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Trade Openness, Human Capital, and Economic Resilience in SAARC Countries: A Post-COVID-19 Analysis

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Abstract

The present study analyzes the interrelationship between trade openness, labor force participation, human capital, and economic growth in the SAARC countries, with particular attention to the implications of the COVID-19 pandemic on these linkages. In this paper, an attempt has been made to gauge both the short-run and long-run impacts that have resulted in the facilitation of economic growth through trade openness by increased market access, technology transfers, and competitive efficiency. However, the pandemic distorted trade flows and lost labor to more labor-intensive industries, generally hitting the low-income and marginal groups harder while underlining vulnerabilities in the trade-dependent economies. These disruptions thus underline the need for adaptive economic policies that balance trade openness with resilience and self-sufficiency in the SAARC nations. The study further identifies human capital as crucial, especially education and skill development, to maximize benefits from trade. The policy recommendations are promoting intraregional trade, investing in digital infrastructure, and promoting better skills in the workforce for sustainable growth. Therefore, this research concludes by calling for a twin-track approach combining trade liberalization with substantial investment in human capital to lead to economic resilience and inclusive development in the SAARC region. especially in the wake of global disruptions like the COVID-19 crisis.

Keywords: Trade Openness, labor force participation, Human Capital, Economic Growth, COVID-19 Impact, SAARC Countries

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Introduction

SAARC countries comprise Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka, among the world's most diverse and fastest-growing economies. However, these nations experienced an average 22% drop in exports during the first year of the COVID-19 pandemic (2020) compared to 2019, severely disrupting growth trajectories and highlighting structural vulnerabilities in trade and labor markets. While prior SAARC trade studies often overlook such pandemic-induced shocks, this study aims to fill that gap by investigating how trade openness, human capital, and labor dynamics influenced economic resilience during and after the crisis. These countries have experienced different degrees of economic development in the last few decades (Raghurampatruni et al., 2021). Industrialization, trade, labor mobility, and Human Capital Development have been the leading causes of such growth. Nevertheless, the cultural and historical connections are apparent, but the economic paths chosen within the region are relatively different. As per Sikder and Dou (2020), although India and Bangladesh have had proper economic development, Afghanistan and Nepal lack appropriate political situations and adequate infrastructure. The economic development within SAARC has been associated with promoting regional integration, improving trade, and other pertinent social questions, such as poverty and unemployment within the region.

Trade liberalization has become an essential factor for the economic growth of SAARC countries which provides opportunities to access the international market, improvement in export capabilities and FDI (Ghazanfar et al., 2021). Integration into regional and global value chains brought about by trade liberalization facilitates the transfer of technology, knowledge, and capital that enhances productivity and resilience. This is particularly relevant in the SAARC context where most of the economies are in the process of moving from the agriculture dominated structure of the economy to industrial and services sectors. However, it was also found that the benefits of trade depend on the internal conditions of a country especially the quality of human capital. Education, skills, and health, which are components of human capital, are the drivers of labor productivity, innovations, and sustainable economic growth (Jafrin et al., 2021). Sri Lanka has shown that through proper investment on education and health sectors, it is possible to build and foster a competitive human capital.

On the other hand, countries like Afghanistan and Nepal don't have adequate infrastructure and political stability to take advantage of trade-led growth. According to Deming (2022), there is a need to ensure that human capital is well matched with the current and evolving world market demands to avert the challenges of mismatch and underutilization. Thus, both external integration and internal capacity-building are important for the sustainable development of the region.

COVID-19 had a severe impact on the global trade and economic prosperity, particularly in revealing the weaknesses of the trade-oriented economies (Curran et al., 2021). The SAARC countries have seen disruptions in the supply chains and decline in global demand, which has made these countries wary of the openness to trade. The pandemic, however, served to highlight the importance of openness to trade while at the same time developing appropriate measures for economic autonomy in the face of future shocks from the global economy.

The current study seeks to establish the causal relationship between trade openness, labor force participation, human capital and economic growth of SAARC countries. It seeks to examine the impact of trade openness and labour force participation in the development of SAARC countries. Since flow size is a critical component in the analysis of trade openness and with the view to stimulating more economic activities, this paper examines the short-run and long-run implications of larger trade flow size. It also looks at the impact of education and skills on human capital in the enhancement of labour productivity and the support of economic growth in the region.

Review of the Literature

❖ Theoretical Foundations of Trade Openness

Trade openness generally lowers or removes trade barriers, including tariffs, quotas, and import restrictions. It is a fundamental CSL economic policy in most developing countries, including the SAARC region. The classical trade theory, described by Adam Smith (1776), supported free trade based on the principle of absolute advantage. Moreover, David Ricardo (1817) expanded this into what is known today as the principle of comparative advantage, which points out that the only way countries can reach maximum total production and, therefore, a state of gain for all

the trading partners is if each concentrate on producing only those goods that they could make most efficiently.

Subsequent theoretical advancements in the twentieth century supported trade in the direction of growth. Heckscher-Ohlin model (1933) Integrated factor endowment into factors such as land, labor, and capital in the flow of trade by enlarging the factors of classical theory. As for more recent theories, more consistent with the endogenous views, there can be found statements to the effect that trade openness indeed is leading to economic growth not merely via opening up of access to international markets but also through the diffusion of technology, innovation, and ideas (Setterfield, 2021). Removing barriers to commerce enables countries to have better access to advanced technologies and knowledge from developed countries; in this way, it improves domestic efficiency.

