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THE ROLE OF HUMAN CAPITAL IN THE ECONOMIC GROWTH OF PAKISTAN

By

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THE ROLE OF HUMAN CAPITAL IN THE

ECONOMIC GROWTH OF PAKISTAN

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ABSTRACT

Role of Human Capital in the Economic Growth of Pakistan

by

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This study analyzes the relation between investment in human capital and rate of growth of per capita income in Pakistan. The study is conducted using data from 1965 to 1992 for Pakistan within the neoclassical growth accounting framework. Recognizing the shortcoming of the previous studies in adjusting for changes in the quality of the labor force, this study incorporates the role of investment in education and health (human capital) in Pakistan's economic growth. Moreover, attention is focused on analyzing the effects of openness to international trade on the economy.

The study utilizes different proxies for investment in human capital in addition to the traditional sources of growth such as capital, labor, and exports. School enrollment ratios, skill differentials, and occupational mixes are used to characterize investment in education, and life expectancy at birth and physician per 1,000 population represent investment in health.

The empirical results suggest that an increase in the rate of growth of capital

stock and openness to trade have a positive and statistically significant impact on Pakistan's economic growth. The coefficient of raw labor is negative and insignificant, indicating that raw labor (low skill) may not significantly contribute to economic growth. The effect of improvement in education on economic growth is generally positive and significant in all the models estimated. Primary and secondary education variables are both positive. The coefficient for primary education is, however, statistically insignificant suggesting that investment in primary education is characterized by a substantially long gestation period. The results of skill differentials and occupational groupings reinforce the findings of a positive relationship between investment in education and the economic growth of Pakistan.

The findings for improvements in health, however, are inconclusive suggesting a nebulous short-run impact on Pakistan's per capita growth rate. This may have been due to the collinear nature of other regressors in the model such as labor and capital both of which have positive effects on economic growth. The study reemphasizes the importance of investment in human capital and stresses the need to formulate appropriate education and health policies by the Pakistani government.

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1

Introduction

Regional Overview

Since its independence from the British in 1947, Pakistan has faced numerous economic, political, and social problems related to its development. In spite of all these problems, Pakistan has been able to achieve a relatively superlative economic growth. It began its efforts for planned economic development in 1955. At that time, the economy was essentially stagnant with per capita income lingering around $65 per year. The general performance of the economy and its very slow rate of economic growth placed Pakistan among the poorest of the developing nations (World Development Report, 1982).

Since the early 1960s, Pakistan's economic performance has undergone a transformation. A comparison of the early 1990s with the late 1940s shows a fairly significant economic growth over the period (averaging about 5 percent). In 1994, the value of Pakistan's economy was estimated at just under US $52 billion. For a population of some 127 million, this means an

average annual income of approximately US $400 per person (World Development Report, 1994).

The country's gross domestic product (GDP) has increased at the average of 4.8 percent per annum since 1947. With the population growth rate of 3.1 percent, personal income increased by only 1.7 percent. Even at this rate, however, the income of an average Pakistani in 1994 was more than three times what it was at the time of its independence. While these statistics confirm that a significant change has occurred, the image of success has been questioned due to a decline in Pakistan's relative economic performance in recent years.

The paradox of growth in Pakistan is that it is a resource-rich, but economically poor and weak country. It is suffering from widespread economic underdevelopment, owing to an under-utilization of human and physical resources with the consequence of poverty and economic growth stagnation.

A 1990 adult literacy rate of 35 percent for Pakistan when compared with other selected nations indicates that little effort is taken on the part of either the government or the people themselves to improve the quality of

labor (Table 1). Comparable efforts also appear to be lacking in improving the health standards since Pakistan lags behind other low-income countries in this area as well (Table 2).

As with other sectors of the economy, Pakistan inherited a relatively underdeveloped educational system in 1947 at the time of independence. The system was made up of three parts: state schools operated by the state or federal authorities, private schools managed by charities, and colleges which were affiliated with Punjab University. The Pakistan government's efforts to ameliorate the level of literacy in the rural areas were inadequate due to its commitment of approximately 80 percent of education expenditures to the urban sectors (Noman, 1988). Furthermore, little attention was paid to improving the economic environment in the countryside which would have motivated the rural people to seek education.

According to Noman (1988), there is a wide gap between rural and urban literacy rates. Adult literacy rate is 48 percent in urban areas compared to 17 percent in the countryside. The literacy rate is low in rural areas because people see little economic return from education and their economic status does not allow them to defer present consumption for

Table 1

School Enrollment Ratios, Adult Literacy Rates, and Expenditures on Education in Selected Developing Countries.

	Primary School Enrollment Ratio		Adult Literacy Rates (Percentage)		Share of Education in Government Expenditures (%)	
	1960	1990	1960	1990	1981	1986
Bangladesh	48	73	24	36	3.8	9.9
Indonesia	67	117	47	82	7.9	8.5
India	42	97	24	48	1.9	2.1
Rep. Korea	96	108	71	96	17.9	18.1
Malaysia	75	93	23	78	15.9	19.4
Pakistan	**30**	**37**	**16**	**35**	**3.1**	**3.2**
Philippines	95	111	72	90	14.2	20.1
Singapore	112	110	74	88	19.1	21.6
Sri Lanka	95	107	61	88	7.2	8.4
Thailand	136	85	68	93	19.3	19.5

Sources: UNESCO, Statistical Yearbook: 1981, 1983, 1985, and 1987; UNESCO Statistical Digest.

Notes: Enrollment ratio is defined as all students enrolled in a school type irrespective of their age divided by the number of student in the relevant age range for that particular school type. Therefore, it is quite feasible for enrollment ratio to exceed 100 percent.

Table 2

Health Indicators in Selected Developing Countries.

	Under Five Mortality Rate (per 1000)		Infant Mortality Rate (per 1000)		Life Expectancy (at birth)	
	1960	1990	1960	1990	1960	1990
Afghanistan	203	65	142	47	47	63
Bangladesh	262	180	215	167	33	43
India	282	142	165	94	44	59
Rep. Korea	120	35	85	23	54	70
Malaysia	105	29	73	22	54	70
Pakistan	**276**	**158**	**163**	**104**	**43**	**58**
Philippines	134	69	80	43	53	64
Singapore	49	9	36	8	65	74
Sri Lanka	114	35	71	26	62	71
Thailand	149	34	103	26	52	66

Source: The Economic and Social Survey of Asia and The Pacific (ESCAP) Secretariat, based on "Survey of the quality of life on health in the ESCAP region," Seoul, Korea.

future human capital investment. There are very few opportunities available for those who do receive education, causing them to migrate to cities in search of jobs. Furthermore, the environment in the countryside does not encourage rural parents to send their children to school because the opportunity cost for the time spent in school could not be justified by the extra income the additional years of schooling might bring.

There is also a great need to improve the health standards in Pakistan. The reasons are similar to those that have contributed to the backwardness of the educational systems, i.e., the lack of rural voice in demanding appropriate facilities and the pronounced urban bias on the part of the government (Table 3). According to the Fifth Five Year Plan, "There are imbalances in the allocation of facilities between rural and urban areas," and "it is evident that the scale on which health services are available for the population of rural areas is comparatively poorer than urban areas" (Government of Pakistan: The Fifth Year Plan, 1988). The objective under this plan was to restore the balance in health services between urban and rural areas. However, that objective has not been realized.

The areas in which Pakistan displays a higher level of development compared to other low income countries relate to the contribution of the

Table 3

Population Growth and Health Infrastructure in Selected Developing Countries.

	Population in Millions		Average annual growth rate %	Population with health services %		
				Urban	Rural	Total
	1980	1990	1980-1990	1980-1990		
Afghanistan	16	17	0.30	100	30	39
Bangladesh	88	114	2.54	97	47	45
India	689	846	2.06	99	39	59
Iran	39	58	3.95	95	65	80
Nepal	15	20	2.76	90	---	90
Pakistan	**85**	**118**	**3.26**	**99**	**35**	**55**
Sri Lanka	15	17	1.5	93	---	93

Source: The Economic and Social Survey of Asia and the Pacific (ESCAP) Secretariat, based on "Survey of quality of life on health in the ESCAP region," Seoul, Korea.

manufacturing sector to the gross domestic product and the share of labor force employed in industry (Table 4). The process of development has moved resources out of the agricultural sector into industry, as well as into commerce, and services. Economic growth has also contributed to the movement of the labor force from agriculture into these non-agricultural pursuits. The movement of these physical and human resources suggests that there would be an increased demand for a well educated and trained labor force.

Productivity and Economic Growth: Pakistan

Improvements in educational attainment of the labor force affect economic growth because a more educated labor force is expected to be more skilled, adaptable and entrepreneurial. Furthermore, education is expected to complement and raise the productivity of new physical capital. Haymai and Ruttan (1970) report that the education of farmers and production laborers is an important determinant of economic productivity. For developing countries, however, the data on education of the labor force are not readily available. Therefore, adult literacy and school enrollments are the effect of education on the economic growth. Changes in these rates over time show that the quality of the labor force has improved significantly. On the average,

Table 4

Total Labor Force and Sectorial Employment in Selected Developing Countries.

(Millions)		Total Labor Force	Total Employment	Agriculture	Manufacturing
Bangladesh	1975	27.3	16.1	11.6	1.3
	1980	30.8	18.9	13.0	1.5
	1986	30.4	26.7	14.5	2.6
China	1975	381.7	381.7	294.6	42.8
	1980	424.4	419.0	302.1	56.0
	1986	515.5	512.8	313.1	89.9
Indonesia	1975	48.4	47.3	29.1	4.0
	1980	52.4	51.6	28.8	4.7
	1986	70.2	68.3	37.6	5.6
Malaysia	1975	4.3	4.0	1.9	0.5
	1980	5.1	4.8	1.8	0.8
	1986	6.2	5.7	1.8	0.9
Pakistan	**1975**	**20.4**	**20.1**	**11.0**	**2.7**
	1980	**24.9**	**24.0**	**12.6**	**3.5**
	1986	**29.3**	**28.2**	**13.3**	**4.5**
Philippines	1975	15.2	14.5	7.8	1.7
	1980	17.3	16.4	8.5	1.8
	1986	21.2	19.8	9.7	1.9
Thailand	1975	18.3	18.1	13.3	1.4
	1980	22.7	22.5	15.9	1.8
	1986	27.7	26.7	17.8	2.1

Source: Asian Development Bank, Member Countries of ABD, (1988).

literacy growth rates are lower in high income countries due to higher initial literacy levels.

