Impact of Human Capital Development on Economic Growth. The Case of the Saudi Economy

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Keywords
human, capital, economic, growth, Saudi.

Abstract

The critical impact of human resource development on economic growth cannot be ignored. Human capital is the primary driver of economic development. This study attempts to investigate the relationship between human capital development indicators (education spending, health spending, and total fixed capital) and economic growth in Saudi Arabia by collecting data every year (1988-2018). The study implemented cointegration (ARDL) to estimate both long-term and short-term. Research shows that (total fixed capital, education spending, and health spending) have a statistically significant impact on short-run economic growth. The results show a long-term positive relationship between these two factors (total fixed capital and education spending) and economic growth. In the long run, there is an inverse and statistically significant relationship between health spending and economic growth. The study recommends that in order for the Saudi government to benefit from investing in human capital, it should invest heavily in human capital.

Introduction

The economic theories of human capital are as old as economics itself. Since the early writings of Adam Smith, who emphasized the importance of specialization and division of labor as the cause of the prosperity of nations, the human factor has played a central role in development. New economic growth models consider human capital as an important element of the development process and claim that it accounts for most of the successes achieved in many countries around the world (Lucas, 1988; Rebelo, 1991). Human capital is defined as a group of certain skills, abilities, and skills acquired by an individual that enables them to engage in productivity and skills (Claudia Goldin (2016). To move forward, it is not enough to improve machinery and trained labor, rather it must have a stock of attentive human skills capable of making the best use of resources and advancing the state (Blundell et al., 1999). Therefore, the relationship between improvement in human capital and economic growth deserves to be studied, since investment in human capital is one of the most crucial factors affecting the economic growth of an economy.

Furthermore, the formation of human capital does not depend on education but on health and social services that make up human capital. Thus, there is a relationship between human development and economic growth, as both are interdependent (Becker, 1964), since economic growth takes place through the improvement of human capacity and employment. achieving the desired growth is reflected in the process of human development. because it expands human resource capacity.

The main objective of this study is to examine the impact of human capital indicators, namely (total fixed capital, health expenditure, and education expenditure) on the economic growth of the Saudi Arabian economy over the period (1988-2018). In terms of the significance of the study, the expected results will provide up-to-date information and analysis on this topic. The results will be useful for future empirical research and studies. They are also needed to make the right decisions on issues related to the topic. To find analytical solutions to research questions, the following assumptions are appropriate:

H1: There is a positive relationship between education spending and economic growth.
H2: There is a significant and positive relationship between health spending and economic growth.
H3: There is a positive effect of total fixed capital on economic growth.

This study was structured as follows: Section 1 contains an introduction. Section 2 presents the theoretical part and literature review. Section 3 presents the data and research methods. The fourth

section highlights the results and discussion. The final section presents conclusions, recommendations, and policy implications.

Theoretical Framework and Literature Review

This section presents the theoretical part of both economic growth, and human capital. It also reviews the most recent literature on the topic.

Theories on economic growth

Adam Smith believes that the wealth and factors that increase the wealth of nations result from the accumulation of capital, and it is considered the cornerstone of Adam Smith's propositions in economic growth. Availability of a suitable and stimulating environment for growth, and that specialization and division of labor will work to increase the productive efficiency of the worker. There is a similarity of opinions between Smith and Ricardo regarding value and prices in their analysis of economic growth in several areas, such as the total output based on the factors of production, but he disagreed with Adam Smith regarding foreign trade that the land is fixed in areas of production, and he also disagreed with him that the basic component of growth is capital formation.

Malthus' contribution is linked to his theory of population, where he believes that population increases according to a geometric progression, while food increases according to an arithmetic progression. Therefore, the increase in population is not matched by an increase in resources, which constitutes an obstacle to growth, unless this is accompanied by an increase in the demand for labor in order to increase production, and therefore Malthus sees the importance of directing capital to the industrial sector as the only way to absorb the increase in population.

Joseph Schumpeter (1950) believes that development under the capitalist system takes place in the form of intermittent leaps and inconsistent impulses accompanied by periods of successive short-term recession and boom, due to the renewals and innovations made by the organizers that increase production and drive the growth process. According to Schumpeter, growth depends on two factors: the regulator and bank credit.