According to Zaman et al. (2021), Opening up trade is central to incorporating developing countries into the world economy. Trade openness allows a country to benefit from the division of international specialization through competition, efficiency, and FDI. FDI contributes financial resources, technology, and managerial skills to the host developing economies, accelerating their economic growth processes. Consequently, the benefits of trade openness would be associated with a country's ability to connect with the global system of value addition and access external assets for domestic growth.

- **Trade Liberalization in the SAARC Region**

In the last two decades, the SAARC countries have witnessed a complete overhaul of their trade policies. As soon as they gained independence, most SAARC countries adopted protectionism. As Gupta (2022) noted, such policies were intended to reduce dependence on imported products by encouraging domestic industries through high tariffs, import quotas, and state-led industrialization. Although these policies effectively nurtured the local industries, they later resulted in some diseconomies and other market imperfections that caused the economy to slow down.

Some SAARC member countries woke up to the grim reality of protectionism by the late 1980s and early 1990s and, therefore, gradually moved up the ladder toward more liberal trade policies (Bhattarai, 2022). One of them is India, which in 1991 carried out economic openness, eliminating tariffs and opening the country's

economy to foreign investments. The structural adjustments that Bangladesh undertook included trade openness, export promotion, and removal of barriers to import. The increasing trend in GDP growth contributed to improving competitiveness in foreign markets.

As per Kumar et al. (2020), Trade openness in South Asia gained a significant victory in 2006 when the South Asian Free Trade Area was formed. It was expected that when the trade openness process of SAFTA came into force, intra-regional trade would be enhanced by eliminating or cutting down tariffs on goods imported between SAARC countries. However, the intra-regional trade is still quite limited and accounts for less than 5% of the region's total trade. The lack of infrastructure and other pre-existing non-tariff barriers, as well as the fact that it is always on the receiving end of various political tensions, have left the overall success of SAFTA as a question mark. These problems remain as barriers to trade in the region. Some Non-tariff Barriers (NTBs) include complex and time-consuming customs formalities, variable regulatory measures, and insufficient transport access. These have been identified as significant barriers to achieving intra-SAARC trade.

As per Curran et al. (2021), the COVID-19 pandemic disrupted trade flows globally, exposing trade-dependent economies' vulnerabilities and renewing the discourses on openness to trade, economic resilience, and self-sufficiency. In the SAARC countries, the pandemic added to the prevailing socioeconomic inequalities, mainly hitting low-income populations and groups marginalized in society. Income levels fell drastically since sectors that drew on international trade and foreign labor markets- tourism, manufacturing, and agriculture suddenly stopped. This entailed massive job losses, contributing to unemployment rates and reinforcing poverty in the area. Essential services like health, education, and social support were disrupted, further aggravating the impact on needy groups.

This crisis again underlined the need for a re-think of trade policies by the SAARC countries and less than excessive dependence on external markets. The current circumstances have highlighted the urge to devise workable trade policies and strategies that adequately balance open trade policies with focused attention on building capacity for increased national and regional production (Curran et al., 2021). Further resource development, notably in agriculture, digital services, and healthcare, would make these economies better prepared in the face of future global disruptions. By building solid internal capacities, the SAARC countries can protect

their economies from similar crises and ensure that sustainable and inclusive growth leaves minimum social and economic disparities.

Besides, the trade of the SAARC countries with the Rest of the world has also expanded considerably in recent decades, particularly after the rise of India as a significant economic power (Kumar, 2021). The trade openness policies that India has embraced, together with integration in the global supply chain, have spread positive effects to neighbors. More importantly, the full potential of regional trade openness in SAARC has not been realized. The region is still less integrated than regional trading blocs such as the Association of Southeast Asian Nations (ASEAN) or EU.

Human Capital and labor force participation

Human capital is valuable to economic growth because it refers to education, skills, and health quality. According to Romer's Endogenous Growth Theory (1990), human capital accumulation is one of the most crucial determinants of long-run economic growth since it improves labor productivity and technological improvements. As per Jafrin et al. (2021), Education and health as a source of human capital have also been considered essential for continuing economic growth in SAARC economies.

All the SAARC member countries have a diverse human capital. However, the region has a bulk and young labor force participation. However, Sri Lanka and India have tried very hard to enhance their literacy rates and expand enrolment to universities, whereas Afghanistan and Nepal lag behind due to political unrest, which is also indicative of poor physical infrastructure and ineffective systems in education (Sarangapani & Pappu, 2020). In this respect, the economic benefits accruing from human capital differ within the region: the countries that are at a better starting point according to investment in education and healthcare see an improvement in their economic growth rates and overall quality of life.

Besides that, there is another area, labor force participation, which can be viewed as another factor influencing economic growth, especially female participation in Bangladesh and India. Besides, education will enhance the chances of labor force participation, especially women, and improve their contribution to economic growth. According to Najeeb et al. (2020), it has been realized that increased female

employment in the recent past has significantly boosted incomes at the household and national levels. Osundina (2020) proved that there was a positive relationship between female education and the economic growth of Pakistan through the enhancement of the quality of the labor force participation.

In most circumstances, the literacy rate can be used to estimate human capital in a cross-sectional economic development analysis. A practical synthesis is provided by Cooray et al. (2014), where the South Asian countries were chosen; the data proves the existence of a positive relationship between literacy rates and economic growth. Countries that invest heavily in education not only have enhanced output of workforce but also those countries quickly transform from an agriculture-based economy to a modern industrial and service-based economy. However, some examples show how increasing literacy and education play genuine roles as a turning point in India's transformation into a postindustrial developed country and a significant economy in the world.

