THE CONTRIBUTION OF HUMAN CAPITAL TO ECONOMIC ACTIVITY IN SINDH*

Syed Kamran Abbas Naqvi
Government City College, Karachi
Kamran Ali Khan
Karachi Chamber of Commerce and Industry
Khurram Iftikhar
University of Karachi

Abstract

This paper examines the relationship between human capital and economic growth in the region of Sindh. Purpose behind this study is, either human capital endorses economic activity or not. Our research is based on the Locus endogenous growth model in order to measure the direct contribution of human capital in activity. The data used in this study covers thirty years from 1978-79 to 2007-08. Further, the Johansen Cointegration and the Granger causality tests are applied for empirical investigation. We found long run relationship among variables. The Granger causality test results show that employment and development expenditure are caused by GDP while GDP is caused by health expenditure and enrollment rate. We recommend that government should try to avoid misuse of limited resources. In addition, government should disaggregate the development expenditures and try to improve only those expenditures which have significant impact on economic growth.

Key Words: Economic Indicators: Gross Domestic Product (GDP), Human Capital, Development,Expenditures, Health expenditures
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Section: 1

1. Introduction

Human capital is basically the engine of knowledge and skills which enhance the capabilities of people or labaour. For example, physical capital plays more significant role in an economy to increase output and income. All economists have acknowledged the important of human capital for research, innovation, promoting economic growth and increasing the welfare of a society. In 1776, the Wealth of Nations, Adam Smith discussed that "ability and talent" are the fundamental source of a society's economic welfare. Becker's (1964) focused the modern microeconomic foundations of investment on human capital. The modern economists Romer (1990) and Lucas (1988) both were agreed that in the modern macroeconomics growth theory, the concentration of human capital is the center "engine" of economic growth. Now, the contribution of human capital towards economic growth or activity has been proved in different cross-countries empirical studies.

There are two main reasons to focus human capital. First, human capital increases productivity and brings new ideas. Second, the concentration of human capital increases the spillover effects of knowledge which enhance productivity and long-run growth within a region as well as morality of a society. Glaeser (2003) suggested that human capital is a key predictor for the success of a region, because, "high skilled people in high skilled industries may come up with more new ideas". We choose to focus the central issue of the causal human capital towards economic activity as a whole in Sindh. This paper is organized as follows: The section-2 provides the explanation of variables on the basis of different theories and literature. Section 3 gives brief overviews of the leading theories that seek to explain the linkages between human capital formation and economic activity. Although the treatment of these theories is necessarily brief and simplified, this section provides useful background for the main parts of the paper. Section 4 consists of econometric modeling, estimation techniques and empirical findings. Finally section 5 gives the conclusion and policy implication.

Section: 2

2.1 Economic Activity in Sindh

To measure the economic activity, we have utilized the gross domestic product of Sindh calculated by Dr. Farooq Arabi. Dr. Arabi measured the annual market value of final goods and services produced in Sindh during given time period. To measure the real economic activity in Sindh, we have also incorporated other significant variable i.e. employment which affects the purchasing power parity of the people. Because if the people are employed then they have power in the form of income to consume which promotes the economic activity as well. According to a UNDP report GDP and employment are important indicators for economic development of a country. If a country's GDP growth is declining then, it will adversely affect the tax to GDP ratio, investment as well as overall economic activities within a region.

2.2 Human capital

Health and education expenditures and enrollment rate are the significant variables for human capital and contributors to human welfare. For example in Africa, income, education and health expenditures are the main determinant of human development. Different nations have different criterion to measure human development. But the common indicators for human development are education expenditure, health expenditure, enrollment rate and per capita income (see Griffin and Knight, 1990; UNDP, 1990). While income can be directly conducive to education and health, but human capital can not be directly purchased like material goods and services. The contemporary theory of human capital was introduced by Mincer (1958), Schultz (1960, 1961), Becker (1975) and Denison (1962, 1979) with different point of views. In this paper, we have used the enrollment rates of high school (shows the attainment of middle school education) and expenditures on health, education and training (shows the investment on human capital) as proxies. This technique to measure human capital was already used by W. Craig Riddell (2006), Simon Appleton and Francis Teal (1997) and Jaison R. Abel Todd M. Gabe (July, 2008).

