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Human Resources Development and Economic Growth in Saudi Arabia

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Abstract. Human capital investment is seen as crucial for economic development and growth. The acquisition of knowledge and skills benefits both the individual and the society as a whole. Development plans in Saudi Arabia recognized the importance of human resources development as a crucial goal in its overall planning strategy. This was reflected in the expenditure on education and human resources development. By using recent developments in econometrics, this study attempts to examine the government policies towards developing human resources. Relevant literature is also surveyed. The results show that these policies have positive impacts on economic growth and development during the period of the study.

Introduction

Human resources development is the process of increasing the knowledge, the skills, and the capacities of people in a society. It includes the accumulation of human capital and its effective impact on the development of the economy. Researchers have always emphasized the importance of human resource development on economic growth and development. Lucas [1, 2], Romer [3, 4], Fareed [5]), King and Rebelo [6, 7], Glomm and Ravikumar [8], Caballe and Santos [9], Lee *et al.* [10], Gemmell [11, 12], Otani [13], Otani and Villanueva 14], Tran-Nam *et al.* [15], Nauriyal and Srivastava [16], Zhang [17], Ziesemer [18], Asteriou and Agiomirgianakis [19], and Milas [20] all emphasize the long run impact of human resource development in general and human capital investment-better education, better training, and taking advantages of new technology and ideas- in particular and see it as crucial for economic development and growth.

Investment, which involves physical and human capital, is a crucial determinant of long run growth and performance of any economy and it has an important bearing on economic growth. Investment in human capital helps to accelerate economic growth by increasing labor productivity and thus encouraging greater physical investment. The acquisition of knowledge and skills benefits both the individual, through higher earnings and enhanced employment, and the society as a whole, through higher productivity and the ability to exploit new opportunities through the use of advanced technology. Moreover, expenditure on education and training may help people to bring out their abilities and talents which are very useful to the development process. Vaizey [21] suggests that attempts to treat education as an individual expenditure yielding an individual benefit are to some extent based on a misunderstanding of the classical position in economics. Further, Schultz [22-25], Denison [26] and Becker [27] criticize the classical theory for ignoring the impact of human capital on the productivity of labor and argue that investment in human capital, population quality and in knowledge in large part determine the future prospects of mankind.

Several authors have also stressed the social nature and scale effects associated with human capital, where the key result is that a higher ratio of human capital to physical capital and hence, a higher ratio of human capital to output raises the growth rate of the economy. Esterlin [28], Romer [3], Lucas [1], [29]), Azariades and Drazen [30], Stokey [31], Sorensen [32], Graca *et al.* [33], Tallman and Wang [34], Borland [35], Einaresson and Marquis [36], Stevens [37], Bedard [38], Gokcekus *et al.* [39], Gundlach [40] and Tamura [41]) consider human capital as the engine of growth and emphasize the channels of effect involving the positive impact of human capital on physical capital and in turn on the growth of output.

Given the shortage in labor and human resource in the early stages of development and the emphasis put on overcoming this obstacle as being crucial for successful development, which was apparent by the massive amount of expenditure spent on infrastructure development, including human and social resources by the government of Saudi Arabia during the last three decades, it is important to investigate the long run implications of the government policy in intervening in the economy in that regard. Thus the aim of the paper-using data covering the period 1965-1999- is to examine and investigate the impact of these government policies on economic growth and development in Saudi Arabia. Properties of the individual variables and the order of integration of the data are examined through using the augmented Dickey-Fuller (ADF) test, (Dickey and Fuller, [42, 43] and the Phillips Perron (PP) test, (Phillips,[44] and Phillips and Perron, [45]). Next, given the significant implications that co-integration model has for econometric analysis, it pays particular attention to the problem of obtaining adequate representations of the non-stationary data, therefore, the hypothesis of long run relationship between the variables is tested using multivariate co-integrating system by employing the methodology of cointegration analysis as suggested by Johansen [46, 47] and Johansen and Juselius [48] to investigate the long run relationship between the variables and to examine the long run impact of public investment in human and social resources on economic development and growth in Saudi Arabia. Then the paper test for the information content of the co-integrating relationship by examining the short run dynamics implied by the associated vector error correction model (VECM).

Development of the Educational System and the Nature of the Saudi Arabian Economy

Before the establishment of Saudi Arabia as a nation state in 1932, the country was predominantly backward in the economic sense. However, the unification of the country was the first step toward the building of modern Saudi Arabia, but the obstacle were great. Illiteracy, nomadism, shortage of natural resources and absence of economic institutions, foreign or domestic, were only a few of the obstacles to be reckoned with. Thus, the discovery of oil in 1938 in the eastern part of the country was a turning point for Saudi Arabia and its economy which transformed the country to a modern one.

The present economic system in Saudi Arabia is based on the principles of free economy where a substantial part of the production and distribution of goods and services is left to individuals and groups enjoying freedom in their dealings and transactions. Within the past 30 years, the Saudi Arabian economy has encountered a dramatic changes due to increases in oil prices and in turn revenues became available to the government. However, the economy became dependent and still depends on the production of oil as the main source of national income. Oil is a national wealth extracted and utilized by the government in the interest of the public. There is no private ownership of oil or oil concessions. Thus, revenues accruing from the sales of oil go to the national treasury to finance government expenditure. As El Mallakh [49] has indicated, it is mainly through these expenditures, among other channels, that oil affects economic growth and development in Saudi Arabia. This gives the government the ability to play a large role and a dominant influence on the performance of the economy. ElMallakh [49]; Al-Johany *et al.* [50] and Looney [51] all have evaluated the importance of the government policies to economic development in Saudi Arabia and concluded that these policies have played significant roles in the economy.

King and Rebelo [6, 127] supprt this view and indicate that government policies affect economic growth. They suggest that, " Changes in public policy can potentially explain periods of secular stagnation or high economic growth. Public policy is potentially powerful in affecting small open economies with freely mobile capital for these economies, taxes can easily shut down the growth process, leading to 'development traps' in which countries stagnate even regress for lengthy periods."

The modern education system in Saudi Arabia is fairly young. It started in late 1940's with opening elementary schools for boys only, to be followed by intermediate and secondary schools in early 1950's. Higher education did not start until 1957. Before 1961, there were very few private schools for girls, but the turning point came with the establishment of the Girls Educational Department and opening of public schools for girls. Vocational training centers and technical schools and institutions were also established in late 1960's.