Trade openness, labor force participation, and Gross Capital Formation are interrelated in creating a favorable environment for economic growth (Intisar et al., 2020). However, literature associating the two variables with economic growth has received considerable attention in developing economies. Trade openness is essential because it enables a country to penetrate more significant markets, import higher technologies, and enhance productivity, which a competent workforce can leverage (Fatima et al., 2020). Gross capital formation is essential in forming gross investment, which is fixed investment in physical capital stock, including the establishment of infrastructure and machinery, which are significant in enhancing productive capacity within an economy and, hence, growth.

A literature survey in SAARC countries has shown that the relationship between trade openness and economic growth is significant. For example, Rehman et al. (2012) proved that the impact of trade openness and human capital enhancement determined the higher economic development of Pakistan and Bangladesh (Intisar et al., 2020). On the other hand, SenGupta (2020) ensured that trade openness led to increased rates of gross capital formation in India, which boosted industrialization and economic growth. Towards this end, investment in roads, ports, and energy, among others, has been essential for the SAARC countries to promote trade and labor mobility.

There is also labor force participation, particularly in skilled and semi-skilled employment, which maximizes the benefits of trade openness. Maestas et al. (2023) posit that countries with high labor force participation rates are likely to have higher levels of economic growth due to the increased number of people involved in financial activities. Coupled with a skilled labor force participation, it raises the level of capital formation over time, and the multiplier impact will yield more benefits for trade openness. The literature review shows that trade openness, human capital development, and investment in gross capital formation are essential for the growth of SAARC economies. However, at the same time, several push factors, such as low literacy rates, inadequate infrastructure, and political instabilities, still act as hindrances to the full economic potential of the regions. The countries of SAARC are pressing on with trade openness and human capital improvement, and their response to these challenges will define the permanency of long-term growth and development.

Pandemic-Era Dynamics and Policy Responses in the SAARC Region (2020–2022)

The COVID 19 pandemic affected the SAARC countries' economic structure during the year 2020 and 2022 in terms of trade openness, labor force participation and human capital. Global trade was significantly affected due to the breakdown of supply chains and restrictions on exports and border closure. Intra-regional trade which is currently low in SAARC was affected even worse as countries focused on the 'self-sufficiency' policy. India for example saw a major decline in its merchandise exports during the initial months of the pandemic, while Nepal and Bhutan struggled with basic import needs due to logistics issues. Labor markets were equally destabilized. Self-employed people who are involved in a significant portion of employment across the countries such as Bangladesh and Pakistan faced harshly the consequences of lockdowns and enterprise shutdowns. Job losses, pay reduction and halting of internal migration avenues consequently reduced the LFPR in the short-run. At the same time, the education system was also greatly impacted by long-term school closures and limited access to online learning materials. In particular, rural and marginalized groups, including women and children, lost learning time that might have a negative impact on human capital formation in the future. Heterogeneous policy measures were adopted in the region, with countries like India and Sri Lanka releasing economic stimulus measures and the process of digitalization, while other countries with limited fiscal space relied on external assistance. However, the resilience was still hampered by pre-existing weaknesses including; poor health systems and structures and high levels of debt. The impact of

these shocks can be observed in the short-run instability highlighted in the empirical literature of this paper. Therefore, it is crucial to understand the structural changes in trade, labour, and education that have occurred in the 2020–2022 period to analyze the impact of COVID and the future prospects of SAARC countries economy.

Methodology

❖ Description of Data Sources

This research explores the correlation between trade openness and SAARC countries' labor force participation, literacy, gross capital formation, and GDP growth. To this end, the analysis uses secondary data from reliable databases such as the World Bank's World Development Indicators, SAARC statistical publications, and national statistics offices of member countries. Trade volume, employment ratio, literacy, gross capital formation, and GDP growth rates have been obtained from 1972 to 2022. These variables were chosen to analyze the main factors that influence economic growth with a particular focus on trade openness and human capital formation, which hugely enhance the efficiency of the labor force participation and, therefore, the economic growth in SAARC economies.

❖ Explanation of Econometric Models

The analysis employed the Cross-Sectionally Augmented Autoregressive Distributed Lag (CS-ARDL) model and the Granger Causality test. The CS-ARDL approach is applied for the long-run and short-run analysis of the variables. This model tries to overcome the problem of cross-sectional dependence across the SAARC countries and models the slope coefficients as heterogeneous across the panel units. This makes it possible to get a reliable estimate of the impact of trade openness, labor force participation and literacy rates, and gross capital formation on economic growth.

CS-ARDL is especially useful when data have different integration orders. That is, some variables are at level (I (0)) while some others become stationary at the first difference (I (1)). This flexibility enables the right cointegration among the variables to be tested over the long run. The model takes the following form:

$$GDP_t=\alpha+\beta_1 TO_t+\beta_2 LF_t+\beta_3 LR_t+\beta_4 GCF_t+\epsilon_t$$

GDP is the dependent variable (economic growth), TO is trade openness, LF is the labor force participation, LR is the literacy rate, and GCF is gross capital formation. Besides, the CS-ARDL is accompanied by the Granger Causality test to identify the causal linkages of the variables. The Granger Causality test can be used to identify whether one variable can predict the future values of another and thereby provides a clue to the direction of causality of trade openness, labor force participation, and literacy rate on economic growth.

- **Overview of Diagnostic Tests**

To enhance the reliability of the results, several diagnostic tests are applied. Cross-sectional augmented Dickey-Fuller (CADF) and cross-sectional Im-Pesaran-Shin (CIPS) tests were performed to check the order of integration of the variables. These tests address issues of cross-sectional dependence and confirm the order of data integration, which is crucial for avoiding spurious regression. The Westerlund cointegration test is used in this study to examine the long-run equilibrium of the variables in the model. This test is chosen because it is least sensitive to cross-sectional dependence and helps to show whether the variables are cointegrated in the context of SAARC countries. Slope heterogeneity tests are conducted to check the null hypothesis that the coefficients of the models are the same across countries, which indicates the different economic structures of the SAARC member countries. These tests are helpful when undertaking a panel analysis as they control for effects that may vary from one country to another.

