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Analysing the Impact of Economic Growth on Forest Loss – The Moderating Role of Democratic Institutions

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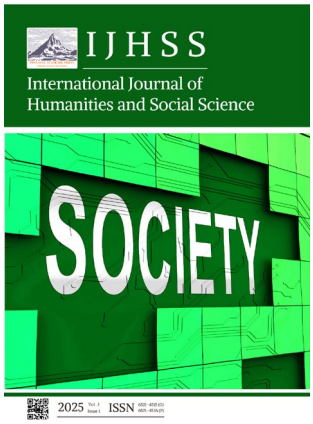

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Abstract: The purpose of this study is to explore the impact of economic growth on forest loss and to examine the moderating role of democratic institutions in it. Through panel data regression analysis, this paper analyses the effects of economic growth, institutional quality and their interaction on forest resource depletion in different countries. The results show that there is a significant negative correlation between economic growth and forest loss, i.e., economic growth is usually accompanied by forest resource depletion. At the same time, democratic institutions play a positive moderating role in this process. Specifically, democracies effectively mitigate the negative impacts of economic growth on forest resources by featuring higher policy transparency and public participation. The interaction effect analysis further proves that democratic institutions can play a key role in the process of economic growth and promote a balance between economic growth and environmental protection. Therefore, this paper suggests strengthening democratic governance, promoting green economic transformation, and enhancing international co-operation to promote sustainable development and forest resource conservation.

Keywords: economic growth; forest loss; democracy; panel data; interaction effects

1. Introduction

1.1. Background and Significance of the Study

Forests are a core component of the earth's ecosystem, and they play an irreplaceable role in regulating climate, maintaining biodiversity, purifying air and water, and maintaining soil and water. However, global forest resources are facing serious threats. According to data released by the Food and Agriculture Organization of the United Nations (FAO), about 74 million hectares of forests are deforested or degraded globally every year, especially in the tropics, and the rate of forest loss is alarming. This phenomenon not only contributes to climate change, but also threatens biodiversity and affects the global water cycle and soil quality.

The causes of forest loss are diverse, with economic growth considered a key driver of forest degradation. As the global economy continues to grow, especially in developing countries, overexploitation of forest resources has become a problem that cannot be ignored. Agricultural expansion, urbanisation and industrialisation have all put enormous pressure on forest ecosystems. In many countries, economic growth has often been accompanied by the exploitation and depletion of forest resources, especially in countries where economic development is still in its infancy, and deforestation is often seen as a necessary step to advance economic development [1].

However, the impact of economic growth on forest loss is not static. Differences in political institutions, particularly in democracies, may have a moderating effect on the relationship between economic growth and forest conservation. In democracies, high political transparency, strong popular participation and better government accountability mechanisms are features that help promote environmental protection policies and reduce forest loss. In contrast, in non-democratic countries, decision-making processes may lack transparency and citizen oversight, and forest resource management faces greater challenges. Therefore, examining whether democracy plays a moderating role between economic growth and forest loss is an important question that needs to be answered in the field of forest conservation today [2]. This study aims to explore the impact of economic growth on forest loss and further analyse the possible moderating effect of democratic institutions in this process. Through this study, we can gain a deeper understanding of the relationship between economic growth and forest protection under different political systems, and put forward targeted policy recommendations to promote the sustainable management of global forest resources.

1.2. Research Questions and Objectives

The main objective of this study is to explore the impact of economic growth on forest loss, focusing on analysing the moderating role of democratic institutions in this process. Specifically, the study will answer the following questions:

How does economic growth affect forest loss? The study will explore the direct impact of economic growth on forest loss, analysing how the state influences forest conservation through development patterns and resource management strategies at different stages of economic growth.

How democracy regulates the relationship between economic growth and forest loss. The study will focus on analysing the moderating effect of democracy on the relationship between economic growth and forest loss, and exploring whether democracies are able to mitigate forest loss due to economic growth by increasing policy transparency, promoting popular participation, and enhancing government accountability [3].

