

IS HUMAN CAPITAL A PANACEA FOR POVERTY AND INEQUALITY: EVIDENCE FROM PAKISTAN?

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ABSTRACT

There is a wide strand of literature covering the topic of human capital, poverty and income inequality. This study is an attempt to explore this relationship for Pakistan for the period from 1972 to 2019 by using ARDL technique for models' estimation. The study used skill as an additional variable for human capital along with the variables of health and education and estimated the impact of human capital on poverty and income inequality separately. It is found that variable of health human capital and education has significant impact on the incidence of poverty. It means higher spending on human capital reduces poverty in Pakistan. The variable of skill is found significant and negatively associated with poverty. Higher spending on education reduces poverty and inequality. The impact of inflation has adverse impact on poverty. The impact of human capital is also seen to be significant in reducing inequality in Pakistan. The study suggests that investing in human capital is pivotal in the development and growth in Pakistan. Policies, therefore, carried out to support growth should not only take into account the level but also the distribution of education and health facilities, generalizing the access to formal education as well as at different stages to a wider section of the population.

Keywords: poverty, inequality and Human capital

INTRODUCTION

The concept of human capital gained currency during the decades of 60s when economic growth found its manifestation in the theory of human capital instead of physical capital. Shultz (1961) and Becker (1964, 1975) were the foundational thinkers who popularized this approach in the literature of economics as the basis of economic growth and development of physical capital. In the theory of production, human capital was then

added as a factor of production. Later on, social and religious capitals have also been added in this list.

The history of economic development has its Underpinning in the concept of human capital. It is admitted fact on all the hands that the character and pace of economic and social development of any country is ultimately determined by its human resources rather than its physical resources(Tang,

2025). The seminal works of Shultz (1961), Mincer (1958) and Becker (1964, 1975) has made human capital as the linchpin of all developmental processes. "The knowledge, skills, competencies, and attributes embodied in individuals that facilitate the development of personal, social, and economic well-being" is the larger definition of human capital. (OECD, 2001). In a nutshell, Human capital is the stock of knowledge, skills and abilities, which can latently facilitate in augmenting the efficiency and working performance in life as a whole. Hence human capital in this context is 'means that determine the end' and here end is the long-term goal i.e. welfare and well-being of an individual (Martin McCracken, 2017).

Pakistan emerged with poor educational structure and with poorly educated population. Lack of resources and political tranquility has kept Pakistan deprived of achieving anything substantial in the field of human resource management and human capital formation (Barakzai et al., 2024). However efforts have been made by various governments in Pakistan to improve human development indicators such as education, health, sanitation and other basic needs but these have always remained pitifully insufficient. It is the concept of human capital which qualifies the meanings of economic development by differentiating it from economic growth (Rashid et al., 2022). It is in the words of founder of Pakistan Mr. Jinnah (Nov, 1947) who explained the importance of education as follows

"You are aware that the value of education and the proper kind of education cannot be overstated. We must seriously address this issue if we are to make significant, quick, and long-lasting progress, taking into account the current circumstances and the enormous advancements that have occurred globally."

This was the vision of Mr. Jinnah to make modern education as the bedrock of economic development of the newly created state. Hence this study is an attempt to explore the association of different components of human capital with poverty and income inequality separately for the Pakistan.

This study is organized in the following manner. After introduction, section 2 consists of review of

literature. Section 3 describes data, variables and methodology subsequently section 4 discusses estimation and discussion of results and finally section 5 discusses conclusion.

2. Review of Literature

There are many studies that reviewed about the human capital, poverty and income inequality. The study has divided the review into two broad categories i.e. national and international studies in order to give a detailed picture of the topic under hand.

Niazi and Khan (2011) highlighted the impact of education on multidimensional poverty in Punjab. The study found that the poverty was higher in the rural areas than the urban ones. The results indicated that there was a significant role of education along with other regional and demographic characteristics to reduce poverty. Similarly, Jamal (2005) explored the brunt of education on poverty decline in Pakistan. In this study the secondary data used from 1972 to 2006. The study suggested that there exist a negative association between education and poverty in the long run and short run. Kefela and Rena (2007) explained chronic and transitory poverty in Pakistan. The study used data from two surveys i.e. 1998-99 and 2000-01 of PSES. The study used multinomial Logit models. The study found that Zakat alone could not help to get out from poverty trap. The study suggested that education has great impact in creating welfare of the people specially the poor ones.

