

EXPLORING THE ENVIRONMENTAL CONSEQUENCES OF FINANCIAL DEVELOPMENT AND FOREIGN INVESTMENTS IN OECD COUNTRIES

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ABSTRACT

Environmental quality is a critical indicator of sustainable development, reflecting the long-term health and resilience of ecosystems and human well-being. This study examines the environmental impacts of financial development and FDI in 27 OECD countries from 2000 to 2023. It utilizes both static and dynamic System GMM methodologies to explore the effects of financial development and FDI on environmental indicators, including carbon emissions, greenhouse gases, and sustainability. The findings reveal that bank credit reduces emissions, indicating its ecologically friendly nature, whereas private sector credit contributes to increased emissions, highlighting the need for regulatory measures. FDI negatively impacts emissions, confirming the pollution haven hypothesis; however, it also hinders sustainable development under certain conditions. The Environmental Kuznets Curve (EKC) is validated, with higher turning points suggesting that significant decarbonization in mature economies remains a challenging task. The results highlight the necessity of embedding sustainability into financial systems through green financing, stricter laws and regulations, and renewable energy incentives. These findings can assist practitioners and policymakers in aligning global financial development with sustainability goals.

Keywords: Financial Development, FDI, Environmental quality, CO₂, GHG, OECD

INTRODUCTION

Ensuring environmental quality is essential for safeguarding ecological balance and public well-being. Sustainable development promotes long-term resource efficiency and intergenerational equity (Sulehri et al., 2024). Integrating these priorities with financial development enables economies to pursue growth without compromising environmental resilience. Financial development is seen as a foundation of economic growth and modernization, incorporating the complex system of institutions, markets, instruments, and regulations that facilitate the efficient allocation of resources. It reduces transaction

costs, reduces information asymmetries, and stimulates the economic activities that provide sustainable growth (OECD, 2023). Financial development is not only important to improve the productivity of the economy but also for integrating environmental concerns into the economic structure (Udeagha & Breitenbach, 2024). A strong financial system may reconcile economic development with environmental sustainability by fostering access to capital green in flex investments and eco-innovation (Wang & Zhan, 2023). Nonetheless, this relationship is highly controversial as financial development is commonly associated with

negative environmental impacts because it stimulates emission-intensive activities.

Financial development facilitates access to credit, empowering individuals and firms to invest in vehicles, machinery, and industrial technologies that contribute significantly to greenhouse gas emissions (Sun et al., 2025; Udeagha & Breitenbach, 2024; Xu & Lin, 2025). In addition, FDI, an important part of financial development, is considered to have a double-edged sword impact. Despite the contribution of enhanced technological progress and improved diversification of the economy that comes with FDI, this may as well come at the cost of environmental degradation in the host country, largely because of weaker environmental standards (Sarkodie et al., 2023; Bhat & Ikram, 2025; Jama & Abdi, 2025). Kim et al. (2023) concluded that OECD economies have strong industrial and financial systems and diverse industrial structures. They also found that financial development influences achieving a balance between economic growth and environmental preservation.

For nearly two decades, the OECD countries have enjoyed economic growth, but environmental pressure has been increasing. Due to consumption and reliance on fossil fuels, the concentration of emissions of carbon dioxide and other harmful greenhouse gases continues to rise. At the same time, climate change has now become one of the major global problems- with OECD nations already suffering local impacts from rising sea levels, heat waves, and loss of biodiversity (Sulehri & Ali, 2024; Zhu et al., 2022; Onyeiwu, 2024; Rathod et al., 2025). These realities underscore the significance of financial development and environmental consequences and the necessity of improved policy to mitigate its adverse effects. Although the relationship between financial development and environmental consequences has generated considerable scholarly attention, the literature still has many gaps. While prior research has examined these issues, its analyses have primarily concentrated on carbon emissions, which are often considered an indirect indicator of environmental deterioration, or non-broader measures such as total greenhouse gas emissions, as well as indicators of

environmental sustainability (Danish et al., 2022; Shahbaz et al., 2023).

Moreover, the majority of studies have focused on emerging economies, providing little evidence for highly industrialized areas such as the OECD countries, which are characterized by different economic structures and different regulatory settings. The variation in the structure of economies within the OECD, from advanced industrial countries to emerging markets, makes regional-level analyses essential to understand the differential processes of financial development and financial contagion (Destek et al., 2023). Herein, the study addresses the identified research gaps by concentrating on the effects of financial development and FDI on the environment in OECD nations between 2000 and 2023. Using the static and dynamic panel approach (SGMM), this study provides robust evidence for the short-term and transitional dynamics of financial development and its environmental consequences. System GMM deals with fundamental econometric problems, including heteroscedasticity, serial correlation, and cross-sectional dependence, and provides estimates that are expected to be much more efficient than fixed effects or ordinary least squares static models (Tang & Tan, 2022). In addition, the research breaks down financial development into individual proxies (domestic credit to the private sector by banks and overall domestic credit to the private sector), allowing a better understanding of how financial development plays its role environmentally.

Aside from exploring financial development, this study also seeks to examine the EKC hypothesis, which underscores the assumption that in the earlier level of economic progress, environmental degradation is on the rise, but in the next period of economic progress, environmental degradation declines with sustainable economic development (Zhang et al., 2022; Xu & Lin, 2025). The EKC approach offers theoretical insight into the complex relationship between national income and environmental quality change and demonstrates this relationship as an inverted U-shape for the economies that are fast transforming towards green technologies (OECD economies). This study strengthens the

EKC evidence from new data and varied environmental indicators through a comprehensive analysis of certain components of the financial systems: carbon emissions, total greenhouse gases, and adjusted net savings.

This study distinguishes itself from prior research by integrating the environmental sustainability implications derived from the relationship between financial development and renewable energy in OECD countries. It not only estimates the impact of financial development on environmental quality but also discovers the role of FDI in shaping these dynamics. The findings are likely to provide policymakers with guidance on how to create financial policies that align well with sustainability targets and are conducive to economic growth. The structure of the paper is outlined as follows. The next section presents a review of the literature on financial development, the quality of the environment, and the EKC hypothesis. In the research methodology section, the data sources, econometric techniques, and model specifications are used. Finally, the empirical findings are detailed in the next parts, and a conclusion summarises the study's implications and suggests possibilities for future research.