- **Explanation of Key Variables**

Trade Openness (TO): Trade openness can be defined as the share of total trade in exports and imports in a country's gross domestic product. It indicates the country's openness to the global economy and is a factor in the economic development rate. Opening up markets, technology, and investment has been instrumental in the SAARC countries through trade openness.

Labor Force Participation (LF): This variable measures the ratio of working-age persons within the population in the labor force participation. High labor force participation means more people are entering the labor force participation to produce goods and services, a factor that is particularly important to the growth of countries with large populations of workers, as is the case in the SAARC economies. Literacy Rate (LR): The literacy rate represents human capital in the analysis. Literacy means education, and education means better human capital and,

therefore, better labor productivity and innovation. The SAARC region has made appreciable progress in enhancing literacy levels, which has had a multiplier effect on economic development.

Gross Capital Formation (GCF): Gross capital formation captures net capital formation by adding expenditures on acquiring fixed assets and physical capital that can increase an economy's productive capacity in the long run. It is expressed in the proportion of the gross domestic product spent on investments.

GDP Growth: GDP growth is the dependent variable that measures a country's economy's ability to grow. It is one of the most popular outlooks on the state of an economy, showing the rate at which, an economy is growing over time.

With the help of these variables and the described econometric models, this study offers a comprehensive insight into the relationship between trade openness, labor force participation, literacy rates, gross capital formation, and economic growth in SAARC countries. The vigorous methods and diagnostics used make the results credible, which adds to understanding the financial processes in the region.

Results and Analysis

- **Descriptive Statistics**

The descriptive statistics provide details about the summary of the main variables, viz. Trade Openness (TO), labor force participation (LF), literacy rate (LR), and Gross Capital Formation (GCF) of the SAARC countries. These statistics are used to explain differences in socio-economic achievements among these nations. For instance, Sri Lanka consistently demonstrates higher literacy rates and more robust human capital policies compared to countries like Afghanistan, where political instability and infrastructural deficiencies hinder educational access and workforce participation. Similarly, India and Bangladesh show higher levels of trade openness and capital formation due to active engagement in global trade and investment flows, whereas Bhutan and Nepal lag behind due to geographic constraints and a less diversified economic base. Such disparities illustrate how policy effectiveness and institutional strength shape economic outcomes across the SAARC region.

Table 1 Descriptive Statistics of Variables

Descriptive Statistics Table				
Variable	**Mean**	**Std Dev**	**Min**	**Max**
Trade Openness (TO)	42.6	22.06	6.53	121.04
Labor Force (LF)	58400000.0	122000000.0	20007.0	5.08e+08
Gross Capital Formation (GCF)	23.58	11.37	4.69	69.47
GDP Growth (EG)	4.91	5.04	-33.49	41.74
Literacy Rate (LR)	53.2755	26.755	10	98.610

The trade openness index (TO) reveals variations in the level of international trade about the country's Gross Domestic Product (GDP) among the SAARC region countries. For instance, in Table 1, the average TO is 34.297 percent, and the standard deviation indicates a dispersion around the mean at the country level. Newly industrialized countries can have spectacularly high values because their entire rationale for exports exceeds other countries possessing limited access to trade because of politically inept policies or poor communication systems.

Labor Force Participation (LF) demonstrates the size of the 15-year-old and above working-age population in the market for productive employment, either as employees or job seekers. The published mean value of LF is 48.873 percent, with % SD showing moderate variation. These disparities in LF are due to differences in economic development, literacy, and cultural constraints that define the workforce, especially ladies' integration.

The fluctuation of Gross Capital Formation (GCF), which reflects investment intensity in an economy, is evident in the SAARC countries. The average GCF is estimated at 23.15 percent, as depicted in Table 1. However, the panel's minimum and maximum GCF levels differ significantly. These differences may indicate disparities in investment in public structures, private capital formation, and foreign direct investments.

These differences in the relative socioeconomic attributes are essential for comprehending the heterogenic nature of SAARC countries' economies and the importance of these variables in the region's development.

❖ Diagnostic Tests

Several tests are carried out to validate the econometric models used in the analysis. First, the CD test evaluates the level of cross-section dependency to determine whether the cross-sections are independent. The results of CD tests summarized in Table 2 further support the conclusions about the cross-sectional dependence of economic variables, including GCF, TO, LR, and LF, rejecting the null hypothesis. This suggests that the economic performance of one SAARC nation affects the others: the probable reason is that integrated trade in the area.

Table 2 Cross-Sectional Dependence (CD) Test results

Variable	CD Test	Prob	Average Joint T	Mean (ρ)	Mean abs (ρ)
EG_{it}	5.739	0.000	51.00	0.15	0.21
GFC_{it}	15.312	0.000	51.00	0.41	0.46
LF_{it}	35.617	0.000	51.00	0.94	0.94
TO_{it}	7.479	0.000	51.00	0.20	0.38
LR_{it}	32.799	0.000	51.00	0.87	0.87

Second, the simultaneous testing of the series stationarity is performed with the CADF test and, in addition, with the CIPS test. The analysis of the CADF test indicates that EG and GCF are level stationary, and TO and LF are non-stationary. The CIPS test corroborates this mixed order of integration in which some series need to be differenced to become stationary (Table 3). This suggests that not all variables have the same statistical properties, hence the need to test for co-integration.

