INVERGE JOURNAL OF SOCIAL SCIENCES
https://invergejournals.com/
ISSN (Online): 2959-4359, ISSN (Print): 3007-2018
Volume 5 Issue 1, 2026

ECONOMIC TRANSFORMATION IN EMERGING ECONOMIES: THE ROLE OF STRUCTURAL CHANGE AND HUMAN CAPITAL

Shahzeb Khattak [1], Rida Fatima [2]

DOI: https://doi.org/10.63544/ijss.v5i1.244

Affiliations:

[1] Department of Political Science, Khushal Khan Khattak University, Karak
Email: shahzebbogara@gmail.com

[2] Ph.D Candidate, Faculty of Business and Economics, Universiti Malaya, Malaysia
Email: fridafatima009@gmail.com
ORCID ID: https://orcid.org/0009-0009-3227-2151

Corresponding Author's Email:

[1] shahzebbogara@gmail.com

Article History:
Received: 27.01.2026
Accepted: 17.02.2026
Published: 28.02.2026

Abstract

This study examined the role of structural change and human capital in promoting economic transformation in emerging economies. Economic transformation has been widely recognized as a key driver of sustainable growth, particularly in developing regions where sectoral shifts and human capital development play significant roles in improving productivity and competitiveness. The study aimed to analyse how structural transformation and human capital development influenced economic growth and long-term economic development. A quantitative research approach was employed using panel data collected from selected emerging economies for the period 2000–2022. Secondary data were obtained from internationally recognized databases, including the World Bank and international development reports. Econometric techniques such as descriptive statistics, panel unit root tests, co-integration analysis, Fully Modified Ordinary Least Squares (FMOLS), and Granger causality tests were applied to examine the relationships among the variables. The empirical results indicated that structural change had a positive and statistically significant effect on economic transformation ($\beta = 0.421$, $p < 0.01$), while human capital also demonstrated a strong positive impact ($\beta = 0.356$, $p < 0.01$). In addition, trade openness ($\beta = 0.215$) and technology adoption ($\beta = 0.298$) were found to significantly contribute to economic growth. The Granger causality results further confirmed that structural change and human capital caused economic transformation in the long run. The findings suggested that emerging economies could accelerate sustainable economic growth by promoting industrial diversification, strengthening human capital development, and supporting technological innovation. These strategies are essential for enhancing productivity, improving global competitiveness, and achieving long-term economic development.

Keywords: Economic Transformation, Emerging Economies, Human Capital, Structural Change, Technological Adoption, Trade Openness

Introduction

The history of economic development has been closely linked to processes of redistribution of resources out of low productivity sectors, like traditional agriculture, into high products sectors, like manufacturing and modern service sectors. This was known as structural change or structural transformation, as this was perceived to be a major mechanism that enabled nations to become productive and raise the national income (Zulkhibri et al., 2015; Riaz et al., 2020). The economies of the emerging world have undergone a quick transformation in their economic frameworks over the last couple of decades as a result of the process of globalization, advancement in technology and as part of the global value chains. The authors found that all countries, which effectively coped with structural change, could attain a greater degree of productivity and

INVERGE JOURNAL OF SOCIAL SCIENCES
https://invergejournals.com/
ISSN (Online): 2959-4359, ISSN (Print): 3007-2018
Volume 5 Issue 1, 2026

sustained economic development (Herrendorf et al., 2014; McMillan et al., 2014).

Human capital development had also been acknowledged as an important factor defining the economic transformation and the overall economic growth. A better approach to endogenous growth theory is that it is suggested that the more a country invested in education, skills, health and accumulation of knowledge the more the labour productivity and the capacity to innovate. It was proposed that human capital was the factor that allowed economies to start using new technologies, enhance the productivity of industries and transition to the low-technology focus (Lucas, 1988; Chowdhury et al., 2018). This was evidenced by empirical studies conducted in third world which revealed that better education and skills in the labour force increased economic growth and competitiveness in the global market (Ahmad and Khan, 2018). Moreover, human capital was viewed as a key factor in transforming the structure because it allowed workers in the traditional sectors to migrate into the modern industries where more skills and knowledge were demanded (Mehmood et al., 2021).

Over the last several years, the economies of emerging economies rapidly underwent changes in their structure based on the technological growth, digitalization and the development of global trade networks. Increased industrial diversification, urbanization and the growth of the service sector was a common characteristic of structural change. These shifts greatly changed the dynamics of the labour market and demanded massive enhancement of human capital needed to continue boosting the level of productivity. Empirical studies showed that structural change and human capital interacted with each other as far as economically performing, and skilled labour played a major role in triggering industrial upgrading and technological transmission (Castellacci & Natera, 2016). Nations that managed to match human capital formation to structural change were more prone to attain better results of economic growth and a more democratic growth outcome (Triatmanto et al., 2023).

With these developments, a number of the emerging economies still struggled to attain sustainable economic transformation. The structural change took time in a number of cases because institutional constraints, poor educational systems and poor technological facilities could not tolerate it. Theorists stated that in many instances the lack of alignment between the skills of labour force and the demands of industries lowered the quality of human capital facilitating economic growth (Evans & Lawanson, 2019). Furthermore, structural change demanded the aligned policy actions which made industrial diversification, investment in human capital and ability to innovate possible. Consequently, the study of structural change interaction and human capital became critical towards the direction along which the emerging economies were able to attain long-term economic change and sustainability development.

Background of the Study

The idea of structural transformation was a main research issue of development economics and was strongly linked to the phenomenon of economic modernization. Classical theories of development were that economic growth came about when labour was redirected in the low productivity agricultural sectors to more productive industrial, service sectors. This revolution in turn enhanced the productivity and the efficiency of the economy. Empirical research proved that the rate of structural change in the countries was higher in terms of simultaneous economic growth and industrialization (Zulkhibri et al., 2015). In the third world, structural change was also done in a form of industrialization, urbanization, and development of the manufacturing and services sector which collectively led to the diversification of the economy and enhanced productivity.