Whether the relationship between economic growth and forest loss varies across political systems is an important question. This study will also compare the relationship between economic growth and forest loss in democracies and non-democracies to reveal how political institutions affect the strength and direction of this relationship.

By exploring the above research questions, this study aims to provide new theoretical perspectives on the balance between economic development and forest protection, as well as empirical support and policy recommendations for policy makers in promoting sustainable development.

1.3. Research Methodology and Framework

In order to verify the impact of economic growth on forest loss and the moderating effect of democracy, this study combines the panel data regression model to analyse the relationship between economic growth, forest loss and democracy index on a global scale.

This study will construct a dataset using global forest loss data, economic growth data, democracy index, and other socio-economic and political variables [4]. A panel data regression model will be constructed to analyse the relationship between economic growth, democracy indices and forest loss. In particular, the study will consider the moderating effect of democracy on the relationship between economic growth and forest loss by introducing an interaction term to verify whether democracy is able to mitigate forest loss due to economic growth.

1.4. Research Innovations and Contributions

This article will conduct quantitative analyses on a global scale to compare the relationship between economic growth, forest loss and democracy in different countries and

regions, filling the gap of the lack of multi-country cross-border comparisons in the existing literature [5]. Meanwhile, the article introduces democratic institutions as a moderating variable to analyse how democratic institutions affect the relationship between economic growth and forest loss. This analysis contributes to understanding the role of political institutions in environmental protection and provides richer policy guidance.

The policy recommendations of this study will provide countries, especially those in the early stages of economic development, with strategies to cope with forest loss. The results of the study will contribute to the formulation of more scientific and sustainable economic development policies that will promote a win-win situation for environmental protection and economic growth. Finally, the article analyses the relationship between economic growth and forest loss from the perspective of political economy, and explores the moderating role of democracy, which can provide new perspectives and ideas for the theoretical system of global sustainable development [6].

1.5. Structure

This paper is divided into five parts. Chapter 2 is the literature review and theoretical framework, systematically sorting out the related studies on economic growth, democratic system and forest loss, and proposing research hypotheses. Chapter 3 introduces the research methodology and data sources, describes the construction of the empirical model and the selection of variables. Chapter 4 presents the empirical analyses, showing the results of the benchmark regression and the test of the moderating effect of democratic institutions. Chapter 5 summarises the findings and discusses policy implications and future research directions.

2. Literature Review and Theoretical Analysis

2.1. The Relationship between Economic Growth and Forest Loss

The relationship between economic growth and forest loss is one of the core topics in environmental economics and sustainable development research. In recent years, with the global emphasis on the ecosystem service function of forests, research on this issue has received increasing attention. Many developing countries, in the process of promoting GDP growth, have converted a large amount of forests into agricultural and industrial land, resulting in a continuous decline in forest cover and irreversible ecological damage. Imperfect governance mechanisms may lead to predatory exploitation of resources, further exacerbating forest loss [7].

However, some scholars have also emphasised that economic growth may provide a resource base for forest conservation. In countries with higher levels of economic sophistication, rising income levels can help to drive public environmental awareness, governmental fiscal capacity, and green technological innovations that lead to environmental improvements. This view echoes the Environmental Kuznets Curve (EKC) theory, which suggests that environmental degradation increases in the early stages of development, but tends to improve after a certain level of economic maturity.

Nevertheless, there is no consensus in the literature on the relationship between economic growth and forest loss. The reason for this is that the impact of economic growth is not linear or unidirectional, but depends on a range of mediating variables and institutional contexts, including the mode of growth (resource-driven or knowledge-intensive), the institutional arrangements for land, the level of technological advancement, and the government's ability to manage forest resources. In countries or regions with weak political institutions or regulatory deficiencies, economic growth tends to reinforce predatory exploitation of natural resources.

