

The Impact of Human Capital on Economic Growth in Saudia Arabia

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ABSTRACT

This study examines the impact of human capital development on economic growth in Saudi Arabia over period 1990- 2022. Specifically, it investigates the relationship between human capital and economic growth. employing the Johnsen test and error correction model (ECM). The findings of the study show that human capital development indicators had positive but insignificant impact on economic growth in Saudi Arabia. Further, evidence from the results indicated that labor and physical capital have contributed largely to economic growth in Saudi Arabia. However, their impacts were largely statistically significant which indicates the importance of these two variables in increasing the economic growth. The result also, revealed that there exists a long-run relationship among the economic growth and regressors in the model and the explanatory variables are highly correlated with economic growth in the model. On this basis of the findings, this study recommends there is need for government to invest more in human capital development process and similarly, government should endeavor to pay attention to the issue of school enrolment.

Keywords: Human capital, economic growth, Saudi Arabia, VECM.

1- Introduction

There was a general consensus among leaders and policy planners in the Arab world and international agencies' economic and management consultants regarding the importance of human capital resources in the development process. This was due to the shortage of a skilled domestic workforce "national skill deficit" which presented a major challenge to the modernizing Arab states and led to their dependence on foreign experts and labor. For example, the number of foreign workers reached 11.6 million in 2016, compared with 10.2 million in 2015(Abougaba,2016)

According to the Stanford University International Index of Artificial Intelligence 2023, Saudi Arabia ranked second in the world in awareness of artificial intelligence technologies after China in terms of Saudi citizens' positivity and optimism toward AI products and services provided in the Kingdom.

Governments incrementally allocate resources for education and technical and vocational training for public sector employees. For example, between 2010 and 2020, the HCI value for Saudi Arabia increased from 0.55 to 0.58 and spends 5.1 percent (2008) of its GDP in government education (Human Capital Project - October 2020)

Education is central to the Kingdom's development agenda as nowhere else in the world. Today, over 90% of Saudi students are educated in public schools and enrollment rates at the secondary and tertiary levels is strongly improved. In addition, the number of women in tertiary education now outweighs the number of men. In 2007, the King Abdullah Project for the Development of Public Education was announced as part of a new education strategy covering four areas: improvement to the public education environment, teacher training, curriculum development, and extracurricular activities. Saudi Arabia is investing heavily in education and training programs to furnish investors with a workforce capable of world leadership in a knowledge-based economy of country total workforce. This leads to a significant recent success in its education strategy. An increase in school funding, coupled with school building and teacher recruitment programs, has led to an increase in literacy rates from 33% in 1970 to 91% today. Also, the establishment of King Abdullah University of Science and Technology (KAUST), a research institution with capacity for 13,000 students, will help ensure that Saudi Arabia can train and retain the next generation of scientists and engineers. Moreover, many public organizations arrange for their employees to go abroad for training and other skill-knowledge exchange activities with universities and governmental agencies in the U.S. and Europe.

Human capital development will play a major role in Saudi Vision 2030. The Saudi labor force will reach about 8.6 million by 2030 with a 44 percent participation rate.

One of the major challenges of Saudi Arabia is an acute shortage of Saudi workers. However, the country has been making intense efforts to address human capital development challenges to match the needs of the labor market. This gradual transition from an oil-based to a knowledge-based economy calls for a radical increase in the country's human capital in a short space of time. (Al-Ghalayini,2018).

To diversify its economy, lessen its reliance on oil, and accomplish the lofty objectives set forth in Saudi Vision 2030, Saudi Arabia has made investment in human resources a primary priority.

The development of human capital is a significant economic growth factor. Higher productivity, innovation, and competitiveness are benefits of education and skill, and these factors improve a country's economic performance. Saudi Arabia wants to create a knowledge-based economy that can flourish in the international market by investing in human resources. (Alfaisal Center for Research & Consultancy Studies, 2023)

A highly skilled workforce fosters an atmosphere that is conducive to employment creation. Saudi Arabia wants to give its people the information and skills they need to participate in a variety of industries, including technology, healthcare, finance, and entrepreneurship, by developing human capital. In turn, this will support economic empowerment and assist in addressing unemployment issues.