Awan, et al. (2011) explored the relationship between human capital and urban poverty and inequality for Sargodha city. The study used the household survey for data collection of poverty and estimated the impact of both education and experience on poverty. The study found that education and poverty has negative relation with poverty. The education is the main factor of human capital which helps reduce the incidence of poverty. Iqbal and Awan (2007) pointed out the situation of poverty in urban areas of Pakistan. The study used the primary data of 330 households collected by PIDE and UOS. The study found that human capital and public services availability are very important to break the vicious circle of poverty.

Khan, et al. (2014) asserted the impact of education and health on poverty and inequality in Pakistan. The study found that there exist a valuable relationship among poverty, education and health. Kakar et al. (2011) observed the relationship between education and growth in Pakistan. The secondary data used in this study taken from SBP, ESPs and WDI. The study found that education and GDP has long run relationship. The quality of education is important for economic growth and abilities of human beings.

Khattak and Khan (2012) discussed the relationship between education and economic growth in Pakistan. The study found that secondary level education effects the economic growth positively. Qadri and Waheed (2011) explained the human capital and GDP in Pakistan by using data from 1978 to 2007. The author found that human capital has positive and long run relationship with economic growth.

Khan (2008) discussed the poverty alleviation and human development in Pakistan. The study found that the successive effort of poverty alleviation depends upon the improvements of human capacities. The study also found that sustainable cooperative efforts are needed to tackle the issue of poverty and inequality and improvement in the human resources. Afzal et al. (2012) explored the link among, education, poverty, inequality and GDP in Pakistan. The Author found that by investing in education economic growth can be increased that will obviously reduce poverty and inequality. The Author also found that there is a negative relationship between RGDP and poverty. RGDP and education has positive relation and negative relation between education and poverty. Rolleston (2009) explored the relationship between human capital, poverty and education in Ghana. The study used the secondary data which was taken from Ghana living standard survey from the period 1991 to 2006. The study found that education level plays significant role on the welfare of household. Omoniyi (2011) investigated the link between human capital and poverty in long run in Mexico. The study found that the investment in education is important to shift recipients from agricultural employment to

nonfarm wage employment. It means education helps broadening the employment opportunities. Santos (2009) pointed out the human capital and quality of education in a poverty trap model. The objective of study was to show the unequal initial income and human capital distribution and unequal quality of education between children through poverty trap model. The study found that human capital endowment is not beneficial for an individual for life. There might be a threshold level of investment in human capital to achieve a minimum acceptable level of living standard otherwise they would remain trapped at low level of poverty.

Galor (2011) explained inequality, human capital formation and process of development. The main purpose of the study was to highlight the distribution of income as a constructive impact on human capital formation and process of development. The study found that unequal distribution of land has been a barrier for the economic development. The study also found that in later that human capital is main instrument of growth leading to reduction in inequality. Andersen (2015) explored human capital, inequality and growth for OECD countries. The study is based on theoretical aspects. The main purpose of study was to show the link between inequality and growth through human capital formation. The study found that there was a lack of rational fiscal policy that caused inequality via taxes and transfers. The study also found that equal distribution of income can be obtained by equal distribution of education.

Based on all the studies that the present study has reviewed, it is suggested that majority of the studies supported the hypothesis that high human capital is a sufficient condition for reducing the incidence of poverty and inequality. A very few studies used skill as factor of human development to see its impact on incidence of poverty and inequality.

3. Data, variables and Methodology

The present study is based on secondary data from 1972 to 2019. All the data used in this study is taken from World Development Indicator, State Bank of Pakistan and Economic Survey of Pakistan. In order to determine the impact of

human capital (Education, Health and skill) on poverty and income inequality the study used different health and education variables. Health indicators fall into two categories: health output indicators and health input indicators. Health output indicators include life expectancy, infant and adult mortality rates, fertility rates, etc., while health input indicators include health service spending, the availability and caliber of healthcare facilities, etc. The health outcome variable was employed in this study as a stand-in for human capital.

Similarly for Education, the study has taken two indicators like Secondary School Enrollment Ratio and Gross enrollment ratio secondary. This study has used tertiary education as a proxy for skilled people which is also an indicator of human capital. None of the earlier studies have used this variable as human capital indicator.

3.1 Concept of variables

In order to determine the impact of human capital on poverty and income inequality the study has used variables explained in Table1.

