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Study of the relationship between US outward foreign direct investments and the environment in OECD Countries

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Abstract

There is significant increase in the focus into the environmental issues in global finance. Investors, companies, policymakers, and the broader public have triggered dramatical shift in business and investment practices, due to the recognition of the implications of these issues on economic and social sustainability.

Researchers attempts to connect environmental policies with economic instruments to facilitate a deeper understanding of the long-term relationship between both areas. These studies are driven by the developed concerns about the climate change and the increase understanding of businesses environmental impact.

Countries now motivating the companies to demonstrate a commitment to reducing their environmental footprint through sustainable operations, responsible sourcing, waste management, and energy-efficient practices.

Considering all the previously mentioned factors, The purpose of this study is to understand how the environmental policies affect the foreign direct invesment of the US. This study started with the definition, measures, and recent trends in Foreign Direct Investment (FDI). Using the OLI Framework, Chapter one provids perspectives from both source and host countries. To provide Foundation to the relationship between the FDI and Environment regulation stringency from the literature point of view, the chapter presents the Pollution Haven Hypothesis and the hypothesis by Michael E. Porter and Claas van der Linde.

Second chapter, demonstrate the relationship between Environmental Policy Stringency (EPS) and FDI by showing some methodologies for measuring EPS, including the OECD's composite index. The chapter aims to explain the complex links between FDI, environmental regulations, and their combined impact on international economics.

Chapter Three focuses on FDI in the United States, providing a detailed analysis of the inward and outward FDI flows. It offers an examination of the country's FDI landscape, illustrating its impact on both the national and global economic stage.

The final chapter presents an econometric model and data analysis of the US's outward FDI and its correlation with the Environmental Policy Stringency index. The chapter employs Wagner & Timmins' 2009 study as the foundation for the econometric model, incorporating two methodologies: the First Difference Model and the Dynamic Panel Model using the Generalized Method of Moments (GMM) estimator. Both methodologies provide a comprehensive, data-driven insight into the FDI-EPS relationship. The findings are partially aligned with the initial estimations and Wagner & Timmins' (2009) results.

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1. Chapter one: FDI definition, Measures and Trends.

1.1Introduction

An investment made by a resident enterprise in one economy (direct investor or parent enterprise) with the goal of creating a long-term investment in an enterprise in another country is known as foreign direct investment (FDI).

The existence of a long-term relationship between the direct investor and the direct investment enterprise, as well as a large degree of influence over the enterprise's management, is necessary for lasting interest. A direct investor's ownership of 10% or more of a direct investment enterprise's voting power is evidence of such a relationship (OECD.org, 2020).

FDI can be implemented in two ways: greenfield or brownfield. On the greenfield, the parent firm establishes a subsidiary in a foreign country and starts from scratch. These projects can include the construction of new distribution hubs, offices, and residential quarters in addition to new production facilities (Chen. J, 2020). This type is defined as an investment undertaken "from the ground up," with the goal of establishing a wholly new business in host territorial areas where no previous manufacturing, distribution, or other infrastructure exist. This form of investment can be quite expensive for the investor, but it is frequently welcomed by host countries due to its high potential for job creation and ability to raise the value-added of the host country's production.

Corporations prospective are often attracted to developing countries by tax advantages, or by receiving subsidies or other incentives to establish a greenfield venture. While these concessions

may result in decreased corporation tax collections for the foreign community in the short term, the economic advantages and strengthening of local human capital can result in good long-term returns for the host country (Moosa, 2002).

Greenfield investments, like any startup, come with additional risks and costs involved with constructing new factories or manufacturing units. Construction overruns, permitting concerns, resource access issues, and difficulty with local labor are all smaller risks.

The other way which the FDI can be implemented on, is the Brownfield investment, also known as cross-border mergers and acquisitions (M&As), which is the acquisition or expansion of an existing business in a foreign country. This is in contrast to greenfield investment, which refers to the establishment of a new business in a foreign country.

There are several benefits of brownfield investment for both the foreign investor and the host country. For the foreign investor, brownfield investment can provide a more streamlined and cost-effective entry into a foreign market as the business is already established and has an existing customer base (Investopedia, n.d). In addition, the acquisition of an existing business may be less expensive than starting a new business from scratch (Investopedia, n.d).

For the host country, brownfield investment can bring new jobs, technology and management skills, and new products and services to the market (Investopedia, n.d). It can also revitalize declining industries and underutilized assets.

Moreover, brownfield investment can also present challenges, such as cultural clashes between the foreign investor and local workforce and difficulties in integrating the acquired business into the foreign investor's operations (Investopedia, n.d). There may also be negative impacts on the

local community, including job losses and environmental degradation, particularly if the foreign investor shuts down operations or makes significant changes to the business. To mitigate these negative impacts, it is important for foreign investors to engage with the local community and address any concerns or issues that arise This may include establishing a community outreach program or implementing corporate social responsibility initiatives.

In recent years, there has been an increasing trend towards brownfield investment in developing countries as foreign investors look to take advantage of growth opportunities in these markets (Takayama, 2022). However, brownfield investment in developing countries also carries risks such as political instability, corruption, and weak legal frameworks. It is essential for foreign investors to carefully assess and manage these risks.

1.2 OLI Framework in FDI

OLI Paradigm is an economic framework used to explain the benefits of investing in the foreign countries. The framework which stands for Ownership, Location, and Internalization Advantages was developed by John Dunning in 1979 and it serve as a guide to the following three prerequisites for a firm to make a foreign direct investment (FDI).

- Ownership advantages: which is achieved by owning exclusive resources. Such as management expertise, brand reputation and intellectual property could provide the firm with a competitive advantage over its competitors. The capacity for a company's ownership advantages being transferrable provides an opportunity for utilizing those benefits within newly entered foreign market.

- Location advantages: The positive aspects associated with running a company at a specific location. Such as Access to nature resources, high skilled labors, low labor cost, and favorable taxation rules. These advantages help the company to produce the product or service at lower cost or higher quality compared to the competitors and compared to the company home country.

- Internalization advantages: which is the benefit of controlling the production within the firm rather than outsourcing to other companies. By doing so, the company is maintaining greater control over its operations, keep the company intellectual proprieties and production secretes and avoid the transaction cost which would be the result if the company decided to outsource part of its operations.

The OLI paradigm provide foundation for the policymakers to understand the factors influencing the FDI decision, so they can improve it and develop new policies that encourage investment.

1.3FDI: A Source Country Perspective vs A Host Country Perspective

The operational view of the source country of the investment is often distinguished from that of the host country in the classification of FDI.

FDI can be classified as horizontal, or vertical, from the perspective of the source country or the investor.

Horizontal FDI is an investment activity that aims to expand manufacturing horizontally. This means that an investor operating in the source country decides to produce the same or a comparable sort of product he produces at home abroad in the country that will host the investment in order to extend his market opportunity. Horizontal FDI is defined by the lack of

product distinction between products produced at home and those manufactured in the host country. This type of investment is generally used to capitalize on a firm's advantage and value proposition uniqueness in the market derived from holding, for instance, patents, and where expansion in the home country may violate anti-trust legislation (in case of monopoly for example).

The vertical FDI, on the other hand, is pursued with the goal of getting the economic benefits that an investor obtains from improved management of his organizational chain. The organization management may think it useful to be as close to the raw materials acquisition market and/or ultimate consumers as possible. The earlier instance may develop as a result of investment in other enterprises that serve as raw material suppliers (backward vertical FDI). The latter may occur through the acquisition of distribution outlets (forward vertical FDI). Finally, and most simply, conglomerate FDI is a combination of the previous two forms (Moosa, 2002).

From the perspective of the host country, FDI can be classified as (i) import-substituting, (ii) export-increasing, or (iii) government-initiated (Moosa, 2002). Import-substituting FDI is primarily determined by factors such as the host country's market size and the presence of transportation costs and/or trade obstacles. It refers to an investment that allows the host country to become a producer of previously imported goods. As a result, imports by the host country, but also exports by the source country, will fall, with a potentially realistic improvement in the prior balance of payments.

Export-increasing FDI occurs when an investor looking for new sources of input. In this case, the host country expands its exports of specific items (often raw materials and/or intermediate goods) to the investor's country and/or other countries where his companies are based. Government-initiated FDI refers to an investment that is stimulated by the provision of incentives by governments to attract investment to improve their balance of payments situations.

A conceivable final FDI classification differentiates between expansionary and defensive FDI. Expansionary FDI is a type of investment that aims to utilize firm-specific advantages such as scale effects, R&D intensity, profitability, and technology acquisition. in the host country while also contributing to the investing firm's sales growth both at home and overseas (Chen & Ku, 2000). Defensive FDI is defined as investment that seeks inexpensive labor (or other cheap input variables) in the host economy to reduce the manufacturing costs (Chen & Ku, 2000).

The OLI theory categorized the types of FDI into four categories, market-seeking FDI, resource-seeking FDI, efficiency-seeking FDI, and strategic asset-seeking FDI. Market-seeking FDI goal to expand into host country local markets and penetrate it, considering factors such as market size, per capita income, market growth, access to regional and global markets, consumer preferences, and the domestic market structure. The second type, Resource-asset seeking FDI is intended to secure natural resources, such as raw materials, and access a labor force with lower costs, skilled labor, physical infrastructure (such as ports, roads, power, and telecommunications), and advanced technology. The third type Efficiency-seeking FDI goal is to create new sources with competitiveness and cost advantages, and it may involves moving production to countries with lower production costs. Finally, strategic asset-seeking FDI aims to

improve a company's global or regional strategy by accessing global networks of created assets, such as technology, organizational abilities, and markets (Wadhwa, 2011).

1.4 FDI & the Pollution Haven Hypothesis:

One of the important drivers of defensive FDI is the origin country regulations. Environmental regulations among the other regulations, can significantly impact a firm's operations and profitability, especially in industries that have a high level of environmental impact such as manufacturing, energy production, and mining. For example, stricter environmental regulations may require firms to make significant investments in pollution control measures or adopt new technologies, which can increase their production costs. In order to mitigate these costs and protect their domestic operations, firms may choose to invest in foreign countries where the regulatory environment is more favorable.

Considering that, the impact of environmental regulations on the FDI can vary depending on many aspects. Some research suggests that firms in more environmentally sensitive industries are more likely to engage in efficiency-seeking FDI in response to stricter environmental regulations (Dean, J. M., Lovely, M. E., & Wang, H., 2009). On the other hand, firms in less environmentally sensitive industries may be less likely to engage in efficiency-seeking FDI due to environmental regulations, as the costs associated with compliance may be less significant for these firms (Dean, J. M., Lovely, M. E., & Wang, H., 2009).

In addition to the direct impact of environmental regulations on production costs, firms may also consider the reputation risks associated with non-compliance. Firms that fail to comply with environmental regulations may face negative publicity, consumer boycotts, and regulatory fines,

which can damage their reputation and reduce their competitiveness. By investing in countries with more favorable environmental regulations, firms can reduce the risk of non-compliance and protect their reputation.

There is also evidence to suggest that firms may engage in resource-seeking FDI as a way to access natural resources (Chen & Ku, 2000). For example, a firm may choose to invest in a foreign country with less stringent environmental regulations in order to access lower-cost raw materials or to dispose of waste in a more cost-effective manner. This type of FDI can be controversial, as it may result in negative environmental impacts in the host country. Therefore, the environment regulations in the host country can be an important factor in a firm's decision to engage in efficiency-seeking FDI. Stricter environmental regulations can increase production costs and reputation risks for firms, while more favorable regulations can provide a competitive advantage. However, the impact of environmental regulations on FDI is complex and can vary depending on the specific regulatory regime and the nature of the firm's operations.

One of the hypotheses that has been proposed to explain efficiency-seeking FDI is the pollution heaven hypothesis, which suggests that firms may engage in efficiency-seeking FDI in order to take advantage of more lenient environmental regulations in the host country. The discussion about this hypothesis started in 1990, when the North America Free Trade Agreement put together the companies from US & Canada which are rich and tightly regulated countries in competition with the companies from Mexico which are less regulated and poor. And it was suggested that (NAFTA) will lead to environment disaster in Mexico and to massive job loss in US and Canada. Then, the B.E. Journal in Economic Analysis & Policy published a study on the

"Pollution Haven Hypothesis," predicting that the free trade in goods would lead to a shift in pollution-intensive production from countries with strict regulations to those with lax environmental regulations. Also, Copeland and Taylor (1995) published study about the effect of human capital on income, regulations, trade flows and pollution levels. The study predicts the Pollution Haven Hypothesis, which states that a movement to free trade leads to the relocation of pollution from the tight regulation country to the low-income, lax regulation country. The hypothesis has proven difficult to test in the real world due to various factors affecting trade patterns not only the regulations and the endogeneity of both trade and pollution policy.
Following the same discussion Copeland and Taylor (2004) find strong evidence in the relation between the environment and the income. They found that the increase in the income, affect the environment quality in a positive way. As it suggests that improvement in the environment policy is following the country income development. This pattern prediction is based on the idea of an inverted-U shaped curve, known as the Environmental Kuznets Curve, which suggests that as a country's gross domestic product (GDP) increases, its pollution levels may initially rise but eventually decline as the country becomes more affluent and begins to prioritize environmental concerns (Grossman and Krueger, 1995).

Number of studies find that Both trade and investment are influenced by pollution regulations (Copeland and Taylor, 2004), and there is a little evidence support the pollution haven hypothesis. Keeping in mind that, Pollution-haven effect is only one of many factors determining trade patterns and not the dominant one.
Another study by Xing and Kolstad (2002) find that US outbound FDI move significantly to more lax environment regulation host countries in heavily polluting industries. However, this is

not valid for less polluting industries (Wijen, Frank; Zoeteman, Kees; Pieters, Jan; van Seters, Paul 2012). This is because as countries industrialize, they tend to prioritize economic growth over environmental concerns, leading to a relaxation of environmental regulations (Ulrich J. Wagner; Christopher D. Timmins 2009). As a result, firms may be more likely to locate in countries with less stringent environmental regulations, leading to an increase in pollution in those countries (Ulrich J. Wagner; Christopher D. Timmins 2009).

According to the pollution heaven hypothesis, firms may choose to invest in countries with lower environmental standards in order to reduce their production costs and increase their competitiveness. This type of defensive FDI can be controversial, as it may result in negative environmental impacts in the host country.

There is some studies that support the pollution heaven hypothesis. For example, a study by Cheng, Z., Li, L., & Liu, J. (2020) by testing the impact of FDI on PM2.5 pollution in 285 cities in China; they found that firms are more likely to engage in defensive FDI in countries with lower environmental standards, as these countries offer a more favorable regulatory environment for firms that have a high level of environmental impact. However, other research has found mixed results, with some studies suggesting that environmental regulations may not be a significant factor in a firm's decision to engage in defensive FDI (Ulrich J. Wagner; Christopher D. Timmins 2009). we will talk about it more in Chapter 2.

1.5Michael E. Porter and Claas van der Linde Hypothesis

Another interesting hypothesis needs to be mentioned here besides the pollution heaven hypothesis.

The hypothesis of Michael E. Porter and Claas van der Linde, which suggests that the competitiveness of an industry can be linked to the strictness of the environment regulations in the host country. According to this hypothesis, stricter environmental regulations can drive innovation and competitiveness in an industry by forcing firms to invest in cleaner technologies and practices.

Porter and van der Linde argue that environmental regulations can create a "level playing field" for firms, as all firms are required to comply with the same standards. This can encourage firms to invest in innovative technologies and practices in order to reduce their environmental impacts and stay competitive. In addition, stricter environmental regulations can create market demand for cleaner technologies and practices, which can further drive innovation and competitiveness.

