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Interconnections of Economic Performance, Unemployment, and Forestry Goods Exports: Evidence from the World's Top Ten Forestry Goods Export Countries

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ABSTRACT

Aim of the Study: This research examines the connection between exports of forestry products, economic growth and unemployment in the selected nations where forestry goods exports significantly and high impact on the national income. The word Economic performance indicates the overall health of a country's economy and is measured by the use of indicators like GDP and productivity, and the Unemployment indicates the percentage of the workforce that is jobless, which reflects the state of the labor market.

Methodology: In this study, two variables treated as dependent variables to see whether the export of forestry goods has an impact on them or not. Descriptive statistics are applied for the analysis of the variables, and slope homogeneity and cross-sectional dependence tests are done to confirm the model specifications. Co-integration tests reveal the existence of a co-integration relationship among the variables. An AMG estimator was utilized in this investigation to assess the influence of forest goods exports, population growth, agricultural consumption, interest rates, and inflation on per capita income and unemployment.

Findings: The outcomes reveal that forest goods exports not only increase GDP per capita but also lessen unemployment. Population growth, agricultural consumption, interest rates, and inflation are among the factors that still have a say in the performance of the economy and the level of unemployment.

Conclusion: This was yet another point going of the existing literature regarding the ability of developing countries to export forestry goods. This study also pointed out that the policymakers should enact regulations for the forest industry healthy growth, ensure interest rates remain stable, encourage international cooperation, and apply good inflation management as a way of boosting GDP per capita, cutting down unemployment, and raising overall economic development.

Keywords: Economic Profomance, Unempoylement, Forestroy Goods, Population Growth, Agriculture Consumption.

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1. INTRODUCTION

Forests are indeed very important and their very nature makes them so, as they are capable of providing a variety of goods and services like timber, the so-called non-timber forest products (NTFPs) and carbon sequestration. Countries that have the fortune of having large forest areas can by their economic performance greatly if they export their forest products, among others. Forestry exports can not only generate jobs, but they can also raise GDP per capita, and through an increased trade of exports improve the trade balance which in turn can have a positive impact on GDP and exports without as much inflation and population growth (Kallio, 2021). On the other hand, it must not be overlooked that in addition to the above-mentioned that even more there are potential disadvantages and trade-offs involved in heavily relying on forestry as an economic pillar that will make a country economically vulnerable and exposed to the market uncertainty. Moreover, the effect of forestry exports on the agricultural sector should be factored in as well.

Therefore, it is quite important to research the relationships between forestry exports, unemployment, and economic performance, as well as to weigh the potential trade-offs of relying on this industry for the economic growth. Through this analysis, the policymakers can have the right facts for their decisions about the economic development strategies, thus ensuring that the growth is long-term and sustainable. The exporting of timber and other forest products may affect the country's economy in various ways such as causing inflation and affecting the interest rates as well as the population growth. In case the forestry sector increases its exports, it may be cutting supplies of the other goods to domestic markets and changing the demand for other products, which would also result in a change in the price levels and interest rates. Moreover, the sustainability of forestry practices and their effect on the population growth should be considered as well (Sunderlin et al., 2005).

In a globalized economic environment, the link between economic performance, unemployment trends and the forestry sector's exportation of goods becomes an important area of research. The present work studies the intertwinement of the mentioned variables and brings the top ten forestry good exporting countries' experiences as main sources. The author Kallio (2021) cites the economic importance of forest resources that not only serve the domestic markets and get the revenue in the form of timber, non-timber forest products (NTFPs), and carbon sequestration but also stimulate the economic growth of the countries. Determining this complex interaction of variables is of paramount importance to the policymakers who want to benefit from forestry exports, but at the same time, are concerned about the possible drawbacks, the necessity of sustainable economic development, and so on.

Kallio (2021) notes that the export of forest products neutralises the direct effects of inflation and growth of the population. On the other hand, the impact on interest rates could differ from one country to another based on its economic setup, policies and trade relations. Therefore, it becomes necessary to study the relationship between forestry exports, inflation, interest rates, and population growth, as well as to consider the possible trade-offs of leaning heavily on this sector for economic development. It is indeed a daunting task for the policymakers to not only at the same time look for the impacts of the forestry sector on inflation, interest rates, and population growth but also to ensure that the sector is providing the economy with long-term sustainable growth through its operations.

The ten largest exporting countries of forestry goods are significant case studies for comprehending the complex interplay between the economy and this particular industry.These countries with large forest resources demonstrate the various ways the export of forestry products can affect economic growth and unemployment. The goal of this research is to draw the attention of the academic community, especially in the fields of nature-friendly economic development and responsible resource management, with the help of their experiences.

The association between forest goods exports and economic performance was the subject of several studies. Bulte et al (2005) were the first to analyzed the impact of timber exports on the economic growth of 22 countries over a 20-year period. The result was the identification of a positive and statistically

significant impact of timber exports on the economic growth of countries with highly developed forest sectors. Sardeshpande & Shackleton (2019) carried out a study that was quite similar and looked into the role of NTFP exports as an economic factor for forest-dependent communities in Brazil, Cameroon, and Indonesia. They came to the conclusion that, especially when directed toward international markets, NTFP exports might become a very strong economic resource for the mentioned communities.

In a nutshell, exports of forest products are one of the main indicators of a country's economic performance and the major source of income for the population living in the forests.At the same time, sustainable forest management practices and good sharing of forest goods exports revenues among stakeholders are of great importance to the economic and social development in the long run.

The main objective of the research was to demonstrate the effects of the exports of forest products on the economy and the unemployment rate. It studies the connection of the countries that dominate the export of forestry goods with their economic situations. The issue of the research has been dealing with the exports of forestry goods in conjunction with the control variables rates of interest, inflation and population growth. The data analysis method was a panel data analysis utilizing multiple sources of data, and the study aimed at exploring the connection of forest goods exports, economic performance, and unemployment by applying sophisticated econometric methods that have not been used in previous studies during the field.

2. LITERATURE REVIEW

The export of forest-related products has been acknowledged as one of the major driving factors of the economy and the main reason for developing several countries (Bulte et al., 2007). The different influences of forestry exports on various economic parameters such as unemployment, GDP, inflation, interest rates, and population growth have been thoroughly examined in the literature. For the countries, where the forest sector was fully developed, the positive and statistically significant impact of timber exports on economic growth has been recorded (Bulte et al., 2007). It is hereby stated that even though the timber exports are very profitable, sustainable forest management practices are still very crucial for long term economic benefits (Bulte et al., 2007). In a very similar manner, (Nepstad et al., 2006) examined the economic effects of forest product exports in the Brazilian Amazon region. The findings revealed that the export of forest products had a stimulating effect on economic growth, particularly in areas where there were good forests and strong administrative support for the governance of the forest (Nepstad et al., 2006). In contrast, researchers Wunder et al (2008) focused on the issue of the impact of non-timber forest products (NTFP) on the life of forest-dependent people in Brazil, Cameroon, and Indonesia. NTFP exports could still be a major source of income for these communities, especially if they are connected to the international market, according to the researchers among others (Sardeshpande & Shackleton, 2019).

It is worth mentioning that, despite the highlighted advantages, exporting forest products may end up having a negative impact on the economy. Forest resources if used extensively and improperly would result in environmental destruction, extinction of species, and local people suffering from negative impacts (Wunder et al., 2008). Hence, the application of eco-friendly forest practices along with a fair sharing of profits is the only way to guarantee long-lasting economic and social progress.

Numerous studies have taken place to inquire into the matter of forest goods exports and unemployment relationship. One such investigation, by Stryamets et al (2012), traced the correlation between forestry exports and employment in Sweden throughout a 30-year period. They reported that the forestry exports positively and significantly affected the employment levels, especially in rural zones where the forestry industry is the main employer of the populations (Stryamets et al., 2012). A similar application of research by Sathaye & Shukla (2013) unfolded the employment effects of the forest products sector in India. The results of the study showed that besides being a major employer, the forest products sector also provided direct and indirect jobs to more than 12 million people, the source being the sector's output with exports being a significant part of the sector (Sathaye & Shukla, 2013).

Nonetheless, it is crucial that the advantages of forest products' exportation be fairly distributed and the logging area handling be eco-friendly to avoid the possible adverse effect on jobs like moving out of communities that are depending on forest (Mahmoudi et al., 2023; Soliev et al., 2021).

To conclude, the authors of the different papers say that the export of forest products can have a significant impact on lowering the level of unemployment and creating new job opportunities in those nations which are endowed with forests. Nonetheless, the adoption of the sustainable management of forests practices and the fair sharing of the benefits are the keys to securing the economic and social development of long duration (Bulte et al., 2005; Wunder et al., 2008).