Furthermore, education and its impact on economic growth was one of the issues that have attracted the attention of both researchers and policy makers over the recent years. The focus on human capital as a driver of economic growth for developing countries has led to undue attention on school attainment. Developing countries have made considerable progress in closing the gap with developed countries in terms of school attainment.

Many economic researchers have affirmed that there is a positive relationship between education and economic growth. Research on this topic which has been carried out over the years has not really achieved its objective. The effect of human capital development on economic growth holds a lot of benefits to our overall economic progress. The government and its agencies will find this work resourceful in forming policies, directives, and regulations for human capital development in order to aid economic growth. This study should also be helpful in examining the issue of human capabilities, which has dominated the debate among economists in recent times. It will also be of benefit to policy makers because it will draw attention to the need for improvement in human capital development in Saudi Arabia. There is also a need for the Saudi Arabia economy to eliminate or minimize the constraints in human capital development, so as to enhance economic growth

Although there have been extensive empirical studies focusing on modeling and analyzing the impact of human capital on economic growth in developed economies, little attention has been paid to Saudi Arabia. To the best of our knowledge, empirical research on the topic is fragmented as there is few works that attempt to investigate this issue for Saudi Arabia economy. Thus, one of the contributions of this study is to provide empirical evidence on the topic for the Saudi Arabia economy. The study also offers a methodological contribution by investigating the impact of humans on economic growth in this area. The study attempts to shed some light on the impact of human capital on economic growth that occurred in Saudi Arabia in the wake of the adjustment and reforms of the vision 2030.

The main aim of the study is to examine the impact of human capital on the economic growth of Saudi Arabia, during the period of 1990 to 2022.

The rest of this study is organized into four parts; part two covers the research methodology and data. The review of the literature on the subject, theoretical and empirical Studies on the impacts of human capital on economic growth presents on part three. Part four majors in results and discussions. Part five then is about the conclusion and policy recommendation and limitation of the study.

2- Methodology and data description

2. 1- Model Specification

The model used in this study is based on a Cobb-Douglas production function model. The choice of this type of production function follows the international literature on neoclassical growth models (Abbas, 2008; Adawo, 2011; Uwatt, 2002). We will consider the following production function:

$$Y_{it} = A_{it} K_{it}^{\alpha} L_{it}^{\beta} H_{it}^{\gamma} e_{it} \quad (1)$$

Where Y is the Real Gross Domestic Product, K is the physical capital, L is labor force, H is the human capital and e is the error term. Taking the log, the relation for growth can be expressed as:

$$\log Y_{it} = \log A_{it} + \alpha \log K_{it} + \beta \log L_{it} + \gamma \log H_{it} + \epsilon_{it} \quad (2)$$

$$\log Y_{it} = a_{it} + \alpha \log K_{it} + \beta \log L_{it} + \gamma \log H_{it} + \epsilon_{it} \quad (3)$$

This specification implies that the econometric estimations do not impose any restrictions on the value of the parameters (the elasticity's product-factor) in trying to get the answer to our problem from the data. Thus, we do not impose the existence of constant returns to scale as a condition for the estimation of the model. This form of estimation, on the one hand, allows us to eliminate the restrictions imposed in the returns to scale for the set of inputs considered and, on the other hand, it allows us to determine the sign of each one of the parameters of the function. Although the economic theory imposes positive values for each one of the elasticity product-factors, the empirical analysis can disclose a distinct result specific to the economy being analyzed as a fact that will be tested.

The Study uses the Johansen cointegration test and error correction model technique on a Cobb-Douglas production function model to determine the impact of human capital on economic growth in Saudi Arabia. The advantages of this approach are 1)

the error correction model have proven to be useful for explaining long run macroeconomic relationship, 2) the literature on cointegration provides a theoretical rationale for the empirical success of error correction model (example (Engle and Granger,1987). To complete the estimation process, diagnostic tests will be conducted to assess the reliability and efficiency of the estimates.

