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Environment And Direct Foreign Investment: Empirical Insight From Green Economy

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ABSTRACT

In the evolving landscape of global finance, the pursuit of economic growth increasingly collides with ecological sustainability. This investigation examines how environmental factors, specifically CO2 emissions, research and development (R&D) expenditure, and renewable energy consumption, influence direct foreign investment inflows under the paradigm of green capitalism. As environmental regulation, innovation, and sustainability energy transactions become central to investment decision-making, understanding their role in shaping global capital flows is both timely and critical. Using a panel data research design, this investigation analyzes secondary data from cross-national resources like the World Bank. Employing descriptive analysis, OLS, and panel regression with fixed effects, the analysis examines how environmental factors indicators correlate with FDI patterns over time. Findings reveal that FDI inflows are substantially associated with rising CO2 emissions, supporting the Pollution Haven Hypothesis in less regulated or politically constrained economies. Conversely, R&D expenditures substantially reduce emissions, emphasizing innovation's moderating role in the FDI environment nexus. Renewable energy consumption, while theoretically efficient, showed a statistically weak association with environmental performance, possibly due to scale or implementation lags. These results underscore the contradictory role of FDI in sustainable development: while it fuels economic modernization, it may exacerbate environmental degradation without targeted green policies. The investigation urges policymakers to embed environmental safeguards within investment frameworks and recommends future research to integrate disaggregated FDI types, governance indicators, and qualitative policy to analyses to align capital better flows with ecological objectives.

INTRODUCTION

"Money talks," thus far it scarcely discusses the environment. The ecological acquisition cost has long been debated in finance boardrooms amid the rush for wealth creation and business expansion. Nevertheless, the urgency of the worldwide climate issues and the widespread authority of financial markets are currently making capital allocation a central topic in discussions about ecological responsibility, particularly using methods like Venture Capital (VC) and FDI. Investment have been praised for fostering innovation and growth, but its effects on the environment are much more diverse and less understood. A crucial question arises as the world economy moves toward resilience and decarbonization: can capital also spur climate-conscious change, or does it only perpetuate extractive practices beneath a green mask? In an effort to answer that question, this analysis appears at how Independent Venture Capital (IVC) and Corporate Venture Capital (CVC) are distinct in their effects on financial and environmental performance. It additionally shows how foreign direct investment (FDI) influences and reacts to environmental regulations, particularly when political institutions are included. Empirical research is scarce on the influences of IVC versus CVC's governance structures and tactical objectives on the environmental, social, and governance (ESG) behavior of financed enterprises, irrespective of VC's role in speeding corporate growth (Shuwaikh et al., 2025). In a similar vein, although foreign direct investment (FDI) is often linked to modernization and expansion, its connection to environmental deterioration or regulation is still up for debate, particularly in situations where institutions are weak or political hurdles are present (Van et al., 2024; Pavlovic et al., 2021).

In accordance with recent research, IVC-backed companies tend to do better on ESG indicators and produce fewer greenhouse gases (GHGs) than CVC-backed companies, reflecting a stronger alignment with long-term sustainability regulations (Shuwaikh et al., 2025). IVCs frequently give prominences to high-risk, high-innovation initiatives that are more optimal for sustainable technologies and regulatory requirements because they are not vulnerable to corporate strategic control. CVCs, on the other hand, might show cautious investment patterns that put short-term synergies ahead of long-term environmental effects due to the operation under parent company interests. Precisely, at the same time, FDI makes a more contradictory claim. Depending on the political constraints in the host nation, foreign direct investment (FDI) inflows may reinforce or undermine environmental regulations (Van et al., 2024). By transferring technology and encouraging competition, foreign direct investment (FDI) tends to

boost regulatory frameworks in politically open countries. Alternatively, it might promote a race to the bottom in less democratic environments when environmental regulations are loosened in order to bring in foreign investment, supporting certain aspects of the Pollution Haven Hypothesis (Pavlovic et al., 2021). Such outcomes necessitate a more thorough examination that takes institutional settings and financial instruments into account.