2.1. Forestry Goods Exports and Economic Performance

The sale of timber and its products to foreign countries has had a steadily increasing influence on the gross domestic product (GDP) of several nations like Canada (Waqas et al., 2022) and Finland (Kallio, 2021) among others. Still, the economic structure and policies of each country play a role in determining the impact of this sector on GDP (Waqas et al., 2022). The GDP impact findings, however, have not been universally accepted with some studies showing a positive influence (Jha et al., 2023) and others indicating a lack of significant impact (Prakash et al., 2022). The matter of forestry goods exports influencing the inflation rate and the interest rate in India is yet to be thoroughly investigated.

The same holds true for the export of forest products, which, in the past, has been pointed out to exert a positive influence on the GDPs of some of the very high forested developing countries like Brazil (Coelho Junior et al., 2023) and Indonesia (Brontowiyono et al., 2022). The forestry sector, through timber, non-timber, and other products, contributes to the economy significantly and through different ways such as domestic sales and investments, in addition to exports (Brontowiyono et al., 2022). However, the impacts on GDP are inconsistent, with some authors stating that the sector has a positive influence (Nguyen & Su, 2021), while others saying that there is no effect which could be termed significant (Vu & Nghiem, 2018).

It has been established through research that the sale of wood products is beneficial to GDP Chen et al (2020) and the production of inflation and the increment of interest rates is not a consequence of this (Chen et al., 2020). On the other hand, the nexus between GDP and the effects of forestry export on the economy is not clear, with some studies giving support for a positive effect Le et al (2019) and others not coming up with any significant impact (Le et al., 2019). The consequences on inflation and interest rates have not yet been adequately studied in Nepal. In a similar manner, the export of forest products has been recognized as a catalyst to the economic growth Wangchuk et al (2021) while the impact on interest rates and inflation remains insignificant (Sawarkar et al., 2020).

The connection between the exports of forests and the interest rates is still somewhat obscure. Researchers have expressed various opinions, for example, while some studies point out that the exports of forests will lead to an increase in interest rates, most likely, as a result of the changes in international trade balance of the country Belhaj & Mubako (2020) on the contrary, there are studies that cannot trace any such increase or decrease as a consequence (Kallio, 2021). To put it differently, the impact of forest export on the rates of interest in HFDC's remains to be determined. On the one hand, there are researchers who predict that the directional change in the country's trade balance would cause an increase in interest rates (Brontowiyono et al., 2022), while others are convinced that the new trading conditions will not affect interest rates at all. The influence of forestry exports on population growth in HFDCs is still an under-researched area as compared to other economic indicators. But, in general, available studies portray the impact of forestry exports on the demographic aspect as neutral (For et al., n.d.).

In conclusion, the existing literature outlining the situation regarding the behavior of forestry exports to economic factors and their respective indicators in HFDCs is quite inconsistent, as it mainly refers to the countries' economic framework and policies. Definitely, the export of forest products as one source of economic activity would lead to better and more abundant job offerings, but the government must weigh such a choice against its impacts on other indicators like GDP, inflation, and interest rates. The export of

forest products can have a considerable impact on the economic indicators across the board in HFDCs. At the same time, the policy-makers need to be quite alert regarding the possible dangers of being too dependent on the forest product exports and hence should take into account the consequences on other economic indicators like inflation and interest rates in a very thorough manner.

2.2. Forestry Goods Export and Unemployment

The sale of forestry products in the international market has been positively associated with the employment growth in the forestry sector and also in the industries related to it like transport and manufacturing (Belhaj & Mubako, 2020; Kallio, 2021). On the other hand, dependence on the forest industry may lead to economic instability and volatility, increasing the likelihood of job losses in the sector (Belhaj & Mubako, 2020). Conversely, the case of India showed that the export of forestry products positively influenced job creation (Ghosh, 2004).

In a similar way, the research proved that the forestry industry could be a considerable provider of jobs in the developing countries with high forest coverage (Coelho Junior et al., 2023). The forestry products export not only promises job opportunities in the sector it self but also in related industries like transport, and manufacturing (Yuca Waarts, Valerie Jansen, Verina Ingram, Maja Slingerland, Fédes van Rijn & Just Dengerink, Jiska van Vliet, Eric Arets, Marieke Sassen, Joost Guijt, 2019). However, a high dependence on forestry may lead to lay offs in economic downturns (Coelho Junior et al., 2023). In the case of China, the export of forestry goods was associated with an increase in employment (Yuca Waarts, Valerie Jansen, Verina Ingram, Maja Slingerland, Fédes van Rijn & Just Dengerink, Jiska van Vliet, Eric Arets, Marieke Sassen, Joost Guijt, 2019).

Additionally, the forest products exports to Vietnam had a good influence on job creation (Nguyen & Su, 2021), while similar studies have shown the same results for the countries of Nepal (Shrestha et al., 2022), Bhutan (Wangchuk et al., 2021), and Thailand (Prakash et al., 2022) respectively.

At last, it can be concluded that the exports of forestry goods could be one of the positive factors for the forest industry and its associated businesses. But, the extent of that positive influence is different for different countries and also their economic situations. Thus, the decision-makers must factor in the potential dangers that could come with the easing up on the reliance on the forestry sector when planning for the long-term sustainability of employment opportunities.

3. RESEARCH METHODOLOGY

3.1. Data and Variables

The study was conducted with the recognition that forest products among the main exports of less economically developed countries affect the performance of their economies and their unemployment rates. The data for the study were obtained from the "Federation of Agricultural Organizations (FAO)," UNCTADstat, and "World Development Indicators" (WDI) which are all reliable sources. The researchers picked the countries for the study based on the availability of data for both dependent and independent variables. From 1990 to 2021, the researchers used multiple econometric methodologies, including panel unit root tests, co-integration tests, and panel short-run and long-run tests, to deal with the problem of cross-sectional correlations in the panel dataset. They used an econometrics equation to study the interaction between forest goods exports and the economic performance, as well as the unemployment rates, with the objective of fulfilling the purpose of the study eventually.

3.1.1. Model Specification

As per Li et al (2020), the empirical study that they conducted revealed that taking all variables to their natural log transformations significantly enhances the precision of estimations. They have proposed the Equation 1 in form of a logarithmic, linear panel function that has encompassed the necessary variables for empirical analysis. The research has now got the function through adjustments and additions ready for its large-scale investigation.

$$\mathrm{LnGDPPCit}_{it} = \beta_0 + \beta_1 \mathrm{lnFPEX\_V}_{it} + \beta_2 \mathrm{INF}_{it} + \beta_3 \mathrm{INT}_{it} + \beta_4 \mathrm{POPG}_{it} + \beta_5 \mathrm{lnEAG}_{it} + \mathrm{e}_{it} \quad 1$$

$$\mathrm{UME}_{it} = \beta_0 + \beta_1 \mathrm{lnFPEX\_V}_{it} + \beta_2 \mathrm{INF}_{it} + \beta_3 \mathrm{INT}_{it} + \beta_4 \mathrm{POPG}_{it} + \beta_5 \mathrm{lnEAG}_{it} + \mathrm{e}_{it} \quad 2$$

3.1.2. Cross-Sectional Dependency

Before any other empirical estimations are done, it is very important to test the hypothesis of cross-sectional dependence in panel data. As socioeconomic networks become more complicated and unobserved shocks occur, the cross-sectional dependence gets more pronounced. If this dependence is ignored, it might result in wrong findings (Taylor et al., 2012). Hence, it is not enough to presuppose independence, rather it is necessary to resort to the methods that serve as a basis for cross-sectional dependence.

The CSD (Cross-Sectional Dependence) test, which was originally created by (Sara, 2010), is utilized in this study to analyze and present cross-sectional dependence. The CSD test equation is as follows:

$$CSD = \sqrt{\frac{2\mathrm{T}}{\mathrm{N}(\mathrm{N}-1)}} \left(\sum_{i=0}^{N-1} \sum_{j=i+1}^{N} \lambda ij \right) \quad 3$$

The main reason behind conducting the CSD test is to find out the level of cross-sectional dependence in the panel data, and this is a prerequisite for robust and valid empirical estimations.

CSD indicates the presence of cross-sectional dependence, which is described by the variables T (the time period) and N (the number of cross-sections in the panel), as well as the cross-sectional connection λij, which measures the extent of correlation between the errors of cross-sections i and j. The rapid industrialization, urbanization, and globalization in developing countries have likely resulted in similar estimates of the slope coefficients among these countries (Ali et al., 2023; Dogan et al., 2020). Therefore, it is important to check whether the slopes can be regarded as identical due to the specific effects of the countries.

