taken. The ESI and FDI data of 33 countries for the period from 2005-15 is analyzed. A random effect and fixed effect test is performed on the panel data of 33 countries. The analysis shows that when the Environmental stringency index increases, the FDI also increases. This means that countries having higher level of ESI attracts more FDI. This result contradict the contentious but generally held view that more strict environmental regulations deter FDI.

Keywords: Environmental regulations, Environmental stringency index, FDI

Introduction
The influence of environmental regulation on FDI and performance of firms is a subject matter that, for decades, has gained greater focus from researchers around the world. The environment is consisted of two factors namely physical environment and biological environment. Physical environment comprises of land, air and water, while biological environment consists of plants, animals and other organisms. Both the physical and biological environment are dependent. But these environment always face sustainability issues and deterioration due to industrialization, the explosion of population, urbanization and unscientific exploitation of natural resources etc. To avoid these kind of negative impact situations, governing bodies always formulate and implement strict rules and procedures. These rules and procedures are generally called as Environmental regulations. Environmental regulations and laws plays a major role in sustainable development of the economy. Those are designed to reduce negative impact of human activities both on people and nature.

After the advent of concept called globalization, the boundaries between the countries in terms of investment, trade and economic relationships lifted. As a result investments from one country began to flow to another country with an aim of gaining better yield from the investment. In the beginning of 2000s huge investments from developed countries began to flow to developing and under developed countries. The reason behind this move was not only to gain better returns. The strict environmental regulation in developed countries discouraged investments in avenues which pollutes natural resources and creates inhabitability for living beings. Eventually investments in developed countries began to become costly.

But the increased flow of investment from developed to developing countries began to create environmental hazardousness. So the developing countries also began to improvise their environmental regulations so as to increase its stringency.

Review of Literature
A literature by (Rivera & Hoon, 2013) studied the effect of environmental governance on multinational corporation’s foreign market entry investments. The primary focus of this study was on the how the difference in environmental regulations results is
difference of Multinational Corporation’s foreign market entry. The authors suggest that there is a higher chance of Multinational Corporation’s investing in countries those having stringent environmental regulations. The MNC’s look for investment avenues which are safe and stable. This suggestions which arrived out of the analysis contradict the traditional view that stringent environmental regulations pull down the MNC’s investment.

A study on environmental regulations and technical efficiencies of firms by (Bandyopadhyay, 2010) broke down the influence of ecological effect on technical efficiencies of Indian cement manufacturing firms. The primary focus of the study was on a firm’s investment in operations in absence and presence of environmental. It determines the specialized effectiveness (Technical Efficiency) points of entities in the nearness and nonattendance of direction and draws the distinctions in their extents in two situations: one is that the organizations bring activities to follow the set guidelines by contributing extra assets for contamination reduction and the other in which the organizations don’t take the fundamental activities. The paper utilizes foundation stage information from Annual Survey of Industries on cement for a long time, the latest information distributed for 2003–2004 and an earlier year for 1999–2000 when the ecological controls in India were in the underlying periods of execution. A non-parametric deterministic methodology for data envelopment analysis (DEA) is used to induce the TE scores of firms. The conventional DEA system is changed by presenting powerless superfluity of awful yields to portray ‘viable ecological direction’, which guarantees that diminishing contamination isn’t costless. For the two years it has been discovered that the TE scores of firms under ‘viable control’ situation are either higher than or equivalent to those determined under ‘insufficient direction’ situation bringing about a higher normal TE at the business level in the ‘powerful control’ situation (Bandyopadhyay, 2010).

A paper written by (Ambeca & Barlac) analyzed the impact of environmental regulation on business. The study was based on the porter’s hypothesis theory. The porter’s hypothesis states that environmental polluting firms can gain a competitive advantage if strict environmental regulations are prevailing, those firms will induce innovations in their operations and will increase efficiency (Porter & Linde), so as to cope up with the strict environmental regulations. This is attained by pumping either productivity or product value which leads to private benefits (Ambeca & Barlac). As a result, environmental regulations would favor both environment and firms under regulation. This stand has found a positive audience among policy makers and the popular press but has been severely criticized by economists (Ambeca & Barlac).

A study conducted by (Meyer, 2003) contemplates the financial effect of environmental regulations. The paper propose that natural controls dependably accompanies a cost Steady advance toward cleaner air, water, and land will be moderated fundamentally, if not switched. The examination demonstrates that thus, the individuals who would like to enhance their state’s business atmosphere, financial aggressiveness, and work picture by moving back ecological statutes are misguided and are in for incredible dissatisfaction. The proof is convincing that this methodology won’t deliver any important monetary additions, while forcing genuine ecological misfortunes. Rather endeavors should move to factors that have been appeared to truly influence the main issue: state expense and work strategies and transportation and correspondence foundation.