Even though the literacy rate and school enrollment have increased in Pakistan, they are still well below other less developed countries (Table 1). Consequently, the educational attainment of the employed labor force is very low. In 1967, about 75 percent of the labor force was illiterate (Labor Force Survey, The Government of Pakistan, 1991). This proportion dropped to 66 percent by 1989. According to the survey, the share of the labor force with primary or less than primary education has declined from about 9 percent of the total labor force in 1967 to about 3 percent in 1985. It has increased slightly to about 4 percent by 1991. Meanwhile, the proportion of the labor force with a secondary or college education has increased from 6 percent to 9 percent in the early 1990s. The contribution of a growing educated labor force to economic growth is an important issue which is examined in detail in this study.

An improvement in health is another source of increased labor productivity. At the micro level, clinical survey responses to disease symptoms, height, weight, and reports on incapacity for undertaking normal activities are used as health indicators. At an aggregate level, basic indicators

of the health status are life-expectancy at birth, mortality rate of infants and children, and population per physician. On the average, these indicators have considerably improved (Table 2); but they are still considered to be well below the level of the developed world. Much like education, improvements in these indicators are higher in less developed countries (LDCs) than in high income countries. This could be due to the rapid increase in their economic growth rate, increase in the initial investment in medical personnel, and public health facilities. Empirical studies for Pakistan indicate a positive relationship between health and economic growth until 1970s. The trend is mixed afterwards. From the comparative data on health indicators for selected countries in the region, one can conclude that Pakistan lags far behind in providing health services to the population (Table 2).

Physical capital stock plays an important role in the productivity and growth of a country. In neoclassical growth models, capital accumulation is the main source of economic growth. High population growth rate, if accompanied by rising capital formation, leads to economic growth because it increases labor productivity and leads to capital-embodied technological change (Lewis, 1954). Thus, a continuous rise in the capital share is necessary to maintain the capital/labor ratio and high levels of productivity in countries with a high rate of population and labor force growth such as

Pakistan. The importance of capital input is more prominent in Pakistan where capital shortage is considered a major deterrent to growth and development. On the average, the capital stock was rising at an increasing rate in Pakistan until the 1980s. There has been a mixed trend since that time. Recent decline in physical capital investment may, therefore, be responsible for the slower economic growth.

The foreign trade sector plays an important role in the economic growth of LDCs. This sector is comprised of imports and exports. In the 1960s and early 1970s, exports were considered to be the 'engine of growth' because they made possible the exploitation of economies of scale which improved a country's competitive position in the world market. Furthermore, with falling foreign aid and low private capital inflows, exports increased the capacity of LDCs to import capital equipment and other intermediate inputs necessary for economic growth. According to World Development Report (WDR, 1992), export growth rates for Pakistan varied significantly over time . The export sector shrank due to global recession which resulted in lower demands for primary inputs from Pakistan during the late 1980s.

The import sector expands the production as well as the consumption possibilities for a country. Imports provide consumers with some basic

necessities that the domestic industry might not be able to produce in adequate quantities. They also serve as indicators of technological transfer for a country. While Pakistan's exports were stagnant, imports continued to increase at the rate of 4.4 percent per annum (WDR, 1992). Thus a growing imbalance between exports and imports in recent years has left the country with large balance of payments deficits.

Despite its economic and political problems, Pakistan has been able to maintain a relatively high growth rate, averaging around 5 percent; whereas other low income countries have been growing at a rate which is equal to 3 percent per annum (Table 5). Specifically how Pakistan's aggregate output growth rate responds to changes in its labor quality, physical capital, and international trade is the issue investigated in this study.

Significance of the Problem

While a general theory of economic development applicable to all nations has not emerged, some basic factors that influence a poor nation's economic growth have been suggested. The major sources contributing to economic growth include capital formation, technological progress, labor

Table 5

Selected Developing Economies in the ESCAP Region: Growth and Inflation.

		Rate of Growth (%)				
		GDP	Agriculture	Industry	Service	Inflation rate %
Indonesia	1989	7.5	3.3	7.8	9.3	6.5
	1990	7.1	2.0	9.7	7.3	7.4
	1991	6.6	1.3	9.9	5.8	9.2
	1992	5.8	3.6	7.5	5.8	7.5
Philippines	1989	6.2	3.0	7.4	7.0	12.2
	1990	2.7	0.5	2.6	4.0	14.2
	1991	-0.8	-0.2	-2.7	0.4	18.7
	1992	0.3	-0.4	-0.5	0.7	8.9
India	1989	5.6	1.7	7.2	7.8	6.2
	1990	5.2	4.8	6.9	4.2	11.5
	1991	1.2	-1.4	0.0	4.3	13.6
	1992	4.0	4.6	1.9	5.0	9.7
Pakistan	**1989**	**4.8**	**6.9**	**4.7**	**3.8**	**10.4**
	1990	**4.6**	**3.0**	**6.4**	**4.5**	**6.0**
	1991	**5.6**	**5.0**	**6.9**	**5.2**	**12.7**
	1992	**7.7**	**-3.9**	**7.9**	**6.5**	**9.6**
Sri Lanka	1989	2.3	-1.1	3.4	3.2	11.5
	1990	6.2	8.5	7.8	4.2	21.4
	1991	4.6	1.9	4.1	6.2	12.2
	1992	4.3	-1.5	7.0	5.3	11.4

Source: ESCAP Secretariat, Seoul, Korea, (1994).

force growth, and investment in human capital (Rana, 1988). Recent studies of the development experience of eighty countries conducted by the World Bank (WDR, 1993) have also concluded that improvement in literacy and health contributed considerably to economic growth.

Inadequate public investment in human capital has emerged as one of the major strains on the economic progress of Pakistan. Poor allocation of funds for education and health sectors has resulted in Pakistan having one of the worst records among developing countries in the provision of social services. In spite of this, the share of expenditure on education fell from 2.1 percent of GNP in 1976 to 1.2 percent in 1992 (WDR, 1993). Pakistan has one of the lowest literacy rates in the world due to the lack of serious commitment to education. The meager allocation of resources for the education sector has also resulted in one of the fastest rates of population growth in the world (Table 3).

Most notably, investment in education for women is one of the potent factors in reducing fertility rate. There is clear evidence to support the fact that reduction in fertility rate decreases the rate of population growth; and a reduction in population growth results in an increased rate of growth in per capita incomes (Easterlin, 1967). Thus there is a consensus among

economists in Pakistan that the cycle of poverty and economic backwardness cannot be broken without human development (Noman, 1988). It is generally recognized that it is much less costly and much more productive to make a systematic effort to provide education, training, nutrition, and health services.

Although this study focuses on conventional quantifiable sources to explain the relationship between human capital formation and economic growth, the importance of more nebulous factors such as political stability, social structure, and religious beliefs cannot be ignored. From the vantage of religion, Islam is deeply concerned with the problem of economic development, but treats it as an important part of a wider problem of total human development. The primary function of Islam is to guide human development on the correct path and in the right direction. According to Gauhar (1978), "The focus for the development effort and the heart of the development process is man. Development, therefore, means the development of man and his physical and socio-cultural environment." Muslim scholars argue that the prime responsibility for an improvement in human development lies with the state.

Prophet Muhammad (peace be upon him) stated that "He whom God has made an administrator over the affairs of Muslims, but remains indifferent to

their needs and poverty, God will also be indifferent to his needs and poverty" (Al-Sijustani, 1952). According to The Holy Qur'an (6:165, 61:71, and 42:32), Islam tolerates some inequalities of income distribution since all men are not equal in their character, ability, and service to the society. But these differentials in earnings are warranted after the state guarantees ". . . a humane standard of living to all members of the society through proper training, suitable jobs, just wages, social security and financial assistance to the needy through the institution of *zakat*" (Ahmad, 1982). It is a part of the religious obligations of a Muslim to pay *zakat* (a form of tax) at a prescribed rate on his net worth or specified income to the *zakat* fund to be used for the welfare of the society.

Furthermore, there appears to exist an understanding among contemporary economists that the sources of economic growth which have international characteristics may be less influenced by the national policy than a source that has domestic feature such as investment in human capital. The new growth theory places a significant importance on investment in human capital because it has far-reaching implications for skill building, increased productivity, increased labor force participation of women, and reduced pressure from rapid population growth (Caldwell, 1980; Gould and Ruffin, 1993). Recent empirical studies also suggest that improvement in the quality

of labor force, i.e. improvement in labor skills resulting from investment in human capital can transform resources into the "wealth" of nations. For instance, Barro (1991), Lucas (1993), and Tallman and Wang (1993) have emphasized the importance of human capital in economic growth.

The theoretical and empirical evidence suggest that a trade-off exists between the quality and the quantity of population (Lucas, 1988; Romer, 1989; Tamura, 1989; Fayissa, 1996). Countries that remain underdeveloped have a consistently low level of human capital and their investment in human capital is very low. According to Barro (1989), countries can invest more in physical and human capital and grow faster, given the existence of higher initial human capital. A more educated and healthy labor force is expected to be more skilled, productive, adaptable, and entrepreneurial. Pakistan's average per capita income is close to the perimeter that separates low-income nations from middle-income nations (Burki, 1986). By this measure, Pakistan should have a relatively high level of human development.

Statement of the Problem

Previous studies of Pakistan concluded that capital formation, labor force (quantity), and foreign trade were major sources of economic growth

(Papanek, 1967; Robinson, 1971; and Thirlwall, 1977). In contrast, this study focuses more narrowly on the role of human capital investment in education and health in Pakistan's economic growth. In addition, the effects of Pakistan's openness to international trade is investigated. The analysis uses the growth accounting framework and incorporates the theory of investment in human capital into a model of economic growth. More specifically, the study addresses the following questions:

1. How does investment in human capital (education and health) contribute to economic growth in Pakistan?
2. Are there significant differences in the relationship between education and rate of economic growth when different proxies are used to measure educational investment?
3. Are there significant differences in the relationship of health to the rate of economic growth when different proxies are used to represent health index?
4. What effect does openness to international trade have on rate of economic growth?

