Population Growth and Economic Development in Saudi Arabia

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Abstract

Population growth affects economic growth and performance if it affects the supply and demand for savings and the efficiency of capital. This concern was an element of the theory of the Malthusian diminishing return to labor as the stock of capital does not increase in the same proportion as does labor.

Theoretical models and empirical studies yield ambiguous predictions and mixed evidence concerning the impact of the increase in the percentage of population that is very young and very old, and the dependency ratio on saving rate.

However, recent population research and studies advance the idea that population growth may stimulate innovation in technology and in turn enhance economic growth. These studies emphasize the fact that there has been enormous increase in knowledge which has been transformed into technology and ways of utilizing resources more efficiently.

Estimates of the population in Saudi Arabia show rapid increase in population since early 1970's, which is due to increased fertility rate and a rise in life expectancy.

Empirical results show that this rapid increase in population has negative impact on both savings and economic growth.

It is important to find ways and policies that both reduce fertility and increase productivity of the population and enhance economic growth.

Introduction

Population growth may affect economic performance if it affects the supply and demand for savings and the efficiency of capital (Kelley, 1976, 1988; Hammer, 1986; Mason, 1988; Shumaker and Clark, 1992; Olson, 1994; Timmer, 1994). This concern was an element of the theory of the Malthusian diminishing return to labor, as the stock of capital (including land) does not increase in the same proportion as does labor force.

Another important theoretical element is the dependence effect, which suggests that saving is more difficult for households when there are more children and that higher fertility causes social investment funds to be diverted away from high productivity use. In an early study for India Coale and Hoover (1958) and Coale (1970) raise the concern that, whereas a rapidly growing population requires substantial investment to maintain workers productivity, the share of national output devoted to saving and investment can be adversely affected by rapid population growth.

The supply of household savings may be reduced by a high dependency ratio if, for a given level of output per worker, it causes consumption to rise and per capita savings to fall. However, demand for savings may increase as population grows, since faster population growth absorbs investible resources, reducing capital per person. Thus, in countries with a growing labor force, the stock of capital must increase to maintain capital per worker and current productivity, otherwise productivity (and thus income) will stagnate or fall. Further, the efficiency of capital may be hindered by rapid population growth if social and political pressure to employ young people leads to a large government sector or to regulations designed to stop private sector from reducing its workforce. On the other hand, several factors suggest that there may be no link between population growth and savings and investment. For instance, in the early stages of development monetized savings may be produced by relatively few families with few children, so their savings may not be affected by the burden of their dependents. Also, poor families are unlikely to have finance savings that show up in national accounts, but may save by accumulating other assets such as land and gold. Furthermore, some empirical studies found no correlation between per capita income and population growth (Lee,1983; McNicoll, 1984; Simon, 1989). Thus, Simon (1989, 325) argues forcefully based on his early studies of population growth that there is no evidence of correlation between population growth and per capita income. " Because the studies persuasively show an absence of association in the data, they imply the absence of a negative causal relationship. In other words, the other writers point to what the studies do not show, whereas I point to what they do show." He suggests that "Absence of correlation between two variables can usually be considered a strong indication that neither variable is influencing the other-in this case, that slower population growth does not cause faster economic development." Simon (1989) also points out to the fact that there might be reversed causality where the level of people's income affects their fertility. " But there seems to be no persuasive reason why the rate of change in income should be an important influence. In principle, it is possible that expectations of higher future income based on a rate of change might affect fertility decision."

Most studies related to the impact of population growth on economic growth and development did not take into consideration the possibility that the variables being non-stationary or co-integrated. This aspect assumes particular importance in light of Simon's (1989) plausible theoretical argument that population and economic development are essentially related over long run horizon and should possess minimal tendency for short run relationship.

Again Simon in his research (1989, 1992) observed that two-variables correlations between the rate of population growth and the rate of growth of per capita income usually show no significant relationship. That is changes in population growth rates have no effect on economic growth and that slower population growth does not cause faster economic development. He contends that the short run economic effects of population, if and when they exist, operate mainly through capital dilution and the cost of raising children. However, population has more pronounced effects on economic growth through several channels as productivity change and the contribution of new ideas, and these channels require a relatively long time to bring in their full effects. Therefore, standard regression analysis, with their typical emphasis on short run effects, may be biased against revealing the true and complete long run relationship between population and economic growth.

According to estimates made by Central Department of Statistics (2001) total population of Saudi Arabia in 1995, 1999 and 2000 was 18.80, 21.33 and 22.01 million respectively compared to 16.90 million in 1992, recording an average annual rate of 3.2 percent for the period 1992-2000. However, estimates for the Saudi Arabian citizens among the total population at the end of 1995, 1999 and 20000 are 13.59, 15.66 and 16.21 million respectively compared to the official 1992 census of 12.30 million with an average annual growth rate of about 3.5 percent. This compared to estimate of 5.30 million in 1974, which suggests an average growth rate of 4.2 percent per year, between 1974-1992, which can be considered one of the highest in the world. Further, according to 1992 census figures and the estimates of 1995, 1999 and 2000 half of the population is under the age of 15 which indicate a high dependency ratio.

Moreover, for the last fifty years the rate of urbanization in Saudi Arabia has increased dramatically. According to the United Nations 'population studies' the rate of urbanization in Saudi Arabia jumped from 19 percent of the total population in 1950 to 49 percent in 1970 and 80 percent in 1990. Further, Central Department of Statistics (2001) indicates that about 60 percent of the population live in three cities which include: Riyadh with 23 percent, Makkah and Jeddah with 22 percent and Eastern province with 24.7 percent of the population.

Given the dramatic structural change in the economy of Saudi Arabia and the rapid increase in the growth and level of the population during the last three decades**,** the aim of the study**,** by employing recent developments in econometric methods and using annual data covering the period 1964**-**2000**,** is to investigate the impact of the rapid growth of population in Saudi Arabia on saving and economic growth and development**.**

Literature Overview

It was first Malthus to support the idea that population growth is a potential determinant of output growth and then it was realized that the relevant measure of growth is output per capita and not aggregate output. This work of Malthus was extended by classical economists to develop the so- called 'Classical' Model which adopted the view that economic growth is determined exogenously and population growth must adjust to it in the long run period. However, it has been argued that in the short run period there is a positive relationship between deviations of per capita income and the rate of economic growth from their long run values.

Solow (1956) extended the classical model when he developed the neoclassical growth model. According to this model economic growth is an endogenous variable that depends on population growth while fertility is still an exogenous variable. Becker (1973, 1992) supports the notion that fertility growth is an endogenous variable to an economic system and developed a theoretical framework to explain that the relationship between the two variables depends on a number of socioeconomic factors such as the incentive for having children, the quality of children, the efficiency of private capital markets and the intergenerational transfers within the family.

While many studies argue that population growth impedes economic development, others contend that the economic effects of population growth are rather stimulative, and some maintain that the two variables are not related at all (Perlman,1981; Simon, 1976, 1977, 1989, 1992; McNicoll, 1984; Ahlburg, 1987; Chesnais, 1987; Blanchet, 1991; Horlacker and MacKellar,1988; Barlow, 1994). Indeed, there are at least three alternative schools of thoughts regarding this relationship (Hodgeson, 1988; and Blanchet, 1991). The first is the 'Orthodox' or 'Malthusian' view that rapid population growth leads to poverty. Under this scenario, family planning to control fertility is an important policy to foster economic growth in over populated countries. Against this position, ' Revisionism' holds that higher population growth increases the stock of human capital and will thus positively contribute to economic development. If true, attempts to curtail population growth become unnecessary or perhaps even harmful to the economic development process. Both of these hypothesis imply that population growth causes (negative or positive) changes in per capita income. On the other hand, the 'Transition' theory takes an opposing stand and maintains that population growth, at least partially, is itself driven by income changes. That is, countries tend to have large population as a result of being poor. This view implies that developing countries with large and expanding population should instead focus on improving the technical skills of their labor force and on enhancing the stock of capital for economic prosperity. This, the hypothesis contends, is the way to control excessive population.

Theoretical models yield ambiguous predictions concerning the effects of an increase in the percentage of the population that is very young and very old on the savings rate (Kelley, 1988).

Empirical studies also provide mixed evidence concerning the impact of increases in the dependency ratios on the savings rate. Leff (1969) in his study of dependency ratios on the savings for seventy four countries indicated that the dependency rates of both the young and the elderly have significantly negative effects on the national savings rate. However, Ram (1982) in a study of 121 developed and developing countries including Saudi Arabia suggested that this is not the case.

