

The Impact of ESG Factors on Export Diversification: Evidence from Emerging Countries Using Panel ARDL Model

BOULDJENIB Adel ^{1*}

¹University of Oum El Bouaghi , INIF Laboratory, (Algeria),
Bouledjenib.adel@univ-oeb.dz

Received: 01/09/2025

Accepted: 30/11/2025

Published: 25/12/2025

Abstract:

This study aims to examine the relationship between environmental, social, and governance (ESG) factors and export diversification in emerging economies. Using a panel ARDL model on data from 1995 to 2022, the research investigates the short and long-term impacts of each ESG pillar on reducing export concentration and encouraging more diversified trade structures.

The results show significant long-term effects: improving ESG performance decreases export concentration. Specifically, lower carbon dioxide emissions, higher life expectancy, and a stronger rule of law are linked to increased export diversification. In contrast, short-term analysis highlights the transition costs of ESG reforms, which can initially slow down diversification efforts.

Keywords: ESG factors; Export diversification; Emerging countries; sustainability.

Jel Classification Codes : Q56, O13.

*Corresponding author: BOULDEJNIB Adel

1. Introduction

Export diversification is a vital strategy for countries because it enhances economic stability and encourages growth. The advantage of diversification lies in its ability to support sustainable economic development, generate new jobs, and boost innovation across different sectors. Additionally, it allows countries to access new markets, helping them adapt to changes in global demand. Therefore, a strong export diversification strategy is crucial for improving a country's economic resilience and securing long-term prosperity.

In emerging economies, export diversification is crucial for fostering economic development and decreasing reliance on external shocks. These countries, which often depend on a limited number of primary commodities or low-value-added products, face considerable risks when global prices change or their export sectors encounter structural issues. Broadening the export base allows emerging nations to boost their competitiveness in international markets, attract foreign investment, and promote more stable and fair growth.

ESG (Environmental, Social, and Governance) factors can influence a country's economic performance by encouraging responsible business practices, decreasing environmental damage, and promoting social justice. In the context of export diversification, including ESG principles can enhance access to international markets, attract foreign investment, and boost a country's global reputation. Therefore, integrating ESG factors into national economic policies can play a crucial role in supporting export diversification.

Despite increasing recognition of the importance of export diversification for economic growth, many emerging economies still show high levels of export concentration, making them vulnerable to external shocks, commodity price volatility, and fluctuations in global demand. While traditional factors influencing export diversification, such as infrastructure, innovation capacity, and human capital, have been widely studied, the potential impact of ESG factors remains

underexplored in the empirical literature, particularly in the context of emerging markets. Based on this, the following question arises: **Do ESG factors influence export diversification in emerging countries in both the short and long term?** This question leads to the following hypothesis: **ESG factors positively impact export diversification in emerging countries in both the short and long term.**

Given the global shift toward sustainable economic models and investment strategies that include ESG considerations, understanding the relationship between ESG factors and export diversification is essential. For policymakers, this paper offers evidence on how enhancing environmental management, social inclusion, and corporate governance can not only help achieve sustainability goals but also strengthen a country's economic objectives by promoting a more diverse and competitive export sector. For academic researchers, the paper connects sustainability science with international trade theory, making valuable contributions to both fields.

This paper makes a novel contribution to the literature by being the first study, to the author's knowledge, to empirically examine the relationship between ESG factors and export diversification at the macroeconomic level in emerging economies. While ESG considerations have gained significant prominence in studies on corporate finance and sustainability, their potential role in shaping national export structures remains largely unexplored.

The study's methodological contribution is evident through the application of the panel autoregressive distributed lag (Panel ARDL) approach. This method enables the estimation of both short-term and long-term equilibrium relationships, effectively addressing the time complexity of ESG impacts on economic structure. This is especially relevant for emerging economies, where the effects of structural adjustments and policy reforms appear gradually over time.

2. Literature review

The relationship between Environmental, Social, and Governance (ESG) factors and macroeconomic indicators has gained increasing attention in academic literature, reflecting the growing importance of sustainable practices in global trade. Previous theoretical and empirical research has explored the connection between export diversification and ESG performance. These studies have provided diverse perspectives on how ESG considerations influence export patterns, economic growth, and environmental sustainability.