Limitations of the Study

This study focuses on a single country during a specific time period, thus, the inferences drawn from it may not be applicable to other LDCs without proper adjustments. While attention is focused on conventional sources to establish the relation between human capital formation and economic growth, nebulous factors such as political environment, socio-economic structure, and religious beliefs are disregarded.

In addition, the data set used in this study are restrained due to the lack of better alternative measures. Real GDP per capita growth rate is used as a rough measure of economic growth, while changes in the age-sex composition of the labor force which affect labor productivity are ignored. Besides, the analysis is restricted due to the complexity of measuring the economic implications of investment in human capital.

Organization of the Study

The study is organized into five chapters. A review of pertinent literature concerning the relevance of human capital investment, physical capital formation, and foreign trade to economic growth is presented in the

next chapter. Chapter 3 develops the theoretical framework for estimating the relationship between human capital investment and economic growth. In addition, operational definitions, measurement of variables, and data sources are presented. Chapter 4 presents the results of empirical model. A summary of conclusions and a discussion of some policy implications of the study are given in chapter 5.

CHAPTER 2

Review of Literature

The primary task of development theory is to examine and explain the nature of the process of economic growth and the factors responsible for it. This effort can be accomplished by identifying and analyzing principal obstacles to development.

Earlier Economic Growth Theories

Economists have been trying to understand the process of economic growth and development since the days of Adam Smith (1776) and David Ricardo (1815). Smith concluded that economic growth will take place as long as a nation's per capita consumption growth rate is less than the per capita output growth rate (Spiegel, 1991). Malthus' thesis (1798) was that an unchecked population of a nation tends to grow at an exponential rate thus outrunning the capacity to produce the food and fiber needed to sustain economic growth. According to Ricardo, when a nation is at its early stage of economic development, the population is small compared to the resources available. Given these differences, high levels of profits may invigorate capital accumulation causing the demand for labor to increase, thus driving

the wages above the subsistence level. This increase in wages leads to prosperity and an increase in population, resulting in reduced profits and thus a decline in capital accumulation. As the population continues to grow relative to fixed land supply, both the marginal and average products decline due to diminishing returns and wages will fall back to the subsistence levels resulting in an economy experiencing stagnation.

More recent theories of economic growth are based on the standard aggregate production function. An aggregate production function describes the relationship of a nation's inputs (such as labor force and stock of capital) to the level of economic growth. The simplest and best known production function used in the analysis of economic growth was developed by Harrod (1939) and Domar (1946). It states that the rate of growth of an economy is directly related with the marginal propensity to save and inversely with the incremental capital/output ratio.

The Harrod-Domar model has been used extensively in both developed and developing countries as a simple way of looking at the relationship between growth and capital requirements (Kasliwal, 1995). The underlying assumption of this model is that capital which determines economic growth is created by investment (fixed equipment, business structures) generated by

the saving of people and corporations. In this model, the output growth rate is considered to be constant and the substitutability between capital and labor is assumed to be fixed. Furthermore, the model suggests that investment would grow at a constant rate to ensure full capacity given the productivity of new investment and the multiplier effect. This implies that an increase in the productivity of capital and a higher multiplier can stimulate growth in the economy (Gillis et al., 1987).

Neoclassical Growth Theories

Growth theory based on the neoclassical framework developed since the mid 1950s can best be analyzed with the Cobb-Douglas production function relating output to inputs. Economists such as Schmookler (1952), Solow (1956), Abramovitz (1956), and Kendrick (1961) have provided empirical tests of this neoclassical growth theory. In his empirical study, Solow observed a large "unexplained residual," also referred to as "technological progress" or "advance of knowledge" as an important factor of production along with the traditional factors such as land, labor and capital.

This observation led to the emergence of a new growth paradigm known as the "economics of human resource, or human capital," or more narrowly,

the "economics of education and health" (Bowman, 1966). Based on this theory, studies were carried out by Schultz (1960), Denison (1964), Correa and Griliches (1973), among others, in order to determine the quantitative relationship between investment in human capital (education and health) and economic growth.

The fundamental approach to estimating the effect of human capital investment on economic growth is to utilize the basic growth accounting framework. One can commence with a simple model based on the pioneering work of Solow (1956) which laid down the foundation for the growth accounting framework. The neoclassical growth model states that the growth rate of output is equal to the growth rate of labor and capital, and other factors weighted by their elasticities (Gillis et al., 1987). It assumes a perfectly competitive economy where the return to a factor is equal to its marginal productivity. The neoclassical growth model allows for a substitutability between capital and labor and assumes full employment of resources. In recent empirical literature, assumptions of constant returns to scale and the concept of full employment of resources have been criticized (Bruno, 1968; and Romer, 1989). Also, Solow's basic growth model fails to take into account the effect of human capital.

The aggregate models discussed above assume homogenous output. To overcome this restrictive assumption, Lewis (1954) developed a two-sector growth model which assumes that an economy consists of two production sectors: consumption and capital production. Capital and labor inputs can be transferred between sectors without adjustment costs. Under the assumption of perfect competition, the wage/rental ratio will be equal in the two sectors. Like Ricardo (1817), Lewis focused particular attention on the implications of surplus labor for the distribution of income which led to the development of the labor surplus model. This model utilizes the assumption that labor is available in unlimited quantity at a fixed real wage. Lewis' labor surplus model was further developed by Fei and Ranis (1964).

Traditionally, there are two approaches to measuring the impact of human capital investment on economic growth; the Denison method and the Schultz method. Their analyses have attempted to explain the source of economic growth with a neoclassical production function that allows one to separate the various causes of growth rather than subsume all of them in the capital output ratio. In attempting to relate education to economic growth for United States and nine European countries, Denison (1964) disaggregated labor by education level to derive the share of different types of labor to national income, whereas Schultz (1961) used the level of investment in

education to get the rate of return to the particular levels of education.

According to Schultz (1961), "human capital is human because it is embodied in man and it is capital because it is a source of future satisfaction or future earnings or both". It is different from physical capital because it cannot be measured directly by its market price (as physical capital), but can only be measured indirectly through the value of goods and services produced (derived demand) and consumed (through wages) by it, assuming the value it receives is equal to its marginal productivity. Schultz's (1967) approach is based on Solow's analytical framework in which the quality and quantity of labor are incorporated as fundamental inputs to resolve the residual factor of economic growth.

In an effort to quantify the sources of economic growth, Denison (1961, 1964, 1985), Correa (1963), Galenson (1964), and Razin (1977) utilized human capital factors such as education, health, and nutrition along with other variables. Primary focus of their analyses rested upon the neoclassical production function in which increases in output were related to increases in inputs of capital, wage differential by educational levels, and improvements in health standards along with other variables. These studies analyzed the sources of economic growth for both the developed and less developed

countries.

Denison concluded that education contributed significantly to the economic growth in the United State and Europeans countries. Correa reported that the contribution of health and nutrition was inversely correlated with the level of development for Latin American countries. Furthermore, the contribution of education to development was highly significant, but had a negative correlation with the rate of growth of income in these countries. Following Denison and Correa's analysis, Galenson (1964) and Razin (1977) conducted cross-national studies for a large number of countries. Since data on income differentials were not available for all countries, school enrollment ratios were used as an educational index. They suggested that higher education had a positive effect on economic growth for LDCs.

This type of labor quality measurement was criticized by McClelland (1966) who pointed out that income differentials were not only due to the school years, but also depended on labor wages and socio-economic factors such as, intelligence, parents' occupation, and health conditions. School enrollment cannot measure the potential contribution of education because it is unlikely that school enrollment at the primary level in, say 1990, would have any impact on economic growth until, perhaps, the year 2010 when

these enrollees enter the labor force. However, according to Saddique (1992), school enrollment can be used to measure the rate of change in social demand for education which may or may not lead to higher economic growth in the future.

More Integrated Growth Theories

McMahon (1984,1987) used both the Denison and Schultz concepts in empirical applications of his growth equations. Using Denison's concept, McMahon (1984) estimated the sources of productivity growth for fifteen OECD countries by incorporating investment in human capital in the form primary, secondary, and higher education. This study analyzed not only the supply-side effects, but also demand-side macroeconomic influences. The concept of total capital was extended to include physical capital, human capital created through explicit investment in education, and stock of knowledge created by investment in research and development. Thus, the model related total investment in capital to economic growth while controlling for factors such as inflation rate and supply-side shocks which influence aggregate demand.

Considering that economies are not always at full employment,

McMahon attempted to control for the demand-side macroeconomic influences by including unemployment as a measure of slack demand and underutilization of human capital and labor. His argument was that the impact of lower utilization rates resulting from slackening demand will lower the productivity of educated labor. His results showed that human capital contribution of increased primary and secondary education was positive, but not significant during a recession. However, during a relatively stable growth period, the results were positive and significant in determining productivity.

McMahon (1987) extended the analysis to focus on the returns to investment in human capital in the form of investment in primary, secondary, and higher education for 30 of the poorest countries in Africa. This analysis emphasized the rates of return on investment in physical and human capital. He concluded that investment in physical, primary, and secondary education were all positively and significantly related to productivity growth after employing a lag structure of two to five years. However, investment in higher education as a percentage of GDP was negatively related to productivity growth. Considering that this may be due to the fact that investment in higher education requires longer lags to affect output, McMahon employed a lag structure of five to seven years. The results then were positive and significant.

Romer (1989) offered a theoretical framework emphasizing the role of human capital in a model of endogenous growth, assuming that there may be a role for the level of human capital to explain the rate of growth of output. His major emphasis was on the connection between basic literacy, the rate of growth of income per capita, and the rate of investment. His study suggested that the initial level of literacy predicted the subsequent rate of investment and indirectly the rate of growth.