The Harrod-Domar model (1945) focused on studying economic growth rates and knowing the role of investment in achieving economic growth. The main conclusion of this model is that the growth of the domestic product is proportional to the share of investment spending in the domestic product. The essence of the development process lies in the percentage that is deducted from the domestic product and directed towards saving instead of consumption. If there is an increase in savings rates, the country will hope for increased growth in economic output.

Theories of Human Capital: Major Contribution

The neoclassical theory examines the importance of technological development in compensating for the negative effects of decreasing marginal productivity of the capital component, without which both the rates of output growth and population growth will equal, as the growth rate of per capita income becomes zero. The Solow model of 1956 is one of the most important models that analyzed the sources of growth. This model is based on expanding the Harrod-Domar model by introducing the labor component and adding a third independent variable, which is technical progress, to the economic growth equation. The Solow model (1956) is considered one of the most important models that analyzed the sources of growth, and most of the modern theories have been based on heavily on this model. These theories are based on common production functions:

$Y = f(L, K)$, (1) and its advanced form, called the Cobb-Douglas production function:

$Y = A. L\alpha . K\beta$, (2) where:

Y = real product (Gross Domestic Product),

L = quantity of consumed workload,

K = quantity of consumed capital,

A = the influence of other, immeasurable factors,

α, β labor and capital elasticity coefficient ($\alpha + \beta = 1$).

This production function was extended by R. Solow who proposed that technological progress is also an additional growth factor. He argued for a qualitative change in the development of growth theories (Solow (1957). The proposed production function is as follows:

$$Y = f(L, K, t), \quad (3)$$

where: t = technical changes as a function of time.

Additionally, the Spencer model (1958) is considered one of the prominent contributions to the theories of human capital, as Mincer used the concept of human capital in building a model aimed at explaining deviations in the distribution of revenues. Furthermore, (Schultz, 1961) is considered a famous proponent of human capital theory. His argument is that the quality of the population, especially investment in education, is a key factor for economic growth. Schultz's (1960) contribution to investment in human capital is considered a major contribution to the field of economics. Schultz pointed out the need to consider an individual's skills and knowledge as a form of capital in which to invest. From Schultz's point of view, this type of investment has achieved faster rates of growth in developed countries than material investment. Similarly, (Dennison, 1962, Becker (1964) supports the same argument that education is a broader source of growth than the growth of physical capital and technological innovation. Thus, those theories added that investment in human capital was the major long-term factor explaining modern economic growth and development. Therefore, to achieve and maintain a modern economy, continuous investment in human capital must occur alongside investments in other forms of capital and technology.

During the 1980s, Romer (1986) replaced Solow's hypothesis of external technological development with other factors, which Solow's approach neglected, what is known as Solow's residuals. Romer presented the accumulation of knowledge as an internal variable. According to him, economic growth in any economy is linked in the long run to the ability of this economy to acquire knowledge and accumulate knowledge. According to Romer, human capital must be allocated between research and innovation activities and between production activities, on the basis that the greater the proportion of human capital allocated to research and innovation activities, the more the economy can achieve a high growth rate in the long run. According to Romer's model, the output is determined from within the model and depends on the level of technological development, which depends on the stock of human capital allocated to research and development activities. This is why Romer's model is one of the most important approaches to self-growth.

On the other hand, endogenous growth theories can be divided into two basic groups. Proponents of the first group (P. Romer, and G. Grossman) argue that the most important factors of economic growth are innovation, research, and scientific development. According to the proponents of the second group (R. Lucas 1986, P. Romer, 1986), technical progress is tied to investment in human capital. The production function in the endogenous theories of economic growth takes the form:

$$Y = A \cdot K, \quad (4)$$

where:
Y = real product (output) economy,
A = coefficient reflecting the level of technique and technology,
K = capital – including physical and human capital.
This study adopts the ideas

Thus, the new modern theories of economic growth began to consider human capital as one of the main factors of economic growth. Theories were based on the assumption that the production function is affected not only by labor and capital but also by education, improved quality of labor and capital, and better infrastructure. This means that education growth and skills development act as a multiplier driving economic growth. These economic theories define physical and human capital. Physical capital includes machinery, equipment, and technology. In addition, human capital is the sum total of knowledge, skills, abilities, and experiences that are innate or acquired by individuals. For instance, (Romer, 1986; & Lucas, 1988, Barro, 1995, World Bank, 2002, Thomas, 2013) presented models of increasing returns in which there is a positive equilibrium growth rate resulting from the endogenous accumulation of knowledge.