Table 1: Description of the Variables

Variables	Abbreviation	As Proxy for	Definition and measurement
Head Count Ratio	POV	Poverty	The percentage of people living below \$3.10 per day at 2011 international prices is known as the poverty headcount ratio at \$3.10 per day.
Life Expectancy	LE	Human capital	The number of years an infant could live if the existing rate of mortality at the moment of birth persisted throughout its life is indicated by life expectancy at birth.
Secondary School Enrollment Ratio	SSER	Human capital	Total number of students enrolled in secondary schools, both public and private, regardless of age.
Gross Enrollment ratio with Tertiary	GERT	skill development	Following on from secondary school leaving, it is total entry in tertiary education, irrespective of age, showed as a percentage of the total population of the five-year age group.
Gross enrollment ratio secondary	GERS	Human capital	Total secondary school enrollment, regardless of age, given as a percentage of the population of official secondary school age. Due to the addition of older and younger children to make up for early or late school entry and grade repetition, GER can exceed 100%.
Consumer Price Index	CPI	Inflation	Inflation is determined by dividing the current year's value of goods and services by the base year's value, given as a percentage.
Government Expenditure	GE	Growth of human capital	All current government expenditures for the acquisition of goods and services, including national defence and security costs, are included in general government final consumption expenditures, with the exception of those related to government capital formation.

Expenditure on Education	EEXP	Growth of human capital	The percentage of direct spending in public schools, excluding other transfers and student financial aid, is used to describe current spending.
Gross Fixed Capital Formation	GFCF	Growth of investment	The construction of roads, railroads, schools, offices, hospitals, private residences, commercial and industrial structures, plant, machinery, and equipment, as well as land developments (hedges, channels, sewers, etc.) are all included in gross fixed capital formation.
GINI Coefficient	INQ	Inequality	The degree to which the income distribution among people or households within an economy deviates from a perfectly equal distribution is measured by the Gini index.

Source: world development indicators

MODELS

$$POV = \alpha + \beta (GE) + \beta_2(CPI) + \beta_3(EEXP) + \beta_3(GERS) + \beta_3(LE) + \epsilon \quad (\text{Model 1})$$

$$POV = \alpha + \beta (LE) + \beta_2(SSER) + \beta_3(GERT) + \beta_3(GE) + \beta_3(CPI) + \epsilon \quad (\text{Model 2})$$

$$INEQ = \alpha + \beta (LE) + \beta_2(GERT) + \beta_3(CPI) + \beta_3(GE) + \epsilon \quad (\text{Model 3})$$

$$INEQ = \alpha + \beta (LE) + \beta_2(GERT) + \beta_3(CPI) + \beta_3(GFCF) + \epsilon \quad (\text{Model 4})$$

POV = Poverty

LE= Life expectancy

SSER= Secondary School Enrollment Ratio

GERT= Gross Enrollment ratio with Tertiary (proxy of skill development)

GERS= Gross enrollment ratio secondary

CPI= Consumer Price Index (Inflation)

GE= Government Expenditure

EEXP= Expenditure on Education

GFCF= Gross Fixed Capital Formation

INQ= Income Inequality

ϵ = Error

4. ESTIMATION AND RESULTS

4.1 Unit Root Test

First of all, the study applies the unit root test through Standard Augmented Ducky-Fuller test to check the stationary of the data. This test was under taken to check the order of integration. Three specifications were used as with constant, with constant and trend and with none for

estimation (See Table2). Three variables LE, Gini coefficient and CPI are stationary at level I(0) which is shown by the 1% and 5%signifinace level at and the rest of other variables are stationary at first difference I(1). According to the model specification when some variables are stationary at I (0) and some are at I (1) the appropriate technique for estimation is ARDL.