2- Literature Review

In environmental economics, the Environmental Kuznets Curve (EKC) hypothesis is now a key concept that emphasizes the endogeneity of the relationship between environmental degradation and economic growth. The EKC hypothesis, introduced by Kuznets (1955) in the context of income inequality, was subsequently applied to environmental studies to propose an inverse U-shaped correlation between income variation and pollution levels; nonetheless, during periods of slower economic growth, industrialization results in heightened environmental degradation because it is heavily dependent on fossil fuels and outdated technologies. Nonetheless, as economies progress through the stages of development, emissions and environmental quality improve due to modernization, technological innovation, environmental regulation, and the transition to cleaner energy (Dinda, 2004; Zhu et al., 2022).

Evidence from empirical studies has been mixed on the EKC hypothesis, such as in the study of Katircioğlu and Taşpınar (2017) in Turkey, which found that emissions worsen initially, but eventually, financial development reduces emissions through green investment. Apergis and Ozturk (2015) also confirmed the EKC in Asian nations because of the function of economic diversification and strict environmental policies in improving the environment. Danish et al. (2023) expanded the Environmental Kuznets Curve to the economies of the Organisation for Economic Cooperation and Development, suggesting that emissions can be mitigated through the mutually beneficial impacts of financial development and technological advances alongside robust institutional frameworks. Nonetheless, there is skepticism about the general validity of the EKC. Dogan and Turkekul (2016) cited the example of emissions in the United States, where urbanization and industrialization have neutralized the gains from economic growth and emissions remain persistent. Likewise, Khan et al. (2022) concluded that the EKC was absent in non-OECD regions and attributed this difference to poor governance and the ineffectiveness of environmental regulations. Our findings suggest a need for context-specific analyses of the interactions among growth, policy, and environmental quality (Kim et al., 2023).

Financial development has a double-edged role in influencing environmental effects. On the other hand, it provides capital to encourage clean energy and sustainable investing. Shahbaz et al. (2023) stressed that financial development reduces pollutants in high-income countries by supporting firms to adopt energy-efficient technologies. Likewise, Wang and Zhan (2023) stated that financial institutions are staging posts of green finance, harmonizing economic behavior with sustainable development objectives. According to Li, D. (2024), advanced financial systems have been instrumental in OECD economies in promoting the growth of green industries and reducing reliance on fossil fuels. Conversely, financial development may exacerbate environmental degradation and more grey activities in emission-intensive activities. Zhang et al. (2023) showed that

industrial emissions in middle-income countries generally tend to increase with financial growth because of relaxed credit constraints. Al-Mulali et al. (2022) also pointed out that economic development encourages unsustainable consumption habits in areas with weak environmental regulations. These seemingly contradictory results emphasize the importance of holistic perspectives that take into consideration the heterogeneity of financial systems and environmental governance systems across countries/regions (Tang & Tan, 2022).

FDI significantly contributes to economic development and is a key factor in financial improvement, with various channels affecting the quality of the environment as well. The pollution halo theory postulates that FDI brings in new technologies and management practices that enhance the cleaner production process (Sarkodie et al., 2023). For example, Danish et al. (2023) demonstrate that FDI in OECD countries engenders emissions mitigation owing to investments in more environmentally friendly technologies under strict laws and regulations. On the other hand, the "pollution haven" hypothesis offers an opposing perspective, claiming that FDI is inclined to migrate to nations with lax environmental legislation in search of reduced manufacturing costs. Studies by Khan et al. (2023) and Zhu et al. (2022) also suggested that FDI could lead to worsening emissions in regions with weak environmental governance. This contrast highlights the critical role of the regulatory frameworks in the net environmental impacts of FDI (Kim et al., 2023).

Moreover, Electricity consumption is a core element of the financial development-environment relationship. In industrialized economies, emissions from non-renewable energy, coal, and oil are dominant. Energy-intensive activities still drive emissions in OECD countries, but new results from Tang and Tan (2022) assert that the implementation of clean energy technologies seeks to capitalize on these benefits. Research by Alam et al. (2023) on how financial development affects investments in clean energy yields encouraging results. Trade openness is another important determinant of environmental performance.

On one side, trade can ease the diffusion of green technologies and create competitive, environmentally friendly markets (Shahbaz et al., 2023). Meanwhile, larger volumes of trade can drive emissions via transport and industrial growth. For instance, Imam et al. (2025) also mentioned that for OECD countries, emissions are lower with trade liberalization, but this effect seems conditional for its sustainability, accounting for the necessity for environmental policies to become stricter, too, in order to maintain a green environment.

OECD countries provide a unique setting for examining the EKC hypothesis and the relationship between environmental quality and financial development. Such countries maintain developed financial sectors, broad economic sectors, and stringent environmental rules, which provide fertile ground for sustainable development. Kim et al. (2023) supported the EKC in numerous OECD countries by documenting decreasing emissions as a result of increasing GDP with the help of technology and policies. But across the OECD, there is variation. Destek et al. (2023) believe that stringent environmental laws are most favorable to high-income OECD countries (2023); emerging economies within this group face the challenge of aligning such monetary development with sustainable goals. This difference shows the necessity of targeted policy measures for the different degrees of industrialization and environmental governance of the region (Wang & Zhan, 2023).

Although the EKC and financial development have been widely studied, several gaps have been identified. First, the focus of most studies is much too narrow, concentrating on carbon emissions rather than more comprehensive measures like total greenhouse gases or ecological footprints (Zhu et al., 2022). Second, much of the analysis uses static econometric models, such as fixed effects or ordinary least squares (OLS), which do not adequately capture dynamics over time. Dynamic panel methods like System GMM have made it possible to tease out some of these relationships (Tang & Tan, 2022). Lastly, limited research has been conducted on the heterogeneous effects of financial

development among heterogeneous economies within the OECD framework (Alam et al., 2023).

3- Research Methodology

Data Characteristics

The study investigates the environmental effects of financial development and FDI in a panel of 27 OECD countries for the period 2000 to 2023. The selected countries and times were chosen based on the availability of consistent data for the relevant variables and the economic diversity present among OECD countries. The analysis used data from reputable databases, mainly the World Development Indicators (World Bank), with additional information on the International Monetary Fund (IMF) and the OECD

Statistics Database. It also means that the data used is reliable and that its sources are valid.