Much of the empirical evidence on the relation between population growth and per capita income is from cross-section studies. For stance, Easterlin (1967), Kuznets (1973), Simon (1977, 1992), and Thirwall (1972) find a weak or insignificant relation, in contrast, Kelley and Schmidt (1994) find a negative and significant relation, at least for less developed countries. A recent time-series study by Dawson and Triffin (1998) finds no long run relation between the variables in the case of India.

The correlation-based analysis typically used in early studies may be considered inadequate to identify the cause and effect relationships between the two variables. However, little has been done to analyze the causal links between population and economic development. Studies by Jung and Quddus (1986), Kapuria-Forman (1995), Darrat and Al-Yousif (1999) and Thornton (2001) shift the focus from the common correlation between population growth and economic development to the more pertinent issue of causality and the co-integration test for long run relationship. Jung and Quddus (1986) and Kapuria-Forman (1995) studies employ standard Granger causality tests to examine the linkage between population growth and economic development with annual data from several developing countries. Jung and Quddus (1986) find no clear evidence for any causal relationship between the two variables. However, Kapuria-Forman (1995) claims otherwise and reports that population growth and economic development display a distinct pattern of causal characterization (primarily from the former to the latter).

Further, based on micro foundation of economic theory, many researchers such as Barro and Becker (1989), Becker (1988, 1992), Becker and Barro (1988), Becker et al. (1999), Ehrlich and Lui (1991), Wang et al. (1994) and Blackburn and Cipriani (1998) treat both population and income growth as endogenous variables in an effort to develop a coherent model of economic growth and explain the process of dynamic economic growth.

Thus, recently the major trend in literature is the development of theoretical dynamic models that treat population growth and development as endogenous variables, jointly and simultaneously determined, rather than separate outcomes of different economic systems. The results obtained by these modern methodologies have put emphases on the effects of range of issues such as the effects of taxes and social security and subsidies programs on fertility (Gomez, 2001). However, over the last two decades, most of the work on endogenous population and economic growth has been theoretical. Few empirical studies have examined the effects of population growth and fertility on economic growth for the U. S., industrialized countries and some developing countries (Ehrlich and Lui, 1991; Winegarden and Wheeler, 1992; Brander and Dowrick, 1993; Brander and Taylor, 1998; Wang et al. 1994; Darrat and Al-Yousif, 1999; Gomez, 2001; and Thornton, 2001).

The notion that a large population of dependent young increases consumption at the expense of savings enjoys a distinguished pedigree. Coale and Hoover (1958) made it a center piece of their work. A decade later the study by Leff (1969) appeared to put the youth dependency hypothesis on a sound empirical footing. However, subsequent research by Goldberger (1973), Ram (1982) and others failed to confirm the dependency hypothesis and thus may cast doubt on the validity of the empirical methods employed in the earlier studies. Thus, Deaton (1992, 51) offered the following judgment concerning the empirical literature on demography and savings ratios. " Although there are some studies that find an influence of population growth or demographic effects, the results are typically not robust and there is no consensus on the direction of the effect on saving."

Some researchers (Fry and Mason, 1982; Mason, 1987, 1988), however, developed what they call a 'variable rate of growth effect' model of the link between youth dependency and national saving rates. This model relies on the insight which motivates the lifecycle theory of savings, given positive labor productivity growth, young cohorts enjoy higher permanent income and higher consumption than their elders. The dependency and life cycle perspectives are united by allowing changes in the youth dependency ratio to induce changes in the timing of life cycle consumption. Drawing on cross section data for seven Asian developing countries, Fry and Mason find solid empirical support for the model, isolating a negative relationship between youth dependency and income growth. Collins (1991) reports similar results for a smaller cross section of developing countries. Taylor and Williamson (1994) apply the model to over a century of saving behavior in Canada, Australia and Argentina, finding suggestive evidence of demographic origins for late 19th century capital flows. Taylor (1995) applies the model to Latin American savings and investment behavior since 1960's and considers its implications for the evolution of the region's current account balance during the early decades of the next century.

Thus, as Simon (1989) has suggested, population has more pronounced effects on economic growth through several channels as 'productivity change and the contribution of new ideas' and these channels require a relatively long time to bring in their full effect. Further Becker et al., (1999,

145) believe that the relationship between population and per capita income is "more complicated than found in either Malthusian, or neoclassical and endogenous-growth models." And conclude that "Under conditions that tend to prevail in poorer, mainly agricultural, economies with limited human capital and rudimentary technology, higher population usually does tend to lower per capita incomes, mainly along Malthusian lines."

The urban-rural status of a household can influence both fertility and the savings decision. As economies experience a shift in activities from agriculture to industry, the value of children as producers declines. The costs of raising children are also higher in an urban setting (Kelley and Williamson, 1984; Yi and Vauple, 1989). Zhang (2002, 93) concludes that "Urbanization eventually leads to declines in fertility, rises in investment per child relative to output per worker, and faster economic growth." However, on the savings side, the story is more difficult. The dominant forces making for savings at the household level are the need for consumption averaging overtime, given anticipated changes in family dependency burden, the desire to provide against downside risks to living standards, and aspiration to improve those standards. Population growth is connected with each, though consequent as well as a determinant of savings behavior. However, high fertility imposes an evident early consumption burden.

Rapid population growth imposes greater demand than slower growth on government investment in economic and social infrastructure that is keyed to young ages-principally, child health services and schools and vocational training-if per capita standards to be maintained. Investment in capital deepening is thereby lessened. Cassen (1978, 225) notes that " the real question is whether such educated and healthy people make a greater contribution to the economy than would be achieved by using the capital to raise the output of a smaller population." He argues that the more significant investment impact of rapid population growth is in impelling an earlier shift in the composition of productive investment toward more capital-and foreign exchange-intensive forms, as the production-raising possibilities for labor-intensive public works get used up.

Government expenditures may be affected in various ways by increased population growth and the associated age structure. There is little doubt that rapid population growth is a serious burden on efforts to generate sustained increase in per capita product and income. This is because rapid population growth may lower the wage-rent ratio, reducing labor's share of output, increasing inequality in income distribution which is a likely result. In addition, differential growth of families by economic status may dilute the assets and income of the poor more than the rich. In return a given overall gain in income is often argued to reduce fertility more if the benefits accrue to poorer families. On the other hand, strong economic performance often raises the rate of population growth, natural increase in fertility or immigration.

Researchers (Shultz, 1988, 1994, 1997; Maddison, 1995; Caldwell, 1998; Lee and Feng, 1999; Caselli and Coleman, 2001 among others) suggest that diminishing returns to labor induced by population growth could be offset by capital formation and growth in productive knowledge. Thus, population growth may trigger economic development as conventionally measured in terms of an increase in per capita income. Alternatively, population growth pressures on the fixed stock of land may be offset by the accumulating returns from independent investments in clearing marginal land, draining and improving the fertility of existing land, investing in reproducible physical capital, adding to the average skill level of workers, and producing more knowledge for workers to use. Thus, Schultz (1988, 423) suggests that " Population growth may remain a Malthusian drag on economic growth per head, but apparently not an insurmountable barrier to modern economic growth in the recent, and possibly exceptional, historical period."

The idea that population growth stimulates innovation in technology or economic organization has been supported by the literature (Green and Sparks, 1999; Galor and Weil, 1996, 2000). The argument developed, is that technological change needed to expand agricultural production often entails initially a great labor input per worker and therefore will not be adopted voluntarily until necessity requires it. McNicoll, (1984, 197) writes " There is strong evidence of population-induced innovation in some agricultural settings; but there are cases too where rapid population growth has been accompanied by stagnant productivity or by labor saving rather than labor using technical progress." However, Kuznets (1973) and Simon (1981, 197) argue by tying the pace of innovation not to population growth but to population size, " because improvements-their invention and their adoptioncome from people, it seems reasonable to assume that amount of improvement depends on the number of people available to use their minds. …… A large population implies a larger amount of knowledge being created, all else being equal."

While some studies showed negative relationship between population growth and economic growth recent research found a variety of outcomes: no statistically significant effect of population growth on economic growth, occasionally a positive effect, and also occasionally a negative effect (Levine and Renelt, 1992; Kelley and Schmidt, 1996; Barro, 1997; Burkett *et al.,* 1999; Johnson, 1994). These differences may be attributed to the fact that the usual measure of investment in national accounts do not take into consideration depletion of natural resources or additions to human capital in the form of education. Johnson (2001, 739) writes "It seems odd that an effort to measure 'what really happened' neglects a major form of capital accumulation in developing countries-namely, the increase in human capital attributable to the increase in life expectancy." He suggests that "This gain is over and above the increase in education as a measure of human capital formation. For most developing countries, the 1970-93 period saw significant increase in both life expectancy and years of education attained."