Table2: Results of the unit root test

Variables	Level			First difference		
	Intercept	Trend & intercept	None	Intercept	Trend & intercept	None
LE	-4.831653* (-3.610453)	-6.288218* (-4.211868)	-6.521933* (-2.624057)	-4.521933 (-3.605593)	-7.561097 (-4.211868)	-6.179618 (-2.624057)
PHCR	-2.537914 (-3.600984)	-2.471622 (-4.198503)	-0.343917 (-2.622585)	-11.02426* (-3.600987)	-10.91902* (-4.198503)	-11.15927* (-2.622585)
GINI	-5.539130* (-3.596616)	-5.483509* (-4.192337)	-0.232773 (-2.622585)	-4.936716* (-3.615588)	-4.9249958 (-4.219126)	-5.006901* (-2.627238)
GFCF	-2.176518 (-3.596616)	-2.342795 (-4.192337)	-0.036500 (-2.621185)	-4.994734 (-3.600987)	-5.345790 (-4.198503)	-4.995796 (-2.622585)
GERT	0.395638 (-3.600987)	-0.894858 (-4.198503)	1.594606 (-2.622585)	-4.065060 (-3.600987)	-4.366553 (-4.198503)	-3.689313 (-2.622586)
EEXP	-3.118283 (-3.600987)	-3.285177 (-4.198503)	0.338381 (-2.621185)	-4.761344* (-3.600987)	-4.660532* (-4.198503)	-4.797956* (-2.622585)
CPI	-6.141085* (-3.600987)	-6.516513* (-4.219126)	-4.212740* (-2.622585)	-4.378615 (-3.600987)	-6.231649 (-4.198503)	-2.002683 (-2.622585)
GE	-0.398107 (-3.596616)	-2.104660 (-4.192337)	3.383449 (-2.621185)	-7.995415* (-3.600987)	-7.896477* (-4.198503)	-6.178305* (-2.622585)
GERS	-0.249630 (-3.600987)	-2.437355 (-4.198503)	1.598915 (-2.622585)	-4.075493* (-3.600987)	-4.104250* (-4.198503)	-3.660999* (-2.622585)

Author's calculations

4.2 Specification of ARDL Model

The following is the general form of error correction model. There are two variables used in this model Z

$$\Delta z_t = \mu + \alpha t + \lambda z_{t-1} + \sum_{i=1}^{p-i} \gamma_i \Delta y_{t-i} + \sum_{i=1}^{p-1} \gamma_i \Delta x_{t-i} + \varepsilon_t$$

On the basis of above equation, the unrestricted error correction model (UECMs) according to the variable is give below.

$$\begin{aligned}\Delta(HCR)_t &= \beta_0 + \beta_1(GE)_{t-1} + \beta_2(CPI)_{t-1} + \beta_3(EEXP)_{t-1} + \sum_{i=1}^{p_1} \lambda_{1i} \Delta(GE)_{t-i} + \sum_{i=0}^{p_2} \lambda_{2i} \Delta(CPI)_{t-i} \\ &+ \sum_{i=0}^{p_3} \lambda_{3i} \Delta(EEXP)_{t-i} \\ \Delta(HCR)_t &= \beta_0 + \beta_1(SSER)_{t-1} + \beta_2(IMR)_{t-1} + \beta_3(GERT)_{t-1} + \sum_{i=1}^{p_1} \lambda_{1i} \Delta(SSER)_{t-i} + \sum_{i=0}^{p_2} \lambda_{2i} \Delta(IMR)_{t-i} \\ &+ \sum_{i=0}^{p_3} \lambda_{3i} \Delta(GERT)_{t-i} \\ \Delta(GINI)_t &= \beta_0 + \beta_1(SSER)_{t-1} + \beta_2(IMR)_{t-1} + \beta_3(GERT)_{t-1} + \sum_{i=1}^{p_1} \lambda_{1i} \Delta(SSER)_{t-i} + \sum_{i=0}^{p_2} \lambda_{2i} \Delta(IMR)_{t-i} \\ &+ \sum_{i=0}^{p_3} \lambda_{3i} \Delta(GERT)_{t-i} \\ \Delta(GINI)_t &= \beta_0 + \beta_1(SSER)_{t-1} + \beta_2(IMR)_{t-1} + \beta_3(GERT)_{t-1} + \sum_{i=1}^{p_1} \lambda_{1i} \Delta(SSER)_{t-i} + \sum_{i=0}^{p_2} \lambda_{2i} \Delta(LE)_{t-i} \\ &+ \sum_{i=0}^{p_3} \lambda_{3i} \Delta(GERT)_{t-i}\end{aligned}$$

In above equation β 's show long run relationship and λ 's showing short run relation.

The Wald test (F-statistic) was calculated following equation regression in order to distinguish the long-term association between the variables in question. The projected long-run coefficients of poverty, income inequality, secondary school enrolment ratio, newborn mortality rate, and gross enrolment with tertiary education can all be restricted in order to perform the Wald test.