The number of all students in 1960 was only 143000 with total expenditure on education of 148 million Saudi Riyals (SR). The number of students increased dramatically during the last 40 years. The number of students in elementary schools rose from 397 thousands in 1969 to more than 2 million in 1993. The number of students receiving middle and secondary education expanded from 77 thousands in 1969 to more than 1.032 million in 1993. The number of students receiving higher education grew from 7 thousands in 1969 to more than 153 thousands in 1993. Total enrollment of boys in general and higher education grew at an average annual rate of 6.7 per cent over the 1969-1993 period and the average growth rate for girls was 11.2 percent over the same period. Enrollments in vocational training centers rose from 578 students in 1970 to over 10,000 in 1995, with an average annual growth rate of 12.6 per cent, and enrollment at technical schools and institutes increased from 848 in 1970 to over 28,000 in 1995, or at an average annual growth rate of around 16 per cent.

Enrollment in all general educational institutions increased from around 600,000 in 1970 to about 3.3 million students in 1995, with an annual average rate of growth of 7.1 per cent. Total number of students at the higher educational institutions has risen from 8000 in 1970 to about 170,000 in 1995 with an average annual growth rate of 13.0 per cent.

The main objectives of the government to develop human resources are to reduce reliance on expatriate labor by national skills creation through the development of general and technical education and on the job training, thus insuring a constant supply of manpower , upgrading its quality and improving its efficiency to meet the requirements of the national economy. Thus, development plans define the concept 'human resources development' from a broad perspective to include manpower development, training programs, other factors affecting labor, education, and cultural development. Therefore, based on the fact that investment in human capital is the corner stone for future economic growth and social prosperity, the government has accorded its utmost care and attention to the development of the education sector. This is reflected in the expenditures on education through the state budget as more than 300 billion Saudi Riyal (SR) has been allocated for education and human and social resources development over the Sixth Plan period (1995-2000) or about 20 per cent of approved government budget over this period. This is a huge increase from about 10 billion allocated for education and human and social resources development in the First Plan (1970-1975).

Table. Financial allocation for Human (HR) and Health and Social (HSR) Resources Developments (in billion SR)

	First Plan (1970-1975)	Second Plan (1975-1980)	Third Plan (1980-1985)	Fourth Plan (1985-1990)	Fifth Plan (1990-1995)	Sixth Plan (1995-2000)
HR	7.0	80.0	129.9	135.0	164.6	216.6
HSR	3.5	27.6	61.2	61.9	68.0	87.5

Sources: *Development Plans* (1970-2000)

Sixth Development Plan(1995-2000, 265), emphasizes the fat that the development of human resources "is the basic pillar for realizing the objectives and aspiration of the development process. This is attributed to the fact that education and training raise the quality and productivity of the work force, as well as contributing to the cultural and personal development of the individual."

Sixth Development Plan (1995, 41) also points out to the fact that, the wealth of the country ultimately lies in the productive skills of its labor force thus, "Accordingly, the development plans have placed great importance on human resources development through continuous advances in primary, intermediate, secondary, and higher education, as well as in technical education and vocational training." Therefore, " the result has been great increase in the productive employment of Saudi Arabian citizens and a steady upgrading of the skill levels and occupational achievements of the Saudi Arabian labor force."

Human Resources Development and Economic Growth: An Overview

Theoretical and empirical studies of the causes of economic growth often ignore human capital as a factor of production. However, recent empirical work has made evident that both the stock of human capital and the investment in education play a determinant role in explaining the disparity across countries in macroeconomic variables, such as productivity, income per capita, or rate of growth. The importance of the stock of human capital as a productive input has been highlighted by the estimation of the neoclassical models. In the standard neoclassical growth model, a higher rate of population growth reduces the steady state value of capital per worker and thereby lowers the steady state value of per capita income. The decrease in per capita income, implies that the economy grows in the transition at a slower rate. The rate of population growth is exogenous in this model, and the effect on the steady state level of capital per worker involves the flow of new capital that has to be provided to accompany the flow of new workers. The point of departure from the neoclassical model, is the assumption that there are constant (rather than diminishing) returns to broad capital accumulation. Broad capital is variously interpreted as including human capital and/or research and development (R&D) expenditure, in addition to tangible investment. Under these conditions, policies to raise the investment rate can have a direct impact on the long run growth rate. In this respect, the basic idea of endogenous growth is that long run growth in income per capita depends on investment decisions rather than, as in the traditional growth theory, resulting from unexplained or exogenous improvement in technology.

Interest in the connection between human capital, particularly education, and economic growth is not new. Economists as: Schultz [22, 25]; Becker [27]; Vaizey [21], Weisbrod [52]; Nelson and Phelps [53]; Robinson [54]; Humphry [55]; and Razen [56] have long suspected that there is a link between national economic policies and long term rates of economic growth. Nelson and Phelps [53] show that education has important eternal benefits in the accumulation of technology and physical capital. A more educated populace is also much more likely to be innovative, which speeds the adoption of new technology. Thus Nelson and Phelps [53, 69] note that "education enhances one's ability to receive, decode, and understand information and that information processing and interpretation is important for performing or learning to perform many jobs."

Schultz [22] showed that education contributes directly to the growth of national income by improving the skills and productive capabilities of the labor force. Schultz [22], suggests that "Although it is obvious that people require useful skills and knowledge, it is not obvious that these skills and knowledge are a form of capital, that this capital is in substantial part a product of deliberate investment ...... The failure to treat human resources explicitly as a form of capital, as a produced means of production, as the product of investment, has fostered the retention of the classical notion of labor as a capacity to do manual work requiring little knowledge and skills, a capacity with which, according to this notion, laborers are endowed about equally. This notion of labor was wrong in the classical period and it is patently wrong now." Schultz [23, 47] notes that " Human investments ... include much more than formal education; they are the sum of all the acquired, useful capabilities of a people, whatever their sources. The health and vitality of a population are a part of it, on-the-job training also plays a large role; and the 'investment' that it takes to move and change jobs in a progressive economy belongs here in addition to formal education."