Thus, Johnson (2001, 743) asks the question "Why can one have a degree of confidence that economic growth can continue with increased population?" his reason is knowledge where " the world has shown an amazing capacity to advance knowledge over the past two centuries compared to all previous time." He gives two reasons for this, that there are more people and thus there are more people who can contribute to the creation of new knowledge. And " we now have people who specialize in the creation of knowledge-we have research institutes and universities, institutions that hardly existed more than a century ago." He pointed out "As the world's population and income have grown rapidly over the past two centuries, the economic gains from new knowledge have increased and the number of persons engaged in advancing knowledge has increased in response." Further he predicts that "It is highly probable that knowledge will grow at a faster rate in the future as the share of the world's resources devoted to the creation of knowledge continues to establish and expand their own research universities and institutes and of the continued growth of population, until population stabilizes before the end of the twenty-first century."

Johnson (2000) points that there was an explosion of knowledge over the past two centuries that made possible an unparalleled increase in per capita well-being 'not just in terms of food but in all aspects of life.' Further "the improvement in well being of world's population goes far beyond the enormous increase in the value of the world's output." However, "The improvements are evident in fewer famines, increased calories in takes, reduced child and infant mortality, increased life expectancy, great reductions in time worked, and greatly increased percentage of the population that is literate."

Studies (Hamilton and Clemens, 1999; Johnson, 2000, 2001; Dasgupta, 2000, 2001) indicate also that the percentage of time people spent in their productive years increased significantly; the percentage of children in the population declined; and the percentage who were elderly had not increased significantly. Thus, these developments should be included in the measurement of capital to measure the productive capacity of wealth of a country. These studies conclude further, that education beyond the primary level for women is associated with lower fertility. Education helps women to process information more effectively and so enable them to use the various social and community services. Education also delays the age at marriage and so lowers fertility and that fertility declines as women's share in paid employment increases. Thus, Dasgupta (2000, 644) concludes "women's education and reproductive health have come to be seen as the most effective channels for influencing fertility."

Therefore, Ruttan (2002) suggests that in the classical model of Malthus or Ricardo, growth is constrained by an inelastic supply of natural resources. In the neoclassical model, economic growth is constrained by the rate of growth of the labor force. Thus "The classical economists were mistaken when they assumed productivity growth was not possible in the agricultural sector. It is also a mistake to assume that productivity growth is not possible in the service sector."

Further, more populous nations, other things equal, tend to have more authority in world affairs than less populous ones. Military power depends in large measure upon the size of the national population which supplies army recruits and pays taxes to equip them.

Methodology

Most growth models specified for developing countries are based on the neoclassical framework (Robinson, 1971; Chenery et al., 1986; Fischer, 1987). This framework takes as its starting point an aggregate production function relating output to factor inputs and a variable usually referred to as total factor productivity:

$$Y = A f(K,N) \quad (1)$$

where: Y is the level of output, K is the stock of physical capital and N is the population. The variable A measures factor productivity, which is generally assumed to grow at a constant exogenous rate. The signs of all partial derivatives of Y with respect to the augments in $f(\,.\,)$ as well as A are assumed to be positive.

Equation (1) can be expressed in growth terms to obtain:

$$dY/Y=[A.dY/dK]dK/Y+[A.dY/dN.N/Y]dN/Y+dA/A \quad (2)$$

which can be written for estimation purposes as:

$$\Delta Y/Y\text{-}1=\alpha 0+\alpha 1 I/Y\text{-}1+\alpha 2 \Delta N/Y\text{-}1 \quad (3)$$

Where:

$\alpha 0=dA/A$

$\alpha 1=A.dY/dK$

$\alpha 2=A.dY/dN\ .\ N/Y$

and $I=dK$

the constant term ($\alpha 0$) is assumed to capture the growth in productivity, $\alpha 1$ is the marginal productivity of capital, and $\alpha 2$ is the elasticity of output with respect to population.

The specification of the savings equation and statistical methodology used varies across the many studies of the effect of dependency on savings. The most widely used specification (Bilsborrow, 1980; Mason, 1987; Shumaker and Clark, 1992) is

$$S=a0+a1D1+a2D2+a3Y+a4dY \quad (4)$$

Where S is the gross domestic saving rate, D1 is the percentage of the population under 15 years of age, D2 is the percentage of population age 60 and older, Y is the gross national product per capita and dY is annual growth rate in per capita gross national product.

Several studies have examined time series variables properties and concluded that most macroeconomic time series data follow random walks (Hall, 1978; Nelson and Plosser, 1982). Further, econometric studies, Granger and Newbold (1974), Granger (1986), Philips (1986, 1987) and Ohanian (1988), have demonstrated that if time series variables are non stationary, all regression results with these time series will differ from the conventional theory of regression with stationary series. That is, regression coefficients with non-stationary variables will be spurious and misleading. Therefore, analysis of time series properties of variables used in macroeconomic research is particularly important when examining the relationship between variables that exhibit a common trend (Granger, 1986; Engle and Granger, 1987; Schwert, 1987, 1989; and Johansen, 1991). Thus, to avoid spurious relationships and misleading results and to provide valid evidence to the order of integration, before proceeding to the co-integration analysis and the estimation of the long run relationship between the variables, time series properties of the individual variables were examined by conducting stationarity tests. A variable that is stationary in level form is I(0), however, a time series containing a unit root follows a random walk and requires differencing to obtain stationarty, and is said to be first order integration 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 (1979, 1981) and Phillips-Perron (PP) test due to Phillips (1987) and Phillips and Perron (1987).

Augmented Dickey-Fuller (ADF) test relies on rejecting a null hypothesis of unit roots (the series are non stationary) in favor of the alternative hypothesis of statinarity:

$$\Delta Xt=\mu+(\alpha-1)Xt-1+\sum_{t=1}^{n}\gamma\Delta Xt-1+ut \qquad (5)$$

Where, Xt is a random variable, Δ is first difference operator, μ is constant term, ut is a stationary random error, t is time, and n is number of lags for the dependent variable which is chosen to ensure that the residuals are white noise. The t-statistics of (α-1) is used to test the null hypothesis that this coefficient is equal to zero (i.e., that is α=1). However, the critical values of the t-statistics do not have the familiar distribution and several authors have constructed appropriate critical values for the t-statistics (i.e., MacKinnon, 1991; Fuller, 1996).

Arbitrariness of lag lengths may affect the reliability of the statistical tests and seriously bias implications of the results. Thus, to determine the proper lags for each variable, the Akaike's final prediction error criterion (FPE) is used as suggested by Hsiao (1979, 1981).

A problem with the ADF is that it involves the inclusion of extra differenced terms in the testing equation which results in a loss of degrees of freedom and a resultant reduction in the power of the 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) 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 type II error will be high.

The PP test generalizes the common Dickey-Fuller procedure by allowing for fairly mild assumptions of the distribution of the errors, particularly with regard to serial correlation and /or hetroskedasticty. Thus, PP test corrects for serial correlation in equation (5)using a non-parametric procedure which modifies the statistic after estimation in order to take into account the effect that autocorrelated errors will have on the results. Asymptotically, the statistics is corrected by appropriate amount, and so the same limiting distribution applies. Perron (1988) suggests estimating the following regression by ordinary least squares (OLS):

$$Xt=\mu+\lambda(t-T/2)+\delta Xt-1+ut \qquad (6)$$

There are more than one method of conducting co-integration tests. However, the empirical testing in this paper uses the multivariate co-integration method developed by Johansen (1988) and Johansen and Jueslius (1990). This approach is preferred to the Engle and Granger (1987) method. Johansen-Jueslius approach provides a very flexible format for investigating the properties of the estimators and is capable of determining the number of co-integrating vectors in the relationship. Banerjee et al. (1993) Phillips and Cuthbertson et al. (1992) have shown that Johansen-Jueslius procedure is preferred. Further, Gonzalo (1994) compared the performance of the co-integration tests using a Monte Carlo study and found that Johansen-Jueslius procedure is the most powerful even for bivariate system.

The Johansen-Jueslius method applies the maximum likelihood procedure to determine the presence of co-integrating vectors in non stationary time series, where they provide two different tests, the trace test and the maximum eigenvalue test, to determine the number of co-integrating vectors.