Human capital contributed a lot towards structural transformation and economic growth. Economic theory stressed cultural factors such as investments in skills and education as this would elevate the ability of individuals to adjust to technological change and industrial transformation. The more developed countries were in terms of human capital, and it was easier to move to more modern technologies, enhance the ability to innovate, and get higher productivity levels (Chowdhury et al., 2018). Empirical studies also indicated that educational attainment and workforce skills enhanced the relationship between structural change and economic growth through allowing the movement of workers among industries (Ahmad and Khan, 2018).

Global value chains enabled the developing countries to enter into international production chains hence making it easier to industrialize and diversify economically. Nevertheless, in order to be successful in the global value chains, skilled labour force was needed, technological capacity and support level institutionally. Research implied that the economies that had more developed human capital bases were in a

INVERGE JOURNAL OF SOCIAL SCIENCES
https://invergejournals.com/
ISSN (Online): 2959-4359, ISSN (Print): 3007-2018
Volume 5 Issue 1, 2026

better position to utilize globalization and achieve structural transformation that is sustainable (Castellacci & Natera, 2016). As a result, the policies of education, vocational training, and innovation became one of the main priorities of the policymakers because of their role as the key contributors to the economic change.

The other significant aspect of economic change was in urbanization and population shift. Along with the growth of the economies, people slowly exited the agricultural rural jobs and entered the urban industrial and service work. This transition helped to increase productivity, better infrastructure and further development of economic opportunities. In one of the research projects, it was revealed that urbanization commonly led to human capital accumulation, as it became the way to obtain education, healthcare, and workplaces (Mehmood et al., 2021).

Objectives of the Study

1. To examine the role of structural change in promoting economic transformation in emerging economies.
2. To analyse the impact of human capital development on economic growth.
3. To investigate the relationship between structural transformation and human capital in shaping economic performance.

Research Questions

Q1. How does structural change influence economic transformation in emerging economies?

Q2. What role does human capital play in promoting economic growth and productivity?

Q3. How do structural transformation and human capital interact in shaping economic development outcomes?

Significance of the Study

The study was important since it helped to expand the existing literature on economic transformation in emerging economies by looking at the joint effect of the structural change and human capital development. The main emphasis of the previous studies was on structural transformation and human capital separately, yet in the current study, they were combined and their impact on economic growth was viewed as collaborative. The study further contributed to the enhancement of the current knowledge on the manner in which economic transformation is taking place in developing and emerging economies by offering empirical insights into the association between these variables. The policy implications of the research works were also critical to the governments and development institutions. The study has provided a policy tool in views of enhancing the labour productivity as well as advancing innovation and boosting economic resilience of the emerging economies by determining the role of human capital whereby more effective education reform, labour development, and industrial policies can be developed.

Hypotheses

H1. Structural change had a significant positive impact on economic transformation in emerging economies.

H2. Human capital had a significant positive impact on economic transformation in emerging economies.

H3. Structural change and human capital jointly contributed to economic transformation in emerging economies.

Literature Review

Structural Change and Economic Development

Structural change was generally taken as a key process in the emergent economies, which caused economic growth. It was about the redistribution of labour, capital and resources in the low productivity sector like the agricultural sector to the high productivity sector like manufacturing and service industry. This change was held to be necessary in enhancing productivity and sustainable economic growth. Empirical research revealed that those countries that underwent a rapid sectoral transformation to industrial and service ones were associated with a higher productivity level and income. The technological advancement and better distribution of resources across the economic spheres were also encouraged by the structural change (Castellacci & Natera, 2016; Leite & Cardoso, 2023).

The scholars also highlighted that structural change was a significant factor in facilitating diversification of the economy and elimination of the reliance on traditional sectors. In situations where the

INVERGE JOURNAL OF SOCIAL SCIENCES
https://invergejournals.com/
ISSN (Online): 2959-4359, ISSN (Print): 3007-2018
Volume 5 Issue 1, 2026

economies were diversified into manufacturing and modern services, they were favoured with economies of scale, technological advancement and enhanced output. Studies on third world economies indicated that the rate of structural change also played a major role in the creation of jobs and the overall economic performance in the long term. The Positive correlation also motivated economies, which managed to divert labour to more productive areas to realize higher growth rates and higher standards of living (Joshi, 2021; Che, 2010).

According to the recent research, it further implied that, structural transformation went hand in hand with technological development and world economic integration. As nations became part of world value chain and embraced current technological processes, their economy structure shifted as countries took a shape of producing knowledge intensive industries. Such a transition allowed the emerging economies to be productive and competitive in the global markets. It was found that structural change was closely related to industrial upgrading and innovation capacity that enhanced the sustainable economic development together (Leite & Cardoso, 2023; Castellacci & Natera, 2016).

Economic Growth and Human Capital

The human capital had long been recognized as an important determinant of the economic growth and development. It included education, skills, health and knowledge which improved the productivity and efficiency of the labour force. The economic theories of endogenous growth noted that investment in education and skill formation were very important in enhancing productivity and innovativeness in an economy. According to the evidence, the rate of economic growth and competitiveness in the global markets in economies with a greater level of human capital was higher (Joseph & Pauline, 2021; Castellacci & Natera, 2016). A number of studies proved that education was especially significant in making economic development and structural transformation possible. Education increased individual potential of adoption new technologies, high productivity, and knowledge intensive activities. Those countries which had invested much in the field of education and training programmes were more likely to generate higher levels of innovation and economic diversification. Empirically it was also found that human work accumulation played a major role in enhancing productivity and production in industrializing economies (Dosi et al., 2016; Leite & Cardoso, 2023).