This matter, then, is addressed through the employment of the (Pesaran & Yamagata, 2008) delta(Δ) and biased-adjusted delta (Δadj) tests. This is done to first test the homogeneity of the slopes before establishing the integration order of the variables. The empirical model for the test can be stated in the following manner:

$$\triangle = 2\sqrt{(\mathrm{N})}\,(2\mathrm{K})^{-\frac{1}{2}} \left(\frac{1}{2}\tilde{\mathrm{S}} - \mathrm{K} \right) \quad 4$$

$$\triangle \,\mathrm{adj} = 2\sqrt{(\mathrm{N})}\, \left(\frac{2k(T-k-1)}{T+1} \right)^{-\frac{1}{2}} \left(\frac{1}{2}\tilde{\mathrm{S}} - \mathrm{K} \right) \quad 5$$

The research intends to investigate the hypothesis of slope equality conditioned by country-specific factors through the adoption of the delta and biased adjusted delta methods. This scrutiny is very important for the correct identification of the integration order of the variables in the next scientific estimations.

3.1.3. Unit Root Test

The panel unit root test is one of the most important methods for checking the stationarity of a series. It was first presented by (Levin et al., 2002; Maddala & Ã, 1999; So et al., 2003) and has become a method of choice in many past studies for testing stability. Additionally, (Pesaran, 2007) made a change to the IPS (Im, Pesaran, and Shin) tests, called the cross-sectional IPS (CIPS) tests, which take into account cross-sectional dependence in the evaluation of unit root properties.

The null hypothesis for this research is that the time series being studied has unit roots. The t-statistic is the method of choice to test this null hypothesis. If the results show that the time series does not have stationarity at the level (I (0)), then the differenced series (I (1)) gets used as a replacement. Prior to conducting parameter estimation, the co-integration relationship will be tested with the intention of verifying that the series is indeed stationary at the first difference. Moreover, the CIPS tests may be heterogeneous and CD-based (cross-section dependence-based), which would render their inferences more trustworthy.

Consequently, the CIPS test model is articulated as follows:

$$\triangle \mathrm{C}_{i,t} = \mu_i + \mu_i \mathrm{X}_{i,t-1} + \mu_i \bar{X}_{i,t-1} + \sum_{m=0}^{n} \mu_{im} \triangle \bar{\mathrm{Y}}_{t-1} + \sum_{m=0}^{n} \mu_{im} \triangle \mathrm{Y}_{t-1} + \vartheta_{it} \quad 6$$

The research intends to identify the stationary characteristics of the time series with the consideration of cross-sectional dependency through the use of a panel unit root test namely the CIPS test. This method improves the credibility of the results obtained from the analysis.

Where the average cross-section, denoted by $\bar{\mathrm{Y}}$, is:

$$\mathrm{C}_{i,t} = \mu_1 \mathrm{ta}_{i,t} + \mu_2 \mathrm{ef}_{i,t} + \mu_3 \mathrm{y}_{i,t} + \mu_4 \mathrm{ti}_{i,t} + \mu_5 \mathrm{id}_{i,t} + \mu_6 \mathrm{fdi}_{i,t} + \mu_7 \mathrm{hc}_{i,t} \quad 7$$

Test statistics from CIPS Pesaran (2007) are shown as:

$$CIPS = N^{-1} \sum_{i=1}^{n} CADF_i \quad 8$$

In this context, "Cross-sectional augmented Dickey-Fuller" is abbreviated as CADF

3.1.4. Co-integration Test

Once the stationarity condition is checked, the next step in the analysis is to look at the co-integration relationship between the variables that were selected in the models that were built. Initially, the researchers chose the appropriate methods to measure this connection and its importance in their study (Westerlund, 2007). In the analysis, the researchers opted for the co-integration test which is the easiest among the rest provided in the literature because it allows the use of raw data for temporal dependence. In addition to this, the Westerlund co-integration test was applied, which is recognized for its robustness against panel heterogeneity and cross-sectional dependence. The use of this method of testing allows the co-integration relationship between the chosen variables to be explored in detail and comprehensively without the need for complex data adjustments (Lorente, 2020). Furthermore, through Monte Carlo simulations, it has been shown that the Westerlund co-integration test is quite powerful even with very small sample sizes. This test offers a plethora of advantages as its restricted free distribution is not particularly easy to detect, but it nevertheless maintains its reliability in revealing co-integration relationships. So, the Westerlund co-integration test has been supported to be a really trustworthy and powerful tool for the analysis of the variables selected in this study particularly when the data samples are small (Westerlund, 2007).

In case the results of the test do not back the null hypothesis, which signifies that co-integration is not present, the investigation takes into account the occurrence of co-integration in the entire or certain panels. The Pedroni co-integration test is used to confirm the impacts of Westerlund co-integration. The Pedroni test checks for co-integration by taking the absence of co-integration as the null hypothesis (Pedroni, 2004). The test statistics are generated from a regression model in the following manner:

$$\mathrm{Y}_{it} = \delta_{it} + \lambda_{it} + \alpha_{it} \mathrm{X}_{it} + \Psi_{it} \quad 9$$

$$\triangle \mathrm{Y}_{it} = \gamma_{it} \mathrm{X}_{it} + \varepsilon_{it} \quad 10$$

The research aims to determine the presence or absence of co-integration among the variables by utilizing the westerlund co-integration test first and then validating the results using the Pedroni co-integration test. This whole procedure becomes very crucial, as it discloses the long-term relationships between the variables and their interdependencies.

3.1.5. Long-Run Panel Estimates

Co-integration among the variables is a prerequisite for exposing significant interactions between them. In this paper, two more estimators are added to diagnose the long-term relationship and then to calculate the coefficients of the explanatory variables.

The first estimator that was employed is the enhanced AMG (Autoregressive Model-based Generalized) estimator, which was made better by the application of some modifications to its performance for the given analysis (Eberhardt, 2012) with regard to the production function. The AMG (Autoregressive Model-based Generalized) estimator, to begin with, was suggested by (Pesaran, 2006a) as a substitute for the CCEMG (Common Correlated Effects Mean Group) estimator and is now acknowledged for its explicit long-run co-integration estimation capabilities along with the generation of reliable results. The AMG estimator has such a powerful capability to handle multi-factor error components and panel heterogeneity that it can be considered as a good option for very extensive use in the analysis of different cross-sections and periods of time throughout this research (Prince & Adeleye, 2021). The AMG model is built on the two-phase method that integrates time-invariant fixed effects along with one dynamic effect parameter to effectively portray the long-lasting interaction between the variables. Apart from the other estimators, the study's objective is to give strong and trustworthy estimates of the long-term relationships and explanatory coefficients.

The estimators when considering the panel-specific factors, provide important information regarding the movements of the variables that are being researched. The application of these kinds of methods is a guarantee for the analysis of interactions between different study variables being thorough and accurate.

$$AMG - step\ 1\ \triangle x_{it} = a_i + \beta_i \triangle y_{it} + y_i \mu_i + \sum_{t=2}^{T} p_i \triangle D_t + \varepsilon_{it} \quad 11$$

$$AMG - step\ 2\ \hat{\beta}_{AMG} = N^{-1} \sum_{i=1}^{N} \hat{\beta}_i \quad 12$$

In the context of the regression model, the observables are shown by the variables xit and yit, where Δ indicates the differencing of the series. The unobserved common factor with different effects is denoted by ut, while pi indicates the standard dynamic process and the coefficients of the time dummies. The coefficients β^i denote the country-specific regressions, while β^AMG refers to the mean group estimator for the AMG method. The disturbance term isεit while ai is the constant term.

Earlier research (Eberhardt, 2012) has demonstrated, through Monte Carlo simulations, that the CCEMG and AMG estimators can nullify the impact of root mean square errors and cross-sectional dependencies in panel data with non-stationary variables, regardless of whether they are mixed or not. That is why, in this particular situation, the testing of the non-stationarity and co-integration of variables is not mandatory when employing the AMG (Akif & Asumadu, 2019). The AMG estimator was used in the research of (Akif & Asumadu, 2019; Dogan et al., 2020) studies, to mention a couple. Yet, the present study has not investigated the long-term relationship under this specific situation.

To validate the results derived from the AMG estimators, CCEMG technique has been employed as already pointed out. The method CCEMG, which was taken in the study, is utilized to confirm as well as to support the AMG estimations. The cross-validation process applied in this research, inspired by Pesaran (2006a) and subsequently advanced by Kapetanios et al (2011), contributes to the reliability and

scientific significance of the results. The CCEMG approach is particularly favorable in handling problems related to cross-sectional dependence. This estimator is capable of providing reliable results even when there is a combination of panel heterogeneity and multifactor error components. The CCEMG estimator can be derived using the following regression model: [The specific regression model equation should be inserted here as provided in your study or manuscript]. Through this method, the research would not only effectively resolve the issue of cross-sectional dependencies but would also reinforce the credibility of its arguments.

$$V_{it} = \emptyset_{1i} + r_1 S_{it} + \vartheta_i q_t + \beta_i \bar{V}_{it} + \gamma_i \bar{S}_{it} + e_{it} \quad 13$$

The research is set to apply the two estimators AMG and CCEMG, which are the most reliable and powerful methods to confirm the long-run relationship and the coefficients of interest. These estimators adopt different data characteristics and deal with the issues of panel heterogeneity and cross-sectional dependence that lead to the results being more trustworthy and valid.