Hypotheses are as:

$H_0 = \beta_1 = \beta_2 = \beta_3 = 0$ (There is no long -run relationship)

$H1 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq 0$ (There exists long run relationship)

4.3 Bound Test for Co-integration

We can test for long-term dynamic relationships between the variables in the ARDL modeling approach using the bound test. The study required a long-term link between the variables in order to proceed. The results of the Wald test (F-Statistic) for the long-term association are interpreted in Table 2.

Following Pesaran and Pesaran (1997) procedure, study estimated ARDL with Wald test (F-statistics) to test for overall significance of the co-efficient of all the variables

Bound test confirm that there exists long run relationship because upper bound values in all levels 1%, 5% and 10% lower than F statistics. Therefore, we can proceed to ARDL Error Correction Model. The investigation would be based on short-run analysis and long-run analysis to determine the dynamic relationship.

Table2: Results of the Bond test

Models	Model 1		Model 2		Model 3		Model 4	
F-Statistics	5.165506*		8.1973605*		6.941651*		5.039948*	
Bonds	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
10%	2.08	3	2.08	3	2.2	3.09	2.2	3.09
5%	2.39	3.38	2.39	3.38	2.56	3.49	2.56	3.49
2.5%	2.7	3.73	2.7	3.73	2.88	3.87	2.88	3.87
1%	3.06	4.15	3.06	4.15	3.29	4.37	3.29	4.37

Author's calculations

4.4 Human capital and poverty: Results and Discussion

Model is used to estimate relationship between human capital and poverty. There are few methods for lag selection. Therefore, we select Akaike Information Criterion for lag selection. The lowest the AIC value better the model. The study takes maximum four lags one by one. The Model (4, 0, 4, 3, 0, 3) is chosen which is based on Akaike

Info Criterion (AIC). The value of (AIC) is - 0.753076 is lowest and the model is best.

Shorts run analysis

To check the short impact of human capital on poverty we use poverty head count ratio as dependent variable and government expenditure, CPI inflation, education expenditure, gross enrollment ratio secondary and life expectancy are independent variables in the model.

Table3: Results of Short Run Model

Variables	Coefficients	T-Statistics[prob.]
D(LNHCR(-1))	1.455271	5.445413[0.0000]
D(LNHCR(-2))	0.862614	4.542011[0.0002]
D(LNHCR(-3))	0.352971	3.269489[0.0040]
D(LNGE)	0.189764	0.669902[0.5110]
D(LNCPI)	0.498881	0.566260[0.5778]
D(LNCPI(-1))	-0.832832	-0.928797[0.3646]
D(LNCPI(-2))	-1.280998	-1.594165[0.1274]
D(LNCPI(-3))	2.776848	3.727056[0.0014]
D(LNEEXP)	-0.539068	-1.993387[0.0508]
D(LNEEXP(-1))	1.547644	4.779944[0.0001]
D(LNEEXP(-2))	1.1005911	3.126962[0.0056]
D(LNGERS)	-2.258663	-4.206439[0.0005]
D(LNLE)	-216.414363	-4.265746[0.0004]
D(LNLE(-1))	3028.026	7.014301[0.0000]
D(LNLE(-2))	-2521.27....	-7.01091[0.0000]
Coin.Eq(-1)	-3.153323	-8.750176[0.0000]
R Square= 0.855485 F-Statistics= 5.919713 Pro (F-Statistics)= 0.000151 DW= 2.282740		

Source: Author's Calculations

Education expenditure has negative and significant impact on poverty. It means that when government increases the expenditures on education, poverty decreases in Pakistan. The finding of Khan et al. (2014) has also confirmed the same result. Life expectancy has also significant

impact on poverty. If we invest in human capital, it will increase employment and growth, resultantly poverty will decline (Asaju, 2012). The well-educated and healthy individual earns more than an uneducated and unhealthy individual (Khan et al. 2014). The variable of government

expenditure has insignificant impact on poverty in short run.

Error correction term in this model is negative and highly significant. It is also called the speed of adjustment. The value of coefficient of ECM is (-3.153323). The value of the coefficient shows that if there is disequilibrium in the model it will converge back to equilibrium by 315.3323 % annually.