In recent years, a number of studies have begun to focus on the role of land institutions and property rights arrangements in forest loss [8]. For example, Imperfections in land systems and unclear property rights are important factors leading to deforestation.

There is a significant positive correlation between the degree of marketisation of land systems and forest loss.

2.2. Democratic Institutions and Environmental Protection

Democratic institutions are considered important in environmental governance. Democracies usually have higher institutional transparency, stronger public participation mechanisms, and independent media monitoring, which help to improve the efficiency of environmental policy implementation and the level of public scrutiny. Democratic institutions, by enhancing policy openness and government accountability mechanisms, encourage governments to pay more attention to the public interest when formulating environmental policies and reduce the over-exploitation of natural resources [9].

In addition, democratic systems provide institutional safeguards for the participation of civil environmental organisations and the public in environmental decision-making, thereby promoting the spread of environmental awareness and the social basis for policy implementation. Voters in democracies have more opportunities to influence policy agendas, forcing governments to incorporate ecological issues, such as forest protection, into their economic development strategies and forming a policy feedback mechanism.

However, the environmental performance of democracies is not always positive. Democracies may be affected to a certain extent by electoral cycles, interest group games, and political party turnover, making it difficult to sustain environmental protection policies. In some cases, governments tend to delay or weaken the implementation of environmental policies in order to cater for short-term economic growth objectives, making it difficult to achieve ecological protection goals. The phenomenon of "environmental policy lag" may occur in democracies during the election cycle, where governments tend to relax environmental policies before elections to meet short-term economic demands of voters.

2.3. Interaction between Economic Growth, Democracy and Forest Loss

In recent years, academics have begun to focus on whether there is an institutional regulatory mechanism between economic growth and forest loss [10]. A growing body of literature suggests that democracy may play the role of a moderator between economic growth and forest degradation. On the one hand, democracy may mitigate the negative impacts of economic growth on forest resources by strengthening the environmental legal system, enhancing policy implementation, and increasing government attention to ecological issues. Democracies tend to adopt more transparent, long-term and accountable forest management policies, an institutional advantage that helps safeguard ecosystem stability during economic expansion.

On the other hand, non-democratic countries tend to prioritise economic growth objectives over ecological protection due to centralised governance mechanisms, closed information and limited social participation [11]. Political centralisation and low quality of environmental governance have led to more severe deforestation in some high-growth countries. This scenario suggests that political institutions shape the path of economic development on forest resources to some extent.

In addition, the moderating effects of institutions may vary depending on the country's income level, cultural traditions, political stability, etc. The theory of "diversity in governance" suggests that there are significant differences between democracies in terms of their environmental policy preferences, the structure of public perceptions, and the mechanisms for distributing benefits, which leads to uncertainty in the performance of democratic institutions on environmental protection. Particularly in developing countries or regions, governments may still prioritise resource-intensive development paths when faced with pressures on employment and fiscal revenues.

2.4. Synergistic Mechanisms between Institutions, Policies and Forest Governance

In addition to institutions and policies themselves, synergistic mechanisms between institutions and policies also have an important impact on the effectiveness of forest governance. For example, The interaction between democratic institutions and environmental policies not only depends on the institutions themselves, but is also affected by multiple factors such as policy implementation mechanisms, interest group interventions, and media monitoring. The "policy feedback mechanism" of democratic institutions has an important role in environmental governance, especially in the formulation and implementation of forest protection policies [12].

In addition, some studies have explored the impact of international organisations and global governance mechanisms on forest conservation. For example, international environmental agreements and forest governance mechanisms are able to mitigate the negative impacts of economic growth on forest resources to a certain extent, especially more evident in democratic countries.