The variables are taken in log form. In this research, we used the variables shown in Table 1, together with their codes, definitions, units, and sources. The dependent variables are the variables LnCO₂, LnGHG, and LnNS, which refer to carbon emissions per capita, per capita total greenhouse gas emissions, and adjusted net savings per capita without particulate emissions damage, respectively. The explanatory variables include foreign direct investment (LnFDI), domestic credit to the private sector by banks (LnFDB), total domestic credit to the private sector (LnFDP), and gross domestic product per capita (LnGDP), which are all primary indicators of financial development and economic activity.

Table 1: Variables

Variable	Definition	Unit Adopted	Source
LnCO ₂	The Logarithm of Carbon emissions per capita	Metric tons per capita	WDI
LnGHG	The Logarithm of total greenhouse gas emissions per capita	kt of CO ₂ equivalent per capita	WDI
LnNS	The Logarithm of adjusted net savings per capita (excluding particulate emissions)	Current US\$ per capita	WDI
LnFDI	The Logarithm of Foreign Direct Investment Inflows	% of GDP	WDI
LnFDB	The Logarithm of domestic credit to the private sector by banks	% of GDP	WDI
LnFDP	The Logarithm of total domestic credit to the private sector	% of GDP	WDI
LnGDP	The Logarithm of GDP per capita	PPP (current international \$)	WDI

Model Specification

Employing a dynamic panel regression framework, we investigate the correlation between environmental quality, FDI, and financial development. The method embeds a lagged dependent variable into a linear Environmental Kuznets Curve (EKC) model, thereby facilitating an understanding of the long-term effects of economic activities and financial development on environmental quality indicators. With impetus for consistency, the framework accounts for dynamic adjustments by including lagged dependent variables because environmental outcomes show persistence over time.

The generalized model is formulated as follows:

$$EQ_{it} = \beta_1 + \beta_2 EQ_{it-1} + \beta_3 FDI_{it} + \beta_4 \ln FDB_{it} + \beta_5 \ln FDP_{it} + \beta_6 \ln GDP_{it} + \beta_7 \ln GDP_{it}^2 + \varepsilon_{it} \quad (1)$$

This general equation is expanded into three specific models for the dependent variables:

$$\ln CE_{it} = \beta_1 + \beta_2 \ln CE_{it-1} + \beta_3 FDI_{it} + \beta_4 \ln FDB_{it} + \beta_5 \ln FDP_{it} + \beta_6 \ln GDP_{it} + \beta_7 \ln GDP_{it}^2 + \varepsilon_{it} \quad (1.1)$$

$$\ln GHG_{it} = \beta_1 + \beta_2 \ln GHG_{it-1} + \beta_3 FDI_{it} + \beta_4 \ln FDB_{it} + \beta_5 \ln FDP_{it} + \beta_6 \ln GDP_{it} + \beta_7 \ln GDP_{it}^2 + \varepsilon_{it} \quad (1.2)$$

$$\ln NS_{it} = \beta_1 + \beta_2 \ln NS_{it-1} + \beta_3 FDI_{it} + \beta_4 \ln FDB_{it} + \beta_5 \ln FDP_{it} + \beta_6 \ln GDP_{it} + \beta_7 \ln GDP_{it}^2 + \varepsilon_{it} \quad (1.3)$$

The logarithmic transformations enable interpreting coefficients as elasticities and mitigate heteroscedasticity. This framework facilitates analysing both linear and non-linear pollution-income relationships, providing insights into the validity of the EKC hypothesis for various environmental metrics.

Estimation Technique

In terms of methodology, System GMM is a widely used econometric approach to estimating dynamic panel data models. System GMM (Blundell & Bond, 1998) overcomes many of the methodological issues arising in this analysis, such as endogeneity, measurement error, autocorrelation, and dynamic panel bias. The presence of lagged dependent variables in regression models introduces a treatment endogeneity that standard fixed-effect and random-effect models cannot properly handle. System GMM addresses this problem by employing lagged values of explanatory variables as instruments, thereby facilitating consistent and efficient parameter estimation. The System-GMM not only uniquely integrates equations in levels and first differences but also estimates the short- and long-run dynamics of environmental quality indicators (Shahbaz et al., 2023). This study prefers the two-step SGMM estimator to the one-step estimator, as the asymmetric efficiency derived from the two-step parameter estimates is applicable solely when robust standard errors are utilized. The instruments' validity is confirmed by the Hansen test, which makes sure they are neither over-identified nor weak. Furthermore, the residuals are put to the Arellano-Bond test for autocorrelation, confirming the AR1 (first-order autocorrelation) and no AR2 (second-order autocorrelation) is present in the model, proving the validity of the GMM estimator dynamic structure (Tang & Tan, 2022).

System GMM is specifically suitable for the panel data structure that contains 27 OECD (N) for a 5-year period (T), as $N > T$, and is able to control the reverse causation problem between financial development and environmental quality as well as FDI and environmental quality (Danish et al., 2023). A diverse range of first-generation unit root tests is then used to solve the stationarity condition of the panel data. Econometric analysis can rely heavily on the concept of stationarity: not having made sure that your variables are stationary can lead to spurious regression results and data that is randomly walking over the years.

Panel units are assumed to be cross-sectionally independent by First-Generation tests. The

LLC (Levin-Lin-Chu) test tests the null hypothesis that there exists a common unit root process for the whole panel, and the ADF and PP (Phillips-Perron) tests allow for individual unit root processes among each of the cross-sections. First-generation tests are useful for performing preliminary assessments of stationarity; however, they have several limitations in the context of cross-sectional dependence (Alam et al., 2023). CADF (**Cross-Sectionally Augmented Dickey-Fuller**) test, introduced by Pesaran (2003). The CADF test relaxes the assumption of cross-sectional independence and accounts for common shocks (e.g., global financial crises or environmental treaties) affecting several countries simultaneously. Since the theory behind integrated global economies such as OECD nations justifies the presence of cross-sectional dependence, the CADF test generates more reliable results by considering this (Wang & Zhan, 2023).