Variations in environmental stringency have resulted anxieties among the researchers about the influence of environmental regulation on foreign investment flows. Several empirical works have been done to test the pollution heaven hypothesis. However the study was not successful to produce decisive validity confirming that variances in environmental regulations across countries are major determinant of trade and investment flows (Javorcik & Wei, 2004). It is crucial to understand the environmental effects of private investment and Identify appropriate responses (Mabey & McNally, 1999). Economic growth has formulated countervailing effects through hike in regulation, technical efficiency, and investment in cleaner production (Mani & Wheeler, 1997).

A study done by (Kalamova & Johnstone, 2011) evaluated the impact of environmental policy stringency on FDI. They examined whether nations with relatively more stringent environmental regimes have a comparative advantage in their
Multinational regulations are highly stringent and marks of being stringency index is a nation comparably stringency index is a nation view of strict regulations across the countries. From one viewpoint, there are economies related with institutionalizing generation economies which will lessen the advantages of misusing peripheral contrasts in administrative stringency. With expanded globalization of generation these weights are probably going to increment. On the other hand, measures, for example, the OECD Guidelines for Multinational Enterprises empower endeavors to blend their natural practices over the source and host nations by receiving innovations what's more, working methods in all parts of the undertaking that reflect measures concerning natural execution in the best performing piece of the venture (OECD 2008).

(Kirkpatrick & Shimamoto, 2008) evaluating the effect of natural control in host nations on Japanese outside direct venture (FDI) choice - making to test the contamination sanctuary theory utilizing information on national natural control models and Japanese internal FDI in five grimy ventures did not discover confirm in help of the contamination paradise speculation. Rather, they found that internal Japanese FDI has all the earmarks of being pulled in to nations which have submitted themselves to a straightforward and stable condition administrative condition.

A study conducted by (Phukan, 2017) examined the impact of environmental stringency index on flow of FDI. The researcher found significant econometrical evidence that changing differences in environmental policy stringency has been influencing the inflow of polluting FDI in India. This results of the study contradicted the traditional view of strict environmental regulations discourage FDI.

**Objectives**

1. To see the association between environmental policy stringency and direction of the flow of FDI.
2. To examine the difference of environmental regulations across the countries.

**Research Methodology**

**Data**

This study used data on environmental policy stringency index (ESI) obtained from OECD. The ESI data of 33 countries were collected. The OECD environmental policy stringency index is a nation specific and globally comparable measure of the stringency of environmental policy. Stringency is characterized as how much environmental policies put an explicit or implicit price on polluting or environmentally hurtful conduct (Phukan, 2017).

The record ranges from 0 (not stringent) to 6 (most elevated level of stringency). The record covers 28 OECD and 6 BRIICS nations for the period 2005-2016. The index is based on the degree of stringency of 14 environmental policy instruments, principally identified with atmosphere and air contamination (Phukan, 2017).

The total FDI (FDI) inflow of 33 countries is sourced from Reserve Bank of India database. This 33 countries includes 25 developed nations and 8 major developing nations.

**Methods**

Firstly a graphical analysis of six high income-developed countries and six major developing countries is done. Graphical methodology has been put in use to see the relationship between environmental policy stringency and inflow of FDI for the twelve countries in separate graph.

To examine whether the difference in environmental policy stringency influences the direction of the flow of FDI, we are considering the inflow of FDI from twenty five developed countries where environmental regulations are highly stringent and eight developing countries where the environmental regulations are becoming stringent. Firstly Environmental Stringency Index of the countries have taken as independent variable. Next, we are using the FDI inflow which is considered as the dependent variable in our statistical analysis.

**Evaluation of factors in ESI measurement of developed and developing countries**

<table>
<thead>
<tr>
<th>Evaluating Factor</th>
<th>Developed Countries</th>
<th>Developing Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission limit values NOx</td>
<td>1158</td>
<td>62</td>
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<tr>
<td>Emission limit values PM</td>
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<td>Sulphur content limit for diesel</td>
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<tr>
<td>Tax Diesel</td>
<td>868</td>
<td>79</td>
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</table>
The graphical analysis between ESI and FDI of developed and developing countries reveals that, the FDI is proportionately aligned with the environmental regulations. There is no difference in case of developed and developing countries. This result induces more credibility and validity for porter hypothesis and pollution haven hypothesis.