The philosophy behind this technique is, individuals acquire knowledge at schools, colleges or working places which enhances their skills capabilities and earning opportunities. According to Keynesian consumption function, consumption directly depends on consumer's income. In developing countries like Pakistan, consumption has significant role in aggregate demand (AD), and all economic activities revolve around aggregate demand.

Section: 3

3 Literature Review

In 2006, Berry and Glaeser pointed out in their model that US metropolitan cities are diverging towards more innovated and skill oriented industries over the passage of time. In their model, entrepreneurs are continuously investing on human capital. High tech firms excessively want to hire high human capital labour. If the workers are move in different cities for better opportunities then they attract highly skilled workers with rewarding handsome salaries and benefits. They used very simple technique for empirical analysis and concluded that all engineers had good opportunities. The industrial growth, particularly in high-tech industries, was observed.

In 2006, W. Craig Riddell studies using such conventional methods to analyse the relationship between education and earnings obtained. These results of earnings after school education are similar to studies which are carried out in other developed countries. They got approximately 8-10 percent rate of return when the analysis is based on annual earnings and 6-9 percent on weekly basis earnings. Such estimates compare favourably with rates of return on physical capital investments. However, many social scientists have been skeptical about these estimates because they do not control for unobserved factors such as ability, motivation and perseverance that may influence both educational attainment and labour market success. Such unobserved factors are likely to imply that conventional estimates of the return to schooling are biased upwards. Furthermore, according to signaling/screening theory, one may observe a positive correlation between education and earnings even when

education has no causal effect on individual productivity and earnings.

Robert Tamura (2002) Federal Reserve Bank, Atlanta, developed a general equilibrium model of fertility and human capital investment under uncertainty. In their model, uncertainty mean, there is probability of survival with respect to age, i.e. old age people have low probability as compare to young. He examined parents, maximized expected utilities with their own earnings and discounted utilities for future generation. He analyzed on the basis of precautionary demand for money (Keynes) and life cycle income hypothesis (Modigliani). Mortality rate of young people is negatively related to human capital of young. Therefore, rising human capital reduces the probability of death and increases investment on human capital. With human capital accumulation, young mortality rate declines as well as fertility. Lower rate of fertility leads to decrease the cost of human capital (small number of children and low expenditures on education) and increases the growth of capital as well as economic growth.

Gustav Ranis (2004) contrasted Human Development, described as the ultimate goal of the development process, with economic growth. He described as an imperfect proxy for more general welfare, or as a means toward enhanced human development. He has broadened the definitions and goals of development but there was still needs to define the important interrelations between human development (HD) and economic growth (EG). To the extent, that greater freedom and capabilities improve economic performance, human development will have an important effect on growth. Similarly, to the extent that increased incomes will increase the range of choices and capabilities enjoyed by households and governments, economic growth will enhance human development.

Acemoglu and Angrist (2001) use variation in educational attainment associated with compulsory schooling laws and child labour laws in the U.S. to examine whether there is evidence of external returns to higher average schooling at the state level.8. They find small (about 1%) social returns in excess of private returns but these are imprecisely estimated and not significantly

different from zero. Because compulsory schooling laws principally influence the amount of secondary schooling received. These results suggest that there are not significant knowledge spillovers associated with additional high school education in America.

In 1999, Hall and Jones argued that focusing on level rather than growth rates, because it provides the analysis of difference in long-run economic growth which is directly related to the economic welfare. They also point out that differences in growth rates are largely transitory and that convergence, a focus of many growth studies, implies common long-run growth rates across countries.

Lucas (1988) discussed that if education and job training are provided to labour then human capital will be another factor of production. He considered an important input in the production function and not fundamentally different from physical capital. By taking assumption of constant returns to human capital formation and had argument that workers' knowledge has spills over affect on growth and labour productivity. Lucas analyzed the direct impact of human capital in production of goods if there are technological innovation and expenditure on R & D.