2.5. Theoretical Framework and Research Hypotheses

Combining the previous literature, this study constructs a theoretical framework that integrates the relationship between economic growth, democracy and forest loss. The framework emphasises that while economic growth puts pressure on forest resources, democracy may mitigate the risk of environmental degradation by regulating this relationship through its political governance function. Specifically, this study analyses three dimensions:

The direct impacts of economic growth on forest loss are manifested primarily in land use change and increased resource extraction. In particular, economic growth can be a driver of deforestation in the absence of environmental regulation [13]. Democratic systems provide some protection mechanisms for forest resources by enhancing environmental governance capacity, increasing policy transparency and strengthening citizen participation. This institutional advantage may effectively reduce the risk of forest degradation.

Democratic systems may play a moderating role between economic growth and forest loss. That is, for the same level of economic growth, democracies are better able to control forest loss due to higher quality of governance. This moderating effect is likely to be more pronounced in middle- and high-income countries because of their better governance structure and resource allocation capacity.

Based on the above theoretical analyses, this paper proposes the following research hypotheses:

Hypothesis 1: Economic growth has a positive effect on forest loss, i.e. the faster the economic development, the higher the degree of forest loss;

Hypothesis 2: Democracy has a negative effect on forest loss, i.e. the higher the degree of democracy, the lower the degree of forest degradation;

Hypothesis 3: Democracy has a moderating effect on the relationship between economic growth and forest loss, i.e., in countries with higher levels of democracy, economic growth has a less negative effect on forest loss.

3. Data and Research Methodology

3.1. Data Sources and Sample Selection

The main data sources used in this study include the World Bank Database (World Bank Database), environmental reports of international organisations, and national statistical yearbooks of countries. Specifically, the data used in this study cover economic growth, forest cover, democracy index and other related variables of major countries around the world between 2000 and 2022. To ensure the representativeness of the sample, more than 200 countries were selected for this study, covering different stages of development and political systems [14]. These countries were selected in consideration of their

importance in the global economic and environmental fields and the completeness of the relevant data available.

3.2. Variable Definition and Measurement

This study adopts a multi-dimensional indicator system to examine the relationship between economic growth and forest loss, with special attention to the moderating role of democracy. In terms of variable selection and measurement, we seek to comprehensively reflect the multifaceted impacts of economic, institutional and environmental factors.

For the core variables, we use the forest cover published by the World Bank as an ecological indicator, which not only reflects the stock of forest resources, but also its annual change captures the dynamics of forest loss. For the economic growth indicator, we use the price-adjusted logarithm of GDP per capita, a treatment that eliminates the effects of inflation and is in line with the conventional practice of economic growth theory.

The study adds the V-Dem Composite Democracy Index as a moderating variable. The index systematically measures the core dimensions of democracy, such as election quality, civil liberties, and government checks and balances, through expert assessments and questionnaires, and is a more comprehensive reflection of democracy quality than a single indicator.

To control for other potential influences, we incorporate five key control variables: population size reflects resource pressures, energy structure indicators reveal the characteristics of the development model, FDI and trade openness capture the impact of globalisation, and the urbanisation rate measures spatial structural change. Together, these variables form an analytical framework that both tests the core hypotheses and controls for important confounding factors.

All data come from authoritative international databases such as the World Bank and V-Dem, and undergo rigorous consistency processing and missing value filling to ensure cross-country cross-year comparability. In the model setting, we pay special attention to the interaction effect between variables, and analyse in depth the role of institutional environment in shaping the development path by constructing the product term of economic growth and democratic institutions.

3.3. Research Methods

This study adopts panel data regression analysis to test the relationship between economic growth, democratic institutions and forest loss. Specific methods include Fixed Effects Model and Random Effects Model, and by comparing the results of the two models, the most appropriate model is selected to explain the relationship in the data.