In his endogenous-growth model, Barro (1989,1991) elaborated on the role of government and the broader concept of capital to include both human capital and non-human capital. The empirical evidence from his cross-country regression showed that the growth rate of real per capita GDP is positively related to initial human capital. He used a school-enrollment ratio as a proxy for human capital. In relation to McMahon (1984, 1987) and Romer (1989), Barro provided alternative proxies for the specification of educational variables, such as school enrollment ratios and literacy rates as a measure of human capital.

Analyses of sources of economic growth for developing countries show that the contribution of capital and labor to economic growth is higher for developing countries than for developed countries (Thirlwall, 1977; Elias,

1978; Burney, 1987; and Maddison, 1987). However, the contribution of these factors fluctuates significantly over time and across countries. In some cases, the sum of factors' contributions is greater than the growth of GDP which implies an inefficient use of resources or the dampening effect of other sources of growth. This was the case in countries such as Argentina, Honduras, Malaysia, and Venezuela (Elias, 1978; Correa, 1970; and Burney, 1986). Moreover, productivity growth rate was significantly higher during the 1960s and decelerated during the 1970s and the 1980s. In terms of productivity growth, Pakistan's performance was better than most of the developing countries.

In recent empirical studies (Romer, 1989; Barro, 1990 and 1991; Lucas, 1988 and 1993), the neoclassical growth model developed by Solow (1957) was scrutinized with respect to its shortcoming in explaining the increase in economic growth due to investment in human capital. The above studies relied on cross-country data in addressing the relationship between economic growth and investment in human capital.

Tallman and Wang (1993) pointed out that the results of cross-country studies were unreliable due to lack of consistency in data collection, measurement problems, and the existence of sample selection bias. A

country-specific study is preferred to a cross-country study because: (i) data measurement quality is much better since it is not constrained by the need for measurement consistency across countries, (ii) the study can focus on historical and institutional aspects of the country, and (iii) the progress of a particular economy could be evaluated without any bias.

Openness to Trade and Economic Growth

The foreign trade sector is expected to play an important role in economic growth. The theory of trade is based on the principle of comparative advantage developed by Ricardo. It implies that all nations can derive mutual benefit from trade by concentrating on the production of what they do relatively best. By doing so, they can cut back on those goods that other countries produce at cheaper cost and use these freed up resources to produce more goods in which they have comparative advantage. Hong Kong, Taiwan, Singapore, and Korea are among the leading countries which have used a comparative advantage in their abundant labor to expand their manufacturing export sector (Lewis, 1980). This expansion in manufacturing export sector is one of the primary factors leading to economic growth in these countries.

Lewis (1980) suggested that LDCs should depend more on South-South trade instead of the dominant North-South trade. For example, Pakistan should trade with Korea and Nigeria with Brazil and so forth. Reidel (1984) refuted Lewis by suggesting that "it is not mainly the demand from the developed countries that propels LDC exports; instead, such exports depend on the LDC's own capabilities of resolving their supply-side problems." Gould and Ruffin (1993) and Fayissa (1996) maintain that there is a strong relationship between a nation's human capital structure and openness of its economy to trade. In those countries where literacy rates were high, open economies tend to have higher economic growth rates than closed economies.

Cho (1994) examined the effects of education, foreign trade, and industrialization on economic growth during the period of 1965-80 for 95 countries. The percentage of age group enrolled in secondary education was used as an explanatory variable for education. The contribution of education to economic growth was positive, but insignificant for all countries. Cho used two proxies to measure the openness of an economy: the export to GDP ratio and the average annual increase in this ratio. The relation of "export to GDP ratio" with the "growth rate of GDP per capita" was not significant. However, the coefficient of average annual increase in this ratio appeared to be significantly related with the growth rate. Cho stated that exports were a

factor, but not the predominate factor which explained the rapid growth of middle income countries during this period.

Middle income countries grew faster than high income countries because of rapid industrialization (Cho, 1994). To estimate the effect of industrialization, two proxies (average annual increases in the portion of the labor force employed in manufacturing production and services production) were used. The results of industrialization as a source of growth suggested that increased employment in the manufacturing sector had a positive and significant effect on economic growth while increased employment in the service sector did not. These results were more significant for LDCs than for developed countries (DCs). According to Cho, "only the rise in manufacturing relative to agricultural and service production seemed to help a country's growth."

Lee, Liu, and Wang (1993) analyzed the importance of human capital and openness of the economy to economic growth of newly industrialized Taiwan. The three-stage least squares (3SLS) method was applied to estimate the model using annual data covering the period from 1964 to 1986. Literacy rates and enrollment ratios at primary, secondary, and higher levels were used as proxies for an educational achievement rate. The degree of

openness of the economy was represented by the export to import ratio. The study concluded that investment in educational achievement rate and foreign trade played a significant role in explaining economic growth in Taiwan. In fact, human capital alone accounted for about 44 percent increase in Taiwan's economic growth.

Pakistan's Economic Growth Experience

The literature on the sources of economic growth for Pakistan suggests that capital formation, labor force (quantity), and foreign trade are key determinants of economic growth. Papanek (1967) analyzed the performance of the industrial sector and its role in the overall economic growth of the country during the 1960s. He observed that domestic capital formation, private foreign capital inflow, foreign aid, government efforts to develop infrastructure suitable to the need of the growing industrial sector (such as accelerated depreciation allowance) and other tax incentives were major factors contributing to Pakistan's economic growth. This study is useful as a benchmark for analyzing the sources related to the industrial sector which contribute to economic growth.

Robinson (1971) and Thirlwall (1974) also concluded that the

contribution of capital and labor to the economic growth in Pakistan was significant. These studies also showed that economic growth was at a peak from 1960-65 when labor productivity growth was high. Burney (1986) confirmed that the contribution of capital and labor in Pakistan varied over time. He noted that capital and labor accounted for more than 70 percent of GDP growth in the 1960s. During the same period the unexplained proportion of growth declined, implying a slow or negligible productivity growth.

A more recent study by Saddique (1992) concluded that improvement in the quality of labor force through an increase in education and health contributed significantly to the economic growth of Pakistan. Even though the labor force quantity improved in the agricultural sector, the output growth rate and productivity improvements were significantly higher in the manufacturing sector. Changes in both the quantity and quality of labor were the major sources of growth in the manufacturing sector, and the contribution of labor was much higher in the manufacturing sector than in the agriculture sector. The findings of these studies lead to the following preliminary conclusions:

a) The contribution of capital is significantly higher in less

developed countries as compared to developed countries and it can be increased if one adjusts capital for changes and improvements in its quality.

b) Foreign trade is an important source of economic growth. In the 1960s and 1970s, the export sector was considered as an "engine of growth".

c) Government infrastructure plays an important role in economic growth.

d) The manufacturing sector has significantly contributed to economic growth over the past years.

e) The generalized Cobb-Douglas production function emerges as the most acceptable functional form to analyze sources of economic growth.

f) If one adjusts for labor quality changes in terms of investment in education and health, its contribution to economic growth increases significantly. Previous studies failed to adjusted for these changes, resulting in the underestimation of labor's contribution to economic growth.

The present study attempts to investigate these propositions with respect to Pakistan's experience in recent years. In the next chapter, a theoretical framework is developed for estimating the interrelationship among the above variables and the country's growth record.

CHAPTER 3

The Theoretical Model

The Equations

The main purpose of this study is to analyze the relationship between human capital investment and Pakistan's rate of economic growth from 1965 to 1992. There are only a few credible models of output determination that take into consideration the element of human capital in economic growth (Kasliwal, 1995). This chapter demonstrates the relationship between changes in the quality and quantity of human resources and other variables with economic growth in a dynamic framework.

A simple growth model based on the pioneering work of Solow (1957), which shaped the base for the neoclassical growth accounting, is used in this study. According to this accounting framework, a national output model can be specified as follows:

$$Y = A\, f(K,L,Ei,Hi,T) \qquad (1)$$

Where:

Y = aggregate output of goods and services

K = aggregate capital stock

L = aggregate labor force (quantity)

Ei = quality of labor force created by investment in education

Hi = quality of labor force created by investment in health

T = a measure of accessibility to foreign trade

A = all factors of production different from K, L, T, Ei, and Hi

i = the various quality of labor measures.

Total differentiation of equation (1) with respect to time will give the following:

$$\Delta Y = \frac{\delta Y}{\delta A}\Delta A + \frac{\delta Y}{\delta K}\Delta K + \frac{\delta Y}{\delta L}\Delta L + \Sigma\left(\frac{\delta Y}{\delta Ei}\Delta Ei\right) + \Sigma\left(\frac{\delta Y}{\delta Hi}\Delta Hi\right) + \frac{\delta Y}{\delta T}\Delta T \qquad (2)$$

where:

ΔY, ΔK, ΔL, ΔT, ΔEi, and ΔHi are the change in Y, K, L, T, Ei, and Hi respectively, and the symbol 'δ' represents the partial derivation.

$\delta Y/\delta K$, $\delta Y/\delta L$, $\delta Y/\delta T$, $\delta Y/\delta Ei$, and $\delta Y/\delta Hi$ are the marginal products of

inputs K, L, T, Ei, and Hi, respectively. The marginal product of a particular input such as labor (L) represents the change in output (Y) for one unit change in input of labor (L).