Thus, through examining two interconnected avenues the relative financial and environmental ends of companies supported by IVC versus CVC and the reciprocal association between FDI and environmental regulation under various political contexts—this paper adds to the library of research on sustainability and finance. The theoretical insights from institutional political economics, financial geography, and green finance are outlined (Newell & Bray, 2025; Lai, 2025). The data structure and technique, including panel data regressions and interaction models, are described. Results on GHG emissions, policy feedback implications, and ESG scores are shown. Implications for investment governance, climate financing strategy, and green industrial policy are covered. This analysis stresses that not all capital has the same climatic implication—its governance, provenance, and institutional context profoundly affect environmental outcomes—by going beyond established measures of profitability. Through this action, it hopes to contribute to more responsible, fair, and efficient financial decision-making as the world moves toward a sustainable economy.

LITERATURE REVIEW

Usually, market size, institutional quality, and economic openness have been the criteria for researching foreign direct investment (FDI). However, environmental parameters have become important parameters in determining foreign direct investment (FDI) in the age of green capitalism, a system that ensures ecological sustainability is integrated into capitalist manufacturing and investment. How much do environmental issues affect the volume and trends of foreign direct investment inflows under the green capitalism paradigm? This is the main research question that drives this review. This appraisal of the literature highlights academic research conducted during the last 10 years (2015–2025), with specific emphasis on rising economies, including those in Asia, Africa, and the Balkans, as well as OECD nations. The political economy of environmental governance, green finance theory, and institutional economics serve as the theoretical foundations.

By merging environmental values into business operations, green capitalism aims to balance ecological restrictions with economic growth (Avila-Calero, 2025). In line with this model,

green innovation, climate policy, and environmental legislation have a greater effect on capital accumulation. These components have become potential financing attractors as well as limitations. Two notable and opposing theoretical hypotheses are the Porter Hypothesis and the Pollution Haven Hypothesis (PHH). The Porter Hypothesis claims that strict but transparent environmental regulations can spur innovation and draw high-quality green FDI, whereas PHH contends that loose environmental regulations draw "dirty" FDI to poor nations (Van et al., 2024).

FDI inflows are considerably influenced by environmental policy, based on a number of studies. In the Balkans, for example, where lax restrictions have drawn pollution-intensive businesses, Pavlović et al. (2021) validated PHH in nations like Serbia and Romania. Similarly, Van et al. (2024) show that political restraints have a major influence on how FDI affects environmental regulation. Strong institutions and democratic accountability in OECD nations provide reciprocal feedback, meaning that foreign direct investment boosts environmental standards rather than diminishing standards rather than lowers them. In contrast, foreign direct investment (FDI) has an opportunity to undermine environmental policies in politically vulnerable states, especially when investors advocate for regulatory easing. This produces a double dynamic: FDI shapes environmental conditions as opposed to merely reacting to them.

Renewable energy influences the adoption, and green innovation on foreign direct investment is additionally addressed in the literature. Nchofoung et al. (2024) indicate that green finance encourages foreign direct investment (FDI) by lowering environmental risk and enhancing industrial efficiency, particularly when coupled with innovation. However, in low-income nations, green technologies can also boost prices, thereby offering international investors conflicting incentives. Due to resource-intensive exports and environmentally exploitative behaviors, Chinese foreign direct investment has been proven to have a costly influence on green growth in Africa (Chen et al., 2024). However, Chinese imports tend to support sustainable development, especially green technologies.

Venture capital moments enable helpful comparisons, albeit being less stressed in FDI literature. According to Shuwaikh et al. (2025), the kind of investor affects the environmental effect since Independent Venture Capital (IVC) produces better ESG performance than Corporate Venture Capital (CVC). This knowledge applies to foreign direct investment (FDI): investments from green sovereign wealth funds or ESG-focused funds may have more ecological effects than others.