Moreover, Harbison [57] emphasised the importance of human resources development in accumulating the wealth of nations and stressed the fact that " Human resources-not capital, nor income, nor material resources-constitute the ultimate basis for the wealth of nations. Capital and natural resources are passive factors of production; human beings are the active agents who accumulate capital, exploit natural resources, build social, economic, and political organizations, and carry forward national development." Thus, "a country which is unable to develop the skills and knowledge of its people and utilize them effectively in the national economy will be unable to develop anything else." Further, Gianaries [58] concludes " there is no doubt that investment in human beings, that is, capital expenditure in education, training and health, is having a pervasive influence upon economic development." Thus, "education or investment in human resources increases the capacity for innovations, motivates occupational mobility and productivity, and facilitates family planning."

Psacharopoulos and Woodhall [59] argue that, " Education, like other forms of investment in human capital, can contribute to economic development and raise the incomes of the poor just as much as investment in physical capital, such as transport, communication, power, or irrigation." Psacharopoulos and Woodhall elaborate [59] by indicating that "Education represents both consumption and investment. On one hand, it is valued for its immediate benefits, but, on the other, it helps to create income in the future by providing educated workers with skills and knowledge that enable them to increase their productive capacities and thus receive higher earnings." That is "the distribution of education influences future income distribution, and thus that the equity implications of educational investment are extremely important."

There has been attempts to measure the contribution of education to economic growth which suggest that a significant share of the growth in national income in developing countries is due to the education of the labor force, and that the contribution is much greater in countries where the stock of human capital is relatively small. According to Psacharopoulos and Woodhall [59], "Not only do developing countries with the fastest rate of economic growth have higher rates of literacy than other countries at the same income, but this is more likely to be due to the effect of education on income than vice versa."

Most studies (Armistrong and Mcvicar, [60]; Barr, [61]; Bils and Klenow, [62]; Blackburn and Ravn, [63]; Jorgenson and Fraumeni, [64]; Krueger and Lindahl, [65]; Blackburn *et al.*, [66]; Booth, [67]; Broer and Jansen, [68]; Carillo and Zazzaro, [69]; Chaterterji, [70]; Mathur, [71]; Temple, [72]; Temple and Voth, [73]; Upadhyay, [74] and Razali, [75]) indicate that general education is at least as important to development objectives as specific skill training and is, in fact, a necessary complement to the latter. Psacharopoulos and Woodhall [59, p. 314] suggest that "The complementarity of general education and skill training is essentially related to the rapid changes being experienced by those who live in developing countries. In such a world a combination of general education and skill training is necessary to qualify persons to be able to adapt to change and to take part in it usefully."

There has also been evidence (Benhabib and Spegel, [76, 77]; Colcough, [78]; Eckstein and Zilcha, [79]; Michael, [80]; Fagerlind and Saha, [81]; Psacharopoulos, [82]; Schults, [83]; Gundlach, [84] and Hanson, [85]) of the importance of the links between educational investment and other types of investment in human capital, notably improvements in health and nutrition and reductions in fertility. Further, it has also been suggested that, not only does educational investment help to reduce child malnutrition and mortality, but it contributes to general improvements in life expectancy and in the long run helps to reduce fertility. According to Psacharopoulos and Woodhall [59, p. 320], in their analysis of recent studies "female education has more influence on fertility than male education. Thus, measurement of the benefits of educational investments should take into account not only the direct benefits of higher labor market earnings of educated workers, but also the indirect effects on women's non-labor market activities." Particularly important in this regard, however, "is the contribution of female education to improvements in the preschool abilities of children, which in turn may contribute significantly to educational efficiency."

Further, recently there is growing recognition in the theoretical and empirical literature that human and physical capital may be endogenous variables in output or growth equations. Thus, there are claims that causality between human and physical capital may work in the opposite direction in that the accumulation of physical capital significantly influences people's decision to invest in human capital. Caballe and Santos [9] argue that an increase in the stock of physical capital can have one of three effects on human capital accumulation. In the normal case, the stock of human capital increase and the economy moves to higher steady state with more of both types of capital. In the paradoxical case, the stock of human capital decreases and the economy falls back to lower steady state. If the two types of capital are unrelated, then human capital will be constant, and the economy will return to the initial steady state. The ambiguity of the effect stems from the fact that increases in physical capital motivate people to accumulate more human capital (since future human capital will be more productive), but they also provide incentives to spend more time at work (since the opportunity cost of labor has risen). Lucas [2], Greiner [86], Garca *et al.*, [33], Foster and Rosenzweig [87], Hansen and Knowles [88], Grier [89], Godo and Hayami [90] Freir-Seren [91], Monastiriotis [92] and Baharumshah *et al.* [93] show that increases in physical capital need to be matched by increases in human capital to maintain the same rate of economic growth. Garca *et al.,* [33] go further and argue that countries with high initial levels of physical capital have more reasons to invest in human capital.

Methodology

Recent models of economic growth, such as Romer [3, 4], Lucas [1, 2], Barro [94], Mankiw *et al* [95], Otani and Villanueva [14], Becker, Murphy, and Tamura [96], and King and Rebelo [6, 7], emphasize investment in human capital as an important factor contributing to growth. These models generate persistent growth endogenously from the actions of individuals in the economy. In Lucas [1, 2] the 'engine of growth' is investment in human capital, which accumulates according to a linear technology, similar to that of Uzawa [97]. In addition, Lucas allows for the possibility that human capital generates a positive externality in the production of final goods. King and Rebelo [7] have argued that the transitional dynamic implied by the standard neoclassical growth models are inconsistent with certain stylized facts about the long run properties of U.S. data. In particular, they argue that the declining growth rates associated with the asymptotic convergence to the steady states that are implied by the model, require counter factual or incredulous assumptions in order to fit the data. They interpret their findings as support for modeling growth and development as an endogenous process. However, Mankiw *et al.* [95]) used the neoclassical model which assumes that the level of technology is the same in each country in the world. The only change they make is to extend the usual two factor neoclassical model by allowing for human capital as well as physical capital. They use the fraction of the working-age population that attends secondary schools as a measure of the rate of investment in human capital that is analogous to the share of physical investment in total GDP. Moreover, Romer [3, 4, 98], in his theory of growth, followed Arrow (1962) treatment of knowledge spillover from capital investment, where Arrow assumes that each unit of capital investment not only increases the stock of physical capital but also increases the level of the technology for all firms in the economy through knowledge spillover. Thus, Romer [3, 98] suggested that investment may generate externalities because capital goods are the bearers of new knowledge, so that one firm's investment enables others to learn about new technology. In this case no one firm can capture all the benefits of its own investment, and the social rate of return exceeds the private rate. On the other hand, most endogenous growth models rely on R&D or human capital accumulation to provide the engine of growth.

