

Original Research

Implications of Trade and Trade Adjustment on Forest Transition in Africa and Asia: Based on FMOLS and DOLS Approaches

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Abstract

In Asian and African countries, the state of economic globalization has been distinct from developed countries since the 1980s. Existing literature focused mainly on trade in forest goods, but this study focused on trade and trade adjustment in Asian and African countries on forest cover change dynamics. To this end, we used Fully Modified Least Square (FMOLS) and Dynamic Ordinary Least Square (DOLS) estimators to investigate the impact of trade and adjustment of trade structure on forest transition in Asian and African panels over the period 1990-2016. Our findings show that trade and trade adjustment indicators such as the percentage of non-primary goods in total exports (PNPEXP), total exports of manufacturing and service goods (TEXP), imports of forest goods (IMFG), and imports of agricultural goods (IMAG) have a positive and significant impact on forest cover in Asian and African countries. The causality test results also confirm that unidirectional causality runs from forest cover to PNPEXP, TEXP, IMAG, and IMFG. Bi-directional causality is found between IMFG and IMAG. We can conclude that Asian and African countries can improve their forest cover by adopting modern trade and trade adjustment strategies.

Keywords: forest transition, trade structure, exports, imports, FMOLS and DOLS, Asian and African countries

Introduction

Human-induced natural forest change is at the heart of the science of land change, aiming to understand how the relationship between people and the environment affects land and land cover [1, 2]. The concept of land use transition links land cover change and common land-use patterns with increased human dominance in a given area [3, 4]. It presents a significant starting point for forest change analysis. According to this concept, forest change occurs in two different stages [5]; the original natural systems, the most important forests, are being transformed relatively rapidly into large agricultural systems. Later, as the population grew, agriculture became more active and market-oriented, re-establishing livelihoods [6]. The rate of transformation of the forest slowed down, and eventually, the forest was restored, which is referred to as forest transition [7]. The forest cover pattern can be viewed as a gradient of growing population density and average income at the national level [8]. During the land-use transition, the key roles of forests change: in the early phase, the forest was the primary source of other land used for agriculture. At this period, wood is primarily seen as an obstacle to agriculture, and large amounts of wood burn or rot and are not used directly in society [9, 10]. Forest resource like wood is also used as fuel and account for a large part of society's total energy use. In the following phases of the transition, the industrialized production process and fossil fuels are the backbones. The process of agricultural intensification continues to develop, and the demand for additional agricultural land is reduced. At this stage, forests have two main functions to society: (i) they are a source of timber products, and their consumption increases with income [10]. In addition, (ii), they are essential components of recreational and protected lands.

Consequently, the scientific debate on forest transition has reached two theoretical stages: the forest transition phase and the degradation phase on the environmental Kuznets curve [11]. The study of forest pathways examines the general mechanism between countries or regions from social ecology. It identifies five pathways to forest transition: national forestry policy, forest scarcity, globalization, economic development, and intensification of small-scale agricultural land. Deforestation is an environmental study of the Kuznets Curve that focuses on the relationship between forest transition and economic growth.

In recent decades, international trade has increased, mainly due to the liberalization of foreign investment. This liberalization has had an enormous impact on society, economy, politics, and culture and has hugely influenced the management and protection of natural resources, including forests [3, 12]. The growing interdependence of the global economy can also be associated with the factors that directly or indirectly cause deforestation and forest transition [2]. However, the ever-increasing complexity of international trade

and investment makes it difficult to explain the interconnected forces responsible for forest cover dynamics. Moreover, such relationships have rarely been analyzed based on empirical evidence. This study focuses on trade and trade adjustment in forest cover patterns targeting affected Asian and African countries. When all other factors remain unchanged, the import of forest goods will reduce the pressure on domestic forests, while the export will boost the pressure on them. Linking forest goods trade flows with forest resource changes can quantify international trade's relevance in the continuing forest transition.

Overview of Forest Cover Change in Africa and the Asian Continent

There are arguments in developing countries regarding the inverse ecological impacts of foreign direct investment (FDI). Severe ecological regulations in developed nations increase the lower ecological standard that establishes "pollution havens" to transfer pollution-intensive production from high-income countries to developing nations [13]. Resultantly, FDI improves forest degradation and inverse outcomes [14]. Because some multinational companies are helping to restore ecological performance in developing countries by transmitting ecological impact control to both management and technological change, on the other hand, goods have been booming in previous eras, global demand for mineral assets is set to increase in the medium term due to urbanization and infrastructure development in emerging countries [15].

In Sub-Saharan Africa, deforestation is a critical ecological concern. However, it is a dynamic and challenging process influenced by many different economic, social and biophysical variables [11, 16]. Sustainability of forest resources is achieved through disturbance, other species' ability to regrow, and ecological conditions [16, 17]. Similarly, some forest cover loss drivers such as rapid urbanization and population growth may be prevalent within a continent or region [18]. Every year African forest is declining 9.9 million acres (4 million hectares) of the forest, which is twice the global average of forest cover loss [19]. The current data from different literature explain that the forest area of Africa has been decreased through net forest area [20-22]. According to the FAO [23], the forest area from the total land area has declined by 3.5% from 1990 to 2015. Similarly, the forest cover indicates an inverse change in North Africa and minor alterations in Sub-Saharan Africa.

According to MacDicken [24], the projected total area in the Asian Pacific region is 723 million hectares. From 2000 to 2015, a vast increase in forest area is about 20 million hectares, but this generates a massive difference amid the sub-regions and countries. Moreover, there is an increase in forest area in the east and south Asia whereas an enormous decrease in south East Asia and Oceania. In addition, it has been seen a regional

increase in India, China, the Philippines, Thailand, and Vietnam. Likewise, there is a considerable increase in Bhutan, Fiji, New Zealand, and Samoa. From 2000 to 2015, countries like the Democratic People's Republic of Korea, Pakistan, Indonesia, Cambodia, Nepal, and Myanmar were drastically going through a decline in the forest area.

Significance of the Study

This study adds knowledge in three primary channels; the first is; this study builds a model for forest transition in Asian and African countries to significantly explore the impact of trade and trade adjustment structure. Second, this study takes advantage of the updated Asian and African countries panel that has never been used in the empirical relationship between these variables. Third, the study uses estimators that have been ignored in the past and are robust for cross-sectional dependence, slope homogeneity, and endogeneity. Finally, this research can guide Asian and African countries, which helps formulate timely policies to address the problems and plan better.

Materials and Methods

Data

This paper has used 36 Asian and African countries' data for analysis from 1990 to 2016 with 972 observations using the World Bank and FAO database. Table 1 shows a variable description, and

Table 2 explains a data description. The selection of the period is based on the availability of the data. The average forest cover in Asian and African countries is 34.343, with a minimum of 1.9 and a maximum of 78.368 across the panel. Similarly, PNPEXP varied between a maximum of 1.69 percent and a minimum of -3.19 percent, with an average of 1.86 percent. The Asian and African continent accounted average mean of TEXP 2.292 with a maximum of 4.798 and a minimum of -2.378. The mean value of import of forestry goods IMFG was 11.60801 with a minimum of 2.484907 and a maximum of 17.61778. Similarly, the mean value of import of agricultural goods IMAG was 13.9676 with a minimum of 9.505246 and a maximum of 18.68621. The other control variables description can be seen in Table 2.