There is some evidence to support the Porter and van der Linde hypothesis. For example, a study by Porter and van der Linde (1995) found that countries with stricter environmental regulations tend to have higher levels of innovation and productivity in the chemical industry. Similarly, a study by Hoekman et al. (2000) found that stricter environmental regulations can drive innovation and competitiveness in the pulp and paper industry.

However, the impact of environmental regulations on innovation and competitiveness can vary depending on the specific regulatory regime and the nature of the industry. Some research suggests that the relationship between environmental regulations and innovation may be more complex than the Porter and van der Linde hypothesis suggests, with other factors such as the availability of funding and the level of technological development also playing a role (Dechezlepretre. A & Sato. M, 2017).

Porter & Linde (1995) provided an example of flower farmers in the Netherlands complying with environmental restrictions. it is commonly recognized that the flower business is well represented in the Netherlands, that the Netherlands is "grabbing" land from the sea, and that the weather in the Netherlands is difficult and unpredictable. Despite this, the Netherlands remains the world's biggest provider of flowers.

The issue occurred when a new law governing the use of chemicals in flower growing came into effect. Companies were not authorized to use these chemicals once the regulation went into effect since their use polluted the land and groundwater. The Netherlands, on the other hand, devised a novel form of flower culture in which flowers are grown in stone wool rather than soil, resulting in a lesser use of pesticides and fertilizers to promote even bloom growth while also boosting floral quality.

This example demonstrates how environmental rules are not always detrimental to a company's bottom line, resulting in higher costs and fewer earnings. This example shows how environmental regulations may and should inspire organizations to innovate and think differently to become more competitive in the market. Although this argument doesn’t reject the hypotheses of the Pollution heaven, yet resource and pollution intensive sectors have a preference for, and influence over, areas with low environmental standards.

1.6FDI Measures:

In terms of FDI's quantitative dimension, it can be illustrated that it is frequently described in terms of flow or stock. Capital invested in an enterprise by a foreign investor – either directly or

indirectly through associated firms. According to UNCTAD, FDI can be measured using FDI flows and FDI stocks; this section will explain both metrics and why they are used as indicators.

FDI flows include equity trades, earnings reinvestment, and intercompany loan transactions. FDI stock is equal to the parent enterprise's share of its capital and reserves (including retained earnings), plus the parent enterprise's net liabilities to affiliates. Furthermore, it is critical to emphasize how FDI flow and stock can take the shape of either inbound or external investment depending on the path it takes.

FDI flow or stock is inbound when a foreign investor invests in a selected country. When a domestic investor invests overseas, he or she is looking outside (Moosa, 2002). According to Cantwell and Bellak (1998), the practice of reporting FDI in terms of stock is widely seen as undesirable. Stocks are quoted in terms of their "book value," or historical cost, which ignores their age distribution and makes the international comparison nearly impossible. Aside from this specific feature, we must recognize that assessing FDI is difficult due to the existence of issues, particularly when the investment takes the form of machinery or contributions to technical capitalization. Furthermore, due to most governments' unwillingness to give detailed information on their firms' international activities for reasons of confidentiality, gaps exist in FDI data accessible for source and host countries (Moosa, 2002).

FDI flows are the cross-border transactions reported during a specific time period (typically year or quarter). FDI flows, is capital received from an enterprise by a foreign investor. According to the World Bank, "For associates and subsidiaries, FDI flows consist of net sales of shares and

loans (including non-cash acquisitions made against equipment, manufacturing rights, etc.) from the parent company plus the parent firm's share of the affiliate's reinvested earnings plus total net intra-company loans (short- and long-term) provided by the parent company. FDI flows for branches are comprised of the growth in reinvested earnings plus the net increase in funds received from the foreign direct investor. Negative-sign FDI flows (reverse flows) indicate that at least one of the components in the preceding definition is negative and is not offset by positive quantities of the other components.

FDI flows are classified into two types (OECD.org, 2020):

- Outward flows: these are transactions that increase the amount of money invested in a foreign economy by origin investors in the reporting economy, such as stock purchases or earnings reinvestment, minus any transactions that decrease the amount of money invested in the reporting economy, such as equity sales or borrowing by the resident investor from the foreign enterprise (UNCTAD, 2020)
- Inward flows: these are transactions that raise foreign investors' investment in the reporting economy and transactions that reduce foreign investors' investment in the reporting economy.

The three components of the FDI flows can be described as the following:

- **Equity capital** is the purchase of shares of an enterprise in a country other than the direct investor's home country by a foreign direct investor.

- **Reinvested earnings** are the direct investor's share (in proportion to direct equity participation) of earnings not distributed as dividends by affiliates or earnings not remitted to the direct investor. Affiliates' residual gains are reinvested.
- **Intra-company loans,** also known as intra-company debt transactions, are short-term or long-term borrowing and lending of cash between direct investors (parent firms) and affiliate enterprises.

Foreign direct investment stocks are the cumulative value held at the conclusion of the reference period (usually a year or quarter)" 2020 (Knoema). FDI stocks reflect the overall level of direct investment at a given point in time, often the conclusion of a quarter or year. we can learn that for associate and subsidiary enterprises, it represents the value of the share of their capital and reserves (including retained profits) attributable to the parent enterprise (this is equal to total assets minus total liabilities), plus the associate or subsidiary's net indebtedness to the parent firm" (UNCTAD, 2007). There are two types as well:

- The value of resident investors' equity in and net loans to companies in foreign countries is the outward FDI stock.
- the value of foreign investors' equity in and net loans to enterprises in the reporting country is the inward FDI stock.

In the Balance of Payments, FDI transactions are reported at their accrued value, i.e., "transactions are documented when economic value is created, transformed, traded, transferred, or extinguished." Because it is highly impossible to apply the accrual principle to all transactions in practice, many are reported at the moment the revenues or payments are made. The International Monetary Fund (IMF) advises utilizing market pricing as the foundation for valuing

flows and equities. The actual price agreed upon by transactors on the date of the transaction is referred to as the market price for flows. In the case of stocks, the market price at the time of stock compilation is suggested. The flow reflected in the Balance of Payments must be equal to the difference between the stock at the beginning of the year and its value at the end of the year. This represents the actual transactions on these assets or liabilities, as well as the change in the stock's value caused by exchange rate movements.

1.7FDI Recent trends and prospects:

This section briefs the fourteen years' of FDI trends globally by providing data from The United Nations Conference on Trade and Development (UNCTAD). The United Nations Conference on Trade and Development is an intergovernmental organization to promote developing countries' interests in global trade, was created in 1964 (UNCTAD, 2020). UNCTAD is one of the United Nations Secretariat that deals with trade, investment, and development concerns.

This section will be divided into two parts; the first part will examine the trends between 2007 and 2018 to understand the trends apart from COVID-19 effects. Then the second part will explore the effect of COVID-19 and how it affects the previous aforementioned trends.

1.7.1 FDI trends from 2007 to 2021:

FDI figures experienced significant changes over the past decades, with globalization and technological advancement playing a key role in shaping these trends. In this section, we will examine FDI trends between 2007 and 2018, considering the various factors that have influenced these trends.

Table 1 : World FDI trends between 2007 to 2021

Year or years range	FDI Trends	Remarkable Events
2007 to 2008	FDI flows reached $1.9 trillion in 2007, driven by high demand for natural resources, but fell by 23% to $1.5 trillion in 2008 due to the financial crisis. Developed countries were particularly impacted by the crisis, which resulted in a 37% fall in FDI flows in 2008.	Financial crisis starting in 2007
2009	FDI flows reached $1.2 trillion, a decrease of 20% compared to 2007, but were recovering due to a rebound in cross-border mergers and acquisitions.	Economic recovery
2010 to 2013	FDI inflows climbed substantially, reaching $1.4 trillion in 2013, due to the recovery of the global economy, a rise in cross-border mergers and acquisitions, and the expansion of global value chains.	Economic recovery
2014	Global FDI flows declined to $1.3 trillion, however recorded an increase in cross-border mergers and acquisitions, particularly in the United States and Europe, as well as a rise in greenfield investments. Developing economies received a record-high $759 billion in FDI, with China, India, and Brazil being among the top recipients.	Growing FDI shift towards emerging markets
2015	Global FDI flows reached a new record to $1.8 trillion, highest level since the pre-crisis levels. due to a surge in cross-border mergers and acquisitions to $721 billion, from $432 billion in 2014,. Developing economies continued to be a major destination for FDI, but the overall flow of FDI into these countries slowed compared to the previous year.	Growing FDI shift towards emerging markets
2018 to 2019	FDI flows remained relatively stable in 2018 but with a shift in investment patterns, while FDI flows decreased by 13% in 2019 due to a drop in investment in developed economies and a more significant decrease in FDI flows to developing economies. The United States remained the top recipient of FDI in both years.	Global economic slowdown due to trade tension and political uncertainty
2020	A large fall in FDI due to COVID -19 pandemic. According to UNACTD global FDI inflow decreased by 41% which considered the largest fall since 2008 financial crisis. M&A decreased by 49% as a result of the pandemic. FDI to developing countries decreased by 22% compared to the developed country 49% showing that the developing countries inflow FDI was less effected compared to the developed countries.	COVID -19 pandemic
2021	The recovery of the global economy from the pandemic effect increased the FDI by 26%. FDI to emerging markets specially in Asia and Africa was one of the major trends during 2021. Also, the growing of the tech industry to adapt the new situation of the pandemic measures, contributed to the FDI trends in 2021. The increase of the opportunities that have a good impact on the environment and society are becoming more and more demanded also influenced the FDI trends in 2021	Economic recovery

Note: (UNCTAD,2008), (UNCTAD,2010), (UNCTAD,2013), (UNCTAD,2016), (UNCTAD,2020), (UNCTAD,2022)

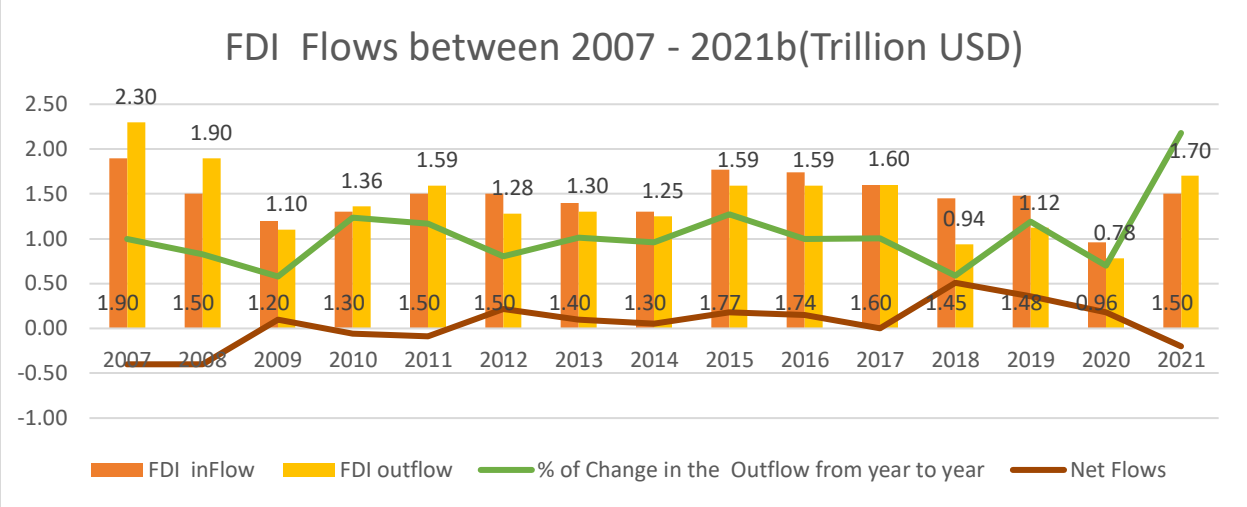


Figure 1: FDI inflow & outflow between 2007 and 2021

1.7.2 ESG in Global finance:

In 2021 Spain stands out in renewables FDI projects growth particularly, going from 46 projects in 2019 to 78 projects in 2021 (Caon, 2022). followed by the US, Brazil, and the UK. (See Figure 2) Following are two examples of major projects under the umbrella of the ESG and influenced the FDI trends during 2021:

- The Climate Pledge is a project started by Amazon and Global Optimism in 2019, the project goal is to gather businesses from all the different industries to cooperate and reach Paris Agreement on climate change goals. The main goal of the agreement is to limit the global temperature increase to well below 2 degrees Celsius above pre-industrial levels and to continuously working to limit it to 1.5 degrees Celsius (Caon,

2022). In 2021 more than 250 signatories from various sectors and countries joined the Climate Pledge project, including IBM, Unilever, Mercedes-Benz, Verizon, Siemens, and Best Buy (Amazon sustainability, 2022).

- The Electric Vehicle (EV) Infrastructure Development project is the second project with the aim to promote the use of EV cars in order to reduce the gas emissions and air pollution. electric and hybrid vehicles attracted 123 projects in 2021. The cumulative fund from the companies reached $ 50 billion (See figure 2) (Mui, 2023), and US governments are also providing funding for the project investing $15 billion in EV infrastructure as part of its infrastructure bill in 2021 (Lambert, 2021).

Country	2019	2020	2021
China	7	5	10
US	61	72	81
Germany	11	17	30
UK	25	40	44
France	11	24	29
Japan	4	12	12
India	2	4	9
South Korea	2	3	4
Brazil	12	55	33
Spain	46	27	78

Figure 2: Number of renewable FDI projects in some countries in from 2019 to 2021.

Source: (Caon, 2022)

The increased focus given to environmental, social, and governance (ESG) issues is one factor that influenced FDI trends in 2021. Opportunities to invest in businesses and projects that have a good impact on the environment and society are becoming more and more demanded by

investors and businesses. As governments and investors work to address the problems caused by climate change and other environmental issues.

ESG can defined as a set of factors used to evaluate a company or investment on environmental, social, and governance factors, which are believed to be indicative of its long-term sustainability and impact.

The environmental set of factors that considered to evaluate the company impact including its use of natural resources, carbon emissions, waste management, and environmental risks. Social factors relate to a company's impact on society, including its labor practices, human rights, community relations, and product safety. Governance factors relate to a company's internal management, including its board composition, executive compensation, and transparency.

The consideration of ESG factors into investment decision has rapidly increased in recent years, with approximate assets under sustainable management reached $17 trillion in 2020 compared to $12 trillion in 2018. This growth has been driven by investors new preferences, increase the awareness of the environment and social issues and regulatory development (Team, T.I.,2023).

The direct relationship between financial risks and environmental and social issues is considered the main motivation for the integration of ESG factors into finance. For example, in recent years, it has become clear that the significant effect of climate change on the global economy includes extreme weather events and transition risks, such as policy changes and technological advances. Investors are increasingly recognizing the need to consider these risks in their investment decisions and to engage with companies to ensure they are managing them effectively.

One more driver helped in the integration of ESG factor into finance which is the regulatory development. For example, the EU has developed a taxonomy for sustainable finance, which considered as a framework for environmentally sustainable economic activities identification. Also, a regulation has been introduced by EU in order to let asset managers to disclose their ESG policies and practices (EU taxonomy for Sustainable Activities).

Considering these efforts of the integration of ESG factors into finance and the growing demands from the investors who are seeking to align their investments with their values, led to develop a range of sustainable financial products, including green bonds, which are used to finance environmentally friendly projects, and sustainability-linked loans, which motivate borrowers to meet sustainability targets through the terms of the loan (Duarte, D.R., Santos, M.B. and Barbosa, P.C., 2022).

Yet, the investors face difficulties in evaluating and comparing the companies due to the lack of transparency and standardization in ESG data. Also, the concerns of calming false or misleading information about the company environmental or social credentials in order to attract investment which is called "greenwashing". All these are considered challenges complicate the integration of ESG factors into finance (Clarke, L., 2022).