Dividing equation (2) by Y:

$$\frac{\Delta Y}{Y} = \frac{\delta Y}{\delta A}\frac{\Delta A}{Y} + \frac{\delta Y}{\delta K}\frac{1}{Y}\Delta K + \frac{\delta Y}{\delta L}\frac{1}{Y}\Delta L + \Sigma\left(\frac{\delta Y}{\delta Ei}\frac{1}{Y}\Delta Ei\right) + \Sigma\left(\frac{\delta Y}{\delta Ei}\frac{1}{Y}\Delta Ei\right) + \frac{\delta Y}{\delta T}\frac{1}{Y}\Delta T \qquad (3)$$

Let: $b_0 = (\delta Y/\delta A) \cdot (\Delta A/Y)$

where, b_0 is the contributions of all other factors to economic growth rate ($\Delta Y/Y$) that are not accounted for by K, L, T, Ei, and Hi. It is the residual factor contributing to economic growth and represents the constant term. Inserting b_0 into equation (3) yields:

$$\frac{\Delta Y}{Y} = b_0 + \frac{\delta Y}{\delta K}\frac{\Delta K}{Y} + \frac{\delta Y}{\delta L}\frac{1}{Y}\Delta L + \Sigma\left(\frac{\delta Y}{\delta Ei}\frac{1}{Y}\Delta Ei\right) + \Sigma\left(\frac{\delta Y}{\delta Hi}\frac{1}{Y}\Delta Hi\right) + \frac{\delta Y}{\delta T}\frac{1}{Y}\Delta T \qquad (4)$$

Multiplying ΔK times K/K, ΔL times L/L, ΔEi times Ei/Ei, ΔHi times Hi/Hi, and ΔT times T/T will give the following:

$$\frac{\Delta Y}{Y} = b_0 + \frac{\delta Y}{\delta K}\frac{\Delta K}{Y} + \frac{\delta Y}{\delta L}\frac{L}{L}\frac{\Delta L}{Y} + \Sigma\left(\frac{\delta Y}{\delta Ei}\frac{Ei}{Ei}\frac{\Delta Ei}{Y}\right) + \Sigma\left(\frac{\delta Y}{\delta Hi}\frac{Hi}{Hi}\frac{\Delta Hi}{Y}\right)$$

$$+ \frac{\delta Y}{\delta T}\frac{T}{T}\frac{\Delta T}{Y} \qquad (5)$$

Let:

$b_1 = \delta Y/\delta K\ (K/Y) =$ the output elasticity of capital

$b_2 = \delta Y/\delta L\ (L/Y) =$ the output elasticity of labor, i.e.; the percentage change in output (Y) due to a given percentage change in the Labor input (L)

$b_3 = \delta Y/\delta T\ (T/Y) =$ the output elasticity of foreign trade

$\lambda_i = \delta Y/\delta Ei\ (Ei/Y) =$ the output elasticity of education proxies

$\alpha_i = \delta Y/\delta Hi\ (Hi/Y) =$ the output elasticity of health proxies.

Equation 5 can be rewritten as:

$$\frac{\Delta Y}{Y} = b_0 + b_1\frac{\Delta K}{K} + b_2\frac{\Delta L}{L} + b_3\frac{\Delta T}{T} + \Sigma\left(\lambda_i\frac{\Delta Ei}{Ei}\right) + \Sigma\left(\alpha_i\frac{\Delta Hi}{Hi}\right) \qquad (6)$$

Where:

$\frac{\Delta Y}{Y}$ = the rate of growth in aggregate output

$\frac{\Delta K}{K}$ = the rate of growth of capital stock

$\frac{\Delta L}{L}$ = the rate of growth of the labor force

$\frac{\Delta T}{T}$ = the rate of growth in foreign trade

$\frac{\Delta Ei}{Ei}$ = the rate of growth of the education proxies

$\frac{\Delta Hi}{Hi}$ = the rate of growth of health proxies.

The quality of the labor force is measured by education proxies (school enrollment ratios in primary and secondary education, occupational groupings, skilled versus unskilled workers), and health proxies (life expectancy at birth, and physicians per 1,000 population).

Equation (6) suggests that the empirical model can be estimated using the rate of change of each of the explanatory variables. Each regression coefficient can be interpreted as the percentage by which output increases as

a result of one percent change in the independent variable.

Equation (6) can alternatively be written as:

$$y = \beta_0 + \beta_1 k + \beta_2 l + \beta_3 t + \Sigma \lambda_i ei + \Sigma \alpha_i hi \qquad (7)$$

where the lower case notations are used for the percentage of change of income, capital, labor, trade, education, and health. The above equation (7) implies that the rate of growth of output is equal to the sum of the rate of growth of each of the inputs weighted by their elasticities. The growth model embodies the standard neoclassical assumptions that there is full employment and factor returns are equal to their marginal products which implies competitive product and resource markets.

Explanation of the Variables

The six unknown parameters to be estimated, are β_0, β_1, β_2, β_3, λ_i, and α_i. The parameter β_0 represents an intercept term. The parameter estimates of β_1 and β_2 allow one to measure how economic growth varies with a given percentage change in the stock of physical capital and labor, respectively.

Generally, an increase in the labor force is expected to affect output positively. However, if surplus labor exists, it can lead to a negligible, zero, or even negative marginal product in the subsistence or lowest income sector of the economy (Kasliwal, 1995). Since labor productivity depends on capital accumulation in a modern economy, any reduction in capital accumulation will influence labor productivity.

The contribution of physical capital stock to economic growth is well acknowledged in the literature (Harrod, 1939; Domar, 1946; Lewis, 1954; and Solow, 1957). In most empirical literature, capital accumulation is found to be an instrumental source of economic growth for a nation. Adam Smith (1776) suggested that capital accumulation is imperative for the division of labor and the productivity growth of labor. In his empirical study, Denison (1961) has also concluded that the productive capacity of an economy is determined by its capital stock.

The coefficient β_3 represents the effect on economic growth of openness of an economy to trade. The early evidence in favor of trade goes as far back as David Ricardo's comparative advantage theory which emphasizes specialization, thus making it possible to take advantage of economies of scale (Kasliwal 1995). The smaller the size of the country, the greater the

need for it to trade beyond its borders with other nations. Through trade, a country can exploit economies of scale which improve its competitive position in the world market.

The next two parameter estimates of λ_i and α_i measure the relationship between economic growth and investment in human capital in Pakistan. Schultz (1961), Psacharopoulos (1985), Mushkin (1962), and Jere (1993) have argued that educational and health systems are important to the growth of a nation due to their: (1) externality impact, (2) positive effects on economic growth, and (3) effects on income distribution. Education and health can both be an investment and a consumption good. The externality impact of health and education can be illustrated as follows: As consumption goods, they benefit the individual who consumes them. The benefits derived from them are not only internalized, but they also generate spillover benefits, thus, making it possible for others to enjoy a better educated and healthy society. Hence, society as a whole benefits. Since education and health create external benefits, economists suggest that a subsidization of these services is necessary to improve efficiency in resource allocation. To the extent that education and health are also investment goods, the return of their investment and their effects on economic growth can be estimated.

The value of λ_i represents the response of the national output to the human capital variables in the form of education. These variables also provide estimates of how different factors of human capital investment relate to economic growth. An increase in the size of the labor force, if accompanied by improvement in its quality is expected to increase labor's contribution to economic growth. Recent studies (McMahon, 1987; Tamura, 1989; and Cho, 1994) show that education influences the performance of the labor force towards economic growth. In LDCs where labor productivity is low, education's role is instrumental in increasing its productivity thus narrowing the gap among them and developed countries. Easterlin (1967), Kuznets (1967), and Grier (1989) have suggested that population growth has a positive effect on the quantity of labor force. Its impact on the quality of labor is, however, negative since a rapid growth in population lowers income and human resource development.

The value of α_i represents the effect of the human capital variables involving health on economic growth. Different proxies such as life expectancy at birth and population to physician ratio are used to estimate the relation of health to economic growth. Even though health services have improved significantly in Pakistan, they are still considered to be below the level required for efficient working and healthy living conditions (Deolalikar,

1988). Increase in the health of the labor force is expected to improve productivity and income distribution (Ram and Schultz, 1979; and Rana, 1988). Human capital theory treats everyone's state of health and its contribution to health services as capital stock. Improvements in health as revealed by long productive life spans of people in many low income countries have undoubtedly been the most important advance in population quality (Ram and Schultz, 1979).

Since the regressors assume a log-linear relationship with output (y), the parameters of equation (7) can be estimated by ordinary least-squares (OLS). The OLS estimates are assumed to yield the best (minimum variance) linear unbiased estimates (BLUE). The coefficients represent elasticities with respect to capital, labor, openness of an economy, and investment in education and health for Pakistan.

Previous studies have utilized cross-section data of countries to estimate the effect of human capital on economic growth rate. According to Tallman and Wang (1993), these studies fail to capture crucial country-specific characteristics that may be important for their economic growth. Since cross-country analysis is generally subject to sample selection bias and suffer from measurement problems, a single-country study may capture more effectively

the significance of the role of human capital investment to economic growth. In this study an accounting approach which is better suited to construct the relationship between total factor inputs and total factor productivity is applied. The growth accounting model is based on the assumption that the weighted sum of input growth rates is equal to output growth. Equation (7) is estimated using time series-data for Pakistan for the period of 1965 to 1992.

Data

Time-series data on education, health, and labor force are frequently used to evaluate the importance of growth performance in Pakistan. Such data have also been used to estimate the impact of human capital and related phenomenon on growth (Schultz, 1967, 1972; and Barro, 1989, 1991). Here the main data sources are IMF International Financial Statistics Yearbook, World Bank Tables, Pakistan Economic and Labor Force Surveys, UNESCO Yearbook, and ILO labor market data. All monetary variables are measured in Pakistani Rupees adjusted by 1990 prices. The data encompass the period 1965 to 1992.

Definitions

Real Gross Domestic Product (GDP) per capita, the dependent variable, is used as a measure of the rate of economic growth (y). Per capita GDP is selected since it is a better measure of well-being for the average person than is total GDP. Furthermore, theories of long-run economic behavior which attempt to explain how and why economies grow over time focus a great deal of attention on labor productivity, or output per worker (Gillis et al., 1987).

Real GDP is defined as the aggregate final output of residents and businesses within an economy (country) during a one-year period adjusted for changing price levels. Real GDP per capita is calculated by dividing total real GDP by population. Data on GDP and population are available from IMF International Financial Statistic Yearbook.

The rate of growth of capital (k) is defined as the gross fixed capital formation (GFCF) to the real GDP ratio. The gross fixed capital formation includes residential and non-residential buildings, roads, construction projects, outlays on reclamation, and improvement of land and development. Data on GFCF are obtained from IMF International Statistics Yearbook.