2.2. Data and Definitions

The series used in the study were all obtained from World Development Indicators (WDI) for the period of 1990 to 2022 (33 years) based on data availability and other different sources. Where real GDP in constant US \$ 2015 was used to proxy economic growth, primary, secondary and tertiary school enrolments were used as two proxies for human capital, labor force was used to proxy labor, and gross of capital formation was used to proxy physical capital.

3-Review of the Literature

A nation's human capital endowment the skills and capacities that reside in people and that are put to productive use can be a more important determinant of its long-term economic success than virtually any other resource. This resource must be invested in and leveraged efficiently in order for it to generate returns, for the individuals involved as well as an economy as a whole. Additionally, despite high unemployment in many countries, the global economy is entering an era of talent scarcity that, if left unaddressed, will hinder economic growth worldwide. Understanding and addressing challenges related to human capital is thus fundamental to short term stability as well as the long-term growth, prosperity and competitiveness of nations.

3.1Theoretical and Empirical Studies on the impacts of human capital on economic growth

In recent years, empirical studies on economic growth and its relation to human capital became a relevant topic in economics and they have had an important role in the formulation and application of development policies.

Yadav and Mohapatra (2023) conducted study entitled "Examining the linkages between human capital and economic growth in India." The main aim of this study was to explore the role of multi-dimensional human capital on the economic growth of the Indian economy. The study used the methodology given by World Bank, (2018) in calculating the human capital index (HCI). The results indicate that quality education, expected year of schooling, and infant mortality rate play a significant role in the improvement of HCI which further impacts the productivity rate of the upcoming generation and the inclusive growth of the country. The results show that policymakers should focus on quality education and health to improve the productivity of future generation workers for sustainable and inclusive growth.

Almutairi (2023) examined the impact on the economic growth of human capital from 1990 to 2019 in Saudia. Using an autoregressive distributed lag (ARDL) model and three educational human capital measures, the empirical findings indicate that both the gross tertiary education enrolment ratio and scholarships, are negatively and significantly connected with economic growth. However, average years of schooling have a negative but insignificant relationship with growth.

Saha & Pinki Das (2023) tested the dynamic relationships among human capital, physical capital, and economic growth using annual time series data from 1997 to 2019. The findings from the ARDL Bound test indicate that there exists a long-run relationship among the four variables. The empirical findings of VECM exhibit no causal (Granger) relationship that runs from health, education, and gross capital formation to gross domestic product, implying that health, education, and gross capital formation have no effects on gross domestic product during the period of study. The empirical findings from VECM also reveal a unidirectional causality running from GDP, education, and gross capital formation to health, and the study further found a unidirectional causal relationship running from gross domestic product to education and gross capital formation.

Sultana, et.al (2022) conducted study entitled ' Exploring the linkage between human capital and economic growth in 141 developing and developed countries" Using a panel of 141 countries (93 developing and 48 developed), the study attempts to explore and compare the impact of human capital on economic growth at different development stages. The findings revealed that all aspects of human capital positively influence growth in developing countries, especially life expectancy gain, which may be explained by the demographic transition these countries are going through.

Mengesha & Singh(2022) examined the long-run effects of human capital accumulation on the economic growth of a developing economy using evidence from Ethiopia. The study employed the human capital theory of economic growth and the augmented Solow-Swan model as a theoretical framework, and the ARDL bounds co-integration and error correction mechanism for parameter estimation. Time-series data, covering the period 1980/81 to 2019/20, the findings showed that the secondary and tertiary educational attainments of the labour force and life expectancy at birth have a significant positive effect on economic growth of Ethiopia, whereas primary education attainment and adult mortality rate have an insignificant negative effect. On the other hand, physical capital accumulation has positively contributed the country's economic growth, but trade openness and external debt adversely affect it.

Ali, et.al (2022) analyzed the impact of trade openness, human capital, and institutional performance on economic growth in OIC countries. The long-run estimates indicated that trade openness, human capital, and public expenditure have a positive and significant association with economic growth for higher-income and overall OIC countries. However, trade openness has a negative, and human capital has an insignificant correlation with economic growth in lower-income OIC countries.