Despite these challenges, the regulatory development, the recognition of the linkage between the financial risk and the environmental and social issues and changing investor preferences are all contributing to the grows of this trend. Therefor business need to adapt and ensure that they are considering ESG factors in their decision-making processes.

Some of the key factors influenced FDI trends between 2007 and 2021 include:

- Economic conditions: FDI is closely tied to economic conditions, with strong economic growth typically leading to increased FDI and vice versa. The global financial crisis of 2008 had significant impact on FDI trends, with the sharp decline in global economic activity leading to a decline in FDI. However, the economic recovery in the years following the crisis saw an increase in FDI, as companies looked to expand to new markets and take advantage of favorable economic conditions.
- Policy developments: Policy developments at both the national and international levels can also influence FDI trends. For example, The Agreement between the United States, Mexico, and Canada (USMCA); this agreement signed in 2018 as a replacement for NAFTA (Investment Policy hub, 2018). Aimed to create more jobs and increase the economic growth. Such agreements help to introduce favorable investment policies and/or remove free trade barriers and can encourage FDI, while the implementation of protectionist measures or the introduction of new regulatory requirements can discourage FDI (OECD, 2006).
- Geopolitical considerations: Geopolitical considerations, including tensions between countries or regional instability, can also impact FDI trends. For example, trade tensions or political instability in a particular region may discourage companies from investing in that region (OECD, 2006).

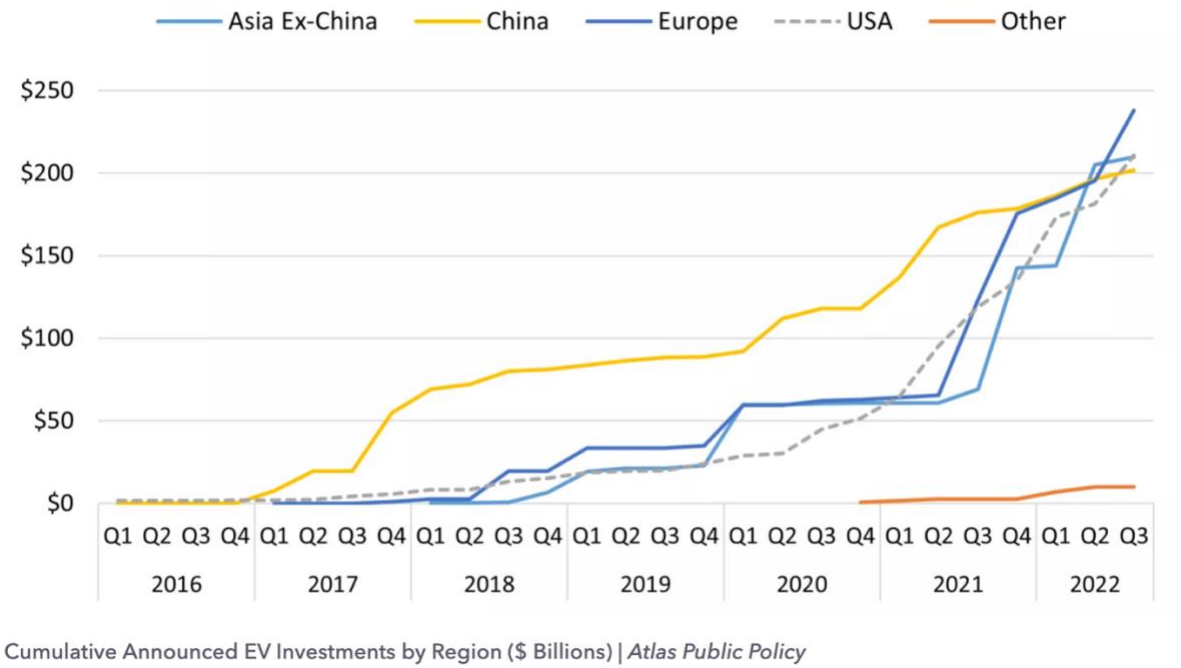


Figure 3: Announced Cumulative EV investments by region (Mui, 2023)

1.7.3 FDI Prospect:

The Global FDI will be impacted by number of variables that are difficult to anticipate with confidence. However, a few trends are expected to have an impact on FDI flows in the upcoming years.

The growing attention given to environmental, social, and governance issues is one trend that is predicted to continue. Opportunities to invest in businesses and projects that have a good impact on the environment and society are becoming more and more favorable to investors and businesses (UNCTAD,2022). As governments and investors work to address the problems caused by climate change and other environmental difficulties, this trend is probably going to persist in the upcoming years.

The continual development of new technologies is another trend that is likely to have an impact on FDI flows. The development of sectors like renewable energy, biotechnology, and artificial intelligence is probably going to draw a lot of investment from international firms looking to capture these new opportunities (UNCTAD,2022).

In the upcoming years, geopolitical tensions and trade conflicts are expected to continue to have an impact on FDI flows. Foreign investors may find it more appealing to invest in stable, low-risk countries as opposed to unstable countries that are involved in trade conflicts or other geopolitical concerns (UNCTAD,2022).

In the upcoming years, FDI flows are also expected to be influenced by economic conditions and growth prospects. Foreign investors are frequently more attracted to countries with strong economic development, low inflation, and stable political situations (UNCTAD,2022). Additionally, countries with attractive business policies and advanced infrastructure may attract foreign investors.

2. Chapter two: Environmental Policy stringency and the relationship with the FDI.

2.1Introduction:

Foreign direct investment (FDI) is an important source of funding for countries development since it can provide the necessary tools and technology, as well as support jobs creation and economic expansion. The relationship between environmental policy stringency (EPS) and foreign direct investment (FDI) is complex and can depend on specific context in which FDI takes place (Botta & Koźluk, 2008). From competitiveness perspective, the relationship can be influenced by many factors, such as the cost of doing business, and the risk of environmental liabilities (Cole, M. A., Elliott, R. J. R., & Zhang, L.,2017).

One way in which environmental policy stringency can affect the competitiveness of a country for FDI is through its impact on the cost of doing business. Countries with stronger Environment policy Stringency may have more stringent environmental regulations, which can increase the costs of doing business for foreign investors. This can make a country less competitive for FDI, as companies may be hesitant to invest in a country with high compliance costs. On the other hand, countries with weak EPS may be more attractive to foreign investors, as there are fewer regulatory costs and a lower risk of environmental liabilities (Grossman & Krueger, 1995).

However, environmental policy stringency can also affect the competitiveness of a country for FDI in other ways. Countries with strong environmental policy stringency may be more attractive to foreign investors with a reputation for environmental responsibility, as they can be

confident that their operations will be in compliance with local environmental regulations (United Nations Development Programme, n.d.). In addition, strong environmental policy stringency can help to improve the company's operational efficiency and protect the local environment, which can be an important consideration for companies that rely on natural resources or rely on the local environment for their operations. As a result, countries with strong EPS may be more attractive for FDI in certain sectors or industries (Cole, M. A., Elliott, R. J. R., & Zhang, L.,2017).

The impact on the risk of environmental liabilities is another way that it may affect the competitiveness of a country for FDI. Countries with strong EPS are likely to have effective environmental regulations and a higher level of environmental protection, which can reduce the risk of environmental liabilities for foreign investors (Borregaard. N & Dufey. A, 2002). This can make a country more attractive to foreign investors, as they are less likely to face regulatory challenges or environmental liabilities. Opposed to, countries with weak EPS may be a concern to foreign investors, as there is a higher risk of regulatory challenges and environmental liabilities (Cole, M. A., Elliott, R. J. R., & Zhang, L.,2017). Investor confidence may be enhanced by a clear and consistent regulatory and policy framework that reduces the likelihood of surprise changes and potential environmental risks.

The environment liability is the costs and responsibilities that the company should consider regarding the effect of its activity on the environment. This include and not limited to compliance obligations, remediation obligations and fines and penalties (*Corporate Finance Institute*).

- Compliance obligations: refers to the country environmental regulations that the business must consider. Such as process documentation, administration cost, staff training to handle hazardous substances. Also, it may incur costs to manage spills, air emissions, waste treatment, and exit costs for closing disposal sites. The company failure in meeting these obligations may lead to a legal action against the company.
- Remediation obligations: refers to activities that require the company to manage pollution or industrial activities that pose a risk to human health and the environment. That's may include water treatment, monitoring, evaluating the environment for adverse effects.
- Fines and Penalties: which is refers to costs that imposed on the company for noncompliance with the country environmental regulations.

2.2Measuring environmental Policy stringency:

Environmental policy stringency can be defined as the government's enforcement degree to environmental regulations. Measuring these policies is a complex concept and can be influenced by different determinates such as the industry type, and social, Political, and economic factors. The complexity of building and implementing these indicators is due to the wide variety of policy instruments available to address climate and energy concerns, which each have different levels of effectiveness, dynamic efficiency, and political acceptability (Millimet, Daniel L.; Roy, Jayjit, 2015).

One example can be the countries with high pollution challenges that may enforce more stringent options, which may bias the indicator (Galeotti. M & Salini. S & Verdolini. E, 2020).

this section will provide an overview of the common methods used by researchers to measure regulatory stringency, and a description of main characteristics, advantages, and limitations of

each method. These methods are divided into five main methods: private-sector pollution abatement expenditures, direct assessments of regulations, composite indexes, measures based on ambient pollution, emissions, or energy use, and pollution-control efforts by governments (Brunel. C & Levinson. A, 2013).

1. Private-sector pollution abatement expenditures: This approach measures stringency by using data on the amount of money that private companies spend on pollution abatement, such as on equipment or processes that reduce emissions or improve environmental quality (Brunel. C & Levinson. A, 2013). By comparing the expenditures of companies in different locations or time periods, researchers can gain insight into the stringency of environmental regulations in those places or time periods.

One of the strong limitations of this approach is that it relies on Surveying the company's managers to report their expenditures on pollution abatement. Inaccuracies in reporting or differences in accounting practices across companies and countries can make it difficult to make valid cross-country or cross-industry comparisons. Moreover, companies may engage in pollution reduction efforts for reasons other than complying with regulations, such as reducing energy costs, so the level of abatement expenditures may not necessarily reflect the stringency of regulations. (Brunel. C & Levinson. A, 2013).

2. Regulation based measures: This approach looks at the actual regulations or laws that govern environmental protection in a given area or time period. Researchers might study the specific requirements or standards set by these regulations, such as emissions limits or permit requirements, in order to assess their stringency (Brunel. C & Levinson. A, 2013). They may also analyze how effectively the regulations are enforced.

One of the approaches is using US Clen Air Act as a natural experiment since the federal government set standard air quality (NAAQS) to provide a general measure of multidimensional stringency. Using this indicator to examine the improvement or deterioration of air quality. Also, utilizing a specific regulation-based metric, such as regulations that only apply to petroleum refineries, is another strategy that demonstrates how regulations boost productivity at the plant level (Brunel. C & Levinson. A, 2013).

A limitation of this approach is that regulations may not always be enforced effectively, making it difficult to estimate the actual level of stringency. Moreover, regulations can be complex and difficult to interpret, making it challenging to accurately assess their stringency. (Jaffe & Palmer, 1997).

3. Composite indexes: This approach aims to simplify the multidimensional problem of measuring stringency by creating a single number or score that represents the overall level of environmental regulation in a given area or time period. Composite indexes are often created by combining multiple data sources or indicators of stringency, such as direct assessments of regulations or pollution levels (Brunel. C & Levinson. A, 2013). This approach can help researchers to quickly and easily compare the stringency of regulations across different countries, regions, or time periods.

There are several different ways that composite indexes can be created, but some common methods follow the following steps:

- Weighting different indicators of stringency: a different indicators of stringency might be used, such as emissions limits, penalties for non-compliance, and compliance rates, and assign each indicator a weight based on its importance. The weights are then used to

create a single score that represents the overall level of stringency (Botta & Kozluk, 2014).

- Aggregating different indicators into a single score: We may use multiple indicators of stringency and combine them into a single score (Botta & Kozluk, 2014). For example, we might use both emissions data and the number of government inspectors as indicators of stringency, and then combine them into a single score. Following a two steps aggregation, first the instrument-specific indicators (e.g., taxes on SOx, NOx, and CO2) into mid-level indicator according to the indicators category. Then all these mid-level indicators grouped into market based and non-market-based instruments.
- Combining multiple composite indexes: a Multiple composite indexes might be used, each measuring different aspect of stringency, such as economic or administrative and combine them into a single score (Botta & Kozluk, 2014).

Composite indexes can be useful for providing a quick and easy way to compare the stringency of regulations across different countries, regions, or time periods. However, it is important to keep in mind that these indexes may not capture all aspects of stringency and may be sensitive to the specific indicators used in the index. Additionally, because they are based on multiple data sources, the weighting and aggregation of different indicators used can affect the final index score. Therefore, it is important to have a clear understanding of the underlying data and methods used to construct a composite index and to be transparent in its construction. (Pizer, 2005)

A limitation of this approach is that it can be challenging to weight different indicators and make valid cross-country or cross-industry comparisons. Additionally, composite indexes may not

capture all aspects of stringency and may be sensitive to the specific indicators used in the index. (Jaffe & Palmer, 1997)

4. Measures based on ambient pollution, emissions, or energy use: This approach looks at environmental outcomes, such as the level of air pollution or emissions, in order to infer the stringency of regulations (Brunel. C & Levinson. A, 2013). For example, a study might compare the levels of air pollution or emissions in different locations or time periods and use this data to assess the stringency of regulations in those places or times.

A limitation of this approach is that it may not take into account other factors that influence pollution levels, such as economic activity or population density. Additionally, a country or region may have high pollution levels due to reasons not related to regulation stringency, such as geography or climate. (Goulder & Williams, 2000)

5. Pollution-control efforts by governments: This approach focuses on the actions of governments, such as the resources devoted to enforcing regulations and monitoring compliance, to assess the stringency of environmental regulations. This can include measures of governmental spending on environment-related programs, allocation of regulatory enforcement agencies and Inspectors, and assessments of their work quality.

A limitation of this approach is that it may not take into account the effectiveness of the regulations themselves, or how well the government is able to enforce them. Additionally, governments may engage in pollution-control efforts for reasons other than achieving environmental goals, such as responding to public pressure or appeasing international bodies. (Jaffe & Palmer, 1997).

2.3Methodology Approach:

In order to select an approach for this study, it should have certain features, firstly, the index should be simple and easy to understand. additionally, it should allow for cross-country comparisons and provide an indicator of policy stringency. The Environmental Policy Stringency (EPS) composite Index in this case is the most suitable approach. This index can be used to assess the environmental impact of FDI (Botta & Koźluk, 2014). The EPS Index is designed to assess the stringency of environmental policies in OECD countries (Organisation for Economic Co-operation and Development). And it is based on data from a various source, including national statistics, expert assessments, and international databases (Botta & Koźluk, 2014).
The EPS index was developed by the OECD (Botta & Kozluk, 2014) as a proxy for environmental regulations in order to capture the multidimensionality of environmental policies and facilitate comparisons between countries by assigning a stringency score based on the extent to which environmental policies impose a cost on polluting or environmentally harmful behaviors.