The improvement of human capital was viewed as the way of enhancing labour mobility and supporting the process of transitioning between the traditional sectors to the modern industry. Having a skilled labour force allowed the workers to move out of the low productivity agricultural jobs to the more productive manufacturing and service jobs. This process added to the increase in income and strengthening of economies. The results of the research implied that the better the educational systems were, the higher the ability of the country to adapt to the technological change and attain sustainable economic growth (Joseph & Pauline, 2021; Joshi, 2021).

In recent studies on skill-based education, several frameworks and models have emerged, highlighting the significance of developing human capital for economic transformation in emerging economies. Rafiq-uz-Zaman and Nadeem (2025a) explored critical success factors for skill-based education programs in Pakistani schools, emphasizing the importance of student-centred approaches. Similarly, Rafiq-uz-Zaman (2025a) compared skill-based education across SAARC countries and presented a policy roadmap for Pakistan to help bridge the region's skill gap. An integrated model for reforming skill-based education, presented by Rafiq-uz-Zaman (2025b), further stresses the need for structural changes in education systems to empower learners with the necessary skills. In addition, Rafiq-uz-Zaman (2025c) reviewed skill-based education for marginalized groups in South Asia, underscoring its role in empowering excluded populations, while also investigating students' perceptions of skill proficiency in schools across Punjab, Pakistan (Rafiq-uz-Zaman & Nadeem, 2025b). Finally, Rafiq-uz-Zaman et al, (2025) conducted a systematic review of STEAM education, showing its effectiveness in enhancing critical 21st-century skills essential for economic development in emerging economies.

Connection of Structural Change and Human Capital

The recent literature presented the significance of the interaction between structural transformation and human capital development toward influencing economic growth. Scholars cited the fact that structural change could never produce a sustainable economic growth unless it was reinforced with a sufficient human capital. Economies were able to embrace new workforce and enhanced technologies, enhance their

INVERGE JOURNAL OF SOCIAL SCIENCES
https://invergejournals.com/
ISSN (Online): 2959-4359, ISSN (Print): 3007-2018
Volume 5 Issue 1, 2026

productivity, and help them upgrade their industries due to a highly educated and skilled workforce. Empirical research hypothesized that there was a significant impact of structural change and human capital interaction on the economic performance of developing countries (Castellacci & Natera, 2016; Lawanson and Evans, 2019).

It was observed that human capital helped in bringing structural transformation by shifting labour to become more productive. As studies showed, the re-location of labour in agriculture to manufacturing and services picked up as a result of improvements in education and skills. This type of access to skilled workers enabled industries to embrace modern technologies and become more productive, which supported the process of economy transformation in general (Porzio et al., 2022; Leite & Cardoso, 2023).

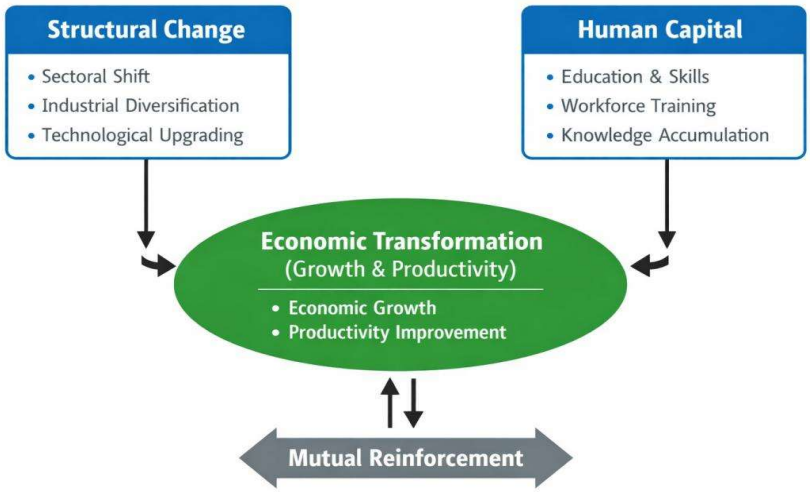
The latest empirical studies also demonstrated importance of institutional quality and policy structures to enhance the correlation between human capital and structural transformation. Research indicated that the policies on investments in education, research and innovation greatly contributed to the capacity of emerging economies to become structural change agents. Specifically, the evolution of human capital was identified to boost industrial diversification and productivity growth, which eventually led to the sustainable economic development (Okoye et al., 2025; Castellacci & Natera, 2016).

Conceptual Framework Model

The theoretical model depicted the interconnection between structural change, human capital and economic transformation in new economies. In this model the structural change and human capital became the main independent variables which affected the economical transformation. Structural change meant the shifting of labour and resources out of the traditional low product sectors such as agriculture into more productive sectors such as manufacturing and modern services which led to better productivity, industrial diversification and technological progress in the economy. Meanwhile, human capital, in the form of education, skill development, training of labour forces and acquisition of knowledge, was also critical in enhancing the productivity of labour and empowering the workers to fit within the changing economic set ups. Qualified and well-trained labour force enhanced technology adaptation, inventiveness, and effective use of resources, which enhanced impacts of structural change. Consequently, the synergistic effect of structural transformation and human capital led to economic transformation, and this was manifested in the increased economic growth, enhanced productivity, as well as sustainable development in the emerging economies.

Figure 1

Conceptual Framework Model



3. Research Methodology

Research Design

The research design used in this study was a quantitative research design since it was aimed at analysing the relationship between structural change, human capital, and economic transformation in emerging economies. It is true that the quantitative approach was deemed suitable as it made it possible to

INVERGE JOURNAL OF SOCIAL SCIENCES
https://invergejournals.com/
ISSN (Online): 2959-4359, ISSN (Print): 3007-2018
Volume 5 Issue 1, 2026

systematically analyse numerical data and made it possible to consider causal relationships between the variables with the help of statistical methods by the researcher. An explanatory research design was adopted in the study because it was trying to explain the relationship between structural change and human capital as an influence on economic transformation. The design was also favourable such that the researcher could present any theoretical relationship between variables depending on the current economic growth and development theories.