The Johansen-Jueslius approach to testing for co-integration considers p-dimensional victor autoregression (VAR) model:

$$Xt=\Pi 1Xt-1+\ldots\ldots\ldots\ldots..+\Pi kXt-k+\varepsilon t \quad (7)$$

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

$$\Delta Xt = \Sigma \Gamma t \Delta Xt-1+\Pi kXt-k+\varepsilon t \quad (8)$$

Where: $\Gamma= -1 +\Pi 1 + \ldots\ldots. +\Pi t$

$\Pi= 1 +\Pi t - \ldots\ldots -\Pi k$

The Π matrix contains information about the long run relationships between the variables. Let the rank of 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 p x r matrix of error correction parameters and β as p x r matrix of co-integration vectors. The vector of constant, μ, allows for the possibility of deterministic drift in the data series. Maximum likelihood estimates of α, β and Γ are derived in Johansen (1988). To test the hypothesis that there are at most r co-integrating vectors, one calculates the trace statistics (λtrace). The maximum eigenvalue test (λmax) is based on the null hypothesis that the number of co-integrating vector is r against the alternative of r+1 co-integrating vectors. Johansen and Jueslius (1990) provided appropriate critical values for (λtrace) and (λmax) statistics and MacKinnon (1991) and Osterwald-Lenum (1992) developed an extended version of these critical values. However, Cheung and Lai (1993) reported extensive Monte Carlo

evidence in support of the trace version over the maximal eigenvalue version of the Johansen test, particularly under condition of non normality.

Another and more robust method (particularly in small samples) proposed by Stock and Watson (1993), which also corrects for possible simultaneity bias among the regressors, involves estimation of long run equilibria via dynamic OLS (DOLS). Stock and Watson (1993) suggest a parametric approach for estimating long run equilibria in systems that may involve variables integrated of different orders but still co-integrated. The potential of simultaneity bias and small sample bias among the regressors is dealt with by the inclusion of lagged and lead values of the change in the regressors. This procedure is preferred to similar estimators due to its favorable performance, as well, in small samples. Stock-Watson (1993) Dynamic OLS:

$$Y = B' Xt + \sum_{j=-k}^{j=k} \eta j \Delta It\text{-}j + \sum_{j=-l}^{j=l} \lambda j \Delta POPt\text{-}j + \varepsilon t \qquad (9)$$

$$S = B' Xt + \sum_{j=k}^{j=k} \eta j \Delta Yt\text{-}j + \sum_{j=-l}^{j=l} \lambda j \Delta POPt\text{-}j + ut \qquad (10)$$

$B=[\alpha, \beta, \theta]'$, $Xt =[1, Yt, It, POP]$

In estimating the long run parameters of production function, the DOLS basically involves regressing any I(1) variables on other I(1) variables, any I(0) variables and leads and lags of the first differences of any I(1) variables. These estimates will facilitate inferences made for the long run. Robust standard errors are derived via the procedure recommended by Newey and West (1987).

Data and Empirical Results

Time series data for Saudi Arabia are used in this study with annual data for the period 1964-2000. All variables are in real terms and transformed to log terms.

It has been always suggested that more observations are better, because it has been indicated that more observations allow for better discrimination among hypothesis. However, Shiller and Perron (1985) 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. Further, Hakkio and Rush (1991) point out that co-integration is a long run concept and, hence requires long run 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 longer time series.

Although real gross national product (GNP) is a good indicator of the overall level of economic development and activity in any economy, however, it could be argued that, for Saudi Arabia, this variable dose not accurately reflect the economic activity within the economy. This is attributed to the economy’s reduced ability to influence the oil production level and the price of oil in international markets. With the extraction and export of oil production being the dominant component of GDP and government revenue to a large part of the economic activity within the country is determined outside its system and has very little control over it. Therefore, 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 long bearing on every aspects of the economic activity. While, during the last two decades, the significance of oil in the economy has declined from around 98 percent late 1970’s to about 60 percent in recent years, it remains the dominant sector. Further, since oil revenues affect directly and indirectly other sectors of the economy and in order to isolate these effects, it is appropriate to use non-oil GDP to represent income or output.

The data on the variables are obtained from Ministry of Planning ‘Facts and Figures’ different issues and from Saudi Arabian Monetary Agency (SAMA) annual reports different issues.

Tables 1-6 show the empirical results of the statistical tests conducted to investigate the impact of the population growth on savings rate and economic growth in Saudi Arabia. Growth of real total non-oil GDP (Y) represents growth of the economy. Independent variables used in this study are in real terms and include: total investment (TI), Population (POP), and savings (S). two independent variables represent savings: SV is total saving of the society (GNP-Consumption) and FS which is financial savings (total liquidity of the country)

Given the time series nature of the data, a first step was to test for unit roots and the common trends of the variables. Table 1 presents the results of augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) stationarity test where the results of both ADF and PP tests reveal that the variables are non-stationary in their levels. However, with their first differences most of these variables become stationary, i.e., they are I(1). Further, because all the variables have been proven to be non stationary in level terms and most of them are integrated of order I(1) as the results show, then a linear combination of the differenced series may still be I(0), thus we can perform the co-integration test with these variables using the Johansen-Jueslius co-integration test. Co-integration test results appear in table 2 and reveal that the variables are co-integrated at the 5% level for both the trace and maximum tests which indicate that we can reject the null hypothesis of no co-integration, and a stable long run relationship between the variables exist.

According to Engle and Granger (1987) a system of co-integrated variables can be represented by a dynamic error correction model. Thus, we proceed to test for error correction by using Johansen-Jueslius vector error correction method (VEC) and table 3 shows the results. The coefficient on this VEC term reflects the process by which the dependent variable adjusts in the short run to its long run position. This VEC term provides another channel through which Granger causality can occur in addition to the traditional channel through lagged independent variables (Granger, 1986).

Table 4 shows DOLS results and indicate that population size and growth have positive impact on economic growth, however, these variables have negative impact on savings (SV) and financial savings (FS). This may be due to the fact that Saudi Arabia has a small population, especially until recently, and imported large number of expatriates and workers (Al Najjar, 1999; Agiomirgianakis and Zervoyiannis, 2001; Hondroyiannis and Papapetrou, 2001).

On the other hand the demographic change (Little and Triest, 2002; Quispe-Agnoli and Zavodny, 2002) represented by the increase in fertility and the decreased mortality in the last three decades may forced people to rely on their savings and forced the government to expand its expenditure on social and welfare services.

Moreover, OLS results in table 5 show that population growth has negative impact on both economic growth (Y) and on savings (SV, FS).

Table 5 also shows that dependency rates (Dep1= population age 15 and less and Dep2= population age 60 and above) have negative impact on economic growth and savings. These results are in agreement with the Malthusian hypothesis and with the results obtained by Leff (1969), Shumaker, Clark (1992) and Dasgupta (1995, 2000) among others.

Finally results of the correlation between the size and growth of population and economic growth and savings are presented in table 6 which show that a negative correlation exists between these variables. These results are in contrast with the claim by Simon (1976, 1989, 1992) that there is no correlation between population growth and economic growth. Further, these results suggest that reducing population growth may raise the saving rate and, hence, the rate of growth in per capita income. However, increasing per capita income growth by whatever means may enable the country to achieve high increase in the saving rate which frees more resources for investment which in turn, produces higher income growth.

Conclusion and Policy Implication

This paper provides an examination of the impact of rapid growth of population in Saudi Arabia on both economic growth and savings for the period 1964-2000. Recent developments in econometrics methods are used. These methods include: stationarity tests, multivariate co-integration tests, suggested by Johansen and Jueslius and dynamic OLS (DOLS) approach suggested by Stock and Watson (1993).

Empirical results from Johansen test of co-integration as well as from error correction models reveal the presence of co-integrating (long run) relationship between population and economic growth and savings. These results provide support to the contention that population and economic development should be expected to possess a long run, rather than short run, relationship. Therefore, failure to account for such a pronounced long run relationship (long run linkage) between population and economic growth can lead to serious bias and incorrect inferences.

According to SAMA 2001 annual report based on estimates made by the Central Department of Statistics the average growth rate of the Saudi Arabian population is around 3.5% which is higher than the average rate reported for the Middle East and North African countries and higher than the average rate of the population of the world. Another factor is improvement in the standards of living leading to a decrease in mortality rate and a rise in life expectancy of the population. Life expectancy of the citizens of Saudi Arabia is estimated at 72 years which is higher than the world rate of about 67 years. Added to this, the continuation of heavy influx of expatriate workers and their families which contributed to the high population growth. The estimates also suggest that total population will increase to 33.4 million and the native Saudi Arabian population to 29.7 in 2020 with an average growth rate of 2.1% and 3.0% respectively.

These increases in population will directly lead to an increase in the demand for basic services such as education, health, transportation and communications, essential public utilities as electricity, water, and sewage, this in addition to the increase in the demand for housing. These increases will put pressure on saving and investment. Thus, there is a need to look seriously at the situation.