The information about variables shows in Table 2; according to our result, the mean forest cover (FC) of our study sample has 34.34289 with a minimum of 1.9 and a maximum of 78.368. The mean percentage of non-primary goods exports (PNPEXP) is 1.860016 with a minimum of -3.91202 and a maximum of 6.192935. Consider the mean value of imports of forestry goods (IMFG) was 11.60801 with a minimum of 2.484907 and a maximum of 17.61778. Our result indicates that the average total export of manufacturing and services goods (TEXP) was 3.29212 percent. The mean value of imports of agricultural goods (IMAG) was 13.9676 with a minimum of 9.505246 and a maximum of 18.68621. On the other hand, we calculate the average GDP Per Capita (GDPPC) as 7.21722.

Similarly, our result indicates that the average value of charcoal production (CP) in tons has 10.87883

Table 1. Variables definition, measurement units, and data source.

Variables	Measurement	Symbols	Source
Forest Cover	Percentage of Forest Cover	FC	FAO (2019)
Non- primary goods in total exports	In percentage	PNPEXP	FAO (2019)
Total exports of manufacturing and services goods	In percentage	TEXP	WDI (2019)
Import value of agricultural goods	1000US\$	IMAG	FAO (2019)
Imports of forestry goods	1000US\$	IMFG	FAO (2019)
Agricultural growth rate	Value	AGR	WDI (2019)
Charcoal Production	Tons	CP	WDI (2019)
Electric consumption per capita	In units	EC	WDI (2019)
Exports of agricultural goods	1000US\$	EAG	FAO (2019)
Exports of forestry goods	1000US\$	EFG	FAO (2019)
Forest plantation	1000 hectare	FP	FAO (2019)
GDP per capita	current US\$	GDPPC	FAO (2019)
Population density	People per hectare	POPD	WDI (2019)
Annual Temperature change in average	Centigrade	TEMP	WDI (2019)

Note: WDI is World Development Indicators, FAO is Food and Agriculture Organization.

with a minimum of 0.00995 and a maximum of 15.31089. Likewise, this study shows the mean value of forest plantation (FP) in hectares has 5.352526 with a minimum of -4.60517 and a maximum of 11.29185. The mean value of exports of forestry goods (EFG) has 10.53105, and exports of agricultural goods (EAG) indicate 13.38764. Correspondingly, our result indicates

the average value of electric consumption per capita (EC) has 6.104751 with a minimum of -1.72614 and a maximum of 9.301752. This study shows the mean value of agricultural growth (AGR) has 22.32722 with a maximum value of 45.08239 and a minimum value of 45.08239.

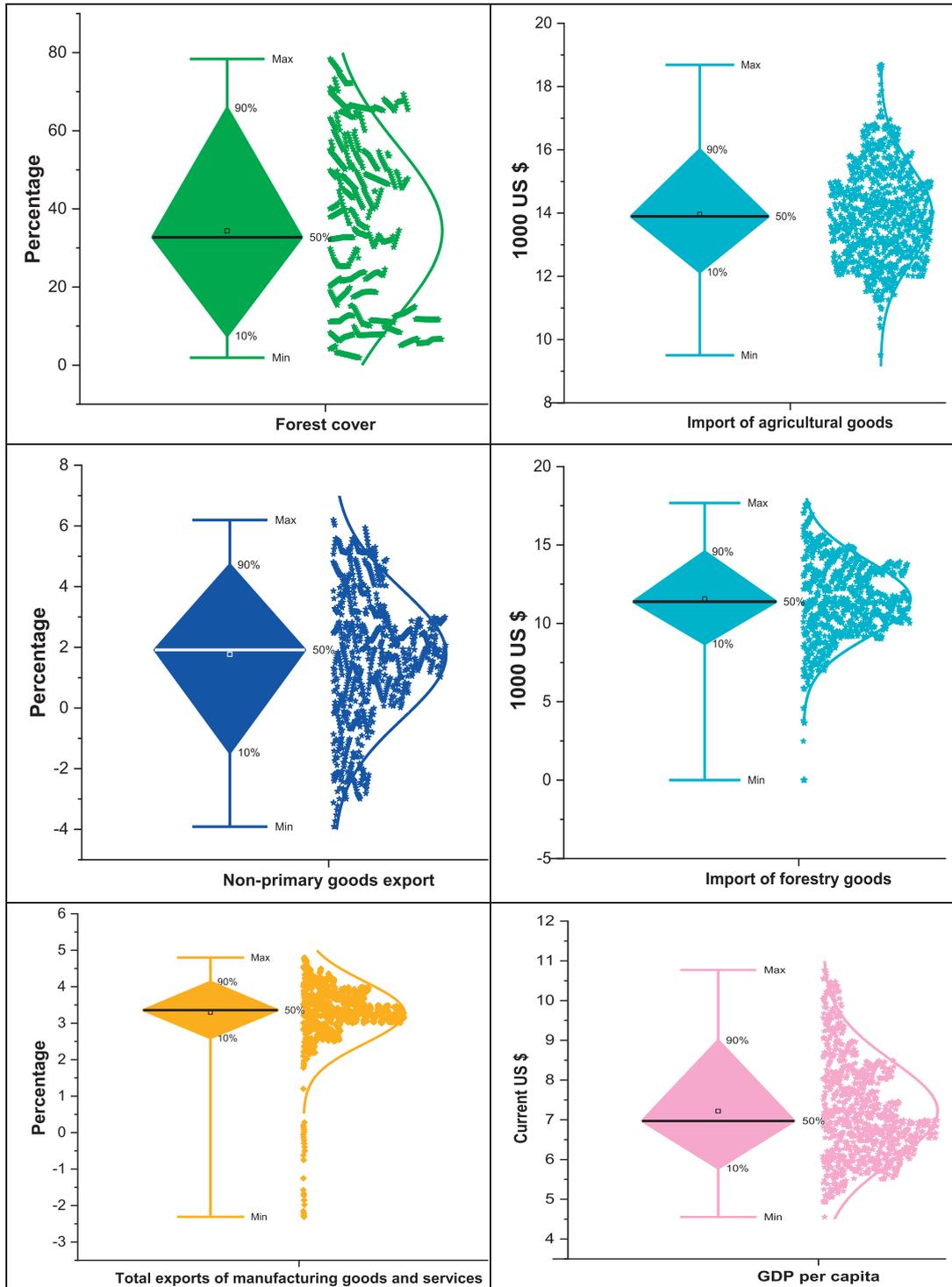


Fig. 1. Provides the Box plot and distribution overlay of forest cover (FC), non-primary goods exports (NPEXP), import of agricultural goods (IMAG), import of forestry goods (IMFG), total exports of manufacturing goods and services (TEXP) and GDP per capita (GDPPC) for Asian and African countries.