Table 3 Results of Cross-Sectionally Augmented Dickey-Fuller (CADF) and Cross-Sectionally Augmented Im-Pesaran-Shin (CIPS)

Variable	Level		First difference		Order
	Intercept	Intercept & trend	Intercept	Intercept & trend	
Cross-Sectionally Augmented Dickey-Fuller (CADF)					
EG_{it}	-2.862 *	-3.390*	n.a	n.a	$I(0)$

GFC_{it}	-3.049 *	-3.279*	n.a	n.a	*I*(0)
LF_{it}	-2.132	-2.665	-3.328 *	-3.439*	*I*(1)
TO_{it}	-2.111	-2.324	-4.521*	-4.550*	*I*(1)
LR_{it}	-1.892	-2.235	-2.917*	-3.208*	*I*(1)
Cross Sectionally Augmented IPS (CIPS)					
EG_{it}	-4.177 *	-5.021 *	n.a	n.a	*I*(0)
GFC_{it}	-2.984 *	-3.348*	n.a	n.a	*I*(0)
LF_{it}	-2.383 **	-2.992**	n.a	n.a	*I*(0)
TO_{it}	-2.262 ***	-2.924**	n.a	n.a	*I*(0)
LR_{it}	-1.784	-1.927	-4.919*	-6.138*	*I*(1)

Lastly, the Westerlund Co-integration Test checks whether the variables have a long-term association. Table 4 shows that the group and panel statistics have rejected the null hypothesis of no co-integration, confirming the long-run relationship between Trade Openness, labor force participation, and economic growth.

Table 4 Results of Westerlund Cointegration Test

Statistic	Value	Z-value	P-value
G_t	-5.022	-6.731	0.000
G_a	-31.051	-4.478	0.000
P_t	-13.66	-6.239	0.000
P_a	-24.469	-3.476	0.000

These diagnostics check the validity of the applied econometric techniques used and corroborate the co-integration of the main variables to provide reliable results for further analysis.

- **Econometric Analysis**

The study uses the Cross-Sectionally Augmented ARDL (CS-ARDL) model to examine the short- and long-run effects of trade openness, labor force participation, and literacy rates on growth in the SAARC countries. The analysis of the results of the estimations presented in Tables 5 and 6 shows that there is a positive and significant effect of trade openness (TO) on growth in the long run, as hypothesized

in the theoretical framework. This affirms the hypothesis that the degree of trade openness promotes economic development through enhanced market access, technology transfer, and competition efficiency.

Table 5 long-run and short-run regression results

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
GCF(-3)	0.030126	0.017126	1.759122	0.0795
LN_LF	0.216739	0.018535	11.69370	0.0000
LR	0.052785	0.008273	6.380424	0.0000
TO	0.049008	0.012012	4.079740	0.0001
Short Run Equation				
COINTEQ01	-0.042868			
D(LN_EG_PCI(-1))	0.116343			
D(GCF(-3))	0.007055			
D(LN_LF)	0.229693	0.218874	1.049430	0.2947
D(LR)	0.003416	0.005766	0.592446	0.5540
D(TO)	0.000299	0.001319	0.226337	0.8211
Root MSE	0.086130	Mean dependent var		0.050966
S.D. dependent var	0.096346	S.E. of regression		0.092630
Akaike info criterion	-1.939616	Sum squared resid		2.848652
Schwarz criterion	-1.404633	Log-likelihood		424.4063
Hannan-Quinn criteria.	-1.727418			

Nonetheless, in the short run, the growth effect of TO is more complicated, and some countries may even suffer negative impacts on growth in the initial stages, primarily because of adjustment costs arising from market openness to global competition. For instance, the less developed countries in SAARC are likely to struggle to resist competition from more industrialized countries, which slows down short-term growth rates. However, they continue to serve the higher interest of liberalized trade, as they help to fuel a perpetual state of economic growth. As, the coefficient of 0.049 on trade openness indicates that a 1% increase in trade openness results in a 0.049% rise in GDP. This underscores the importance of promoting trade liberalization policies in the SAARC region.

Table 6 long-run and short-run regression analysis

TO	**0.023488**	**0.007010**	**3.350857**	**0.0009**
LN_LF	0.788599	0.318593	2.475252	**0.0138**
GCF	0.005786	0.005516	1.048889	**0.2950**
Short Run Equation				
COINTEQ01	-0.100214	0.020993	-4.773614	**0.0000**
D(TO)	0.001227	0.001128	-1.087045	**0.2778**
D(LN_LF)	-0.428521	0.292086	-1.467108	**0.1433**
D(GCF)	0.005113	0.002046	2.499362	**0.0129**
C	1.598112	0.316089	5.055886	**0.0000**
@TREND	0.005085	0.001530	3.323444	**0.0010**
Root MSE	0.083972	Mean dependent var		**0.052423**
S.D. dependent var	0.100536	S.E. of regression		**0.092122**
Akaike info criterion	-1.884223	Sum squared resid		**2.876927**

Schwarz criterion	-1.205847	Log-likelihood	**453.3814**
Hannan-Quinn criter.	**-1.615787**		

Another essential variable, labor force participation (LF), presents a direct and statistically significant relationship with economic growth for both the short and long-run analyses. Employment rate, especially that of women, can improve productivity and the Use of human capital, thus leading to efficiency and economic growth. Also, from Table 6, it is evident that nations with higher rates of LF have faster economic growth rates; this calls for more inclusive labor policies that will increase levels of human resource participation in developed economies.