Long Run analysis

The results of the model 1 are shown in table 5. The coefficient of gross enrollment ratio secondary has negative and significant impact on poverty in long run. Asghar et al. (2012) has also explored same result. Education increases the value and efficiency of labor force, which ultimately affect the living standard of individuals (khan et al. 2014). Life expectancy has negative and highly significant effect on poverty in the long run. A healthy worker earns more than an unhealthy worker. The coefficient of CPI has

positive and highly significant effect on poverty in the long run. This result of the study is corroborated by the earlier study of Khan et al.(2014). Chaudhry (2009) found that food price inflation increases poverty in Pakistan. The coefficient of government expenditure is positive and statistically insignificant. We checked the stability of the model by cusum and cusum square method. Result in diagram 5 and 6 show (see appendix) that there is stable relation among the variables in both long run and short run.

Model 2 is estimated to explore relationship between human capital and poverty by using proxy of skill as human capital. According to Akaike Information Criterion for lag selection the study chose ARDL Model (4, 0, 4, 3, 0, 3).The value of Akaike Info Criterion (AIC) is -0.753076 which is minimum. This is shown in Diagram 2 (see appendix). The table 4 shows the short run results of the ARDL model 2.

Table4: Short analysis of human capital and poverty

Variables	Coefficients	t-statistic[prob.]
LNHCR(-1)	1.012485	5.141386[0.0001]
LNHCR(-2)	0.552477	4.064567[0.0009]
LNHCR(-3)	0.262719	2.896479[0.0105]
LNLE	-88.091759	-2.095878[0.0524]
LNLE(-1)	2217.869	6.779887[0.0000]
LNLE(-2)	-1191.60...	-5.250986[0.0001]
LNSSER	-0.536348	-0.995288[0.3344]
NSSER(-1)	2.613324	4.496087[0.0004]
LNGERT	-0.594712	-2.213580[0.0417]
LNGERT(-1)	-0.503839	-1.550447[0.1406]
LNGERT(-2)	-1.503444	-4.469139[0.0004]
LNGERT(-3)	-0.977415	-3.304942[0.0045]
LNGE	1.385844	4.798050[0.0002]
LNGE(-1)	4.629605	8.810821[0.0000]
LNGE(-2)	3.79790	8.138771[0.0000]
LNGE(-3)	1.913888	5.410615[0.0001]
LNCPI	4.300661	5.437598[0.0001]
CoinEq(-1)	-2.921253	-9.991543[0.0000]
R-squar = 0.90 Adjusted R-Squar = 0.76 F-Statistic = 6.55 DW = 2.65 Prob.(F-Statistic) = 0.0002		

Source: Authors calculations

It is seen that expectancy (LE) that is used as proxy for health human capital has negative and highly

significant impact on poverty which is an obvious outcome of human capital on poverty. Gross

enrollment with tertiary education (GERT) has negative and significant impact on poverty in short run which is also confirmed from the findings of Kefela and Rena (2007). Kim and Ierada-Hagiwara (2010) have also confirmed that trained and educated labor force easily handle new technology and new production methods. The training increases the worker's ability to earn more than that of uneducated worker. In this model the government expenditure and CPI have positive and significant impact on poverty.

Error correction term in this model is negative and highly significant. It means that there exists a long run relationship among the variables. It is also called the speed of adjustment. The value of coefficient of ECM is (-2.921253). The model is convergent and shows that if there is disequilibrium in short run then the model it will converge back to equilibrium by 2.921253 % per anum.

Long Run Impact of Skilled base Human Capital on Poverty

The long run results of this model are shown in Table 5. In this model secondary school enrollment ratio (SSER) has negative and

significant impact on poverty. It means that if the government increases the enrollment ratios in secondary level then it will reduce poverty. The job opportunity will rise for educated individual that will affect per capita income. The growth rate also increases per capita income of an individual. If the growth rate rises in the country then poverty decreases because the poverty and growth has negative relationship (Ali et al. 2012). Gross enrollment ratio with tertiary education (GERT) has negative and highly significant impact on poverty. According to human capital theory individuals with professional education have greater chances of earning. Experience is found to have positive correlation with income this is confirmed from GERT which is negatively related to poverty. Government expenditure (GE) has negative and significant effect on poverty which is also confirmed from the findings of Deaton (2013). It is suggested that public spending increases economic activities and output which reduces the poverty. The variable of CPI has positive and significant impact on poverty. The stability of the model is shown using CUSUM and CUSUM SQ test.