For example, Lucas (1988) emphasized the importance of human capital in light of the insufficient accumulation of natural capital (Physical Investments) to achieve continuous growth. According to Lucas, investment in education and training leads to many gains on both levels: the individual, as it leads to an increase in worker and total productivity, as it works to drive the rate of economic growth in the long term. Lucas provided an explanation for the increase in the rate of growth disparity between developed and less

developed countries. According to Lucas, the marginal productivity of capital increases with the increase in the ratio of human capital to in-kind capital, due to the savings (externalities) that result from working in the presence of more efficient people.

Although the term human capital has been used in numerous economic and social writings over the past century, there is still no common and unified definition for it. Most of them consider human capital as a group of skills, abilities, and capabilities that an individual acquires, as well as his or her ability to participate in economic life and earn income, which can be enhanced through investments in education, health care, training, and other forms of human capital. Among the widely used definitions of human capital is the one adopted by UNICEF which considers the stock healthy, educated, efficient, and productive population, in a state, is as an effective factor in assessing its potential for economic growth and advancement in human capital (Ashraf, 2007, Benhabib, 1994, Black, 1996).

Literature Review

Over the past three decades, various empirical studies have been conducted to examine the relationship between growth and human capital indicators. This section presents the most recent studies conducted in the field of human capital.

Fajebe (2019) examined how human resource development affected economic growth in Nigeria during the period (1980 - 2017). The article used the technique (ARDL) to investigate the long-term relationship. The variables economic growth and secondary education enrollment had strong and statistically significant short-run effects. In the long-term analysis, secondary school enrollment rates and life expectancy were also important determinants of economic growth.

Furthermore, Tichaona (2016) examined the relationship between human capital and economic progress in Zimbabwe over the period (1980-2008). The study used the pairwise Granger Causality Model (VAR). The results confirmed a one-way causal relationship between school attendance and economic growth in Zimbabwe, leading from education to economic growth, as indicated by the Granger causality test, removing the functions of erroneous and impulsive reactions. The results also demonstrate a common process from education to economic growth to physical investment, demonstrating that improving human capital generates a return on investment.

Jude. (2015) examined the empirical confirmation of the relationship between human capital indicators, such as education, health, and economic growth in a selected number of African countries during the period (1996-2010). Using cross-sectional and dynamic data systems, research shows that spending on education and health is detrimental to economic growth, while human capital has a direct marginal impact. Furthermore, the analysis shows spending on education and health respectively.

Panagiotis (2014) investigated the relationship between academic achievement and economic progress to predict the expected impact of education spending at different levels on the economic development of Greece over the period (1960 - 2009). The results revealed a long-term relationship between education level and gross national income. Furthermore, two levels of education (high school and university) both had a positive and statistically significant impact on growth. On the other hand, education had no impact on economic progress.

UkaszLach (2010) examined the causal relationship between total fixed investment and GDP in Poland. The study used both bootstrap procedure and nonlinear causality test. Quarterly data was collected (Q1 2000 – Q4 2009). The results reflected a significant relationship between the short-run response to fixed assets and GDP as well as between fixed assets and employment. However, the long-term positive effect of fixed assets on economic progress was found in only a small sample.

Asteriou (2001) used cointegration regression to examine the long-run relationship between formal education and GDP in the Greek economy. The results illustrated that there was a significant relationship between enrollment rates at primary, secondary, and tertiary levels and GDP per capita. The main direction of causality crosses the variables of education and economic growth, but in the case of higher education, there was an opposite causality.