Krueger and Lindahl (1998) used the cross-country growth equations which showed more robust results. First, the changes in human capital stock do not suppose to affect economic growth rate. This difference with the strong evidence came from the microeconomic literature of education on income. The change in the stock of education is directly correlated with economic growth. Second, the effect of human capital stock on economic growth is much more robust but its significant varies across the countries. The two other important conclusions established by Kruger and Lindahl were: (a) the secondary and higher education have greater effect as compare to primary, and (b) insignificant or negative of women education on output (economic growth). The argument is that females are discouraged to work in society after getting higher education that's why it has a negative affect.

Anand and Ravallion (1993) found the significant affect of economic growth on human development through central and

local government budgetary expenditures. However, the effectiveness of this robust relation depends upon nature of government expenditures. Government should focus on important sectors of an economy such as expenditures on education and health, which play important role in human capital development. Government expenditures for human development should distribute among low income groups and areas.
The government must also have the institutional capacity to efficiently allocate these expenditures.

Sen (2000) discussed that income growth clearly strikes one as the main contributor to directly increasing the capabilities of individuals and consequently the human development of a nation. For example, while the citizens of the Indian state of Kerala have life expectancies and literacy rates comparable to those of many developed countries, the fact that they cannot enjoy many of the benefits of citizens of such countries (such as better housing, transportation, or entertainment) demonstrates the importance of GDP as an instrument for achieving a wide range of capabilities. However, GDP also has a strong effect on literacy and health outcomes, both through private expenditures and government programs. Thus, higher incomes facilitate the achievement of other crucial human development objectives, it also has an indirect effect on human development. The impact of economic growth on a nation's human development level, of course, also depends on other conditions of the society. One important component here is the role of the distribution of income, both at a micro level within a household as well as at a macro level across households.

Barro and Lee (1992) through the World Bank have provided better estimates of educational attainment for a large number of countries over the period 1960 to 1985. Hence, these data make it possible to use a broad sample of experience across countries and over time to assess the interplay between human capital and economic growth. They summarized preliminary empirical results that use these data. These results provided empirical support for economic theories that emphasize the role of human capital in the growth process. They had used the census-survey data from the United Nations and other sources for more

than 100 countries. These figures were combined with information about school-enrollment ratios to construct a panel data set on educational attainment at five-year intervals from 1960 to 1985. Roughly 40 percent of the cells in this data set correspond to direct census-survey observations. The remaining 60 percent of the cells are constructed by a perpetual-inventory method that uses the census-survey values as benchmark stocks and the school-enrollment ratios as investment flows.

Section: 4

4. Methodology

The objective of this paper is to examine the relationship between human capital and economic growth in the case of Sindh. Different forms of government expenditure and economic growth have been used in the literature. Pryor (1968) used government consumption expenditures instead of using government expenditures to find out the impact of government expenditures on economic growth while Peacock-Wiseman (1961) used government expenditures. Goffman (1968), Musgrave (1969), Gupta (1967) and Michas (1975) worked on per-capita instead of gross domestic product like Mann's (1980).

In this study, we have government expenditures instead of government expenditures as a percentage of GDP. In addition we use economic growth instead of ing per-capita. We didn't work on per-capita because major part of the labor force is employed in informal sector in case of Sindh.

4.1 Model

The model, used in this paper, is built upon the following augmented function:

$$GDP \bullet f(DEX_t, EDU_t, HLT_t, EMP_t, ENR_t) \ldots\ldots\ldots\text{(a)}$$

Where,
GDP= Gross domestic product at constant market price
DEX= Development expenditures
HLT = Health expenditures

EMP = Employed labor force
ENR = Enrollment in high school
For estimation purposes, Equation (a) can be represented by the following LOG form:

$$LGDP_t = a_0 + a_1 LDEX_t + a_2 EDU_t + a_3 HLT_t + a_4 EMP_t + a_5 ENR_t + U_t \ldots\ldots\ldots (b)$$

4.2 Data

In this study, thirty years' time series data from 1978-79 to 2007-08 is used for empirical investigation. The effect of human capital has been investigated by different variables. Education is one of the important factors that affect efficiency of labor. High school enrollment and education expenditures are used to capture the effect of quality of life. Health expenditure, development expenditure and employment rate are also used to take into account the effect of human capital on economic growth. All these variables have been taken from Sindh Development Statistics. The dependent variable (i.e. GDP) is taken from Farooq Araby (2006).