Export diversification is a vital economic strategy focused on reducing reliance on a narrow range of exports, particularly in low-income countries and small states (Lee & Zhang, 2022). Diversification acts as a mechanism that helps build economic resilience, enabling countries to lessen their vulnerability to external shocks by broadening their export base (Vogel, 2024).

Environmental concerns, such as carbon emissions and energy consumption, along with social factors like workers' rights and human capital, as well as governance issues, influence economies' ability to diversify their exports while maintaining sustainability (Rehman et al., 2021; Liu et al., 2019).

2.1. Environment (E) pillar

The application of the Environmental Kuznets Curve (EKC) hypothesis, which suggests that economic development initially causes environmental degradation but later leads to environmental improvement as income increases, has been a common theme in understanding the relationship between export diversification and environmental sustainability. (Liu et al., 2019) point out that there is a nonlinear relationship between economic development and environmental performance in low- and high-income countries. Low-income countries show a U-shaped relationship between export diversification (used as a proxy for economic development) and CO₂

emissions, while the Kuznets curve appears as an inverted U-shape in OECD countries. This latter pattern aligns with the overall results across the study sample of 125 countries.

Similarly, (Can et al., 2020) confirm the validity of the Environmental Kuznets Curve (EKC) hypothesis using a sample of 84 developing countries. He indicates that as the economy grows, environmental degradation increases up to a certain point, then begins to decrease as growth continues. (Ali et al., 2022) also support the EKC hypothesis in their study of India, suggesting an inverse relationship between ecological footprint and economic growth. This means that initially, as the economy grows, the ecological footprint increases, but after reaching a certain level of economic development, the ecological footprint begins to decline.

Mixed results were also found by (Shahzad et al., 2021) when they investigated the impact of export product diversification on renewable energy consumption in G-7 and E-7 countries. For G-7 countries, which are more developed, the study reveals that diversifying export products has a positive impact on renewable energy consumption. For the E-7 countries, which are emerging economies, the results suggest a more complex relationship, the impact of export diversification on renewable energy consumption is not clear and may vary depending on other economic and political factors present in these countries.

Other studies have identified a negative relationship between the environment pillar and export diversification. (Liu et al., 2024) found that both export diversification and natural resources increase carbon emissions in the UAE. Similarly, (Udeagha & Ngepah, 2023) emphasized that economic growth related to export diversification can worsen environmental damage, especially in countries with weak governance structures. In the same context, (Saboori et al., 2022) concluded that export diversification in Oman has a positive impact on environmental degradation, likely due to the types of industries being developed or expanded.

In contrast, some studies have identified a positive relationship between the environment pillar and export diversification. (Rehman et al., 2021) found that export diversification, along with renewable energy consumption and regulatory quality, can reduce greenhouse gas emissions in Asian countries. Similarly, (Fareed et al., 2021) found that export diversification in Indonesia positively impacts the load capacity factor, a key measure of environmental sustainability. In the same context, (Wang et al., 2020a) found that countries can reduce their reliance on carbon-intensive industries and shift toward more sustainable economic activities by diversifying exports. Consistent with previous studies, (Sultanova & Naser, 2025) and (Yakubu et al., 2022) found that diversification reduces the ecological footprint. These findings were supported by (Jiang et al., 2022), who determined that diversification and productive agriculture reduce pollution over the long term, and (Dai & Du, 2023), who suggested that trade diversification and environmental policies alleviate environmental pressure. Additionally, (Geng & Fan, 2023) found that diversification reduces resource stress.

2.2 Social (S) pillar

Social factors like labor and human rights significantly influence export diversification strategies. Countries with higher social standards are more likely to attract foreign investment and access global markets, which can promote export diversification. For example, in a study on Malaysian SMEs, (Adenan et al., 2024) found that compliance with social standards, such as human rights and social responsibility, can improve companies' financial performance, making them more competitive internationally.

(Kampoowale et al., 2024) showed that ESG performance is regarded as a mediating factor in the relationship between board gender diversity and financial performance, and that ESG performance itself positively affects financial performance.

Human capital development is also a key social factor that influences export diversification. Studies have shown that investing in education and workforce development can lead to increased labor

efficiency, which is essential for diversifying exports into high-value-added products (AMazzioni et al., 2024; Giri et al., 2019). In this context, a study of sub-Saharan African countries found that improving educational outcomes at the secondary level is a crucial factor in driving export diversification, especially in the manufacturing sector (Ajayi, 2023).