Cross-sectional dependence results from events like the global financial crisis (2008) or environmental treaties that lead to the co-movement of the economic and environmental variables across countries. Pesaran CD test results show substantial cross-sectional dependencies, which provide evidence for conducting econometric techniques such as System GMM, which considers such interdependencies (Zhu et al., 2022). Importantly, this study passes a comprehensive test for stationarity to establish robustness in the empirical findings. It also considers the cross-sectional dependence among the individual countries, examining how these deviations might affect the meaningful implications of the dynamic relationships between financial development, FDI, and environmental quality in the context of OECD countries.

Statistics for each variable are presented in Table 2, where we can see its maximum, minimum, mean, and standard deviation. The summary is essential for comprehending the variability and distribution of data, which helps guide the selection of appropriate econometric methods.

Table 2: Statistical Summary of Variables

Variable	Observations	Mean	Min	Max	Std. Dev
LnCE	621	0.911	0.521	1.31	0.18
LnGHG	621	-1.897	-2.105	0.025	0.302
LnNS	621	2.912	0.102	4.002	0.889
LnFDI	621	0.548	-2.567	2.112	0.563
LnFDB	621	1.804	-0.652	2.324	0.412
LnFDP	621	1.856	-0.712	2.389	0.45
LnGDP	621	4.412	3.589	4.789	0.246
LnGDP ²	621	19.104	12.502	22.345	2.015

4- Empirical Results

This part discusses the empirical findings of the study, including the stationarity of the variables, cross-sectional dependence, and the relationships between financial development,

FDI, and environmental quality of OECD countries, as well as regression analysis. This provides valuable information on how the factors complement each other and helps to validate the proposed hypotheses.

Table 3: Panel Unit Root Test Results

Variable	ADF Statistic	LLC Statistic	PP Statistic	ADF First Difference	LLC First Difference	PP First Difference
LnCE	-2.132 (0.785)	-1.723 (0.042)**	-1.875 (0.812)	23.432 (0.000)***	-5.934 (0.000)***	25.892 (0.000)***
LnGHG	-1.879 (0.693)	-3.214 (0.001)***	-1.743 (0.751)	28.345 (0.000)***	-6.101 (0.000)***	26.784 (0.000)***
LnANS	6.512 (0.001)***	-4.002 (0.001)***	6.123 (0.003)**	27.512 (0.000)***	-3.498 (0.001)***	27.984 (0.000)***
LnFDI	9.245 (0.000)***	-5.012 (0.000)***	9.243 (0.000)***	38.512 (0.000)***	-7.345 (0.000)***	37.985 (0.000)***
LnFDB	-0.234 (0.623)	-8.123 (0.000)***	-0.123 (0.542)	14.612 (0.000)***	-5.453 (0.000)***	13.721 (0.000)***
LnGDP	-1.623 (0.812)	-4.928 (0.000)***	-1.743 (0.823)	8.243 (0.000)***	-5.493 (0.000)***	8.912 (0.000)***
LnGDP ²	-1.6401 (0.847)	-3.5272 (0.000)***	-1.8102 (0.8693)	4.7541 (0.000)***	-7.3741 (0.000)***	6.6481 (0.000)***

Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

To ensure the reliability of the panel data in this study, it is necessary to know whether the variables are stationary or non-stationary. So, unit root tests are performed in this research, for example, the ADF. In this paper, the Maddala-Wu test, along with the Levin-Lin-Chu (LLC) and Phillips-Perron (PP) tests, was applied for the determination of the presence of unit roots in time series variables. As can be seen in Table 3, all of the variables (LnCE, LnGHG, LnNS, LnFDI, LnFDB, LnFDP, LnGDP, and LnGDP²) are at their first differences, which is to say that they are all stationary. Such a finding confirms that the null hypothesis of non-stationarity is rejected at a 1% level of significance, making

econometric analysis robust (Shahbaz et al., 2023; Danish et al., 2023).

Cross-sectional dependence is an issue due to the interdependence of OECD economies. We used the Pesaran CD test to check the correlation of error terms across cross-sections. The results in Table 4 show that the null hypothesis of independence cannot be rejected across all the variables at a 1% significance level, and thus, significant cross-sectional dependence is confirmed amongst the variables. The discovery emphasizes the interdependence of OECD economies that may stem from common economic policies, environmental pacts, and trade linkages (Wang Zhan, 2023).

Table 4: Cross-Sectional Dependence Test Results

Variable	CD-Test Statistic	p-value
LnEQ	8.74	(0.000)
LnGHG	6.63	(0.000)
LnNS	15.72	(0.000)
LnFDI	9.34	(0.000)
LnFDB	20.02	(0.000)
LnGDP	53.45	(0.000)
Ln(GDP) ²	53.41	(0.000)

Static models (POLS, FE, and RE) results are presented in Table 5. In all models, LnCE is the dependent variable. The Hausman test was performed to decide the correct static model and showed that chi-square = 15.24 (p = 0.012) with a static model using the correct static model. Thus, we reject the null hypothesis and accept that the correct model is RE (the alternative hypothesis would be that the correct model is FE). Therefore, the FE model was applied to examine the nexus of financial development, FDI, economic growth, and CO₂ emissions.

The findings indicate that LnFDI has a statistically significant and positive impact on carbon emissions across the models, consistent with the "pollution haven hypothesis; This suggests that FDI inflows into OECD countries are associated with emission-intensive activities. However, the magnitude of this impact is smaller in the FE model compared to the OLS model, reflecting the importance of

controlling for unobserved heterogeneity. LnFDB exhibits a significant negative coefficient in all models, particularly in the RE and FE models. This implies that domestic credit helps reduce carbon emissions by financing cleaner and more sustainable investments. Similarly, the EKC hypothesis is validated, as indicated by the significant positive coefficient for LnGDP and the negative coefficient for its squared term LnGDP², confirming the existence of an inverted U-shaped relationship between carbon emissions and economic growth. The static models explain a moderate proportion of the variation in carbon emissions, as indicated by the R² values. However, the limitations of static models necessitate the introduction of dynamism through the two-step System GMM estimator to better capture the dynamic relationships among the variables and address endogeneity concerns.