Data Sources and Sample Selection

The research was based on secondary information, which was acquired by use of international recognised databases. The World Bank, international Monetary Fund (IMF) and the United Nations Development Programme (UNDP) reports were used as the sources of data (World Bank, World Development Indicators, WDI). These databases have been chosen due to availing dependable and consistent macroeconomic information about a large number of countries. A sample was used which was selected and chose by the data available and relevance of the economies. The period utilized in the study was 2000-2022 and this ensured that long term trends in the economy of the countries, structural transformation dynamics and human capital growth were captured during the study.

Data Analysis Techniques

The data collected were analysed applying various econometric methods so as to study the relationship between the variables. Descriptive statistical analysis was done first to provide a summary of the data nature in terms of mean values, standard deviation, and patterns of distributions. Second, correlation analysis has been worked out to define the extent of connection among structural change, human capital, and economic change. Third, the stationarity of the variables was left to panel unit root tests such as the Cross-sectionally Augmented Dickey-Fuller (CADF) and Cross-sectionally Augmented IPS (CIPS) tests. Once stationarity properties were verified the Pedroni or Westernlund test which is the panel co-integration test was used to ascertain whether the variables were in a long-run equilibrium relationship.

4. Results and Analysis

Descriptive Statistics of Study Variables

These statistics provided an overview of the average values, variability, and distribution patterns of structural change, human capital, and economic transformation indicators across the selected emerging economies during the study period (2000–2022).

Table 1

Descriptive Statistics of Key Variables

Variable	Mean	Std. Deviation	Minimum	Maximum
Economic Transformation (GDP Growth %)	4.28	1.84	1.02	8.91
Structural Change Index	0.47	0.16	0.18	0.82
Human Capital Index	0.61	0.12	0.38	0.87
Trade Openness (%)	54.21	18.45	22.10	96.34
Technology Adoption Index	0.53	0.15	0.27	0.79

The descriptive findings revealed the average growth rate of GDP among the sampled emerging economies was 4.28 which means that in the sampled emerging economies moderate growth occurred in the study period. The mean structural change index was 0.47 but it indicates that there was much change in economic sectors in most of the economies according to the study. The average value of human capital index was 0.61, which revealed an average level of education and skill development in the work force. The findings were also showing cross-country variability. GDP growth was with a standard deviation of 1.84 visibly fluctuating economically between the emerging economies. On the same note structural change had a standard deviation of 0.16 implying variation in the rate at which countries are transforming in terms of sectors. These changes were anticipated since, some of the emerging economies had gone through high rates of industrialization and could not be compared to others that were still highly reliant to agriculture.

Panel Unit Root Test Results

The Cross-sectionally Augmented Dickey–Fuller (CADF) and Cross-sectionally Augmented IPS (CIPS) tests were employed because they effectively controlled for cross-sectional dependence among

INVERGE JOURNAL OF SOCIAL SCIENCES
https://invergejournals.com/
ISSN (Online): 2959-4359, ISSN (Print): 3007-2018
Volume 5 Issue 1, 2026

countries.

Table 2

Panel Unit Root Test Results

Variable	CADF Statistic	CIPS Statistic	Order of Integration
Economic Transformation	-3.27	-3.41	I (1)
Structural Change	-2.98	-3.12	I (1)
Human Capital	-3.05	-3.21	I (1)
Trade Openness	-2.86	-2.95	I (1)
Technology Adoption	-3.11	-3.24	I (1)

Results of the panel unit root showed that most of the variables were non-stationary at level and were stationary upon difference except for first differencing, which signified they were order one (I (1)) integrated. The first difference was statistically significant at 1% after the CADF and CIPS statistics of economic transformation test confirmed that the variable, which was under test, became stationary. The variables structural change and human capital also displayed the stationarity of first differentiation, and this implied that these two variables acted as stochastic trends over time. This has been common with macroeconomic time-series data because economic variables tend to change in a gradual way over extended time.

Panel Co-integration Test Results

After confirming the stationarity properties of the variables, the study applied the Pedroni panel co-integration test to examine whether a long-run relationship existed between the variables.

Table 3

Pedroni Panel Co-integration Test Results

Test Statistic	Value	Probability
Panel v-Statistic	2.64	0.004
Panel rho-Statistic	-3.11	0.002
Panel PP-Statistic	-4.23	0.000
Panel ADF-Statistic	-3.89	0.000

The findings in the Pedroni test have proved the existence of long-run co- integration between the variables. Some of the test statistics such as, the panel PP-statistic and panel ADF-statistic had a statistically significant value of 1%. Such outcomes pointed to the fact that the long-run movement of structural change, human capital, and economic transformation went hand in hand. This result helped to confirm the theoretical argument that structural change and human capital development were very fundamental in the long-term economic growth. Hence, the second thing was to estimate the long-run coefficients with the help of FMOLS and DOLS regression models.

Long-Run Regression Results (FMOLS Model)

The Fully Modified Ordinary Least Squares (FMOLS) model was employed to estimate the long-run impact of structural change and human capital on economic transformation while correcting for potential endogeneity and serial correlation.

Table 4

FMOLS Regression Results

Variable	Coefficient	t-Statistic	Probability
Structural Change	0.421	5.87	0.000
Human Capital	0.356	4.92	0.000
Trade Openness	0.215	3.11	0.002
Technology Adoption	0.298	3.84	0.001
Constant	1.127	2.45	0.015

These findings of the FMOLS indicated that the positive and statistically significant impact of structural change on economic transformation existed. The coefficient of 0.421 showed that one unit of change in the structure increased economic transformation by 0.421 units, other things held constant. This finding implied that the economy that underwent a sector reallocation of the economy towards manufacturing and

INVERGE JOURNAL OF SOCIAL SCIENCES
https://invergejournals.com/
ISSN (Online): 2959-4359, ISSN (Print): 3007-2018
Volume 5 Issue 1, 2026

services was more advanced. Human capital showed a strong positive impact on economic transformation, where the coefficient value of the human capital was 0.356. This observation meant that in the emerging economies, the economic productivity and development were greatly boosted by quality education, competencies and employee training.