2.3 Governance (G) pillar

Governance standards, such as institutional quality and the rule of law, are essential for promoting export diversification. Countries with strong institutional frameworks are better able to attract foreign direct investment, which contributes to export diversification. (Luo et al., 2024) suggested that governance quality, including political stability, regulatory quality, and control of corruption, enhances the positive association between ESG performance and financial performance. (Mooneepen et al., 2022) found that companies tend to achieve higher ESG performance in countries with lower levels of democracy and political stability, and that corporate governance performance is higher in countries with better regulatory quality. In a study of BRICS countries, (AMazzioni et al., 2024b) found that higher levels of transparency and the absence of corruption are associated with better environmental and social performance, which may strengthen a country's ability to diversify its exports. (Ibrahim et al., 2020) indicate that corruption and bureaucratic inefficiency hinder production diversification. (Sener & Akben, 2020) highlighted the role of country-level governance in shaping corporate diversification. They noted that the governance environment within a country can influence how firms diversify, possibly due to differences in regulatory frameworks, law enforcement, and overall institutional quality.

The role of governance factors in export diversification can be seen through their impact on investment decisions, (Chaklader et al., 2024) found that companies with higher scores on ESG criteria attract

more foreign investment. This suggests that strong ESG performance may contribute to economic stability.

Governments often use financial incentives like tax breaks and subsidies to encourage export diversification. However, the effectiveness of these incentives depends on the quality of governance and the presence of credible institutions (Gamariel et al., 2022; Giri et al., 2019). For instance, Gamariel et al. (2022) found that financial incentives for foreign investors in special economic zones in sub-Saharan African countries can enhance the impact of FDI on export diversification, especially when paired with improved access to infrastructure.

3. Data and model

3.1 Data

Our dataset includes annual data from 27 emerging countries from 1995 to 2022 (a total of 729 country-year observations). This dataset encompasses the following variables:

Market concentration Theil index aggregated by products (dependent variable): This is an overall measure of the market concentration for individual products. It is the weighted sum of Theil indices that measure the market concentration for each exported product, using the shares of each product in total exports as weights. It is calculated as follows:

The share of product k in total exports of an economy (X_k):

$$x_k = \sum_{j=1}^m X_{kj} \times \left[\sum_{k=1}^n \sum_{j=1}^m X_{kj} \right]^{-1}$$

- The share of market j in the exports of product k ($x_{j,k}$):

$$x_{j,k} = \sum_{j=1}^m X_{kj} \times \left[\sum_{j=1}^m X_{kj} \right]^{-1}$$

- T_M : Market (per product) concentration Theil index

$$T_m = \sum_{k=1}^n x_k \times \left[\sum_{j=1}^m x_k \times x_{j,k} \ln(x_{j,k} \times m) \right]$$

Where:

- n: total number of all available (potential) exported products;
- m: total number of all available (potential) markets these products are exported to;
- X_{kj} : value of exports of product k to market j;
- x_k : share of product k in total exports;
- $x_{j,k}$: share of market j in the exports of product k.

Per capita annual CO2 emissions (E pillar): It shows the average person's emissions in a country or region. It is calculated by dividing total emissions by the population.

Rule of law (G pillar): It reflects people's perceptions of how much they trust and obey societal rules, especially regarding contract enforcement, property rights, police, courts, and the likelihood of crime and violence.

Life expectancy at birth (S pillar): refers to the number of years a newborn would live if current mortality rates remain the same throughout their life.

Trade as a percentage of GDP (control variable): the total value of exports and imports of goods and services expressed as a percentage of GDP.

Data are sourced from the World Bank database for ESG and control variables and from the UN Trade Data Hub for the Theil concentration index.

All variables were transformed using natural logarithms for analysis to ensure comparable measurement units and reduce heteroscedasticity and skewness of the original data.