Labor force growth rate (*l*) is represented by the rate of growth in the size of the raw labor force in Pakistan. This variable is expected to capture how the rate of economic growth varies with the rate of growth of raw labor. The labor force data comprise the economically active population including the armed forces and the unemployed but not including household workers (women in domestic services), students, retired persons, and persons dependent upon others. Labor force data for the period are obtained from the Yearbook of Labor Statistics, International Labor Organization (ILO).

Tallman and Wang (1993) argued that factors such as openness of an economy to trade play an important part in creating the demand for human capital which may lead to industrialization. The foreign trade sector is expected to exert some impact on the economic growth of LDCs. This sector consists of imports and exports. To measure the openness of the economy to trade (*t*), the ratio of imports plus exports to GDP is used as a proxy. Data on these variables are obtained from the IMF International Financial Statistics Yearbook.

Investment in education (*ei*) is represented by the three following variables:

(1) The annual percentage change in school enrollment ratios at primary (*ep*), and secondary (*es*) levels are used as proxies. These ratios are derived from total enrollment at primary and secondary level schools. Primary education is defined as education of at least six years of schooling, depending on the organization of the local school system. Secondary education is based upon at least six years of further instruction at the secondary and vocational schools. According to UNESCO (1991), "Data on schooling are gathered mainly from official response to UNESCO questionnaires, special surveys, annual reports from the schooling systems/Ministry of Education of each country, and publications supplemented by information available to the Secretariat from national and international sources." Even though school enrollment ratios are not a perfect proxy for investment in education, they are the best available measure of the rate of change in social demand for education leading to improved economic growth.

The school enrollment variable is calculated by taking the total enrollment of the primary and secondary levels and dividing it by the total population of the specific age group, respectively. Specifically:

$$\text{Primary-level enrollment ratio} = \frac{\text{total enrollment in primary schools}}{\text{total population aged 6-11}}$$

$$\text{Secondary-level enrollment ratio} = \frac{\text{total enrollment in secondary schools}}{\text{total population aged 12-18}}$$

These proxies are widely used in the literature to capture the effect of education on economic growth (McMahon, 1987; Lee, Liu, and Wang, 1993; and Cho, 1994). Data on these variables are obtained from the UNESCO Statistical Yearbook, Asia Yearbook, and World tables.

(2) Alternatively, the impact of education on economic growth may be explained by using the increase in the portion of the skilled workers versus the unskilled workers in the labor force. Perhaps, a even better proxy variable may be the wage differential between the average real wages in the agricultural and the non-agricultural sectors which is used extensively in international trade literature (Branson, 1977 and Stern, 1976). Unfortunately, data on wage for the agricultural sector in Pakistan are not available. Therefore, in this study the skilled/unskilled employment growth rates are utilized. Data for skilled labor force (*sk*) are proxied by the total employment in the non-agricultural sector whereas total employment in the agricultural sector will represent the unskilled labor force (*usk*).

It is assumed that a worker's productivity skill results solely from the individual investment in human capital and that this investment will contribute to the national output. A highly skilled worker (such as an engineer) is expected to be more productive, thus contributing more to economic growth than a less skilled worker (such as a rural farmer). Data related to total employment in these sectors are obtained from ILO Yearbook of Labor Statistics.

(3) Investment in education in a nation is also implied in the occupational composition of its labor force. Gillis et al.(1987) state that, "In any economy there is a strong tendency for people with certain levels of education to hold certain types of jobs. For example, nearly all people who have received a university education work at professional, technical, or managerial jobs in developing countries. People whose schooling ended at the secondary level tend to hold middle-level jobs in the clerical, sales, and service occupations." One may conclude that there is a link between investment in human capital and occupational grouping, i.e., the higher the level of education, the higher the occupational mix such as more professional workers and fewer production workers. The skills enhanced by education are complementary to the occupational mix leading to higher technological inputs and overall productivity.

In this study, the occupational mix is categorized into three groups: professional (*pro*), office (*off*), and production (*prd*) workers to explain how the various occupational groups contribute to economic growth. The total employment of professional, technical, managerial, and related occupations is used as a proxy for professional workers. For office workers, the total employment of administrative, clerical, and service workers is used as a proxy. Production workers are proxied by the total employment of production workers, operators, and laborers in the non-agricultural sector. Data for this purpose are taken from the ILO Yearbook of Labor Statistics.

Another source of investment in human capital includes an improvement in health standards which is expected to enhance labor productivity (Ram and Schultz, 1979). The World Health Organization (WHO), which is a United Nation's agency responsible for programs to improve health standards, defines health as "a state of complete physical, mental, and social well being." Like education, health services increase the quality of human resources, both now and in the future. Improved worker health can provide immediate benefit by increasing the workers' strength, stamina, and ability to concentrate while on the job (Mushkin, 1962). The health variable is measured by two indicators: life expectancy at birth (*life*) and physicians per 1,000 population (*ppp*).

Life expectancy at birth (*life*) is the average number of years members of a given population are expected to live at the time of birth. The relation between income level and life expectancy is strong, but its impact on economic growth varies across countries. For example, Chile and Sri Lanka have life expectancy of above 70 years which is far above the average for their income levels. The life expectancy in India and Pakistan is, however, well below most of the LDCs as compared to their exceptional economic growth rate in the past few years (World Bank, 1992). Data for life expectancy at birth are obtained from World Tables.

The rate of change in a physician per 1,000 population (*ppp*) is another measure of improvement in the health services. An improvement in health services increases life spans. Longer life spans provide additional incentives to acquire more education, an investment in future earnings by increasing the productivity of the labor force. Despite the fact that there is only one doctor per 20,000 rural people in Pakistan, an estimated 72 percent of new doctors are allowed to emigrate (Burki, 1986). Data on this variable are available from World Development Reports.

Limitation of the Data

Data quality is a significant problem in most of the LDCs. Such limitations have been recognized and documented by the World Bank and the IMF in their annual reports. Data reported by these organizations suffer from narrow definitions, possible differences in accounting concepts and methods, and inadequate statistical coverage of subnational governments. Behrman (1994) argues that all data suffer to some degree from measurement error. An important aspect of time-series data is that empirical information on a given variable may not be available every year. In many cases, data are based on estimations, interpolations, and projections and are not based on empirical observations in the year to which such data refer.

ILO is the main source for international labor market data. These data are drawn from information sent to the ILO by national statistical services, or taken from official publications. There are problems of comparability of data across countries and over time within countries because of differences in definitions, methods of collection, and classification of the data (ILO, 1991).

The economic return to investment in education and health is difficult to quantify and empirically verify. The contribution to economic growth of

these factors is the expected lifetime increase in productivity. It is hard to measure the immediate potential contribution of education since it is unlikely that a child enrolled in primary school in 1995 will contribute to economic growth, perhaps, until the year 2010. Improvements in health standards can help increase or maintain the productivity level of the active members of the labor force, but they may also increase the expected lifetime earning of a new born child.

School enrollment ratios may be misleading since the data are collected at the beginning of the school year. They may fail to account for the high frequencies of dropouts who withdraw from school before completing the academic year, and repeaters or those who take more than the recommended number of years to complete the calendar year.

Furthermore, the economic return of the educated worker may be correlated with the social characteristics of the society. Families with high income can send their children to better schools which may affect their productivity. Moreover, poor families may not send their children to school due to the high opportunity cost of schooling. Therefore, the social characteristics play an important role in determining the level of education and productivity of the work force, which may overestimate the contribution

of education to the economic growth of a nation. The effect of improvements in health is even harder to measure, partly due to its reciprocal relationship. As economic development takes place, it leads to a better health status of the labor force.

Since data for certain years are not available, linear interpolation of data are used as reasonable estimates of the missing years. For example, data for 1966 were missing on primary school enrollment. A simple average is taken for the 1965 and 1967 years to represent the missing data. Despite these limitations, the data set for Pakistan is the best available for economic analysis. However, caution is exercised in interpreting results and generalizing the conclusions.

CHAPTER 4

Estimation Results

This chapter analyzes the empirical contribution of human capital formation on the growth of real GDP per capita in Pakistan. Various versions of equation (7) in the previous chapter are used to elucidate the above relationship.

Three different models are developed to observe the impact of investment in education on economic growth while the forth model analyzes the relationship between investment in health and economic growth. The results of investment in primary and secondary education on economic growth are presented in Table 6. The estimation results using a skill differential measure as a proxy for investment in human capital are reported in Table 7. Table 8 exhibits the results of the various occupational mixes on the economic growth of Pakistan. Finally, the effect of improvement in health on economic growth is reported in Table 9. The production function framework of equation (7) is used to estimate the OLS regressions for all models.

Real GDP per capita growth rate represents the dependent variable while the explanatory variables include human capital elements, the stock of

physical capital, raw labor, and foreign trade as a measure of openness of an economy. The last three variables appear in all regressions. Since the expected signs of the estimated coefficients for these variables are the same in all the models, these findings are interpreted and discussed before focusing attention on human capital formation.

All regressions are tested for the presence of multicollinearity and autocorrelation. Multicollinearity is not a factor in any of the models, whereas the Durbin-Watson statistics obtained for the equations are mostly in the inconclusive range. Thus, a dynamic structure is introduced in the time series model by including lagged values of one or more independent variables as explanatory variables to correct for the likelihood of autocorrelation.

Sources of Economic Growth

Capital Formation

The significance of capital formation is pervasive in a developing country such as Pakistan where capital deficiency is a major barrier to economic growth. The growth rate of capital stock has increased significantly over time in Pakistan (IMF, 1994) which suggests a continuous

augmentation of the productive capacity of the economy. The results in all models estimated show that the relationship between investment in physical capital (k) and economic growth (y) is positive and statistically significant at the one percent level of significance. This is consistent with the hypothesis that physical capital formation contributes significantly to productivity growth.

The coefficient of capital formation of 0.634 in Table 6 suggests that a ten percent increase in the rate of capital formation leads to a 6.34 percent increase in the real GDP per capita. These and similar statistically significant results in Tables 7, 8, and 9 support the findings of previous studies that capital formation has a positive and statistically significant impact on the economic growth of Pakistan in recent years. Thirlwall (1974), Burney (1986), and Siddique (1992) found that capital formation increased economic growth in the range of 31 to 43 percent in the last three decades.