Table 5: Static Panel Data Estimation for Carbon Emissions (LnCE)

Variable	Pooled OLS	Random Effects	Fixed Effects
LnFDI	0.061*** (0.014)	0.020*** (0.007)	0.019*** (0.006)
LnFDB	-0.512*** (0.067)	-0.371*** (0.158)	-0.099** (0.221)
LnFDP	0.562*** (0.065)	0.328*** (0.151)	0.097 (0.224)
LnGDP	1.602** (0.989)	6.001*** (0.389)	6.232*** (0.412)
Ln(GDP) ²	-0.189** (0.132)	-0.743*** (0.051)	-0.768*** (0.048)
Constant	-3.234* (2.012)	-12.214*** (0.892)	-12.423*** (0.841)
R ²	0.431	0.137	0.003
Wald (χ^2)		283.42	
F statistic	42.31		56.89
Breusch-Pagan Test		1145.21	
Hausman Test		15.24**	

		(0.012)	
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Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

The static model for lnGHG was analyzed through POLS, FE, and RE models. Since the random effects are proving to be too weak, the Hausman test in Table 6 was used to find an adequate model. The chi-square test was non-significant at the 10% level ($p > 10\%$) with a chi-square statistic of 3.12 ($p = 0.692$). This result ends up accepting the null hypothesis, which implies that the RE model is preferred over the FE model. Thus, the RE model was adopted for further analysis as it is based on the assumption that the country-specific effects are uncorrelated with the explanatory variables (Gujarati & Porter, 2019; Wooldridge, 2020). This study also conducted the Breusch-Pagan Lagrangian multiplier test to compare the RE model with the OLS model. The test showed that χ^2 (172.34 [$p = 0.000$]) rejected the null hypothesis by stating that variances on the parties are not zero. This indicates that the RE model is a better specification than the OLS, which, as discussed above, does not account for unobserved heterogeneity between countries. The RE model states that lnFDB has a significant negative impact on greenhouse gases ($p < 0.01$). It also highlights the role of financial intermediaries in environmentally sustainable investments, as a one percent increase in lnFDB raises greenhouse gases by

1.05 percent. This remark is also in agreement with prior studies by Khan et al. (2023), which discovered similar findings in middle-income countries. In contrast, greenhouse gases are positively and significantly associated with the lnFDP, meaning that for every 1% increase in the lnFDP, greenhouse gases increased by 1.02%. It suggests the potential for harmful financial development in the sense of poorly regulated investments damaging the environment.

The effect of lnFDI on greenhouse gases is positive, albeit not significant, in the RE model. These findings are consistent with the mixed evidence found in the literature regarding FDI and environmental performance. Furthermore, even the log of GDP and the square term of the same have statistically significant positivity and negativity against greenhouse gases, respectively. With these results, they establish support for the EKC hypothesis, that is, environmental deterioration rises with economic growth up to a point (the turning point), then falls. The turning point for the OECD countries is found at 73,520 dollars, in line with the findings of Lu (2019) and Armeanu et al. (2021) on emissions and economic growth.

Table 6: Static Panel Data Estimation for Total Greenhouse Gases (lnGHG)

Variable	Pooled OLS	Random Effects	Fixed Effects
LnFDI	1.112*** (0.029)	0.043 (0.031)	0.031 (0.035)
LnFDB	-1.243*** (0.132)	-1.051*** (0.304)	-0.423 (1.421)
LnFDP	1.287*** (0.131)	1.022*** (0.303)	0.429 (1.420)
LnGDP	8.102*** (2.001)	8.358*** (2.251)	8.542*** (2.410)
LnGDP ²	-0.911*** (0.243)	-0.934*** (0.273)	-0.947*** (0.303)
Constant	-19.456*** (4.521)	-20.214*** (5.013)	-20.634*** (5.432)
R ²	0.241	0.221	0.121
Wald (χ^2)		26.92	
F statistic	16.21		4.03
Breusch-Pagan Test		172.34***	
Hausman Test		3.12	

		(0.692)	
Turning Point		\$73,520	

Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

The findings provide new insights into the links between FDI, financial development, and emissions of greenhouse gases in OECD countries. The results illustrate a Janus-faced character of financial development—while access to domestic credit provided by banks to the private sector has the potential to promote sustainability practices, unmitigated development of credit can lead to an increase in environmental deterioration. The validation of the EKC hypothesis suggests that high-income nations are capable of changing their trajectories towards cleaner phases of growth if sufficient policy interventions are introduced. The threshold points of \$73,520 per capita for emissions from greenhouse gases suggest that for OECD countries, emissions may decrease as a result of economic growth when technology is better or environmental regulation is more stringent. Nonetheless, the non-significance role of FDI implies that the part FDI plays in environmental results is very much conditional on the domestic regulatory structure and industrial structure in the host countries. This concurs with previous studies, including Shafiq et al. (2022); such conclusions are based on the need for targeted financial policies that will optimize trade-offs between economic growth and decouple environmental deterioration from human economic activity.

The net savings (LnNS) analysis (excluding the damage caused by particulate emission) uses

static models, POLS, FE, and RE models. Table 7 presents the output of the Hausman test to ascertain whether the fixed or the Random effect model is suitable. The test's chi-square was 12.89 ($p = 0.018$), significant at the 5% level. Hence, we can reject the null hypothesis that the RE model is appropriate in favor of the alternative hypothesis that the FE model is a better fit. Thus, based on this outcome, a more extensive examination of the static model was conducted through the incorporation of dynamic factors, and to address the time dependence and potential endogeneity, the two-step System GMM model was adopted.

Results from the FE model reported a positive and statistically significant relationship between LnFDI and adjusted net savings, which indicates that a 1% increase in received FDI, measured in GDP, results in a 0.19% increase in adjusted net savings. Therefore, it clearly shows that there is a vital need for green FDI in a way that would be conducive to sustainable development. Conversely, LnFDB bears a negative and statistically significant relationship, where an increase of 1 percent in LnFDB leads to a decrease in adjusted net savings by 6.78%. It reflects the inevitable environmental price that unregulated credit availability can exact on an economy if focused on sectors that cause adverse environmental impacts.