3.2 Research model

This paper uses the panel Auto-Regressive Distributed Lag Modelling Approach (Panel ARDL) for research, which was first

introduced by (Pesaran et al., 1995). This model uses previous periods to show the long-term and short-term regression relationships between dependant and independent variables. Therefore, in order to examine the ESG effect on export diversification, the following research model was formulated.

$$\begin{aligned} \Delta LOG_EC_{it} = & \phi_i (LOG_EC_{i,t-1} - \theta_{1i} LOG_AE_{i,t-1} - \theta_{2i} LOG_RL_{i,t-1} - \\ & \theta_{3i} LOG_LE_{i,t-1} - \theta_{4i} LOG_TGDP_{i,t-1}) + \sum_{j=1}^{p-1} \beta_{ij} \Delta LOG_EC_{i,t-j} + \\ & \sum_{j=0}^{q-1} \delta_{1ij} \Delta LOG_AE_{i,t-1} + \sum_{j=0}^{q-1} \delta_{2ij} \Delta LOG_RL_{i,t-1} + \\ & \sum_{j=0}^{q-1} \delta_{3ij} \Delta LOG_LE_{i,t-1} + \sum_{j=0}^{q-1} \delta_{4ij} \Delta LOG_TGDP_{i,t-1} + \mu_i + \epsilon_{it} \end{aligned}$$

Where:

- EC_{it} : The Market concentration Theil index of country i in year t;
- $AE_{i,t-1}$: Annual CO2 Emission per capita of country i in year t-1;
- $RL_{i,t-1}$: Rule of Law of country i in year t-1;
- $LE_{i,t-1}$: Period life expectancy at birth of country i in year t-1;
- $TGDP_{i,t-1}$: Trade as percentage of GDP of country i in year t-1;
- μ_i : a country-specific effect;
- ϵ_{it} : the error term ;
- Δ the first order difference term;
- θ : Long-term coefficients ;
- δ : Short term coefficients ;
- ϕ : error correction term;
- LOG : logarithm.

4. Results and discussion

4.1. Descriptive Statistics

Table 1. Descriptive Statistics

Variables	Mean	Median	Max	Min	ST. DEV.
LOG_EC	1.2017	1.1743	1.6045	0.7695	0.1685
LOG_AE	1.3846	1.3950	4.3389	-0.7386	1.0527
LOG_RL	-0.6719	-0.6051	-0.0356	-2.9759	0.4420
LOG_LE	4.2804	4.2993	4.4181	3.9873	0.0727
LOG_TGDP	4.1330	4.1280	5.3954	2.7495	0.4928

Source: Eviews 13 output.

Descriptive statistics show significant differences across countries in ESG indicators and export concentration index. The Thiel Index indicates limited variation. Meanwhile, per capita CO2 emissions displays high dispersion, reflecting structural imbalances among countries. Rule of law, life expectancy and trade openness are more evenly distributed.

4.2. preliminary tests

Before estimating the model, we first need to perform several preliminary tests.

4.2.1. Slopes heterogeneity

The fundamental assumption of the panel ARDL model is the heterogeneity of the slopes. To test for slope heterogeneity, we use the (Pesaran & Yamagata, 2008) test, which is an improved and more robust version of (Swamy's, 1970) test. The results are shown in table 2.

Table 2. test for slopes heterogeneity

Test	Statistics Value
Delta	20.194***

Source: STATA 17 output.

The results of the slope heterogeneity test suggest the rejection of the null hypothesis of homogeneous slope coefficients across countries ($p < 0.001$). This indicates significant cross-sectional variation in how ESG and control variables influence export diversification.

4.2.2. Cross sectional dependence of variables

The second preliminary test we need to perform is the test for cross-sectional dependence. Cross-sectional dependence (CD) refers to the correlation among units (countries) in panel data across different time periods. Cross-sectional dependence will help us select the appropriate test for stationarity and cointegration. Table 3 shows preush-pagan test for cross-sectional dependence, this test is suitable for $T > N$.

Table 3. cross sectional dependence test

Variables	Statistics value
LOG_EC	3024.022***
LOG_AE	4016.581***
LOG_RL	2387.872***
LOG_LE	7802.954***
LOG_TGDP	2730.258***

Source: Eviews 13 output.

For all variables, the test is significant at $\alpha = 0.05$, which indicates a cross-sectional dependence between units in all model variables.

4.1.3. Panel unit root tests

To prevent regression errors, unit root tests should be performed on panel data before regression analysis. This paper employs three panel unit root test methods that consider potential cross-sectional dependence: Pesaran's CIPS test, Levin-Lin-Chu Test, and Augmented Dickey-Fuller test.