According to some studies (Burkett et al., 1999; Dasgupta, 1995, 2000; Johnson, 2000, 2001, among others) high population growth harms the environment, and puts pressure on depleted resources. Therefore, rapid population growth may not be beneficial to the society.

According to recent research, for Saudi Arabia to avoid the negative impact of the rapid growth of population on economic growth and development certain policies need to be considered. As Dasgupta (2000, 2001), Johnson (2000, 2001) and Dreze and Murthi (2001) have suggested women’s education and employment certainly reduce fertility. Further, the increase in life expectancy should be used as a means of increasing the productivity of human capital.

Moreover, Johnson (2000, 2001) has emphasized the importance of the increase in knowledge that can be transformed into technology and ways of utilizing resources more efficiently. He concludes (2000, 13) it is not only that “knowledge has increased rapidly but the means of communicating that knowledge in effective way have been markedly improved and the knowledge has become much more accessible throughout the world.” Therefore in his view, “ The rapid growth of knowledge has resulted both from the growth of the world’s population and the increase in the percentage of that population that is now able to devote time and energy to the creation of knowledge.”

Thus, education and skills match (Allen and Velden, 2001) and the quality of labor force measured by comparative tests of mathematical and scientific skills as suggested by Hanushek and Kimko (2000) are important aspects of productivity and economic growth. They conclude (2000, p. 1203) that “ A single conclusion emerges from the various analytical specifications: labor force quality has a consistent, stable, and strong relationship with economic 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, the findings by Zhang (2002, 93) that urbanization leads to declines in fertility confirm the finding of other research and studies. However, he reaches an important conclusion that developing countries, such as Saudi Arabia, could slow down population growth and stimulate economic growth by “improving rural education and infrastructure to enhance rural mobility and productivity.” Therefore, improving rural infrastructure “with respect to education facilities, transportation, and communication in particular, helps to break down the isolation in rural areas, reduce moving costs, and leads to similar fertility, education investment, and savings across rural and urban areas.”

When policy makers in Saudi Arabia plan for future economic growth they should consider the possibility that the increases in fertility may be influenced by the fact that parents may not bear the full cost of raising children because society, represented by the government, pays a significant part of the cost. Further, economic growth may encourage an increase in fertility. Thus, these growth policies may not succeed unless they are accompanied by policies related to population growth that can be implemented at the same time.

Finally, financial institution and capital market developments are important factors in encouraging future savings by individuals and families. Thus, financial and capital markets developments are crucial aspects in mobilizing savings to channel them to productive use. Financial markets and intermediaries should be innovative and intended to improve the productivity of investment, capital accumulation and economic growth.

Table (1)
Stationarity Test

Variables	ADF		PP	
	Level	Differenced	Level	Defferenced
lnY	-1.4012	-2.065	-0.8397	-2.2924
lnPOP	-2.329	-4.666*	-2.3992	-6.0440*
lnPYC	0.1277	-1.7009***	-1.2359	-1.8141**
lnTI	-1.6474	-2.6281***	-2.2454	-3.0017**
lnSV	-2.6156	-3.5626*	-2.2145	-3.59173*
lnFS	-1.9076	-1.7756	-0.4421	-2.0122

Table (2)
The Johansen Co-Integration Test

Egenvalues	λmax	λtrace	5% for λmax	5% for λtrace	Hypothesis
lnY=f(lnPOP, lnTI)					
0.52423	24.513	43.646	20.95	34.55	r=0*
0.37645	15.587	19.133	14.07	18.17	r≤1**
0.10190	3.547	3.547	3.74	3.74	r≤2***
lnPYC=f(lnPOP, lnTI)					
0.41818	17.873	37.044	20.95	34.55	r=0**
0.36694	15.087	19.171	14.07	18.17	r≤1**
0.11639	4.084	4.084	3.74	3.74	r≤2**
lnSV=f(lnY, lnPOP)					
0.52916	24.86	41.704	20.95	34.55	r=0*
0.28843	11.224	16.848	14.07	18.17	r≤1***
0.15655	5.618	5.618	3.74	3.74	r≤2*
lnSV=f(lnPOP, lnTI)					
0.5859	29.093	56.845	20.95	34.55	r=0*
0.4892	22.169	27.753	14.07	18.17	r≤1*
0.1557	5.584	5.584	3.74	3.74	r≤2**
lnFS=f(lnY, lnPOP)					
0.5901	29.429	41.242	20.95	34.55	r=0*
0.1735	6.287	11.813	14.07	18.55	r≤1
0.1542	5.526	5.526	3.74	3.74	r≤2**
lnFS=f(lnPOP, lnTI)					
20.95	0.5436	25.884	40.811	34.55	r=0*
0.2946	11.516	14.928	14.07	18.17	r≤1***
0.0982	3.412	3.412	3.74	3.74	r≤2**

* is significant at 1%, ** significant at 5%, and *** significant at 10%.

Table (3)
Vector Error Correction (VEC) Results

ΔlnY=0.0685+0.4039ΔlnYt-1 +0.195ΔlnYt-2 – 0.4377ΔlnPOPt-1 – 0.0654ΔlnPOPt-2
(1.966)** (1.333) (0.6805) (-0.9612) (0.13666)

+0.113ΔlnTIt-1 –0.135ΔlnTIt-2 –0.001 Trend –0.11VECt-1
(1.3899) (-1.762)*** (-0.829) (-1.94)**

Adj-R-sq=0.565 , F=6.0259**, Loglikelihood=65.657, AIC=-3.541, SC=-3.1288.

ΔlnPYC=-0.0436+0.7675ΔlnPYCt-1–0.385ΔlnPYCt-2+5.675ΔlnPOPt-1–0.847ΔlnPOPt-2
(-0.1602) (3.509)* (-1.953)** (1.150) (-0.1579)

+0.776ΔlnTIt-1 –0.952ΔlnTIt-2 –0.128VECt-1
(0.8534) (-1.079) (-2.6015)*

adj-R-sq=0.741, F=13.314*, Log likelihood= -13.314, AIC=1.332, SC=1.698.

ΔlnSV= -0.1988 +0.6083ΔlnSVt-1 +0.053ΔlnSVt-2 –2.6022ΔlnPOPt-1 +0.3887ΔlnPOPt-2
(-0.802) (2.692)* (0.2113) (-0.777) (0.115)

+2.543ΔlnYt-1 –0.0013ΔlnYt-2 +0.0069Trend –0.573VECt-1
(1.582)*** (-0.00084) (0.684) (-1.90)**

adj-R-sq=0.381, F=3.249**, Log Likelihood=3.2485, AIC=0.3595, SC=0.7717.

ΔlnFS= 0.1649 +0.544ΔlnFSt-1 –0.298ΔlnFSt-2 +0.971ΔlnPOPt-1 –0.332ΔlnPOPt-2
(3.815)* (2.6486)* (-1.794)** (1.0590) (-0.4127)

+0.2093ΔlnTIt-1 +0.0584ΔlnTIt-2 –0.0053Trend –0.0941VECt-1
(2.002)** (0.5178) (9-2.349) (-3.469)*

adj-R-sq= 0.845, F = 22.108*, Log Likelihood= 50.024, AIC= -2.564, SC= -2.152.

* significant at 1%, ** significant at 5%, *** significant at 10%.
AIC=Akaike Information Criterion, SC=Schwartz Criterion.

Table (4)
Stock-Watson Dynamic OLS Results (DOLS)

Variables/	Dependent		
	(Y)	SV	FS
Independent		Estimates	
Constant	2.213 (17.08)*	-2.1758 (-3.1872)*	-8.1878 (-21.681)*
lnPOP	1.283 (11.337)*	-2.5043 (-6.9564)*	-0.250 (-1.256)
lnY	0.650 (5.922)*	2.71411 (8.561)*	2.414 (13.764)*
ΔlnPOP	1.1449 (0.819)	-8.4716(-2.357)**	4.636 (2.332)
ΔlnY	-0.3098 (-1.202)	1.9902 (1.1694)	-1.1182 (-1.188)
ΔlnPOPt+1	2.3447 (1.725)**	-9.659 (-2.8462)*	4.0844 (2.176)**
ΔlnPOPt+2	2.826 (2.027)**	-5.4518 (-1.60)***	2.755 (1.424)
ΔlnPOPt-1	1.884 (1.281)	-8.775 (-2.662)*	4.2153 (2.311)**
ΔlnPOPt-2	2.569 (1.766)**	-4.900 (-1.500)***	2.450 (1.307)
ΔlnTIt+1	0.268 (0.8706)	--------------------	------------------
ΔlnTI+2	-0.288 (-0.944)	---------------------	-------------------
ΔlnTI-1	-0.272 (-1.212)	--------------------	--------------------
ΔlnTIt-2	-0.735 (-3.867)*	--------------------	---------------------
ΔlnYt+1	-------------------	2.798 (1.600)***	0.531 (0.547)
ΔlnYt+2	--------------------	1.2152 (0.739)	-0.3204 (-0.352)
ΔlnYt-1	--------------------	2.0423 (1.129)	-0.6018 (-0.6015)
ΔlnYt-2	------------------	0.048 (0.0324)	-0.0765 (-0.0931)
Adj-R-sq	0.978	0.894	0.995
F	109.998*	21.4332*	436.456*
Log Likelihood	36.266	10.67	28.431
AIC	-1.551	0.1554	-1.0188
SC	-0.944	0.763	-0.42157