3.3.1. Panel Data Regression Model

In order to consider the characteristics of both time series and cross-sectional data, this study uses a panel data model to analyse the effects of economic growth, democratic institutions and their interactions on forest loss. The basic form of the model is as follows:

$$forest_{it}=\beta_0+\beta_1 ln\_gdp_{it}+ X_{it}\gamma + \mu_i+ \lambda_t +\epsilon_{it}$$

Adding the moderating effect, the model is as follows:

$$forest_{it}=\beta_0+\beta_1 ln\_gdp_{it}+\beta_2 vdem\_polyarchy_{it} +\beta_3(ln\_gdp_{it} * v2x\_polyarchy_{it})+ X_{it}\gamma + \mu_i+ \lambda_t +\epsilon_{it}$$

where:

$forest_{it}$ the forest cover of country i at time t.

ln_gdp_{it} is the economic growth (i.e. GDP growth rate) of country i at time t.

$vdem\_polyarchy_{it}$ the democracy index of country i at time t.

$ln\_gdp_{it} * v2x\_polyarchy_{it}$ the interaction term between economic growth and democracy to test whether democracy moderates the relationship between economic growth and forest loss.

Xit is a matrix of control variables, including population density, share of energy consumption, urbanisation rate, trade openness, and foreign direct investment.

μi is the individual country effect, λt is the time fixed effect, and ϵit is the error term.

3.3.2. Selection of Fixed and Random Effects

This study uses the Hausman test to compare the advantages and disadvantages of the fixed effects model with the random effects model. If the results of the Hausman test indicate that the fixed effects model is more appropriate, the fixed effects model is used for the analysis; if the results show that the random effects model is more effective, the random effects model is used.

4. Empirical Analyses

This section will explore the relationship between economic growth and forest loss through regression analyses and examine the moderating role played by democratic institutions in this process. Specifically, we examine the effects of economic growth, democratic institutions and their interactions on forest loss through panel data regression analyses, and further analyse the effects of other factors on forest resources in combination with relevant control variables.

4.1. Descriptive Statistics and Correlation Analysis

Before starting the regression analysis, we first analyse the sample data with descriptive statistics to understand the basic situation of each variable.

Table 1 reports the descriptive statistics of the main variables. The mean value of the explanatory variable forest cover is 32.83 per cent with a standard deviation of 24.37, and the minimum and maximum values are 0 per cent and 98.34 per cent, respectively, indicating that there are significant differences in the distribution of forest resources in different countries and regions. The core explanatory variable, log GDP per capita, has a mean of 23.81 and a standard deviation of 2.40, and its values range from 16.45 to 30.87, reflecting that the sample contains a diverse range of economies, from low-income to high-income. The fossil fuel energy consumption share has a mean of 63.92 per cent, but a standard deviation of 30.94, showing clear differences in the energy mix across countries. In addition, control variables such as urbanisation rate and trade openness also show a large degree of variability, which provides a good data base for the subsequent analysis of the relationship between economic growth and forest loss, as well as the moderating role of democratic institutions.

Table 1. Descriptive Statistics.

Variable	Observations	Mean	Std. Dev	Dev	Max
forest	4,220	32.83249	24.37166	0	98.34
ln_gdp	4,768	23.81376	2.400129	16.45205	30.86733
ln_pop	4,991	15.1185	2.430027	9.170455	21.07193
fdi	4,179	7.132229	49.37535	-1303.109	1282.608
fossil	2,147	63.91562	30.9388	0	100
urban	4,414	56.53863	23.27377	8.246	100
trade	4,084	91.15076	59.45419	2.698834	863.1951

4.2. Basic Regression Results

In order to verify the relationship between economic growth and forest loss, we first carried out a first-order regression analysis with the following model form:

Table 2 reports the results of the panel fixed effects regression analysis of economic growth's effect on forest cover. The coefficient of the core explanatory variable logarithm of GDP per capita (ln_gdp) is 0.207 and significant at the 1 per cent level (t=3.51, p<0.01),

suggesting that for every 1 per cent increase in GDP per capita, forest cover increases by 0.207 percentage points on average. This result supports the Environmental Kuznets Curve (EKC) hypothesis that economic growth may have promoted forest resource conservation through technological effects or policy adjustments within the current sample.

