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Trade Openness and Economic Growth of Nepal: An Econometric Analysis

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Abstract

Background: The relationship between trade openness and economic growth has been a subject of empirical investigation- a multifaceted and evolving issue in the context of Nepal which is a highly import-based economy. In this background, the results of the exploration of the relationship between trade openness and economic growth would be relevant to suggest that policymakers in adopting the policies and boosting the available capital and labour to attain the benefits of trade openness.

Objectives: This study examines the impact of trade openness on the economic growth of Nepal considering GDP, human capital, real gross capital formation, and trade openness employing both descriptive and econometric methods.

Methods: This study incorporated the annual time series data published by the government of Nepal from the year 1990 to 2021 and analyzed employing the vector error correction model (VECM) along with the descriptive analysis.

Results: Descriptive statistics reveal that the model follows a normal distribution, as indicated by the results of Jarque-Bera, where the p-values of the variables exceed 0.05. The variables demonstrate stationary at the first order and are cointegrated as such vector error correction model (VECM) is employed. The presence of a negative and significant error correction term (ECT) indicates that the variables are adjusting towards long run equilibrium. Furthermore, the stability of the model is confirmed by the cumulative sum (CUSUM) test as the residual plots remain within acceptable boundaries of a 5 percent significance level. Finally, the results indicate that trade openness does not have a significant and pivotal influence on economic growth.

Conclusion: Trade openness does not have a significant influence on economic growth. Capital has a significant and positive relationship with stimulating economic growth, however, human capital has a significant but negative relationship with economic growth in the long run in Nepal.

Keywords: Capital formation, economic growth, human capital, trade openness

JEL Classification: E22, O47, J24, F43

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Introduction

The issue of trade openness has gained significant attention, particularly following the adoption of privatization, liberalization, and globalization since the 1990s. The ongoing discourse revolves around the integration of domestic economies into the global economy to reap the advantages of international trade. Trade openness has proven to be a driving force behind economic prosperity for the participating nations. Moreover, a nation undergoes challenges as well as opportunities regarding the existing economic condition, the interaction among trade openness, human capital, and capital shapes the growth of an economy.

The connection between trade openness and economic growth has generated prolonged debate among economists and the discussion incorporates the direction and scale of effects, with questions persisting about the causal relationship as well (Edwards, 1998). Trade openness operates as a catalyst for efficient resource allocation through comparative advantage, boosting income levels by facilitating technology transfer, technological advancement, and increased productivity (Grossman & Helpman, 1991). While developed economies tend to benefit significantly from trade openness, the same cannot be said for underdeveloped nations. For these fragile economies, exposing themselves to international markets might obstruct their economic activities (Ojeyinka & Adegboye, 2017).

Trade openness fosters specialization in sectors with economies of scale, leading to long term efficiency and productivity gains (Krueger, 1978). Modern endogenous growth models demonstrate a positive correlation between trade openness and economic growth, attributed to the global dissemination of advanced technologies (Romer, 1994). Nevertheless, it's important to note that passive trade openness might not necessarily be advantageous for less advanced transition economies (Silajdzic & Mehic, 2018).

Taking these into consideration, this paper aims to investigate the causal connection between trade openness and economic growth in Nepal, incorporating human capital and gross real capital formation. This study is based on the theoretical understanding that trade openness enhances trade, thereby boosting economic growth through intensified investment stimulation.

Review of Literature

Kumari et al. (2023) empirically analyzed foreign direct investment, trade openness, and economic growth in India using annual time series data from 1985 to 2015 employing the Vector Auto Regression (VAR) model and found no long run relationship among the variables under consideration. The results of VAR Granger causality indicate bi-directional causality between economic growth and FDI however, no bi-directional causality between trade openness and economic growth.

Upadhaya et al. (2023) examined the relationship between trade openness and economic growth in Nepal using the time series annual data from 1975 to 2020 employing the autoregressive distributed lag

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(ARDL) model considering economic growth, trade openness, population growth, growth of capital stock and government expenditures. The results indicated a significant and positive relationship between trade openness and economic growth in the long run.

Kong et al. (2021) analyzed the relationship between trade openness and economic growth using the provincial panel data from 1994 to 2018 on economic growth, foreign direct investment, trade openness, and real exchange rate of 30 provinces in China. The study using the ARDL model found trade openness positively and significantly promotes economic growth and there exists a long run stable cointegration relationship between trade openness and economic growth.