Breakdown data on FDI categories (like greenfield vs. brownfield) often becomes unavailable, which is probably problematic for evaluating environmental implications precisely. There is limited theoretical understanding of the association between FDI and environmental regulations, and most research is country-specified, which restricts generalizability. There is a lack of theoretical research on temporal dynamics as well as how FDI changes stricter as environmental regulation. Climate risk disclosure regulation, AI-powered indicators, and the functions of the ESG rating agencies are some of the new areas of attention (Lai et al., 2025). Through this influence, neither uniform nor unidentical, the literature unequivocally confirms that environmental factors have a huge influence on FDI inflows. Tight environmental regulation can merge clean, innovation-driven FDI in the environment with great institutional quality. In contrast, environmental deterioration and regulatory capture continue to be a huge crisis in fragile states. Future research should examine the longitudinal datasets to examine how environmental reforms affect FDI trends over time. Create novel theoretical frameworks that incorporate financial, ecological, and institutional viewpoints. Understand the way foreign investment and green capital venture potentially collaborate. In addition to being academically promising, this path is crucial for politicians who want to balance environmental sustainability and economic growth in the era of the climate catastrophe.

METHODOLOGY

RESEARCH DESIGN

This analysis employs a quantitative panel data research design to examine the link between environmental factors and foreign direct investment inflows across countries over time, utilizing secondary data to explore the link. Further, the panel data approach allows the analysis to observe variation within individual countries over time (temporal dynamics) as well as simultaneously comparing differences between countries (cross-sectional dynamics), which provide control over the unobserved heterogeneity and country-specific effects (Wooldridge, 2013). Such approaches enhance the trustworthiness of ethical inference in macroeconomics and sustainability-focused research (Dzou et al.,2025). The panel data embrace standardized variables originating from reputable secondary resources like the World Bank, covering multiple years and a diverse range of countries. This longitudinal structure serves as essential for witnessing both ongoing patterns and sudden shifts in investment behaviors while considering institutional-specific variations, regulatory shifts, and policy shocks (Cheng et al.,2021).

SAMPLING TECHNIQUES

This analysis employs a purposive sampling technique, focusing on countries with available and consistent panel data for key environmental and economic indicators over a defined period. This non-profitability method ensures the selection of relevant cases that align with the analysis's objectives. The selection of the countries relied on the accessibility of broad and reliable secondary data on FDI and environmental indicators spanning several years. Key variables such as CO2 emissions, renewable energy consumption, and R&D expenditures were only collected in countries with reliable longitudinal data from international sources such as the World Bank (Chen et al.,2025; Dzou et al.,2025). The accessibility of annual observations additionally acted as a guide for data selection, ensuring consistency in periods across countries. This criterion conforms with methodological guidelines in FDI and green economy research, in which balanced panels improve the estimator's accuracy and reduce bias (Tawiah et al.,2024). The significance of limiting the sample to countries with enough time-series data to support fixed-effect modeling and other econometric approaches was also underlined by Chen et al. (2025).

DATA ANALYSIS METHODS

The analysis was directed using STATA software to administer several econometric techniques: Descriptive analysis, Correlational analysis, Fixed effects, and Random effects models. These techniques are used to emphasize the relation across key indicators like FDI inflows, R&D expenditures, and renewable energy resources consumption across time and countries. This research depends solely on publicly available secondary data, guaranteeing that no personal or sensitive information is used. The triangulation of statistical methods (including fixed or random effects correlation matrices) was imposed to enhance reliability. Construct validity is ensured through the usage of well-established, internationally acknowledged indicators. Multicollinearity checks and heteroscedasticity tests verified internal consistency.

DATA PREPARATION

The dataset was meticulously prepared using information from the World Bank Development Indicators (WDI) database prior to starting the statistical analysis. This investigation includes factors related to economic and environmental performance and focuses on a panel of nations over a number of years. For dealing with missing values, mean substitutional was used. Based on the observations that are available, the average value of each variable was determined, and the corresponding average was utilized to fill in any missing value cells. Without lowering the

sample size, this approach helped to keep the consistency and accuracy of the dataset. All continuous factors were standardized so that it was easier to evaluate variable measures on multiple scales and to guarantee that regression coefficients were directly comparable. Excel was the tool to carry out these modifications. For multiple-variate regression models, this standardization was essential.