Table (5)
OLS Regression Results

	Dependent Variables						
	LnY	lnSV			lnFS		
		1	2	3	1	2	3
C	0.066	0.0165	-0.0013	-0.014	0.0236	0.004	0.005
	(3.228)*	(0.1200)	(-0.0113)	(-0.0120)	(0.529)	(0.106)	(1.07)
ΔlnY		0.2537	0.4013	0.410	0.247	0.260	0.30
	--------	(2.704)*	(2.887)*	(2.90)*	(8.292)*	(8.28)*	(8.30)*
ΔlnPOP	-0.0627	-0.696			-0.502		
	(-0.1437)	(-1.032)	---------	---------	(-0.591)	--------	--------
ΔlnTI	0.282						
	(4.550)*	--------	--------	--------	--------	--------	--------
ΔlnDep1			-0.7249			-0.078	
	--------	--------	(-1.1469)	--------	--------	(-0.100)	--------
Δlndep2				-0.7410			0.080
	--------	--------	--------	(-1.247)	--------	--------	(-0.101)
adj-R-sq	0.403	0.2212	0.2272	0.230	0.693	0.690	0.6701
F	10.475*	4.401**	4.557*	4.643*	35.057*	34.51	34.509
D.W.	1.751	1.549	1.5404	1.640	1.727	1.22	1.21
Lg lik	60.185	-0.6908	-0.559	-0.590	37.514	37.33	37.34
AIC	-3.364	0.2171	0.2094	0.210	-2.03	-2.02	-2.019
SC	-3.229	0.3518	0.3440	0.3402	-1.896	-1.88	-1.90

Table (6)
Correlation between the Variables

	SV	FS	POP	Y	ΔSV	ΔFS	ΔPOP	ΔY
SV	1.000	-----	-----	-----	-----	-----	-----	-----
FS	0.0137	1.000	-----	-----	-----	-----	-----	-----
POP	-0.0385	0.986	1.000	-----	-----	-----	-----	-----
Y	0.1966	0.9754	0.9511	1.000	-----	-----	-----	-----
ΔSV	-0.0151	-0.399	-0.300	-0.378	1.000	-----	-----	-----
ΔFS	0.4520	-0.3466	-05112	-0.3486	0.294	1.000	-----	-----
ΔPOP	0.3038	0.5815	0.5259	0.5718	-0.194	-0.116	1.000	-----
ΔY	0.3.272	-0.3843	-0.4607	-0.3667	0.441	0.831	-0.0685	1.000

References

1. Agiomirgianakis, G. and Zervoyiannis, A. " Economic Growth, international Labor Mobility and Unanticipated non-monetary Shocks," *Journal of Policy Modeling*, 2001 (23), 1-16.
2. Ahlburg, D. " The Impact of Population Growth on Economic Growth in Developing Nations: the Evidence from Macroeconomic Demographic Models," in *Population Growth and Economic Development: Issues and Evidence*, D. Gale Johnson and R. Lee (eds), 1987.
3. Allen, J. and van der Velden, R. "Educational Mismatches versus Skill Mismatches: Effects on Wages, Job Satisfaction, and on the Job Search," *Oxford Economic Papers*, 2001(53), 434-452.
4. Al-Najjar, B. "Population Policies in the Countries of the Gulf Cooperation Council," in *Change and Development in the Gulf.* A. Abdelkarim (ed.) , London: MacMillan Press, 1999.
5. Banerjee, A., Dolado, J., Galbrith, J. and Hendry, D. *Cointegration, Error Correction, and theEconomic Analysis of non Stationary Data.* Oxford: Oxford University Press, 1993.
6. Barlow, R. " Population Growth and Economic Growth: Some More Correlation," *Population and Development Review*, 1994 (20), 153-165.
7. Barro, R. "Determinants of Economic growth*: A* Cross-Country Empirical Study," *Harvard Institutefor International Development: Discussion*, 579, 1997.
8. Barro, R. and Becker, G. " Fertility Choice in a Model of Economic Growth," *Econometrica*, 1989 (57), 481-501.
9. Becker, G. "An Economic Analysis of Fertility," in *The Economic Approach to Human Behavior.* Chicago: University of Chicago Press, 1973.
10. ------- " Family Economics and Macro Behavior," *American Economic Review*, 1988 (78), 1-13.
11. -------- " Fertility and the Economy," *Journal of Political Economy*, 1992 (100), 185-201.
12. Becker, G. and Barro, R. " An Reformation of the Economic Theory of Fertility," *Quarterly Journal of Economics*, 1988 (103), 1-25.
13. Becker, G., Glaser, E. and Murphy, K. " Population and Economic Growth," *American Economic Review*, 1999 (89), 145-160.
14. Bilsborrow, R. "Dependency Rates and Aggregate Savings Rates Revisited: Correction, Further
15. Analysis, and Recommendations for the Future," in J. Simon and J. Da Vanzo (eds.), *Research in Population Economics*, Greenwich: JAI Press, 1980. Holland, 1988.
16. Blackburn, K. and Cipriani, G. " Endogenous Fertility, Mortality and Growth," *Journal of Population Economics*, 1998 (11), 517-534.

17. Blanchet, D. " On Interpreting Observed Relationship between Population Growth and Economic Growth: A Graphical Exposition," *Population and Development Review*, 1991 (17), 105-114.
18. Brander, J. and Dowrick, S. " The Role of Fertility and Population in Economic Growth : An Empirical Results from Aggregate Cross-National Data," *NBER Working Paper* 4270, 1993.
19. Brander, J. and Taylor, S. " The Simple Economics of Easter Island: A Ricardo-Malthus Model of Renewable Resource Use," *American Economic Review*, 1998 (88), 119-138.
20. Broome, J. "The Welfare Economics of Population," *Oxford Economics Papers*,1996 (48),177-193.
21. Burkett, J., Humblet, C. and Putterman, L. " Preindustrial and Postwar Economic Development: Is There a Link," *Economic Development and Cultural Change*, 1999 (47), 471-495.
22. Caldwell, J. " Malthus and the Less Developed World: The Pivotal Role of India," *Population and Development Review*, 1998 (24), 675-696.
23. Caselli, F. and Coleman, W. " The U. S. Structural Trasformation and Regional Convergence: A Reinterpretation," *Journal of Political Economy*, 2001 (109), 584-616.
24. Cassen, R. " Population and development: A Survey," *World Development*, 1978 (4), 785-830.
25. Chenery, H., Robinson, S. and Syrquin, M. *Industrialization and Growth*: *A Comparative Study*. Oxford: Oxford University Press, 1986.
26. Chesnais, J. "Population Growth and Development: An Unexplained Boom," *Population Bulletin of the United Nations*, 1987, (22), 17-25.
27. Cheung, Y. and Lai, K. "Finite Sample Size of Johansen's Likelihood Ratio Tests for Cointegration," *Oxford Bulletin of Economics and Statistics*, 1993 (55), 313-328.
28. Coale, A. " The Problem of Rapid population Growth," in *economic Development Challenge and Promise*. S. Spiegelglas and C. Welsh (eds), London: Prentice-Hall Press, 1970.
29. Coale, A. and Hoover, E. *Population Growth and Economic Development in Low Income Countries a Case Study of India's Prospects*. Princeton: Princeton University Press, 1958.
30. Collins, S. "Saving Behavior in Ten Developing Countries," in B. bernheim and J. Shoven (eds.), *National Saving and Economic Performance*. Chicago: University of Chicago Press, 1991.
31. Cuthbertson, K., Hall, S. and Taylor, M. *Applied Econometrics Techniques*. New York: Phillips Allen, 1992.