Badwan (2022) conducted study, aimed to measure the impact of investment in human capital on economic growth in a group of Arab countries during the period (2001 to 2021) using static panel models. The study found a set of results, the most important of which is the absence of the impact of the enrollment rate in primary and secondary education on the per capita share of GDP. The study also found the presence of a significant and negative impact of the enrollment rate in higher education on the per capita share of GDP and in addition to a positive morale effect on spending on employment and education, life expectancy on per capita GDP.

Khatoun & Haya (2021). analysed the association between human capital and economic growth, used GDP as a dependent variable. This study further used Human development index as independent variable. Proxy of human development index consist of education index, health, fertility, infant mortality, life expectancy and sanitation. Time series data for the years 1990-2019 were used. ARDL model was used by incorporating the human capital formation with other explanatory variables. The findings shows that the human capital has positive and significant impact on growth and the negative influence on the population and infant mortality rate.

Qamruzzaman, et.al (2020) investigated the interaction between financial innovation, human capital development and economic growth in Bangladesh, India, Pakistan, Sri Lanka, Nepal, and Bhutan for the period of 1981Q1–2016Q4 by applying Autoregressive Distributed Lag (ARDL) and Granger-causality under error correction model (ECM). The finding confirms long-run association among financial innovation, human capital development, and economic growth of selected South Asian countries. Also, found both long-run and short-run elasticities from financial innovation and human capital development to economic growth is positive for each country.

Chikalipah & Makina (2019) examined the two-way relationship between economic growth and human development in Zambia over the period 1970 to 2015. By applying the cointegration and vector error correction model techniques, the findings demonstrate, that economic growth and human development are cointegrated. Second, there is no evidence of two-way causal effect observable between economic growth and human development in the short run. Also, found that economic growth has long-run effect on human development, with no evidence of reverse causality.

Sydney ,Godwin (2018) estimated the two-way causality between economic growth and human development in Nigeria over the period from 1961 to 2015. The findings suggest the economic growth and human development share a long run relationship, that is, they are cointegrated.

Abla A. H. Bokhari (2017) examined the relationship between investment in human capital and economic growth in the Kingdom of Saudi Arabia for the period 1970-2014. Granger Causality approach has been employed, followed by error correction model. Any long-run or short-run causality was not observed between expenditure on education and economic growth (per capita gross domestic product). Investment in human capital, with the right policy assessments and rehabilitation, can be translated into an essential element of growth in the Saudi economy.

Briefly, according to the previous empirical studies reviewed in the present study showed that the impact of investment in human capital on economic growth is still arguable. While some might have declared that it has the significant effect, others fail to prove this. In view of these caveats and the ongoing debate on the role of human capital development in economic growth, the result of the present study should not be viewed as conclusive empirical evidence, rather as an additional motivation for further research in this area.

It is worth mentioning that human capital was seen as fundamental determinant in the short and long- term quest for development.

4- Results and Discussion

4.1- Summary of Descriptive Statistics

The summary of descriptive statistics of Y, H, L and K are reported in table 4.1 the descriptive statistics give the characteristics of the variables. As observed from the table, the mean, median, standard deviation, skewness as well as the kurtosis and Jarque-Bera measures of our variables of interest are given. The Y, H, L and K for example have mean values of 4.90E+11, 233.8442, 9798905 and 24.10000 respectively. The standard deviations of Y, H, L and K are 1.51E+11, 56.75712, 3652765 and 8.072445 respectively.

Furthermore, the Jarque-Bera1 statistics show that Y, H, L and K are normally distributed and free from heteroscedasticity problem.