STATISTICAL ANALYSIS

Initially, descriptive analysis was carried out to examine the main variables' dispersion and central tendencies. Estimation have been performed for matrices like mean, median, standard deviation, minimum, and maximum. These present a summary of the overall patterns in FDI investment, environmental metrics, and R&D investment across nations and assist in identifying outliers. The initial guidance and strength of the relation between independent and dependent variables were evaluated via correlation analysis. To figure out whether or not correlations such as those between R&D spending and emissions are statistically substantial, the Pearson correlation coefficient was calculated, and substantial levels were examined. In order to adjust for both cross-sectional and temporal variation, the investigation employed panel data techniques. The models that were estimated were: The Fixed Effect Model is responsible for each country's time-invariant attributes. It is ideal for separating the effects of factors like R&D or renewable energy in each country. The Random Effect Model creates the assumption that variation between nations is random and unrelated to the predictor. To ascertain whether FE or RE was more appropriate, Hausman tests might have been used.

ANALYSIS

This analysis experimentally investigated the connection between environmental factors and FDI inflows using panel data regression models. The essential finding includes:

FDI inflows were positively and considerablely associated with increased CO_2 emissions. Research and development (R&D) expenditure negatively affected emissions, confirming its mitigating role. Renewable energy consumption displayed a negative but statistically weak association with emissions. Multicollinearity was not detected. Nevertheless, heteroscedasticity was present and addressed via Robust standard error. The Hausman test favored the fixed effect model over the random effect model, indicating that unobservable country-specified characteristics considerably influence the dependent variables. These outcomes depict that the current pattern of FDI inflows is closely aligned with pollution-intensive investment, especially in developing economies.

RESULTS

DESCRIPTIVE STATISTICS

The central tendency and dispersion of each variable under research are summarized by the descriptive statistics, which offer a preliminary overview of the dataset.

TABLE 1: DESCRIPTIVE SUMMARY

variables	mean	Standard deviation	minimum	maximum
FDI inflows	1.31	1.39	-8.95	5.11
CO2 emissions	8.14	3.38	3.38	16.0
R&D expenditure	2.30	.85	.60	3.58
Renewable energy resources	12.12	3.24	3.07	18.5

FDI Inflow: With a standard deviation of 1.39 and an average of 1.31 for FDI inflows, there is a moderate amount of variation around the mean. The observed value ranges from a minimum of -8.95, which indicates a substantial outflow of capital in certain economies or periods, to a maximum of 5.11, which indicates a substantial inflow of capital. A negative minimum value indicates that there may have been net outflows of foreign investment from some areas, perhaps as a result of economic downturns, political unrest, or multinational corporations repatriating their profits. The range of values (from -8.95 to 5.11) indicates that different countries or regions have had quite different experiences with FDI inflow.

CO_2 Emissions: With a standard deviation of 3.38 and an average CO_2 emissions level of 8.14, there is a comparatively large variation in emission levels between observations. The recorded values range from a minimum of 3.38 to a maximum of 16.0. The spread indicates that some nations have relatively low carbon dioxide emissions, perhaps as a result of low industrial activity or successful environmental policies, while others have much higher emissions, most likely as a result of growing industries, the use of fossil fuels, or loose environmental regulations. Differences in development stages, energy consumption trends, and environmental governance frameworks are also reflected in the variation.

R&D Expenditure: With a standard deviation of 0.85, the average research and development (R&D) expenditure is 2.30. 3.58 is the highest recorded value, and 0.60 is the lowest. While some still devote very little to R&D, the majority of the countries in the dataset invest similarly, as evidenced by the relatively small range and low variability. Higher R&D expenditures may indicate a more innovative and technologically sophisticated nation, which may have an effect

on its ability to draw in sustainable foreign direct investment and its environmental results. On the other hand, due to a lack of funding or a lack of policies, lower-income nations might find it difficult to make the shift to green or knowledge-based economies.

Renewable Energy Consumption: With a mean of 12.12 and a standard deviation of 3.24 for renewable energy resources, there is moderate dispersion. Significant variations in the adoption and use of renewable energy are evident throughout the dataset, with the lowest value being 3.07 and the highest being 18.5. While lower values indicate a continued reliance on conventional energy sources, higher values indicate a greater integration of renewable energy sources (such as solar, wind, or hydroelectric). This discrepancy could result from variations in international support for energy transitions, policy frameworks, natural resource endowments, and technological infrastructure.

