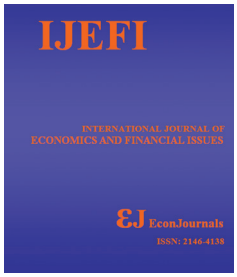


International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2015, 5(4), 843-853.

Human Capabilities and Economic Growth: A Comparative Human Capability Index

Mine Yilmazer[1], Serkan Çinar[2]*

[1]Department of International Trade, Celal Bayar University, School of Applied Sciences, Manisa, Turkey, [2]Department of Banking and Finance, Celal Bayar University, School of Applied Sciences, Manisa, Turkey. *Email: serkan.cinar@cbu.edu.tr

ABSTRACT

The purpose of this paper is to contribute to research probing the underlying role human capital plays on economic growth in 1985-2011 for 17 developed and developing countries. Firstly, we examined the determinants of human capabilities and formulated a new human capital index (comparative human capability index). Secondly, we analyzed the relationship between human capital and economic growth using the endogenous growth model. Results of the panel cointegration tests support a long-run positive relationship between human capital and economic growth in both developed and developing countries, however, our results show that human capital is more effective in developed countries than in developing countries.

Keywords: Human Development, Economic Growth, Panel Data
JEL Classifications: O15, C33

1. INTRODUCTION

The levels of income gaps between countries that have experienced two world wars, local or global crisis and local wars became more apparent in the 20th century. Nowadays, the difference in per capita income between the world's richest and poorest countries is 500 to 1; however, this ratio was 10 to 1 in the 1900's. Why do these differences still exist among countries in the 21st century? How do we eliminate their divergence? In reality, developing countries are generally growing faster than developed countries. The per capita income of some developing countries is constantly increasing; however it is apparent it is very difficult for them to reach the levels of development in developed countries. Developed countries have always had high per capita income as a product of having a skilled workforce that can produce technological advancements. The gap in human capital between countries should be closed if economic growth attends to human capital.

Human capital is the process of improving human capabilities. Its determinants are physical capital, social change, personal, social and political rights. Secondary education, training, economic efficiency, physical, mental and social well-being are all requirements for human capital improvement. Nowadays, it is clearly understood that the expansion of human capabilities is an important factor for economic growth and development. This concept however has been brought into question recently. Following criticisms in the 1970's of a material well-being or physical goods and services-based development approach, the criticisms became focal point of discussion when determining issues of standards or quality of life, poverty reduction policies and income distribution inequalities in the scope of "human-centered approaches." One of the human-centered approaches is the "Basic Needs Approach," developed by Seers (1969), Streeten (1984) and Stewart (1985). These researchers apologized that the real aim of development is to realize basic needs and to improve the quality of life, with acquisition opportunities for a full life. The most effective approach in the explanation of human development is the human capabilities approach, which was first developed by Amartya Sen and Martha Nussbaum. This approach was derived from the concept of human rights which are the so-called "first-generation rights" (political and civil liberties) and "second generation rights" (economic and social rights) (Nussbaum, 2003. p. 36). In similar studies, Sen focused on two concepts which are the so-called "functionings" and "capabilities." According to Sen, functionings are the regulations of beings and their actions. These have been simplified using the

following example by Sen. Having a bicycle provides mobility, but to be able to cycle achieves a better life. The roots of this approach are based on Adam Smith, Karl Marx and Aristotle (Sen, 1990. p. 43). Human capabilities contribute not only to economic growth but also to social development because they realize healthier lives, improved education, freedom and equal human rights (Sen, 1997. p. 1960). Wealth inequality gives an overview of economic development; but wealth is not sufficient to clarify the quality of life (Sen, 1990. p. 52). If the quality of life is more important in the process of development, people who are successful in their lives occur in the center of economic development (Sen, 1984; 1987; 1990; Qizilbash, 1996. p. 1210; Griffin, 1989. p. 10). Sen emphasized that, differences in human capabilities can arise from personal factors such as physical or mental heterogeneities among persons (such as disability, illness), non-personal resources (such as public health care), environmental diversities (such as climatic conditions, epidemic diseases) (Sen, 2005. p. 154). Qizilbash (1996) and Griffin (1989) have used Streeten's "Basic Needs Approach" and Sen's "Capabilities Approach" forming a lengthy "living life list" improving the well-being value concept. David Clark, who conceived of concept of human well-being using the values and experiences of the poor, found that the perception of a good life in South Africa where; jobs, housing, income, family, religion, health, good clothes and safety paramount (Clark, 2006. p. 8). Anand and Sen who were the first to have used the concept of human development, improved their approach and implied that not only present generations but also future generations should be protected from ill-health, undernourishment, illiteracy, poverty and other forms of deprivation in the concept of sustainable human development (Anand and Sen, 2000. p. 2030).

The quality of human life should be improved for sustainable economic growth and development. Therefore, human capital has been used as an alternative indicator in contemporary growth models. So for the first time the importance of human capabilities was included in addition to physical capital in the 1960's economic growth studies. Schultz (1961), Becker (1994), Arrow (1962) have all emphasized that education, skills and health investments besides physical capital have an important role on economic growth. Schultz (1961) believed that health services, elementary education, secondary and higher level education and training effect the productivity of human capital. Becker (1994) noted that investment in human capital (schooling, training, medical services, child care) has an important effect on the differences in earnings among people. On the other hand, Arrow (1962) determined that labor productivity is increased by "learning by doing" in the long-term. According to Uzawa (1965), technological knowledge is embodied in labor and improved in labor efficiency. In this context, Romer (1986), Lucas (1988), Rebelo (1991), Barro and Sala-I Martin (1995) analyzed the relationship between human capital and economic growth using the endogenous growth model. Romer (1986) used both increasing marginal productivity of knowledge and decreasing marginal productivity of physical capital in his model. Lucas (1988) discussed the importance of human capital accumulation on economic growth and international trade through schooling and learning by doing. Rebelo (1991) said that investment of human capital is very important on economic growth especially when physical capital is restricted. Many researchers who followed these studies have tested the endogenous growth model. Some of these researchers such as Barro (1991), Benhabib and Speigel (1994), Barro and Lee (1996), Mankiw et al. (1992), Sachs and Warner (1997), van Zon and Muysken (2001) used a number of different variables such as education, health, demographic characteristic, skills, technology, R and D, infrastructure, institutions, government investments. Following which it is now generally accepted that the improvement of human capabilities with the gain of labor productivity contributes to economic growth, in addition to an improvement of human values contributing to economic development. In contrast, according to some researchers such as Benhabib and Spiegel (1994), Islam (1995), Pritchett (2001), Temple (2001), Hanushek (2013), Glewwe et al. (2014) the effect of human capital on economic growth is negligible.