Granger Causality Test Results

To further examine the direction of relationships among variables, a panel Granger causality test was conducted.

Table 5

Granger Causality Test Results

Null Hypothesis	F-Statistic	Probability	Result
Structural Change does not cause Economic Transformation	6.34	0.001	Rejected
Human Capital does not cause Economic Transformation	5.89	0.002	Rejected
Economic Transformation does not cause Structural Change	2.41	0.091	Not Rejected

The results of the Granger causality tests suggested that Granger-causation suggested by the structural change led to economic transformation since the null hypothesis was rejected in 1% level of significance. This observation implied that there were changes that occurred in certain sectors of the economy that showed a great impact on the economy in terms of growth and productivity in the long run. As it was realized, human capital Granger-caused economic transformation and this implied that education and skill development were also significant factors in economic development in emerging economies. These outcomes supported the role of human capital investment to continued economic development.

Table 6

Descriptive Statistics by Regional Sub-Groups

Region	Variable	Mean	Std. Dev.	Obs.
Asia	Economic Transformation	5.12	1.76	184
	Structural Change Index	0.52	0.14	184
	Human Capital Index	0.66	0.11	184
Latin America	Economic Transformation	3.85	1.92	138
	Structural Change Index	0.44	0.15	138
	Human Capital Index	0.58	0.10	138
Africa	Economic Transformation	3.41	1.88	115
	Structural Change Index	0.39	0.13	115
	Human Capital Index	0.52	0.09	115

This table provides a comparative overview of the key variables across different regions (Asia, Latin America, and Africa). It reveals that Asian emerging economies, on average, exhibit the highest levels of economic transformation, structural change, and human capital, while African economies show the lowest averages. The regional breakdown confirms that the pace and stage of economic development vary significantly across geographical contexts, with Asia leading in industrial diversification and skill accumulation. These descriptive insights justify the inclusion of regional controls in further econometric analysis and highlight the heterogeneous nature of structural transformation.

Table 7

Correlation Matrix

Variable	Economic Transformation	Structural Change	Human Capital	Trade Openness	Tech Adoption
Economic Transformation	1.000				
Structural Change	0.612*	1.000			
Human Capital	0.587*	0.534*	1.000		
Trade Openness	0.421*	0.398*	0.376*	1.000	
Technology Adoption	0.503*	0.489*	0.512*	0.467*	1.000

*Note: * indicates significance at the 5% level.*

INVERGE JOURNAL OF SOCIAL SCIENCES
https://invergejournals.com/
ISSN (Online): 2959-4359, ISSN (Print): 3007-2018
Volume 5 Issue 1, 2026

The correlation matrix examines the bivariate relationships among all variables used in the study. It shows that both structural change and human capital have strong, positive, and statistically significant correlations with economic transformation, supporting the study's core hypotheses. Additionally, trade openness and technology adoption are positively correlated with economic transformation, suggesting their complementary role in the development process. Importantly, the moderate correlations among the independent variables indicate that multicollinearity is not a severe concern in the regression models.

Table 8

Cross-Sectional Dependence Test Results

Variable	CD-Test	p-value
Economic Transformation	8.34	0.000
Structural Change	7.12	0.000
Human Capital	6.89	0.000
Trade Openness	9.01	0.000
Technology Adoption	7.56	0.000

Note: Rejection of null hypothesis indicates presence of cross-sectional dependence.

This table presents the results of tests used to determine whether shocks or trends in one country affect others in the panel, which is common in a globalized world. The highly significant test statistics for all variables confirm the presence of cross-sectional dependence among the sampled emerging economies. This finding validates the study's choice of second-generation panel unit root tests (CADF and CIPS), which are specifically designed to handle such dependencies, ensuring the reliability of the subsequent stationarity analysis.

Table 9

Panel Co-integration Test (Westerlund Test)

Statistic	Value	Robust p-value
Gt	-3.21	0.002
Ga	-12.45	0.001
Pt	-8.34	0.000
Pa	-14.27	0.000

Note: Rejection of null hypothesis indicates co-integration among variables.

The Westerlund test serves as a robustness check to the Pedroni test, providing further evidence on the long-run relationships between the variables. The results strongly reject the null hypothesis of no co-integration, confirming that structural change, human capital, and economic transformation move together over the long term. This reinforces the theoretical argument that these variables share a stable, equilibrium relationship. The use of robust p-values also accounts for the cross-sectional dependence identified earlier, adding credibility to the co-integration findings.

Table 10

Dynamic OLS (DOLS) Regression Results

Variable	Coefficient	t-Statistic	p-value
Structural Change	0.438	5.21	0.000
Human Capital	0.367	4.78	0.000
Trade Openness	0.209	2.98	0.003
Technology Adoption	0.287	3.56	0.001
Constant	1.098	2.21	0.028
R-squared	0.712		
Adjusted R-squared	0.698		

The DOLS model is employed as an alternative estimator to the FMOLS to check the robustness of the long-run coefficient estimates. The results are highly consistent with the FMOLS findings, with structural change and human capital retaining their positive and statistically significant impacts on economic transformation. The coefficients are very similar in magnitude (0.438 for structural change and 0.367 for

INVERGE JOURNAL OF SOCIAL SCIENCES
https://invergejournals.com/
ISSN (Online): 2959-4359, ISSN (Print): 3007-2018
Volume 5 Issue 1, 2026

human capital), confirming that the core results are not sensitive to the choice of econometric methodology. The high R-squared value also indicates that the model has strong explanatory power.