Table 4:1 Summary of Descriptive Statistics

	Y	H	L	K
Mean	4.90E+11	233.8442	9798905.	24.10000
Median	4.59E+11	219.3819	8989951.	25.70000
Maximum	7.70E+11	313.6125	15995144	39.10000
Minimum	2.84E+11	164.7176	5000971.	12.60000
Std. Dev.	1.51E+11	56.75712	3652765.	8.072445
Skewness	0.388908	0.207593	0.339362	0.239183
Kurtosis	1.631769	1.331662	1.704074	1.803807
Jarque-Bera	3.405949	4.064131	2.942622	2.282103
Probability	0.182141	0.131065	0.229624	0.319483
Sum	1.62E+13	7716.858	3.23E+08	795.3000
Sum Sq. Dev.	7.27E+23	103083.9	4.27E+14	2085.260
Observations	33	33	33	33

Note: the denotation Y= economic growth H= human capital L= labor K= physical capital

Source: Prepared and compiled by the author based on the outputs of EViews

4:2 Correlation

Table 4:2: Matrix of correlations between model variable

	Y	H	L	K
Y	1.000000	0.977327	0.988410	0.790222
H	0.977327	1.000000	0.982263	0.680319
L	0.988410	0.982263	1.000000	0.771633
K	0.790222	0.680319	0.771633	1.000000

Source: Prepared and compiled by the author based on the outputs of EViews

The matrix of correlations between the model variables represented in Table 4:2 shows that there is a very strong and highly correlation of economic growth with the human capital amounted to 0.977327, this result is inconsistent with Ali, et.al (2022) who found that human capital to be insignificant correlated with economic growth. And also, the results in table 4.2 revealed that economic growth has a very strong and high correlation with the labor amounted to 0.988410, while a strong direct correlation with the physical capital, which amounted to 0.790222.

4:3 Unit Root test

Time series with a unit root has been the subject of much recent attention in the econometrics literature. Because the unit root hypothesis of considerable interest in application not only with from financial and commodity market where it has a long history but with aggregate time series. The presence of unit root may render standard asymptotic distribution inapplicable. In order to avoid the problem of spurious correlation in the regression analysis, the time series properties of the variables used in the regression analysis in this study are investigated using the standard Augmented Dicky Fuller (ADF)

According to the results given in the table 4.3, all the variables have a unit root in their levels. This implies that the null hypothesis that is nonstationary or existence of unit root is failed to be rejected. After first differencing all the variables, which were non stationary have been transformed into stationary. Therefore, all variables are integrated at order one.

Table 4:3 Unit Root test

Variables	Variables At levels		Variables at first Differences	
	With	Without	With	Without
Y	-1.4452 (0.8273)	4.3328 (1.0000)	-4.4857 0.0062**	-1.1896 (0.2086)
H	-1.8960 (0.6325)	2.5648 0.9966)	-3.7651 0.0325***	-1.9990 0.0452**
L	-2.4577 (0.3450)	0.6751 (0.8559)	-5.5457 0.0005**	0.1357 0.7175
K	-2.6267 (0.2723)	0.1769 (0.7309)	-1.3831 0.8429	-2.4816 0.0149***

Note:1- all variables are non-stationary at the level.

2- Numbers in parentless are showing the p- values

3- all variables are stationary at the first difference at (**) and (***) indicate significance at 1% and 5% respectively.

Source: Prepared and compiled by the author based on the outputs of EViews

4.4- Co-integration Test

To test for a co-integrating relationship among variables we used Johnson co-integration test. The test results in the table 4.4 below reveal that the dependent variable is co-integrated with the independent variables. According to the results in Table 4.4, both trace test and max-Eigen value test yield one co integrating equation at the 0.05 level of significance. Therefore, the test indicates a rejection of the null hypothesis that says no co-integration. There are one co-integration relationships between/among the variables that show long run relationship between the variables. As conforms by Sydney and Godwin (2018).

Table 4:4 Johansen Cointegration test

tests		Eigenvalue	5% critical value	Prob.**	Trace Statistic	5%critical value	Prob.**
H0	Ha						
r=0	r=1	28.94861	27.58434	0.0332	53.77732	47.85613	0.0126
r<=1	r=2	18.39582	21.13162	0.1157	24.82870	29.79707	0.1676
r<=2	r=3	5.160027	14.26460	0.7215	6.432881	15.49471	0.6443
r<=3	r=4	1.272854	3.841466	0.2592	1.272854	3.841466	0.2592

Notes: r indicates number of cointegration vector

Source: Prepared and compiled by the author based on the outputs of EViews

4: 5 Long run Estimates

The VECM estimated results based on the baseline co-integrated model indicated that ECT found to be significant, insuring the existence of a long-run equilibrium between variables.