Table 4. Panel unit root tests

Variables	Pesaran's CIPS		Levin-Lin-Chu Test		ADF test	
	Level	difference	Level	Difference	level	Difference
LOG_EC	-2.186	-4.870***	-2.136	-7.230***	52.623	228.580***
LOG_AE	-1.294	-4.841***	-1.343*	-13.305***	49.949	313.360***
LOG_RL	-1.163	-3.901 ***	2.581	-8.032***	40.193	199.455***
LOG_LE	-2.238 **	-4.008***	-6.530***	-15.092***	60.465	360.063***
LOG_TGDP	-1.522	-4.593***	-0.606	-10.170***	64.060	247.140***

Source: Eviews 13 output.

Table 4 displays the results of unit root tests for each variable. Level indicates the original series, while Difference shows the first-order difference series. Most series are non-stationary at level but become stationary after the first difference, except for LOG_LE in Pesaran's CIPS and Levin-Lin-Chu tests, and LOG_AE in the Levin-Lin-Chu tests, which are stationary in level. Based on these results, it is evident that the series are non-stationary at level but stationary at first difference, making cointegration testing necessary to examine the long-term relationships between the variables.

4.2.4. Panel cointegration tests

To demonstrate the existence of long-term equilibrium between the dependent and independent variables, a cointegration test should be conducted. To analyze the cointegration relationship in a panel data model, this study selected (Kao, 1999) and (Pedroni, 2004) tests because they are more comprehensive. The Pedroni test used seven test statistics (four within-dimension tests and three between-dimension tests).

Table 5. Cointegration tests

Test	Statistic	Value
Kao	t-statistic	1.9516***
Pedroni	(panel v-statistic)	-1.7337
	(panel rho-statistic)	1.1486
	(panel PP-statistic)	-5.005***
	(panel ADF-statistic)	-3.200***
	Group rho-Statistic	3.3317
	Group PP-Statistic	-4.050***
	Group ADF-Statistic	-1.9661***

Source: Eviews 13 output.

From the table above, Kao test shows significant results at $\alpha=0.05$, thus we reject the null hypothesis of no cointegration. Similarly, Pedroni test shows significant results in four of seven tests (panel PP-statistic, panel ADF statistic, Group PP-statistic, Group ADF-statistic). This means that most cointegration tests in the Pedroni test indicate the presence of a cointegration series.

These results strongly indicate a long-term relationship among our variables, further validating the use of the Panel ARDL approach.

4.3. Regression results

Because of the heterogeneity of our variables, we estimate our model using two estimators:

- **Mean Group (MG) Estimator:** which allows for heterogeneity in both short-run and long-run coefficients across countries.

- **Pooled Mean Group (PMG) Estimator:** which assumes homogeneity in long-run coefficients but allows for heterogeneity in short-run coefficients and error variances across countries.

Hausman test will be used to select between these estimators.

Table 6 below summarizes the regression results for both the long run and short run.

Table 6. Regression results

Variables	PMG	MG
Long run coefficients		
LOG_AE	-0.1107***	-0.0424
LOG_RL	-0.1670***	-0.4699*
LOG_LE	-0.9159***	-0.2923
LOG_TGDP	-0.0810***	-0.1108
Short run coefficient		
ECT	-0.1947***	-0.1403***
D(LOGRULE)	0.0196*	-0.0031
D(LOG_EMISSION)	0.0773**	0.2202*
Hausman test	4.1446	

Source: Eviews 13 output.

The results of the Hausman test between PMG and MG indicate that the null hypothesis is accepted, and therefore, PMG is preferred over MG.

The empirical findings of this study offer multiple insights into the complex relationship between ESG factors and export diversification across 27 emerging economies from 1995 to 2020. Using the panel ARDL framework, the results show statistically significant long-term effects of ESG indicators on export concentration, supporting the research hypothesis that ESG performance helps promote export diversification.

The negative coefficients in the long-run relationship for all ESG-related variables indicate that improvements in environmental factors (represented by per capita CO₂ emissions), social factors

(represented by life expectancy), and governance factors (represented by rule of law) are associated with lower export concentration, which implies greater diversification. This result aligns with the a priori expectation that countries committed to ESG standards create favorable environments for economic growth and diversification. In particular, the negative coefficient for CO₂ emissions supports the hypothesis that environmentally responsible practices can shift the production structure away from polluting sectors, enabling more sustainable and diversified export patterns. This finding is consistent with previous research (Rehman et al., 2021; Fareed et al., 2021; Wang et al., 2020b), which found similar links in Asian economies.