Nowadays, most researchers who have studied human capital and economic growth have established similar results. Castello and Domenech (2002) calculated a "human capital gini coefficient" using the indicators of schooling years and population. They found an inequality of human capital is greater across countries than within each country and observed a strong correlation between the Gini index and life expectancy. According to Wigley and Akkoyunlu-Wigley (2006) educational attainment has a significant effect on life expectancy by way of income growth in developing countries. Costantini and Monni (2006) emphasized that economic growth is positively influenced by human development, trade openness, quality of institutions and natural resources endowments. Mukherjee and Chakraborty (2010), Suri et al. (2011) realized a two-way relationship between economic growth and human development. Not only human development measures basic human well-being but also it is an important input into economic growth. Fleisher et al. (2010) found that human capital investment in less-developed areas of China can more achieve economic efficiency because it contributes to reduction in regional inequality. Dias and Tebaldi (2012) emphasized on structural institutions that are rooted on the historical development affect long-term economic performance, while political institutions are uncorrelated. Acemoglu et al. (2014) show that differences between human capital and institutions and found that the impact of institutions on long-run development is robust.

This paper aims to contribute to research on the role of human capital on economic growth. In this context, we examined the determinants of human capabilities and the relationship between human capital and economic growth based on research in literature. Following which, we investigated key indicators used to measure human capital or human development performance in developed and developing countries. An alternative human capital index has been defined and calculated, providing an alternative method of making comparisons to levels of human capital in countries. Moreover, we attempted to analyze the impact of human capital on economic growth using an endogenous growth model. We analyzed the different effects of human capital on economic growth using panel data from developed and developing countries. Finally, our results show that human capital is more effective in developed countries than in developing countries.

2. MEASUREMENT OF HUMAN CAPITAL

"Human development is development by the people of the people and for the people" (Alkire, 2010. p. 25). The basic purpose of development is to enlarge people's choices according to Mahbub ul Haq, the founder of the Human Development Reports. Human development is defined as "to be healthier, access better knowledge and achieve a quality life." The purpose of development is to improve the choices of people in economic, social, political and cultural life (UNDP, 1990). Human development index (HDI), measured by the United Nations Development Programme (UNDP) is a human well-being process that shows improvement of capabilities, health, educational attainment and all standards of living indicators.

The relationship between human capital and economic growth has been examined on the basis of data gained from the following researchers' findings on HDI (Anand and Ravallion, 1993; Ravallion, 1997; Ranis et al., 2000; Ranis, 2004; Mukherjee and Chakraborty, 2010; Shome and Tondon, 2010). However, it has been deemed by some researchers that key indicators used by the UNDP to measure HDI are not sufficient. Health, life, education, decent standards of living, political freedom, creativity, productivity, the environment, culture and the arts are the only possible valid dimensions because no other fixed-list of a human dimension and its development exists (Alkire, 2010. p. 9). There are several studies in the literature, which have used alternative gauges to measure HDI. Morris (1979) using life expectancy, infant mortality, literacy; Dasgupta and Weale (1992) using income, infant mortality, political and civil human rights; Qizilbash (1996) using health, shelter, security, literacy; Nussbaum (2000) using human capabilities such as life, health, senses, thought, emotions; Narayan et al. (2000) using various dimensions of well-being; de Toledo Piza and Kuwahara (2009) using health, education, income, housing, infrastructure, access to information have measured different human capital indexes and compared the differences among countries or different regions in a country. Moreover Noorbakhsh (1998) suggested some improvements to alternative indices on the same components of HDI. Raya (2001) has measured an index best known as the quality of life index that includes key indicators of human capabilities; to be well-nourished, educated and possessing the capability of healthy reproduction in the Philippine provinces. Alkire et al. (2014) also approximated global multidimensional poverty index using ten indicators relating to health, education as standard of living. Similarly, social progress index that is composed of basic human needs, foundation of wellbeing and opportunity dimensions has been calculated for 50 countries since 2013 (Stern et al., 2014. p. 4).

3. COMPARATIVE HUMAN CAPABILITY INDEX (CHCI)

In this study, we have formulated a new human capital index in conjunction with the UNDP's HDI method. Our "human capital index" however, also included economic (gross domestic product [GDP] per capita, domestic savings/GDP, trade/GDP) and social components (life expectancy, secondary schooling, GDP per person employed). This new index, called CHCI provides an alternative method of comparison when determining levels of human capital.

Figure 1 shows the indicators used in the measurement of CHCI. Indexes which reflect the improvement in economic wealth and social infrastructure are measured by means of six indicators. These indicators are out-lined in the following section.

3.1. Economic Wealth Indicators

Three of the CHCI's indicators are used to determine economic wealth. Firstly, the level of GDP per capita is an indicator of material well-being in conjunction with the indicators of savings and trade, which all indicate access and usage of domestic and foreign income for a country. If economic wealth increases a greater proportion may be spent on education, health and careers by households and governments alike.

3.1.1. GDP per capita (constant 2000 US$)

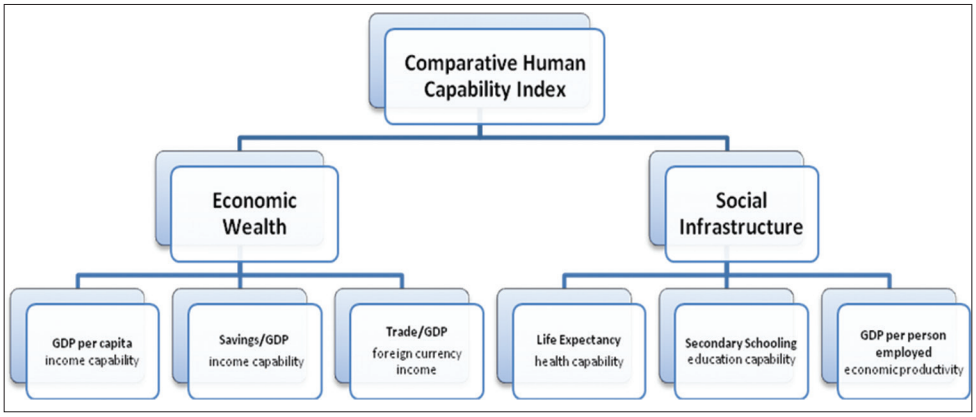
GDP per capita is the most important indicator in the measurement of a country's developmental process. This indicator has been used as an indicator to quantify human capital, particularly UNDP's HDI and others. A high level of income is required to access the resources that create higher standards of living. In this way it can provide health care and educational opportunities, better nutrition, and the prevention of many kinds of deprivations. The underlying concept is a greater expansion in an economic wealth achieves economic freedom by ridding a country of the material deprivations. In an economic development approach founded on "human-capabilities" many researchers have measured human capabilities using criteria have used GDP per capita as an indicator. It has been used by Morris (1979); Dasgupta and Weale (1992); Qizilbash (1996); Nussbaum (2000); de Toledo Piza and Kuwahara (2009) and in the measurement of UNDP's HDI since 1990. GDP per capita has also been taken into consideration in conjunction with other human capital indicators in the all of these studies.