The literacy rate (LR) is also an essential element of economic growth, mainly due to its impact on human capital. A quality-educated workforce can embrace and adapt to technological innovations, improve productivity, and encourage innovations crucial for long-term economic growth (Sharma et al., 2020). Table 6 reinforces the observations made earlier and supports the notion that raising literacy levels signifies positive progress toward economic status in SAARC nations, hence supporting the argument on the role of education in sustainable development.

Moreover, the Granger Causality Test is carried out to check the causal relationship between the above-stated variables. The results show a bidirectional causal relationship between trade openness and economic growth in most SAARC countries (Table 7). By this realization, we can infer that not only does trade openness contribute to economic growth, but also that opening up economies, and hence growth, leads to more trade therefore reinforcing the cycle of growth and trade. Cross causality is used to explain the relationship between labor force participation and economic growth one on the other since a growing economy will support more people into the labor force participation. In contrast, a growing labor force participation boosts the economy further.

Table 7 Lagged Regression Model

Variable	Coefficient	Std. Error	Z-score	P-value
$oneTO_{it-1}$	0.0058383	0. 0379003	0.15	0.878
TO_{it-2}	-0.0978392	0.0485849	-2.01	0.044
TO_{it-3}	0.0662324	0.048845	1.36	0.175
TO_{it-4}	0.0454474	0.0378521	1.20	0.230
LR_{it-1}	-0.0523079	0. 2070451	-0.25	0.801
LR_{it-2}	0.1635922	0.2859757	0.57	0.567
LR_{it-3}	-0.4277667	0.2794047	-1.53	0.126
LR_{it-4}	0.3503053	0.2029116	1.73	0.084
LF_{it-1}	-1.01e-08	1.29e-07	-0.08	0.937
LF_{it-2}	-7.45e-09	2.02e-07	-0.04	0.971
LF_{it-3}	1.30e-07	2.53e-07	0.51	0.607
LF_{it-4}	-1.61e-07	1.65e-07	-0.98	0.328
GFC_{it-1}	0.1214526	.071611	1.70	0.090
GFC_{it-2}	-0.2071337	0.0969673	-2.14	0.033
GFC_{it-3}	0.0290745	0.0997275	0.29	0.771
GFC_{it-4}	0.0342146	0.0773864	0.44	0.658
HPJ –statistic = 37.4542 with Prob. = 0.0018, BIC lags length = 4				

Finally, the study has found that gross capital formation (GCF) was a significant way to achieve economic growth. These are evidenced by the fact that higher investment levels in infrastructure technology and capital goods tend to enhance production capacities and efficiencies and have positive and significant long-term effects on growth by the GCF (Table 6). This has born aurally the delegates the necessity of SAARC countries to give priority to capital formation to sustain the growth Path.
Therefore, based on econometric modeling, we re-established the vocalist roles of trade openness, labor force participation, and literacy rate in encouraging the economic growth of SAARC nations. The findings extend their policy implications by stressing the need to boost trade openness, improve labor market accessibility, and increase education levels to facilitate sustainable development for each region.

Discussion

This paper has also tried to investigate the impacts of trade openness on the SAARC countries. They have been proven to be very important in improving the economic performance of the SAARC countries in the long and short run. Technological development, and capital accumulation, all of which are growth components. Trade openness facilitates access to broader markets, promotes technological development, and supports capital accumulation, and helps enhance industrial competitiveness through market expansion. For instance, according to Sudan (2022), trade openness has significantly boosted GDP increment in the case of India and Bangladesh and will, therefore, foster economic diversity. In the short run, trade openness experiences transitional impacts of changes in the demand for labor and imperfect mobility, leading to unemployment, industrial changes, and restructuring. The transitional challenges are even more evident in countries with less diversified economies, such as Bhutan and Nepal, where agriculture dominates, and the sector experiences a hard time finding its bearing in the new open trade world. The econometric results in this study corroborate the theoretical classification regarding the positive long-run impact of trade openness and prove that overall trade integration enhances the growth rate in SAARC countries. Specifically, a coefficient of 0.049 on trade openness implies that a 1% increase in openness contributes approximately 0.049% to GDP growth, underscoring the policy relevance of open market strategies However; the short-term effects suggest that vulnerable sectors require transitional support during the liberalization process. While previous literature has largely focused on trade-growth links in stable conditions, this study provides novel insight by examining these dynamics in a post-COVID context, revealing both resilience factors and short-run shocks unique to the SAARC region.

The two most important variables in all SAARC economies relate to the labor force participation and education, which are vital in revitalizing economic growth. Some nations, such as Sri Lanka and India, have invested more in education and human capital training. This has translated to a higher percentage of turnover in the labor force participation and better education standards, leading to higher economic growth (Rathnasiri, 2020). As a result of the high literacy rate and skilled labor force participation, the Sri Lankan economy is better placed than its neighboring countries to capture the gains from trade openness and capital formation. On the contrary, countries such as Afghanistan and Nepal reflect low levels of education

and limited employment, thus restraining economic development. For example, Afghanistan's literacy level is lower than many of its neighbors, which is compounded by political strife and few primary education facilities, especially for females. This scenario limits the nation's prospects of deploying its labor force participation for dynamic, productive use (Zhu et al., 2024). The comparison shows the unequal distribution of SAARC countries. These findings align with the empirical results, which indicate that countries with stronger human capital bases are better positioned to benefit from trade and investment-driven growth. This highlights the importance of strategic investment in education and labor market reforms to bridge development gaps within the region. These inequalities can only be redressed through policy change targeting education and the labor market in the region to realize a just development path across the countries.