The contribution of capital formation to economic growth was low during the 1970s (Siddique, 1992). This may have been due to the slow growth of the manufacturing sector, the nationalization policy, high inflation rate, and unstable political conditions due to separation of East Pakistan (Bangladesh). Furthermore, the escalation of Soviet-Afghan war brought

more than US $4 billion as economic aid to Pakistan from the United States and its allies. The increased inflow of foreign capital contributed towards a macroeconomic revival, increasing the GDP growth rate to about 7 percent. However, all foreign assistance was sharply reduced after the Soviet-Afghan war, leading to a sluggish capital accumulation.

Remittances from Pakistani workers employed in the Middle East also contributed significantly to the country's capital accumulation; however, this source of capital formation has tapered off since the early 1990s due to global recession affecting the Middle East economies (Government of Pakistan, Labor Force Surveys). Investment in capital formation has, however, increased once again owing to the government's industrialization policies contributing to higher economic growth in Pakistan.

Raw Labor

Reference to Tables 6, 7, and 8 indicates that the coefficient of raw labor (l) is negative and statistically insignificant. It is positive only in Table 9. This discrepancy may be due to the collinear nature of the other regressors such as life expectancy and physician per population ratio. Nevertheless, one may conclude that raw labor may not be a critical factor in determining

economic growth in Pakistan.

This result is expected since a major portion of the labor force is comprised of agricultural workers who contribute significantly less to economic production compared to workers in other economic sectors. The results are generally consistent with the findings of previous studies (McMahon, 1987; Siddique, 1992; and Ibrahim, 1994) which argue that the unskilled work force contributes marginally to the per capita growth rate. Moreover, an increase in the labor force may not contribute to economic productivity if a surplus supply of labor exists without employment opportunities.

Openness to Trade and Economic Growth

The foreign trade sector plays an important role in economic growth since it encourages specialization and makes it possible to reap economies of scale. With respect to the effect of openness of an economy (t) on the rate of economic growth (y), the findings in this study show a statistically significant and positive relation in all models. These results appear in Tables 6, 7, 8, and 9 and they are in line with the Lee, Liu, and Wang (1994) and Cho (1993) studies which find a statistically significant relation between openness and

economic growth.

Empirical evidence points to various cases of countries that have had grown with no trade, for example Australia and New Zealand, and others such as Peru and Bolivia which have had trade with no growth. Krueger (1984) presented evidence to challenge the past notions that trade was necessarily an engine for growth. He argued that the relation of trade with growth may indicate an opposite causality, i.e., economic growth causes increased trade, rather than vice versa.

Openness to trade appears to play an important role in Pakistan, though the trade performance is somewhat less dramatic in recent years. This might have been due to the fact that the developed world was in recession during the early 1980s which led to a stagnant or dropping demand for primary goods. According to Lewis (1979), the demand for LDC's primary exports depends on the rate of growth of the DC's economies with an elasticity of 0.87. This means that a 2 percent growth of GDP in the industrial economies would raise LDC's exports by (0.87 * 2 percent) 1.74 percent. Pakistan's major trading partners (the United States, Japan, and Germany) were experiencing a recession in the early 1990s. Consequently, it is not unexpected that Pakistan's exports to these countries would have declined in

the recent years, thus negatively affecting its overall trade balance.

Human Capital and Economic Growth

The growth experience of recently developed countries such as Korea, Taiwan, Singapore, and Hong Kong support the view that human capital formation contributes significantly to economic growth. Increasing human capital is expected to exhibit a population quantity/quality trade-off. Countries with a higher rate of human capital formation grow faster than countries with a low level of human capital accumulation.

Investment in Education and Economic Growth

There is a strong relation between education and income at both the individual and the societal level. Education accounts for much of the improvement in labor force quality which may lead to higher productivity per employee hour in LDCs. In this study, three different proxies are used to explain the relation between Pakistan's investment in education and its economic growth.

The estimated parameters in Table 6 are consistent with the theoretical

Table 6

Rate of Economic Growth and Level of Education : Primary/Secondary School Enrollment Ratios.

Explanatory Variable	Parameter Estimate	t-value
Capital Stock (*k*)	0.634*	3.01
Raw Labor (*l*)	-0.195	-0.95
Enrollment Ratio of Primary Education (*ep*)	0.413	0.67
Enrollment Ratio of Secondary Education (*es*)	1.466*	3.20
Foreign Trade (*t*)	0.036**	2.15
Constant	1.026***	1.63
No. of Observations	28	
R^2	0.494	
R^2- adjusted	0.379	
F-statistic	4.29	
Durbin Watson	1.55	

Note: All variables represent annual percentage growth rate.
(*) significant at $\rho \leq .01$
(**) significant at $\rho \leq .05$
(***) significant at $\rho \leq .10$

contentions on the sources of economic growth. The coefficients of primary education (*ep*) and secondary education (*es*) are both positive, thus supporting the theoretical prediction that investment in education contributes positively to economic growth of Pakistan. The coefficient of 0.413 for primary education is, however, statistically insignificant.

The estimated coefficient for secondary education (*es*) is statistically significant and positively related with the growth of real GDP per capita. An initial result for investment in secondary education was negatively related to economic growth. Considering that investment in education requires long lags to affect economic productivity, the model was re-estimated using a lag structure of three years. The result is statistically significant and positive at the one percent level. The coefficient of 1.466 suggests that secondary education (*es*) has a strong impact on Pakistan's economic growth consistent with the traditional growth theory and empirical evidence. McMahon (1987) found that investment in education had a significant and positive effect on GDP growth of both DCs and LDCs by using a lag structure of five to seven years.

This evidence must, however, be interpreted cautiously since education is an important source for future economic returns. The result merely

suggests that investment in education is characterized by a substantially longer gestation period than that of many other type of physical capital formation (Fayissa, 1996). A period of ten to twenty years may be involved, depending on the length of the education process. Even though certain skills may be acquired in a short period of time, the educational capital stock cannot be acquired quickly, particularly for the more advanced type of education. Furthermore, school enrollments may be a more appropriate measure for the rate of change in social demand for education rather than a measure of current economic growth (Barro, 1990).

Skill Differentials and Economic Growth

Table 7 presents the impact of labor skill differentials on the rate of economic growth. The parameter estimate of skilled workers (*sk*) suggests that investment in human capital represented by an increase in the skill level of labor has a positive and statistically significant effect on Pakistan's economic growth. This confirms the theoretical assumption (Branson, 1977 and Stern, 1976) that a productive skill is positively related with national output.

The coefficient of unskilled workers (*usk*) is statistically significant with

Table 7

Rate of Economic Growth and Labor Skill Differentials

Explanatory Variable	Parameter Estimate	t-value
Capital Stock (*k*)	0.526*	3.31
Raw Labor (*l*)	-0.116	-0.38
Skilled Workers (*sk*)	0.171***	1.39
Unskilled Workers (*usk*)	-0.310*	-2.55
Foreign Trade (*t*)	0.034***	1.35
Constant	1.729*	2.18
No. of Observations	28	
R^2	0.519	
R^2-adjusted	0.410	
F-statistics	4.74	
Durbin Watson	1.55	

Note: All variables represent annual percentage growth rate.
sk = total employment in the non-agricultural sector
usk = total employment in the agricultural sector
(*) significant at $\rho \leq .01$
(**) significant at $\rho \leq .05$
(***) significant at $\rho \leq .10$

an anticipated negative sign. This finding is consistent with the results reported for raw labor (*l*). Generally, an increase in the labor force is expected to affect output positively. However, if surplus labor exists, it can lead to a negligible, zero, or even negative marginal product in the subsistence sector (Kasliwal, 1995).

Furthermore, the changing structure of the Middle East economies during the last three decades had some important consequences for Pakistan. During the 1970s and 1980s, more than two million Pakistani workers (roughly ten percent of the total Pakistani labor force) were employed in the booming oil economies of the Gulf States. Manual workers (unskilled/semiskilled) comprised 83 percent of the total migrant workers employed overseas (Government of Pakistan, Labor Force Survey). During this period, the net present value (based on various cost and benefit analysis) for these unskilled workers was estimated at US $178 million or almost US $3,000 per worker. A worker who could earn US $600 per year in Pakistan could make as much as US $4,000 per year in the Middle East. A substantial inflow of remittances in the form of foreign exchange developed which increased from US $340 million in the mid 1970s to more than US $2 billion in the 1980s (Pakistan Economic Survey). Thus, during this period unskilled workers became a significant factor in promoting economic growth in

Pakistan.

However, due to a stagnation in the Middle East economies and the eruption of the Gulf war, the majority of overseas workers were forced to return to their homeland. The massive inflow of unskilled workers led to a surplus in Pakistan's subsistence labor market, causing mass unemployment and reductions in real wages. This supports the contention that surplus unskilled labor market can lead to a negligible, zero, or even negative marginal product in the subsistence sector, thus reducing the per capita growth rate (Burney, 1986; Siddique, 1992; and Kashiwal, 1995).

The Middle Eastern economies are now in the process of maintaining the physical infrastructure built over the last three decades. This and the rapid industrialization in Pakistan have stimulated the demand for better trained and educated work force.

Occupational Mix and Economic Growth

Another theoretical assumption is that skills enhanced by education are complementary to the occupational mix leading to higher technological inputs and greater overall productivity. Thus, the higher the level of education, the

higher the occupational mix.

The estimated coefficient of professional workers (*pro*) reported in Table 8 is positive and statistically significant at one percent level. The coefficient of 1.295 implies that a 1 percent increase in the employment of professional workers results in a 1.295 percent increase in Pakistan's real GDP per capita. The coefficient estimate of office workers (*off*) is also positive and significant at the 5 percent level. These results support the findings of a recent study by Ibrahim (1994) which contends that professional and office workers contribute positively to economic growth of the Association of Southeast Asian Nations (ASEAN).

The relation between production workers (*prd*) and economic growth is statistically insignificant with an expected negative sign, as shown in Table 8. This result is in line with previous studies which found a negligible contribution to economic growth by low skilled workers. Gillis et al. (1987) and Cho (1994) argue that an increase in the employment of non-professional occupations contributes substantially less to economic growth compared to employment in professional occupations.