3.1.2. Gross domestic savings (percentage of GDP)

Gross domestic savings is another indicator of a material standard of living. Firstly, it is commonly perceived that savings indicate an individual or social dimension of human capital. The ability of savings which is an important indicator of the level of income, can improve in different dimensions i.e., human capital. Demographic factors may have an effect on workers' health and productivity through their effect on savings. High life expectancy and low fertility rates may have contributed to increasing savings rates (Bloom et al., 1999. p. 13). Chakraborty (2004) has emphasized that low savings and health investment rates cause high mortality rates in societies. According to Bloom and Williamson (1998) increased savings lead to low fertility. Human capital impacts and is impacted by economic development strategies. Bloom and Malaney (1998); Bloom and Williamson (1998); Hamoudi and Sachs (1999) and Sachs and Warner (1997) have all focused on government savings.

Current savings influence future generations' wealth and economic performance. Genuine savings has been created with this in mind. Genuine savings or net investments were estimated by World Bank

Figure 1: Comparative human capability index and its indicators



in 1997, these reflect a change in natural and human capital. Gross national savings is the difference between gross national income and public and private consumption and it is an added investment of human capital (educated expenditure) and is subtracted from a depletion of natural resources (World Bank, 2006. p. 155-157). There are some studies on the relationship between savings and future well-being (Ferreira and Vincent, 2005; Hamilton and Clemens, 1999; Hamilton and Hartwick, 2005).

3.1.3. Trade (percentage of GDP)

Trade or in other words "openness" is another indicator, which has a positive impact on human capital investment because it creates higher levels of employment and increased foreign currency reserves. Benhabib and Spiegel (2003) interrupted openness and life indicators as "human capital." These indicators correlate "human capital" because investment in human capital in real terms results in a country's development.

First Barro and Sala-I Martin (1995), Barro (1996), Barro (2000) considered rates in terms of trade as one of the determinants of economic growth in an economic growth model. Later a number of researchers; Sachs and Warner (1997), Bloom and Malaney (1998), Bloom et al. (1989), Gallup and Sachs (2000), Bhargava et al. (2001), Yanıkkaya (2003), Söderbom and Teal (2003), Lam (2013), Shahbaz and Rahman (2014) used openness indicators with the other human capital indicators in the endogenous economic growth model.

3.2. Social Infrastructure Indicators

The remaining three of the six indicators are related to social infrastructure. These three indicators (life expectancy, secondary schooling and GDP per person employed) show significant improvements in the standard of living and economic well-being.

3.2.1. Life expectancy at birth, total (years)

A long life span is a frequently used indicator of health, well-being and efficient workforce. Barro (1996), Barro and Lee (1994), Bloom and Malaney (1998), Bloom et al. (2000), Bloom et al. (1999), Gallup and Sachs (2000), Bhargava et al. (2001), Bloom et al. (2004), van Zon and Muysken (2005), Jack and Lewis (2009), Weil (2007) investigated the relationship between health and economic growth using life expectancy. The researchers found that an improvement in health has a positive and significant effect on output. Using cross-country macroeconomic data, Bloom et al. (2004), Bloom and Canning (2005) found that good health and a resultant positive well-being had as significant and important effect on education as on worker productivity and wages. Acemoglu and Johnson (2006) reached a similar conclusion that an increase in life expectancy, preventing mortality from major diseases, led to an increase in population. However, they were unable to ascertain any positive effects from data on life expectancy to GDP per capita. Castello-Climent and Domenech (2006) found that children brought up in underprivileged families have a lower life expectancy and the resulting empirical evidence indicates human capital inequality has a clear and negative effect on life expectancy. Bowser (2010) discovered improvements in life expectancy as a result of increased tobacco taxes to also have had a positive effect on economic growth in the US.

3.2.2. Secondary school enrollment (% gross)

Levels of educational attainment can be considered an indicator of human capital improvement (Breton, 2013. p. 1023). It is also observed that indicators of secondary school enrollment have been used to determine levels of educational in a workforce. Increasing secondary school enrollment increases the number of skilled laborers with vocational education, thereby increasing macro-economic efficiency.

Lucas (1988), Lau et al. (1991), Barro and Lee (1993), Barro and Lee (2000) and Barro and Lee (2001), de la Fuente and Domenech (2002), Bassanini and Scarpetta (2001), Bloom and Malaney (1998), Gallup and Sachs (2000), Krueger and Lindahl (2001) emphasized that GDP growth is positively related to secondary school enrollment in developing countries. Bassanini and Scarpetta (2001), de la Fuente and Doménech (2002), Acemoglu et al. (2014) found that human capital when measured in terms of, number of years schooled, showed a positive impact on per capita growth. Some researchers such as Stephan (1997), Chatterji (1998), Kwabena et al. (2006), Zhang and Zhuang (2011) also maintained tertiary education to have had a beneficial effect on economic growth.

There is a positive relationship between primary and secondary education as a determinant of human capital and economic growth since human capital is productive and consumptive, as in Pakistan/India Abbas (2000), China Shou-Fu and Zhao (2009),

India Banerjee and Roy (2014). According to Benhabib and Spiegel (2003) human capital has a positive effect on total-factory productivity growth rate. Education investment, workers' savings, schooling rates is all positively related to human capital and a country's economic growth (Bildirici et al., 2005. p. 135). Lim and Tang (2008) investigated national and global human capital inequalities using the education inequality and human capital Kuznets curve. They found, human capital inequality is increasing in "within-country" although decreasing in "between-country" often as a result of migrant workers and international students. Tridico (2009) found an investment in health and education and an improvement in social institutions causes higher GDP per capita in emerging and transition economies.