Malefane and Odhiambo (2021) examined the impact of trade openness on economic growth in Lesotho using the time series data from the year 1979 to 2013 regarding GDP, investment, government consumption expenditure, inflation, money supply, import and export employing autoregressive distributed lag (ARDL) bound testing approach. The results of the study indicate that trade openness does not have a significant impact on economic growth either in the short run or the long run.

Cevik et al. (2019) analyzed the trade openness and economic growth in Turkey using the time series data from 1950 to 2014 employing rolling frequency domain analysis to examine the changes like causal relationships over time. The findings of the Granger causality test indicate the bi-directional causality between trade openness and economic growth. On the other hand, the results of the frequency domain approach indicate that the effect of trade openness on economic growth takes a shorter time than the effect of economic growth on trade openness.

Obeid and Awad (2018) assessed the effect of trade openness on the economic growth of Jordan using the quarterly data from 1992 to 2015 employing the autoregressive distributive lag (ARDL) bound test. The results indicate the long-run positive effect of trade openness represented by the ratio between total trade and GDP on economic growth. However, trade openness does not have the short run statistically significant effect on economic growth.

Makun (2017) examines the effect of trade openness along with human capital and economic policies on the economic growth of Malaysia using time series data from 1980 to 2013. The empirical results indicate that trade openness has a positive impact on economic growth and human capital has a positive and significant impact on trade openness to enhance economic growth. In addition, sound economic policies when interacting with the trade openness relatively have a higher positive effect on economic growth.

Ahmad et al. (2017) analyzed the impact of trade openness and economic growth in Pakistan using the annual time series data from 1975 to 2014 employing the econometric method of analysis considering gross fixed capital formation, foreign direct investment, import and export in addition to the economic growth and trade openness. The results reveal that there exists a long run cointegrated relationship among the variables and trade openness has a positive and significant effect on economic growth.

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Keho (2017) assessed the relationship between trade openness and economic growth in Cote d'Ivoire from the period of 1965 to 2014 using a multivariate framework including capital, human capital along trade openness as the independent variables. Employing the autoregressive distributed lag bounds test for the cointegration found that trade openness has a positive effect on economic growth in both the short run as well as long run. Moreover, the results of the Granger causality show that trade openness does granger cause economic growth.

Idris et al. (2016) analysed the causal relationship between trade openness and economic growth across the 87 countries drawn from both the Organizations for Economic Co-operation and Development (OECD) and developing nations. The study employed annual panel data from 1977 to 2011 and employed dynamic panel data estimation techniques. The outcomes of the study disclosed the existence of a bidirectional causal association between trade openness and economic growth within both the OECD and developing countries which is consistent with the endogenous theory.

Bastola and Sapkota (2015) analyzed the causal relationship between the trade and economic growth of Nepal considering the relationship among the gross domestic product, exports and imports using the time series annual data from the year 1965 to 2011 employing the auto-regressive distributed lag (ARDL) model. The study came to conclude the stability of the long run parameters, however, there exists only the unidirectional causal relation between trade and GDP. Moreover, consistent with the export led growth (ELG) hypothesis, exports have a positive impact, but imports have negative effects on economic growth.

Hye and Lau (2015) examined a link between trade openness and economic growth in India by employing the autoregressive distributive lag model along with the rolling window regression method using the annual time series data from 1971 to 2009 on real GDP, real gross fixed capital formation, secondary school enrollment and trade openness, ratio between total trade and GDP. The results of the analysis concluded that human and physical capital are positively related to economic growth, however, trade openness has a negative impact on economic growth in the long run. In addition, in the short run trade openness is positively related to economic growth.

This study unlike the existing literature, considers the number of secondary students as the proxy of the human capital in the context of Nepal along with the gross capital formation to examine the relationship between trade openness and economic growth. Moreover, the existing literature though provides sufficient in-depth insights into the overall effect of trade openness on economic growth but falls short in incorporating the stimulating agents' namely human capital and capital formation.

Materials and Methods

Data Sources

This study incorporates the annual time series from the year 1990 to 2021 and the variables under examination are GDP at a constant price, human capital, real gross capital formation, and trade

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openness. The data series on GDP, trade openness, and real gross capital formation were sourced from the official website of the Ministry of Finance (MoF) and human capital from Nepal Rastra Bank (NRB).