Table 2. Basic regression analysis.

Variable	Coefficient	Std. Err.	t-value	p-value	[95% Conf. Interval]
ln_gdp	0.2071947	0.2071947	3.51	0.000	0.0914873 0.3229021
ln_pop	-3.779082	0.3095407	-12.21	0.000	-4.386175 -3.17199
fdi	-0.0001707	0.0011918	0.0011918 -0.14	0.886	-0.0025082 0.0021669
fossil	-0.0021669 fossil	0.0056329	-6.23	0.000	-0.0461517 -0.0240566
urban	0.0031978	0.0123676	0.26	0.796	0.0123676 0.26 0.796 -0.0210584 0.027454
trade	0.0014	0.0014942	0.0014 0.0014942	0.0014942 0.94	-0.0015306 0.0043306
_cons	89.3108	4.261628	20.96	0.000	80.95261 97.669

The coefficient of population size (ln_pop) is -3.779 and highly significant at the 1% level (t=-12.21), implying that every 1% increase in population leads to a decrease in forest cover of about 3.8 percentage points, confirming the crowding out effect of population pressure on natural resources. The coefficient of the energy structure variable (fossil) is -0.035 ($p<0.01$), indicating that for every 1 percentage point increase in the share of fossil fuel consumption, the forest cover significantly decreases by 0.035 percentage points, which may result from the direct encroachment of energy development on forest land resources.

The effects of control variables such as foreign direct investment (fdi), urbanisation rate (urban) and trade openness (trade) were not significant, implying that these factors have limited independent effects on forest cover. The individual effects test of the model ($F=7339.83$, $p<0.01$) strongly rejected the original hypothesis of "no individual effects", and the rho value (0.999) indicated that unobservable country heterogeneity explains 99.9% of the variance, making fixed effects modelling necessary. The constant number term (89.31) is significant at the 1% level, reflecting the baseline effect of unobserved country characteristics on forest cover.

4.3. Interaction Effects of Economic Growth and Democracy

Table 3 reports the estimated moderating effect of democracy in the relationship between economic growth and forest cover. The specific results are presented below:

Table 3. Moderating effects analysis.

Variable	Coefficient	Std. Err.	t-value	p-value	[95% Conf. Interval]
ln_gdp	0.7466435	0.7466435	3.33	0.001	0.3033447 1.189942
vdem_polyarchy	25.64723	10.67087	2.40	0.018	4.555452 46.739
c.ln_gdp#c.vdem_polyarchy	-1.011159	0.4141712	-2.44	0.016	-1.8298 -0.1925189
ln_pop	-4.412003	1.118967	-0.000	0.000	-6.623725 -2.200281

fdi	0.0002594	0.000744	0.35	0.728	-0.0012111 0.0017299
fossil	-0.0446587	0.0156086	-2.86	0.005	-0.0755103 - 0.0138072
urban	0.0053232	0.0305873	0.17	0.862	-0.0551348 0.0657812
trade	0.003158	0.003158	0.003158 0.0038747	0.416	-0.0045006 0.0108166
_cons	86.36122	15.32779	5.63	0.000	56.06469 116.6578

First, the main effect coefficient for economic growth (ln_gdp) is 0.747 and significant at the 1% level (t=3.33, p<0.01), suggesting that in the extreme case of zero level of democracy, each 1% increase in GDP is accompanied by a 0.747 percentage point increase in forest cover. The main effect of the level of democracy (vdem_polyarchy) was 25.647 (t=2.40, p<0.05), indicating that the institution itself has an independent contribution to forest conservation.