Table 4.5 presents the result on effect of human capital on economic growth in the long-run.

The results as reported in table 4.5 show the coefficient of labor is positive and significant at 0.05 in the long run. This indicates that the labor matters and plays an important role in economic growth in Saudi Arabia. That is an increase in labor should encourage economic growth. This is quite consistent with the theoretical expectation and, also, it is in line with findings by (Ochonogor, et.al 2013) who reported a positive relationship between the economic growth and labor.

The findings of the study as represented in table 4.5 shows coefficient of the physical capital is found to be significant and strong effect on economic growth and also has a positive signed at 1percent level of significance in the long run, implying that a rise in the physical capital causes economic growth to rise. This result confirms the theoretical argument that a rise in physical capital will rise the economic growth. The results are in accordance with investment multiplier theory which explains that there is positive relationship between investment and economic growth which reflects the fact physical capital react favorably to economic growth. Moreover, the result confirms that capital along with labor force play an important role in the growth process of developing countries. Our results are in line with the studies of Awad and Yussof (2013), Adow, (2011), Hussin et al. (2012) Abla& Bokhari (2017) and Mengesha & Singh(2022)

From the results on Table 4.4 the effect of human capital on economic growth was positive but insignificant at any conventional level of significance in long-run. The result generally revealed that county human capital did not add significantly to economic growth in Saudi Arabi counties during the period under review. This can be justified by different reasons :mis-specification of the models, measurement errors in education data, the selected proxies for human capital or might be due, for example, to the imperfection in policies adopted by the country's policy makers to transform the growth into improving the average skills of the people, others suggested that, human capital attracts physical capital, some degrees of complementarily between the two factors, and this may reflect, human capital affects growth through channels other than the ones usually allowed for, within a growth-accounting framework.(Atif and Yossuf(2013).This results is inconsistent with studies of Intisar, A., et.al (2022) and Sultana ,et.al (2022) Yadav, and Mohapatra, (2023)who found significant and positive relationship between human capital and economic growth.

This result is consistent with several studies (Kweka and Morrissey, 2000; Cardenas, 2007; Adawo, 2011; Husnain et al. (2011); Gebrehiwot (2015), Kartal et al. (2017) and Gebreegziabher (2018) in that it found human capital to be insignificant and has positive relationship in the long run. In contrast, Adawo (2011) and Almutairi (2023) who found the relationship is negative. Also, the above results conform the findings of Badwan (2022) who found economic growth in the Arab countries under study is negatively and normally related to the rate of enrollment in higher education, which

contradicts the economic theory and reflects the deteriorating state of the higher education situation in Arab countries. A possible explanation for insignificant result is the low level of county spending in capital expenditure (infrastructure on education), probably because effects from education sector would have very long lags, cost of education and inequity in access, market failure, under-enrollment, school drop-out, low education expenditure absorption rate and corruption (Adawo, 2011; OCOB, 2017)

Further, the insignificance of human capital on economic growth is consistent with conclusions of Benhabib and Spiegel (1994) and Pritchett (2001) who reported a negative and insignificant coefficient on the growth of human capital. Pritchett contended that these findings constitute a “micro-macro paradox”: although the microeconomic literature finds consistent evidence of substantial private returns to education in the form of higher wages. Macroeconomics studies are unable to come up with a proof that growth in education spurs income growth. He added three possible explanations that could account for his result: firstly, the newly created educational capital has gone into piracy, that is, privately remunerative but socially unproductive activities, this refers to rent-seeking and other distortions in the economy. Secondly, there has been a slow growth in the demand for educated labor, hence the supply of educational capital has outstripped demand and returns to schooling have declined rapidly. Thirdly the education system has failed, so a year of schooling provides few (or no) skills” (Pritchett 2001). This is compatible with a signaling model of wages in the spirit of Spence (1973).