4.3 Estimation Techniques

In order to find out the long run relationship between variables, we first checked the order of integration by applying the unit root tests. Then, after getting the order of the integration the Johansen test of cointegration was applied. Granger causality test is applied to investigate the uni or bi directional causality between variables. For short run dynamics, we applied Error correction model (ECM). Finally, an impulse response function is applied to trace out the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables.

4.4. Estimation Results

4.4.1 Unit Root Test

To test the order of integration of the variables, we used the standard tests for unit root, namely the Augmented Dickey-Fuller (ADF) test. Results of the test are presented in **Table 1.**

Table 1: Results of Augmented Dickey-Fuller (ADF)

Variables	Order of Integration	Number of lags	Level of significance
LGDP	I(1)	0	1%
LDEX	I(1)	1	10%
LEDU	I(1)	0	5%
LHLT	I(1)	0	1%
LEMP	I(1)	0	10%
LENR	I(1)	0	1%

4.4.2 Long Run Relationship

Equation (b) is estimated using annual data covering the period of 1979-2008. Before testing for the existence of a long run relationship among variables it is important to decide the order of the lag. Results based on several tests except Akaike information criteria (AIC) suggest that optimal lag is three **(See Table 2)**. So, we use one lag for empirical findings.

Table 2 Selection for Lag Order Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	57.12450	NA	9.13e-10	-3.787000	-3.499036	-3.701373
1	176.8159	177.3206	1.99e-12	-9.986365	-7.970618	-9.386978
2	204.8727	29.09588	5.62e-12	-9.397975	-5.654447	-8.284828
3	**311.9003**	**63.42379***	**1.35e-13***	**-14.65928***	**-9.187971***	**-13.03237***

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

The Johansen Cointegration test is applied to investigate the long run relationship between variables. On the basis of our results (See Table 3) On the basis of trace value test and maximum Eigen value test, there are three co-integrated equation and we found that both variables are integrated and have a long run relationship.

Table 3: Results of Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.980052	263.5598	103.8473	0.0000
At most 1 *	0.951358	157.8652	76.97277	0.0000
At most 2 *	0.792683	76.23719	54.07904	0.0002

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.980052	105.6946	40.95680	0.0000
At most 1 *	0.951358	81.62805	34.80587	0.0000
At most 2 *	0.792683	42.48469	28.58808	0.0005

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

4.4.3 Causality

Correlation does not necessarily imply causation in any meaningful sense. To overcome this problem, Granger (1969) approach to the question of whether x causes y is used to see how much of the current y can be explained by past values of y and then to see whether adding lagged values of x can improve the explanation. We found uni-directional causality among GDP, development expenditures employment and enrollment rate, in case of Sindh. Employment and development expenditure are caused by GDP while GDP is caused by health expenditure and enrollment rate. Results are given in **Appendix.**

Section: 5

5. Conclusion and Policy Recommendations

The objective of this paper is to investigate the relationship between human capital and economic growth in Sindh. The data used in this study is running over thirty years from 1978-79 to 2007-08.

The Johansen Cointegration test has been applied on the variables including education expenditures, health expenditures, enrolment rate, employment and economic growth. The Cointegration method reveals that there is long term relationship among variables. Granger causality test investigates that employment and development expenditure are caused by GDP while GDP is caused by health expenditure and enrollment rate.

We recommend that government should try to avoid misuse of limited resources. In addition, government should disaggregate the development expenditures and try to improve only those expenditures which have significant impact on economic growth. We further suggest that at the initial stage government should try to increase health expenditures and high school enrolment rate particularly instead of useless spending in over all education sectors. Furthermore, significant efforts are required to improve GDP in order to generate employment as employment is caused by GDP.