One may draw the conclusion that a higher level of education results in a

Table 8

Rate of Economic Growth and Occupational Mixes

Explanatory Variable	Parameter Estimate	t-value
Capital Stock (*k*)	0.803*	5.39
Raw Labor (*l*)	-0.494*	-2.89
Professional Workers (*pro*)	1.295*	4.13
Office Workers (*off*)	0.209**	1.83
Production Workers (*prd*)	-0.034	-0.52
Foreign Trade (*t*)	0.415*	2.91
Constant	-3.201*	-2.82
No. of Observations	28	
R^2	0.689	
R^2-adjusted	0.600	
F-statistics	7.74	
Durbin Watson	1.39	

Note: All variables represent annual percentage growth rate.
pro = total employment of professional, technical, managerial, and related occupations
off = total employment of administrative, clerical, and service workers
prd = total employment of production workers, operators, and laborers
(*) significant at $\rho \leq .01$
(**) significant at $\rho \leq .05$

higher occupational mix, i.e., more professional workers and fewer production workers. The results for Pakistan support the evidence that a transition from a lower to a higher occupational mix increases workers productivity and contributes significantly to its economic growth.

Investment in Health and Economic Growth

Like education, health services increase the quality of human resources at the present and in the future. Better workers' health can provide immediate benefits by increasing their strength, stamina, and ability to concentrate while on the job which may lead to higher future earnings.

Measures of the effects of better health on labor productivity have varying results as presented in table 9. The estimated coefficient of life expectancy at birth (*life*) is statistically significant with an unanticipated negative sign. The estimated coefficient for physician per 1,000 population (*ppp*) is positive, but statistically insignificant. These results suggest that an improvement in health services may not be critical to the economic growth of Pakistan. For the majority of the developing countries, however, an increase in life expectancy adds years to the working lives (rather than retirement years) of their adults. In return, a lengthening of working life

Table 9

Rate of Economic Growth and Investment in Health

Explanatory Variable	Parameter Estimate	t-value
Capital Stock (*k*)	0.445*	2.73
Raw Labor (*l*)	0.113	0.64
Life Expectancy at Birth (*life*)	-1.834***	-8.51
Physician Per 1,000 Population (*ppp*)	0.144	0.56
Foreign Trade (*t*)	0.269**	2.26
Constant	3.077*	4.35
No. of Observations	28	
R^2	0.600	
R^2-adjusted	0.510	
F-statistics	6.58	
Durbin Watson	1.78	

Note: All variables represent annual percentage growth rate.
(*) significant at $\rho \leq .01$
(**) significant at $\rho \leq .05$
(***) significant at $\rho \leq .10$

reduces the dependency ratio of the work force which leads to an increase in per capita income.

One must, however, realize that the increases in per capita income are only potential because they depend on the productive employment opportunities available to the surplus labor force. Since health services are lacking in the non-urban areas, population in the rural sector benefits the most from improvement in health standards. The evidence in the previous section supports the notion that increase in the unskilled labor force (agricultural sector) contributes marginally to economic growth of Pakistan.

These results tend to support Correa's (1970) argument that improvement in health may cause substantial surplus of labor in the form of seasonal idleness in agriculture and open urban unemployment. And if employment opportunities are lacking, the case for seeking productivity benefits from health could be lost in the short-run.

In the case of Pakistan, restoring a worker to good health may not directly contribute to national production in the short-run because investment in health might operate more as a complement than as a substitute for other inputs, such as physical capital and technology. Moreover, both the

quantitative (extended working life) and qualitative effects (increased worker productivity and earnings) of health are hard to measure, since the increase in productivity or earnings that is attributed to improvement in health may be difficult to identify.

Caution must be exercised in interpreting these results since improvements in health in many LDCs have undoubtedly been the most important advance in population quality (Ram and Schultz, 1979). While the economic implications of health advances are hard to measure, there is little doubt that the life expectancy is enhanced due to better health services. Longer life spans provide additional incentives to acquire more education which is an investment in future earnings. Moreover, better health results in more years of participation in the labor force, leading to greater productivity per worker.

The major results of this study are presented and interpreted in this chapter. The positive relationship between investment in human capital and economic growth is ascertained by employing different models. Three proxies are used to characterize investment in education, while two proxies represent investment in health. For the most part, the results are encouraging.

The effects of improvement in education on economic growth are generally positive and significant in all the models estimated. The results suggest a positive impact for secondary education, but a negative impact of primary education on economic growth. The negative coefficient of primary education merely suggests that it takes longer before its effects on economic growth are noticed. The results of skill differentials and occupational groupings reinforce the findings of a positive relationship between investment in education and economic growth of Pakistan.

The study shows that improvements in health may not be a significant factor in explaining Pakistan's economic growth. This result, however, does not imply that investment in health has an impecunious effect on labor productivity. It simply suggests that the effect of health on growth may be captured by labor and capital productivity, both of which have positive impact on economic growth.

CHAPTER 5

Summary, Conclusion, and Implications

Summary

Since 1947, Pakistan has experienced a relatively impressive economic growth. The image of its success, however, has been questioned due to a decline in Pakistan's relative economic performance in recent years. Pakistan's average per capita income is close to the perimeter that separates low income nations from middle income nations. By this measure, Pakistan should have a relatively high level of human development. The main interest of this study, therefore, is to analyze the relationship between investment in human capital and Pakistan's economic growth.

A myriad of theoretical and empirical studies from Adam Smith (1776) to the current neoclassical theories have investigated the link between population quality and economic growth. In general, economic theoreticians concur that the enhancement of human capital (i.e., investment in education, health, and training etc.) can transform human resources into the 'wealth' of nations. It is now widely believed that improvement in the quality of people as productive agents must be a central objective of development policies in

the LDCs.

The role of human capital investment in education and health in Pakistan's economic growth from 1965 to 1992 is investigated by utilizing the neoclassical growth accounting framework. Four different models are developed to demonstrate this relationship.

The empirical results of this study reveal that the relation between investment in physical capital, raw labor, and openness to trade are consistent with the theoretical contentions of the sources of economic growth. The coefficients of investment in capital stock and openness to trade are positive and show a significant impact on Pakistan's per capita growth rate. However, the coefficient of raw labor is negative and insignificant as anticipated, indicating that unskilled labor may not be a crucial factor in explaining economic performance of the country.

The evidence suggests that improvement in the educational system contributes positively to labor productivity in Pakistan. Three different proxies: school enrollment ratios, skill differentials, and occupational mixes are used as measures of investment in education. The results indicate that secondary education has a positive and statistically significant impact on

economic growth, while the negative coefficient for primary education suggests that investment in education is characterized by a longer gestation period than other type of investments.

Moreover, estimations based on skill differentials and occupational mixes reinforce the findings of a positive relation between human capital and economic growth. The evidence suggests that an increase in the skill level of the labor force has a significantly positive effect on Pakistan's economic growth. These results also support the contention that worker productivity increases due to the transition from a lower to a higher occupational mix (less production workers and more professional workers).

The findings for investment in health, however, are inconclusive suggesting a nebulous short-run impact on economic growth. This may have been due to the collinear nature of the other regressors in the model. Furthermore, economic returns to health relative to the returns to education are difficult to measure if not impossible. One must, however, realize that the need for health improvement as a development activity does not entirely rest on the ability to prove that healthy workers contribute to the national output. Better health is also an important goal in its own right since it increases the range of human potential, enhancing the quality of life, and it is regarded as a

basic human need.

Conclusion

The bulk of the evidence in this study strongly suggests that the development of human capital, particularly education, is an important source of economic growth in Pakistan. The results support the assertation that education at each level is a productive and desirable social investment that yields high returns in the future. And the importance of education is further evident because an increase in initial life expectancy due to better health services increases the demand for investment in future education, which may lead to higher expected lifetime earnings. This interrelationship between education, health, and economic growth indicates the need to formulate appropriate education and health policies.

Policy Implications

The findings of this study strongly suggest that an improvement in the quality of the labor force is imperative for Pakistan's economic growth. Some critical future choices must be made by Pakistan's government to develop its human resources since it lags behind other low-income countries in this area.

Policies involving human capital investments in education and health should be given top priority. Special attention may be needed to allocate financial resources to these sectors, particularly in the non-urban areas. Moreover, the relatively longer useful life spans due to improvements in health make it necessary that a proper type of educational policy be implemented to meet the demands for future skills required by the growing economy. This applies less to general and elementary education, which lays a flexible human resource foundation, and more to specialized and technical training.

There appears to exist a shortage of persons with critical skills in the 'modernizing' manufacturing sectors and a surplus of labor in the 'traditional' agricultural sectors. This requires that the number of accessible technical and vocational institutions may be increased to meet the demand of the rapidly growing manufacturing sectors. Furthermore, steps could be taken to identify the critical shortages/surpluses of skilled/unskilled human resources in each major sector of the economy, and the reasons for such deficiencies be analyzed in detail. Such analysis would be the basis for future planning and the establishing of targets needed for human resource development for each economic sector.

If migration of workers to the Gulf States has positive consequences on Pakistan's economy, then efforts are required to educate and train workers to increase their marketability for work opportunities in these states. Therefore, channeling of these workers' remittances from overseas into modern investments appears to be a policy option of increasing significance and incentive should be provided to develop these areas.

In order to reduce the burden on the educational system and to improve the performance of its essential functions, policies which (a) encourage greater reliance on job related learning experiences as a basis for occupational advancement and (b) stimulate the use of successful work experience as a criterion for advancement in the educational system may be pursued.

In addition, a population policy toward a deceleration of the rate of population growth may be enforced. A shift from a higher to a lower birth rate will increase the educational resources available for each child. Emphasis may also be given to the educational attainment of women which helps reduce the gender gap and contributes to the early decline in the fertility rate.

This study reemphasizes the belief that investment in human capital cannot be ignored if improvements in both economic performance and quality of life are desired. Pakistan must make critical choices to develop and take advantage of its most abundant resource, its people.

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