32. Darrat, A. and Al-Yousif, Y. “ On the Long-Run Relationship between Population and Economic Growth: Some Time Series Evidence for Developing Countries,” *Eastern Economic Journal*, 1999 (25), 301-313.
33. Dasgupta, P. “The Population Problem: Theory and Evidence,” *Journal of Economic Literature*, 1995 (33), 1879-1802.
34. -------- “Population and resources: an Exploration of Reproductive and Environmental Externality,”*Population and Development Review*, 2000 (26), 643-689.
35. --------- “ On Population and Resources: Reply,” *Population and Development Review*, 2001(27), 748-754.
36. Dawson, P. and Triffin, R. “ Is There a Long-Run Relationship between Population Growth and Living Standards? The Case of India,” *Journal of Development Studies*, 1998 (34), 149-156.
37. Deaton, A. *Understanding Consumption*. Oxford: Oxford University Press, 1992.
38. Dickey, D. and Fuller, W. “ Distribution of the Estimators for Autoregressive Time Series with Unit Roots,” *Journal of the American Statistical Association*, 1979 (74), 427-431.
39. -------- “Likelihood Ratio Statistics for Autoregressive Time Series with Unit Root,” *Econometrica*, 1981 (49), 1057-1072.
40. Dreze, J. and Murthi, M. “Fertility, Education, and Development: Evidence from India,” *Population and Development Review*, 2001 (27), 33-63.
41. Easterlin, R, “Effects of Population Growth in the Economic Development of Developing Countries,” *Annals of the American Academy of Political and Social Science*, 1967 (369), 98-108.
42. Ehrlich, I. and Lui, F. “ Intergenerational Trade, Longevity and Economic Growth,” *Journal of Political Economy*, 1991 (99), 1029-1059.
43. Engle, R. and Granger, C. “ Cointegration and Error Correction: Representation, Estimation and Testing,” *Econometrica*, 1987 (55), 251-276.
44. Fischer, S. “ Economic Growth and Economic Policy,” in V. Corbo and M. Golgstein and M. Khan (eds.) *Growth Oriented Adjustment Programs.* Washington D.C. World Bank, 1987.
45. Fry, M. and Mason, A. “The Variable Rate-of-Growth Effect in Life-Cycle Model,” *Economic Inquiry*, 1982 (20),
46. Fuller, W. *Introduction to Statistical Time Series*. New York: John Wily and Sons, 1996.
47. Galor, O. and Weil, D. “The Gender Gap, Fertility, and Growth,” *American Economic Review*, 1996 (86), 374-387.
48. --------- “ Population, Technology, and Growth: From Malthus Stagnation to the Demographic Transition and Beyond,” *American Economic Review*, 2000 (90), 806-828.

49. Goldberger, A. "Dependency rates and Savings Rates: Further Comment," *American Economic Review*, 1973 (63), 232-233
50. Gomez, M. Subsidy Policies in a Fertility Choice model," *Atlantic Economic Journal*, 2001 (29), 438-449.
51. Gonzalo, J. " Five Alternative Methods of Estimating Long Run Equilibrium Relationships," *Journal of Econometrics*, 1994 (60), 203-233.
52. Granger, C. " Developments in the Study of Cointegrated Economic Variables," *Oxford Bulletin of Economics and Statistics*, 1986 (48), 213-228.
53. Granger, C. and Newbold, P. "Spurious Regressions in Econometrics," *Journal of Econometrics*, 1974 (2), 111-120.
54. Green, A. and Sparks, G. "Population Growth and the Dynamics of Canadian Development: a Multivariate Time Series Approach," *Explorations in Economic History*, 1999 (36), 56-71.
55. Hakkio, C. and Rush, M. "Cointegration: How Short is the Long Run?" *Journal of International Money and Finance*, 1991 (10), 571-581.
56. Horlacher, D. and MacKellar, F. "Population Growth versus Economic Growth," in D. Salvatore (ed.), *World Population Trends and Their Impact on Economic Development*. Westport: Greenwood Press, 1988.
57. Hall, R. " Stochastic Implications of the Life Cycle Permanent Income Hypothesis: Theory and Evidence," *Journal of Political Economy*, 1978 (86), 971-987.
58. Hamilton, K. and Clemens, M. " Genuine Savings Rates in Developing Countries," *World Bank Economic Review*, 1999 (13), 333-356.
59. Hammer, J. " Population Growth and Savings in LDC's: A Survey Article," *World Development*, 1986 (14), 579-591.
60. -------- " Demographic Transition and Aggregate Savings in Less Developed Countries," *Journal of Economic Development*, 1987 (12), 21-37.
61. Hanushek, E. and Kimko, D. "Schooling, Labor-Force Quality, and the Growth of Nations," *The American Economic Review*, 2000 (90), 1184-1208.
62. Hodgson, D. " Orthodoxy and Revisionism in American Demography," *Population and Development Review*, 1988 (14), 541-569.
63. Hondroyiannis, G. and Papapetrou, E. "Demographic Changes, Labor Effort and Economic Growth: Empirical Evidence from Greece," *Journal of Policy Modeling*, 2001 (23),169-188.
64. Hsiao, C. "Causality Tests in Econometrics," *Journal of Economic Dynamics and Control*, 1979 (1), 321-349.
65. ---------- "Autoregressive Modeling and Money-Income Causality Direction," *Journal of Monetary Economics*, 1981 (7), 85-106.
66. Johansen, S. "Statistical Analysis of Cointegrating Vectors," *Journal of Economic Dynamics and Control*, 1988 (12), 213-254.

67. -------- " Estimation and Hypothesis Testing of Cointegration Vectors in Gausian Autoregressive Models," *Econometrica*, 1991 (59), 1551-1580.
68. Johansen, S. and Jueslius, K. " Maximum Likelihood Estimation and Inference on Cointegration: with Application to the Demand for Money," *Oxford Bulletin of Economics and Statistics*, 1990 (52), 169-210.
69. Johnson, D. "Effects of Institutions and Policies On Rural Population Growth with application to China," *Population and Development Review*1994 (20), 503-531.
70. ---------- "Population, Food and Knowledge," *American Economic Review*, 2000 (90), 1-14.
71. ---------- " On Population and Resources: a Comment," *Population and Development Review*, 2001 (27), 739-747.
72. Jung, W. and Quddus, M. "Economic Development and Population Growth: International Evidence Based on Causality Analysis," *Analysis Economics*, 1986, 33-46.
73. Kapuria-Forman, V. " Population and Growth Causality in Developing Countries," *Journal of Developing Areas*, 1995 (29), 531-540.
74. Kelly, A. "Savings, Demographic Change, and Economic Development," *Economic Development and Cultural Change*, 1976 (24), 683-693.
75. -------- "Economic Consequences of Population Change in the Third World," *Jpurnal of EconomicLiterature*, 1988 (26), 1685-1728.
76. Kelley, A. and Williamson, J. "Population Growth, Industrial Revolutions, and the Urban Transition," *Population and Development Review*, 1984 (10), 419-441.
77. Kelley, A. and Schmidt, R. " Population and Income Change: Recent Evidence, " *World Bank Discussion Paper*, 249, 1994.
78. ------------- "Toward A Cure for the Myopia and Tunnel vision of the Population Debate: A Dose of Historical Perspective," in D. Ahlburg, A. Kelley and K. Mason (eds.), *The Impact of Population Growth on Well-being in Developing Countries*, Berlin: Springer-Verlag, 1996, 11-35.
79. Kuznets, S. *Population, Capital and Growth.* New York: W.W. Norton and Company, 1973.
80. Lee, R. " Economic Consequences of Population Size, Structure and Growth," International Union for the scientific Studies of Population, *Newsletter*, 1983 (17), 43-59.
81. Lee, J. and Feng, W. " Malthusian Models and Chinese Realities: The Chinese Demographic System 1700-2000," *Population and Development Review*, 1999 (25), 33-65.
82. Leff, N. "Dependency Rates and Savings Rates," *American Economic Review*, 1969 (59), 886-896.