Regardless of the reasons of insignificant contribution of the human capital to the final output or the economic growth, it is still possible to detect the significant contribution of a variable by other specifications or channels. In this regard, Benhabib and Spiegel (1994) and Papageorgiou (2001) argue that the structural specifications that allow human capital to operate as a facilitator to technological progress, is more successful in explaining the growth than the standard growth accounting specification. The results in table 4.5 shows adjusted R2 and p-values for the model showed that the overall goodness of fit of the model was satisfactory, The F-statistics measuring the joint significance of all regressors was significant at 1% for the model. Further, the regression model passed all the diagnostic tests.

Table 4.5: Estimated Long-run Model

Variables	Coefficients	Standard Error	t-Statistic	Probability
C	25.96681	0.071642	362.4502	0.0000
H	0.000745	0.000917	0.812014	0.4234
L	0.004578	0.002004	2.284492	0.0298
K	6.33E-08	1.21E-08	5.238352	0.0000
R-squared	0.982415	Mean dependent var	26.87140	
Adjusted R2	0.980596	S.D. dependent var	0.305279	
F-statistic	540.0557	Akaike info criterion	-3.36425	
Prob(Statistic)	0.0000	Schwarz criterion	-3.182863	
Log likelihood	59.51026	Hannan-Quinn criterion.	-3.303224	
S.E. of regression	0.042525	Durbin-Watson stat	1.312892	
Sum squared resid	0.052442			

Source: Prepared and compiled by the author based on the outputs of EViews

4.6 Short run Estimates

VECM was established to identify short-run relationship and ECT

In this section, we discuss the impact of different variables included in the model on economic growth using the short run results from the table 4.6 below.

If dependent and independent variables are I(1) but have a long-run relationship, there must be some force which brings the equilibrium error back towards zero. The error-correction model (Short run dynamic model) does exactly this (Borojo & Yushi (2015)). The coefficient of one-period lagged error-correction term (lagECM) measures the speed of adjustment to the co-integration relationship. It is negative as is expected to be negative, statistically significant, and has an absolute value smaller than one, indicating the gradual convergence of the system toward long run equilibrium values (Engle and Granger 1987). Based on the result, the magnitude of the error correction coefficient is -0.87 implying that within one year it adjusts about 87% of the disequilibria.

From the results in table 4.6, physical capital has found to be with non-significant impact on economic growth in short run.

However, the results of short-term dynamics reveal that human capital has positive statistically significant effect on economic growth in Saudi Arabia. It means that economic growth of Saudi Arabia can be increased with an increase in human capital investment. This result is consistent with Awad and Atif (2013) who found positive and significant of human capital on economic growth in short run. And also, it is inconsistent with the Abla & Bokhari, (2017) and Hassan and Kalim (2012) who found insignificant coefficient of expenditure in education (human capital) in the short-run.

Labor force has significant and negative effect on economic growth in short run. The sign of coefficient is inconsistent with expectation. In fact, labor is primary factor of production that contributes to economic growth. Various studies have confirmed the

view that labor is growth promoting see for example (Shahid (2014), and Ul Haque. et.al. (2019)

However, Khan &Sharif (2019) found that the labor force growth rate is positive and insignificant in low and middle developing countries. The finding from this study, similar to Awad and Atif (2013) findings, that labor force plays a negative but unimportant role on the total GDP. The meaningless role of the labor force might be justified via the definition of total labor force data utilized in the study. Thus, including unemployment and nonproductive agents (army forces) and at the same time exclude other productive agents (homemakers, etc) in the labor forces.