From the analysis through graphs it is evident that developed country’s environmental regulation stringency level is much more than developing countries. Australia is having the highest ESI figure of 4.07, while lowest ESI is of Brazil (0.38) which is a developing country. The most FDI attracting country is United States, but they are having a moderate ESI level of 2.69. The least FDI attracting country is South Africa, even though they are having only an ESI level of 0.52.

From the analysis it is also evident that all the developing countries accounted in this study is considerably improving their ESI level. While the developed nations are still maintaining their strict levels. But both the developed and developing nations are showing an upward increase in their FDI inflows.

So it is evident that, investors are not looking for avenues which are of less cost, but for countries which are having stable and strict environmental hazard prevention measures. This is the era calling more importance for sustainable development. So without the perfect balance of environment and ecology, establishments cannot be made. So countries are not compromising on environment protection for FDI.

### Influence of Environmental Stringency on Foreign direct investment: A global perspective

To examine whether the difference in environmental policy stringency influences the direction of the flow of FDI, we are considering the inflow of FDI in 33 countries for the period of 2005-15 where environmental regulations are spread from high to low stringent levels. The FDI inflow is taken as dependent variable. The Environmental stringency level of those same 33 countries for a period of 2005-2015 is taken as the independent variable.

The model for panel data analysis is

\[
Y_{it} = \alpha + \beta X_{it} + \epsilon_{it}
\]

Here,
- ‘\(Y\)’ is the dependent variable – Inflow of FDI to countries
- ‘\(i\)’ denotes countries
- ‘\(t\)’ denotes time

<table>
<thead>
<tr>
<th>Tax NOx</th>
<th>326</th>
<th>48</th>
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<tbody>
<tr>
<td>Tax SOx</td>
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<td>34</td>
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<td>Trading Schemes CO2</td>
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<td>Trading Schemes Green Certificates</td>
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<tr>
<td>Trading Schemes White Certificates</td>
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</tr>
</tbody>
</table>

Included 27 developed countries and 6 developing countries for period of 2005 to 2015

These are the underlying environmental policy instrument for ESI calculation. This is a comparative analysis between the implications of developed and developing countries.

**Alignment of FDI flows with ESI in Developed and Developing countries**

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**Findings:**
‘t’ denotes time period from 2005 to 2015

‘X’ is the independent variable: Environmental Policy Stringency of the countries.

1. Developed and Developing countries

Coefficients:

| Estimate | Std. Error | t value | Pr(>|t|) |
|----------|------------|---------|---------|
| (Intercept) | 8.0844 | 0.1888 | 42.822 | < 2e-16 *** |
| X | 1.4187 | 0.2193 | 6.646 | 0.0211 * |

Signif. codes: 0 ‘****’ 0.001 ‘***’ 0.01 ‘**’ 0.05 ‘*’ 0.1 ‘.’ 1

2. Developed Countries

Coefficients:

| Estimate | Std. Error | t value | Pr(>|t|) |
|----------|------------|---------|---------|
| (Intercept) | 8.4939 | 0.2999 | 28.136 | < 2e-16 *** |
| X | 0.6689 | 0.3494 | 1.914 | 0.0464* |

Signif. codes: 0 ‘****’ 0.001 ‘***’ 0.01 ‘**’ 0.05 ‘*’ 0.1 ‘.’ 1

3. Developing Countries

Coefficients:

| Estimate | Std. Error | t value | Pr(>|t|) |
|----------|------------|---------|---------|
| (Intercept) | 8.0844 | 0.1888 | 42.822 | < 2e-16 *** |
| X | 1.4187 | 0.2193 | 6.646 | 0.0211 * |

Signif. codes: 0 ‘****’ 0.001 ‘***’ 0.01 ‘**’ 0.05 ‘*’ 0.1 ‘.’ 1

Findings:

From the panel data analysis it is evident that environmental stringency index (ESI) has a positive relationship with inflow of FDI. The hypothesis for the research was if environmental regulations are stringent, the investments will become costlier and investors will refrain from investing in such avenues. But the results evolved from the analysis proves that environmental stringency and FDI has positive relationship. It means that investors look for an investment avenue having stable and stringent environmental regulations. If the regulations are fluctuating then the investor or the business have to adjust and rapidly change its commitments to the environment.

Conclusion

Investors while investing in a country and the country that accepts the investment is foreseeing a Sustainable development. In this era of environment with increased pollution levels, countries are not compromising on preservation of biological as well as physical environment. Developed countries are maintaining their high Environmental stringency levels, while developing countries are increasing the Environmental stringency levels from year on year. Thus investors are moving away from the concept of low cost investment to a sustainable growth.

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