Table 2. Description of variables.

Variable		Mean	Std.Dev.	Min	Max	Obs.
FC	Overall	34.34289	21.70697	1.9	78.368	N = 971
	Between		1.086545	31.87069	36.21572	n = 27
	Within		21.68086	1.405172	76.49517	T = 36
LNPNPEXP	Overall	1.764548	2.146733	-3.91202	6.192935	N = 971
	Between		0.087091	1.60883	1.898726	n = 27
	Within		2.145029	-3.79945	6.305506	T = 36
LNIMAG	Overall	13.9676	1.475621	9.505246	18.68621	N = 971
	Between		0.726948	12.85131	15.03603	n = 27
	Within		1.291531	10.55898	17.61778	T = 36
LNIMFG	Overall	11.60801	2.359693	2.484907	18.8897	N = 971
	Between		0.758907	10.29023	12.73297	n = 27
	Within		2.238967	3.802686	19.40927	T = 36
LNTEXP	Overall	3.29212	0.853792	-2.30795	4.798354	N = 971
	Between		0.121562	2.990207	3.473814	n = 27
	Within		0.845409	-2.37037	4.832975	T = 36
LNGDPPC	Overall	7.21722	1.254263	4.552615	10.77166	N = 971
	Between		0.513755	6.625935	7.992825	n = 27
	Within		1.148367	5.090975	10.19634	T = 36
LNPOPD	Overall	4.328916	1.144866	0.541359	7.132643	N = 971
	Between		0.146198	4.071949	4.560582	n = 27
	Within		1.135833	0.798325	6.966085	T = 36
LNCP	Overall	10.87883	3.408537	0.00995	15.31089	N = 971
	Between		0.194351	10.49988	11.13466	n = 27
	Within		3.403192	-0.16053	15.13486	T = 36
LNFP	Overall	5.352526	2.537314	-4.60517	11.29185	N = 971
	Between		0.19402	5.093368	5.716199	n = 27
	Within		2.530153	-4.51408	11.12916	T = 36
LNEFG	Overall	10.53105	3.090795	0.693147	18.31621	N = 971
	Between		0.927934	9.001571	11.84424	n = 27
	Within		2.953471	1.413798	18.63139	T = 36
LNEAG	Overall	13.38764	2.253476	1.609438	17.83118	N = 971
	Between		0.662303	12.46268	14.42682	n = 27
	Within		2.15762	2.511256	17.03856	T = 36
TEMP	Overall	6.91842	4.60267	-18.06	26.06	N = 971
	Between		2.73811	1.68222	1.269972	n = 27
	Within		3.73599	-1.54583	2.192008	T = 36
LNEC	Overall	6.104751	1.512415	-1.72614	9.301752	N = 971
	Between		0.359881	5.496795	6.628542	n = 27
	Within		1.470562	-1.11819	9.185696	T = 36
LNAGR	Overall	22.32722	1.943049	17.34227	45.08239	N = 971
	Between		0.515668	21.77642	23.57221	n = 27
	Within		1.875929	17.49429	43.83741	T = 36

Model Specification

Based on the above discussion, the variables which are under discussion in this study including forest cover FC, the percentage of non-primary goods in total exports (PNPEXP), total exports of manufacturing and services goods (TEXP), import of agricultural goods (IMAG), import of forestry goods (IMFG), population density (POPD), GDP per capita (GDPPC), Charcoal production (CP), forest plantation (FP), exports of forestry goods (EFG), exports of agricultural goods (EAG), electric consumption (EC), agricultural growth rate (AGR) and average temperature change (TEMP) in Asian and African countries. Based on these variables, the following econometric model has been used for estimation.

The empirical model of this study is as follows

$$\begin{aligned} \ln FC_{it} = & \beta_0 + \beta_1 \ln PNPEXP_{it} + \beta_2 \ln TEXP_{it} + \beta_3 \ln IMAG_{it} + \beta_4 \ln IMFG_{it} \\ & + \beta_5 \ln POPD_{it} + \beta_6 \ln GDPPC_{it} + \beta_7 \ln CP_{it} + \beta_8 \ln FP_{it} + \beta_9 \ln EFG_{it} \\ & + \beta_{10} \ln EAG_{it} + \beta_{11} \ln EC_{it} + \beta_{12} \ln AGR_{it} + \beta_{13} \ln TEMP_{it} + \mu_{it} + \varepsilon_{it} \end{aligned} \tag{1}$$

Econometric Procedures

For the empirical assessment of Equation (1), we used a five-step process: (1) Pesaran cross-section dependence (CD) test is applied to check for cross-sectional dependence across the panel. (2) Pesaran CIPS is used for panel unit root tests. (3) “Westerlund test [25] is utilized to check the long-run association among the variables. Also, the Pedroni [26] and Kao [27] co-integration tests is conducted to check robustness of the Westerlund co-integration tests. (4) The Fully Modified Ordinary Least Square FMOLS is used to determine the long-run association between forest cover and trade and trade adjustment in the Asian and African continent. (5) The DH [28] panel causality test is used to identify the trend of the causal connection between the variables.

Cross-Sectional Dependence and Slope-Homogeneity Tests

The cross-sectional dependency is a critical concern in the data, and overseeing this problem can mislead the outcomes [29]. We have precisely applied Pesaran cross-section dependence [30] test. This examination discusses the misrepresentation in sizes from past studies, and it is suitable for large N and a fixed T. this examination is showed mathematically in the following way.

$$CD = \sqrt{\frac{2}{N(N-1)} \sum_{k=1}^{N-1} \sum_{l=k+1}^N Tki \theta_{kl} I \rightarrow N(0,1)} \tag{2}$$

Where θ_{kl} is the coefficient of correlation achieved from the above models residual. The CD test statistics

are asymptotically commonly dispersed with a mean zero.

The IPS and CIPS Unit Root Test

Levin, Lin Chu, and Phillip Perron are the first generation unit root tests that failed to discover the cross-sectional dependence of the panel. The Pesaran CIPS unit root is used to access this drawback, presented by Pesaran [31]. Pesaran developed the “Dickey-Fuller (ADF)” test with cross-sectional averages of lags of the dependent variable and the first difference of each unit of a cross-section. Furthermore, the augmented regression called “Cross-Sectional ADF (CADF)” and is written as follows:

$$\Delta X_{it} = \alpha_i + \beta_i X_{it-1} + \gamma_i \bar{X}_{t-1} + \sum_{k=0} \delta_{ik} \Delta \bar{X}_{t-k} + \sum_{k=1} \delta_{ik} \Delta X_{it-k} + \varepsilon_{it} \tag{3}$$

Where \bar{X}_t indicates the average at T (time) of the whole N nations. Based on the statistics of CADF, the CIPS test of unit root could be considered as:

$$CIPS = N^{-1} \sum_{t=1}^N CADFi \tag{4}$$

Where $CADFi$ specify t-statistics in the regression of $CADFi$ fixed in Eq. (3).