However, the short-term significant and positive effect of CO₂ emissions on export concentration suggests a trade-off over time. In the short term, efforts to reduce emissions (e.g., through regulatory restrictions) may negatively impact economic activity and limit efforts to diversify exports. Environmental costs may also increase as economies invest in diversification efforts or industrial expansion. This is shown by (Shahzad et al., 2021) in emerging markets, where short-term expansion into new sectors can temporarily heighten environmental pressures before long-term benefits are realized.

Findings on the governance pillar, represented by the rule of law, highlight the crucial role that institutional strength plays in shaping trade outcomes. The long-term negative link between the rule of law and export concentration shows that strong legal systems, contract enforcement, and property rights can boost investor confidence and encourage export diversification. This supports the findings of (Luo et al., 2024) and (Gamariel et al., 2022), who stressed the importance of institutional quality in attracting FDI and encouraging sectoral diversification. However, the short-term positive relationship observed in our study suggests that governance reforms may initially involve economic restructuring and adjustments that temporarily slow export diversification. These transitional challenges

align with the findings of (Mooneepen et al., 2022), who underscored the context-specific effects of governance on economic outcomes.

The long-term negative relationship between the social pillar, measured by life expectancy at birth, and export concentration aligns with the view that improved human capital and healthcare promote more innovative and diversified production systems. This finding agrees with (AMazzioni et al., 2024b) and (Ajayi, 2023), who emphasized the importance of social development and human capital in export diversification, especially in sub-Saharan Africa and low-income countries.

Incorporating control variables, represented by trade openness, enhances the analysis and reflects the structural context in which ESG factors function. Trade openness was negatively linked to export concentration over the long term, confirming the liberalization-diversification relationship identified by (Vogel, 2024) and (Swathi. M & Sridharan, 2022).

The value of the error correction term (ECT) is negative and significant at $\alpha=0.01$, confirming the existence of long-term relationships. Its value suggests it would take approximately 5 years for the dependent variable to return to equilibrium.

This study makes a significant contribution by integrating the three pillars of ESG within a unified econometric framework, addressing a key gap identified by (Chaklader et al., 2024) and (Kampoowale et al., 2024), who pointed out the lack of comprehensive approaches in earlier research. Furthermore, while many prior studies have focused on environmental impacts or relied on case-specific perspectives, our analysis of a diverse sample of emerging economies offers more generalizable insights.

The use of the panel ARDL model, supported by pre-estimation diagnostics, including unit root, cointegration, and cross-sectional dependence tests, ensures methodological rigor. This econometric

approach also addresses previous concerns in the literature about model misspecification and heterogeneity bias.

The findings indicate that policymakers aiming to diversify exports should focus not only on trade-related instruments but also on investing in environmental sustainability, corporate governance, and social development. Incorporating ESG principles into national trade and industrial strategies can bring substantial advantages for a country's competitiveness.

4.4. Errors dignostics

The most important assumption for PMG estimators is the independence of errors. Table 5 shows four tests for this independence.

Table 7. Errors independence tests

Tests	Statistics value
Breush-Pagan LM	381.3767
Pesaran Scaled LM	1.1464
Bias Corrected scaled LM	0.6064
Pesaran CD	3.5743**

Source: Eviews 13 output.

From table 7, we see that three out of four tests are not significant. The most important tests are the Breusch-Pagan LM test, which assumes that $T > N$, and the Bias-Corrected scaled LM test, which assumes that N and T are large. Both of these tests are not significant, so we can accept the null hypothesis of independent errors.

5. Conclusion

This study aimed to investigate whether environmental, social, and governance (ESG) factors significantly influence export

diversification in emerging economies, using a panel ARDL model on data from 1995 to 2022. The paper empirically assessed the short- and long-term effects of ESG pillars on export diversification. Empirical results confirm a long-term relationship between ESG factors and export diversification, supporting the hypothesis that ESG factors positively impact export diversification in the long term. Specifically, lower CO₂ emissions, higher life expectancy, and a stronger rule of law are strongly associated with diversified export structures. These findings suggest that diversification and sustainability can go hand in hand and even strengthen each other. However, short-term dynamics show opposite effects: environmental improvements and governance reforms may initially slow diversification due to transitional costs. Therefore, the hypothesis that ESG factors positively influence export diversification in the short term is rejected.