2.3.1 OECD EPS the composite index:

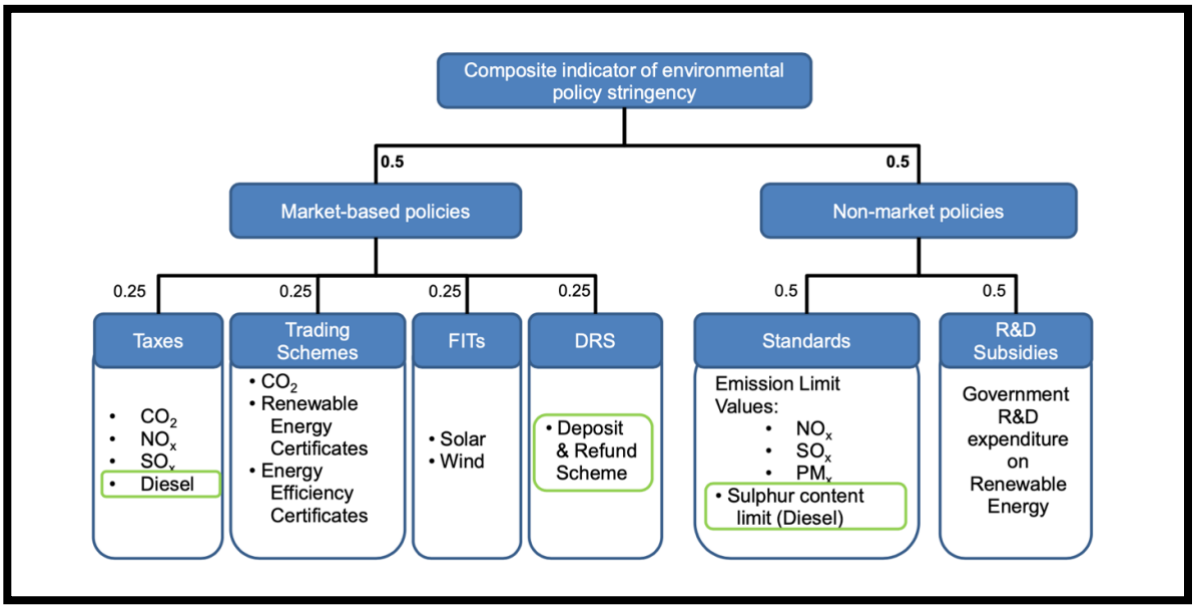
The EPS composite policy index is an indicator resulting from the aggregation of individual indicators into a single measure based on an analytical model. It can be useful for measuring the complexity and multi-dimensionality of environmental policy, such as product market regulation, employment protection legislation, financial sector regulation, competition law and policy, and the burdens on businesses (Botta & Koźluk, 2014).

The indicators used to measure the level of strictness in environmental policy use a scale ranging from 0 to 6, with higher values indicating more stringent regulation. Also, it assesses the level of strictness in environmental policy by analyzing the cost associated with activities that may have a negative impact on the environment (Botta & Koźluk, 2014). This cost can be determined through a variety of methods, including taxes, emission limits, and subsidies. A higher cost or lower value for these measures is considered to indicate a more stringent environmental policy.

OECD proposed two composite indicators to measure the strictness of environmental policy. The first indicator focuses on the energy sector specifically the production, transmission, and distribution of electricity, gas, and steam, and includes 15 policy instruments. The second indicator economy-wide **(Figure 1)** and (**Table1)** expands upon the first by including additional policy instruments related to the pollution from the transport sector, waste, and water to capture the overall strictness of environmental policy across the economy (Botta & Koźluk, 2014).
The wide coverage of the indicator allows for a comprehensive understanding of environmental policy and its impact on polluting or environmentally harmful behavior. Also, standardization eases the comparison across countries and over time.

While the EPS index primarily focuses on air and climate policy instruments, it does not consider other important policy areas such as climate change, biodiversity, natural resources, or waste, nor does it account for "soft" policies such as tax incentives for environmentally friendly investments. Yet Botta and Kozluk (2014) found that the EPS index can serve as a useful tool for cross-country analysis.

Figure 4: The overall structure of the EPS index for the extended (economy-wide) indicator



Source: Botta & Kozluk (2014)

Table 2. Policy instruments taxonomy - Source: De Serres et al. (2010)

	Name	Example in the database
Market-based instruments	Taxes and charges directly applied to the pollution source.	Tax on emissions of NO_X
	Taxes and charges applied on input or output of a production process.	Diesel tax
	Trading scheme	Emissions Trading Scheme for CO_2, Renewable Energy Certificates
	Subsidy for environmentally - friendly activities	Feed-In Tariffs
	Deposit-refund systems	Deposit Refund Scheme for beverages
Non-Market-based instruments	Command – and - control regulations	Emission Limit Value for NOx for large size coal-fired plants
	Technology - support policies	Government R&D expenditures (% GDP, Renewable energy)
	Voluntary approaches	Not covered

2.3.2 The Relationships between FDI and Environment Regulation:

The global economic activities and trade patterns are influenced by the complex relationship between environmental policy, production location, and trade flows. One key aspect of this relationship is the pollution haven hypothesis (PHH), which suggests that stronger environmental regulations may motivate organizations to relocate production activities to areas with less stringent environmental regulations. This can create "havens" of areas with higher pollution activities and manipulate the spatial distribution of economic activity and trade patterns.

Millimet, Daniel L.; Roy, Jayjit (2015). In Empirical Tests of the Pollution Haven Hypothesis When Environmental Regulation is Endogenous. Suggest that an examination of this relationship is crucial due to these reasons:

1) The huge rise of the FDI in the past two decades has increased the need to understand how the level of the environment stringent might influence the FDI direction and trade flows.
2) International coordination may be necessary to avoid negative effects such as transboundary pollution if countries are able to attract FDI by applying less stringent environmental regulations. Additionally, The PHH could influence more countries to lower the stringent of their environmental regulations which may lead to a "race to the bottom" in environmental standards. The effect may be extended to the natural capital and exacerbate the effects of pollution on health and mortality in countries with lax regulation.

3) If countries are able to influence the Company's decision on moving some of its activity and trade patterns through environmental regulation, then considering environmental policies as a part of the trade agreements may be necessary to realize the intended effects of such agreements. And therefore, this may impact the institutional structures such as the World Trade Organization (WTO) in impeding countries from choosing their desired environmental policies if they impact trade flows between members.
4) The analysis of the pollution haven hypothesis (PHH) will better describe the implications of the capital mobility and how regulations affect the flow, however, the existing literature has been unable to conclusively prove the validity of the PHH due to limitations in data and methodologies (Millimet, D. L., and Roy, J., 2016).

Levinson (2008) divided the literature into two generations (Millimet, D. L., and Roy, J., 2016). The first generation considers environmental regulations as exogenous; meaning it's not affected by other variables in the model such as the location of production, trade patterns, or economic activity. such as Jeppesen et al. (2002) and Millimet and List (2004). This generation used cross-sectional data and didn't find statistical evidence supporting the pollution haven hypothesis (PHH) (Millimet, D. L., and Roy, J., 2016).

The second generation, such as those conducted by Levinson and Taylor (2008), Keller and Levinson (2002), and List and Co (2000). Used the panel data studies to exclude unobserved heterogeneity invariants on some dimensions like time and some sectors differentiated by pollution intensity. To avoid biased results that may occur as a result of the correlation between unobserved heterogeneity and environmental stringency. This generation finds statistically

significant evidence in support of the pollution haven hypothesis (PHH). However, some factors may affect these study results such as the omission of third-country effects, the omission of relevant variables that vary over time and affect the pollution-intensive and non-pollution-intensive sectors, for example, the tax breaks, errors in environment regulation proxies, the relationship between the current and previous environment regulations and shock to economic activity.

Some papers studied pollution havens at a global level using the FDI data. Eskeland and Harrison (2003) and Hanna (2004) have studied the FDI outward flow variation duo to the stringency of domestic regulation across sectors to examine the pollution haven effect, but these studies have not considered regulatory stringency in the host countries. Xing and Kolstad (2002) have addressed this issue by modeling industry-level FDI flows from US manufacturing into a small cross-section of destination countries as a function of "environmental laxity". However, their finding of a pollution haven effect hinges on the assumptions of the strong relationship between regulation and performance (Ulrich J. Wagner; Christopher D. Timmins, 2009).

in this study, we are trying to utilize the work of (Ulrich J. Wagner; Christopher D. Timmins, 2009) by testing the Pollution Hypothesis (PHH) using the outward FDI data from the US, considering the OECD EPS index as a country's Environment policy strictness indicator, and 13 years' time frame.

3. Chapter Three: FDI in The United States

3.1Introduction:

The study of foreign direct investment (FDI) is a key component of understanding the complex relationships between countries and their economic, social, and environmental conditions. The strength of the inward and outward FDI of a country can be influenced by various factors, such as economic growth, political stability, infrastructure, and natural resources. These factors can impact the attractiveness of a country for foreign investors and the opportunities available for domestic companies to invest abroad.

In this chapter, we aim to follow the trends of the FDI in US. By examining these trends and understanding the drivers such as the economic slowdown, and the impact of the pandemic. We will understand better which variables we can use in order to study the relation between environment policy stringency and FDI outwards from US into the host countries economically.

These variables such as Market size indicated by GDP, ease of doing business indicated by Tariff and corporate tax can have a positive or negative impact on attracting the FDI. Therefore, we need to include them as control variables to help determine the specific effect of environmental policy stringency on the FDI. Controlling these variables will help in identifying the effect of the environment policy stringency into FDI outflow without the influence of the other variables.

3.2Inward FDI to US

Between 2007 and 2021, inward FDI in the United States experienced significant fluctuations due to various economic and political factors. Some of these factors include the global financial

crisis in 2008, which lead to a decrease in FDI globally, and economic growth slowed down. Another factor is the political uncertainty and change in trading agreements, such as imposing tariffs on a wide range of Chinese imports as part of the trade dispute with China in 2018. Which lead to reducing the trade deficit and protecting the American Businessmen and workers between the United States and China. Moreover, The COVID-19 pandemic also significantly impacted the FDI, leading to a decrease in investment due to economic uncertainty and disruptions in global trade.

One of the major drivers of inward FDI in the United States between 2007 and 2021 despite the major economic disruptive events was the country's strong economic growth and stable political environment. The United States has a highly developed and diversified economy, which makes it an attractive destination for foreign investors. Additionally, the country has a legal system that protects property rights and enforces contracts, which provides a level of predictability and security for foreign investors.

Another important factor that contributed to inward FDI in the United States was the country's skilled and educated workforce. The United States has a large pool of highly skilled workers, particularly in sectors such as technology, finance, and healthcare, which are attractive to foreign investors.

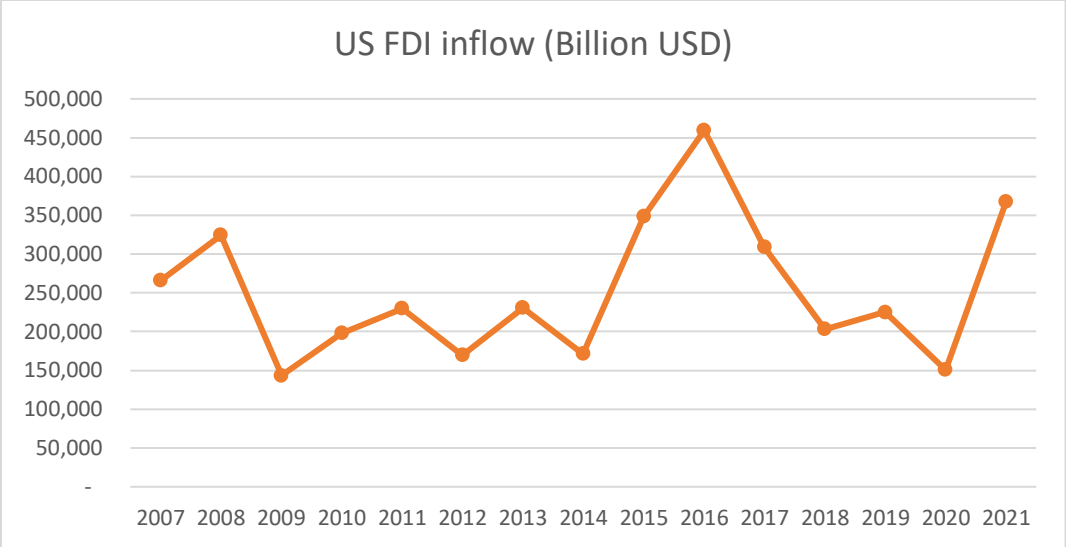


Figure 5: Inflow FDI to US between 2007 to 2021 (UNCTAD)

3.3Outward FDI from the US

Outward FDI from the United States between 2007 and 2021 reached a peak of $403.6 billion in 2021, driven by the country's strong economic growth and favorable business climate, as well as the availability of capital and technology. The largest industries for outward FDI were manufacturing, wholesale and retail trade, and finance and insurance. The main countries that received investment from the United States were Canada, the United Kingdom, and Mexico. The economic situation in the United States was favorable, with strong economic growth and low unemployment rates. Outward FDI from the United States was influenced by a combination of economic, political, and environmental factors.

- **2007**

Outward FDI from the United States reached $393.5 billion in 2007, driven by the country's strong economic growth and favorable business climate, as well as the availability of capital and technology (United States Bureau of Economic Analysis, 2022). The largest industries for outward FDI were manufacturing at 25% share out of total outward FDI amount, wholesale and

retail trade at 11%, finance and insurance at 16%, and Mining at 12%(United States Bureau of Economic Analysis, 2022). The main countries that received investment from the United States were Canada, the United Kingdom, and the Netherlands (United States Bureau of Economic Analysis, 2022). The economic situation in the United States was favorable, with strong economic growth and low unemployment rates at 4.62% (United States Bureau of Economic Analysis, 2022).

- **2008**

Outward FDI from the United States declined to $308.3 billion in 2008, impacted by the global financial crisis, which reduced the availability of credit and decreased the attractiveness of investment in foreign countries (United States Bureau of Economic Analysis, 2022). Yet the largest industries for outward FDI continued to be, manufacturing, finance and insurance, and Mining at a consequence share 22%, 16% and 15% from the FDI. The economic situation in the United States was challenging, with a recession and high unemployment rates at 5.78% (United States Bureau of Economic Analysis, 2022).

- **2009-2010**

Outward FDI from the United States declined to $266.1 billion in 2009 and $304.8 billion in 2010 as the global economy continue slowing down from the financial crisis (United States Bureau of Economic Analysis, 2022). The largest industries for outward FDI were Finance & insurance at 20% share out of total outward FDI amount, manufacturing at 19%, and Mining at 11% United States Bureau of Economic Analysis, 2022). The economic situation in the United States continued, with unemployment rates at 9.6% in 2010 (Theodossiou & Hipple, 2011).

- **2011-2013**

Outward FDI from the United States reached $396.1 billion in 2011, $328.6 billion in 2012, and $307.3 billion in 2013, driven by the country's economic recovery, as well as the availability of capital and technology (United States Bureau of Economic Analysis, 2022). The largest industries for outward FDI returned again to be the manufacturing industry at 23% share out of total outward FDI amount, finance and insurance at 13%, and Mining at 9%(United States Bureau of Economic Analysis, 2022).

- **2014-2015**

Outward FDI from the United States declined to $333.5 billion in 2014 and $264.9 billion in 2015, impacted by a slowdown in the global economy and increased competition from other countries for foreign investment (United States Bureau of Economic Analysis, 2022). The top industries for US outward FDI in this period were manufacturing at 23%, Financial and insurance at 14%, wholesale and retail trade at 10%, and Mining outward investment decreased to 7% due to the loss in Iron ore value and weak demand from China and a glut of supply. (Younglai. R, 2014)

- **2016-2017**

Outward FDI from the United States increased to $289.3 billion in 2016 and $300.2 billion in 2017, influenced by the growing shift of FDI towards the emergent markets. The top industries for US outward FDI were manufacturing at 31%, Financial and insurance at 15%, wholesale and retail trade, and Chemicals both came at 8% (United States Bureau of Economic Analysis, 2022).