CORRELATION MATRIX

The linear connections between research and development (R&D) spending, CO_2 emissions, foreign direct investment (FDI), and the use of renewable energy sources were investigated using the Pearson correlation analysis. Positive values indicate a direct connection, negative values indicate an inverse connection, and values near zero indicate a weak or nonexistent linear connection. The values range from -1 to +1.

TABLE 2: CORRELATION MATRIX

Variable 1	Variable 2	Pearson correlation
FDI	CO2 emission	0.7569
FDI	R&D Expenditures	0.4777
CO2 emission	R&D expenditure	0.3718
R&D expenditure	Renewable energy consumption	0.4584
CO2 emission	Renewable energy consumption	-0.2719
Renewable energy consumption	FDI	-0.0877

Pairwise Pearson correlation showed:

CO_2 Emissions and FDI (r = 0.7569): FDI and CO2 emissions are strongly positively correlated. This implies that CO_2 emissions typically rise in tandem with an increase in FDI inflows. The Pollution Haven Hypothesis, which holds that foreign investments, particularly in developing nations, are linked to environmentally damaging industrial activity because of laxer

regulations, may be supported by this finding.

R&D Expenditures and FDI (r = 0.4777): FDI and R&D expenditures are found to be moderately positively correlated. This reveals that nations or areas that receive more foreign direct investment also typically make larger investments in R&D. This could be a result of foreign investment fostering innovation and technological advancement.

R&D Expenditure and CO_2 Emissions (r = 0.3718): CO2 emissions and R&D spending have a somewhat positive link. This finding might reveal that areas with greater emissions are also spending more on research and development, either in response to environmental deterioration or as a component of innovation policies meant to reduce emissions.

R&D Expenditures and Renewable Energy Consumption (r = 0.4584): Spending on R&D and the use of renewable energy are somewhat positively correlated. According to this association, a strategic shift towards sustainability may be reflected in higher R&D expenditures that aid in the creation and uptake of renewable energy technologies.

CO2 Emissions and Renewable Energy Consumption (r = -0.2719): The connection between CO2 emissions and the use of renewable energy is weak to moderately negative. This inverse connection reveals that CO2 emissions tend to decline as the proportion of renewable energy rises. It backs up the idea that using renewable energy reduces carbon footprints.

FDI and Renewable Energy consumption (r = -0.0877): There is hardly any discernible linear link between FDI and the use of renewable energy, as evidenced by the weak and negative correlation. This finding implies that FDI inflows might not be specifically aimed at the renewable energy sectors or that the possible link between the two is being diluted by other structural or policy-related factors.

PANEL REGRESSION ANALYSIS

FIXED EFFECT MODELS

The fixed effect model controls for all time-invariants differences amongst countries by estimating individual intercepts for every country. This indicate that it captures the influence of omitted variables that do not change over the time but may vary amongst countries (Wooldridge, 2013). The consequential outcomes of models are:

TABLE 3: FE MODELS SUMMARY

Variable	coefficient	Std. Error	t-value	p-value
CO2 emission	.6223	0.4328	1.44	0.157

R&D expenditures	-0.5463	0.4793	-1.44	0.260
Renewable energy consumption	0.2480	0.2694	0.92	0.362

CO_2 Emission (p = 0.157, coefficient = 0.6223): Keeping other factors equal, an increase of one standard deviation in CO2 emissions corresponds, on average, to an increase of 0.6223 standard deviations in FDI inflows. There is insufficient evidence to support this effect in the population, though, as this connection is not statistically notable ($p > 0.05$). The lack of significance statistically undermines the Pollution Haven Hypothesis, even though the positive sign may support it (countries with higher emissions attract more FDI).

R&D Expenditure (Coefficient = -0.5463, p = 0.260): On average, FDI inflows decrease by 0.5463 standard deviations for every standard deviation increase in R&D expenditures; however, this effect is statistically notable ($p > 0.05$). This finding runs counter to popular belief that R&D encourages innovation and draws in foreign capital. The negative association, however, may be the result of multicollinearity or regional variation that the model did not account for, given the large confidence interval and insignificance.