Table5: long run impact of human capital on poverty

Model 1		Model 2	
Variables	Coefficients	Variables	Coefficients
LNGE	0.79960 0.717140[0.4820]	LNGE	-0.867080* -4.705924[0.0002]
LNCPI	1.069441* 6.296328[0.0000]	LNCPI	1.470332* 5.394197[0.0524]
LNEEXP	-0.823074* -8.60882[0.0000]	LN GERT	-0.252969* -2.187742[0.0439]
LN GERS	-0.655952* -3.955001[0.0000]	LN SSER	-0.868619* -4.256464[0.0005]
LNLE	-16.866355* -3.881266[0.0010]	LNLE	-0.528262 -0.109989[0.9138]
C	69.567357* 4.441615[0.0003]	C	43.3455557* 3.441615[0.0003]

Source: author's calculations

4.5 Human capital and inequality

Model 3 is used to estimate relationship between human capital and income inequality where Gini coefficient (Gini) is dependent variable and independent variables are life expectancy (LE), gross enrollment ratio with tertiary education (GERT), government expenditure (GE) and inflation (CPI) LINGERS. The value of Akaike Info Criterion (AIC) is -0.731438 which is lowest.

Short Run Impact of Human Capital on Income Inequality

To check the short impact of human capital on income inequality the study uses Gini coefficient as dependent variable and gross enrollment ratio with tertiary education (GERT), life expectancy (LE), CPI inflation and government expenditure (GE) as independent variables.

Table6: Short Run Results

Variables	Coefficients	t-Statistic [Prob.]
D(LNGINI(-1))	1.72840	5.181177[0.0001]
D(LNGINI(-2))	0.934770	4.265039[0.0006]
D(LNGINI(-3))	0.469510	3.177059[0.0059]
D(LNLE	92.356554	1.817226[0.0880]
D(LNGLE(-1))	3584.154....	4.593269[0.0003]
D(LNLE(-2))	-6958.31....	-5.185729[0.0001]
D(LNLE(-3))	3975.083...	5.796742[0.0000]
D(LNGERT)	0.214682	0.811240[0.4291]
D(LNGERT(-1))	1.092611	3.121993[0.0066]
D(LNGERT(-2))	1.210058	3.339872[0.0042]
D(LNCPI)	3.089026	2.797426[0.0129]
D(LNCPI(-1))	-6.989625	-5.187728[0.0001]
D(LNCPI(-2))	-4.513630	-3.166908[0.0060]
D(LNGE)	0.548304	1.729087[0.1030]
D(LNGE(-1))	-3.592284	-5.748801[0.0000]
D(LNGE(-2))	-2.826239	-4.297876[0.0000]
D(LNGE(-3))	-0.726316	-1.742287[0.1006]
Coint.(-1)	-3.650800	-7.393612[0.0000]
R-squar = 0.75 Adjusted R-Squar = 0.416181 F-Statistic = 2.321301 D. W = 2.79		

Source: Authors calculations

As shown in table 6, In short run the life expectancy (LE) is positive and statically insignificant. In the medium term, income inequality is positively and statistically insignificantly impacted by the gross enrollment ratio with tertiary education (GERT). Income inequality is positively and marginally impacted by government spending (GE). However, income inequality is positively and statistically significantly impacted by CPI inflation. This model has a negatively significant error correction term. Another name for it is the speed of adjustment. The ECM coefficient has a value of -3.650800. The coefficient's value indicates that the model will

return to equilibrium by 365.0800% each year if there is short-term disequilibrium.

Long Run Relationship

Results of the model are shown in table 8. It is seen that Life expectancy has negative and significant impact on Gini coefficient in long run; Ali et al. (2012) have confirmed same results. Better health facilities can result in lower income inequalities because it enables poor population to participate in labor market actively and get their due share in profits and spend it on food and health care. The same results were found by other studies as Deaton(2003). The variable of CPI has positive

and significant impact on income inequality in long run. When CPI increases then income inequality also increases. It is obvious from available economic literature that higher inflation causes higher income inequalities. The variable of government expenditure has positive impact on income inequality in long run. This result of the study is peculiar in the economies like Pakistan where most of the government spending is focused around social overhead capital rather than human capital. The findings of Jamal (2005) have also presented same outcome in his study in Pakistan. The Cusum and cusum square test are used to check the stability of the model. It is seen from the Diagram 9 and 10 that model is stable (see appendix).