Robinson [54, p. 404] moreover, suggests that " A major factor omitted in the regression models is the role of education. From time series studies, there is mixed evidence on the contribution of education to growth in the less developed economies." However, "On the whole, one would expect to find an average positive contribution of education (and other omitted factors) to growth and expect to find a significant constant term in the regression equation." In recent studies, human capital plays a special role including a number of endogenous growth models. Romer [3], Mankiw *et al.* [95], Barro [94], and others include different forms of human capital as a factor in the production function. Following Mankiw et al. who use a Cobb-Douglas production function, most models use growth rates. However, O'Neill [100] writes the production function in level forms rather than growth rates. He assumes that this kind of formulation allows breaking up the time variation in cross country income differences into three components: changes in the distribution of education, changes due to the value of education for given levels of education, and changes in the residual distribution. Based on these studies (Barro, [94]; Mankiw *et al.,* [95]; Fernandez and Mauro, [101] and Razali, [75], among others) different formulations of human capital have been used to examine the impact of human resources development on economic development and growth as the case of Saudi Arabia. Accordingly, the potential impact of human resources development on economic growth is possible, as suggested by Barth and Cordes (1980[102]), to be formulated and analyzed as follows:

$$\mathbf{Y=Af(L, K,H)}$$
$$f1,\ f2 > 0,\ f3 \geq 0,\ f11,\ f22 < 0,\ f12 \geq 0,\ f13 \geq 0,\ f23 \geq 0, \qquad (1)$$

Where Y is the level of real output, L denotes employment, K is the stock of physical capital and H is the stock of human capital, $f1$ is the marginal productivity of labor, $f2$ is the marginal productivity of physical capital, $f3$ is the marginal productivity of human capital, $f11$ is the change of the marginal productivity of labor, $f22$ is the change of the marginal productivity of physical capital, $f12$ is the change in marginal productivity of labor with respect to capital, $f13$ is the change in marginal productivity of labor with respect to human capital, and $f23$ is the change of marginal productivity of physical capital with respect to human capital. By treating human capital as a separate input in the production function, an increase in human capital investment, other things being equal, will have the following effects: (i) in the case where human capital stock is productive and complements physical capital and labor, an increase in human capital stock will increase output directly as any other factor of production ($f3>0$). It will indirectly increase labor , investment and output by raising the marginal productivities of labor and physical capital stock ($f13, f23>0$). (ii) In the case where human capital and physical capital stock are direct substitute, an increase in human capital investment, generates a positive direct effect, but a negative indirect effect that could more than offset the positive effect, that is when the following condition holds: [(ƒ3+ƒ13)+(ƒ23)-(ƒ12)]<0. (iii) In the case where human capital and physical capital and labor are independent, an increase in human capital investment will generate a direct positive effect on output, and the effect on labor and physical capital might be zero (ƒ13, ƒ23=0). Some studies use the following formulation for estimation purposes (see for example: Gemmell, [12]; Chatterji, [70]; Fukao and Otaki, [103]; Graca *et.al.* [33]; Gundlach, [40] and Kim and Kim, [104], among others).

$$dY/dY=dY/dL \,.\, dL/Y + dY/dK \,.\, dK/Y + dY/dHC \,.\, dHC/Y \qquad (2)$$

Where dY/dL, dY/dK are marginal productivities of the respective inputs (L, K) and dY/dHC measure the overall effects of human resources growth and development on economic growth and development. For estimation purposes, dY/dL= a1; dY/dK= a2; and dY/dHC= a3 are assumed to be constant. Adding a constant term a0 and a random disturbance term, e, to equation (2) the empirical estimation model becomes:

$$dYt/Y=a0 + a1\, dL/Y + a2\, dK/Y + a3\, dCH/Y + e \qquad (3)$$

Where: Y = non oil GDP (YT is total GDP and YP is private sector GDP), d =changes in variables;
dK=I,
I = investment (PI is private investment, GI is government investment, and TI=PI+GI, total investment)
L=labor force
dL/L = change in labor force to labor force.
HC =human capital (HRX is expenditure on human resources development and HSC is number of graduate students from high school)
e =error term

Tests of Stationarity and Cointegration in Time Series Data

Several studies have examined time series variables properties and concluded that most macroeconomic time series data follow random walks. While Nelson and Plosser (1982[105]) documented that 14 major macroeconomic variables exhibit non-stationary behavior over time, Hall (1978[106]) shows that the aggregate consumption follows a random walk process.

Time series studies, Granger [107], Granger and Newbold [108], Phillips [109], and Ohanian [110], have demonstrated that if time series variables are non-stationary all regression results with these series will differ from the conventional theory of regression with stationary series. That is, regression coefficients with non-stationary series will be spurious and misleading. Therefore, analysis of the time series properties of variables used in macroeconomic research is particularly important when examining the relationship between variables that exhibit a common trend (Granger, [107]; Engle and Granger, [111]; and Johansen, [47]. Thus, to avoid spurious relationships and misleading results and to provide valid evidence to the proper relationships among the variables, before proceeding to the cointegration analysis and the estimation of the long run relationship, the time series properties of the individual variables were examined by conducting stationarity or unit roots tests. A variable that is stationary in level form ia I(0). However, a time series containing a unit root follows a random walk and requires first differencing to obtain stationarity, and it is said to be first order integrated, I(1).