The theoretical contribution of this study lies in integrating the three pillars of social, environmental, and governance (ESG) into a single analytical framework, an approach rarely used in previous studies. Practically, using the panel ARDL model, enhanced with comprehensive diagnostics for heterogeneity, cross-sectional dependency, and cointegration, enables a more precise analysis of the relationship between social, environmental, and governance (ESG) factors and export diversification over time. This not only enhances methodological rigor but also allows the extraction of policy-relevant insights applicable to various emerging markets economies.

As with any empirical research, this study has some limitations. First, despite the extensive dataset, macroeconomic-level ESG variables may not fully reflect the nuances of each country. Second, while the ARDL model is useful, its results are still sensitive to omitted-variables bias, which cannot be completely addressed. Third, the ESG indicators used are proxies and may not capture all dimensions of sustainability as they are implemented in practice.

Based on these findings, we present several recommendations. For policymakers in emerging countries, integrating environmental,

social, and governance (ESG) principles into export and industrial strategies should be a top priority, not only to meet international standards but also to stimulate economic diversification. Environmental and governance reforms should be accompanied by transitional support to reduce potential short-term negative impacts. Institutions need to be strengthened, and investments in social infrastructure, such as education and healthcare, should be prioritized. For researchers, future research could examine case studies within specific sectors, alternative measures of ESG performance, and their vulnerability to external shocks.

6. Bibliography List :

- Adenan, F. A., Ariff, A., & Adnan, S. M. (2024). *ESG in Small and Medium-Sized Enterprises: Malaysian Perspectives*. *E3S Web of Conferences*, 574, 03001–03001.
- Ajayi, K. J. (2023). *Impact of Export Diversification on Economic Growth in Sub-Saharan Africa (SSA)*. *South Asian Journal of Social Studies and Economics*, 20(3), 289–299.
- Ali, S., Can, M., Shah, M. I., Jiang, J., Ahmed, Z., & Murshed, M. (2022). *Exploring the linkage between export diversification and ecological footprint: evidence from advanced time series estimation techniques*. *Environmental Science and Pollution Research*, 29(25), 38395–38409.
- AMazzioni, S., Soschinski, C. K., Leite, M., Dal Magro, C. B., & Raimundini Sanches, S. L. (2024a). *ESG Performance in Emerging Economies*. *Macro Management & Public Policies*, 6(1).
- Can, M., Dogan, B., & Saboori, B. (2020). *Does trade matter for environmental degradation in developing countries? New evidence in the context of export product diversification*. *Environmental Science and Pollution Research*, 27(13), 14702–14710.
- Chaklader, B., Chaklader, G., & Shrivastav, S. K. (2024). *Impact of environmental, social and governance (ESG) on foreign*

- institutional investments in India: a machine learning perspective. *Benchmarking*. 32(7),2404-2424.
- Dai, S., & Du, X. (2023). Discovering the role of trade diversification, natural resources, and environmental policy stringency on ecological sustainability in the BRICST region. *Resources Policy*, 85.
- Fareed, Z., Salem, S., Adebayo, T. S., Pata, U. K., & Shahzad, F. (2021). Role of Export Diversification and Renewable Energy on the Load Capacity Factor in Indonesia: A Fourier Quantile Causality Approach. *Frontiers in Environmental Science*, 9, 770152.
- Gamariel, G., Bomani, M., Musikavanhu, L., & Juana, J. (2022). Foreign direct investment and export diversification in developing countries. *Risk Governance and Control: Financial Markets & Institutions*, 12(1), 74–89.
- Geng, Y., & Fan, A. (2023). How trade diversification affects resources sustainability in China: Exploring the role of institutional quality and environmental policies uncertainty. *Resources Policy*, 86.
- Ibrahim, N. N., Veronique, D. P., & Gautier, T. T. (2020). Export Diversification in Sub-Saharan Africa: What are the Explanatory Factors in Country Groups? *Asian Journal of Economics, Business and Accounting*, 17(3), 27–37.
- Jiang, G., Alvarado, R., Murshed, M., Tillaguango, B., Toledo, E., Méndez, P., & Isik, C. (2022). Effect of Agricultural Employment and Export Diversification Index on Environmental Pollution: Building the Agenda towards Sustainability. *Sustainability (Switzerland)*, 14(2).
- Kampoowale, I., Kateb, I., Salleh, Z., & Alahdal, W. M. (2024). Board gender diversity and ESG performance: pathways to financial success in Malaysian emerging market. *International Journal of Emerging Markets*.
- Lee, D., & Zhang, H. (2022). Export diversification in low-income countries and small states: Do country size and income level