The regression model consists of the visible variables Vit and Sit, whereas qt signifies a hidden common factor with different coefficients. The coefficient r_1 shows country-specific figures, and ∅1i and eit denote the intercept and error components of the model, respectively. This setup not only includes observable and latent factors but also gives the research the power to handle the different countries' varying coefficients and the model's inevitable errors efficiently.

3.1.6. Dumitrescu-Hurlin Causality Test

The panel data model and the time series method both provide different advantages for causality testing. The first offer the researcher to identify the possible causal relationships and this was shown in the study. Also, the research can utilize these methods to effectively and accurately explore causality, thus contributing to the understanding of the relationships and the influences among the factors being examined by (Heidarian & Green, 1989). Besides, the panel data method helps to be more certain about the causal relationships because it has more observations than a time series model does. The large number of data points makes it possible for the study to come up with strong and trustworthy conclusions about the causality of the variables. The application of the panel data method gives the study a clearer picture of the causative links among the variables and, consequently, more accurate and legitimate results (Dumitrescu & Hurlin, 2012).

TheSociety (2013) saw the unveiling of a new method that is able to spot Granger causality through the aid of panel data. Besides discovering the existence of Granger causality, this approach was also able to reveal non-causality cases in groups sharing similar characteristics. The differentiation of panel subgroups based on similarity was considered a catalyst for Granger causation to be stronger among the panels. Such a novel methodology not only opened up a new path for comprehension of the interactions and influences among variables but also mainstreamed in the field of causality testing (Dumitrescu & Hurlin, 2012).

In order to verify the presence of a "heterogeneous non-causal relationship" (HENC) between the contending theories, the authors of the study devised the test dubbed "homogeneous non-causal connection (HNC)" test. This test depicts a situation where, if the heterogeneous non-causal connection was valid for certain cross-sectional units, then Granger causality would be established. The HENC assumption finally permits a less demanding condition of homogeneity, which is an essential feature of this testing procedure.

Also, this technique has the ability to deal with imbalanced panels and different lagged series efficiently. The usage of this method is still reliable for drawing conclusions even in the presence of cross-sectional dependence among the observations.

To conclude, the model merges together the strengths of both panel data and time series methods in an effective way. It permits the determination of causal links through the use of cross-sectional data, which results in the making of more accurate inferences. On top of that, the model shows flexibility by being

able to handle imbalanced panels and different lag structures, thereby making it even more suitable for extensive and accurate causal analysis.

$$\mathrm{Xi,t} = \Psi\mathrm{i} + \sum_{k=1}^{1} \lambda^{k}{}_{i} X_{i,t-k} + \sum_{k=1}^{1} \xi^{k}{}_{i} T_{i,t-k} \quad 14$$

Here, the lag length is referred to as "k," while "λ^ki" represents the autoregressive coefficient. The notation "λ^ki" refers to the extent to which the historical data affects the present value, and its magnitude is determined by the particular lag "k" being analyzed.

4. DATA ANALYSIS AND RESULTS

4.1.1. Results of Descriptive Statistics

Table 1: *Variable description (for developing countries with high forest goods exports)*

Symbol	Variables	Unit	Source
Dependent Variable			
LnGDPpc	GDP per Capita	In constant 2015 US$	WDI, 2022
UME	Unemployment Rate	Unemployment, total (% of the total labor force) (modeled ILO estimate)	WDI, 2022
Independent variables			
lnFPEX_V	Forest goods exports value	Export Value (1000 US$)	FAO, 2022
POPG	Population growth rate	Population growth (annual %)	WDI, 2022
lnEAG	Expenditure on agricultural goods	Final consumption expenditure agriculture goods (% of GDP)	WDI, 2022
INT	Interest rate	Real interest rate (%)	WDI, 2022
INF	Inflation	Inflation, consumer prices (annual %)	WDI, 2022

WDI is World Development Indicator; FAO is Food and Agriculture Organization

Table 2: *Descriptive statistics*

Variables	Obs	Mean	Std. Dev	Min	Max
lnGDPc	320	7.562515	.8767501	5.243239	9.22577
UME	320	5.081865	3.688377	.25	14.66
lnFPEX_V	320	12.25802	3.304003	3.135494	16.60267
POPG	320	1.129971	.6803992	-4.707735	2.80057
lnEAG	320	73.96914	9.977221	48.91336	99.35768
INT	320	7.783531	11.9066	-24.60017	77.61684
INF	320	33.82275	234.1109	-1.710337	2947.733

Std. Dev. shows standard deviation; Max and Min designate maximum and minimum values, respectively.

The information provided pertains to various variables and their characteristics. Table 1 presents the data sources for these variables, while Table 2 describes their properties. Within our dataset, we observed that the mean GDP per capita for the sample is 7.562, ranging from 5.243 to 9.225. The unemployment rate, the second dependent variable, shows an average of 5.081 with a range of 0.25 to 14.66. In contrast, the forest goods exports have a mean of 3.382 with a wide range of 3.135 to 16.602. The population growth rate's mean is 1.130, and it fluctuates from -4.707 to 2.800. Moreover, the data reveal that the mean total expenditure on the whole agricultural products is 73.969. The average annual interest rate is 7.783% over the period, with a minimum of -24.600% and a maximum of 77.616%. The average percentage annual interest rate for the selected countries from 2000 to 2021 is 33.822% with a range of -1.710% to 2947.733%. The 10th, 50th, and 90th percentiles along with the 1st and 99th percentiles are illustrated in

Figure 1 by box charts with the whisker caps denoting the latter. Dots represent the extremes while a square indicates the average value.

4.1.2. Slope Homogeneity Testing (SH) and Cross-Sectional Dependence Testing (CSD) Results

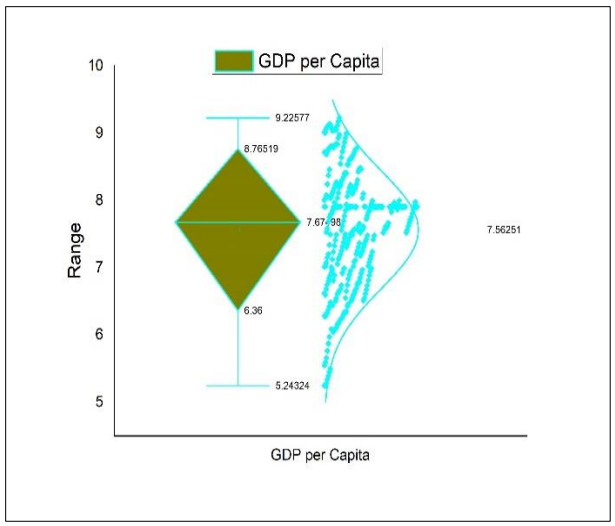
Table 3: *Homogeneity of slope test results and cross-sectional weak dependence test*

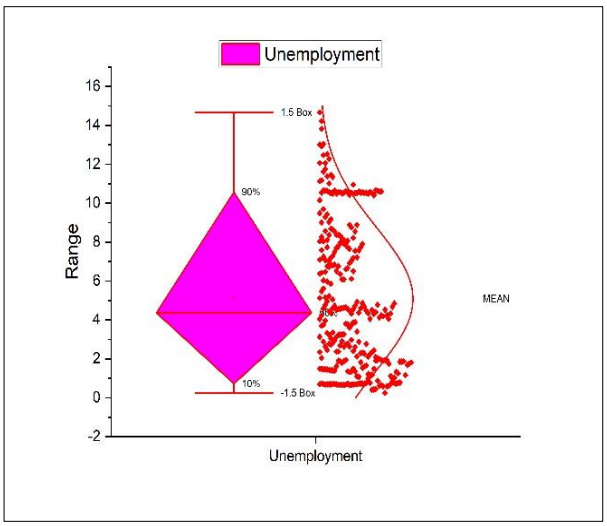
Model	SH Statistics	Variables	CD-Statistics
Economic Performance-Model		lnGDPc	37.07 ***
Delta	15.323***	UME	2.46 ***
Adj.Delta	17.693***	lnFPEX_V	27.84***
		POP	21.98 ***
Unemployment-Model		lnEAG	7.37***
Delta	10.167***	INT	4.10 ***
Adj.Delta	11.702***	INF	12.09 ***

Null Hypothesis: errors are weakly cross-sectional dependent

The outcomes from both the CSD and SH tests are given in Table 3. It is worth mentioning that the delta (Δ) value and the adjusted delta (Δadj) value are both significant at the 1% level, which indicates that the slopes of the selected models are not equal. This validation supports the correctness of the model specifications used in this research. It is necessary to consider the CSD and SH tests together to prevent any possible estimation bias from occurring.