Model Specification

This study tries to investigate the causal relationship between trade openness and economic growth. The study also incorporated human capital and capital formation as well for the analysis. An empirical model of trade openness and economic growth along with the human capital and capital can be presented as:

GDP=f (Human Capital, Capital, Trade Openness) …….....…. (3.1)

Where, GDP indicates the GDP at constant price, human capital is measured as the number of secondary students, capital is measured as the real gross fixed capital formation in the current US dollar, and trade openness is measured as the ratio between the sum of export and import of goods and services and GDP at a constant price in current US dollar. Presenting the empirical in the log form:

LNGDP=LNHUMAN CAPITAL+LNCAPITAL+ LNTRADE OPENNESS …..... (3.2)

This study is based upon the neoclassical growth theory model that trade openness stimulates the economic growth of Nepal by employing the Cobb-Douglas production function.

Mathematically,

$Q_t=A_t K_t^{\alpha} L_t^{\beta}$ ……..…….……...……..……...… (3.3)

Where, Q, K, L, and A represent the output, capital, labour, and technological progress respectively. Representing the production function with the assumption that trade openness influences technological progress.

Result and Discussion

Descriptive Statistics

Descriptive statistics have been used to depict the summary attributes of GDP, human capital, capital, and trade, the variables under consideration. This indicates the presentation of several observations, central tendency measures, and measures of dispersion in addition to minimum and maximum values, skewness and kurtosis, and the Jarque-Bera test.

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Table 1

Descriptive Statistics and Correlation Matrix

	LNGDP	LNHUMAN CAPITAL	LNCAPITAL	LNTRADE
Mean	6.0194	3.5914	3.3085	3.8451
Median	5.8320	3.5959	3.3034	3.8294
Maximum	7.0969	3.6119	3.7228	4.1594
Minimum	5.1017	3.5439	3.0080	3.5460
Std. Dev.	0.7095	0.0190	0.2039	0.1413
Skewness	0.2560	-0.7249	0.3090	0.2028
Kurtosis	1.4504	2.7011	2.2855	2.9358
Jarque-Bera	3.4402	2.8300	1.1528	0.2178
Probability	0.1790	0.2429	0.5619	0.8968
Sum	186.6006	111.3342	102.5621	119.1968
Sum Sq. Dev.	15.1013	0.0108	1.2469	0.5992
Observations	31	31	31	31

Source: Calculation using Eviews 10.

Table 1 shows the descriptive information of the variables under consideration in their log form. The mean values are 6.0194 for LNGDP, 3.5914 for LNHUMAN CAPITAL, 3.3085 for LNCAPITAL, and 3.8451 for LNTRADE. The minimum and maximum values which also indicate the range of variability within the data reveal that LNGDP ranges from 5.1017 to 7.0969, LNHUMAN CAPITAL from 3.5439 to 3.6119, LNCAPITAL from 3.0080 to 3.7228 and LNTRADE from 3.5460 to 4.1594. The data dispersion around the mean given by the standard deviation is 0.7095 for LNGDP, 0.0190 for LNHUMAN CAPITAL, 0.2039 for LNCAPITAL, and 0.1413 for LNTRADE. The skewness values indicate the distribution asymmetry and the kurtosis value indicates the thickness of the tails relative to normal distribution. The probability value of Jarque-Bera is greater than 0.05 in the case of all the variables under consideration, indicating that all the variables are normally distributed.

Unit Root Test

An augmented Dickey-Fuller test was conducted to examine the stationarity of the variables under consideration. The variables though were found to be non-stationary at level, were all stationary at their first difference considering their log form.

Table 2

Results of Unit Root Test

Variables	Level	First Difference	Remarks

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	t-statistics	p-value	t-statistics	p-value	
LNGDP	0.6248	0.9881	-5.1073	0.0003	I(1)
LNHUMAN CAPITAL	1.7674	0.9995	-3.3413	0.0231	I(1)
LNCAPITAL	-1.9007	0.3275	-7.0135	0.0000	I(1)
LNTRADE	-2.7103	0.0841	-4.3286	0.0021	I(1)

Source: Calculation using Eviews 10.

Table 2 indicates that the p-values of all the variables at level LNGDP, LNHUMAN CAPITAL, LNCAPITAL, and LNTRADE were greater than 5 percent indicating non-stationarity of the variables. However, the p-value of all the variables was less than 5 percent at their first difference indicating the stationarity of the variables.

Optimum Lag Selection

Optimal lag selection involves the process of examining the existence of long run relationships among the variables under analysis. For this purpose, the value of several lag selection criteria was computed to select the suitable lag length.