Table 4.6: Estimated Short run Model

Error Correction	D(LNY (-1))	D(LNH (-1))	D (LNIK (-1))	D(LNL (-1))
CointEq1	-0.866177 (0.15461) [-5.60216]	-0.153362 (0.13156) [-1.16575]	-0.798049 (0.79695) [-1.00138]	-0.115274 (0.12133) [-0.95005]
D(LNGDP(-1))	0.196113 (0.10760) [1.82264]	0.066652- (0.09155) 0.72803]-[0.429271 (0.55460) [0.77401]	0.090351 (0.08444) [1.07003]
D(LNH (-1))	0.449524 (0.23002) [1.95424]	0.391451 (0.19572) [2.00005]	-0.254512 (1.18564) [-0.21466]	--0.073574 (0.18051) [-0.40758]
D(K(-1))	0.081122- (0.05083) [-1.59598]	0.045043- (0.04325) [-1.04148]	0.049466- (0.26199) [0.18881-]	0.036604- (0.03989) [0.91768-]
D(LNL (-1))	-0.661681 (0.26668) [-2.48122]	0.110360 (0.22691) [0.48637]	0.470783 (1.37456) [0.34250]	0.285180 (0.20927) [1.36271]
C	0.037936 (0.01184) [3.20441]	0.010540 (0.01007) [1.04631]	-0.007512 (0.06102) [-0.12310]	0.024726 (0.00929) [2.66145]
R-squared	0.717701	0.263441	0.090882	0.160190
Adj. R-squared	0.661242	0.116129	-0.090942	-0.007772
Sum sq. resids	0.012164	0.008806	0.323175	0.007491
F-statistic	12.71174	1.788321	0.499835	0.953728
Log likelihood	77.58330	82.58985	26.74789	85.09743
Akaike AIC	-4.618277	-4.941281	-1.338573	-5.103060
Schwarz SC	-4.340732	-4.663735	-1.061028	-4.825514

Note: 1-Standard errors in () & t-statistics in []

2-t values, if it is more than 1.96 then the particular variable is significant

5- Conclusion, Policy Recommendation and Limitation of the study

5.1 Conclusion

The study investigates empirically the impact of human capital on economic growth in Saudi Arabia during 1990-2022. The basic macroeconomic variables of concern are derived from literature review – the real gross domestic product for economic growth, the total labor force as proxy for labor, following Saha & Pinki Das (2023) the gross fixed capital formulation as a proxy of physical capital as well as the primary, secondary and tertiary school enrollment which is used to proxy the human capital. Data for these variables is collected from the World Bank database and others sources. to avoid the problems of spurious correlation often associated with non-stationary time series to concurrently generate long-run equilibrium relationships the augmented Dickey-Fuller method used.

The Vector Error Correction is used to analyze the relationship among the selected variables employed. The results of the study reveal a strong and high correlation between the explanatory variables in the model. The results indicates that physical capital and labor force have a positive and significant effects on economic growth, implying that physical capital and labor should be considered a prominent factor in the short run that contributes to economic of Saudi economy.

Also, the results indicate the existence of long-run relationship among the variables. The insignificant influence of the human capital in the economic growth process might be due to several reasons among others, mis-specification of the models; measurement errors in education data, and the selected proxies for human capital. Based on the results of short run dynamic model, the magnitude of the error correction coefficient is -0. 866 implying that within one year it adjusts about 87% of the disequilibria. Furthermore, the labor force has significant ad negative impact on economic growth of Saudia Arabia in the short run.

5.2 -Policy Recommendations

Based on the results, it has been recommended that:

- 1- Develop policies that enhance budget allocation for human capital development and reduce country's brain drain by providing congenial work environment.
- 2- Government should invest in their human capital by improving their knowledge, skills and attitude leading to economic and societal benefits.
- 3- Introduce changes in the curriculum and structure of educational system of Saudia by focusing on practical implementation of theoretical aspects.

5.3 Limitation of the Study

The study faces some limitation. First, the analysis of the study employs annual data 1990-2022. The size of the sample has been limiting factor in this work, if the data is available in desire frequency and period (quarterly or even longer annual basis. More conclusive result could be obtained, Also the data are collected from different sources so the overall quality and reliability of the data was quite questionable. Results based

on such data may not be highly reliable and will be interpreted with caution. To address limitation of the study, it is therefore suggested that further research should be

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