Panel Co-Integration Tests

Using the co-integration standard analysis such as Pedroni [32] when the data might lead to biased outcomes caused by cross-sectional dependence [33, 34]. For discovering the association of co-integration among the variables, we applied an error component-centered examination of con-integration presented by Westerlund [25]. Westerlund co-integration test evaluates the cross-sectional dependence. It employs a model with two autoregressive (AR) parameters unique to the panel, i.e., the panel-specific-AR and the same-AR test statistic. The panel-specific-AR examination statistics explain the existence of co-integration by the use of null hypothesis rejection criteria. But the null hypothesis rejection of panel-specific-AR examination statistics involves that there is no co-integration in the complete panel [35, 36]. The panel same-AR and specific-AR examination statistics could be explained by equations correspondingly:

$$GR = \sum_{i=1}^N \sum_{t=1}^T \hat{F}_{it} \hat{R} \hat{R}^{-1} \tag{5}$$

$$GR = \sum_{i=1}^N \sum_{t=1}^T \hat{F}_{it} (\sum_{i=1}^N \hat{R} \mathbf{1}) \tag{6}$$

Where, $\hat{F}_{it} = \sum_{k=1}^t \hat{f}_{ik}$, $\hat{R}_i = \sum_{t=1}^T \hat{f}_{ik}^2$ and \hat{f}_{ik} indicates the residual from the regression of the panel, and GR shows the group mean-variance ratio statistics.

We applied further examinations of the data with Kao [37] and Pedroni [38] residual-based co-integration to robustness outcomes. Pedroni [26] co-integrated uses seven tests considered into two test clusters with a panel-specific and cross-sectional test. The cluster-specific examination uses three tests among dimensions: group PP-statistics, group rho-statistics, and group ADF-statistics. The panel examination uses four tests: panel PP-statistics, panel rho-statistics, panel v-statistics, and panel ADF-statistics. The null hypothesis of “no co-integration is rejected when the probability values of the examinations are less than 5% level or below for at least four of the seven criteria. Identical to the Pedroni co-integration [26], Kao examination [27] also uses null of no co-integration for a set of panel data. Both analysis performance is based on the standard normal distribution.

Fully Modified Least Square (FMOLS)

The FMOLS was presented by Phillips and Hansen [39] in command to manage an optimal co-integration regression assessment. Furthermore, the study applied the Pedroni [40] heterogeneous FMOLS examination for the panel co-integration regression as it has the benefits of rectifying serial correlation and endogeneity [41]. Hamit-Haggar [42] explained that the FMOLS is an appropriate method for the panel studies, which comprises heterogeneous co-integration. Given that, a panel FMOLS test for the coextensive of model 1 was:

$$\hat{B}_{NT} - \beta = \sum_{i=0}^N L_{22i}^{-1} \sum_{i=0}^T (X_{it} - X_{it}^2) \left(\sum_{i=1}^N L_{11i}^{-1} L_{22i}^{-1} (\sum_{i=1}^T (X_{it} - X_i) \hat{u}_{it} - T \hat{y}_i) \right) \quad (7)$$

Where,

$$\hat{u}_{it} = u_{it} - \frac{L_{21i}}{L_{22i}} \Delta X_{it} \hat{y}_i = \Gamma_{21i} \Omega_{21i}^0 - \frac{L_{21i}}{L_{22i}} (\Gamma_{22i} + \Omega_{22i}^0) \quad (8)$$

In addition, L_i was the lower triangulation of Ω .

The Dynamic OLS investigation had a similar asymptotic delivery due to the panel FMOLS test derived by Pedroni [43]. Both the DOLS and FMOLS tests were performed as indicated to confirm the consistency of the consequence.

Panel Causality Test

The heterogeneous panel casualty test developed by Dumitrescu and Hurlin [28] is acceptable to discuss the objective. The method reflects heterogeneous panel data, which permits the unimpeded parameters to vary from one country to another under the null and alternative hypotheses. Whereas their Granger causality

test statistics for unstable panels and different lag instructions in the autoregressive procedure. A block bootstrap process rectifies the experimental critical values of panel causality tests and discourses cross-sectional dependence. The limit of the test is that it is only appropriate to static data. Dumitrescu and Hurlin [28] indicate the data is changed to its first difference to resolve the unit root for the panel causality examination. The linear method as:

$$y_{i,t} = \alpha_i + \sum_{q=1}^Q \gamma_i^{(q)} y_{i,t-q} + \sum_{q=1}^Q \beta^{(q)} X_{i,t-q} + u_{i,t} \quad (9)$$

Where stationary variables x and y are for N countries and T periods, q shows the lag order for all cross-sections N , $\partial_i^{(q)}$ explains autoregressive parameters, $\beta_i^{(q)}$ indicates coefficient slopes, and u_{it} is the novelty term. The test provides for $\delta_i^{(q)}$ and $\beta_i^{(q)}$ to vary across different countries. The value of lag (q) is find created on the Akaike information criterion (AIC) with a maximum amount of lags of two given the number of countries inside each area.

In the null hypothesis of homogenous non-causality, there is no causal association for any of the cross-section units of the panel. On the other hand, the method permits heterogeneity, which indicates that the causal association could be detected in one subcategory of countries, but not essentially in another subcategory of nations given varied physical conditions and economic activities. Thus, the null hypothesis is defined as:

$$H_0: \beta_i = 0 \quad \forall i = 1 \dots N$$

With $\beta_i - (\beta_i^{(1)}, \dots, \beta_i^{(Q)})$ under the alternate H_1 , β_i may vary across different units, and no causality is between estimated variables in the subgroups of nations ($i = 1 \dots N_1$). Therefore, the alternate hypothesis is explained as:

$$H_1: \beta_i = 0 \quad \forall i = 1 \dots N_1, \beta_i \neq 0 \quad \forall i = N_1 + 1, N_1 + 2 \dots N$$

where N_1 is unidentified but $0 < N_1 / N < 1$.

The examination statistic is shown as:

$$Z_{N,T}^{HNC} = \sqrt{N/2K} (W_{N,T}^{HNC} - K) \rightarrow_{T,N \rightarrow \infty} N(0,1)$$

Where, $W_{N,t}^{HNC} = \left(\frac{1}{N}\right) \sum_{t=1}^N W_{i,t}$ and $w_{i,t}$ is the individual Wald statistics for the i_{th} cross-sections unit corresponding to the individual test $H_0: \beta_i = 0$.

Robustness Analysis

The dynamic ordinary least square DOLS estimation is additionally used to check the robustness of the outcomes of the panel FMOLS estimator. The FMOLS estimations for the model Equation 6 and 7, which show almost the same results as the DOLS estimator, show

an increase in trade and trade adjustment activities leads to a rise in the FC in Asian and African countries.

Results and Discussion

Results of CD and Slope-Homogeneity Test

Table 3 shows the results of the cross-sectional dependence test. For the panel of 36 Asian and African countries, the null hypothesis rejects at a 1 % level to find the significance of cross-sectional independence, which indicates that the data is firmly cross-sectional dependent.