Table 3

Results of Optimum Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	130.5252	NA	0.0000	-8.7259	-8.5373	-8.6668
1	218.8807	146.2435*	1.32e-11*	-13.7159	-12.7730*	-13.4206*
2	235.7921	23.3262	0.0000	-13.7788*	-12.0814	-13.2472

Source: Calculation using Eviews 10.

*Indicates lag order selected by the criterion

LR: Sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Table 3 shows the results of the lag length selection for the unrestricted VAR model by considering distinct lag selection criteria and the outcomes indicate that significant numbers of criteria LR, FPE, SC, and HQ indicate the optimum lag orders of 1 except AIC which shows the optimum lag of 2. Since substantial criteria suggest a maximum lag length of 1, this study adopts an optimum lag of 1.

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Cointegration Test

A co-integration test was conducted to examine whether the series under consideration were cointegrated over the sample period. Johansen cointegration test was employed to examine the long run equilibrium relationship among the variables.

Table 4

Results of Cointegration

	Trace			Max-Eigen		
Maximum Rank	Statistic	Critical Value	p-value	Statistics	Critical	p-value
None *	80.7744	47.8561	0.0000	35.9277	27.5843	0.0034
At most 1 *	44.8467	29.7971	0.0005	29.1033	21.1316	0.0031
At most 2 *	15.7434	15.4947	0.0459	15.5210	14.2646	0.0315
At most 3	0.2224	3.8415	0.6372	0.2224	3.8415	0.6372

Source: Calculation using Eviews 10.

In Table 4, the value of both the trace statistics and max-eigen value for the maximum rank of None is greater than their critical values at a 5 percent level of significance indicating the existence of at least one co-integration relationship among the variables over the sample period.

Estimation of Vector Error Correction Model

A vector error correction model was conducted to analyze the long run and short run dynamics between the variables under consideration and provide insights regarding the direction and speed of the adjustment process towards the long run equilibrium. The existence of the cointegration among the variables under analysis has given a way forward to applying the VECM.

Table 5

Results of Normalized Cointegrating Coefficients

LNGDP	LNHUMAN CAPITAL	LNCAPITAL	LNTRADE
1	35.7435	-0.3339	0.5697
	-2.4036	-0.1916	-0.1752

Source: Calculation using Eviews 10.

Table 5 indicates that in the long run, LNHUMAN CAPITAL and LNTRADE have a negative impact on the LNGDP whereas LNCAPITAL has a positive impact. This indicates that capital is the major driving determinant of the economic growth of Nepal rather than human capital and trade openness.

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Table 6

Results of Long-run Relation of Vector Error Correction Model

Variable	Coefficients	Standard-error	t-Statistics
LNGDP(-1)	1.0000		
LNHUMAN CAPITAL(-1)	35.4623	3.1427	11.2842
LNCAPITAL(-1)	-0.5500	0.2295	-2.3967
LNTRADE(-1)	0.2299	0.2139	1.0746
C	-132.4616		

Source: Calculation using Eviews 10.

The value of t-statistics to be significant should be greater than 1.96 and the relationship between the dependent and independent variables are inversely interpreted. In Table 6, the long-run coefficients indicate the negative and significant relationship between human capital and GDP and the positive and significant relationship between capital and GDP, but trade was found to have a negative but insignificant relationship with the GDP.

Table 7

Results of Short Run Relation of Vector Error Correction Model

Variable	D(LNGDP)	Standard-error	t-Statistics
CointEq1	-0.3643	0.1012	-3.5987
D(LNGDP(-1))	0.1149	0.1302	0.8826
D(LNHUMAN CAPITAL(-1))	7.3413	3.1530	2.3283
D(LNCAPITAL(-1))	0.3475	0.1163	2.9879
D(LNTRADE(-1))	-0.4346	0.1479	-2.9386
C	0.0763	0.0148	5.1636

Source: Calculation using Eviews 10.

Table 7 indicates the results of the short run relationship of the vector error correction model. The negative value of the error correction term indicates the adjustment process is towards the equilibrium however the absolute value is 0.3643 indicating the slow pace.

Vector Error Correction Estimates

Vector error correction estimates are conducted to examine the long run relationship among the variables under consideration while employing the vector error correction model.