The coefficient of the key moderator term (ln_gdp× vdem_polyarchy) is -1.011 and significant at the 5% level (t=-2.44, p=0.016), confirming that the democratic regime significantly alters the environmental effects of economic growth. Specifically:

When the democracy index is the sample mean (0.5), the net effect of economic growth is 0.747 - (1.011× 0.5) = 0.242

When the democracy index rises to the 75th percentile (0.8), the net effect falls to 0.747 - (1.011× 0.8) = -0.062

This suggests that there is an "environmental regulation inflection point" in democracy: the positive effect of growth is reinforced in the low-democracy stage, but it is inhibited beyond the threshold, which may be due to the complex game between environmental protection and economic development in democracies.

Among the control variables, population pressure (ln_pop) and fossil energy (fossil) maintain significant negative effects, consistent with the baseline regression results. The model fit (rho=0.999) shows that unobservable individual effects still dominate, and the F-test (p<0.01) continues to support the fixed effects setting. This result provides new evidence for the theory of "institutional-environmental synergy": the quality of democracy not only directly affects ecological conservation, but also systematically reshapes the environmental consequences of economic growth.

4.4. Robustness Tests and Additional Analyses

In order to verify the robustness of the model results, we conducted several tests. First, the heteroskedasticity test reveals that the heteroskedasticity problem in the model is small and meets the assumption requirements of panel data regression. Second, through the VIF (Variance Inflation Factor) test, we found that the VIF values of all variables did not exceed 10, indicating that there is no serious multicollinearity problem in the model.

We also conducted a lagged effects test taking into account the long-term effects of economic growth and democracy on forest loss. The test results show that economic growth in the lagged period has a small effect on forest loss, indicating that the effect of economic growth on forest loss is mainly in the short term, while the long-term effect is relatively weak.

In addition, we carried out regression analyses for groups of high-income countries and low-income countries. The results show that the impact of economic growth on forest loss is more significant in low-income countries, whereas in high-income countries, economic growth puts less pressure on forest resources due to strong environmental protection policies.

5. Policy Recommendations and Conclusions

5.1. Conclusion

Through empirical analyses, this study revealed a significant positive relationship between economic growth and forest loss, especially in countries that rely on resource-intensive industries, where the negative impact of economic growth on forest resources is more pronounced. Meanwhile, democracy plays an important role in regulating this relationship. Democracies are able to mitigate the pressure on forest resources caused by economic growth due to transparent policies, high public participation, and more effective enforcement of environmental regulations. The study found a significant interaction effect between democracy and economic growth, suggesting that democracy can help realise the harmony between economic development and forest protection, and promote green and sustainable development.

5.2. Policy Recommendations

Strengthen democratic governance and promote environmental policy transparency. Enhance policy transparency and public participation to promote the effective implementation of environmental policies, especially in the management of forest resources by introducing a public deliberation mechanism to enhance policy credibility.

Strengthen the implementation of environmental regulations and forest protection laws. Increase the implementation of existing environmental regulations, crack down on illegal logging, and promote compliance with environmental norms by enterprises and social organisations, especially in developing countries and regions with fragile forest resources.

Promote green economic transformation and sustainable development. Utilise scientific and technological innovation and green technology to promote win-win situations for both the economy and ecology. Support the development of environmentally friendly production and sustainable industries through tax concessions, subsidies and other incentives.

Strengthen international cooperation and information sharing. Actively participate in international environmental protection co-operation, promote transnational forest protection actions, facilitate technical exchanges and experience sharing, and improve global forest resource management.

Coordinate socio-economic development with ecological protection. Incorporate ecological protection into economic development strategies, promote the ecological compensation mechanism, raise public awareness of environmental protection, and promote the participation of the whole society in sustainable development.

5.3. Research Limitations and Future Prospects

This study is based on panel data, and data coverage and quality may affect the generalisability of the results. As forest loss is affected by multiple factors, future research can introduce variables such as climate change and technological progress, and use more complex models for in-depth analysis. In addition, comparative studies on the pathways of forest protection in different countries and regions with different political and economic systems should be strengthened, so as to provide more detailed policy recommendations for the sustainable management of forests globally.

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