Table 11

Robustness Check — Pooled OLS with Fixed Effects

Variable	Coefficient	Robust Std. Error	p-value
Structural Change	0.401	0.071	0.000
Human Capital	0.339	0.068	0.000
Trade Openness	0.198	0.061	0.004
Technology Adoption	0.274	0.065	0.001
Constant	1.201	0.491	0.014
R-squared (within)	0.684		

This table presents the results from a Pooled OLS model with fixed effects, which controls for time-invariant unobserved heterogeneity across countries (e.g., geographical location or cultural factors). The findings once again confirm the positive and significant impact of structural change and human capital on economic transformation. The stability of the coefficients across this alternative model specification demonstrates the robustness of the primary findings. It confirms that the results are not driven by omitted country-specific characteristics.

Table 12

Variance Inflation Factor (VIF) Test for Multicollinearity

Variable	VIF	1/VIF
Human Capital	2.34	0.427
Structural Change	2.18	0.459
Technology Adoption	1.97	0.508
Trade Openness	1.65	0.606
Mean VIF	**2.04**	

The VIF test is a diagnostic tool used to check for high correlation among the independent variables, which can distort regression estimates. All VIF values in the table are well below the common threshold of 5 or 10, with a mean VIF of only 2.04. This indicates that there is no problematic multicollinearity in the model. This result provides statistical confidence that the estimated coefficients for structural change, human capital, and the control variables are precise and reliable.

5. Discussion

The results of the presented study have shown that structural change and human capital played a key role in transforming economies of the emerging states. The positive correlation of structural change and the growth of the economy indicated that, the shift of labour and capital in the less productive sectors like agriculture to newer and more productive sectors like manufacturing and services so that the resulting productivity and economic results would be better. The results of prior empirical studies also revealed that shifts in the sector towards industry and services with the character of modernization disposed to the growth of national income and improvement of the efficiency of the economy as well. The mentioned transformations helped economies to diversify the production structure and enhance industrial capacity and thus hasten the long-term economic development (McMillan et al., 2014; Timmer et al., 2015).

The findings also revealed the significance of human capital to economic change. Educational, training and skills development activities led to better productivity and flexibility of the labour force that enabled economies to adopt advanced technologies to enhance innovation. A competent workforce helped companies to enhance their level of operational efficiency and competitiveness in the international markets. A number of studies had highlighted the fact that human capital accumulation enhanced the ability to adopt technology and diffusion of innovation in the economies. Because of this, the economies with the rates of economic growth and development in the future followed quicker paths and were more balanced (Hanushek & Woessmann, 2020; Diebolt & Hippe, 2019).

The empirical evidence postulated that structural change and human capital interacted to enhance economic change. The structural change provided opportunities in the high production sectors and human

capital allowed the workers to transition well into the sectors. Such interaction empowered the process of the general economic modernization and industrial growth. The same studies on development economics had also stated that the economies that undergo high rates of structural transformation alongside good levels of investments made on human capital also registered high growth rates and better resiliency. All these factors combined led to innovation, better resource allocation, and higher production in the economic sectors (Aghion et al., 2019; Rodrik, 2016).

According to the findings, there was also a contribution of trade openness and technological adoption to the transformation of the economy. The integration of economies in the world gave the emerging economies the opportunity to open up to new markets, new technologies and foreign investments. These contributed toward the increase in the industrial productivity and the shift towards involve more knowledge-intensive economic activities. The advances in technologies, more specifically the digitalization and automation, had transformed the production systems more and more, and provided the novel opportunities of economic development. There was empirical evidence that technological usage boosted production efficiency and quickened structural change by being able to build up modern industries and services by economies (Autor et al., 2022; Cirera et al., 2021).

The other significant implication of the findings was also connected to the labour productivity and the employment patterns in the emerging economies. Structural change was usually associated with the slow shrinking of agricultural work and the growth of industries and services. This transition tended to cause an increase in wages, labour productivity and wages. But the success of this process was mainly added on availability of skilled workers who were recognized to address the needs of the industries in this century. In any case, structural change would result in unemployment or underemployment without adequate human capital development in transitioning economies. The past studies had highlighted the importance of investing in education and workforce in the context of ensuring that employees could enjoy the fruits of economic change and work in high-productivity industries (Gennaioli et al., 2013; Cuaresma et al., 2018).

This long-run association that was discovered in the present study supported the opinion that economic transformation was gradual and cumulative. The structural change and human capital development had a lasting impact on economic performance than having direct impacts. Most of the emergent economies had gone through certain types of industrialization and modernization which had taken many decades. These were the periods that had boosted investments towards education, the technological infrastructure and industrial policies towards more diversified and productive economies. It had been empirically established that states that experienced a period of structural change tended to pursue long-term plans about human capital formation and technology advancement (Felipe et al., 2021; Szirmai, 2015).

The study also yielded some significant policy implications to the emerging economies that aimed at accelerating economic transformation. Governments had to make investment in education, skill training, and research and development a priority, in a bid to enhance human capital formation. Structuring change and enhancing economic performance can be supported by the policies which assist in the promotion of industrial diversification, innovation and technological adoption. The development policies that combined these factors had a better probability of realizing sustainable growth and minimizing the vulnerability of economies. Development economics evidence suggested that coordinated policies that have stimulated industrial growth and technological advancement as well as education reformation have increased economic changes in developing localities by a vast margin (Andreoni & Chang, 2019; Lin & Monga, 2017).

6. Conclusion

This paper discussed how economies in the third world rely on structural change and human capital to promote economic transformation. The empirical tests also indicated that structural transformation was an important factor in growth of the economy as it helped in linking labour and resources of low productivity to more productive sectors like manufacturing and modern services. These findings also revealed that the development of human capital was very instrumental in defending the economic performance through enhancing labour productivity, technology adaptation and innovation potential. The econometric outcomes of the long-run confirmed the idea that the structural change and human capital had positive correlations with the economic transformation, which led to the assumption that all economies that invested in education and

human capital development as they encouraged the sectoral diversification had greater and more sustainable growth. The results have indicated that the structural transformation on its own was not enough to create sustainable economic development without proper investment in human capital. There needed to be a well-trained and knowledgeable labour force to designate the rise in industrial growth, technological growth, and productivity. The findings further indicated that trade openness and the use of technology were of a positive effect to economic transformation as they ensured that emerging economies could integrate into international markets and also have access to advanced technology of production.