3.2.3. GDP per person employed (constant 1990 PPP $)

GDP per person employed is an indication of a country's improvement in terms of human capabilities and economic performance. This indicator, one of the most important indicators of labor productivity, may reflect the quality of life and the achievements of benefits from opportunities attained from human capital such as education, health (Roth and Thum, 2013. p. 505). Differences may be seen between growth rates of GDP per capita and GDP per person employed. Labor productivity of some countries is higher compared to others.

The first purpose of "Millennium Development Goals," set by the United Nations, is to eradicate poverty and hunger. The growth rate of GDP per person employed has been used as an indicator (one of eight indicators) to monitor progress. This indicator aims to achieve full and productive employment for all, including women and the young.

4. DATA DEFINITIONS

We have used a new index CHCI as an indicator of human capital in production function, in doing so we have also attempted to determine the effect of human capital on economic growth in both developed and developing countries. It is assumed that all component indicators of the new index have a positive effect on economic growth. Component indicator's indexes of CHCI have been calculated using UNDP's HDI.

$$\text{Component Indicator's Index} = \frac{X_i - X_{min}}{X_{max} - X_{min}} \quad (1)$$

X_i is the value of these annual indicators for each country. The largest and smallest data among the countries has been taken as both minimum and maximum values (X_{max} and X_{min}) for each year in the formula. CHCI is based on the arithmetic mean of component indices measured using minimum and maximum values for each year on the assumption that all variables are of equal weight. Indexes have been calculated respectively using maximum and minimum values for each year and each country group. CHCI has a value between 0 and 1; the higher the number is, the more developed the country is.

The formula used to calculate CHCI is:
CHCI = 1/6 (GDP per capita) + 1/6 (savings) + 1/6 (trade) + 1/6 (life expectancy) + 1/6 (school enrollment) + 1/6 (GDP per person employed)

We have used the time-period 1985-2011 for 17 developed and 17 developing countries. The source of the data is World Development Indicators and Global Development Finance.

CHCI value is indicated in 2011 for panel countries in Table 1 (calculated by us). According to CHCI calculation value, while developed countries have the highest rate, developing countries have lower rate among 34 panel countries. The first 17 countries of CHCI ranking are all developed countries included in the panel.

5. ECONOMETRIC METHODOLOGY

The model of this study is built on the classical production function framework and is used to analyze the impact of the human capital on economic growth. We have applied Breusch and Pagan (1980) and Pesaran (2004) Lagrange multiplier (LM) test statistics for cross-section dependence. We have also used the panel unit root tests (Levin, Lin and Chu [LLC] test, Im, Pesaran and Shin (IPS) test and cross-sectionally augumented IPS (CIPS) test developed by Levin et al. (2002), Im et al. (2003) and Pesaran (2007), respectively. Our panel cointegration analyses were based on the Westerlund model (2005). Finally, long-run coefficients were established using Pesaran et al. (1999) study.

Table 1: Calculated CHCI values and panel countries list

Rank	Countries	CHCI-2011
1	Ireland	0.789
2	Netherlands	0.710
3	Norway	0.702
4	Belgium	0.682
5	Switzerland	0.651
6	Denmark	0.632
7	Sweden	0.626
8	Austria	0.600
9	Japan	0.579
10	Finland	0.577
11	France	0.553
12	Canada	0.549
13	Spain	0.545
14	United States	0.530
15	United Kingdom	0.527
16	New Zealand	0.506
17	Italy	0.491
18	Malaysia	0.427
19	Chile	0.408
20	Thailand	0.364
21	China	0.356
22	Argentina	0.333
23	Costa Rica	0.323
24	Bulgaria	0.316
25	Uruguay	0.314
26	Venezuela	0.312
27	Tunisia	0.308
28	Mexico	0.296
29	Peru	0.269
30	Turkey	0.242
31	Colombia	0.237
32	Indonesia	0.202
33	Philippines	0.158
34	India	0.106

CHCI value is indicated in 2011 for panel countries in Table 1 (calculated by us), CHCI: Comparative human capability index

5.1. Testing for Cross-Sectional Dependence

We have examined the significance of cross-sectional correlations among residuals. This test for cross-section dependence was carried out using the Breusch and Pagan (1980) and Pesaran (2004) LM test statistics. The Breusch and Pagan LM test are based on the sum of squared coefficients of correlation among cross-sectional residuals ($\hat{u}_{it}$) obtained through ordinary least squares. The test statistic denoted by CD_{LM1} can be calculated as:

$$CD_{LM1} = \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij}^2 \tag{2}$$

Where, the $\hat{\rho}_{ij}$ stands for the sample estimate of the cross-sectional correlation among residuals. Under the null hypothesis of no cross-sectional correlations, fixed N and $T \rightarrow \alpha$, the CD_{LM1} statistic is distributed as Chi-squared with $N(N-1)/2$ degrees of freedom.

The test statistic CD_{LM2} can be represented as:

$$CD_{LM2} = \sqrt{\frac{1}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} (T\hat{\rho}_{ij}^2 - 1) \tag{3}$$

Here it is seen that under the null of no cross-sectional correlations with first $T \rightarrow \alpha$ and then $N \rightarrow \alpha$, Pesaran (2004) test statistic (CD_{LM2}) is asymptotically distributed as a standard normal.

5.2. Westerlund Cointegration Test

The test of Westerlund (2005) is based on the null hypothesis of cointegration that allows for the possibility of multiple structural breaks in both the level and trend of a cointegrated panel regression. In this model, when variables are non-stationary, the model requires these variables to be cointegrated. To this end, consider the following empirical specification of our theoretical model.

$$s_{it} = \alpha_{ij} + \tau_{ij} t + \beta_i (M_{it}) + \omega_{it} \tag{4}$$

Where, β_i is country specific slope parameters that are assumed to be constant over time, while α_{ij} and τ_{ij} are again country specific intercept and trend parameters that are subject to M_i structural breaks. The error is with that which we assumed be generated as;

$$\begin{aligned} \omega_{it} &= g_{it} + \varepsilon_{it} \\ g_{it} &= g_{it-1} + \rho_i \varepsilon_{it} \end{aligned} \tag{5}$$

With ε_{it} having a mean zero and stationary distribution that is independent across i. The fact that ε_{it} is only assumed to be stationary means that it can be both heteroskedastic and serially correlated.