Results of the IPS and CIPS Tests

Table 4 indicates the panel unit root test results of Pesaran (CIPS) to endorse the integration and level of stationarity of all sets of variables. It ratifies that for the panel of 36 Asian and African countries, all the variables reject the null hypothesis of stationarity at levels with intercept, intercept and trend. After using the first differencing, the entire variables show stationarity. The I (1) integration among variables permits us to identify the data for a long-run association.

Results of the Westerlund Co-Integration Test

Table 5 for the forest cover model discloses the main critical results of the panel co-integration tests of Pedroni [26] Kao [27] and Westerlund [44] for the two models. From the outcomes of the Westerlund test, we conclude that the overall panels and some panels are indicated that there is a co-integration among variables in both models. Furthermore, we used

Table 3. Results of weak cross-sectional dependence (Pesaran, 2015) and slope homogeneity test (Pesaran, Yamagata 2008).

Variable	CD-statistic	Variable	CD-statistic
FC	109.671***	EC	111.807***
PNPEXP	103.756 ***	EAG	112.102***
TEXP	110.858***	EFG	110.591***
IMAG	112.347***	FP	111.996***
IMFG	111.726***	GDPPC	112.211 ***
AGR	112.292***	POPD	112.364***
CP	111.920***	TEMP	87.560***
Test for slope homogeneity			
Δ	-4.244***		
Δ^{adj}	-4.442***		

Note: CD test null hypothesis: errors are weakly cross-sectional dependent and slope homogeneity null hypothesis: slope coefficients are homogenous.

Padroni [26] and Kao [27], co-integration examination to check the robustness of Westerlund outcomes. From the three co-integration tests of Pedroni, all test is enormously significant: panel ADF-statistics, panel pp-statistics, and modified pp-statistics. This delivers a strong indication that co-integration exists between the underlying variables. The Kao- co-integration examination also gives similar results for both methods. The existence of co-integration makes it responsible for approximation the procedures for a long-run association.

Results of FMOLS Results

After the findings of co-integration among variables, the ordinary least square (OLS) is used to determine long-run parameters or elasticities, fully modified ordinary least square (FMOLS) analyses were developed by Pedroni [40]. The expected co-integrated vector by OLS is super convergent with the asymptotically biased distribution. These difficulties are alike for panel data, time series, and more salient even in the presence of heterogeneity [45]. FMOLS used to accounts for endogeneity in errors and serial correlation; so this study has used DOLS to check the robustness of the long-term elasticities of variables; this test corrects the serial correlation and endogeneity problems.

Table 6 shows the results of the FMOLS method, which provides expected outcomes of the forest transition factors; for the case of an overall panel of African and Asian continents, there is a significant and positive relationship between forest cover (FC) and percentage of non-primary goods in total exports (PNPEXP), if a 1% increase in the percentage of non-primary goods in total exports (PNPEXP) leads to increase 0.495% in FC. Similarly, the variable total exports of manufacturing and services goods (TEXP) indicates a significant and positive association between FC, if a 1% increase in the total exports of manufacturing and services goods (TEXP) leads to an increase of 1.064% in FC. Whereas, the variable import of agricultural goods (IMAG) and import of forestry goods (IMFG) explain a significant and positive relationship with FC if a 1% increase in import of agricultural goods (IMAG) and import of forestry goods (IMFG) leads to an increase 1.286% and 0.112% in FC respectively. Likewise, the variable agricultural growth rate (AGR), charcoal production (CP), exports of agricultural goods (EAG), exports of forestry goods (EFG), and population density (POPD) indicate a significant and negative relationship with FC if a 1% increase in agricultural growth rate (AGR), charcoal production (CP), export of agricultural goods (EAG), export of forestry goods (EFG) and population density (POPD) leads to -0.12%, -0.266%, 1.157%, -0.083% and -11.204% in FC respectively. Likewise, the variable electric consumption per capita (EC), forest plantation (FP), average temperature change (TEMP), and GDP per capita (GDPPC) explain the significant and positive association with FC, if a 1% increase in

Table 4. Pesaran IPS & CIPS tests of unit root.

Variable	Level		1st-difference		Variable	Level		1 st -difference		Integration order
	IPS-statistics	p-values	IPS-statistics	p-values		CIPS-statistics	CIPS-statistics			
Intercept						Constant				
FC	1.29615	0.903	-3.955	0.000	FC	-5.422	-6.090			I[1]
PNPEXP	2.552	0.995	-2.421	0.007	PNPEXP	-5.570	-6.190			I[1]
TEXP	-1.648	0.049	-11.821	0.000	TEXP	-5.224	-6.190			I[1]
IMAG	5.245	1.000	-16.085	0.000	IMAG	-5.327	-6.190			I[1]
IMFG	0.153	0.561	-19.052	0.000	IMFG	-5.896	-6.190			I[1]
AGR	5.589	1.000	-11.763	0.000	AGR	-5.934	-6.190			I[1]
CP	-1.441	0.075	-14.548	0.000	CP	-6.038	-6.190			I[1]
EC	1.115	0.867	-11.896	0.000	EC	-6.050	-6.190			I[1]
EAG	5.502	1.000	-11.674	0.000	EAG	-5.882	-6.190			I[1]
EFG	-3.819	0.000	-21.316	0.000	EFG	-5.331	-6.190			I[1]
FP	3.078	0.999	-12.451	0.000	FP	-5.949	-6.190			I[1]
GDPPC	4.720	1.000	-9.360	0.000	GDPPC	-5.325	-6.164			I[1]
POPD	9.283	1.000	-13.682	0.000	POPD	-6.128	-6.190			I[1]
TEMP	-6.956	0.000	-29.799	0.000	TEMP	-5.496	-6.190			I[1]
Intercept & trend					Constant & trend					
FC	6.291	1.000	-2.939	0.002	FC	-5.470	-6.099			I[1]
PNPEXP	0.217	0.586	1.542	0.939	PNPEXP	-5.570	-6.190			I[1]
TEXP	1.180	0.881	-9.856	0.000	TEXP	-5.224	-6.190			I[1]
IMAG	-0.233	0.408	-13.296	0.000	IMAG	-5.327	-6.190			I[1]
IMFG	-5.762	0.000	-15.666	0.000	IMFG	-5.894	-6.184			I[1]
AGR	-0.264	0.396	-8.125	0.000	AGR	-5.647	-6.190			I[1]
CP	-2.669	0.004	-14.981	0.000	CP	-6.038	-6.123			I[1]
EC	0.986	0.838	-10.430	0.000	EC	-6.027	-6.190			I[1]
EAG	2.212	0.986	-9.489	0.000	EAG	-5.882	-6.130			I[1]
EFG	-7.843	0.000	-18.008	0.000	EFG	-5.372	-6.190			I[1]
FP	4.889	1.000	-21.236	0.000	FP	-5.949	-6.190			I[1]
GDPPC	0.325	0.627	-5.038	0.000	GDPPC	-5.261	-6.099			I[1]
POPD	-24.444	0.000	-18.648	0.000	POPD	-6.128	-6.190			I[1]
TEMP	-12.651	0.000	-26.515	0.000	TEMP	-5.496	-6.168			I[1]
Level of significance			1%	5%	10%					
CIPS-Constant (critical values)			-2.3	-2.16	-2.08					
CIPS-Constant & trend (critical values)			-2.3	-2.16	-2.08					

electric consumption per capita (EC), forest plantation (FP) and GDP per capita (GDPPC) leads to 0.490%, 2.225% 0.342% and 0.498% in FC respectively.