83. Levine, R. and Renelt, D. "A Sensitivity Analysis of Cross-Country Growth Regressions," *American Economic Review*, 1992 (82), 942-963.
84. Little, J. and Triest, R. "The Impact of Demographic Change on U. S. Labor Market," *FRB-Boston- New England Economic Revew*, 2002 (1st Quarter), 47-68.
85. MacKinnon, J. "Critical Values for Cointegration Tests," in R. Engle and C. Granger (eds), *Long Run Economic Relationships: Reading in Cointegration.* Oxford: Oxford University Press, 1991.
86. Maddison, A. *Monitoring the World Economy*. Paris: Organization for Economic Cooperation and Development, 1995.
87. Mason, A. " National Saving Rates and Population Growth: A New Model nd New Evidence," in D. Johnson and R. Lee (eds.), *Population Growth and Economic Development: Issues and Evidence.* Madison: University of Wisconsin Press, 1987.
88. ---------- "Saving, Economic Growth and Demographic Change," *Population and Development Review*, 1988 (14), 113-144.
89. McNicoll, G. " Consequences of Rapid Population Growth: An Overview and Assessment," *Population and Development Review*, 1984 (10), 177-240.
90. Nelson, C. and Plosser, C. " Trends and Random Walks in Macroeconomic Time Series: Some Evidence and Implications," *Journal of Monetary Economics*, 1982 (10), 130-162.
91. Newey, W. and West, K. "A Simple, Positive Semi-Definite, Heteroskdasticity and Autocorrelation Consistent Covariance Matrix," *Econometrica*, 1987 (55), 703-708.
92. Ohanian, L. " The Spurious Effects of Unit Roots on Vector Autoregression: A Mone Carlo Study," *Journal of Econometrics*, 1988 (39), 251-266.
93. Olsen, R. "Fertility and the Size of the U. S. Labor Force," *Journal of Economic Literature*,1994 (32), 60-100.
94. Osterwald-Lenum, M. " A Note with Fractiles of the Asymptotic Distribution of the Maximum Likelihood Cointegration Rank Test Statistics: Four Cases," *Oxford Bulletin of Economics and Statistics*," 1992 (54), 461-471.
95. Perlman, M. "Population and Economic Change in Developing Countries: A Review Article," *Journal of Economic Literature*, 1981 (19), 74-82.
96. Perron, P. " Trends, Random Walks in Macroeconomic Time Series: Further Evidence from New Approach," *Journal of Economic Dynamics and Control*, 1988 (12), 297-302.
97. Phillips, P. " Understanding Spurious Regressions in Econometrics," *Journal of Econometrics*,1986 (33), 311-340.
98. ------- " Time Series Regressions with Unit Root," *Econometrica*, 1987 (55), 277-301.

99. ------- " Optimal Inference in Cointegrated Systems," *Econometrica*, 1991 (59), 283-306.
100. Phillips, P. and Perron, P. " Testing for a unit Root in Time Series Regression," *Biometrica*, 1987 (75), 335-346.
101. Quispe-Agnoli, M. and Zavodny, M. " The Effect of Immigration on Output Mix, Capital, and Productivity," FRB-Atlanta, *Economic Review*, 2002 (87), 17-27.
102. Ram, R. "Dependency Rates and Aggregate Savings: A New International Cross-Section Study," *American Economic Review*, 1982 (72), 537-544.
103. Robinson, S. " Sources of Growth in Less Developed Countries: A Cross Section Study," *Quarterly Journal Of Economics*, 1971 (33), 391-408.
104. Ruttan, V. "Can Economic Growth Be Sustained? A Post-Malthusian Perspective," *Population and Development Review*, 2002 (28), 1-12.
105. Schultz, T. " Human Capital, Family Planning, and Their Effects on Population Growth," *American Economic Review*, 1994 (84), 255-260.
106. Schultz, T. "Economic Demography and Development: New Directions in an Old Field," in G. Ranis and P. Schultz (eds.) *The State of development Economics: Progress and Perspectives*. New York: Basil Blackwell, 1988.
107. ---------- " The Demand for Children in Low income Countries," In M. Rosenzweig and O. Stark (eds.) *Handbook of Population and Family Economics*, 1A, Amsterdam: North Holland, 1997.
108. Schwert, G. " Effects of Model Specification on Tests for Unit Root in Macroeconomics Data," *Journal of Monetary Economics*, 1987 (20), 93-103.
109. -------- "Tests for Unit Roots: A Monte Carlo Investigation," *Journal of Business and Economics Statistics*," 1989 (7), 147-159.
110. Shiller, R. and Perron, P. "Testing the Random Walk Hypothesis: Power versus Frequency of Observation," *Economics Letters*, 1985 (18), 381-386.
111. Shumaker, L. and Clark, R. "Population Dependency Rates and Savings Rates: Stability of Estimates," *Economic Development and Cultural Change*, 1992 (40), 319-332.
112. Simon, J. " Population Growth May be Good for LDC's in the long Run: A Richer Simulation Model," *Economic Development and Cultural Change*, 1976 (24), 309-337.
113. -------- *The Economics of Population Growth*. Princeton: Princeton University Press, 1977.
114. ------- " On Aggregate Empirical Studies Relating Population Variables to Economic Development," *Population and Development Review*, 1989 (15), 323-332.
115. ------- *The Ultimate Resource*, Princeton: Princeton University Press, 1981.
116. ------- *Population and Development in Poor Countries*. Princeton: Princeton University, 1992.

117. Solow, R. “Technical Change and the Aggregate Production Function,” *Review of Economics and Statistics*, 1956 (39), 312-320.
118. Stock, J. and Watson, M. “ A Simple Estimator of Cointegrating Vectors in Higher Order Integrated Systems,” *Econometrica*, 1993 (61), 783-820.
119. Taylor, A. “Debt, Dependence and Demographic Transition: Latin America into the Next Century,” *World Development*, 1995 (23),
120. Taylor, A. and Williamson, J. “ Capital Flows to the New World as an Intergenerational Transfer,” *Journal of Political Economy*, 1994 (102), 348-371.
121. Thirwell, A. “ A Cross Section Study of Population Growth and the Growth of Output and Per Capita Income in A Production Function Framework,” *The Manchester School*, 1972 (40), 339-356.
122. Timmer, P. “Population, Poverty and Policies,” *American Economic Review*, 1994 (84), 261-65.
123. Thornton, J. “ Population Growth and Economic Growth: Long-Run Evidence from Latin America,” *Southern Economic Journal*, 2001 (68), 464-468.
124. Wang, P., Yip, C. and Scotese, C. “Fertility Choice and Economic Growth Theory and Evidence,” *Review of Economics and Statistics*, 1994 (46), 255-266.
125. Winegarden, C. and Wheeler, M. “ The Role of Economic Growth in the Fertility Transition in Western Europe: Econometric Evidence,” *Economica*, 1992 (59), 421-435.
126. Yi, Z. and Vaupel, J. “The Impact of Urbanization and Delayed Childbearing on Population Growth and Age in China,” *Population and Development Review*, 1989 (15), 425-445.
127. Zhang, J. “Urbanization, Population Transition, and Growth,” *Oxford Economic Papers*, 2002 (54), 91-117.

النمو السكاني والتنمية الاقتصادية في المملكة العربية السعودية

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الملخص :

النمو المطرد للسكان يؤثر على النمو الاقتصادي أذا كان هذا النمو السكاني يؤثر على العرض والطلب على الادخارات ومن ثم على كفاءة رأس المال. هذا التخوف يعتبر أحد أسس نظرية مالثوس عن تأثير زيادة النمو السكاني على إنتاجية العمالة ومن ثم تناقص إنتاجيتها على أساس أنه لا يوجد مع هذه الزيادة في العمالة المترتبة عن الزيادة في السكان ما يقابلها من رأس المال. حيث يفترض أن نسبة النمو في رأس المال لا تتناسب مع الزيادة المطردة في العمالة.

النماذج النظرية والدراسات الإحصائية المتعلقة بالنمو السكاني تعطي توقعات غامضة ونتائج مختلفة ومتضاربة حول تأثير النمو السكاني المتمثل في نسبة الأطفال المعتمدين على عائل وكذلك نسبة الكبار المتقاعدين على نسبة الادخار.

إلا أن الدراسات السكانية الحديثة طورت أفكارا جديدة حول هذا التأثير فهي تؤكد أن نسبة التزايد في السكان قد تؤدي إلى تأثيرات إيجابية عن طريق تحفيز الابتكارات والتطورات التي تؤدي بالمقابل إلى زيادة النمو الاقتصادي. فهذه الدراسات تؤكد على حقيقة التطورات الهائلة في المعرفة التي تم تحويلها إلى تقنية متطورة ومن ثم تم تطويعها لاستخدام الموارد الطبيعية الاستخدام الأمثل.

التقديرات السكانية للمملكة العربية السعودية توضح أنه منذ بداية السبعينات طرأت تطورات كبيره على النمو السكاني بسبب زيادة نسبة المواليد وكذلك الزيادة في العمر المتوقع للسكان.

النتائج الإحصائية لهذه الدراسة توضح أن هذه التطورات في زيادة السكان لها تأثير سلبي على كل من الادخار وكذلك على النمو الاقتصادي. لهذا فأنه من المهم البحث عن الطرق وإيجاد السياسات التي تحد من الزيادة المطردة في نسبة المواليد وفي نفس الوقت أيجاد الوسائل الكفيلة بزيادة الإنتاجية للسكان ومن ثم تعزيز النمو والتنمية الأقتصاديه.