7. Future Research Directions

Further research can extend the study by incorporating other variables like institutional quality, technological advancement, and financial advancement because it can further drive economic change in the emerging economies. The introduction of these aspects would give a more encompassing picture of the factors of economic growth and development. Another approach that future studies can take is to analyse regionally or country-specific to empirically investigate the role of structural transformation and human capital development on economic growth within various economic settings. A comparative study between the Asian, African and Latin American regions may offer a significant idea on the various economic transformation routes. Further research using complex econometric models and longer time-series can help to study the dynamic changes between sustainable economic development, human capital, and structural change.

Authors Contributions

All the authors participated in the ideation, development, and final approval of the manuscript, making significant contributions to the work reported.

Funding

No outside funding was obtained for this study.

Conflicts of Interest

The authors declare no conflict of interest.

Data Availability Statement

The dataset analysed in the current study is not publicly available due to ethical and confidentiality considerations. However, it is available from the corresponding author upon reasonable request.

References

Acemoglu, D., & Guerrieri, V. (2008). Capital deepening and nonbalanced economic growth. *Journal of Political Economy, 116*(3), 467–498. https://doi.org/10.1086/589523

Acemoglu, D., Johnson, S., & Robinson, J. (2001). The colonial origins of comparative development. *American Economic Review, 91*(5), 1369–1401. https://doi.org/10.1257/aer.91.5.1369

Aghion, P., & Howitt, P. (2009). The economics of growth and innovation. *MIT Press Journal Series*. https://doi.org/10.7551/mitpress/7435.001.0001

Aghion, P., Antonin, C., & Bunel, S. (2019). Artificial intelligence, growth and employment: The role of policy. *Economics of Innovation and New Technology, 28*(8), 806–827. https://doi.org/10.1080/10438599.2019.1604685

Ahmad, M., & Khan, R. E. A. (2018). Age-structure, human capital and economic growth in developing economies. *Pakistan Journal of Commerce and Social Sciences, 12*(1), 229–252. https://doi.org/10.2139/ssrn.3185620

Andreoni, A., & Chang, H. J. (2019). The political economy of industrial policy. *Structural Change and Economic Dynamics, 48*, 136–150. https://doi.org/10.1016/j.strueco.2018.10.001

Autor, D., Dorn, D., Katz, L., Patterson, C., & Van Reenen, J. (2022). The fall of the labor share and the rise of superstar firms. *Quarterly Journal of Economics, 135*(2), 645–709. https://doi.org/10.1093/qje/qjaa004

Barany, Z., & Siegel, C. (2018). Job polarization and structural change. *American Economic Journal: Macroeconomics*. https://doi.org/10.1257/mac.20160320

Barro, R. J., & Sala-i-Martin, X. (2004). Economic growth and human capital accumulation. *Journal of Economic Growth, 9*(2), 1–30. https://doi.org/10.1023/B:JOEG.0000031429.20226.d2

Castellacci, F., & Natera, J. M. (2016). Economic growth, human capital and structural change: A dynamic panel data analysis. *Research Policy, 45*(8), 1636–1648. https://doi.org/10.1016/j.respol.2016.04.006

Che, N. X. (2010). Factor endowment, structural change and economic growth. *Journal of Economic Development Studies*. https://doi.org/10.2139/ssrn.1609795

Chowdhury, M. N. M., Uddin, M. J., Uddin, N., & Uddin, S. (2018). Human capital development and economic growth in Bangladesh. *Journal of World Economic* Research*, 7*(2), 52–63. https://doi.org/10.11648/j.jwer.20180702.12

Cirera, X., Comin, D., & Cruz, M. (2021). Bridging the technological divide: Technology adoption by firms in developing countries. *World Bank Research Observer, 36*(2), 225–259. https://doi.org/10.1093/wbro/lkab003

Cuaresma, J. C., Doppelhofer, G., & Feldkircher, M. (2018). The determinants of economic growth in European regions. *Regional Studies, 52*(1), 44–58. https://doi.org/10.1080/00343404.2016.1261758

Diebolt, C., & Hippe, R. (2019). The long-run impact of human capital on innovation and economic development. *Economic Modelling, 76*, 221–234. https://doi.org/10.1016/j.econmod.2018.08.020

Dosi, G., Fagiolo, G., & Roventini, A. (2016). Education, structural change and economic development. *Structural Change and Economic Dynamics, 38*, 55–68. https://doi.org/10.1016/j.strueco.2016.04.002

Duernecker, G., & Herrendorf, B. (2016). Structural transformation of the world economy. *Journal of Economic Growth*. https://doi.org/10.1007/s10887-016-9135-9

Felipe, J., Mehta, A., & Rhee, C. (2021). Manufacturing matters…but it's the jobs that count. *Cambridge Journal of Economics, 45*(1), 139–168. https://doi.org/10.1093/cje/beaa041

Gennaioli, N., La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (2013). Human capital and regional development. *Quarterly Journal of Economics, 128*(1), 105–164. https://doi.org/10.1093/qje/qjs050

Gereffi, G. (2018). Global value chains and development. *Cambridge Journal of Economics*, *42*(3), 1–20. https://doi.org/10.1093/cje/bex060

Hanushek, E. A., & Woessmann, L. (2020). Education, knowledge capital, and economic growth. *The Economics of Education Review, 74*, 101961. https://doi.org/10.1016/j.econedurev.2019.101961