References

Acemoglu, Daron and Joshua Angrist. "How Large are Human Capital Externalities?

Amartya Sen. 2000. The Income Component of Human Development Index, Journal of Human Development, Vol. No: 1, Trinity College, Cambridge.

Anand and Ravallion. 1993. Human Development Effect on Economic Growth.

Barro and Lee. 1992. Human Capital and Economic Growth, Staff Report, World Bank.

Becker, Gary S. 1964. Human Capital, New York: Columbia University Press.

Becker.s.Gray. 1992. The Economic Way of Looking At Life, Nobel Lecturer, Department of Economics, University of Chicago.

Evidence from Compulsory Schooling Laws" NBER Macroeconomics Annual 2000,
2001, 9-59.

Gustav Ranis. May 2004. Human Capital and Economic Growth, Economic Growth Center: Yale University.

Jaison R. Abel,Todd M. Gabe. July 2008. Human Capital and Economic Activity in Urban America, Staff Report no. 332: Federal Reserve Bank of New York.

Krueger and Lindahl. 1998. Education for Growth: Why and For Whom?, Working Paper, Princeton and Stockholm Universities.

Lucas, R.E. Fr. (1988) On the mechanics of economic development, Journal of Monetary Economics, 22, pp. 3 -42.

Robert Tamura. 2002-5. Human Capital and Economic Development, Working Paper, South Carolina: Clemson University.

Romer P. M. (1990) Endogenous Technological Change, Journal of Political Economy, 98 (5), pp.71-102.

Schultz, T. W. (1961) Investment in human capital, American Economic Review, 51, pp. 1-17. 14

Simon Appleton and Francis Teal. 1998. Human Capital and Economic
Development, The African Development Report, Oxford University.

W. Craig Riddell. 2006. The Impact of Education on Economic and Social Outcomes, Department of Economics: Colombia, University of British.

Appendix

Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Probability
LEDU does not Granger Cause LDEX	29	1.40169	0.24715
LDEX does not Granger Cause LEDU		0.38315	0.54131
LEMP does not Granger Cause LDEX	29	2.73357	0.11029
LDEX does not Granger Cause LEMP		8.89961	0.00613
LENR does not Granger Cause LDEX	29	2.96393	0.09702
LDEX does not Granger Cause LENR		1.15311	0.29276
LGDP does not Granger Cause LDEX	**29**	**6.29453**	0.01868
LDEX does not Granger Cause LGDP		0.00129	0.97164
LHLT does not Granger Cause LDEX	29	0.43916	0.51336
LDEX does not Granger Cause LHLT		1.75583	0.19667
LEMP does not Granger Cause LEDU	29	5.30449	0.02952
LEDU does not Granger Cause LEMP		1.05337	0.31419
LENR does not Granger Cause LEDU	29	1.71451	0.20186
LEDU does not Granger Cause LENR		2.94511	0.09803
LGDP does not Granger Cause LEDU	29	2.55449	0.12206
LEDU does not Granger Cause LGDP		3.13009	0.08859
LHLT does not Granger Cause LEDU	29	0.47714	0.49584
LEDU does not Granger Cause LHLT		2.98829	0.09573
LENR does not Granger Cause LEMP	29	0.16880	0.68455
LEMP does not Granger Cause LENR		1.00796	0.32464
LGDP does not Granger Cause LEMP	**29**	**20.6778**	0.00011
LEMP does not Granger Cause LGDP		0.09173	0.76440
LHLT does not Granger Cause LEMP	29	0.00137	0.97081
LEMP does not Granger Cause LHLT		4.74628	0.03862
LGDP does not Granger Cause LENR	29	0.67096	0.42016
LENR does not Granger Cause LGDP		**6.32892**	**0.01839**
LHLT does not Granger Cause LENR	29	3.79058	0.06242
LENR does not Granger Cause LHLT		3.42769	0.07550
LHLT does not Granger Cause LGDP	**29**	**5.97931**	**0.02156**
LGDP does not Granger Cause LHLT		2.90802	0.10006