- **2018-2019**

In 2018 and 2019, US outward FDI declined to reach $93.4 billion in 2019 (UNCTAD, 2020). The main drivers of US outward FDI in this period were the search for new markets and the pursuit of technological advantages (OECD, 2020). The top industries for US outward FDI in this period were manufacturing, at 27%, Financial and insurance at 19%, and wholesale and retail trade at 8% (United States Bureau of Economic Analysis, 2022). The top countries for US outward FDI in this period were the United Kingdom, India, and China (OECD, 2020).

In the period from 2020 to 2021, US outward FDI has been affected by the COVID-19 pandemic and the resulting economic downturn. In 2020, US outward FDI declined to $92.8 billion (OECD, 2021). US outward FDI to Europe increased from $8 billion in 2019 to $50 billion. But it is largely declined in Asia (UNCTAD, 2021).

Table 3: US outward FDI amount per year

Year	Outward FDI (Billion USD)	Largest Industries and industry contribution percentage	Unemployment rate (as an indicator for the economic situation)
2007	393 518	• Manufacturing 25% • Wholesale and retail trade at 11%, • Finance and insurance at 16% • Mining at 12%	4.62%
2008	330 491	• manufacturing, 22% • finance and insurance, 16% • Mining 15%	5.78%
2009 - 2010	287 901/ 277 779	• Finance & insurance, 20% • manufacturing at 19%, • Mining at 11%	9.6%

2011 - 2013	396 569/ 328 343	• manufacturing industry at 23% • Finance and insurance at 13%, • Mining at 9%	8.95% - 7.37%
2014- 2015	292 283	• manufacturing at 23%, • Financial and insurance at 14%, • wholesale and retail trade at 10% • Mining, 7%	6.2% - 5.3%
2016 - 2017	284 469	• manufacturing at 31%, • Financial and insurance at 15%, • wholesale and retail trade, 8% • Chemicals 8%	4.36%
2018 - 2019	-157 406	• manufacturing, at 27%, • Financial and insurance at 19%, • wholesale and retail trade at 8%	3.5%

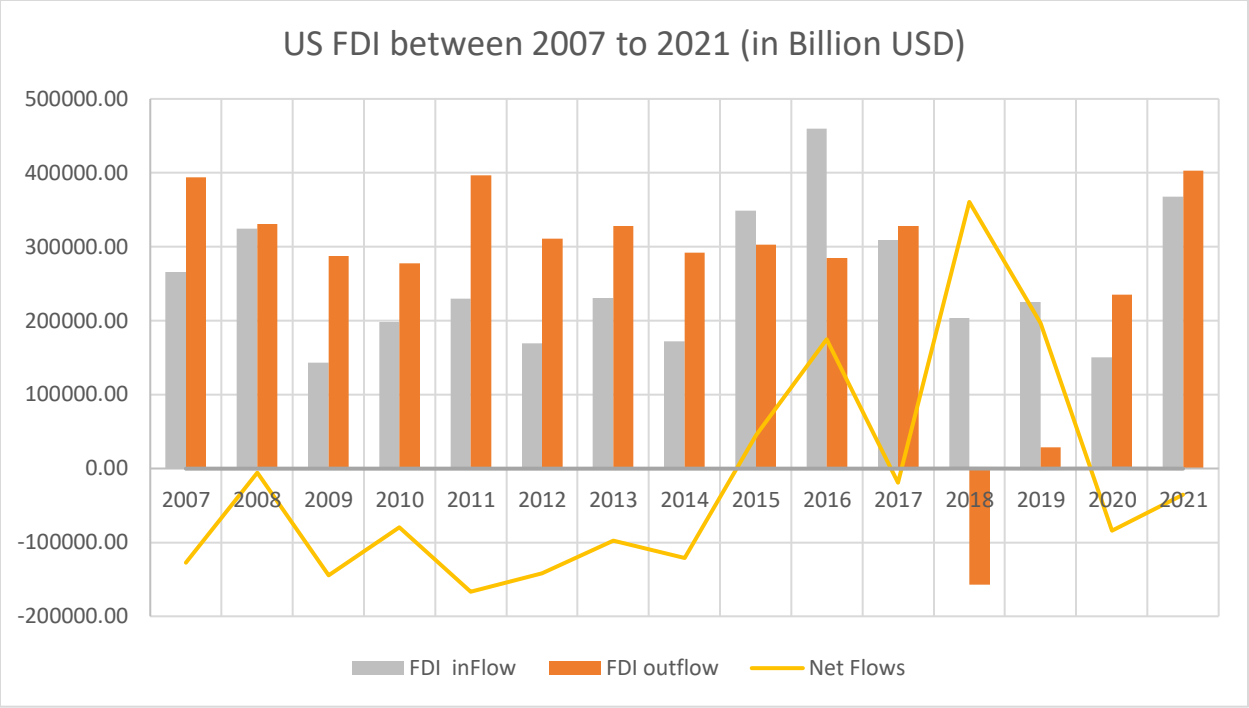


Figure 6: US FDI (Inflow & outflow) between 2007 till 2021

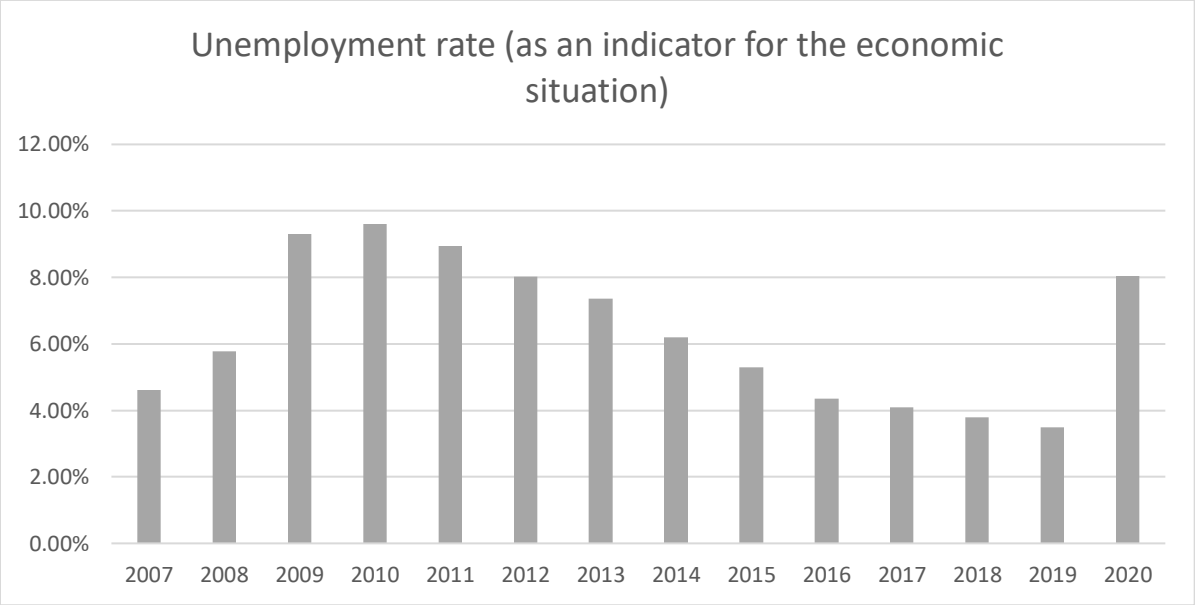


Figure 7: Unemployment rate in US between 2007 till 2020

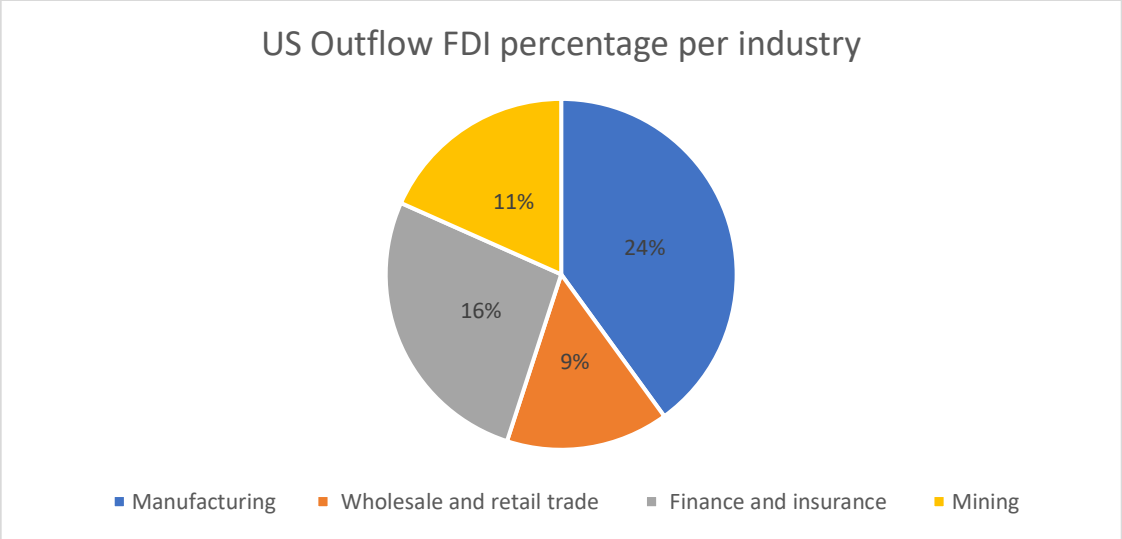


Figure 8: US Outflow FDI average percentage per industry between 2007 till 2019

4. Chapter Four: Econometrics Model and Data analysis

4.1 US Outward FDI data:

For the FDI data we are using a comprehensive database which offers the FDI destination country, investment company, parent company, destination state, destination city, number of jobs created, industry sector and subsector. From these wide variables we have grouped the FDI based on the destination country and the investment year. The detailed analysis is elaborated in Chapter 3.

In the coming section, we will start with a deep dive into the summary statistics of the Environmental policy stringency for the dataset understudy which allows incorporating those results into the econometric model later on to understand how the environmental policies affect the FDI.

4.2 FDI and Environmental Policy Stringency index analysis

4.2.1 Environmental Policy Stringency Trends in OECD Countries overview

In this section we examine the Environmental Policy Stringency (EPS) Index of the Organization for Economic Co-operation and Development (OECD) 34 member countries and some non-member countries (Brazil, Russia, India, China and South Africa) from 2007 to 2020. The EPS index present a quantitative measure for the countries environment policy stringency on a scale from 0 to 6. The higher the score the stricter the environment policy of this country's. The index also shows how country environmental policies have developed over time. This helps the policy makers in comparing the development of other countries policies compared to theirs which in turn allows the generation of more efficient polices overall.

4.2.2 Methodology:

In order to have a better understanding for the data, statistical analysis was performed to assess the general trend in environmental policy stringency over time, and to identify the countries with particular high or low level of policy stringency. Furthermore, the changes in the countries index were tracked to understand how the countries responded in adjusting their environmental policies to the environmental changes.

To achieve this the dataset was examined using 3 methods:

- **Overall data analysis**: by calculating the mean, standard deviation, minimum, and maximum for over all data to show the difference between the stricter environment policy countries verses the less strict one and the average index across the OECD countries.
- **Environmental policy trend analysis**: by calculating the mean, standard deviation, minimum, and maximum EPS index per year to track the trends and follow the patterns in the environmental policy over time.
- **Environmental policy snapshot analysis (country/ time):** By calculating the mean, standard deviation, minimum, and maximum EPS index per country over the 13 years frame to identify the country policy strictness consistency and variation, which will directly explain the level of policymaking development.

4.2.3 Results:

Overall data analysis results:

The analysis showed that the mean EPS score across all countries and years is 2.763, with a standard deviation of 0.936870288 reflecting the variation across all the countries during the

period of 2007 till 2020. The minimum value of 0.167 recorded in Brazil in 2011, which represented that Brazil had relatively lax environmental policies among all the countries and years from 2007 till 2020. the maximum value of 4.889 was observed in France in 2020 which indicate a relatively stricter environment policy among all the countries and years under study.

Environmental policy trend analysis results:

The analysis showed that over the 13 years, the general trend is going towards more strict policy. This result was common across all the OECD countries. Although the rate of increasement varies significantly. France, Denmark and Germany for example maintained a high levels of environmental policy stringency, whereas Turkey, Indonesia and Brazil, have lower stringency levels throughout the same period.

On yearly prospective, the analysis showed that the standard deviation values present some variation in the EPS index values. This variation in the EPS index values was a result of the variation in the policy stringency among the same countries during each year. While the parallel movements in the EPS index among the countries represents how the different strategies and priorities influence the environmental policies in general.

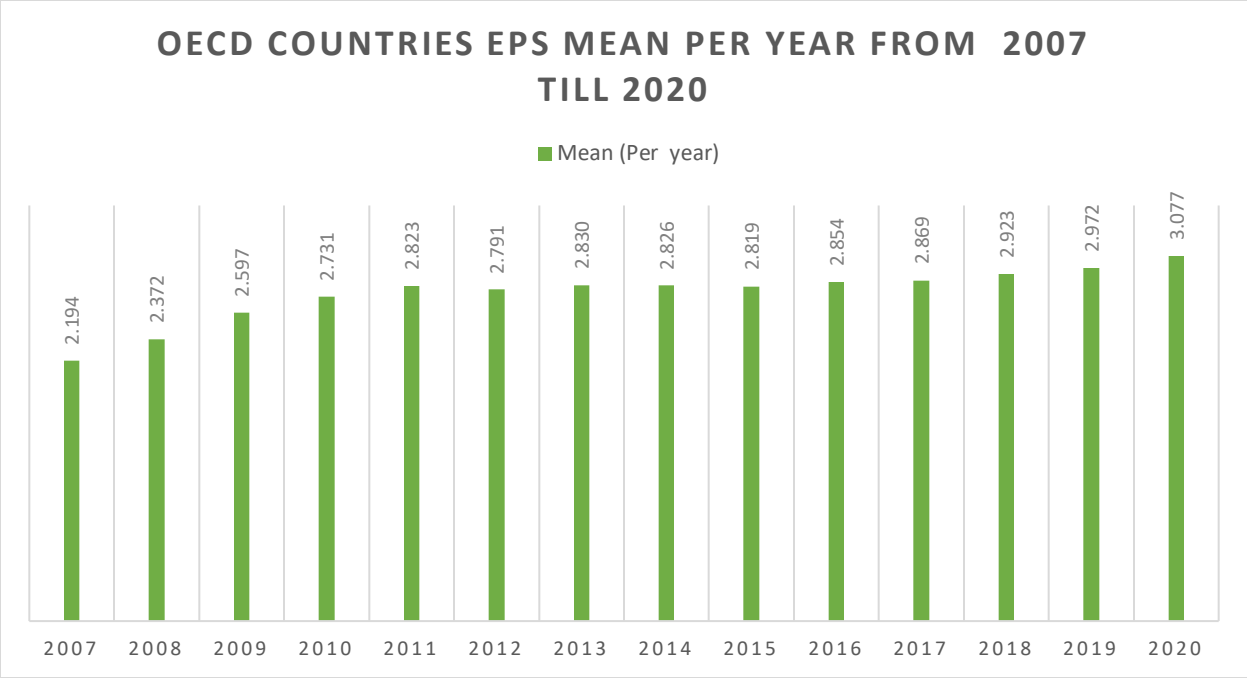


Figure 9: OECD countries EPS Mean per year from 2007 till 2020.

Environmental policy snapshot analysis (country/ time) results:

From Country perspective, the variation in mean EPS index is significant ranging from a low of 0.920 for Turkey to a high of 3.88 for Denmark. The standard deviation also shows significant differences, reflecting the level of differentiation in policy stringency across the years differs among the countries. For example, France and Denmark representing consistent high level of environment stringency with low standard deviation of 0.469 and 0.342 respectively versus China which represent relatively high standard deviation of 0.903.