Table 7: Estimates of Static Panel Data for Net Savings (LnNS)

Variables	Pooled OLS	Random Effects	Fixed Effects
LnFDI	-0.051 (0.089)	0.152 (0.095)	0.187* (0.099)
LnFDB	0.701* (0.401)	-0.125 (0.914)	-6.782** (3.945)
LnFDP	-0.761* (0.392)	-0.085 (0.895)	7.152** (3.982)
LnGDP	-10.012* (5.921)	1.128 (6.457)	-0.372 (6.915)
LnGDP ²	1.425 (0.723)	0.131 (0.767)	0.356 (0.842)
Constant	20.501	-4.795	-2.752

	(12.652)	(13.672)	(14.562)
R ²	0.241	0.214	0.063
Wald (χ^2)		27.98	
F statistic	16.21		11.21
Breusch-Pagan Test		229.15***	
Hausman Test			12.89**
			(0.018)

Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

On the other hand, LnFDP influences net savings positively and significantly, and an increase of 1% in LnFDP induces a 7.15% improvement in environmental sustainability. This would indicate that credit flows to private sector projects can also be green if regulated appropriately. The LnGDP and LnGDP² effects are a mixed bag in that LnGDP is negatively associated with lnNS while LnGDP² is positively associated. The EKC hypothesis suggests there is a turning point or income level at which environmental sustainability increases with increases in income level, which is consistent with the results for net savings.

Robustness Check

To ensure the robustness of the estimates, we employed the two-step System GMM estimator on the data in Table 8, which addressed the possibility of endogeneity, unobserved heterogeneity, and serial correlation. The nested framework of financial development, economic growth, and environmental outcomes allows for more stable and less erroneous results. Two dependent variables are carbon emissions (LnCE) as a proxy for environmental quality and net savings (LnNS) as a measure of environmental sustainability. These findings offer support for expected positive relations between all of the core variables. The lagged variable (LnCEit-1) was positively and significantly related to carbon emissions, with an increase of 1% in past emissions, resulting in an increase of 0.48% in current emissions. It reinforces the idea that emissions carry long-term consequences because the amount of carbon in the atmosphere has incrementally risen over centuries globally. Similarly, LnFDI stayed with a positive and statistically significant impact on eco-emission (a 1% increase in LnFDI contributes to eco-emission by up to 0.07%). This result supports the pollution

haven hypothesis, which states that with lax regulation enforcement, greater FDI leads to worsening environmental damage. The domestic credit allocated to the private sector of banks, measured as LnFdb, also showed a negative and significant pattern regarding carbon emissions, where a 1% increase of 1% in LnFdb leads to a decrease in emissions by 0.82%. It also highlights that more regulated credit policies are crucial to environmental preservation. However, domestic credit to the private sector LnFDP was positive and statistically significant, with a 1 percent increase in LnFDP leading to an increase in emissions of 0.75 percent increase. These findings demonstrate that financial development may either improve or worsen environmental quality, depending on the nature of credit and its purpose.

For LnNS, the lagged variable (LnNSit-1) was associated positively and significantly; a 1% increase in savings of the previous period generates a 0.15% increase in savings promoting environmental sustainability in this period. The adjusted net savings results show that the coefficients for LnFDI and LnFDP were positive and significant. Specifically, a 1% increase in LnFDI and LnFDP, respectively, improved net savings by 0.32% and 11.46%. On the other hand, LnFDB exercised a significant negative effect on the level of environmental sustainability, where an increase of 1% in LnFDB leads to a change of -12.69% adjusted net savings. These findings thus point to the necessity for financial policies to channel credit growth to pursue environmental objectives. LnGDP and LnGDP² showed negative and positive signs on carbon emissions and net savings, respectively. Thus, the results validated the EKC hypothesis, as there was a positive and significant association of lnGDP and a negative and significant association of LnGDP². The turning points for

carbon emissions and savings were \$108,920 and \$112,505, respectively, meaning that after these income levels, environmental quality and

sustainability are expected to improve as a result of technological advances and strong environmental policies.

Table 8: Two-Step System GMM Findings

Variables	Carbon Emission	Net Savings
LnCE	0.480*** (0.055)	
LnNS		0.152*** (0.032)
LnFDI	0.070*** (0.012)	0.321*** (0.298)
LnFDB	-0.820** (0.132)	-12.692*** (0.312)
LnFDP	0.745** (0.142)	11.465*** (0.823)
LnGDP	1.912*** (0.498)	17.812*** (4.023)
LnGDP ²	-0.204** (0.053)	-1.883*** (0.462)
Constant	-3.785** (0.701)	-37.310*** (8.672)
Wald (χ^2)	18,912.45	6,562.72
Hansen Test	0.836	0.732
AR(1)	-3.10 (0.002)	-1.78 (0.018)
AR(2)	0.43 (0.670)	1.10 (0.265)
Turning Point	\$108,920	\$112,505

Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

5- Discussion and Implications

These results provide important evidence on the complicated interconnection of financial development, growth, and environmental outcomes in the case of OECD countries. This also reflects many of these financial institutions, which appear to have implemented sustainability principles domestically, with domestic credit to the private sector by banks shown to help reduce carbon emissions and greenhouse gases (Xu & Lin, 2025). For instance, by financing green projects and promoting clients to integrate sustainable practices such as renewable energy sources, green technologies, and energy-efficient buildings. On the contrary, domestic credit to the private sector (excluding banks) had positive associations with emissions, highlighting the importance of tightening regulation and/or providing incentives for

private sector financing to better align with sustainability goals. Lawmakers might solve this by introducing environmental hazard evaluations into credit score systems and providing subsidized terms for inexperienced initiatives.

FDI was found to have a positive impact on emissions, providing evidence for the pollution haven hypothesis (Yao et al., 2025). This means that FDI inflow may lead to pollution because host countries have relaxed environmental standards. An effective response to this may be for the government to subject foreign investments to environmental quality standards, such as making foreign investors adopt environmental disclosure requirements and sustainability benchmarks. This could avoid investment in projects that cannot serve our sustainable development objectives.

The findings also support the EKC hypothesis with turning points of carbon emissions and adjusted net savings at \$108,920 and \$112,505, respectively. The implications of these findings are that while economic development may initially harm the environment, eventually, the environment improves as environmentally friendly technologies are used and governments begin to enforce more stringent environmental regulations. But those record-high turning points reveal the difficult work of decarbonization in developed economies, where entrenched dependence on fossil fuels and other non-sustainable practices loom large. These challenges will require that policymakers make the transition to renewable energy, prevent carbon from reaching the atmosphere, and implement zero-carbon spreads.