Another factor that has been seen to determine economic growth in SAARC countries is FDI and technological transfers. FDI also delivers people management skills, technology, and market access, which is critical in developing regional industries (Tripathi & Inani, 2020). India and Bangladesh, together with other developing nations, have also been able to foster FDI, mainly in technology, textiles, and manufacturing industries, because of their effect on economic growth. Technology transfers, commonly associated with FDI, are a central column for boosting productivity and effectiveness. Empirical findings from this study support the role of FDI as a key contributor to long-term GDP growth, especially in more industrialized SAARC members. For instance, India's growing software and IT industries are due to its technological collaboration with multinational firms, which is compounded by the growth of service industries. However, other countries in the SAARC region, such as Bhutan and Afghanistan, have many problems acquiring FDI owing to political insecurity, the absence of infrastructural facilities, and bureaucratic controls on investment (Khatır, 2023). These limitations reduce their ability to benefit from the productivity and innovation gains associated with global investment flows. Furthermore, they continue to carry out conventional economic activities that can be less productive than technology-transferred economic activities. FDI and technological transfers are significant prerequisites for the development of the SAARC region. Therefore, decision-makers should concentrate on creating the appropriate environment to attract FDI by enhancing governance, infrastructure, and policies that accelerate the technology vital to long-run growth. The results of this study are in harmony with most previous studies on trade openness, labor force participation employment, and human capital development

in influencing economic growth. Some previous literature has pointed out the importance of trade openness in improving financial performance by increasing competitiveness and market access (Grossman & Helpman, 1991; Romer, 1990). Consequently, the positive effects of trade openness on GDP growth in the SAARC countries, as captured in these models in the long run, support these theoretical frameworks. However, this study also introduces new knowledge by empirically highlighting country-specific short-run vulnerabilities and transitional disruptions, including the short-term factors linked to trade openness. While this literature primarily focuses on the advantages in the long run, this research also recognizes the short-term costs or disruption that take place, mainly where the structures of the economy in transition are not yet as diverse as in the more established industrialized world; thus, the call for policy flexibility during the transition phase. The impact we found of the labor force participation and education on economic growth is supported by the findings of earlier studies that education and an increase in the labor force participation serve as input for output and economic development (Lucas, 1988; Barro, 1991). SAARC countries' labor force participation participation rates and education systems are compared and analyzed to understand better how the regional disparities impact the economy. Sri Lanka and India proved to have higher human capital than others. They are examples of how a higher educational structure benefits the country. Meanwhile, countries like Afghanistan continue to struggle with systemic educational limitations, which restrict their ability to leverage labor for growth.

Extending the study's focus on FDI and technology transfers is even more helpful to the existing literature, given that the center of spin growth still lies in external investments in developing new regions (Kopiński, 2023). Nevertheless, this research contributes to the discussion by offering concrete examples from SAARC nations to show how this strategy has achieved differential degrees of success in influencing FDI and technology acquisition to facilitate improved productivity and growth. The findings also reinforce the consensus that trade openness plays a catalytic role in driving economic expansion across developing SAARC economies. Nevertheless, to envision and actualize the full benefits of the SAARC economic community, countries must implement sound fiscal policies that align with sustainable and inclusive development. The first key policy implication is to negotiate high-quality trade agreements that focus not only on tariffs but also on the non-tariff aspects of trade, such as identifying facilitative measures that deal with customs and transport systems. These measures will reduce the bear costs of transactions and enhance the

international market competition for goods. Furthermore, trade policies should seek to protect domestic industries from competition between global markets and local markets. Instead of subsidies, which can be contentious, the government can consider providing tax incentives to encourage value-added exports from emerging industries, such as information technology and eco-friendly industries, in the hope of development while preserving the earth's resources (Gereffi et al., 2021). Secondly, SAARC countries must integrate at the regional level to enhance the intra-SAARC trade. Measures like accessible trade areas and adopting a standard external tariff may be beneficial in stabilizing the regional economies and, hence, decreasing reliance on extra-regional markets.

To counterbalance the negative social result of trade openness, it is strictly recommended that the government implement social policies that would safeguard some strategic sectors, including agriculture and small-scale industries, by providing societal security and retraining measures. These will assist the workers in moving to better comparative sectors, thus preserving the inclusive benefits of trade liberalization. A cohesive strategy integrating infrastructure development, innovation promotion, and robust social safety nets is essential to ensure sustainable long-term gains from trade openness while minimizing transitional disruptions. Furthermore, Trade openness and human capital formation require formulating and implementing labor market policies (Intisar et al., 2020). One of the policy recommendations suggested in the paper is to support skills development initiatives to enhance workforce capabilities. SAARC governments have been urged to focus on vocational training and technical education to suit the new needs of industrial sectors such as information technology manufacturing and services. This will lift labor productivity and facilitate the workforce's competitiveness in meeting future international market demands.

Moreover, the flexibility of the labor market is crucial for the promotion of innovation as well as FDI attraction. Self-employment options, opportunities for flexible working hours and remote working, part-time employment, and fixed-term contracts contribute to improved participation in the labor force participation, especially for women and other vulnerable groups (Becker et al., 2020). To mitigate the social costs of labor market reforms, governments should implement complementary measures such as unemployment insurance and targeted retraining programs. Another area that governments should intervene in is putting more people on the payroll by reducing the regulatory barriers for SMEs with high

compliance costs. This could mean rationalizing unnecessary red tape, cutting taxes, and rewarding employers for creating jobs that come with formality. Promoting people to work in the formal economy extends the employment rate. It helps boost otherwise stagnant government revenue by taxing and increasing Social Security contributions, fanning economic growth. Therefore, integrating labor market reforms with trade openness policies will improve human capital development and enable the employment needs of the integrated global economy.