- matter. *Structural Change and Economic Dynamics*, 60, 250–265.
- Liu, H., Kim, H., & Choe, J. (2019). Export diversification, CO2 emissions and EKC: panel data analysis of 125 countries. *Asia-Pacific Journal of Regional Science*, 3(2), 361–393.
- Liu, X., Udemba, E. N., Emir, F., Hussain, S., Khan, N. U., & Abdallah, I. (2024). Nexus between resource policy, renewable energy policy and export diversification: Asymmetric study of environment quality towards sustainable development. *Resources Policy*, 88, 104402.
- Luo, Z., Li, Y., Nguyen, L. T., Jo, I., & Zhao, J. (2024). The Moderating Role of Country Governance in the Link between ESG and Financial Performance: A Study of Listed Companies in 58 Countries. *Sustainability*, 16(13), 5410–5410.
- Mooneepen, O., Abhayawansa, S., & Mamode Khan, N. (2022). The influence of the country governance environment on corporate environmental, social and governance (ESG) performance. *Sustainability Accounting, Management and Policy Journal*, 13(4), 953–985.
- Rahul Giri, B., Noor Quayyum, S., & Joy Yin, R. (2019). Understanding Export Diversification: Key Drivers and Policy Implications. *IMF Working Papers*, 2019(105), 1–29.
- Rehman, M. A., Fareed, Z., Salem, S., Kanwal, A., & Pata, U. K. (2021). Do Diversified Export, Agriculture, and Cleaner Energy Consumption Induce Atmospheric Pollution in Asia? Application of Method of Moments Quantile Regression. *Frontiers in Environmental Science*, 9.
- Saboori, B., Zaibet, L., & Boughanmi, H. (2022). Export diversification, energy consumption, economic growth and environmental degradation: Evidence from Oman. *International Journal of Ambient Energy*, 43(1), 8486–8504.
- Sener, P., & Akben-Selcuk, E. (2020). Does governance affect corporate diversification behaviour in emerging markets. *Applied Economics Letters*, 27(15), 1238–1242.

- Shahzad, U., Lv, Y., Doğan, B., & Xia, W. (2021). Unveiling the heterogeneous impacts of export product diversification on renewable energy consumption: New evidence from G-7 and E-7 countries. *Renewable Energy*, 164, 1457–1470.
- Sultanova, G., & Naser, H. (2025). Navigating sustainability: how export diversification influences ecological footprints in developed and developing countries. *Discover Sustainability*, 6(1).
- Swathi. M., & Sridharan, P. (2022). Determinants of Export Diversification: Evidence from Fractional Logit Estimation Model. *Foreign Trade Review*, 57(2), 160–177.
- Udeagha, M. C., & Ngepah, N. (2023). Towards climate action and UN sustainable development goals in BRICS economies: do export diversification, fiscal decentralisation and environmental innovation matter? *International Journal of Urban Sustainable Development*, 15(1), 172–200.
- Vogel, T. (2024). Combining the pieces: identifying key determinants of export diversification in Africa amidst model uncertainty. *Weltwirtschaftliches Archiv-Review of World Economics*.
- Wang, L., Chang, H. L., Rizvi, S. K. A., & Sari, A. (2020a). Are eco-innovation and export diversification mutually exclusive to control carbon emissions in G-7 countries? *Journal of Environmental Management*, 270, 110829.
- Yakubu, I. N., Kapusuzoglu, A., & Ceylan, N. B. (2022). Investigating the Role of Export Diversification, Remittances, and Environmental Sustainability in Accordance with Clean Energy and Zero Emission. In *Contributions to Economics* (pp. 51–65). Springer Science and Business Media Deutschland GmbH.