In model 4 dependent variable is Gini and independent variables are LNLE, LNGERT, LNCPI and LNGFCF. The model (3, 4, 0, 0, 2) is selected on the base of lowest value of Akaike Info Criterion which is -0.380224 and shown in the diagram4.

Short Run Impact of Human Capital on Income Inequality

In order to determine the short run impact of human capital on income inequality the study uses Gini-coefficient as dependent variable and gross enrollment ratio with tertiary education (GERT), life expectancy (LE), CPI inflation and gross fixed capital formation (GFCF) are used as independent variables.

Table7: Shorts Run Impact

Variable	Coefficient	t-Statistic[Prob.]
D(LNGINI(-1))	0.536536	2.513056[0.0188]
D(LNGINI(-2))	0.294093	1.937934[0.0640]
D(LNLE)	46.240166	0.770862[0.4480]
D(LNLE(-1))	478.458376	0.877470[0.3886]
D(LNLE(-2))	-1002.65...	-1.137474[0.2661]
D(LNLE(-3))	1016.882...	2.298215[0.0302]
D(LNGERT)	0.096392	0.342862[0.7346]
D(LNCPI)	-1.311939	-1.427514[0.1658]
D(LNGFCF)	0.960496	2.035766[0.0526]
D(LNGFCF(-1))	-1.860562	-3.928177[0.0006]
Coinq(-1)	-1.686995	-5.951263[0.0000]
R-squared = 0.45 Adjusted R-Squared = 0.16 F-Statistic = 1.55 D.W = 2.19		

Source: Authors calculations

In this model life expectancy (LE), gross enrollment with tertiary education (GERT) and CPI have positive and insignificant impact on income inequality in short run which are confirmed by Johansen (2014). Today the role of technology is very important and demand of skilled people increasing. Income inequality has witnessed to increased due to low availability of trained people. Gross fixed capital formation has positive and significant impact on income inequality. It means with higher level of investment inequality may decrease which also supported by the theory of trickle down approach. The value of the coefficient of ECM is negative and highly significant in this model. It is the speed

of adjustment. The value of the coefficient of error correction term is (-5.951263). The value of the coefficient shows that if there is disequilibrium in short run the model will converge back to equilibrium by 595.1263 % annually.

Long run analysis

The results of the model are shown in Table 8. The coefficients of life expectancy have positive and significant impact on income inequality. Gross enrollment tertiary has also positive impact on income inequality. This variable is used as proxy for skilled persons. It is theoretically sound to believe that increase in the skilled persons will reduce inequality because with more skill, labor

can earn more which ultimately will help reduce inequality. Gross fixed capital formation has positive and significant effect on income inequality. The coefficient of CPI is negative and statistically significant in long run. Gross fixed capital formation has positive and significant

impact on income inequality. Our model is stable in both short run and long run because Cusum and cusum square tests shows that the blue line is between red lines.

Table 8: Long run analysis

Model 3		Model 4	
Variables	Coefficients	Variables	Coefficients
LNGE	1.116901* 5.968976[0.0000]	LNGFCF	1.022491*-2.598594[0.0155]
LNCPI	0.464473* 2.15213[0.0460]	LNCPI	-0.690649* 5.394197[0.0524]
LNGERT	0.181626* -2.119271[0.0501]	LNGERT	-0.252969* 1.493260[0.1479]
LNLE	-15.190950* -2.703161[0.0157]	LNLE	19.046340* 2.781508[0.0101]
C	33.981540** 1.832155[0.08506]	C	43.3455557* 3.441615[0.0003]

Source: author's calculation

5. Conclusion

The impact of human capital on poverty and income disparity is covered in this study. The findings indicate that human capital characteristics are important and have a negative correlation with poverty. It implies that poverty is decreased by investing in human capital. Human capital has a negative and substantial effect on income inequality as well. Model 4, however, contradicts the study's hypothesis. Therefore, by improving people's abilities and skills, education can have a significant impact on economic growth. The degree of poverty and economic inequality are also found to be significantly impacted by health human capital.

According to the study, human capital, such as health and education, plays a significant role in lowering poverty and income disparity in a nation

like Pakistan. Therefore, policies implemented to promote growth should consider not only the quantity but also the distribution of health and educational resources, extending access to formal education to a larger segment of the population at various times.

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