Table 6 shows the results of the FMOLS method, which provides expected outcomes of the forest

transition factors; for the case of an African continent, there is a significant and positive relationship between forest cover (FC) and percentage of non-primary goods in total exports (PNPEXP), if a 1% increase in the percentage of non-primary goods in total exports

Table 5. Results of panel co-integration.

Westerlund (2005) co-integration	
Some panels are co-integrated (VR)	2.253 (0.012)
All panels are co-integrated (VR)	2.800 (0.003)
Pedroni (1999,2004) co-integration	
Modified Phillips-Perron t	2.921 (0.002)
Phillips-Perron t	-10.286 (0.001)
Augmented Dickey-Fuller t	-10.225 (0.006)
Kao Test (1999)	
Modified Dickey-Fuller t	3.224 (0.001)
Dickey-Fuller t	0.846 (0.000)
Augmented Dickey-Fuller t	-0.081 (0.000)
Unadjusted modified Dickey-Fuller t	-45.327(0.000)
Unadjusted Dickey-Fuller t	-24.605(0.000)

Note: Values in parenthesis are (p-values), VR is variance ratio.

(PNPEXP) leads to increase 0.488% in FC. Similarly, the variable total exports of manufacturing and services goods (TEXP) indicate a significant and positive association between FC, if a 1% increase in the total exports of manufacturing and services goods (TEXP) increases 1.223% in FC. Likewise, the variable import of agricultural goods (IMAG) and import of forestry goods (IMFG) explain a significant and positive relationship with FC if a 1% increase in import of agricultural goods (IMAG) and import of forestry goods (IMFG)

leads to increase 1.672% and 0.038% in FC respectively. Likewise, the variable electric consumption per capita (EC), forest plantation (FP), GDP per capita (GDPPC), and average temperature change (TEMP) indicate significant and positive association among FC, if a 1% increase in electric consumption per capita (EC), forest plantation (FP), GDP per capita (GDPPC) and an average temperature change (TEMP) leads to increase 0.999%, 1.931%, 0.461% and 0.552% in FC respectively. Also, the variable agricultural growth rate (AGR), charcoal production (CP), exports of agricultural goods (EAG), exports of forestry goods (EFG), and population density (POPD) show significant and negative linkages with FC, if a 1% increase in agricultural growth rate (AGR), charcoal production (CP), exports of agricultural goods (EAG), exports of forestry goods (EFG) and population density (POPD) leads to decrease -0.074%, -1.074%, -1.581%, -0.009 and 0.552% in FC respectively.

Table 6 shows the FMOLS method, which indicates expected results of the forest transition factors; for the case of an Asian continent, there is a significant and positive relationship between forest cover (FC) and percentage of non-primary goods in total exports (PNPEXP), if a 1% increase in the percentage of non-primary goods in total exports (PNPEXP) leads to increase 0.193% in FC. Similarly, the variable total exports of manufacturing and services goods (TEXP) indicate a significant and positive association between FC, if a 1% increase in the total exports of manufacturing and services goods (TEXP) leads to increase of 0.098% in FC. Likewise, the variable import of agricultural goods (IMAG) and import of forestry goods (IMFG) explain a significant and positive relationship

Table 6. Long-run estimation results of FMOLS for overall panel (Africa and Asia).

	Overall panel	Africa continent	Asia continent
Variables	Coeff. [Prob.]	Coeff. [Prob.]	Coeff. [Prob.]
LNPNPEXP	0.495 α [0.000]	0.488 α [0.000]	0.193 α [0.000]
LNTEXP	1.064 α [0.000]	1.223 α [0.000]	0.098 α [0.000]
LNIMAG	1.286 α [0.000]	1.672 α [0.000]	2.267 α [0.000]
LNIMFG	0.112 α [0.000]	0.038 β [0.021]	0.074 α [0.000]
LNAGR	-0.012 [0.681]	-0.074 β [0.013]	-0.216 α [0.000]
LNCP	-0.266 α [0.000]	-1.074 α [0.000]	-0.313 α [0.000]
LNEC	0.490 α [0.000]	0.999 α [0.000]	2.432 α [0.000]
LNEAG	-1.157 α [0.000]	-1.581 α [0.000]	-0.764 α [0.000]
LNEFG	-0.083 α [0.002]	-0.009 [0.749]	-0.086 α [0.000]
LNFP	2.225 α [0.000]	1.931 α [0.000]	1.102 α [0.000]
LNGDPPC	0.948 α [0.000]	0.416 α [0.000]	0.051 α [0.000]
LNPOPD	-11.204 α [0.000]	-10.557 α [0.000]	-10.512 α [0.000]
TEMP	0.342 α [0.000]	0.552 α [0.000]	0.632 α [0.000]

Note: α & β shows significance levels 1% and 5%.

with FC if a 1% increase in import of agricultural goods (IMAG) and import of forestry goods (IMFG) leads to increase 2.267% and 0.074% in FC respectively. Also, the variable agricultural growth rate (AGR), charcoal production (CP), exports of agricultural goods (EAG), exports of forestry goods (EFG), and population density (POPD) show significant and negative linkages with FC, if a 1% increase in agricultural growth rate (AGR), charcoal production (CP), exports of agricultural goods (EAG), exports of forestry goods (EFG) and population density (POPD) leads to decrease -0.216%, -0.313%, -0.764%, -0.086% and 10.512 % in FC respectively. Likewise, the variable electric consumption per capita (EC), forest plantation (FP), GDP per capita (GDPPC), and average temperature change (TEMP) indicate significant and positive association among FC, if a 1% increase in electric consumption per capita (EC), forest plantation (FP), GDP per capita (GDPPC) and an average temperature change (TEMP) leads to increase 2.432%, 1.102%, 0.051% and 0.632% in FC respectively.

Results of Robustness Analysis

After the findings of co-integration among variables, the ordinary least square (OLS) is used to determine long-run parameters or elasticities, dynamic ordinary least square (DOLS) examinations were developed by Pedroni [32]. The expected co-integrated vector by OLS is super convergent with the asymptotically biased distribution. These difficulties are alike for panel data, time series, and more salient even in the presence of heterogeneity [29]. At the same time, DOLS practices the generalized least square process to correct the serial correlation in errors and increase lags to correct the endogeneity in regressor [46]. Therefore, this study applied the DOLS test to check the robustness for an estimate of the long-run elasticities of variables; this method corrects the serial correlation and endogeneity problems.