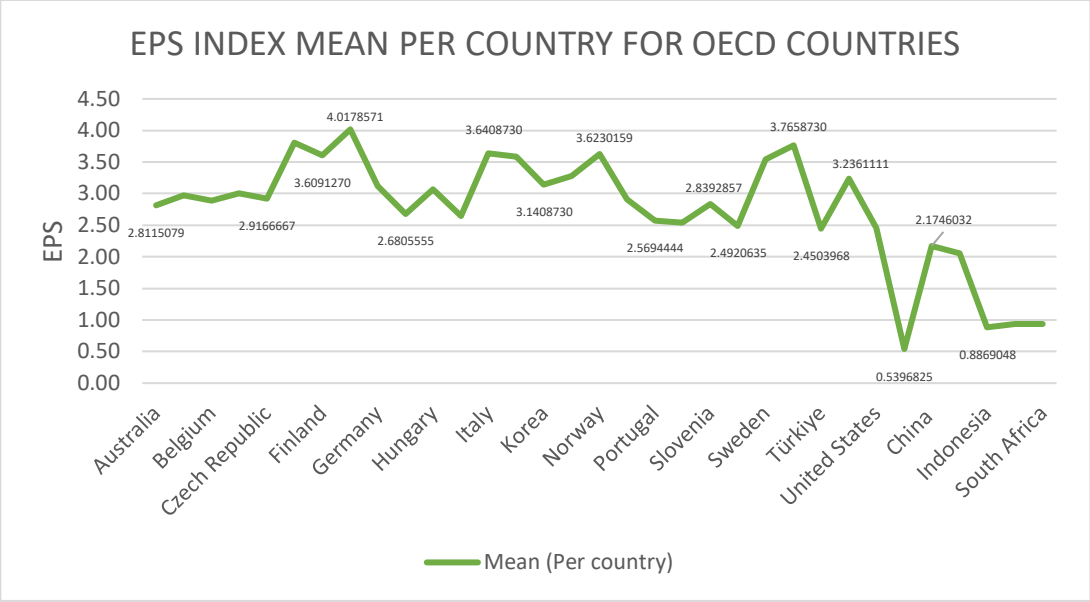


Figure 10: OECD countries EPS Mean per country from 2007 till 2020.

Results of summary statistics:

The OECD EPS index dataset shows a general trend of increasing environment policy stringency over time indicated by the higher mean values in later years. Moreover, the developed countries such as France and Germany, in general have stricter environmental policies compared to emerging economies like China, India, and Brazil. However, the emerging economy countries efforts to increase their environmental policies are noticeable since their EPS index is gradually increasing over time as their economy growth evolve.

The variations clearly present the differences in political, economic, and social contexts that influence environmental policies, such as public awareness, international commitments, and national policy priorities.

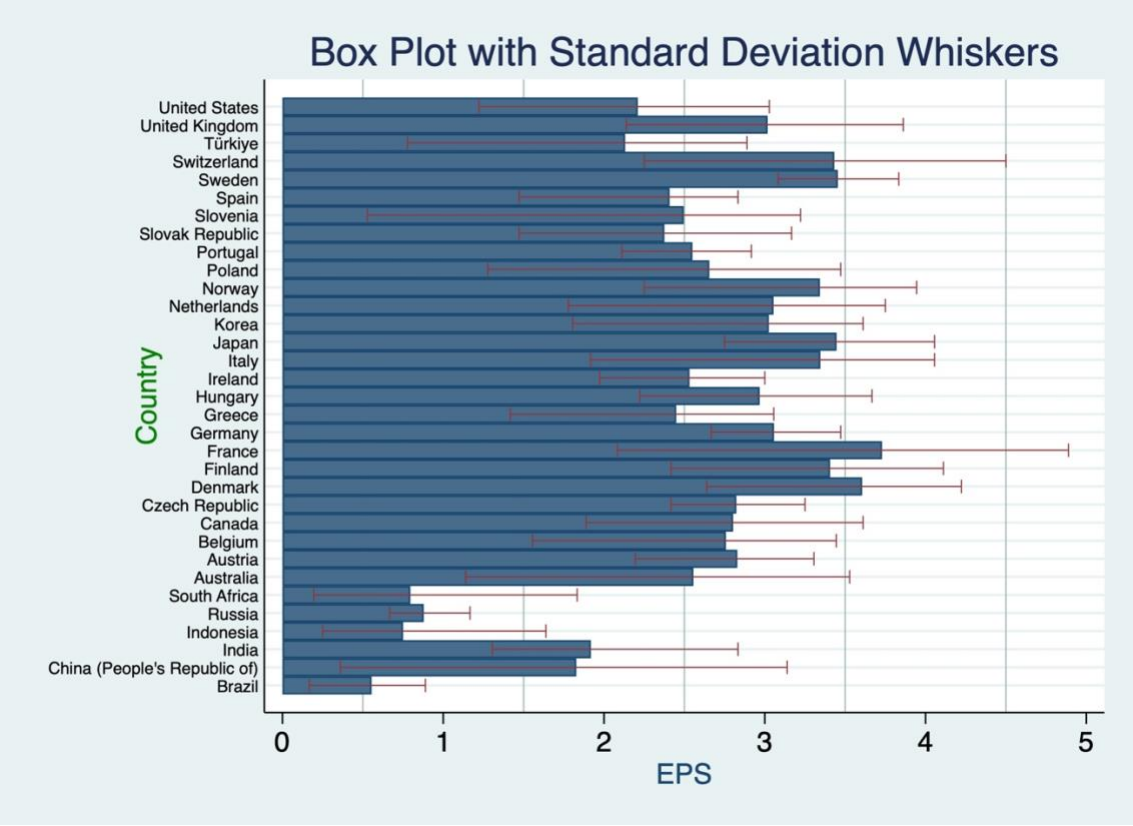


Figure 11: OECD countries EPS standard deviation Whiskers per country from 2007 till 2020.

4.3Econometric Model

4.3.1 Background:

In this section we are trying to estimate the relationship between Environmental Policy Stringency Index and US Outward Foreign Direct Investment (FDI). The goal is to know whether changes in environmental policy strictness for the destination country affect US outward FDI to that country.

The paper (Wagner &Timmins, 2009) was used as a source to help in the definition of the econometric model for this study. (Wagner &Timmins, 2009) tested the Pollution heaven

hypothesis using panel data on outward foreign direct investment (FDI) considering different Germany manufacturing sectors.

(Wagner &Timmins, 2009) shows that the unobserved effects associated with Foreign Direct Investment (FDI) agglomeration can mask the pollution haven effect. To address this, they have used two stages regression starting implement the Generalized Method of Moments (GMM) estimator on the FDI inward stocks as a lagged dependent variable (proxy for the agglomeration). For the independent variables they used TAX because the government may apply set of taxes to attract the FDI. Exchange rate as its likely to respond to the large FDI changes. GDP and TARIFF as those variables may respond to past inflows of FDI and may affect trade policy.

In the second stage they compute the time-constant component using liner regression in Stringency, average FDI stock, Literacy, Ln(Roads), Ln(Area), Ln(Distance) for each industry i and country j. this stage helped them to control the time-constant unobserved heterogeneity in the cross-section panel.

4.3.2 Methodology:

As stated in the previous section, this research utilizes the same core econometrics concepts of the work of (Wagner &Timmins, 2009) with some modifications in the process. There are mainly two major differences between this study and (Wagner &Timmins, 2009).

The first one, for the Environment policy enforcement, they have used a variable taken from the Executive Opinion Survey (World Eco- nomic Forum 2003) which measures the "overall stringency of environmental regulations and enforcement" on a scale from 1 to 7.
But in this study, the analysis is built on OECD Environmental Policy Stringency Index (EPS) which is an index that measures the degree of policy stringency per country and based on the degree to which environmental policies put an explicit or implicit price on polluting or environmentally harmful behavior (Gozluk, Garsous, 2016). The index degree stands on 14 environmental policy instruments, primarily related to climate and air pollution. The index has values from 0 (less stringent) to 6 (highest level of stringency), and it covers 28 OECD and 6 BRIICS countries for the period 1990-2015.
The second major difference between this analysis and (Wagner &Timmins, 2009) is that they used two stages to study the correlation between the FDI and the environment stringency as mentioned above. Wagner &Timmins, 2009 second stage primely employs all the time invariant variables to examine the correlation on an industry-specific basis which is not the case in this analysis since this study is not considering the correlation per industry.

The databased understudy was constructed in a panel model, which is a form of cross sectional data showing the Outward FDI from US to Country i in year t and show also the respective EPS index in year t. The data for the 32 OECD countries was gathered over the period 2007 to 2020 (13 years), so the study could have a maximum of 442 observations (i=32, t=13 → i*t = 442). The dataset is made of rows identified by the Country-ID which is the panel identifier build by combining the country name with the year whereas the regressors are organized in columns.

Our proposition is that the intensity of environmental policies, as captured by a higher EPS index in the host country, may influence FDI. A stringent environmental policy could be viewed as a barrier to FDI, as increased operational costs and regulatory compliance might discourage investors.

In this model, the relationship between the Environment policy stringency and US Outward FDI will be tested using the First difference estimator approach to understand the relationship considering the time series. The first difference estimator is also used to address the issue of the omitted variables bias for unobserved variables that are affecting the FDI and correlated with EPS index but not included in the model.

As a second approach, the GMM model proposed by Arellano and Bond (1991) is used to explore the dynamic specifications of the model, which may help to understand the year-to-year change according to the country policy strictness.

First difference Model:

Starting from the static investment equation.

$FDI_{i,t} = \beta 0 + \beta 1\ (EPS\text{-}index_{i,t}) + \beta 2 X_{i,t} + ui + eit$ (Eq1)

Where:

$FDI_{i,t}$: The dependent variable which is the US outbound FDI to OECD country i in year t

B0 is the intercept term.

β1, β2, β3 are the coefficients to be estimated.

EPS-indexit: The independent variable, is the EPS index of the OECD country i in year t,

Xi,t: Control Variables that influence FDI (Corporate income tax, and Tariff) for country i in year t

ui is a fixed effect that captures the unobserved factors,

eit is the error term, capturing unexplained variation in the dependent variable not captured by the other predictors.

The estimation of this equation required addressing the following points:

- **Omitted variable bias**: An omitted variable bias may occur if there are relevant variables that affect US outbound FDI and correlated with EPS index but are not included in ui. In this study both Corporate Tax and Tariff are endogenous.For the corporate tax because its one of the ways that the government is using to attract the FDI while correlation between Tariff and FDI is represented by the past FDI flows.
- **Non strict exogeneity**: if the error in current period is correlated with the EPS index in current or past periods, this will violat the assumption of strict exogeneity.

Taking the first difference estimator of (Eq1)

$\Delta FDIi,t = \beta 1\ \Delta$ (EPS-indexi,t) + $\beta 2\ \Delta Xi,t + \Delta eit$ (Eq2)

Where:

ΔFDIi, t: The dependent variable represents the change in US outward FDI to country i from one time period to the next. Measuring the change in FDI will capture the shift of the capital investment from one period to the next period.

β1, β2 is the coefficient to be estimated.

ΔEPS-indexit: The independent variable, represents the change in the EPS index of the OECD country i in year t,

ΔXi,t: Represent the change in the control variables that has an influence on the FDI flows.

eit is the error term, capturing unexplained variation in the dependent variable not captured by the other predictors.

The first difference estimator can help in eliminate all the time invariant component and addressing the omitted variable bias and the violation of the strict exogeneity assumption.

Dynamic Panel Model using Generalized Method of Moments (GMM) estimator:

To accommodate dynamic effects, we incorporate the lagged dependent variable, FDIi,t-1. This creates a dynamic panel data model, which better captures the temporal effects of previous investments on current FDI flows:

$\Delta FDIi, t = \beta 0\ \Delta FDIi,t-1 + \beta 1\ \Delta$ EPS-indexi,t + $\beta 2\ \Delta Xi,t + \Delta eit$

Where:

ΔFDIi,t: Represents the change in US outward FDI to country i from one time period to the next.

ΔEPS Indexi, t-1: Represent the change in the OECD Environmental Policy Stringency Index (EPS) in country i from the previous time period.

B0, β1 is the coefficients to be estimated.

ΔXi,t: Represent the change in the control variables that has an influence on the FDI flows.

Δeit: Representing unobservable factors that affect the change in FDI for country i at time t

The GMM estimator solve the correlation problem between the error term and the lagged dependent variable,

Cov(FDIi,t−1, ei,t) < 0. And also solving the potential endogenous between ΔFDIi, t-1 (the lagged dependent variable) and ΔEPS-indexi, t and the error term.

Assuming that the error term in one period is correlated with the error term in the next period. This would make ΔFDIi,t-1 correlated with the error term, Δeit. Also in the ΔEPS-indexi, t if there are omitted variables that affect both the environmental policy stringency index and the outward FDI this would lead to a correlation between ΔEPS-indexi,t and Δeit.

Variables description:

To build the econometric model for the relationship between the FDI and Environment policy Stringency its crucial to correctly define the variable on the dataset that used for the analysis.

1. Capital investment (cap_invest): This represents the US outward FDI that invested on some destinations. The Capital investment help us to understand the outflows of money toward a certain country. Using this variable will help us to understand the pattern of the FDI towards the destination's countries.
2. ΔFDIi,t (d_cap_invest): This represents the change in US outward FDI to country i from one time period to the next. Measuring the change in FDI will capture the shift of the capital investment from one period to the next period.
3. ΔFDI_i,t-1 (ld_cap_invest): This represent the lagged variable of change in outward FDI. showing the change in US outward FDI to country i from the previous time period. This variable will help us to capture the dynamic effect of the Outward FDI flows.
4. EPS Indexi,t (eps_index): This is the OECD Environmental Policy Stringency Index (EPS) used to measure the Environmental Policy Stringency to each country by evaluating degree

to which environmental policies place a cost, whether stated directly or indirectly, on activities that contribute to pollution or environmental harm. the index ranges from 0 to 6 The higher the score the stricter the environment policy of this countries. The index covers 34 countries from 2007 to 2020 (Botta, Kozluk, 2014).

5. ΔEPS Indexi, t-1 (d_eps_index): this is the change in the OECD Environmental Policy Stringency Index (EPS) in country I from the previous time period. This variable will help us to capture the dynamic effect of EPS index.
6. Corporate Tax Rate (corporate tax): The corporate tax rate in the host country can influence the attractiveness of FDI, as it may affect the after-tax return on investment. You can use data on statutory corporate tax rates from the OECD Tax Database.
7. Tariff (Tariff): unweighted average of effectively applied rates for all products subject to tariffs calculated for all traded goods. Data has been classified according to the Harmonized System of trade at the six- or eight-digit level. Data compiled from various sources by the World Bank.

Table 4: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
cap invest	442	2836.91	4052.601	1	25723
eps index	442	2.772	.953	.17	4.89
Tariff	434	3.924	2.793	1.71	14.81
corporate tax	442	24.206	7.198	8.5	48.32
d cap invest	406	-90.84	2373.268	-10652	13018
ld cap invest	371	6.879	2384.378	-10652	13018
d eps index	406	.066	.223	-.84	1
d tariff	392	-.094	.732	-5.76	5.07
d corporate tax	406	-.343	1.685	-15.38	10

4.3.3 Results:

The objective of this study is to understand the relationship between the Environmental Policy Stringency using OECD (EPS) Index and U.S. Outward Foreign Direct Investment (FDI). We have employed a panel data analysis and conducted first difference estimators and GMM estimators. The results of this analysis are explained in the following section.