Consequently, the study is carried out on the foundation of the null hypothesis that CSD is non-existent. The CSD test results are in agreement with the conclusions made, as they provide more proof for the rejection of the null hypothesis of the CSD test. These results make the study's findings more credible and reliable.





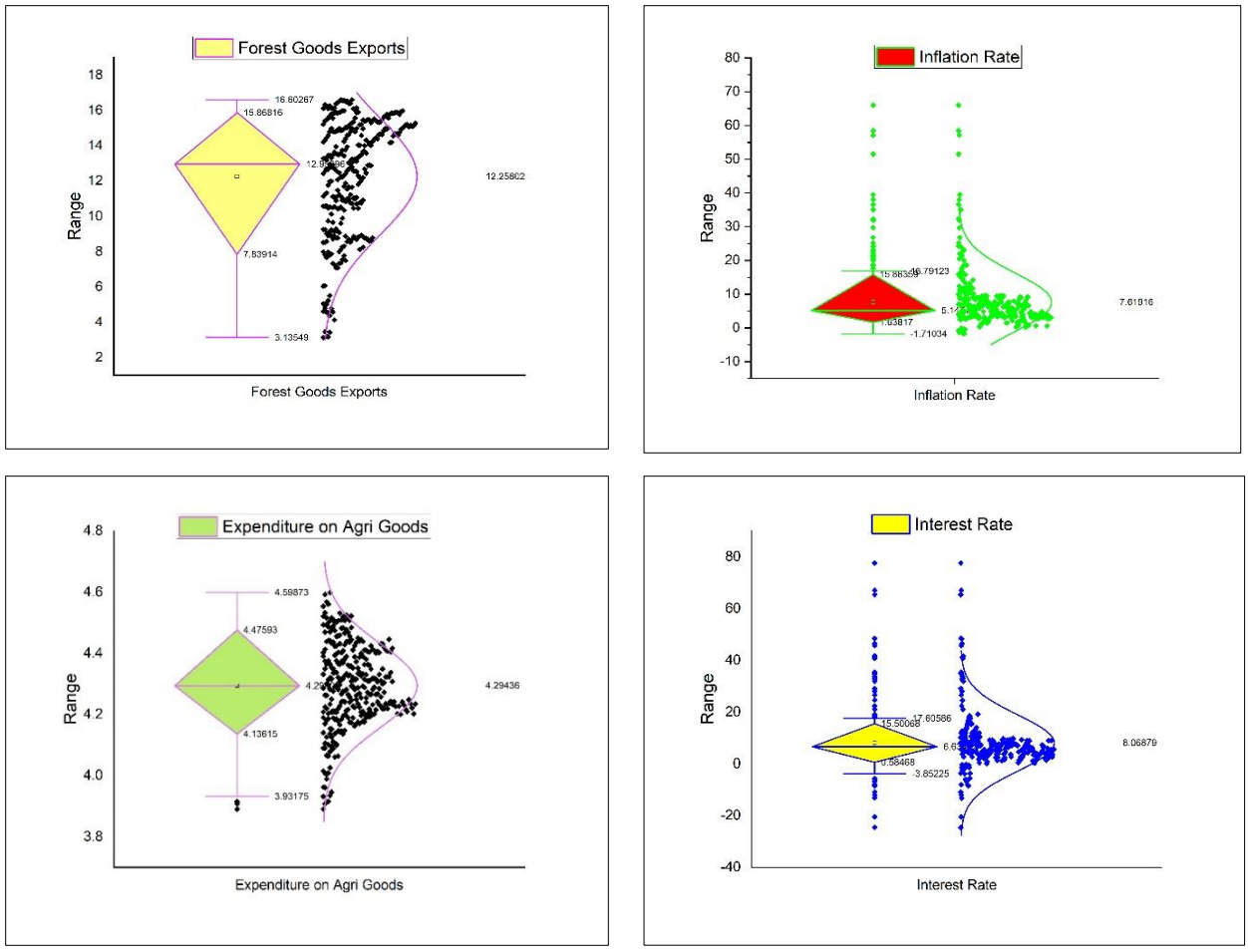


Fig. 1 Box plots were used as a tool to show the distribution of economic performance, unemployment, forest goods exports, inflation rate, expenditures on agricultural goods, and interest rate as the variables investigated in the study for the ten countries that are mostly dependent on forest goods' export, selected from an overall research subject. The time frame of the study is between 1990 and 2021. The box plots provide a transparent view of the middle values, the range and the possible unusual values for each variable making it very easy to compare and draw insights into their respective distributions among the countries and throughout the years.

4.2. Results of CIPS and CADF

Table 4: *Pesaran unit root test CADF and CIPS*

CIPS			**CADF**	
	At level	**At first diff**	**At level**	**At first diff**
Variable	Statistics	Statistics	Statistics	Statistics
lnFPEX_V	-1.739	-4.648***	-1.754	-3.688***
UME	-1.638	-5.876***	-2.173	-3.807***
lnGDPc	-1.758	-4.077***	-1.779	-3.017***
INF	-3.523***	-5.98***	-2.874***	-5.389***
INT	-2.472	-5.139***	-1.561	-4.701***
POPG	-1.348	-4.226***	-1.82	-3.688***
ln EAG	-1.959	-4.901***	-2.207**	-4.184***

The outcomes presented in Table 4 showcase the findings from the CADF and CIPS tests. These results reveal that, except for the inflation rate variable (INF), not all of the chosen variables demonstrate stationarity at the base level. Stationarity becomes apparent when there is statistical significance at the 1% level in the first difference of the variables. After achieving stationarity, the subsequent stage involves an investigation into the potential presence of a co-integration relationship among these variables. To achieve this, three separate co-integration tests were carried out.

4.3. Results of the Co-integration Test

Table 5: *Co-integration test results for the Economic Performance-Model*

Westerlund (2005) Co-integration	
"Some panels are Co-integrated" (VAR)	-1.745 (0.040)
"All panels are co-integrated" (VAR)	-1.877 (0.030)
Pedroni (1999, 2004) Co-integration	
"Modified Philip's-perron" t	-1.432 (0.076)
"Philip's-perron" t	-9.039 (0.000)
"Augmented Dickey-Fuller" t	-8.849 (0.000)
KAO Test (1999)	
"Modified Dickey-Fulle"r t	-11.009 (0.000)
:Dickey-Fuller: t	-11.004 (0.000)
"Augmented Dickey-Fuller" t	-11.835 (0.000)
"Unadjusted modified Dickey-Fuller" t	-21.013 (0.000)
"Unadjusted Dickey-Fuller" t	-12.765 (0.000)

Values in parenthesis are (p values); VR is the variance ratio

Table 6: *Co-integration test results for the Unemployment-Model*

Westerlund (2005) Co-integration	
"Some panels are Co-integrated" (VAR)	-1.737 (0.041)
"All panels are co-integrated" (VAR)	-1.823 (0.034)
Pedroni (1999, 2004) Co-integration	
"Modified Philip's-perron" t	4.429 (0.000)
"Philip's-perron" t	4.500 (0.000)
"Augmented Dickey-Fuller" t	4.887 (0.000)
KAO Test (1999)	
"Modified Dickey-Fulle"r t	-17.764(0.000)
:Dickey-Fuller: t	-11.127 (0.000)
"Augmented Dickey-Fuller" t	-5.355 (0.000)
"Unadjusted modified Dickey-Fuller" t	-18.376 (0.000)
"Unadjusted Dickey-Fuller" t	-11.157 (0.000)

Values in parenthesis are (p values); VR is the variance ratio

The findings of co-integration tests by Westerlund, Pedroni, and Kao are presented in Table 5 and Table 6. The Westerlund co-integration test was applied using both select panels and all panel statistics for two distinct models: economic performance and unemployment. The assays carried out for these investigations indicated that some panels and all panel assessments over the two models were getting very low p-values, which in turn, proved the existence of co-integration between the variables. The Pedroni co-integration tests, mainly the modified Phillips-Perron t-test, produced great results, the Phillips-Perron t-test being significant at the 1% level and the Dickey-Fuller augmented t-test being significant at the 5% level. Therefore, these results give further support to the assertion of co-integration among the variables. The same issue arises from the Kao co-integration test, although the Unadjusted Modified Dickey-Fuller

t-test gives a non-significant p-value. Hence, co-integration is a definite basis, on which the long-run effects of the models are estimated.

4.4. Results of AMG and CCEMG Model 1

An AMG estimator was applied in this particular research study to analyze how different factors like Forest goods Exports (lnFPEX_V), Population Growth (POPG), agricultural goods expenditure (lnEAG), interest rate (INT), and inflation (INF) affect GDP per capita (Economic performance) and unemployment. The panel AMG model estimation results (shown in Table 7) bring significant insights. In detail, lnFPEX_V, INT, and INF have a significant and positive effect on GDP per capita, while lnEAG has a significant but negative effect. The variable POPG shows a positive effect but is not statistically significant in case of Economic performance (GDPPc).