D(LNGDP)=C(1)*(LNGDP(-1)+35.4623*LNHUMANCAPITAL(-1)-0.5499*LNCAPITAL(-1)+0.2299*LNTRADE(-1)-132.4616+C(2)*D(LNGDP(-1))+C(3)*D(LNHUMANCAPITAL(-1))+C(4)*D(LNCAPITAL(-1))+C(5)*D(LNTRADE(-1))+C(6)

Table 8

Results of Vector Error Correction Model (VECM) Estimates

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	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.3643	0.1012	-3.5987	0.0015
C(2)	0.1149	0.1302	0.8826	0.3866
C(3)	7.3413	3.1530	2.3283	0.0290
C(4)	0.3475	0.1163	2.9879	0.0066
C(5)	-0.4346	0.1479	-2.9386	0.0074
C(6)	0.0763	0.0148	5.1636	0.0000
R-squared	0.5628	Mean dependent var		0.0688
Adjusted R-squared	0.4677	S.D. dependent var		0.0758
S.E. of regression	0.0553	Akaike info criterion		-2.7706
Sum squared resid	0.0703	Schwarz criterion		-2.4877
Log likelihood	46.1731	Hannan-Quinn criteria.		-2.6820
F-statistic	5.9204	Durbin-Watson stat		2.4171
Prob(F-statistic)	0.0012			

Source: Calculation using Eviews 10.

In the table 8 C(1) indicates the impact of lagged values of LNGDP, LNHUMAN CAPITAL, LNCAPITAL and LNTRADE including the constant term on the change in D(LNGDP) which is significant and inversely associated with the D(LNGDP), C(2) indicates the impact of the lagged value of D(LNGDP) on the change in the D(LNGDP) which is not statistically significant indicating no significant influence on its own change, C(3) indicates the impact of the lagged value of LNHUMAN CAPITAL on the change in D(LNGDP) which is statistically significant and positively associated with the D(LNGDP), C(4) indicates the impact of the lagged value of LNCAPITAL on the change in D(LNGDP) which is statistically significant and has positive association with D(LNGDP), C(5) indicates the impact of the lagged value of LNTRADE on the change in D(LNGDP) which is statistically significant and has negative association with D(LNGDP), C(6) indicates the constant term and is statistically significant and has positive baseline change in D(LNGDP).

The results of the long run relationship of VECM where C(1) indicates the speed of adjustment towards the long run equilibrium. The negative coefficient (-0.3643) and significant p-value (0.0015) of C(1) indicate that 36.43 percent of disequilibrium is corrected within a year.

The value of R squared is 0.5628 indicating that 56.28 percent variation in D(LNGDP) is explained by the independent variables in the model. The p value of the F statistic test which examines the overall significance of the model, is less than 5 percent indicating the significance of the model. The value of Durban-Watson close to 2 which is 2.4171 indicates that there is autocorrelation in the model.

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Diagnostic Tests

For the examination of the performance of the model under analysis, a serial correlation test and heteroscedasticity test were conducted for the assurance of the correct specification of the models.

Table 9

Results of Breusch-Godfrey Serial Correlation LM Test

F-statistic	2.7190	Prob. F(2,25)	0.0854
Obs* R-squared	5.5385	Prob. Chi-Square (2)	0.0627

Source: Calculation using Eviews 10.

Table 9 indicates that F-statistics is 2.7190 with the corresponding p-value 0.0854 greater than 0.05 implying that there is no autocorrelation among the residuals in the model.

Table 10

Results of the Heteroscedasticity Test

Chi-Square	Degree of Freedom	Probability
223.9192	200	0.1181

Source: Calculation using Eviews 10.