Researchers have developed several procedures to test for the order of integration. The most popular ones are augmented Dickey Fuller (ADF) test due to Dickey and Fuller [42, 43], and Phillips Perron (PP) due to Phillips [44] and Phillips and Perron [45] The ADF test relies on rejecting a null hypothesis of unit root (the series are non-stationary) in favor of the alternative hypothesis of stationarity:

$$\Delta Xt=\mu+(\alpha-1)Xt-1 +\sum_{t=1}^{n}\gamma t\Delta Xt-1+ut \tag{4}$$

Where, Xt is a random variable, Δ is first difference operator, ut is a stationary random error, t is time period and n is number of lags for the dependent variable which is chosen to ensure that the residuals are white-noise. The t-statistic of (α-1) is used to test the null hypothesis that this coefficient is equal to zero (i.e. that α =1). However, the critical values for the t-statistics do not have the familiar distribution. Thus, several authors have constructed appropriate critical values for the distribution of the t-statistics (Fuller, [112]; MacKinnon, [113]). To determine the proper lags for each variable, the Akaike's final prediction error criterion (FPE) is used, as suggested by Hsiao [114, 115].

A problem with the ADF test is that it involves the inclusion of extra differences terms in the testing equation, which results in a loss of degrees of freedom and reduction in the power of testing procedure. Alternatively, the Phillips Perron (PP) approach allows for the presence of unknown forms of autocorrelation and conditional heteroscedasticity in the error term. Perron (1988[116]) demonstrates that if a series is stationary about a linear trend but, no allowance for this is made in the construction of the unit root test, then the probability of a type II error will be high. Thus, the PP test corrects for serial correlation in equation (4) using a non- parametric procedure. This procedure modifies the statistics after estimation in order to take into account the effects that the autocorrelated errors will have on the results. Asymptotically, the statistic is corrected by the appropriate amount, and so the same limiting distribution applies. Perron [116]) suggests estimating the following regression by ordinary least squares (OLS):

$$Xt=\mu+\lambda(t-T/2)+\delta Xt-1+ut \tag{5}$$

While there are more than one method of conducting cointegration tests, the empirical testing in this paper uses the multivariate cointegration method developed by Johansen[46, 47] and Johansen and Jueslius [48]. This approach is preferred to the Engle-Granger [111] method for several reasons. Engle-Granger procedure depends upon the normalization of the variables and may be sensitive to the choice of dependent and independent variables in the cointegrating equation. Thus, it is possible that the arbitrary choice of one variable as the dependent variable and the other as independent variable may lead to the conclusion that the variables are cointegrated, whereas reversing the choice of dependent and independent variables may indicate no cointegration. Further, because the Engle-Granger procedure relies on a two step estimator, in which the first step is to generate the residuals from the cointegration regression and the second step is to use the residual generated from step one to test for unit roots, any errors introduced in the first step also affects the second step.

On the other hand, the Johansen-Jueslius approach provides a very flexible format for investigating the properties of the estimator under various assumptions about the underlying data generating process. Another advantage is that, unlike the Engle-Granger cointegration method, Johansen-Jueslius procedure is capable of determining the number of cointegration vectors in the relationship. In the case of more than two variables, Banerjee *et.al.* [117] and Cuthbertson *et al.* [118] have shown that the Johansen-Jueslius procedure is preferred, and Phillips [44] has also indicated that this procedure has optimal properties in terms of symmetry unbiasedness, and efficiency. Moreover, Gonzalo [119] compared the performance of the cointegration tests using a Monte Carlo study, and found that the Johansen-Jueslius procedure is the most powerful even for the bivariate system. He showed that it has consistent estimates, even if the errors are non Gausian and the dynamics are not known.

The Johansen-Jueslius method applies the maximum likelihood procedure to determine the presence of cointegrating vectors in non-stationary time series. Furthermore, this method provides two different tests, the trace test and the maximum eigenvalue test, to determine the number of cointegrating vectors. The presence of significant cointegrating vectors indicates a stable relationship between the relevant variables. Johansen [46] has shown that both tests will have non-standard distribution under the null hypothesis, even in large samples. While Johansen and Jueslius (1990) provided appropriate critical values, Osterwald-Lenum [120] developed and extended versions of these critical values.

The Johansen and Jueslius approach to testing for cointegration, considers a p-dimensional vector autoregression (VAR) model:

$$X = \Pi xt\text{-}1 + \ldots\ldots + \Pi kXt\text{-}k + \varepsilon t \qquad (6)$$

This autoregressive model may be written as a conventional error correction model as follows:

$$\Delta Xt + \mu + \Sigma \Gamma t \Delta Xt\text{-}1 + \Pi 1 Xt\text{-}k + \varepsilon t \quad (7)$$

Where: $\Gamma = -1+\Pi 1+ ...... +\Pi k$
$\Pi = 1 - \Pi 1 - ...... - \Pi k$

The Π matrix contains information about the long-run relationship between the variables. Let the rank of the Π matrix be denoted by r. When $0< r <p$, the Π matrix may be factored into $\alpha\beta'$, where α may be interpreted as a p x r matrix of error correction parameters and β as a p x r matrix of cointegrating vectors. The vectors of constants, μ, allow for the possibility of deterministic drift in the data series. Maximum likelihood for α, β and Γt are derived in Johansen (1988[46]). To test the hypothesis that there are at most r cointegrating vectors, one calculates the trace statistics (λtrace). The maximum eigenvalues test (λmax) is based on the null hypothesis that the number of cointegrating vectors is r against the alternative of r+1 cointegrating vectors. Johansen and Jueslius (1990[48]) provide critical values for λtrace and λmax.

Data and Empirical Results

This study uses annual data covering the period 1965-1999. All variables are in real log terms.

Conventional wisdom suggests that more observations are better, because more observations allow better discrimination among hypotheses. However, Hakkio and Rush [121] suggest that this conventional wisdom needs to be taken with care. In their view, cointegration is a long-run concept, and hence requires long span of data. Thus, there is little gain from increasing observations using higher frequency with the same time span, but there is a gain from using the same frequency data with a longer time span. Moreover, Shiller and Perron [122] argue forcibly that, particularly when analyzing the long run characteristics of economic time series, the length of the time series is far more important than the frequency of observations.

Although the real Gross National Product (GNP) is a good indicator of the overall level of economic development and activity in any economy, it could in fact be argued that, for Saudi Arabia, this variable dose not accurately reflect the level of economic activity within the economy. This is attributed to the country's reduced ability to influence the oil production level and the price of oil in the international market. With the extraction and export of oil being the dominant component of GDP and government revenue, the value of a large part of the economic activity within the country is determined outside its system and has very little control over it. Moreover, as Saudi Arabia is an oil-based economy, in which most economic activities are linked to oil, it is generally believed that this basic and important characteristic has a bearing on every aspect of economic activity. While, during the last two decades, the significance of oil in the economy has declined, it remains the dominant sector.