Graff (1995) explored the impact of human capital on economic growth in about 114 countries during the period (1965-1985). Overall, the results reflected that the accumulation of human capital, physical capital, and technological progress are all important determinants of economic growth. In a related study,

Graff (1996) examined the importance of higher education for a small group of developing countries. The results showed that this variable turns out to be an important factor for economic growth. So long as investment in higher education did not lead to imbalances elsewhere in education delivery, especially to the detriment of primary education levels.

Data and Methods

Data was obtained from secondary sources; mainly the annual reports of the Central Bank of Saudi Arabia (SAMA). The cointegration between the variables shows that the time series is stationary. When the unit root is tested for linear trends, the results show the order of the variables I(1), so the study has applied the autoregressive distributional lag (ARDL) according to the work of Pesaran, Shin & Smith (2001). The empirical model of the relationship between human capital and economic progress is functionally specified as follows (Solow, 1957):

GDP = f (GFC, EXEDU, EXHEA) ……...

……. (5)

Yt = βo + β1 X1t+ β2 X2t+ β3 X32t+ μt

…..... (6)

The specified variable above can be defined as:

Yt=real gross domestic product (for economic growth) as the dependent variable

Explanatory variables are:

X1t=fixed capital formation

X2t=Expenditure on education

X3t=Expenditure on health

μt = error term

It is expected that β1, β2, and β3> 0could have a positive relationship with economic growth Graff (1995, 1996), or the stationarity of the variables, the Augmented Dickey-Fuller (ADF) test is required to ensure that there is no unit root. To test whether there is a long-run relationship between the variables, the Autoregressive Distributed Lag (ARDL) model proposed by Pearsen et al. (2001) is used.

Steps to Apply the ARDL Model

The first step is the UECM cointegration test, using the following formula assuming the relationship between the independent variables (GDPtY) (EXEDUtX1, EXHEAStX2, and GFCtX3):

$$\Delta Y_t = a_0 + \sum_{i=1}^{m} \beta_i \Delta Y_{t-1} + \sum_{i=0}^{n} \theta_i \Delta X_{t-1} + \lambda_1 Y_{t-1} + \lambda_2 X_{t-1} + \eta_t$$

λ_1 and λ_2 both represent the coefficients of (long-run relationship. While β and θ reflect the coefficients of short-run relationships. Δ represents the first difference of variables while each degree is Finally, η is a random error term that has an arithmetic mean of zero, constant variance, and no serial correlation between them.

The second step verifies the existence of a long-term relationship between the variables using the bound test according to the procedure of Pesaran et al (2001) procedure based on the F-test.

The third step: determine the specifications of the ARDL model for short-term movements by building the following ECM model:

$$\Delta Y_t = c + \sum_{i=1}^{p} \vartheta_i \Delta Y_{t-i} + \sum_{i=0}^{q} \delta_i \Delta X_{t-i} + \psi ECT_{t-1} + \nu_t$$

where the error correction term and all the coefficients of the short-run equation are related to the short-run dynamics of the model's convergence to the steady state. ψ represents the error correction factor that measures the rate at which short-run imbalances are corrected in the direction of long-run equilibrium. It is assumed to be negative and significant as a condition for accepting short-run model estimates.

The maximum length of the slowest selected in the model (ARDL) for annual data using the (Akaike) criterion (AIC) and the lowest value for the criterion, the criterion used to determine the lag period optimal for model ARDL level relationships. Diagnostic tests such as serial correlation, heterogeneity, and

cumulative residual stability (CUSUM) were performed to test the autoregressive ARDL model.4 Analysis of Empirical Results

Unit Roots Tests

It is important initially to check the stationary of the variables, and then select the necessary procedure for the analysis. The Dickey-Fuller enhanced unit root test (ADF) was used to determine the order of integration of the underlying variables. The hypothesis that the variables Y, X1, X2 and X3 have a unit root cannot be rejected at the 5% significance level. Table 1 shows the results of the unit root test at the level and the first difference.