5.3. Pooled Mean Group (PMG) and MG Tests for Long-Run Coefficients

The autoregressive distributed lag (ARDL) model was used to estimate long-run equation (Bahmani-Oskooee and Brooks, 1999; Bahmani-Oskooee and Kutan, 2009). The following sample ARDL model:

$$y_{it} = \alpha_i + \varphi_i y_{i,t-1} + \gamma_i X_{it} + \delta_i z_t + u_{it} \tag{6}$$

For $i = 1,2,....,N$, $t = 1,2.....,T$, where, x_{it} is a $k \times I$ vector of agent-specific forcing variables and z_t is a vector of common forcing variables (Pesaran, 1997. p. 187).

The estimators such as MG estimator, used to estimate individual ARDL models, do not allow for the short-run heterogeneity or long-run homogeneity related variables in this model. To overcome the shortcomings of the individual ARDL models, we have used a panel ARDL model and estimated it by making use of the PMG estimator. Pesaran et al. (1999) developed two estimators; MG estimator and the PMG estimator. The MG estimator imposes no restrictions on the parameters of ARDL specifications and derives the long-run parameters from an average of the long-run parameters obtained from the individual ARDL estimates. The main shortcoming of this estimator is that it does not allow certain parameters to belong to the same cross panel members. To overcome this shortcoming of the MG estimator, the PMG estimator may be utilized instead. The PMG estimator requires the long-run parameters to be the same but allows intercepts, error variances, and the short-run parameters to differ freely across countries. Thus, it allows for the short-run heterogeneity in conjunction with the long-run homogeneity of the variables in the panel ARDL model.

This model is able to established and allow for differences between alternative model specifications. Tests of homogeneity of long-run parameters can be carried out individually or together by employing the likelihood ratio or other standard tests. However, Pesaran et al. (1999) pointed out that in the case of cross-country studies, these tests tend to over reject the homogeneity hypothesis. Therefore, we have used Hausman (1978) type test for long-run homogeneity.

5.4. Empirical Model and Results

In recent years, growth theories emphasize the accumulation of human capital with an associated period of accelerated growth towards a new steady state growth path of output. Ever since Uzawa (1965), Nelson and Phelps (1966), Lucas (1988), Romer (1990), Mankiw, et al. (1992) various papers have been attributed to human capital as a key factor in the stimulation of economic growth. This paper aims to contribute to the research over the role of human capital on the growth path of output.

We have assumed that the endogenous growth model has the following form:

$$Y_{(t)} = K_{(t)}^{\alpha} H_{(t)}^{\beta} (A_{(t)} L_{(t)})^{1-\alpha-\beta} \tag{7}$$

Where, Y is output; K is physical capital, H is stock of human capital. L is labor, A is level of technology; α and β are the partial elasticity of output with respect to physical and human capital (Mankiw et al., 1992. p. 416).

We have derived an equation for the aggregate output in country i, at time t:

$$y_{i,t} = \alpha_{0,i} + \phi_i y_{i,t-1} + \beta_{1,i} k_{i,t} + \beta_{2,i} l_{i,t} + \beta_{3,i} h_{i,t} + \varepsilon_{i,t} \tag{8}$$

Where, *t* and *i* are the time, countries, respectively. ε is the usual error term. *y* denotes GDP growth (annual %); *k* is gross fixed capital formation (constant 2005 US$); *l* is total labor force in millions; and *h* is CHCI.

5.4.1. Cross-sectional dependence test results

We examined the significance of cross-sectional correlations among residuals. The tests statistics with their corresponding probabilities are shown in Tables 2 and 3.

The correlations among cross-sectional residuals are highly significant according to CD_{LM1} and CD_{LM2} tests. As a result, we have allowed for the cross-section dependence when testing the stationarity of the series.

5.4.2. Panel unit root test results

We first examined the stationarity of developed countries and developing countries for panel data sets. We used LLC, IPS and CIPS developed by Levin et al. (2002), Im et al. (2003) and Pesaran (2007) panel unit root tests, respectively.

As indicated in the Tables 4 and 5, we observed that all the variables appear to be stationary especially for the first difference. We can also observe that all the variables seem to be stationary especially in the level and for the first difference in Tables 4 and 5. The results indicate that the null of non-stationarity cannot be rejected in only $LLC_{t\text{-stat}}$ in level for *k, l*, $IPS_{W\text{-stat}}$ in level *k, l* and $CIPS_{stat}$ in level in level for *h*.

5.4.3. Cointegration tests results

Westerlund (2005) cointegration test is done to test the null hypothesis of cointegration against the alternative of non-cointegration, which is equivalent to testing H_0: $\sigma_i^2 = 0$ for all *i* against H_1: $\sigma_i^2 > 0$ for some *i*.

Table 6 indicates that the null hypothesis of cointegration is strongly rejected for the no break-model and asymptotic normal distribution. However, these results should be interpreted with caution, as erroneous omissions of structural breaks are known to make this type of test biased towards cointegration. "Break-model" is the null hypothesis of cointegration is also unable to reject an asymptotic normal distribution. Indeed, if we allow for structural shifts as well as cross-country dependence, the null hypothesis of cointegration cannot be rejected at the 10% of level bootstrapped distribution. This finding suggests that the variables are in fact cointegrated, which is evident in the model.

Table 2: Cross-sectional dependence test results (Developed countries)

Test statistic	*Y*		*k*		*L*		*H*	
	Value	*P*	Value	*P*	Value	*P*	Value	*P*
CD_{LM1}	224.7362	0.0000	223.6912	0.0000	184.2695	0.0037	296.5343	0.0000
CD_{LM2}	5.3804	0.0000	5.3170	0.0000	2.9267	0.0017	9.7338	0.0000

Table 3: Cross-sectional dependence test results (Developing countries)

Test statistic	*Y*		*k*		*L*		*H*	
	Value	*P*	Value	*P*	Value	*P*	Value	*P*
CD_{LM1}	174.5802	0.0143	189.1868	0.0017	474.5116	0.0000	258.4236	0.0000
CD_{LM2}	2.3392	0.0096	3.2249	0.0006	20.5252	0.0000	7.4230	0.0000

Table 4: Panel unit roots tests results (Developed countries)