The results indicate that an increase in forest goods exports significantly enhances revenue in selected developing countries. Holding other factors constant, a 1% increase in forest plantation is associated with a long-term increase of 0.0723% in GDP per capita. World Bank data supports the finding that forest goods exports have been growing in selected developing countries since the 1990s. Furthermore, previous studies have also demonstrated the positive impact of forestry goods exports on GDP in high forest-covered developing countries like Brazil (Coelho Junior et al., 2023) and Indonesia (Brontowiyono et al., 2022).

Table 7: *Results of panel AMG and CCEMG estimators*

Variables	**AMG (*lnGDPc*)**	**CCEMG (lnGDPc)**	**AMG (UME)**	**CCEMG (UME)**
lnFPEX_V	0.265**	0.337**	-0.163***	-0.914**
	(0.117)	(0.148)	(0.059)	(0.457)
POPG	-0.161	-0.443	0.239***	0.595**
	(0.246)	(0.430)	(0.079)	(0.236)
ln EAG	-0.560**	-0.585*	-0.650	-0.479
	(0.254)	(0.345)	(0.851)	(4.617)
IR	0.009***	0.007**	-0.098*	-0.033
	(0.002)	(0.003)	(0.052)	(0.135)
INF	0.046*	0.013*	0.062*	0.102**
	(0.022)	(0.002)	(0.037)	(0.020)
Observations	**257**	**257**	**257**	**257**
Groups	9	9	9	9
Wald chi-statistics	8.81	8.57	3.74	5.84
(RMSE)	0.148	0.103	0.513	0.307

*Standard error in parentheses ***p<0.01, **p<0.05, *p<0.1*

The findings of our study align with the conclusions reached by (Coelho Junior et al., 2023) and Asmara et al. (2021), Similarly, their study identified a positive correlation between higher exports of forest goods and an increase in GDP per capita. However, our investigation unveils that the growth of the population (POPG) does not yield a noteworthy influence on GDP per capita. Furthermore, we note an inverse association between expenditure on agricultural goods (EAG) and GDP per capita, signifying that a 1% growth in EAG results in a reduction of 0.560% in GDP per capita. The new finding confirms earlier scholarly references, for instance, the study done by Nguyen & Su (2021), which indicates that consumer expenditures increase as a consequence of higher spending on agricultural goods and, thus, negatively affect GDP per capita. The same issue was pointed out already by Hoang (2017), revealing the same arguments in different empirical works asserting that agricultural expenditure has negative effect on GDP per capita.

In the course of our analysis, we detect a remarkable and favorable relationship between the interest rate (INT) and GDP per capita (GDPc). At the same time, inflation (INF) positively impacts the economy

significantly and this impact is through the creation of large job opportunities in the developing countries where the funds are directed, which, in turn, sends the income to the people. These conditions reveal the direct link between the major ten high forest products exporting countries' exports, main economic indicator GDP per capita, and foreign exchange earnings from developed countries. On the other hand, the degree of exports' role in raising the state of per capita income depends on various factors, like the level of trust in the institutions, the economic climate and trade relations, as well as the regulations in the government and labor market (Akhtar-danesh, 2017; Alexandru et al., 2020). The findings of Bulte et al (2005) and Nguyen & Su (2021) have been further backed by our results, who reported a positive association between inflation (INF) and GDP per capita.

4.5. Results of AMG and CCEMG Model-2

The study results reveal that the export increase of forest goods has promising impact on the unemployment decline of selected developing countries. If we keep other factors constant, then in the long run, a 1% rise of forest plantation would bring about a decrease of -0.163% in the unemployment rate. This is in line with the findings of former researchers namely Coelho Junior et al (2023) and Brontowiyono et al (2022) who also concluded that enhanced forest goods exports were the causes of decreased unemployment rates. Nevertheless, the current research shows that the population growth (POPG) in the second model is positively and significantly related to unemployment, meaning that a larger rise in population results in higher unemployment rates. Conversely, the influence of agricultural goods expenditure (EAG) and the interest rate on unemployment is found to be statistically insignificant indicating that these factors do not play an important role in unemployment.

Concerning inflation (INF), the results of model 2 are remarkable. It indicates a positive and significant effect on the unemployment rate which means that an increase in inflation causes an increase in unemployment. In the current research, we take the world inflation rate for the selected countries into account, and the results make it very clear that inflation is a major factor causing unemployment. In particular, the rise in inflation rate by 1% is followed by an increase in the unemployment rate by 0.062%. These findings are in line with those of Ghosh (2004) who had also documented a positive connection between inflation and unemployment.

To conclude, the research suggests that the export of forest products can be a potent weapon against the problem of unemployment in developing nations. On the other hand, while population growth and inflation have opposing impacts on unemployment, the former pushes the rates up while the latter deepens the crisis. The influence of spending on agricultural products and of interest rates on unemployment appears not to be significant. The presented results offer essential guidance for the policymakers in terms of sculpting the future strategies to cope up with the unemployment issues faced in developing countries.

4.6. Robustness Analysis

In order to increase the reliability of our estimations with the panel-based AMG method, we performed an extra analysis employing the CCEMG estimator. The output of the CCEMG estimator not only confirms but also powerfully supports that of the AMG estimator, revealing that the positive effect of forest goods export increases on unemployment is the case. This concurrence of the two estimators makes our conclusions more robust. Therefore, we can assert with high confidence that among the factors affecting unemployment in the panel of 10 high-export developing countries, inflation is the main one, while interest rate and agricultural goods' expenditure have little or no effect.

The major point that can be drawn from these forecasts is that the export of forest products has an extraordinary effect on the unemployment rate, making it a crucial factor for its reduction. Besides, inflation (INF) is found to have an opposite effect on the unemployment rate, whereas the interest rate (INT) has no effect in the ten high forest goods export developing countries. Thus, the authors infer that the reduction of unemployment is one of the key features of forest goods exports and simultaneously draw attention to the necessity of proper management of the inflation rate. The limited effect of interest rates

points to the probability that other factors are exercising a stronger influence over the unemployment situation in these nations.

Furthermore, the CCEMG estimator reinforces our primary conclusion that the export of forest products has an advantageous influence on the unemployment rate. It also stresses the importance of inflation as a factor influencing unemployment, while it acknowledges the minimal role of the interest rate in the scenario of the ten developing countries with the highest forest goods export.

4.7. Dumitrescu-Hurlin Test Results

To determine the causal relationships between the key variables in the research, the Dumitrescu-Hurlin causality test was performed. The results of the test are summarized in Table 8, which provides a view of the causal relations between GDP per capita, Unemployment (UME), forest goods export value (FPEX_V), and the other factors considered in the study of the ten developing countries that depend heavily on forest goods exports. The study reveals the existence of one-sided causal relationships. More specifically, there is a clear unidirectional causation from GDP per capita to forest goods exports and from GDP per capita to the indicators such as inflation rate (INF), interest rate (IR), and population growth. Also, there is a one-way causation between forest goods exports and Unemployment (UME) as well as between forest goods export value and population growth. These findings give an important understanding of the directional influences that cross the variables investigated in the context of the selected countries.

Table 8: *Results of Dumitrescu-Hurlin causality test*

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.	Direction
GDPPC # FPEX_V	1.82968	1.47359	0.1406	FP→ GDP
FPEX_V # GDPPC	4.31567	6.34017	0.0000	
INF # GDPPC	1.74072	1.29946	0.1938	GDPPC→INF
GDPPC # INF	2.50820	2.80188	0.0051	
IR # GDPPC	1.02998	-0.09189	0.9268	GDPPC →IR
GDPPC # IR	4.05495	5.82979	0.0000	
PP # GDPPC	3.28683	4.32611	0.0000	PP→GDPPC
GDPPC # PP	0.57993	-0.97292	0.3306	
INF # FP	1.09712	0.03953	0.9685	FP→INF
FP # INF	2.73956	3.25477	0.0011	
IR # FPEX_V	1.74982	1.31727	0.1877	FP→IR
FPEX_V # IR	2.57757	2.93767	0.0033	
PP # FPEX_V	2.67579	3.12994	0.0017	PP→FP
FPEX_V # PP	1.31010	0.45647	0.6481	
IR # INF	3.08339	3.92786	0.0000	IR↔INF
INF # IR	5.72647	9.10195	0.0000	
PP # INF	2.51099	2.80734	0.0050	PP→INF
INF # PP	1.82519	1.46481	0.1430	
PP # IR	1.65906	1.13958	0.2545	PP # IR
IR # PP	1.16747	0.17726	0.8593	

Note: # indicates does Granger-cause, ↔ shows bi-directional causality, and → refer to unidirectional causality.