Education is an essential component of human capital and a determinant of working population productivity and economic growth. To enhance the quality of education within countries in the SAARC member states, the government should address issues in both the primary and the tertiary education system reforms (Valero, 2021). This includes enhancing teacher professional development, increasing the quality of infrastructures, and introducing and promoting STEM in classrooms to align students with the global economy's requirements. Furthermore, government policies should encourage private sectors to offer internship and apprenticeship programs where the intern gains practical experience and better transitions into employment. For the realization of labor force participation participation issues, mainly women and youngsters, SAARC nations should strengthen the policies related to education and employment (Jafrin et al., 2021). With the provision of scholarships for females and other groups of the marginalized population, together with measures against workplace discrimination, more people will join the workplace. Additionally, policies that improve childcare affordability and introduce flexible parental leave will empower women to participate more fully in the labor force participation without sacrificing family responsibilities.

According to Bishwakarma and Hu (2022), SAARC integration also needs regional cooperation to harness the strength of resources within the SAARC members to bring about compound growth. One solution is to create a regional policy to recognize education in the country, promoting labor migration. Moreover, SAARC countries could explore cooperation in R&D related to agriculture, energy, and resilience to climatic shocks. Collaborative R&D fosters regional integration and increases innovation and technological development, the pillars of the economy's long-term growth. Therefore, investment in better-quality education, enhancement of employment rates, and emphasis on regional cooperation–centric policies will help SAARC countries realize more sustainable and inclusive economic growth.

Improved human capital development, complemented by efficient regional social capital, synergizes to create new regional economic streams.

Furthermore, the COVID-19 pandemic profoundly impacted trade openness, labor force participation participation, and economic growth across SAARC countries, exposing structural weaknesses in their economies. Econometric analysis shows that the pandemic triggered a substantial, albeit temporary, contraction in trade activities as lockdowns, travel restrictions, and supply chain disruptions curtailed cross-border exchanges. This downturn was especially severe in labor-intensive industries such as textiles, tourism, and manufacturing, which are crucial to many SAARC economies. The resulting job losses and decreased labor force participation participation intensified economic hardships for vulnerable populations, including migrant workers and those in informal sectors lacking adequate social protection.
For SAARC nations, this period underscored the importance of adopting adaptive and resilient economic policies to mitigate the impact of future global shocks. The pandemic highlighted the need for diversified trade strategies that not solely rely on traditional exports beyond dependence on traditional export sectors and incorporate emerging sectors like digital services and renewable energy. It also reinforced the value of investing in workforce skills, healthcare, and digital infrastructure to improve labor force participation resilience. Strengthening domestic capacity, enhancing regional cooperation, and fostering innovation are essential steps for SAARC countries to withstand and recover more swiftly from external disruptions.

Conclusion

The result justifies the hypothesis that trade openness, human capital development, and economic growth are significantly positive in SAARC countries. Trade openness has consistently contributed to economic growth by enabling access to foreign markets, promoting technology transfer, and enhancing competition. Education and the labor force participation are the two primary human capital components that greatly facilitate the achievement of optimum benefits from trade openness. Comparing India and Sri Lanka with Afghanistan and Nepal, we can see that nations with improved education systems and skilled workers have better economic growth rates. In line with the econometric analysis carried out using the CS-ARDL model and the Granger causality test, this study concludes that future research and policy analysis must embrace a dual perspective that incorporates trade openness policies

and investment in human capital in the countries of the SAARC region. Such scratches call for policy changes that encase trade promotion and education development to effect sustainable economic change in the future. The COVID-19 pandemic has brought to the forefront that unless there is a balanced approach to trade openness, the tendency of SAARC economies toward resilience needs to be promoted. Henceforth, policies must ensure trade integration, self-sufficiency, and resilience against disruptions in the world economy.

This line of research has significant policy implications for the future FTA and trade policies in the SAARC region. Therefore, the authorities should focus on the openness of the trade regime and improving the cooperation within the region regarding the increase in the volume of intraregional trade and FDI and renegotiating existing bilateral or multilateral agreements like the South Asian Free Trade Area (SAFTA) agreement. However, the openness of trading relations should go hand in hand with significant educational investments. In effect, to supply the right quality of human capital, governments should prioritize education systems and labor market institutions to enable adequate flexibility in the workforce. Also, it must be noted that measures that safeguard the vulnerable sectors in the initial periods of openness, like subsidies and welfare measures and retrenchment and retraining, etc., are required to avoid immediate shocks, but this promotes sustainable growth in the long run.

Moreover, the present study opens up several research avenues for understanding the dynamics of trade openness, human capital, and economic growth in the context of SAARC. First, future research should survey individual SAARC countries to determine concrete advantages and risks inherently associated with trade openness policies and concrete recommendations for all SAARC member countries regarding how to make the most of liberalized trade. For instance, the effect of the volume of foreign direct investment on political stability and trade openness is an area that may hold policy implications for trade bureaucrats.

Furthermore, there is a need to research to capture whether advanced technologies and technological innovations contribute to human capital in promoting economic growth. Consequently, insights into how technological developments for the respective digital economies can be implemented within the educational context and labor market systems to boost productivity will become increasingly pertinent. Finally, further research needs to pay much attention to trade openness's prolonged

social and environmental consequences, especially within the SDGs framework. This would afford a much better account of how trade and human capital investments could be part of growth that is more inclusive, pro-poor, and friendly to the environment in the SAARC Region.

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