Coefficient	$LLC_{t\text{-stat}}$		$IPS_{W\text{-stat}}$		$CIPS_{stat}$	
	Level	First D	Level	First D	Level	First D
y	−6.122***	−7.483***	−2.987***	−7.046***	−4.269***	−5.342***
k	−1.881	−3.867***	−0.077	−3.422***	−2.926***	3.830***
l	−3.966***	7.299***	−2.152**	−6.472***	−2.402**	−2.563**
h	−4.327***	−12.14***	−1.464*	−11.58***	−1.99	−2.681*

***, ** and * indicate the rejection of the null hypothesis at 1%, 5% and 10% level of significance, respectively. The lag lengths are selected using AIC. Newey-West bandwidth selection with Bartlett kernel is used for both LLC test. The critical values for the CIPS test were obtained from Pesaran (2007), Table 2c (Case III: Intercept and trend), LLS: Levin, Lin and Chu, IPS: Im, Pesaran and Shin, CIPS: Cross-sectionally Augumented IPS

Table 5: Panel unit roots tests results (Developing countries)

Coefficient	$LLC_{t\text{-stat}}$		$IPS_{W\text{-stat}}$		$CIPS_{stat}$	
	Level	First D	Level	First D	Level	First D
y	−5.269***	−9.880***	−6.449***	14.01***	−4.131***	4.927***
k	−1.403*	−7.574***	−2.349***	−9.180***	−4.600***	5.127***
l	1.265	−3.504***	1.451	−4.889***	−3.625***	−4.235***
h	−3.703***	−8.064***	−2.984***	−10.74***	−2.743**	−4.012***

***, ** and * indicate the rejection of the null hypothesis at 1%, 5% and 10% level of significance, respectively. The lag lengths are selected using AIC. Newey-West bandwidth selection with Bartlett kernel is used for both LLC test. The critical values for the CIPS test were obtained from Pesaran (2007), Table 2c (Case III: Intercept and trend), LLS: Levin, Lin and Chu, IPS: Im, Pesaran and Shin, CIPS: Cross-Sectionally Augumented IPS

5.4.4. Estimation of long-run coefficients

Table 7 indicates the alternative estimation for both developed and developing countries: MG, which imposes no restrictions; PMG which imposes common long-run effects and dynamic fixed effects which constrains all of the slope coefficients and error variances to be same (Pesaran et al., 1999. p. 628).

The negative and significant error correction coefficients ($Ø_i$) illustrated on Table 7 indicates not only the presence of the cointegration among the variables but also the adjustment towards equilibrium between variables and economic growth.

The Hausman test indicates that the null hypothesis of the long-run homogeneity for each variable cannot be rejected at 1% level of significance. This justifies a use of the PMG estimator, which is consistent and efficient under the long-run homogeneity. Therefore the use of the PMG estimator seems to be more applicable than the MG estimator. The diagnostic test results reported in Table 7 shows the absence of any autocorrelations or heteroscedasticity in the individual equations, as can be seen in the long-run coefficients in Table 7. While a 1% increase in CHCI increases economic growth by 4.50% in the developed countries, and a 1% increase in CHCI increases economic growth by 1.15% in the developing countries, demonstrating CHCI has a greater influence on economic growth in the developed countries.

Table 6: Cointegration tests results (developed and developing countries)

Model	Developed countries		Developing countries	
	Test	Cointegration test	Test	Cointegration test
No breaks	Value	6.774	Value	5.729
	P value[a]	0.012	*P* value[a]	0.000
	P value[b]	0.973	*P* value[b]	0.872
Breaks	Value	6.453	Value	5.495
	P value[a]	0.007	*P* value[a]	0.004
	P value[b]	0.992	*P* value[b]	0.961

The *P* value[a] is based on the asymptotic normal distribution. The *P* value[b] is based on the bootstrapped distribution. We use 500 bootstrap replications

6. CONCLUSIONS

In this study, we tried to test the effect of human capabilities on economic growth establishing an endogenous growth model. For this purpose, we have taken steps to calculate a new human capital index called CHCI. This index consists of two main criteria; economic wealth (GDP per capita, domestic savings/GDP, trade/GDP) and social infrastructure (life expectancy, secondary schooling, GDP per person employed). Economic wealth indicators show the level of domestic-foreign income and investment in human capabilities in a given country. The impact of human capabilities on economic growth is strengthened when economic wealth is substantial and stable. Accordingly, social infrastructure indicators, which include health and education capabilities and productivity of labor, increase the efficiency of human capital on production by preventing deprivations.

CHCI may provide an alternative method of comparing the human capital level among and within countries. We have examined the role of human capital on economic growth in 17 developed and 17 developing countries over the 1985-2011 periods. Therefore, we have estimated individual long-run coefficients in both developed and developing countries in our model. We have found supportive evidence that human capabilities have a positive and significant effect on economic growth in both groups of countries. In addition to these findings, our results have indicated varying impacts of human capabilities on developed and developing countries. The CHCI coefficient (4.50) in developed countries is higher than CHCI coefficient (1.15) in developing countries. Therefore it can be said human capabilities have a greater effect on economic growth in developed countries than developing countries. CHCI provides an alternative method of comparison when determining levels

Table 7: Results for PMG and MG panel ARDL (1,1,1,0)

Coefficient	Developed countries			Developing countries			
	PMG	MG	DFE	PMG	MG	DFE	Hausman test
Long-run coefficient							
y	0.001 (0.037)	−0.044 (0.039)	0.031 (0.044)	0.156 (0.047)	0.210 (0.075)	0.203 (0.047)	0.87/9.51 (0.35)/(0.07)
k	−0.168 (0.043)	−0.088 (0.108)	−0.123 (0.049)	−0.063 (0.041)	0.142 (0.233)	0.647 (0.060)	0.80/0.65 (0.37)/(0.42)
l	−0.039 (0.042)	−0.315 (0.135)	−0.068 (0.054)	0.083 (0.039)	−0.219 (0.162)	0.048 (0.050)	3.67/4.63 (0.06)/0.06
h	4.507 (1.569)	14.736 (3.446)	5.757 (1.639)	1.156 (3.586)	17.431 (7.165)	4.040 (4.025)	4.88/9.04 (0.05)/(0.08)
Error correction coefficient							
Ø	−0.750 (0.067)	−0.936 (0.067)	−0.729 (0.045)	−0.831 (0.077)	−0.976 (0.073)	−0.913 (0.045)	
Short-run coefficient							
Δ*y*	0.001 (0.000)	0.041 (0.034)	0.023 (0.032)	0.130 (0.012)	0.170 (0.059)	0.187 (0.044)	
Δ*k*	−0.126 (0.011)	−0.063 (0.094)	−0.090 (0.035)	−0.052 (0.005)	0.087 (0.204)	0.059 (0.055)	
Δ*l*	−0.029 (0.003)	−0.297 (0.141)	−0.050 (0.039)	0.069 (0.006)	−0.083 (0.110)	0.043 (0.935)	
Δ*h*	3.378 (0.301)	13.159 (3.614)	4.197 (1.214)	0.960 (0.089)	12.915 (5.651)	3.693 (3.679)	
Diagnostics							
Log-like	−530.3	−457.6	−647.6	−873.4	−815.4	−992.4	
χ^2_{SC}	−28.29	−20.28	−72.33	68.82	68.51	4.26	
χ^2_{HE}	0.86	0.66	22.42	0.44	2.52	13.85	