Thus, non-oil GDP (Y) represents income. Two different variables are used: (YT) is total non-oil GDP and (YP) which is non-oil private GDP. Investment includes three different variables: (TI) is total investment, (PI) is private investment and (GI) which is government investment. Human resources are represented by two variables: HRX is expenditure on human resources development; this variable is used to capture the effects of factors affecting human resources development as on the job training and training after graduation provided by the government; and HSC is number of students who graduated from high school. Data on GDP (YT, YP), Total Gross Domestic Investment (TI), Private Investment (PI), Government Investment (GI), Number of Students Graduated from High School (HSC), and Human Resource Expenditures (HRX) are obtained from the Ministry of Planning Facts and Figures' different issues. Data on population and labor force are obtained from the IMF-Financial Statistics, Ministry of Planning ' Statistical Yearbook ' and Development Plans (different issues).

Tables 1-5 show the empirical results of the statistical tests conducted to investigate the relationship between human resources development and economic growth in Saudi Arabia.

Table 1. Unit roots tests

Variables	ADF		PP	
	Levels	F-Difference	Levels	F-Difference
ln Y	-1.49	-1.596	-1.719	-5.369*
InL	0.356	-2.834***	0.610	-4.634
InTI	-1.647	-2.628***	-2.245	3.002**
InPI	-1.227	-3.546**	-2.613	-3.656*
InGI	-2.001	-3.730*	-2.482	-3.799*
InHRX	-1.64	-2.868***	-1.648	-4.090
InHSC	-1.864	-2.973**	-1.334	-5.028*

In all tables: *Significant at 1%, **Significant at 5%, and ***Significant at 10% levels.

Table 2:.Johansen-Jueslius cointegration test

Eigen values	λmax	λtrace	5%for λmax	5% for λtrace	Hypothesis
		lnYT = f(lnPI, LnGI, lnL, lnHRX)			
0.632	32.99	95.938	33.46	77.74	r=0*
0.544	25.568	62.950	27.97	54.64	r≤1*
0.412	17.519	37.082	20.97	34.55	r≤2**
0.272	10.49	19.563	14.07	18.17	r≤3**
0.241	9.07	9.073	3.74	3.74	r≤4*
		lnYP= f(lnPI, lnGI, lnL, lnHRX)			
0.666	36.22	88.712	33.46	77.74	r=0*
0.428	18.43	52.493	27.97	54.64	r ≤1***
0.390	16.33	34.068	20.97	34.55	r≤2**
0.247	9.37	17.744	14.07	18.17	r ≤3***
0.225	8.38	8.378	3.74	3.74	r≤4*

Table 2:. Contd.

Eigen values	λmax	λtrace	5%for λmax	5% for λtrace	Hypothesis
		LnYP=f(lNPl, lnGl, lnL, lnHRX)			
0.743	36.71	95.828	33.46	76.07	r=0*
0.536	20.71	59.122	27.97	53.12	r≤1**
0.471	17.21	38.416	20.97	34.91	r≤2**
0.362	12.15	21.211	14.07	19.96	r≤3**
0.285	9.06	9.06	9.24	9.24	r≤4**
		lnYP= f (lnPl, lnGl, lnL, lnHSC)			
0.682	30.90	98.360	33.46	76.07	r=0*
0.607	25.19	67.456	27.97	53.12	r≤1*
0.477	17.52	42.264	20.97	34.91	r≤2*
0.432	15.28	24.741	14.07	19.96	r≤3*
0.296	9.46	9.46	9.24	9.24	r≤4**

YT and YP are total and private non oil gross domestic product (GDP), respectively.

Table 3. Vector error correction (VEC) results

ΔlnYT=0.703ΔlnYTt-1+ 0.491lnΔYTt-2-0.753ΔlnLt-1-0.141ΔlnLt-2 +0.009ΔlnPlt-1-0.049 ΔPlt-2
(2.574)** (2.007)** (-2.028)** (-0.396) (0.1583) (-0.74)
+0.063lnΔGlt-1 -0.1066lnΔGlt-2 -0.0292lnΔHRXt-1 -0.0282lnΔlnHRXt-2-0.057ECt-1
(1.463) (-2.772)* (-0.7956) (-0.801) (-1.875)***
R=0.67, F=7.199*, Log Likelihood=71.382, AIC=-3.774, SC=-3.755.

ΔlnYP=0.022+0.348ΔlnYPt-1+0.0187ΔlnYPt-2+0.033ΔlnPlt-1+0.12ΔlnPlt-2+0.016ΔlnGlt-1+
(0.948) (1.194) (0.09) ((0.701) (1.809)*** (0.567)
0.013ΔlnGlt-2 +0.691ΔlnLt-1+0.332ΔlnLt-2+0.017ΔlnHRXt-1-0.042ΔlnHRXt-2-0.022ECt-1
(0.435) (1.600)*** (0.911) (0.602) (-1.428) (-2.58)**
R=0.227, F=7.893*, Log Likelhood=76.784, AIC=-3.986, SC=-3.391.

ΔlnYT=0.0590+0.276ΔlnYTt-1+0.277ΔlnYTt-2+0.150ΔlnTlt-1-0.236ΔlnTlt-2-0.609ΔLt-1
(2.141)** (0.824) (0.920) (1.437) (-2.084)** (-1.337)
+0.286ΔlnLt-2-0.0364ΔlnHSCt-1-0.0541ΔlnHSCt-2-0.456ECt-1
(0.652) (-0.511) (-0.706) (-2.491)**
R=0.682, F=6.947*, Log Likelihood=57.20, AIC=-3.631, SC=-3.147.

ΔlnYP=0.0501+0.573ΔlnYPt-1-0.198ΔlnYPt-2-0.304ΔlnLt-1+0.1163ΔlnLt-2+0.171ΔlnTlt-1
(1.514) (1.975)** -0.711) (-0.826) (0.335) (2.137)**
-0.0666ΔlnTlt-2-0.0209ΔlnHSCt-1-0.0865ΔlnHSCt-2-0.0791ECt-1
(-0.914) (-0.2554) (-1.169) (-1.77)***
R=0.791, F=11.50* , Log Likelihood=62.97, AIC=-4.075, SC=-3.591.