First difference estimator Results:

Using the capital investment (d_cap_invest) which is the US outward FDI as the dependent variable. The primary independent variables are the first differences in the Environmental Policy Stringency (EPS) index (d_eps_index). The tariff (d_tariff), and corporate tax (d_corporate_tax) were used as control variables. Also, to account for common time trends, we have incorporated year dummies.

The regression results as shown in Table5. The coefficient for d_eps_index is -788.576, suggesting that a unit increase in the first difference of the EPS index negatively correlates with the capital investment by about 788.576 units. But as shown the p-value of 0.130 is more than the threshold of 0.05 as an indicator to fail rejecting the null hypothesis at the 5% significance level. meaning that the results is statistical not significant at the conventional level of 5%. This indicate that within our dataset changes in the EPS index may not have a considerable impact on the changes in U.S. outward FDI.

The d_tariff variable coefficient results of 387.3176. This indicates the positive relation with the capital investment with an approximate one unit increase in tariff coincides 387.318 unit increase in capital investment, given all other variables remains constant. This result is statistically

significant at the 5% level (p-value of 0.013). but giving our assumption of increasing the tariff rate should decrease the amount of FDI since the investment cost will be increased. Therefore, this result may not be precisely estimated duo to some missing data within the dataset.

The d_corporate_tax coefficient is 3.425, indicating a positive relationship with capital investment. however, its also not statistical significance (p-value of 0.957), indicating that changes in the corporate tax rate might not significantly influence changes in U.S. FDI.

Table 5: First difference regression

d_cap_invest	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
d_eps_index	-788.576	519.544	-1.52	.13	-1810.152	233	
d_tariff	387.318	155.77	2.49	.013	81.028	693.607	**
d_corporate_tax	3.425	63.934	0.05	.957	-122.287	129.137	
2008b	0	.	.	.	.	.	
2009	-3932.904	540.977	-7.27	0	-4996.624	-2869.185	***
2010	-2296.518	537.895	-4.27	0	-3354.178	-1238.858	***
2011	-1826.676	542.918	-3.36	.001	-2894.213	-759.139	***
2012	-3419.707	569.887	-6.00	0	-4540.271	-2299.143	***
2013	-1845.364	560.036	-3.30	.001	-2946.559	-744.169	***
2014	-2646.542	571.194	-4.63	0	-3769.677	-1523.408	***
2015	-2351.024	560.259	-4.20	0	-3452.658	-1249.39	***
2016	-2502.373	552.424	-4.53	0	-3588.6	-1416.146	***
2017	-2152.056	547.647	-3.93	0	-3228.891	-1075.22	***
2018	-1732.382	544.931	-3.18	.002	-2803.875	-660.889	***
2019	-2799.646	548.608	-5.10	0	-3878.37	-1720.921	***
2020	-3175.378	548.372	-5.79	0	-4253.638	-2097.119	***
Constant	2348.555	399.098	5.88	0	1563.811	3133.298	***

Mean dependent var	-90.615	SD dependent var	2296.237
R-squared	0.181	Number of obs	392

F-test	5.553	Prob > F	0.000
Akaike crit. (AIC)	7132.403	Bayesian crit. (BIC)	7195.943

*** p<.01, ** p<.05, * p<.1

GMM estimator Results:

The lagged FDI variable (d_cap_invest (L1.) and d_cap_invest (L2.)) shows significant negative impacts on the current change in capital investment. This result shows that the FDI will keep returning to its trend every time if its significantly increased or decreased in the previous year. However, we need to do further research to confirm this hypothesis.

The Environmental Policy Stringency (EPS) Index variable (d_eps_index) as shown in Table 6 present a negative coefficient, confirming that stricter environmental policies could negatively affect the foreign investment, possibly due to the increased costs of compliance consequent with the stricter regulations. However, the p-value is 0.515, which exceeds the threshold of 0.05, thereby leading to a failure to reject the null hypothesis at the 5% confidence level. This implies that the result is not statistically significant, which indicate that the Environment policy stringency doesn't has a clear impact on U.S. outward FDI. This suggting that other factors could be more influencing in the decision of FDI.

The coefficient of the control variable (d_tariff) shows that the Tariff is positively correlated with the capital investment, but statistically insignificant since the p-value is 0.112 exceeding the threshold of 0.05. This suggests that the increase in tariffs might lead to an increase in U.S. outward FDI, although our initial estimations that higher tariffs could act as a barriers to the FDI increase. This could be due to the accuracy or incomplete of the dataset related to tariffs.

Finally, the change in the corporate tax rate (d_corporate_tax) shows statistically insignificant positive relationship with capital investment. Which indicate that corporate tax rate changes in the destination country doesn't not has strong influence on the U.S. FDI decisions, and maybe other factors such as market size, political stability, and infrastructure might be more critical in the decision process of the FDI.

Table 6: Regression results

d_cap_invest	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
L	-.608	.055	-11.12	0	-.715	-.501	***
L2	-.384	.049	-7.88	0	-.479	-.288	***
d_eps_index	-336.472	517.068	-0.65	.515	-1349.906	676.962	
d_tariff	219.838	138.196	1.59	.112	-51.022	490.697	
d_corporate_tax	2.039	68.072	0.03	.976	-131.38	135.459	
Constant	-204.431	100.975	-2.02	.043	-402.339	-6.523	**

Mean dependent var	-146.353	SD dependent var	1993.630
Number of obs	287	Chi-square	137.403

**** p<.01, ** p<.05, * p<.1*

4.3.4 Conclusion:

This study aimed to examine the relationship between the Environmental Policy Stringency and the U.S. outward Foreign Direct Investment (FDI). The literature analyzed the same view and exhibit the different views of the pollution heaven hypothesis. Ulrich J. Wagner; Christopher D. Timmins, 2009 on their study showed a significant evidence of the Pollution heaven effect, that the strong environment policy deter the FDI in the chemical industry. This study utilized Wagner

& Timmins, 2009 econometrics model using a better indicator for the environment policy stringency which is the OECD EPS index. And utilize recent updated data that could provide better insight.

The economic model presented in this study partially aligned with the model described by Wagner & Timmins (2009). One of the key difference, and potential reasons for any discrepancies in results, the fact that this study does not segregate FDI by industry. Notably, Wagner & Timmins (2009) established a confirmed negative relationship between FDI in the chemical industry and environmental policy stringency. In our study, we observe a negative relationship, which may be suggestive of the pollution haven hypothesis. However, this relationship does not demonstrate statistical significance when FDI is analyzed overall, without considering the variation of industry-specific impacts. This underlines the importance of industry categorization in understanding the relationship between FDI and environmental policy stringency. In this study the first-difference model and GMM model were employed to study this relationship.

The findings from the first difference model shows that the change in the EPS index was found to have no statistically significant impact on changes in the US outward Foreign direct investment. the analysis suggested that also the corporate tax rates doesn't have statistically significant on the FDI change. However, the tariff rates show significant positive impact on the change in US FDI. and consequently, the first different estimator shows a lack of strong evidence supporting the pollution heaven hypothesis.

In the GMM model, in the FDI lagged values were found to have a statistically significant impact on the change of FDI. A possible interpretation of these results is that the FDI business decision is

influenced more by past trends and tariffs more than the environment policy stringency. However, the changes in the EPS index, tariff rates, and corporate tax rates were found to have no statistically significant influence on changes in US FDI similar to the first difference estimator model.
and consequently, both models show a lack of strong evidence supporting the pollution heaven hypothesis.

Recommendations for Further Research:

For the further research, segregating the FDI per industry could be a potential improvement for the results in order to identify the impact of the resource-based industries. Moreover, studying the source country FDI per industry may help to explain the relationship between the environment policy stringency and the FDI.

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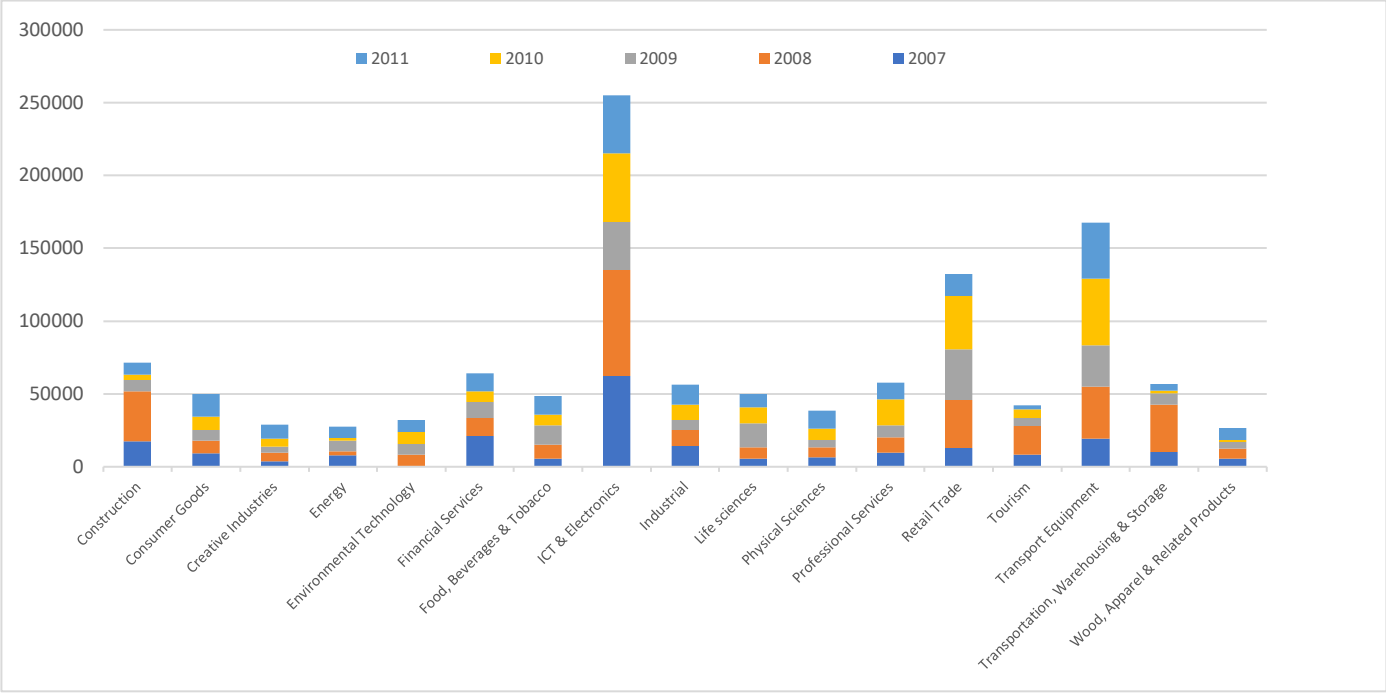
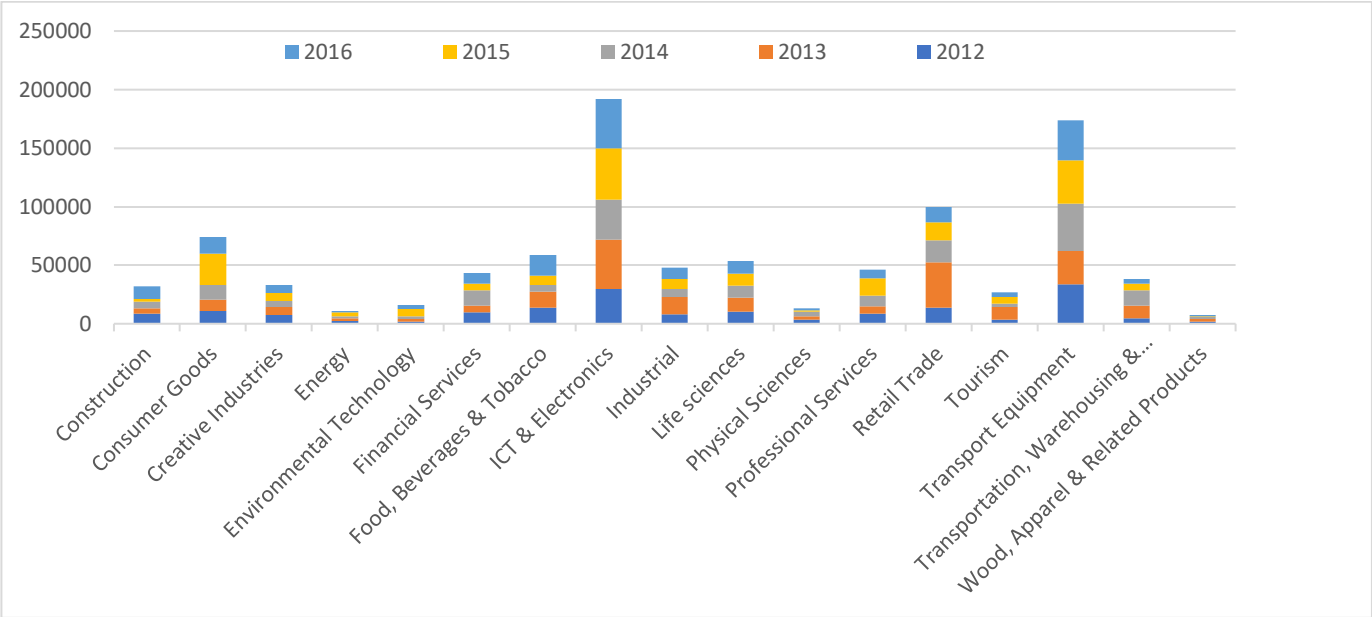
Appendix

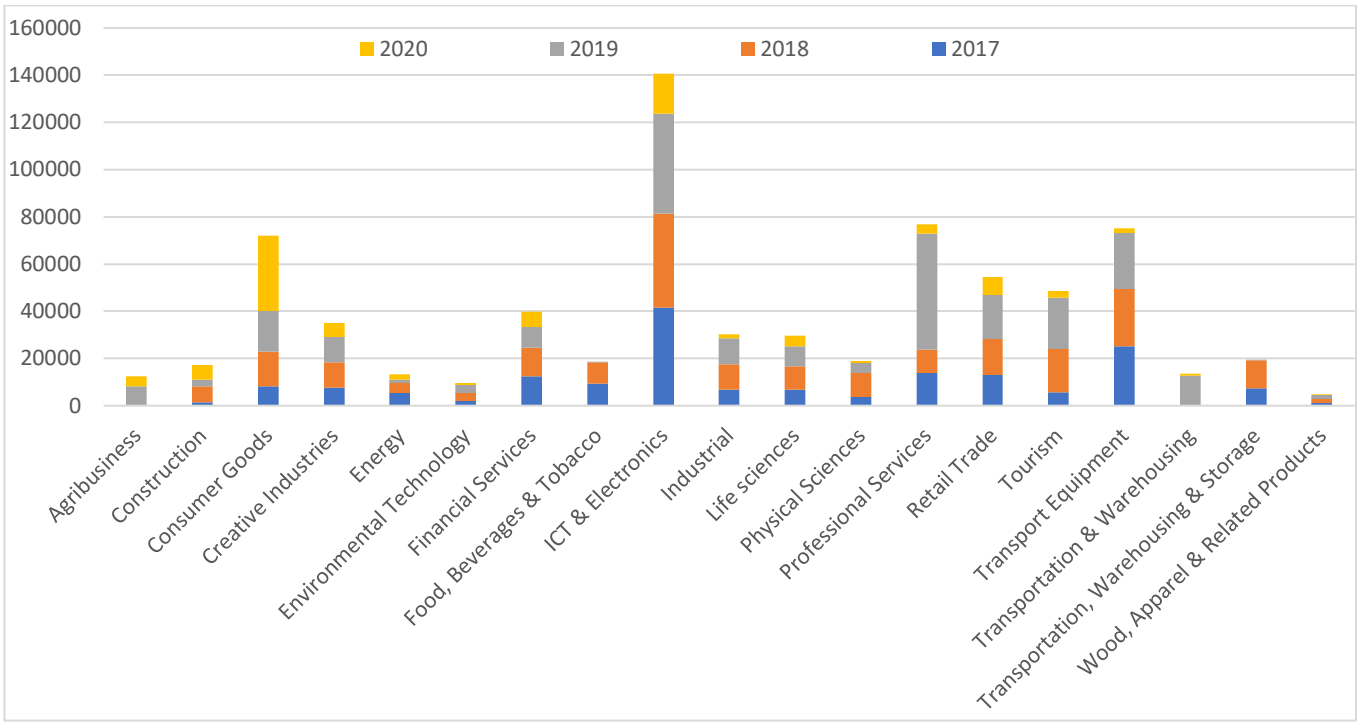
Outbound FDI by Sector between 2007 till 2020:



Outbound FDI by sector from 2007 till 2011

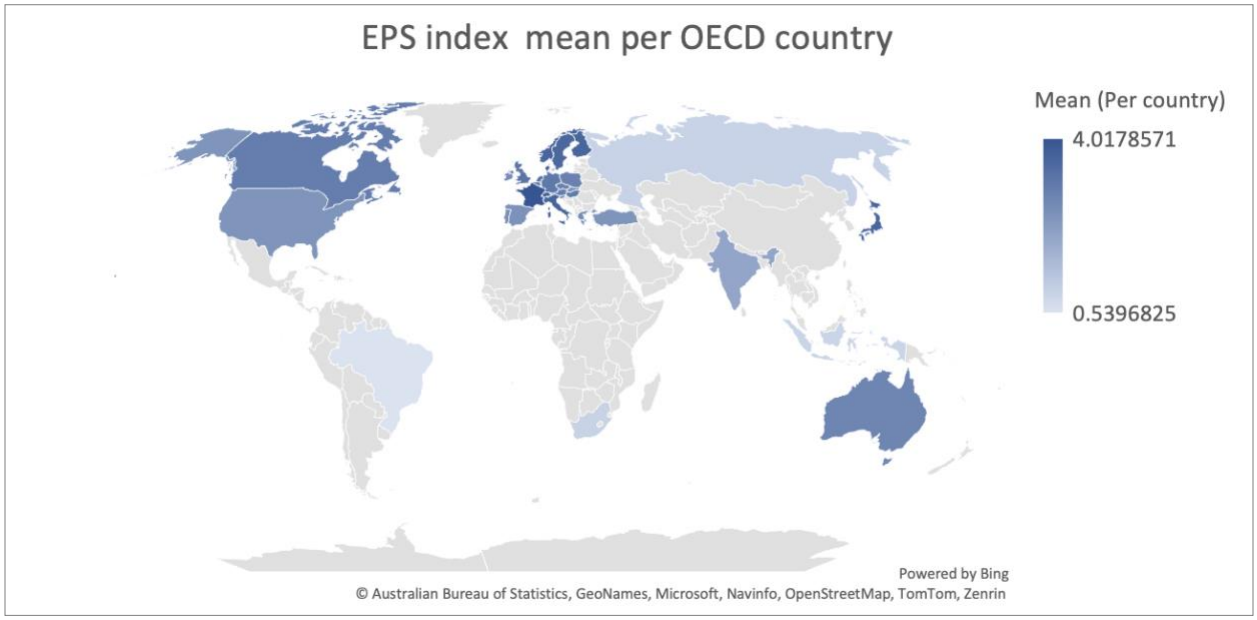


Outbound FDI by sector from 2012 till 2016



Outbound FDI by sector from 2017 till 2020

OECD EPS index



Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Mean (Per co	Standard Dev	Minimum (P	Maximum (P
Australia	1.1388888	1.4722222	1.8055556	2.2222223	2.2222223	2.3611112	2.5277777	2.8333333	3.0000000	3.4166667	3.5277777	2.6944444	2.6944444	2.6944444	2.7500000	2.8611112	2.8611112	2.9166667	2.8115079	0.3515632	2.2222223	3.5277777
Austria	2.1944444	2.1944444	2.3055556	2.5277777	2.2500000	2.6666667	2.9444444	3.0833333	3.0555556	2.9444444	3.2777777	3.1111112	2.9444444	2.9444444	2.9444444	3.0833333	3.1388888	3.3055556	2.9781746	0.26333805	2.2500000	3.3055556
Belgium	1.5555556	2.4722223	2.5833333	2.6388888	2.3055556	2.6388888	2.6666667	2.5555556	2.9444444	3.0555556	2.9444444	2.9444444	2.8333333	2.8888888	2.9444444	3.0000000	3.2222223	3.4444444	2.8849206	0.28261958	2.3055556	3.4444444
Canada	1.8888888	1.8888888	2.0555556	2.4722223	2.8611112	2.9444444	3.1944444	3.6111112	3.6111112	3.4444444	3.4444444	3.1944444	2.5277777	2.3611112	2.5833333	2.6944444	2.6388888	3.0277777	3.0099206	0.41767787	2.3611112	3.6111112
Czech Repub	2.4166667	2.4166667	2.4166667	2.7222223	2.6388888	3.0833333	3.1944444	3.1111112	3.1111112	3.2500000	3.0000000	2.5000000	2.5555556	2.7222223	2.7222223	2.8888888	3.1111112	2.9444444	2.9166667	0.24725464	2.5000000	3.2500000
Denmark	2.6388888	2.8055556	3.0277777	3.1388888	3.1388888	3.1944444	3.4166667	4.0833335	4.2222223	3.8888888	4.0555553	4.1111112	4.0277777	3.9444444	4.0277777	3.7777777	3.6666667	3.7222223	3.8055555	0.34281391	3.1388888	4.2222223
Finland	2.4166667	2.6388888	2.7500000	2.9722223	2.9722223	3.1944444	3.1666667	3.1111112	3.7500000	3.6388888	3.6388888	3.6944444	3.8611112	3.8333333	3.8333333	3.9166667	3.8055556	4.1111112	3.6091270	0.3507664	2.9722223	4.1111112
France	2.0833333	2.8333333	2.8611112	3.0833333	3.2500000	3.4166667	3.6944444	3.6111112	3.9444444	3.9166667	3.9166667	4.2222223	4.0277777	3.9166667	4.1666665	4.5555553	4.7222223	4.8888888	4.0178571	0.46946238	3.2500000	4.8888888
Germany	2.6666667	2.7777777	2.8888888	2.9444444	2.7777777	3.0277777	3.1388888	3.0833333	3.1666667	3.0555556	3.2222223	3.1111112	3.0277777	3.0833333	3.0277777	3.2500000	3.3055556	3.4722223	3.1250000	0.16114431	2.7777777	3.4722223
Greece	1.4722222	1.4166666	1.7777778	1.8888888	1.9722222	2.2500000	2.4444444	2.6111112	2.7500000	2.6388888	2.5833333	2.8888888	3.0555556	2.8888888	2.8611112	2.8611112	2.8333333	2.8888888	2.6805555	0.29392189	1.9722222	3.0555556
Hungary	2.3611112	2.2222223	2.8333333	2.9722223	2.7777777	3.0555556	3.6388888	3.5277777	3.6666667	3.5555556	2.8888888	2.8888888	2.9722223	2.6944444	3.1111112	2.6944444	2.7500000	2.8055556	3.0734127	0.36602624	2.6944444	3.6666667
Ireland	1.9722222	2.0277777	2.0833333	2.4444444	2.3611112	2.6388888	2.6666667	2.6666667	2.5833333	2.5833333	2.8055556	2.8611112	2.8611112	2.5000000	2.4444444	2.5000000	2.5555556	3.0000000	2.6448413	0.18073745	2.3611112	3.0000000
Italy	1.9166666	1.9722222	2.2222223	3.1388888	2.9722223	3.0833333	3.2777777	3.4722223	3.5000000	3.5833333	3.6666667	4.0000000	4.0555553	4.0555553	4.0555553	3.7777777	3.7500000	3.7222223	3.6408730	0.35346337	2.9722223	4.0555553
Japan	2.7500000	3.0277777	3.0277777	2.9722223	3.0555556	3.0000000	3.1111112	3.2222221	3.4166667	4.0555553	3.8333333	3.8333333	3.7222221	3.9444444	3.8888888	3.6111112	3.7777777	3.7777777	3.5892857	0.35808698	3.0000000	4.0555553
Korea	1.8055556	2.2222223	3.1388888	3.3055556	3.3055556	3.1388888	3.3055556	3.3888888	3.6111112	3.0000000	3.0000000	2.8333333	2.9444444	3.0000000	3.0000000	3.1111112	3.1666667	3.1666667	3.1408730	0.20599524	2.8333333	3.6111112
Netherlands	1.7777778	1.8055556	2.7500000	2.7777777	2.7777777	3.2222223	3.5555556	3.7500000	3.1666667	3.1388888	3.0555556	3.1111112	3.1944444	3.3333333	3.1111112	3.5000000	3.4722223	3.4722223	3.2757937	0.25188377	2.7777777	3.7500000
Norway	2.2500000	2.2500000	2.4722223	2.4722223	2.8055556	2.9722223	3.6666667	3.6666667	3.7222223	3.6666667	3.6666667	3.7222223	3.7222223	3.7222223	3.7222223	3.8333333	3.8888888	3.9444444	3.6230159	0.3242557	2.8055556	3.9444444
Poland	1.2777778	1.3333334	2.0833333	2.3611112	2.2500000	2.5833333	2.7777777	2.9444444	3.0000000	2.7222223	2.8888888	2.9444444	2.9444444	2.8333333	2.8888888	3.0555556	3.4166667	3.4722223	2.9087301	0.30476367	2.2500000	3.4722223
Portugal	2.2777777	2.2777777	2.6666667	2.6944444	2.3611112	2.6944444	2.7500000	2.7500000	2.9166667	2.8055556	2.8055556	2.1111112	2.1666667	2.3888888	2.3888888	2.3888888	2.6666667	2.7777777	2.5694444	0.26006564	2.1111112	2.9166667
Slovak Repub	1.4722222	1.4722222	2.0833333	2.1388888	1.8055556	1.8055556	2.4166667	2.3055556	2.6944444	2.5833333	3.1666667	3.0000000	2.8333333	3.0555556	2.4166667	2.5555556	2.4444444	2.5000000	2.5416667	0.40733859	1.8055556	3.1666667
Slovenia	0.5277778	0.5277778	0.0277777	2.0833333	2.0833333	2.2500000	2.9166667	2.8611112	2.8611112	2.7500000	2.9166667	2.8888888	2.8888888	2.9444444	3.0000000	3.0000000	3.1666667	3.2222223	2.8392857	0.31145788	2.0833333	3.2222223
Spain	1.4722222	2.2222223	2.3611112	2.3888888	2.4722223	2.5555556	2.6666667	2.6111112	2.8333333	2.8055556	2.2222223	2.3888888	2.3888888	2.2777777	2.2777777	2.4444444	2.4444444	2.5000000	2.4920635	0.18695232	2.2222223	2.8333333
Sweden	3.0833333	3.1388888	3.0833333	3.2500000	3.0833333	3.4166667	3.6111112	3.6111112	3.5000000	3.3888888	3.4444444	3.5555556	3.6111112	3.6666667	3.6111112	3.6666667	3.6111112	3.8333333	3.5436508	0.17558556	3.0833333	3.8333333
Switzerland	2.2500000	2.2500000	2.2777777	2.2777777	2.5277777	3.1666667	3.3611112	3.3333333	3.5555556	3.6388888	3.6388888	4.0555553	4.0277777	4.1388888	4.1388888	4.4166665	4.2222223	4.5000000	3.7658730	0.54918506	2.5277777	4.5000000
Türkiye	0.8333333	0.8333333	0.7777778	1.6111112	1.6111112	1.6388888	1.6944444	2.5555556	2.7777777	2.3888888	2.5277777	2.5277777	2.6111112	2.6944444	2.7777777	2.7222223	2.8888888	2.8888888	2.4503968	0.45736799	1.6111112	2.8888888
United Kingd	2.1388888	2.1388888	2.3055556	2.4166667	2.2500000	2.4722223	2.6666667	3.3611112	3.3333333	2.8888888	3.2222223	3.7500000	3.8611112	3.3611112	3.4722223	3.5277777	3.5277777	3.6111112	3.2361111	0.48539325	2.2500000	3.8611112
United State	1.2222222	1.2222222	1.2222222	1.6666666	1.6666666	1.8888888	2.3333333	2.0277777	2.0277777	2.3611112	2.4444444	2.4166667	2.4722221	2.9722221	2.9722221	2.9166667	2.9166667	3.0277777	2.4603174	0.44905651	1.6666666	3.0277777
Brazil	0.7500000	0.5555556	0.5555556	0.5555556	0.2222222	0.2222222	0.2222222	0.2222222	0.1666667	0.2500000	0.5833333	0.5833333	0.6388889	0.8888889	0.8888889	0.8888889	0.8888889	0.8888889	0.5396825	0.31003215	0.1666667	0.8888889
China	0.3611111	0.6944444	0.6944444	0.6944444	0.6944444	0.8055556	0.9722222	1.3055556	1.4722222	2.4722223	2.5277777	2.7500000	2.8888888	2.7777777	2.8333333	2.8611112	2.9444444	3.1388888	2.1746032	0.90322496	0.6944444	3.1388888
India	1.3055556	1.3055556	1.5555556	1.5555556	1.5000000	1.5000000	1.5833334	1.6944444	1.7777778	1.8611112	1.7777778	1.8611112	1.9722222	2.5277777	2.5277777	2.6944444	2.6944444	2.8333333	2.0575397	0.4863356	1.5000000	2.8333333
Indonesia	0.2500000	0.2500000	0.2500000	0.3333333	0.3333333	0.3333333	0.3333333	0.6666667	0.8333333	0.8333333	0.7500000	0.7500000	0.7500000	1.0833334	1.2500000	1.3055556	1.5555556	1.6388888	0.8869048	0.42859898	0.3333333	1.6388888
Russia	0.7222222	0.6666667	0.6666667	0.6666667	0.6666667	0.6666667	0.6666667	0.6666667	0.6666667	0.6666667	1.0833334	1.0833334	1.0833334	1.1666666	1.1666666	1.1666666	1.1666666	1.1666666	0.9345238	0.2427992	0.6666667	1.1666666
South Africa	0.2500000	0.2500000	0.1944445	0.4444445	0.4444445	0.3888889	1.1111112	1.8333334	1.5277778	0.8611111	0.8611111	0.8611111	0.8611111	0.8611111	0.8611111	0.9166667	0.8611111	0.9166667	0.9404762	0.36865191	0.3888889	1.8333334
Mean (Per y	1.6818182	1.8055555	2.0547138	2.2373737	2.1944445	2.3720539	2.5968014	2.7314815	2.8232323	2.7912458	2.8299663	2.8257576	2.8190235	2.8535353	2.8686868	2.9225589	2.9722222	3.0765993				
Standard Dev	0.77089873	0.82857436	0.86168452	0.8603853	0.87676189	0.9494338	0.98118687	0.94858841	0.97367993	0.95473157	0.91119889	0.95453334	0.93886528	0.87586136	0.87569616	0.88384956	0.87544082	0.90459301				
Minimum (P	0.2500000	0.2500000	0.1944445	0.3333333	0.2222222	0.2222222	0.2222222	0.2222222	0.1666667	0.2500000	0.5833333	0.5833333	0.6388889	0.8611111	0.8611111	0.8888889	0.8611111	0.8888889				
Maximum (P	3.0833333	3.1388888	3.1388888	3.3055556	3.3055556	3.4166667	3.6944444	4.0833335	4.2222223	4.0555553	4.0555553	4.2222223	4.0555553	4.1388888	4.1666665	4.5555553	4.7222223	4.8888888				

OECD EPS index per year