The need for the financial industry to move towards sustainability and fit their strategy within global frameworks such as the UN Sustainable Development Goals (SDGs) or the Paris Climate Accord. This means setting up solid sustainability policies, advancing ESG disclosure, and incorporating environmental facets into the loan evaluation processes. Also, it has to have teams that will take care of sustainability in the places to train these people & it must consist of transparency of good governance (Shafiq et al., 2022). They can also collaborate with governments and other stakeholders on innovative financing mechanisms, potentially facilitating green bonds or sustainability-linked loans that would have an impact of urgency for green transitions.

It requires governance and accountability to hit those targets. Strong institutions, accountability, and a strong anti-corruption agenda are key to ensuring financial flows are channelled into sustainable development (Banga & Afzal, 2025). Diversity & Sustainability National and global regulations can be improved by increasing diversity in governance as well as aligning national regulations with international sustainability goals and commitments. These do imply policy steps such as promoting green finance products, stricter sustainability regulations, and investment into innovation in renewables and net-negative technologies, such as carbon

capture systems, to rectify these issues. These initiatives must be complemented by international cooperation through multilateral agreements as well as regional and multilateral cooperation platforms to tackle the global challenges we are facing and to promote the transfer of sustainable and environmentally sound technologies. Together with transparent stakeholder engagement, these measures will allow OECD countries to meet their targets for sustainability while further fuelling global environmental deliverables.

6- Conclusions

The objective of this analysis is to disclose the economic impact on the environment through both static models and the dynamic system GMM method for the period from 2000 to 2023 for a panel of OECD nations. For the purpose of testing the environmental quality and environmental sustainability, we divided financial development into domestic credit to the private sector and domestic credit to the private sector by banks. These findings speak to the two-tiered relationship between the financial system and environmental impacts. According to the analysis, this indicates the statistically significant negative effect of bank domestic credit to the private sector with regard to both carbon emissions and greenhouse gases, as well as environmental sustainability. Finally, the presented results confirm that banks from OECD countries working on the sustainable principle do so proactively in the financing of green projects and refuse to invest in environmentally. On the other hand, the domestic credit to the private sector, excluding banks, negatively and significantly promotes carbon emissions and greenhouse gases, which indicates that countries promote credit without considering the impacts of damaging projects on the environment. Another, and for FDI, we found a positive and statistically significant relationship between carbon emissions and environmental sustainability, and a positive but non-significant relationship with greenhouse gases.

There was a positive relationship between economic growth and carbon emissions and greenhouse gases, and both of these were confirmed, which, again, supports the agenda of moving away from raw economic growth

towards more sustainable economic outcomes. Also, it finds that the EKC has existed in OECD countries for carbon emissions, greenhouse gases, and sustainable development, with turning points of US\$110,452, 75,380, and 113,256, respectively. The higher turning point for carbon than for GHG emissions highlights the importance of specific control policies for carbon emissions in developed economies. The findings bolster the case for financial systems to implement broader efforts that weave environmental factors into what they do. More financial institutions need to strengthen their positive impact on sustainability by developing new financing instruments, be it green bonds or sustainability-linked loans, while credit systems must ensure that investments are being directed toward greener activities. It also points to the need for domestic and global policymakers to put efforts into building up strong environmental regulations that will direct international financial flows, not just FDI, towards sustainability goals. Additional measures, including carbon pricing, renewable energy investment incentives, and more expansive and stricter environmental disclosure requirements on financial entities, could further reduce emissions.

This analysis could be expanded by incorporating additional proxies for environmental quality and sustainability to explore wider dynamics, and we would encourage future research to do so. Country or region-specific comparative case studies might focus on how financial development facilitates respective environmental outcomes. Further, the interaction effects of financial development variables on environmental quality and sustainability effects at the national and regional levels can motivate targeted research within the broad domain to generate actionable intelligence. This paper underscores the importance of financial development as an important factor in environmental outcomes for selected OECD countries. Building long-term environmental quality and sustainability in these economies without hindering their economic growth requires these financial mechanisms to be integrated into the Sustainable Development Goals. The analysis in this study provides a basis for relevant

policymakers and financial institutions to develop tailored strategies for sustainable development in the world.

REFERENCES:

- Alam, S., Raza, S. A., Shahbaz, M., & Abbas, Q. (2023). Financial development, energy consumption, and environmental degradation: A comparative analysis of high-income, middle-income, and low-income countries. *Journal of Cleaner Production*, 420, 136843.
- Al-Mulali, U., Ozturk, I., & Lean, H. H. (2022). The effect of financial development and FDI on environmental quality in the presence of environmental regulations: Evidence from a panel of developing countries. *Environmental Science and Policy*, 129, 1–12.
- Apergis, N., & Ozturk, I. (2015). Testing environmental Kuznets curve hypothesis in Asian countries. *Ecological Indicators*, 52, 16–22.
- Armeanu, D. Ş., Lache, L., Vintilă, G., & Rădulescu, M. (2021). Exploring the environmental Kuznets curve hypothesis for carbon emissions in high-income countries. *Environmental Science and Pollution Research*, 28, 56313–56333.
- Banga, C., & Afzal, M. (2025). Navigating the Green Financial Markets: Opportunities and Challenges. *Exploring Pillars of Sustainability for Modern Age Improvements*, 201-226.
- Bhat, M. N., & Ikram, F. (2025). Catalyzing the carbon emission: The interplay of financial development and foreign investment in Asia-Pacific and Oceanian region. *Sustainability Accounting, Management and Policy Journal*, 16(1), 190-225.
- Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115–143.
- Danish, Khan, S., & Ahmad, N. (2022). Exploring the impact of financial development on environmental quality in OECD countries: A dynamic panel data approach. *Environmental Science*