Table 7 shows the DOLS method, which provides expected results of the forest transition factors; for the case of an overall panel of African and Asian continents, there is a significant and positive relationship between forest cover (FC) and percentage of non-primary goods in total exports (PNPEXP), if a 1% increase in the percentage of non-primary goods in total exports (PNPEXP) leads to increase 0.105% in FC. Similarly, the variable total exports of manufacturing and services goods (TEXP) indicates a significant and positive association between FC, if a 1% increase in the total exports of manufacturing and services goods (TEXP) leads to an increase of 0.550% in FC. The variable import of agricultural goods (IMAG) explains a significant and positive relationship between FC if a 1% increase in import of agricultural goods (IMAG) leads to an increase of 0.403 in FC. Likewise, the variable electric consumption per capita (EC), forest plantation (FP), GDP per capita (GDPPC),

and average temperature change (TEMP) indicate significant and positive association with FC if a 1% increase in electric consumption per capita (EC), forest plantation (FP), GDP per capita (GDPPC) and average temperature change (TEMP) leads to increase 0.496%, 0.802%, 0.906% and 0.383% in FC respectively. Also, the variable charcoal production (CP), exports of agricultural goods (EAG), and population density (POPD) show significant and negative association among FC, if a 1% increase in charcoal production (CP), exports of agricultural goods (EAG) and population density (POPD) lead to decrease -0.257%, 1.472% and 7.55% in FC respectively. Correspondingly, the variable import of forestry goods (IMFG), agricultural growth rate (AGR), and exports of forestry goods (EFG) indicate a non-significant association among FC, respectively.

The long-run estimation results of DOLS for the African continent in Table 7 indicate the expected results of the literature about the forest transition factors; for the case of African countries, there is a significant and positive relationship between forest cover (FC) and percentage of non-primary goods in total exports (PNPEXP) if a 1% increase in the rate of non-primary goods in total exports (PNPEXP) leads to an increase of 0.006% in FC. Whereas, the variable total exports of manufacturing and services goods (TEXP) indicates a significant and positive association between FC if a 1% increase in the total exports of manufacturing and services goods (TEXP) leads to an increase of 0.064% in FC. Likewise, the variable import of forestry goods (IMFG) and import of agricultural goods (IMAG) show a significant and positive relationship with FC if a 1% increase in import of forestry goods (IMFG) and import of agricultural goods (IMAG) leads to increase of 0.043% and 0.010% in FC respectively. Likewise, the variable electric consumption per capita (EC), forest plantation (FP), GDP per capita (GDPPC), and average temperature change (TEMP) indicate significant and positive association with FC if a 1% increase in electric consumption per capita (EC), forest plantation (FP), GDP per capita (GDPPC) and average temperature change (TEMP) leads to increase 0.069%, 3.160%, 0.037% and 0.033% in FC respectively. Also, the variable agricultural growth rate (AGR), charcoal production (CP), exports of agricultural goods (EAG), exports of forestry goods (EFG), and population density (POPD) show significant and negative association among FC, if a 1% increase in agricultural growth rate (AGR) charcoal production (CP), exports of agricultural goods (EAG), exports of forestry goods (EFG) and population density (POPD) leads to decrease -0.075%, -0.027%, -0.062%, -0.023 and -7.017% in FC respectively.

The long-run estimation results of DOLS for the Asian continent in Table 7 indicates the expected results of the literature about the forest transition factors; for the case of Asian countries, there is a significant and positive relationship between forest cover (FC)

and percentage of non-primary goods in total exports (PNPEXP) if a 1% increase in the rate of non-primary goods in total exports (PNPEXP) leads to an increase of 0.061% in FC. Whereas, the variable total exports of manufacturing and services goods (TEXP) indicates a significant and positive association between FC if a 1% increase in the total exports of manufacturing and services goods (TEXP) leads to an increase of 0.019% in FC. Likewise, the variable import of forestry goods (IMFG) and import of agricultural goods (IMAG) show a significant and positive relationship with FC if a 1% increase in import of forestry goods (IMFG) and import of agricultural goods (IMAG) leads to increase of 0.070% and 0.010% in FC respectively. Likewise, the variable electric consumption per capita (EC), forest plantation (FP), and GDP per capita (GDPPC) indicate significant and positive association among FC, if a 1% increase in electric consumption per capita (EC), forest plantation (FP) and GDP per capita (GDPPC) leads to increase 2.218%, 1.302%, and 1.826% in FC respectively. Also, the variable agricultural growth rate (AGR), charcoal production (CP), exports of agricultural goods (EAG), exports of forestry goods (EFG), and population density (POPD) show significant and negative association among FC, if a 1% increase in agricultural growth rate (AGR) charcoal production (CP), exports of agricultural goods (EAG), exports of forestry goods (EFG) and population density (POPD) leads to decrease -0.011%, -0.096%, -0.492%, -0.063 and -4.643% in FC respectively. Correspondingly, the variable average temperature change (TEMP) indicates a non-significant relationship between FC in the Asian continent.

Results of Panel Causality Test

There is unidirectional causality between the percentage of non-primary goods exports and forest cover. Similarly, the import of forestry goods indicates unidirectional causality between forest cover. Whereas import of agricultural goods has cause forest cover, forest cover does not support granger causality to import agricultural goods. Likewise, the variable total exports of manufacturing and services goods show unidirectional causality with forest cover. In addition, the import of forestry goods explains unidirectional causality between percentages of non-primary goods exports.

Furthermore, the variable import of agricultural goods and percentage of non-primary goods exports explain non-granger causality between each other. At the same time, the variable total exports of manufacturing and services goods and percentage of non-primary goods export indicate non-granger causality. However, the import of agricultural goods indicates bi-directional causality with the import of forestry goods. Likewise, the variable total exports of manufacturing and services goods and import of forestry goods explain non-granger causality. Besides, the variable total exports of manufacturing and services goods and the import of agricultural goods do not show causality that is more significant.

Discussion

Forest transition pathways proposed a significant theoretical insight into drivers and pathways to forest

Table 7. Long-run estimation results of DOLS for overall panel (Africa and Asia).

	Overall Panel	African continent	Asian continent
Variables	Coeff. [Prob.]	Coeff. [Prob.]	Coeff. [Prob.]
LNPPEXP	0.105 α [0.000]	0.006 α [0.000]	0.061 α [0.000]
LNTEXP	0.550 β [0.044]	0.064 α [0.015]	0.019 α [0.006]
LNIMAG	0.403 β [0.046]	0.010 β [0.033]	0.070 α [0.000]
LNIMFG	0.156 [0.108]	0.043 β [0.025]	0.416 α [0.005]
LNAGR	-0.118 [0.132]	-0.075 γ [0.074]	-0.011 γ [0.083]
LNCP	-0.257 α [0.000]	-0.027 β [0.084]	-0.096 β [0.035]
LNEC	0.496 α [0.000]	0.069 β [0.034]	2.218 α [0.000]
LNEAG	-1.472 α [0.000]	-0.062 β [0.049]	-0.492 α [0.000]
LNEFG	-0.018 [0.696]	-0.023 β [0.026]	-0.063 β [0.043]
LNFP	0.802 α [0.001]	3.160 α [0.000]	1.302 β [0.012]
LNGDPPC	0.906 α [0.000]	0.037 β [0.032]	1.826 α [0.000]
LNPOPD	-7.55 α [0.000]	-7.017 α [0.000]	-4.643 α [0.000]
TEMP	0.383 α [0.000]	0.033 β [0.034]	0.288 [0.000]

Note: α , β & γ shows significance level 1%, 5% and 10%.