5. CONCLUSION AND POLICY RECOMMENDATIONS

The research stresses the role that forestry exports play in determining a country's economic situation, job availability, and trade balance. Thus, it strongly calls for a careful consideration of the trade-offs and drawbacks related to the different avenues. Besides, the study has pointed out the positive aspects of forestry exports to the economy by drawing for instance, the connections to inflation, interest rates, and demographic growth. As part of the descriptive statistic, the study offers a detailed account of the

principal variables in the dataset by providing very precise figures based on a number of parameters such as mean, standard deviation, minimum, and maximum for GDP per capita, unemployment, forest goods exports, population growth, and agricultural goods consumption, alongside interest rates and inflation.

In the course of confirming the model specifications, the study conducts slope homogeneity (SH) and cross-sectional dependence (CSD) tests. It is found that there is a large variability in model slopes, which confirms the selected specifications and also the rejection of the null hypothesis about the existence of cross-sectional dependence. After that, the stationarity of the variables is checked by CIPS and CADF tests that indicate that the only variable which is stationary at the level is inflation rate while the rest are non-stationary. Co-integration tests (Westerlund, Pedroni, and Kao) all point in the same direction of a long-run relationship among variables.

In the last phase to be precise the research makes use of AMG and CCEMG estimators to evaluate the influence of forest goods exports, population growth, expenditure on agricultural goods, interest rates, and inflation on GDP per capita and unemployment. The findings reveal that forest goods exports, interest rates, and inflation all have significant positive effects on GDP per capita, while the expenditure on agricultural goods has a significant but negative impact. The population growth shows a positive effect, yet its influence on the economic performance is not backed by statistical significance. The complete examination highlights the centrality of forest goods exports to the economy of the country, and it is the responsibility of the policymakers to tackle the conflicts that might arise and opt for sustainable forest management that will lead to sharing of benefits fairly.

5.1. Policy Implication

From the conclusions of the study, a few policies can be drawn:

1. Forest Goods Exports should be promoted and supported: The study underlines the beneficial effect of forest goods exports on GDP per capita. The states should be concerned with creating and enlarging their timber industry while also catering to nature through sustainable practices. This could be done through the revenue generated coming from exports of forest products in a way that the revenue goes back to the state and the nature too. The states that are investing in their forests will keep their forests alive and printing at the same time!
2. Interest rates should be kept at a constant level and inflation: The rates of interest (INT) and inflation (INF) both have a good side which is the impact on GDP per capita, according to the study. Governments should prioritize the establishment of stable interest rates which will lead to increased investments and thus more economic activities. Besides, a combination of efficient monetary and fiscal policies should be put in place to control inflation and keep it at a moderate level, as extremely high inflation could be detrimental to the economic performance.
3. International cooperation is the government's mission: They should, above all, play the role of facilitators in the process of enhancing international cooperation and partnerships given the favorable influence of forest products exports on GDP per capita. Governments can do this through their participation in trade agreements, sharing of sustainable forest management practices, and attracting foreign investments and technological advances in the forestry sector. Besides, international collaboration can significantly increase forest goods exports and lead to the development of the economy.
4. Due to the strong link between forest product exports and decreased unemployment, the governments and respective stakeholders have to direct their efforts toward the forest product export industry promotion and support. The growing of forest goods exports can be supported with measures such as offering incentives for the forest plantation establishment, bettering the transportation and logistics infrastructure, and the building of international trade relationships that would allow easier access for forests goods in the market. Countries can get to the point of

creating job opportunities through the competitiveness and the exportation of forest goods and, thus, help to lower the unemployment rates.

5. In order to effectively handle the inflation problem, the study recommends that inflation could possibly cause a rise in unemployment, thus the authorities need to react rapidly with a mix of measures to cope with the inflation rates. One of the measures could be an effective monetary policy, such as maintaining price stability and controlling inflation expectations. The other avenues that could be pursued alongside this are promoting fiscal discipline, and implementing measures to enhance the economy's productivity and competitiveness which are some of the other methods that can be used to fight inflation forces. Through effective inflation management, nations can establish a stable economic atmosphere that encourages job creation and reduces the rate of unemployment.

The significance of the issue that these policy recommendations should be tailored according to the specific circumstances and characteristics of each country cannot be stressed too much. It is recommended that governments consider conducting further research and analysis to explore the feasibility and impact of these recommendations in their own settings, in addition to taking into account the social, environmental, and labor market conditions which are also important factors.

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Conflict of Interest

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REFERENCES

Akhtar-danesh, N. (2017). *A Comparison between Major Factor Extraction and Factor Rotation Techniques in*. 147–156. https://doi.org/10.4236/ojapps.2017.74013

Akif, M., & Asumadu, S. (2019). Science of the Total Environment Investigation of environmental Kuznets curve for ecological footprint : The role of energy and fi nancial development. *Science of the Total Environment*, *650*, 2483–2489. https://doi.org/10.1016/j.scitotenv.2018.10.017

Alexandru, U., Cuza, I., & Paula, R. (2020). Approaches to improve young peoples experiences on the labor market. *EUROPEAN FINANCE, BUSINESS AND REGULATION*, *October*.

Ali, L., Akhtar, R., Hussain, J., Khan, G., Mumtaz, S., Akhtar, N., Ali, R., & Tao, C. (2023). Economic Performance of Forest Plantations in Asian Countries. *Journal of the Knowledge Economy*, *0123456789*. https://doi.org/10.1007/s13132-023-01240-w

Belhaj, O. S., & Mubako, S. T. (2020). Land use land cover change and urban growth in Khoms district, Libya, 1976-2015. *International Journal of Applied Geospatial Research*, *11*(2), 42–58.

https://doi.org/10.4018/IJAGR.2020040103

Brontowiyono, W., Asmara, A. A., Jana, R., Yulianto, A., & Rahmawati, S. (2022). Land-Use Impact on Water Quality of the Opak Sub-Watershed, Yogyakarta, Indonesia. *Sustainability (Switzerland)*, *14*(7). https://doi.org/10.3390/su14074346

Bulte, E. H., Damania, R., & Lopez, R. (2005). On the gains of committing to inefficient forest fire managementtle. . . *Journal of Environmental Economics and Management*, *50*(2), 311–335.

Bulte, E. H., Damania, R., & Deacon, R. T. (2005). Resource intensity, institutions, and development. *World Development*, *33*(7), 1029–1044. https://doi.org/10.1016/j.worlddev.2005.04.004

Bulte, E. H., Damania, R., & López, R. (2007). On the gains of committing to inefficiency: Corruption, deforestation and low land productivity in Latin America. *Journal of Environmental Economics and Management*, *54*(3), 277–295. https://doi.org/10.1016/j.jeem.2007.05.002

Chen, X., Liu, Q., Fang, K., He, J., Chen, Y., Wang, T., Fang, C., & Shen, Y. (2020). Tracking national sustainability of critical natural capital and the socioeconomic drivers in the context of the Belt and Road Initiative. *Ecological Indicators*, *114*(March), 106315. https://doi.org/10.1016/j.ecolind.2020.106315

Coelho Junior, L. M., Santos, H. F., Soares, N. S., Martins, J. M., & Silva, M. L. da. (2023). International competitiveness of exports of forest products. *Ciência Rural*, *53*(9), 1–8. https://doi.org/10.1590/0103-8478cr20220137

Dogan, E., Ulucak, R., Kocak, E., & Isik, C. (2020). Science of the Total Environment The use of ecological footprint in estimating the Environmental Kuznets Curve hypothesis for BRICST by considering cross-section dependence and heterogeneity. *Science of the Total Environment*, *723*, 138063. https://doi.org/10.1016/j.scitotenv.2020.138063

Dumitrescu, E., & Hurlin, C. (2012). Testing for Granger non-causality in heterogeneous panels ☆. *Economic Modelling*, *29*(4), 1450–1460. https://doi.org/10.1016/j.econmod.2012.02.014

Eberhardt, M. (2012). Estimating panel time-series models with heterogeneous slopes. *Stata Journal*, *12*(1), 61–71. https://doi.org/10.1177/1536867x1201200105

For, A. B., Finance, C. S. A., The, I. N., & Sector, C. (n.d.). *a Blueprint for Csa Finance in the Cocoa Sector*.

Ghosh, J. (2004). Globalization, export-oriented employment for women and social policy: A case study of India. *Globalization, Export-Orientated Employment and Social Policy: Gendered Connections*, 91–125. https://doi.org/10.1057/9780230524217_4

Heidarian, J., & Green, R. D. (1989). *The impact of oil-export dependency on a developing country The case of Algeria*. 247–261.