The maximum number of lags for each variable is set at two, and optimal lag lengths are selected by the AIC. χ^2_{SC}, χ^2_{HE} denote Chi-squared statistics to test for no residual serial correlation and homoscedasticity, respectively, PMG: Pooled mean group, DFE: Dynamic fixed effects, ARDL: Autoregressive distributed lag

of human capital. CHCI value of developed countries is quite higher than developing countries similarly to other human capital indexes (Anand and Ravallion, 1993; Ravallion, 1997; Ranis et al., 2000; Ranis, 2004; Mukherjee, and Chakraborty, 2010). Finally, any appreciable development in economic wealth and social infrastructure emerge as more significant in terms of economic growth in developed countries than in developing countries. For approximately the last 30 years both physical and human capital accumulation have been the overriding concerns in the development of advanced technologies and sustainable growth in developed countries.

REFERENCES

Acemoglu, D., Johnson, S. (2006), Disease and development: The effect of life expectancy on economic growth. NBER Working Paper Series, 12269.

Acemoglu, D., Gallego, F.A., Robinson, J.A. (2014), Institutions, human capital and development. NBER Working Paper Series 19933.

Alkire, S. (2010), Human Development: Definitions, Critiques, and Related Concepts, Research Paper 2010/01, UNDP Human Development Reports. p9, 25.

Alkire, S., Chatterjee, M., Conconi, A., Seth, S., Vaz, A. (2014), Global Multidimensional Poverty Index 2014, OPHI-Oxford Poverty & Human Development Initiative.

Anand, S., Ravallion, M. (1993), Human development in poor countries: On the role of private incomes and public services. The Journal of Economic Perspectives, 7(1), 133-150.

Anand, S., Sen, A. (2000), Human development and economic sustainability, World Development, 28(12), 2009-2049.

Arrow, K.J. (1962), The economic implications of learning by doing. The Review of Economic Studies, 29(3), 155-173.

Bahmani-Oskooee and Brooks (1999): Bahmani-Oskooee, M., Brooks, T.J. (1999), Bilateral J-curve between US and her trading partners. Review of World Economics, 135(1), 156-165.

Bahmani-Oskooee and Kutan (2009): Bahmani-Oskooee, M., Kutan, A.M. (2009), The J-curve in the emerging economies of Eastern Europe. Applied Economics, 41(20), 2523-2532.

Banerjee, R., Roy, S.S. (2014), Human capital, technologic progress and trade: What explains India's long run growth? Journal of Asian Economics, 30, 15-31.

Barro, R.J. (1991), Economic growth in a cross section of countries. The Quarterly Journal of Economics, 106(2), 407-443.

Barro, R.J. (1996), Determinants of economic growth: A cross-country empirical study. NBER Working Paper, 5698.

Barro, R.J. (2000), Rule of law, democracy and economic performance. In: O'Driscoll, G.P., Holmes, K.R., Kirkpatrick, M., editors. 2000 Index of Economic Freedom. Washington, D.C.: The Heritage Foundation and Dow Jones & Company, Inc.

Barro, R.J., Lee, J.W. (1993), International comparisons of educational attainment. Journal of Monetary Economics, 32(3), 363-394.

Barro, R.J., Lee, J. W. (1994), Sources of economic growth. Carnegie Conference Series on Public Policy, 40, 1-46.

Barro, R.J., Lee, J.W. (1996), International measures of schooling years and schooling quality. American Economic Review, 86(2), 218-223.

Barro, R.J., Lee, J.W. (2001), International data on educational attainment: Updates and implications. Oxford Economic Papers, 53(3), 541-563.

Barro, R.J., Sala-I Martin, X. (1995), Economic Growth. New York: McGraw-Hill.

Bassanini, A., Scarpetta, S. (2001), Does human capital matter for growth in OECD countries? Evidence from pooled mean-group estimates, Working Paper 282, OECD Economics Department.

Becker, G.S. (1962), Investment in human capital: A theoretical analysis. Journal of Political Economy, 70(5), 9-49.

Becker, G.S. (1994), Human capital revisited. In: Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education. 3rd ed., Ch. II. London: University of Chicago Press.

Benhabib, J., Spiegel, M.M. (1994), The role of human capital in economic development: Evidence from aggregate cross-country data. Journal of Monetary Economics, 34(2), 143-173.

Benhabib, J., Spiegel, M. (2003), Human capital and technology diffusion, Working Paper, 2003-02, FRBSF Working Paper.

Bhargava, A., Jamison, D.T., Lau, L., Murray, C.J.L. (2001), Modeling the effects of health on economic growth. Journal of Health Economics, 20(3), 423-440.

Bildirici, M., Orcan, M., Sunal, S., Aykac, E. (2005), Determinants of human capital theory, growth and brain drain; an econometric analysis for 77 countries. Applied Econometrics and International Development, 5(2), 109-140.

Bloom, D., Malaney, P.N. (1998), Macroeconomic consequences of the Russian mortality crisis. World Development, 26(11), 2073-2085.

Bloom, D.E., Williamson, J.G. (1998), Demographic transitions and economic miracles in emerging Asia. World Bank Economic Review, 12(3), 419-455.

Bloom, D.E., Canning, D., Sevilla, J. (2004), The effect of health on economic growth: A production function approach. World Development, 32(1), 1-13.

Bloom, D.E., Canning, D. (2005), Health and economic growth: Reconciling the micro and macro evidence, Working Paper, Center on Democracy, Development, and the Rule of Law Stanford Institute on International Studies.