Table 1
Unit Root Tests using ADF

Variables	Levels	1st Difference
Y	0.242	3.748*
X1	1.487	4.184*
X2	4.3	4.07*
X3	0.0069	4.439*

Note: * represents significance at 5% level

Autoregressive Distributed Lag (ARDL) Bound Test Result

To confirm the results of the bound tests of cointegration for the long-term analysis, the coefficient of the lagged correction term must be significant and have a negative sign. The results of the ARDL bound test are presented in Table 2. They show that the value of the F-statistic is 4.627413 and exceeds both the upper and lower limits at critical values by 2.5%, 5%, and 10%. This shows a proven co-integration. So, the research can continue with the ARDL error correction model. The study will rely on the short-term analysis and the long-term analysis of ARDL to determine the dynamic relationship. The ECM of the ARDL model is effective in determining the long-run relationships between variables. Therefore, according to the relevant critical values presented in Table (2), there is strong evidence that there is a long-term relationship between human capital formation and economic growth in Saudi Arabia.

Table 2
ARDL bounds test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significant	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	4.627413	10%	2.37	3.2
K	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Source: Output using EViews 11.0 Software

Long-run ARDL Relationships

The results in Table 3 illustrate the estimation of the long-run dynamic relationship between (GFC, EXEDU, and EXHEA) on the economic growth of the Saudi economy. The ARDL results of the long-run relationship between the variables show that the estimated coefficients indicate that there is a long-run cointegration equation. This reflects the long-term relationship between the research variables. Table (3) shows a long-term negative relationship between health spending and economic growth, which is statistically significant at the 5% level. The results also show a positive long-run relationship between (total fixed capital expenditure) on education and economic growth, although this relationship is not statistically significant.

The estimated coefficients for education expenditure and total fixed capital formation suggest that a 1% increase in both variables would result in an increase in Saudi Arabia's economic growth of 13,59582%, and 0.918708%. Similarly, with all other explanatory variables, a one-unit increase in health spending would lead to a 19,85552% increase in economic growth in Saudi Arabia.

Table 3
Estimated long-run coefficients using the ARDL approach

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DX1	13.59582	7.530451	1.805445	0.1140
DX2	-19.85552	8.290388	-2.395005	0.0478
DX3	0.918708	1.370791	0.670203	0.5242
C	24556.07	10374.37	2.366995	0.0498
EC = DY - (13.5958*DX1 -19.8555*DX2 + 0.9187*X3 + 24556.0723)				

Source: Output using EViews 11.0 Software

Short-run ARDL Relationships

Table 4 contains the short-term analysis in (ECM). The results of the ECM_ARDL model (4,4,4,4) show that the ECM or ECt-1 recovery power is negative as expected and is significantly different from zero at the 5% statistical level. So, there is an error correction mechanism: the long-term imbalance between economic growth, total fixed capital, education spending, and health spending. This proves the cointegration relationship between the research variables. The estimated value of ECt-1 is -3.02, showing that the long-term equilibrium adjustment to cope with the imbalance caused by short-term shocks of the previous period is 30.2%.

The adjusted R-squared test is used to explain the total variation of the dependent variable that can be explained by the independent variable. The results show that the three independent variables of the equation explain 93.4% of the change of the dependent variable. This means that the specified model fits very well. Table 4 shows that EXDEA, EXHEA, and GFC contribute significantly to overall economic growth (three lags) in the short run.

Table 4
ARDL Error Correction Regression Short-run Dynamic Analysis

Dependent Variable: D(Y)				
Selected Model: ARDL(4, 4, 4, 4)				
Sample: 1988 2018				
Included observations: 27				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DY(-1))	1.277334	0.436984	2.923067	0.0222
D(DY(-2))	1.307642	0.364990	3.582676	0.0089
D(DY(-3))	-0.905385	0.379996	-2.382619	0.0487
D(DX1)	2.471122	2.362381	1.046030	0.3303
D(DX1(-1))	-40.59761	5.383186	-7.541559	0.0001
D(DX1(-2))	-30.95014	4.206427	-7.357821	0.0002
D(DX1(-3))	-10.01968	3.087553	-3.245185	0.0142
D(DX2)	-0.457992	4.532923	-0.101037	0.9224
D(DX2(-1))	44.22562	9.825146	4.501269	0.0028
D(DX2(-2))	30.61533	8.290903	3.692641	0.0077
D(DX2(-3))	19.01520	5.601855	3.394447	0.0115
D(X3)	5.971286	0.499778	11.94787	0.0000
D(X3(-1))	2.096886	0.779683	2.689409	0.0311
D(X3(-2))	4.171380	0.875766	4.763119	0.0021
D(X3(-3))	6.106020	0.882039	6.922618	0.0002
CointEq(-1)*	-3.018529	0.500604	-6.029780	0.0005
R-squared	0.972317	Sum squared resid		5.98E+10
Adjusted R-squared	0.934568	Log likelihood		-328.8121
S.E. of regression	73736.90	Durbin-Watson stat		2.345999