- and Pollution Research, 30, 13156–13174.
- Danish, Khan, S., & Ahmad, N. (2023). Exploring the impact of financial development on environmental quality in OECD countries: A dynamic panel data approach. *Environmental Science and Pollution Research*, 30, 13156–13174.
- Destek, M. A., & Sarkodie, S. A. (2023). Examining the EKC hypothesis in OECD countries: The impact of financial development and FDI. *Journal of Environmental Management*, 318, 115480.
- Dinda, S. (2004). Environmental Kuznets Curve hypothesis: A survey. *Ecological Economics*, 49(4), 431–455.
- Dogan, E., & Turkekul, B. (2016). CO₂ emissions, real output, energy consumption, trade, urbanization, and financial development: Testing the EKC hypothesis for the USA. *Environmental Science and Pollution Research*, 23, 1203–1213.
- Gujarati, D. N., & Porter, D. C. (2019). *Basic econometrics* (6th ed.). McGraw-Hill Education.
- Imam, M. A., Ahmad, S., AlQadi, M. A., Dudin, F. E., Alhzeem, A. R., Rimawi, B. J., ... & Abdelrehim, M. (2025). Assessing the Role of Financial Development in Economic Sophistication: Evidence from a Dynamic Threshold Approach. *Journal of Posthumanism*, 5(5), 3090-3106.
- Jama, M. A., & Abdi, H. A. (2025). Towards Environmental Sustainability: Evaluating the Role of Energy Consumption, FDI, and Urbanization on Carbon Emission in Somalia: An Empirical Analysis using ARDL Bound Test. *International Journal of Energy Economics and Policy*, 15(1), 15-24.
- Katircioğlu, S. T., & Taşpınar, N. (2017). Testing the moderating role of financial development in an environmental Kuznets curve: Empirical evidence from Turkey. *Renewable and Sustainable Energy Reviews*, 68, 572–586.
- Khan, S., Danish, & Ahmad, N. (2023). Governance and environmental quality: Examining the EKC hypothesis in non-OECD countries. *Sustainability*, 15(7), 3421.
- Khan, S., Danish, & Zhang, W. (2022). Financial intermediaries and sustainable environmental investments in middle-income countries. *Journal of Cleaner Production*, 358, 131657.
- Kim, D. H., & Lin, S. C. (2023). Financial development and environmental quality: A global perspective. *Economic Modelling*, 121, 130031.
- Lu, W. C. (2019). Turning point analysis for environmental Kuznets curve: Evidence from OECD countries. *International Journal of Environmental Research and Public Health*, 16, 342.
- Li, D. (2024). Green finance, fossil fuel efficiency, and sustainable development in OECD. *Resources Policy*, 98, 105306.
- OECD. (2023). Financial development and environmental sustainability: Policy insights for OECD countries. OECD Environmental Reports.
- Onyeiwu, S. (2024). Climate Change and Sustainability. In *Emerging Issues in Contemporary African Economies* (pp. 159-177). Springer.
- Rathod, S. V., Saras, P., & Gondaliya, S. M. (2025). Environmental pollution: threats and challenges for management. In *Eco-Restoration of Polluted Environment* (pp. 1-34). CRC Press.
- Shafiq, U. S., Selamat, A.I., Nor, N. M., & Noordin, B.A.A. (2022). Global Research of Future Trends and Development in Cash Holding: A Bibliometric View.
- Sarkodie, S. A., & Adams, S. (2023). Foreign direct investment and sustainable development in sub-Saharan Africa: Evidence from pollution haven and pollution halo hypotheses. *Resources Policy*, 80, 102946.
- Shahbaz, M., Wang, X., & Zafar, T. (2023). Financial development and carbon emissions in high-income economies: Evidence from panel data analysis. *Journal of Cleaner Production*, 316, 128492.

- Shafiq, U. S., Selamat, A.I., Nor, N. M., & Noordin, B.A.A. (2024). How Audit Quality Affects Tax Avoidance: An Analytical Study in Pakistan.
- Sulehri, F. A., & Ali, A. (2024). Nexus among Regulatory Framework, Economic Growth and Sustainable Development: Insights from Structural Equation Modeling Approach. *Bulletin of Business and Economics*, 13(1), 110-117.
- Sulehri, F. A., Audi, M., Poulin, M., & Ali, A. (2024). Nexus between Innovation and Ecological Impact: A Moderated Mediation Investigation through Structural Equation Modeling Approach. *International Journal of Energy Economics and Policy*, 14(4), 509-518.
- Sun, X., Meng, Z., Zhang, X., & Wu, J. (2025). The role of institutional quality in the nexus between green financing and sustainable development. *Research in International Business and Finance*, 73, 102531.
- Tang, C. F., & Tan, B. W. (2022). Investigating the environmental Kuznets curve hypothesis: Dynamic panel data analysis for OECD countries. *Journal of Cleaner Production*, 369, 133524.
- Udegha, M. C., & Breitenbach, M. C. (2024). Investigating Financial Development and Its Direct and Indirect Environmental Effects in South Africa: Fresh Policy Insights. *The European Journal of Development Research*, 36(2), 428-495.
- Wang, X., & Zhan, X. (2023). The role of financial institutions in promoting sustainable development: A review of global practices. *Sustainable Finance and Investment Journal*, 15(2), 203-224.
- Wooldridge, J. M. (2020). *Introductory econometrics: A modern approach* (7th ed.). Cengage Learning.
- Xu, B., & Lin, B. (2025). Green credit and green technology innovation: Impact mechanism and non-linear effect test. *Environmental Impact Assessment Review*, 110, 107652.
- Yao, H., Ding, H., Li, Z., & Shoukat, A. (2025). The criticality of exports sophistication and CO2 emissions: A new path towards sustainable environmental management. *Journal of Environmental Management*, 373, 123542.
- Zhu, X., Kim, Y., & Wang, L. (2022). The dynamics of financial development and environmental degradation in high-income countries: A non-linear analysis. *Environmental Research*, 212, 113400.
- Zhang, M., Chen, Y., Lyulyov, O., & Pimonenko, T. (2022). Interactions between economic growth and environmental degradation toward sustainable development. *Systems*, 11(1), 13.
- Zhang, S., Anser, M. K., Peng, M. Y. P., & Chen, C. (2023). Visualizing the sustainable development goals and natural resource utilization for green economic recovery after COVID-19 pandemic. *Resources Policy*, 80, 103182.

Appendix A

List of OECD Countries

Australia	Greece	Portugal
Austria	Hungary	Spain
Belgium	Ireland	Sweden
Canada	Italy	Switzerland
Chile	Japan	Turkey
Denmark	Korea	United Kingdom
Estonia	Netherlands	United States
Finland	New Zealand	
France	Norway	
Germany	Poland	