Renewable Energy Consumption (Coefficient = 0.2480, p = 0.362): FDI inflows increase by 0.2480 standard deviations for every standard deviation increase in renewable energy consumption, although this effect is not statistically substantial. Although the effect's direction is consistent with theories of the green economy, indicating that cleaner energy use may draw sustainable investments, the effect's insignificance shows that, for this dataset or period, renewable energy levels may not yet be a deciding factor in FDI decisions.

RANDOM EFFECT MODELS

This approach is more effective if the assumptions hold but may lead to biased results if the unobserved factors are correlated with the regression (Greene, 2012). The consequential outcomes of models are:

TABLE 3: RE MODEL SUMMARY

variables	coefficient	Std. error	z-value	p-value
CO2 emission	0.7515	0.2349	3.20	0.001
R&D expenditures	0.0295	0.2545	0.12	0.907
Renewable energy consumption	0.0966	0.2053	0.47	0.638

CO_2 emission: FDI inflows increase by 0.2480 standard deviations for every standard deviation increase in renewable energy consumption, although this effect is not statistically

substantial. Although the effect's direction is consistent with theories of the green economy, indicating that cleaner energy use may draw sustainable investments, the effect's insignificance shows that, for this dataset or period, renewable energy levels may not yet be a deciding factor in FDI decisions.

R&D Expenditure: With a p-value of 0.907, notably higher than any typical threshold (0.05, 0.10), R&D expenditures have a very weak and statistically innotable effect on the dependent variable. Although a very slight positive link is revealed by the coefficient of 0.0295, this effect is not statistically notable. This indicates that FDI inflows and the selected economic outcome in your model are not substantially implicated by higher R&D spending as measured here (possibly as a percentage of GDP). This might be the result of limitations in the quality of R&D investments in some nations or time lags (the effects of R&D may not be felt for years).

Renewable Energy Consumption: Additionally, there is no statistically substantial correlation between the dependent variable and renewable energy consumption. With a p-value of 0.638, it is substantially higher than the typical 5% cutoff. Although there is a slight positive correlation indicated by the coefficient of 0.0966, this effect cannot be statistically distinguished from zero. This implies that there is no discernible effect of raising the proportion of renewable energy consumption (for example, as a percentage of overall energy use) on the dependent variable in this regression. Among the potential causes are:

In many places, the renewable energy industry might not yet be big enough to have an effect on macroeconomic metrics like foreign direct investment. This model does not immediately account for the potential long-term or indirect benefits of renewable energy.

DISCUSSION

This research examines how FDI inflows under green capitalism are influenced by environmental factors, including CO2 emissions, R&D spending, and the use of renewable energy. The results indicate that FDI and CO_2 emissions are strongly positively correlated, which supports the Pollution Haven Hypothesis (Pavlović et al., 2021). R&D expenditure has a small but possible influence on environmental mitigation, as evidenced by its negative but statistically innotable effect on emissions (Chen et al., 2025). The weak and non-notable correlation between FDI and renewable energy consumption reveals that clean energy is still a secondary consideration when making investment decisions today (Nchofoung et al., 2024). These observations illustrate how FDI still frequently prioritizes immediate industrial gains over long-term ecological sustainability. These dynamics are greatly influenced by institutional

strength and political context, necessitating specific policies to draw in green investment (Van et al.,2024)

In less regulated or politically constrained economies, our results support the Pollution Haven Hypothesis by confirming that higher CO_2 emissions are considerably associated with increased FDI inflows, which is consistent with earlier research by Pavlović et al. (2021) and Van et al. (2024). They do not, however, concur with the observations of Nchofoung et al. (2024), who discovered that renewable energy had a greater implication on luring foreign direct investment. Since our investigation concentrated on a larger and more institutionally diverse sample, this discrepancy may be explained by variations in methodological approach and country selection.