* Significant at 1%, ** Significant at 5%, *** Significant at 10% levels.
R=adjusted R squared, F=F-statistics, AIC=Akaike Information Criteria, SC=Schwarz Criteria.

Table 4. Regression results with (ΔYT)

Ind. Var.	1	2	3	4	5	6
C	0.0301	0.0301	0.0236	0.0295	0.0109	-0.025
	(2.086)**	(2.003)**	(1.000)	(1.771)***	(0.218)	(-0.380)
ΔlnTI	0.2559	------------	0.2423	------------	----------	-----------
	(5.681)*		(3.931)*			
ΔlnPI	-----------	0.128	-----------	0.1419	0.525	0.545
(2.942)*	(3.474)*	(3.635)*	(3.364)*			
ΔlnGI	-----------	0.1204	-------------	0.1482	-----------	-----------
(4.785)*		(6.0828)*				
ΔlnL	0.343	0.343	0.3817	0.226	-.045	-0.1901
	(1.0413)	(1.016)	(0.797)	(0.677)	(-0.312)	(-0.144)
ΔlnHRX	0.0243	0.0300	--------------	-------------	0.264	-----------
	(0.861)	(1.07)			(3.218)*	
ΔlnHSC	----------	------------	0.0352	0.0733	---------	0.4391
			(0.4134)	(1.2556)		(2.042)**
ad-R-sq	0.649	0.639	0.424	0.73220	0.550	0.440
F	21.343*	15.596*	7.634	19.455	14.421*	8.057*
L-Lik	70.83	70.920	49.869	60.914	29.44	21.746
AIC	-3.931	-3.878	-3.276	-3.994	-1.497	-1.268
SC	-3.752	-3.653	-3.086	-3.756	-1.317	-1.077

* Significant at 1%, ** Significant at 5%, and *** Significant at 10% level.
In tables 4 and 5: ad-R-sq=adjusted R squared, F=F-statistics, L-Lik=Log Likelihood, AIC=Akaike Information Criteria, and SC=Schwarz Criteria.

Table 5. Regression results with (ΔYP)

Ind. Var.	I	2	3	4	5	6
C	0.0281	0.0284	0.031	0.0236	0.0246	0.0187
	(1.543)	(1.4754)	(1.475)	(1.0000)	(0.9782)	(0.638)
ΔlnTI	0.1800	----------	----------	0.2423	-------------	-----------
	(3.163)*			(3.9306)*		
ΔlnPI	-------------	0.0882	0.088	-----------	0.1166	0.118
(1.600)***	(1.460)		(1.888)***	(1.64)***		
ΔlnGI	-------------	0.0809	----------	----------	0.1150	----------
	--					
		(2.507)*		(3.121)*		
ΔlnL	0.0513	0.3111	0.244	0.3817	0.3525	0.312
(0.7612)	(0.7200)	(0.522)	(0.798)	(0.6993)	(0.531)	
ΔlnHRX	0.05127	0.05764	0.101	----------	-----------	-----------
	(1.600)**	(1.606)***	(2.928)*			
ΔlnHSC	-------------	------------	--------	0.0353	0.0465	0.148
				(0.4134)	(0.5264)	(1.60)***
ad-R-sq	0.441	0.408	0.304	0.424	0.376	0.149
F	9.663*	6.683*	5.794*	7.6336*	5.0662*	2.57***
L-Lik	62.871	62.482	59.147	49.869	49.335	44.391
AIC	-3.463	-3.3813	-3.244	-3.2763	-3.167	-2.885
SC	-3.284	-3.1569	-3.064	-3.086	-2.929	-2.695

* Significant at 1%, ** Significant at 5%, and *** Significant at 10% level.

Given the time series nature of the data, a first step was to test for unit roots and the common trend of the variables. By using models 3 and 4 table 1 presents the results of the augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) stationarity tests, where the results for both ADF and PP tests reveal that the variables are non-stationary in their level terms. With first differences, these variables became stationary at I(1). By using models 4 and 5 results of Johansen-Jueslius cointegration tests appear in Table 2 and reveal that the variables are cointegrated which indicate that we can reject the null hypothesis of no coinegration of the variables at their level terms. Thus these results indicate that a long run relationship exists between these variables. Because all variables have been proven to be non stationary at their level terms and integrated of order I(1) as the results show, with linear combination of the differenced series still I(0), then we can perform the cointegration test with these variables. Table 3 (model 5) shows the results of the vector error correction (VEC) tests with the variables and according to Engle and Granger (1987) give the direction of causality and the speed of adjustment of the variables to the long run equilibrium.

The coefficients on VEC's terms reflect the process by which the dependent variables adjust in the short run to its long run position with coefficients ranging from 0.022 to 0.456. Thus these tests indicate that both measures of human resources development (HRX and HSC) cause economic growth (Y) in Saudi Arabia. Thus, causality runs from human resources development measures (HRX, HSC) to economic growth. This introduced a channel through which Granger causality has emerged.

Since cointegration clarifies the 'spurious regression' or 'nonsense correlation', problem associated with trending time series data (Ericsson, 1992[123]; Phillips, 1986[109]; Ohanian, 1988[110]), an OLS regression based on the differenced variables was conducted. Tables 4 and 5 show the results of regressing the differenced log of economic growth (YT, YP) as dependent variables on the differences of the logs of others variables. The dominant role played by the government is the reason for employing two dependent variables (YT= total GDP and YP=private GDP). By using mode 2 the following conclusions are drawn:

1) The coefficients of Δln of investment variables (TI, PI, GI) have the expected signs. They are positively correlated with the Δln of GDP (YT, YP) and statistically significant. These results indicate that the investment types contribute to the growth of output .

2) The coefficient of Δln of labor was found to have positive sign, but not significant. However, in two cases it became negative. This can be attributed to the fact that Saudi Arabia has a small population and during the last 3 decades or so imported and still use large number of skilled and unskilled foreign workers who were not included in the labor force used in this estimation. This might suggest that the influx of expatriate labor following the oil boom has contributed with local labor force to the growth of output (GDP) during the period of the study.