Source: Output using EViews 11.0 Software

Post Estimation Tests

Serial Correlation Test

Table 5 shows that the probability of the observed R-squared is greater than 0.05 and is reasonable. Therefore, the null hypothesis of no serially correlated residuals (i.e. autocorrelation) is not rejected).

Table 5
Serial Correlation Test

Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	0.252151	Prob. F (5,2)	0.9070
Obs*R-squared	10.43942	Prob. Chi-Square (5)	0.0637

Source: Output using EViews 11.0 Software

Heteroscedasticity Test

Table 6 shows that the probability of the observed R-R square (0.3782) is greater than 0.05 and is therefore acceptable. Therefore, the null hypothesis of the absence of homogeneity is not rejected.

Table 6
Heteroscedasticity Test

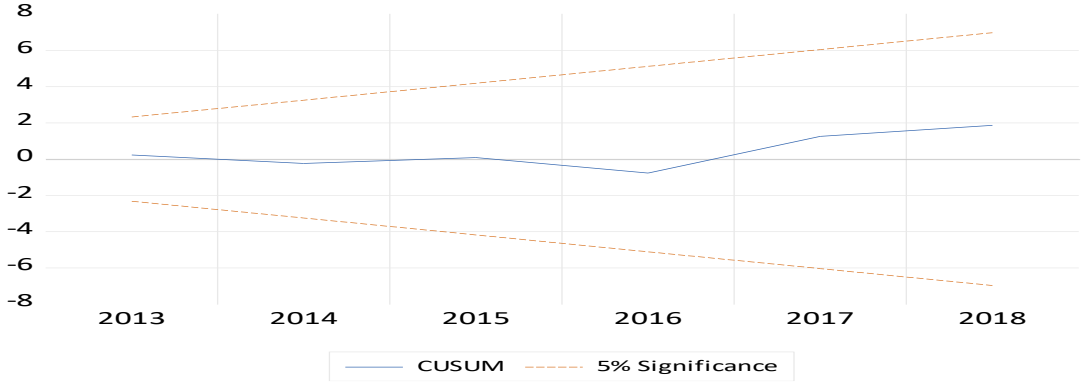
Null hypothesis: Homoscedasticity			
F-statistic	1.110787	Prob. F(19,7)	0.4738
Obs*R-squared	20.27521	Prob. Chi-Square(19)	0.3782

Source: Output using EViews 11.0 Software

Stability Tests

To test the stability of the long-run coefficients, short-term dynamics were performed. Therefore, the cumulative sum of the recursive residuals (CUSUM) was used to evaluate the stability of the estimates. The CUSUM histogram is within the 5% critical significance level, indicating that the specification of our regression model is stable and accurate, as shown in Figure 1. Diagnostic tests have confirmed validity. of the model. This means that the model can be trusted for research, for policy implications, and for decision-makers.

Figure 1
Stability Tests



Conclusion & Recommendations

The article studies the relationship between several indicators of human capital (total fixed capital, health spending, and education spending) with economic growth in Saudi Arabia during the period (1988 - 2018). He used these human resource development indicators and proved to be good indicators of economic growth. Economic growth, total fixed capital, and spending on education and health are expected to be statistically significant in the short run. On the other hand, the two explanatory variables (educational expenditure and total fixed capital) are not significant in the long run. On the other hand, health spending has a negative impact on economic growth in the long run. The effects are statistically significant. Total

expenditure on fixed capital and education remained at the projected level, unlike health expenditure. The main policy recommendation is that the public and private sectors in Saudi Arabia allocate more resources to human resources to ensure future economic growth. An enabling environment through macroeconomic stability and financial commitment is needed to encourage better human resource development. The document calls for further study and research in this area.

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