This might indicate disparities in how countries apply research into commercial green technologies or delays in the benefits of innovation-driven investment (Chen et al., 2025). These observations imply that proactive green innovation policies may have a delayed effect on capital flows, even though environmental degradation still draws foreign direct investment (FDI) in weaker institutional contexts.

First, the sample was restricted to nations with readily available and consistent data on R&D spending, CO2 emissions, FDI inflows, and the use of renewable energy. This could limit the observations' applicability to countries with less complete or dependable data coverage. This limits the results' generalizability to a wider global context, especially to low-income or fragile states where data gaps are prevalent.

Second, panel data regression techniques are limited by potential omitted variable bias and endogeneity issues, especially in macroeconomic studies involving multiple interacting systems, even though they improve causal inference by taking time variation and country-specific effects into account. Third, variations in measurement standards among nations may introduce inconsistencies, and the analysis is only as accurate as the reported statistics due to its reliance on secondary data sources like the World Bank.

Additionally, the research used mean substitution to deal with missing data, which may affect coefficient precision and underestimate variability while maintaining sample size. Standardized variables improve interpretability as well, but they may mask the magnitude of effects in practice. Lastly, this research focuses on linear links and ignores potential non-linear or dynamic effects, like threshold effects in FDI behavior or delayed reactions to environmental reforms. Future research should try to address these methodological and theoretical limitations

using richer datasets, longitudinal tracking, or more sophisticated econometric techniques. These limitations should be carefully taken into account when interpreting the results.

The observations of these studies carry several important implications:

- **Policy:** The Pollution Haven Hypothesis is supported by the strong positive correlation between CO_2 emissions and foreign direct investment inflows. This reveals that developing nations may continue to draw pollution-intensive investments if strict environmental regulations are not in place (Pavlović et al., 2021; Van et al., 2024). This underlines how urgently policymakers must integrate environmental conditions into investment criteria in order to strike a balance between ecological protections and economic growth objectives.
- **Theory:** By emphasizing how institutional strength and innovation policy mediate the environmental effects of foreign direct investment, the analysis adds to the expanding conversation on green capitalism (Avila-Calero, 2025). Future research should examine time-lagged effects, sectoral disaggregation of FDI (e.g., greenfield vs. brownfield), and the mediating role of institutional quality, given the statistically weak or inconsiderable influence of R&D expenditures and renewable energy consumption on FDI inflows.
- **Practice:** Investment institutions and development banks should consider ESG factors more rigorously when evaluating FDI destinations. Incentives for green investments and disincentives for pollution-intensive capital should be institutionalized.

To capture the complex dynamics of political economy and investor behavior in various regulatory contexts, future research will use mixed methods or case-based approaches. The understanding of how investment decisions interact with sustainable development goals could be further improved by extending the focus to firm-level data and incorporating ESG metrics and AI-based environmental performance indicators (Lai, 2025). By addressing these areas, future studies can offer a more comprehensive view of how capital flows interact with sustainability goals in the context of green capitalism.

CONCLUSION

To sum up, this analysis advances our knowledge of the association between environmental factors and foreign direct investment (FDI) within the dynamic framework of green capitalism. The analysis shows, via a thorough panel data analysis spanning many nations and years, that although foreign direct investment (FDI) is positively correlated with CO_2 emissions, thereby bolstering the Pollution Haven Hypothesis, its association with R&D expenditures and

renewable energy use is weak and statistically insubstantial. This implies that environmental concerns continue to be a secondary consideration when making investment decisions in many developing and institutionally fragile nations. The results stress that FDI still prioritizes short-term financial gains over long-term sustainability unless there are robust political and regulatory frameworks in place to mitigate its environmental effects.

By emphasizing the intricate and occasionally conflicting role of FDI in ecological governance, these insights make a notable contribution to the fields of institutional political economy and sustainable finance. They open the door for further studies that look into sector-specific environmental effects, disaggregated FDI flows, and the long-term effects of innovation policies on sustainability. More notably, they advocate for an integrated policy approach that aligns investment governance, environmental regulation, and ESG standards to guide capital flows toward genuinely sustainable development. Understanding the environmental effects of financial globalization is becoming more than just an academic exercise; it is a crucial policy requirement as the world economy faces growing climate risks.

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