3) Human resources development variables, proxied in this study by expenditure on human resources (HRX) and graduates of high school students (HSC), have the expected signs and are significant specially when government investment is excluded. This is may be due to the fact that human resources expenditure and development are related to government investment. The coefficients on HSC and HRX range between 0.148 to

0.4391 for HSC and 0.0513 to 0.264 for HRX.

These results provide evidence supporting the contention that development and growth of human capital can foster income growth. This is also an indication that human capital development in Saudi Arabia can affect income growth, which implies that the government in Saudi Arabia should continue its policies of developing and improving human resources development. Since these policies have positive and significant impacts on the growth of output and income, it is clear that investment in human capital can be considered as an 'engine of growth.' These findings are in agreement with Schultz's suggestions [22, 23] that investment in human capital should be considered as a form of investment rather than a consumption. These results are also in agreement with the suggestion of Robinson [54] that the role of education is an omitted factor in regression models, and it should be added to the production function.

These results are also empirically in agreement with the findings of Armstrong and McVicar [60], Benhabib and Spiegle [76, 77], Booth [67], Broer and Jansen [68], Brumm [124], Chatterji [70], Graca *et al.* [33], Hanson [85], Sorensen [32], Simon and Nardnelli [125], Tallman and Wang [34], and Stevens [37], among others.

Conclusions and Policy Implications

Human capital plays important roles in economic development and growth. For developing countries, such as Saudi Arabia, human resources development is a crucial factor in the long run path of growth and development.

Empirical results appear to favor the contention that human resources development has a favorable impact on the growth of income and the overall results seem to support the hypothesis that human capital is an 'engine of growth' and emphasize the important role played by human capital in the process of economic development. It also showed that foreign labor satisfied domestic demand for labor and contributed to the growth of output.

Now that the education system is graduating large number of people who are entering the labor market, the emphasis should be shifted to developing economic resources to absorb the increasing number of educated people. Thus, the drop in oil revenue since 1983 and expected shifts in policy emphasis, require the government to have effective fiscal and monetary tools that will allow the necessary policy to be carried out.

Government policies can influence investment decisions both directly through taxes and subsidies as the case of Saudi Arabia and indirectly via reform of institutional arrangements. Thus, intervention might in principle be used to raise investment and hence the long run growth rate.

Institutions and policies may have strong effects on the growth rate than would have been predicted using the traditional neoclassical growth model. Moreover, it is important to take a broad view of the role for policy. Rather than restrict the perspective to investment subsidies and taxation, reform of institutions potentially becomes a key aspect of policy making.

Education and skills match (Allen and Velden, [126], investment in igh technology (Pakko, [127] and quality of labor force measured by comparative tests of mathematical and scientific skills as suggested by Hanushek and Kimko [128] are important aspects of productivity and economic growth. Hanushek and Kimko [128], conclude that "A single conclusion emerges from the various analytical specifications: labor force quality has a consistent, stable, and strong relationship with growth." They also find clear evidence that " international test performances relate to productivity differences." Which appear to be "related to schooling differences and not to cultural factors, family support and attitudes, and the like. This direct linkage to productivity suggests a causal impact in international economic performance."

Moreover, one can argue as Comeau [129] has concluded " investment in human capital includes more than formal schooling. Human capital also includes on-the job training, various skills, knowledge, health characteristics, and habits of the population". In addition "number of years of schooling does not reflect the quality of schooling that arguably may be more important a catalyst of economic growth."

Forster and Rosenzweig [87]; Carlino [130] and Blondal *et al.*, [131] emphasize the importance of the accumulation of education on knowledge, experience and social benefits to the society. Carlino ([130]) conclude that as "individuals accumulate knowledge, they also contribute to the productivity of many other individuals with whom they have contact either directly or indirectly." Thus "The accumulation of knowledge by any one individual has a positive effect as knowledge spillovers." On the other hand Blondal *et al.*, [131] conclude "The social benefit includes the increased economy wide productivity associated with the investment in education and a host of possible non-economic benefits, such as lower crime, better health, more social cohesion and more informed and effective citizens."

Thus, it is important for policy-makers to pay attention not just to the government policies and the level of its expenditure, but also to the composition of this expenditure. Cuts in investment expenditure should fall only on investments that are not directly related to the development of infrastructure and social services. There should be an awareness of the consequences for the long term growth of the economy of across the board reduction in spending and expenditures that involve deep cuts in human resources development and infrastructure investment.

Further, since economic growth and development are the main objectives of the government investment and human resources development policies, the issue for growth policy should go beyond the traditional measures of saving and investment to emphasize on investment in economic infrastructure through technology and people. Not only are investment in research and people genuine investment in themselves, they may also generate beneficial externalities through defusion of knowledge and skills.

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تنمية المصادرالبشرية وأثرها على النمو الاقتصادي في المملكه

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(قدم للنشر في ١٤٢٣/١/٢٧هـ ؛ وقبل للنشر في ١٤٢٤/٢/١٤هـ)

ملخـــص البحث . يعتبر الاستثمار ي رأس المال البشري مهما للنمو والتنمية الأقتصادية. كذلك فأنه من المؤكد أن التعليم واكتساب المهارات لا يقتصر مردودها على الفرد فقط بل يتعدى الى المجتمع ككل.

لقـــد أدركت المملكة منذ البداية وذلك عن طريق الخطط الخمسية أهمية تنمية المصادر البشرية لاعتبارها هدفا مهما في استراتيجيات التنمية الأقتصادية. ويتوضح ذلك أكثر عند التمعن في خطط التنمية المتعاقبة وما أولته من أهمية لذلك عن طريق الأنفاق الكبير خلال السنوات الماضية.

باستخدام التطورات الحديثة في الاقتصاد القياسي تقوم هذه الدراسة بمحاولة قياس تأثير السياسات الحكومية في المملكة تجاه التعليم والتدريب واكساب المهارات وأهمية ذلك على التنمية الأقتصادبة. وتبين النتائج التي تم التوصل إليها على نجاح هذه السياسات وذلك للتأثير الأيجابي لسياسات تنمية المصادر البشرية على التنمية الاقتصارية في المملكه.