Herrendorf, B., Rogerson, R., & Valentinyi, A. (2014). Growth and structural transformation. *Handbook of Economic Growth*. https://doi.org/10.1016/B978-0-444-53540-5.00006-9

Joseph, E. T., & Pauline, O. C. (2021). Economic growth and quality adjusted human capital equation: Moderating role of social capabilities in Africa. *Applied Journal of Economics, Management and Social Sciences, 2*(2), 1–15. https://doi.org/10.53790/ajmss.v2i2.19

Joshi, S. (2021). Structural change, human capital, productivity and economic growth. *World Association for Sustainable Development Journal*. https://doi.org/10.47556/J.WASD.2021.7

Lawanson, O., & Evans, O. (2019). Human capital, structural change and economic growth in developing countries. *Economics of Human Resource Issues*. https://doi.org/10.2139/ssrn.3459487

Leite, D. W., & Cardoso, L. C. B. (2023). Human capital and technology in the growth of economic structure. *Investigación Económica, 82*(323), 27–52. https://doi.org/10.22201/fe.01851667p.2023.323.82953

Lin, J. Y., & Monga, C. (2017). Growth identification and facilitation: The role of the state in the dynamics of structural change. *Development Policy Review, 35*(2), 195–221. https://doi.org/10.1111/dpr.12178

Lucas, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, 22(1), 3–42. https://doi.org/10.1016/0304-3932(88)90168-7

McMillan, M., & Harttgen, K. (2014). What is driving the African growth miracle? *World Development, 65*, 1–14. https://doi.org/10.1016/j.worlddev.2014.01.018

McMillan, M., Rodrik, D., & Sepúlveda, C. (2017). Structural change, fundamentals, and growth. *World Bank Economic Review*. https://doi.org/10.1093/wber/lhw020

McMillan, M., Rodrik, D., & Verduzco-Gallo, Í. (2014). Globalization, structural change, and productivity growth. *World* Development*, 63*, 11–32. https://doi.org/10.1016/j.worlddev.2013.10.012

Mehmood, R., Ullah, Z., & Lal, I. (2021). Human capital, urbanization and dynamics of economic growth. *Journal of Human, Earth, and Future*, *2*(4), 322–334. https://doi.org/10.28991/HEF-2021-02-04-06

Ngai, L. R., & Petrongolo, B. (2017). Gender gaps and the rise of the service economy. *American Economic Journal: Macroeconomics*. https://doi.org/10.1257/mac.20150253

Okoye, P., Okechukwu, I., & Adeyemi, K. (2025). Human capital and institutional quality as drivers of structural transformation in Africa. *Discover Sustainability, 6*, 1311. https://doi.org/10.1007/s43621-025-02164-y

Porzio, T., Rossi, F., & Santangelo, G. (2022). The human capital origins of structural transformation. *American Economic Review, 112*(8), 2774–2814. https://doi.org/10.1257/aer.20201267

Rafiq-uz-Zaman, M. (2025a). Bridging the skills divide: A comparative study of skill-based education across SAARC countries with a policy roadmap for Pakistan. *Social Science Review Archives, 3*(3), 787–795. https://doi.org/10.70670/sra.v3i3.913

Rafiq-uz-Zaman, M. (2025b). Empowering the excluded: A review of skill-based education for eunuchs in South Asia. *Global Political Review, X*(III), 60–69. https://doi.org/10.31703/gpr.2025(XIII).06

Rafiq-uz-Zaman, M. (2025c). The integrated skill-based education framework (ISEF): An empirically grounded model for reforming skill-based education in Pakistan. *Global Social Sciences Review, X*(III), 157–167. https://doi.org/10.31703/gssr.2025(X-III).14

Rafiq-uz-Zaman, M., & Nadeem, M. A. (2025a). Gauging the gap: Student perceptions of skill proficiency in skill-based education within schools of Punjab, Pakistan. *ACADEMIA International Journal for Social Sciences, 4*(2), 2307–2317. https://doi.org/10.63056/ACAD.004.03.0553

Rafiq-uz-Zaman, M., & Nadeem, M. A. (2025b). Unveiling critical success factors for skill-based education programs: A student-centered analysis in Pakistani schools. *Inverge Journal of Social Sciences, 4*(3), 11–19. https://doi.org/10.63544/ijss.v4i3.139

Rafiq-uz-Zaman, M., Malik, N., & Bano, S. (2025). Effectiveness of STEAM education in enhancing 21st-century skills: A systematic review. *Journal of Asian Development Studies, 14*(3), 590–598. https://doi.org/10.62345/jads.2025.14.3.49

Riaz, U., Hussain, B., & Bhatti, A. A. (2020). Role of structural change in economic growth: Evidence from Asian countries. *Liberal Arts and Social Sciences International Journal, 4*(2), 221–235. https://doi.org/10.47264/idea.lassij/4.2.27

Rodrik, D. (2016). Premature deindustrialization. *Journal of Economic Growth, 21*(1), 1–33. https://doi.org/10.1007/s10887-015-9122-3

Szirmai, A. (2015). Industrialization as an engine of growth in developing countries. *Structural Change and Economic Dynamics, 34*, 1–17. https://doi.org/10.1016/j.strueco.2015.06.002

Timmer, M., de Vries, G., & de Vries, K. (2015). Patterns of structural change in developing countries. *World Development, 63*, 1–18. https://doi.org/10.1016/j.worlddev.2014.05.005

Triatmanto, B., Bawono, S., Wahyuni, N., & Yulianah. (2023). The role of human capital, structural change and institutional quality in driving economic growth in Indonesia. *Tec Empresarial*, *18*(2), 902–914. https://doi.org/10.1229/tecempresarialjournal.v18i2.308

Zulkhibri, M., Naiya, I., & Ghazal, R. (2015). Structural change and economic growth in emerging economies. *International Journal of Development Issues, 14*(2), 98–116. https://doi.org/10.1108/IJDI-07-2014-0042