Hoang, H. K. (2017). *Analysis of food demand in Vietnam and short-term impacts of market shocks on quantity and calorie consumption*. 1–25. https://doi.org/10.1111/agec.12397

Jha, C. K., Ghosh, R. K., Saxena, S., Singh, V., Mosnier, A., Guzman, K. P., Stevanović, M., Popp, A., & Lotze-Campen, H. (2023). Pathway to achieve a sustainable food and land-use transition in India. *Sustainability Science*, *18*(1), 457–468. https://doi.org/10.1007/s11625-022-01193-0

Kallio, A. M. I. (2021). Wood-based textile fibre market as part of the global forest-based bioeconomy. *Forest Policy and Economics*, *123*(November 2020), 102364. https://doi.org/10.1016/j.forpol.2020.102364

Kapetanios, G., Pesaran, M. H., & Yamagata, T. (2011). Panels with non-stationary multifactor error structures. *Journal of Econometrics*, *160*(2), 326–348.

https://doi.org/10.1016/j.jeconom.2010.10.001

Le, T.-H., Chang, Y., Taghizadeh-Hesary, F., & Yoshino, N. (2019). Energy insecurity in Asia: A multi-dimensional analysis. *Economic Modelling*, *83*, 84–95. https://doi.org/https://doi.org/10.1016/j.econmod.2019.09.036

Levin, A., Lin, C.-F., & James Chu, C.-S. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of Econometrics*, *108*(1), 1–24.

Li, L., Tariq, M., & Faizan, M. U. (2020). *Influence of international trade on forest transition : evidence influence of international trade on forest transition: evidence from 62 developing countries*. *Fresenius environmental bulletin*, *29*(10), 9113-9124.

Lorente, D. B. (2020). *The mitigating effects of economic complexity and renewable energy on carbon emissions in developed countries*. *August*, 1–12. https://doi.org/10.1002/sd.2125

Maddala, G. S., & Ã, S. W. (1999). *A comparative study of unit root tests with panel data and a new simple test*. *Oxford Bulletin of Economics and Statistics*, *61*(S1), 631-652. https://doi.org/10.1111/1468-0084.0610s1631

Mahmoudi, B., Ng, E., Mafi-Gholami, D., & Eshaghi, F. (2023). Forest Dwellers' Dependence on Forest Resources in Semi-Arid Environments. *Sustainability (Switzerland)*, *15*(3), 1–13. https://doi.org/10.3390/su15032689

Nepstad, D., Schwartzman, S., Bamberger, B., Santilli, M., Ray, D., Schlesinger, P., Lefebvre, P., Alencar, A., Prinz, E., Fiske, G., & Rolla, A. (2006). Inhibition of Amazon deforestation and fire by parks and indigenous lands. *Conservation Biology*, *20*(1), 65–73. https://doi.org/10.1111/j.1523-1739.2006.00351.x

Nguyen, C. P., & Su, T. D. (2021). Alleviating energy poverty for forest conservation: It seems to work, but what are we missing? *Land Use Policy*, *109*(June), 105625. https://doi.org/10.1016/j.landusepol.2021.105625

Pedroni, P. (2004). Panel cointegration : asymptotic and finite sample properties of pooled time series tests with an application. *Economic Theory*, *20*, 597–625. DOI: 10+10170S0266466604203073

Pesaran, M. H. (2006a). Estimation and Inference in Large Heterogeneous Panels with a Multifactor Error Structure. *Econometrica*, *74*(4), 967–1012. https://doi.org/10.1111/j.1468-0262.2006.00692.x

Pesaran, M. H. (2006b). Estimation and Inference in Large Heterogeneous Panels with a Multifactor Error Structure. *Econometrica*, *74*(4), 967–1012. https://doi.org/10.1111/j.1468-0262.2006.00692.x

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Economics*, *22*(2), 265–312. https://doi.org/10.1002/jae.951

Pesaran, M. H., & Yamagata, T. (2008). Testing slope homogeneity in large panels. *Journal of Econometric*, *142*(1), 50–93. https://doi.org/10.1016/j.jeconom.2007.05.010

Prakash, A., Sarkar, K. K., & Kumar, A. (2022). Estimation of Green GDP for India. *RBI Bulletin*, *October*, 149–163.

Prince, S., & Adeleye, N. (2021). Environmental preservation amidst carbon emissions , energy consumption , and urbanization in selected african countries : Implication for sustainability. *Journal of Cleaner Production*, *285*, 125409. https://doi.org/10.1016/j.jclepro.2020.125409

Sara, V. (2010). Cross-sectional Dependence in Panel Data Analysis. *MPRA Paper*, *20367*.

Sardeshpande, M., & Shackleton, C. (2019). Wild edible fruits: A systematic review of an under-researched multifunctional NTFP (Non-Timber Forest Product). *Forests*, *10*(6), 1–24. https://doi.org/10.3390/f10060467

Sathaye, J., & Shukla, P. R. (2013). Methods and models for costing carbon mitigation. *Annual Review of Environment and Resources*, *38*, 137–168. https://doi.org/10.1146/annurev-environ-083111-092115

Sawarkar, A. D., Shrimankar, D. D., Kumar, A., Kumar, A., Singh, E., Singh, L., Kumar, S., & Kumar, R. (2020). Commercial clustering of sustainable bamboo species in India. *Industrial Crops and Products*, *154*(June), 112693. https://doi.org/10.1016/j.indcrop.2020.112693

Shrestha, U. B., Lamsal, P., Ghimire, S. K., Shrestha, B. B., Dhakal, S., Shrestha, S., & Atreya, K. (2022). Climate change-induced distributional change of medicinal and aromatic plants in the Nepal Himalaya. *Ecology and Evolution*, *12*(8), 1–14. https://doi.org/10.1002/ece3.9204

So, K., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, *115*(1), 53–74. https://doi.org/10.1016/S0304-4076(03)00092-7

Society, T. E. (2013). *Estimating Vector Autoregressions with Panel Data Author (s): Douglas Holtz-Eakin , Whitney Newey and Harvey S . Rosen Published by : The Econometric Society Stable 56*(6), 1371–1395.

Soliev, I., Theesfeld, I., Abert, E., & Schramm, W. (2021). Benefit sharing and conflict transformation: Insights for and from REDD+ forest governance in sub-Saharan Africa. *Forest Policy and Economics*, *133*(October), 102623. https://doi.org/10.1016/j.forpol.2021.102623

Stryamets, N., Elbakidze, M., & Angelstam, P. (2012). Role of non-wood forest products for local livelihoods in countries with transition and market economies: Case studies in Ukraine and Sweden. *Scandinavian Journal of Forest Research*, *27*(1), 74–87. https://doi.org/10.1080/02827581.2011.629622

Sunderlin, W. D., Belcher, B., Santoso, L., Angelsen, A., Burgers, P., Nasi, R., & Wunder, S. (2005). Livelihoods, forests, and conservation in developing countries: An overview. *World Development*, *33*(9 SPEC. ISS.), 1383–1402. https://doi.org/10.1016/j.worlddev.2004.10.004

Taylor, P., Sarafidis, V., & Wansbeek, T. (2012). *Cross-Sectional Dependence in Panel Data Analysis*. *November 2014*, 37–41. https://doi.org/10.1080/07474938.2011.611458

Vu, X. B., & Nghiem, S. (2018). Provincial divergence and sub-group convergence in vietnam's GDP per capita. *Journal of Economic Research*, *23*, 81–107.

Wangchuk, J., Choden, K., Sears, R. R., Baral, H., Yoezer, D., Tamang, K. T. D., Choden, T., Wangdi, N., Dorji, S., Dukpa, D., Tshering, K., Thinley, C., & Dhendup, T. (2021). Community perception of ecosystem services from commercially managed forests in Bhutan. *Ecosystem Services*, *50*, 101335. https://doi.org/10.1016/j.ecoser.2021.101335

Waqas, Khan, D., & Magda, R. (2022). The Impact of Forest Wood Product Exports on Environmental Performance in Asia. *Sustainability (Switzerland)*, *14*(20), 1–14. https://doi.org/10.3390/su142013334

Westerlund, J. (2007). Testing for error correction in panel data. *Oxford Bulletin of Economics and Statistics*, *69*(6), 709–748. https://doi.org/10.1111/j.1468-0084.2007.00477.x

Wunder, S., Campbell, B., Frost, P. G. H., Sayer, J. A., Iwan, R., & Wollenberg, L. (2008). When donors get cold feet: The community conservation concession in Setulang (Kalimantan, Indonesia) that never happened. *Ecology and Society*, *13*(1). https://doi.org/10.5751/ES-02376-130112

Yuca Waarts, Valerie Jansen, Verina Ingram, Maja Slingerland, Fédes van Rijn, G. B., & Just Dengerink, Jiska van Vliet, Eric Arets, Marieke Sassen, Joost Guijt, S. van V. (2019). A living income for smallholder commodity farmers and protected forests and biodiversity : how can the private and public sectors contribute ? *Wageningen Economic Research*, 1–26.