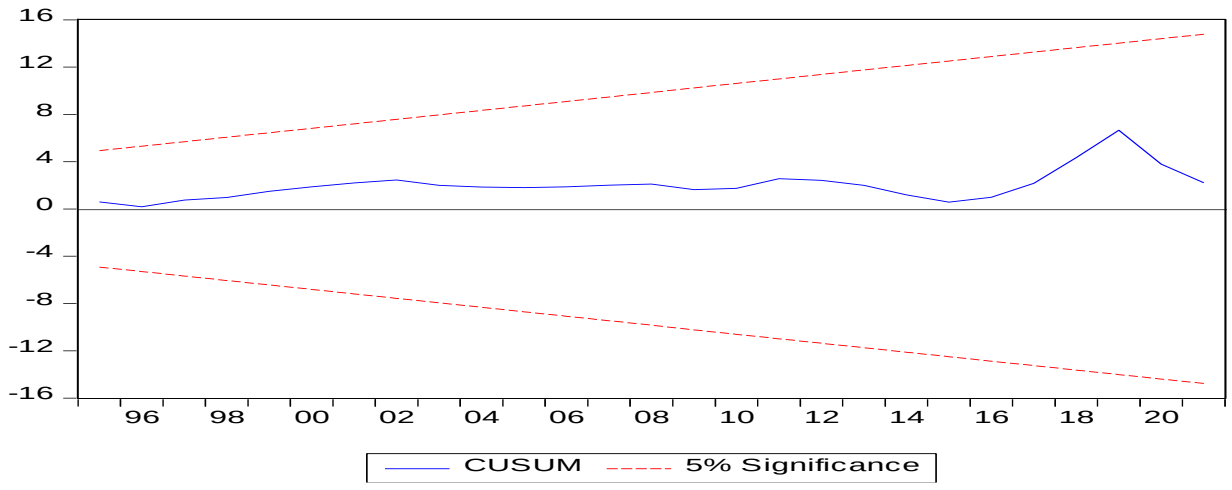
Table 10 indicates that the chi-square value is 223.9192 with the corresponding p-value of 0.1181 greater than 0.05 implying that there exists no heteroscedasticity in the model.

Stability Test

To examine the structure stability in the model, Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMQ) were conducted and presented in the figure.

Figure 1

Results of the CUSUM test



Source: Calculation using Eviews 10.

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In Figure 1, the residual plots lie within the boundaries at a 5 percent level of significance which indicates the stability of the parameters in the estimated model.

This study reveals a noteworthy finding that trade openness does not have a significant impact on economic growth. Considering the literature, the findings seem to be distinct from those of Upadhaya et al. (2023), Kong et al. (2021), Cevik et al. (2019), Makun (2017), Ahmad et al. (2017), Keho (2017), Idris et al. (2016), Bastola and Sapkota (2015) who revealed that trade openness has a positive influence on the economic growth. On the other hand, Hye and Lau (2015) found a negative relationship between trade openness and economic growth. However, supporting the claims of Kumari et al. (2023), and Malefane and Odhiambo (2021) this study concluded that trade openness has no significant impact on the economic growth of a country.

This has challenged the widely established view that trade openness acts as a driving instrument in attaining the predetermined objective of economic growth of developing nations like Nepal. The geographical constraints and import based economy followed by infrastructural limitations could be the restrictive factors to attain the anticipated benefits from trade liberalization and openness raising the question regarding the nexus between trade openness and growth. This study contributes valuable insights regarding the dynamics inherited between trade and growth paving the way for future studies addressing the multifaceted challenges.

Conclusion and Suggestions

This study examines the connection between trade openness and economic growth by incorporating the roles of human capital and real gross fixed capital as the policymakers should adopt strategies to enhance human capital and capital factors, which are pivotal for reaping benefits from trade openness. The results of Johansen cointegration demonstrate the presence of a long term relationship among the variables. The Jarque-Bera results confirm the normal distribution of these variables. Results from the augmented Dickey-Fuller test reveal that all variables are stationary through their first differences. The cointegration analysis result shows at least one cointegration equation, confirmed through both trace and max-eigen values. Examining the results of the Vector Error Correction Model (VECM) in the long run, capital exerts a significant positive impact, and human capital exhibits significant negative relationships with economic growth but no significant impact of trade balance on economic growth. In the short run, the VECM illustrates an adjustment process towards equilibrium, though at a gradual pace. Moreover, in the long run, 36.43 percent of the disequilibrium is corrected within a year. The model identifies the substantial influence of lagged values of LNGDP, LNHUMAN CAPITAL, LNCAPITAL, and LNTRADE, along with a constant term, on the variation in D(LNGDP). However, the lagged value of D(LNGDP) itself does not have a significant impact on its own change. Overall, the model is statistically meaningful, indicating a moderate degree of variance in D(LNGDP). Moving on to model diagnostics, tests for serial correlation and heteroscedasticity yield negative results, indicating

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the absence of autocorrelation and heteroscedasticity in the model. Finally, the CUSUM test outcome suggests model stability. Thus, this study in contrast to the neoclassical theory and most of the empirical literature that trade openness stimulates economic growth, was found to be insignificant which may be due to the significant volume of imports but nominal volume of exports in the case of Nepal rather than suggests increasing the capital formation for the enhancement of the economic growth.

Policymakers should emphasize the enhancement of human capital and promoting real gross fixed capital to unlock the full potential of economic growth. In addition, to address the problem of the negligible impact of the trade balance on economic growth, policy adjustments are suggested.

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