Table 8. Granger non-causality test results of DH (2012).

Null Hypothesis	F-Statistics	Prob.
LNPNPEXP \neq LNFC LNFC \neq PNPEXP	0.08205 0.00384	0.0921 0.9962
LNIMFG \neq LNFC LNFC \neq LNIMFG	2.54386 2.10377	0.0791 0.1226
LNIMAG \neq LNFC LNFC \neq LNIMAG	2.78131 0.70020	0.0625 0.4968
LNTEXP \neq LNFC LNFC \neq LNTEXP	3.16923 1.55506	0.0425 0.2117
LNIMFG \neq LNPNPEXP LNPNPEXP \neq LNIMFG	1.61107 7.38215	0.2003 0.0007
LNIMAG \neq LNPNPEXP LNPNPEXP \neq LNIMAG	0.88140 1.04774	0.4146 0.3512
LNTEXP \neq LNPNPEXP LNPNPEXP \neq LNTEXP	0.90753 0.46247	0.4039 0.6299
LNIMAG \neq LNIMFG LNIMFG \neq LNIMAG	45.1270 3.87310	2.E-19 0.0211
LNTEXP \neq LNIMFG LNIMFG \neq LNTEXP	0.15813 1.30293	0.8538 0.2722
LNTEXP \neq LNIMAG LNIMAG \neq LNTEXP	1.50802 0.66748	0.2219 0.5133

Note: DH is Dumitrescu and Hurlin, and \neq indicates does not granger cause.

transition (FT) from socio-economic and political development. This cross-country examination is based on economic globalization's perspective to find the forest transition factors and propose policy implications for the supplementary theoretical investigation to forest transition in Asian and African continents.

This study outcome recommended that the economic development indicator GDP per capita (GDPPC) indicate a positive association between forest cover (FC) in an overall panel of 36 Asian and African countries. At the same time, the GDPPC has also shown a significant and positive relationship with FC of Asian and African panels. The economic improvement produces more employment opportunities in cities and boosting rural-urban migration for getting non-farm jobs, which growing reforestation in rural areas and the end upsurges forest cover [47]. Similarly, the variable population density (POPD) shows a significant and negative linkage with FC of an overall panel of 36 Asian and African countries. Likewise, the POPD of 19 Asian and 17 African countries also indicates a significant and negative relationship to FC. Population stress is an essential proximate source of forest degradation and deforestation in developing nations [3, 7, 48]. In addition, the variable forest plantation (FP) explains significant and positive linkages between FC of 36 Asian and African countries (overall panel). Whereas the FP of Asian and African panels also indicate a significant and positive association with FC. The more consideration of ecological effects when understanding forest transition using afforestation [3, 7, 49].

Likewise, the variable charcoal production (CP) of an overall panel of Asian and African countries indicates a significant and negative linkage with FC. In contrast, the CP of Asian and African panels also explains the significant and negative association to FC. According to [3, 12, 50] charcoal consumption and production is the key driver of deforestation and degradation. Correspondingly, the variable electric consumption per capita EC shows a significant and positive linkage in an overall panel of 36 Asian and African countries. In comparison, the EC of Asian and African panels indicate significant and positive links to FC. According to Tanner et al. [51], the higher electricity consumption decreases stress on forest resources, ultimately reducing deforestation. In addition, the variable agricultural growth rate AGR of the overall Asian and African continent panel indicates a significant and negative relationship to FC.

On the other hand, the AGR of Asian and African continent panels explain significant and negative association to FC. Agricultural enhancement has a major factor in forest cover loss in tropical and sub-tropical countries [52–54]. Likewise, the variable average temperature change TEMP in an overall panel of Asian and African countries explains the significant and positive linkages to FC. At the same time, the variable TEMP indicates a significant and positive association with FC in Asian and African panels as well. The low-temperature places are unsuitable for forest enhancement, while increasing temperatures enhancing conditions only up to a particular level. The chances of forest transition declines above a specific threshold of temperature [55, 56].

In the fast enhancement of global economic integration, forest transition in numerous countries is linked by the international trade of agricultural and forestry goods. This scientific study indicates the sign of the deforestation leakages theories as well. The percentage of primary goods exports has associated with the total exports of goods and services generally in developed and emerging countries; the exports of primary goods (agricultural, forestry) had a negative relationship to forest cover in emerging economies. So, to know about the association between forest transition and economic globalization, we just need to show the general situation of individual nation's contribution to the global economic integration and improved the deep understanding into leakage impact by associated forest transition to local socio-economic progress influenced by economic globalization actions. In these circumstances, the development of countrywide businesses and adjustment of trade structure in the growth of global economic integration may significantly affect changes in forest resources; a topic has never been deliberated entirely yet.

The DOLS results indicate that the variable percentage of non-primary goods in total exports PNPEXP and total exports of manufacturing and services goods TEXP have a significant and positive

association with FC of the overall panel Asian African continents as well. These results of the study suggested that the impact of export structure change associated with forest resources in Asian and African continents. In contradiction of the background of worldwide economic combination, the model delivers the hypothesis that the individual country or region could increase nationwide forest resource protection when the trade development of the nation or region depends more on manufacturing and services industries.

Conclusion

Global ecological change is the leading cause of land cover change in emerging economies. In particular, the more significant change inland is the conversion of forestland into crop and pastoral land, which increases worries about carbon sequestration, global ecological services, and habitat preservation. Still, forest abolition persists in many parts of the world and inverse movements in some places as well; such forest transition has been found in numerous regions such as North American and European countries before 1980 and recently in emerging economies such as Nepal, China, Costa Rica, Vietnam, and Ecuador. This study suggested that the FDI inflow in the services and manufacturing sectors could expand forest protection and adjust trade structure on the forest transition. The auxiliary addition of this study is the trade and adjustment of trade structure. This study extensively describes the association among the trade, adjustment of trade structure with forest transition. This study provides a comprehensive research insight into the globalization pathways, which are linked with forest transition.

This study investigated the linkages between trade and adjustment of trade structure with a forest cover of Asian and African continents. The trade and adjustment of trade structure indicators such as percentage of PNPEXP and TEXP indicate a significant and positive association with forest cover in an overall panel of 36 Asian and African countries; similarly, this study also focused on the Asian and African panels separately as well. The outcomes of these Asian and African panels indicated that PNPEXP and TEXP explain the significant and positive relationship with forest cover. We used FMOLS to determine the association between trade and trade adjustment with a forest cover of Asian and African continents as overall and individual panels. We also applied the DOLS method to check the robustness of our results. This study results recommended that the African and Asian countries improve the forest cover by increasing their exports of manufacturing and services goods and decreasing the exports of primary goods.

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Conflicts of Interest

The authors declare no conflict of interest.

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