Bloom, D.E., Canning, D., Malaney, P.N. (1999), Demographic change and economic growth in Asia, Working Paper 15, Center for International Development at Harvard University-CID.

Bowser, D. (2010), The effect of life expectancy on economic growth in the United States, Population Association of America Conference, April 2010.

Breusch, T.S., Pagan, A.R. (1980), The Lagrange multiplier test and its applications to model specification in econometrics. Review of Economic Studies, 47(1), 239-253.

Breton, T. (2013), Were Mankiw, Romer and Weil right? Reconciliation of the micro and macro effects of schooling of income. Macroeconomics Dynamics, 17(5), 1023-1054.

Castello, A., Domenech, R. (2002), Human capital inequality and economic growth: Some new evidence. The Economic Journal, 112(478), 187-200.

Castello-Climent, A., Domenech, R. (2006), Human capital inequality, life expectancy and economic growth. The Economic Journal by Royal Economic Society. Available from: http://www.ideas.repec.org/a/ecj/econjl/v118y2008i528p653-677.html. [Last accessed on 2011 May 11].

Chakraborty, S. (2004), Endogenous lifetime and economic growth. Journal of Economic Theory, 116(1), 119-37.

Chatterji, M. (1998), Tertiary education and economic growth. Regional Studies, 32(4), 349-354.

Clark, D.A. (2006), Capability approach. In: Clark, D., editor. The Elgar Companion to Development Studies. p8. Available from: http://www.gprg.org/pubs/workingpapers/pdfs/gprg-wps-032.pdf. [Last accessed on 2011 Jun 03].

Costantini, V., Monni, S. (2006), Environment, human development and economic growth. Ecological Economics, 64(4), 867-880.

Dasgupta, P., Weale, M. (1992), On measuring the quality of life. World Development, 20(1), 119-131.

de la Fuente, A., Doménech, R. (2002), Human capital in growth regressions: How much difference does data quality make? An update and further results. CEPR Discussion Papers, 3587.

de Toledo Piza, C.C., Kuwahara, M.Y. (2009), Giving a step further: Can we go beyond the HDI? HDC A-Human Development Capability Association.
Dias, J., Tebaldi, E. (2012), Institutions, human capital, and growth: The institutional mechanism. Structural Change and Economic Dynamics, 23(3), 300-312.
Ferreira, S., Vincent, J.R. (2005), Genuine savings: Leading indicator of sustainable development? Economic Development and Cultural Change, 53(3), 737-754.
Fleisher, B., Li, H., Zhao, M.Q. (2010), Human capital, economic growth, and regional inequality in China. Journal of Development Economics, 92(2), 215-231.
Gallup, J.L., Sachs, J.D. (2000), The economic burden of malaria. Working Paper 52, Center of International Development at Harvard University.
Glewwe, P., Maiga, E., Zheng, H. (2014), The contribution of education to economic growth: A review of the evidence, with special attention and an application to Sub-Saharan Africa, World Development, 59, 379-393.
Griffin, K. (1989), Alternative Strategies for Economic Development. London: MacMillan Academic and Professional Ltd. p10.
Hamilton, K., Clemens, M. (1999), Genuine savings rates in developing countries. World Bank Economic Review, 13, 333-156.
Hamilton, K., Hartwick, J. (2005), Investing exhaustible resource rents and the path of consumption. Canadian Journal of Economics, 38(2), 615-621.
Hamoudi, A.A., Sachs, J.D. (1999), Economic consequences of health status: A review of the evidence. Working Paper 30, Harvard Center for International Development.
Hanushek, E.A. (2013), Economic growth in developing countries: The role of human capital. Economics of Education Review, 37, 204-212.
Hausman, J.A. (1978), Specification tests in econometrics. Econometrica, 46(6), 1251-1271.
Im, K.S., Pesaran, M.H., Shin, Y. (2003), Testing for unit roots in heterogenous panels. Journal of Econometrics, 115, 53-74.
Islam, N. (1995), Growth empirics: A panel data approach. The Quarterly Journal of Economics, 110(4), 1127-1169.
Jack, W., Lewis, M. (2009), Health investments and economic growth: Macroeconomic evidence and microeconomic foundations. In: Spence, M., Lewis, M., editors. Health and Growth. Commission on Growth and Development. Ch. 1. Washington, DC: World Bank.
Krueger, A.B., Lindahl, M. (2001), Education for growth: Why and for whom? Journal of Economic Literature, 39(4), 1101-1136.
Kwabena, G.B., Paddison, O., Mitiku, W. (2006), Higher education and economic growth in Africa. The Journal of Development Studies, 42, 509-529.
Lam, R.C. (2013), Export and growth: A linkage effect perspective. International Journal of Development Issues, 12(1), 53-66.
Lau, L.J., Jamison, D.T., Louat, F.F. (1991), Education and productivity in developing countries: An aggregate production function approach, Working Paper 612, World Bank Policy Research.
Levin, A., Lin, C.F., Chu, C.S.J. (2002); Unit root tests in panel data: Asymptotic and finite-sample properties. Journal of econometrics, 108(1), 1-24.
Lim, A., Kim, S., Tang, K.K. (2008), Human capital inequality and the Kuznets Curve. The Developing Economies, 46(1), 26-51.
Lucas, R.E. (1988), On the mechanics of economic development. Journal of Monetary Economics, 22(1), 3-42.
Mankiw, N.G., Romer, D., Weil, D.N. (1992), A contribution to the empirics of economic growth. Quarterly Journal of Economics, 107, 407-437.
Morris, D.M. (1979), Measuring the Condition of the World's Poor: The Physical Quality. New York: Overseas Development.
Mukherjee, S., Chakraborty, D. (2010), Is there any relationship between economic growth and human development? evidence from Indian States, MPRA Munich Personal RePEc Archive Paper 22997.
Narayan, D., Chambers, R., Shah, M., Petesch, P. (2000), Voices of the Poor: Crying out for Change. New York: Oxford University Press for the World Bank.
Nelson, R.R., Phelps, E.S. (1966), Investment in humans, technological diffusion and economic growth. American Economic Review, 56, 69-75.
Noorbakhsh, F. (1998), The human development index: Some technical issues and alternative indices. Journal of International Development, 10(5), 589-605.
Nussbaum, M. (2000), Women and Human Development: The Capabilities Approach. Cambridge, UK: Cambridge University Press.
Nussbaum, M. (2003), Capabilities as fundamental entitlements: Sen and social justice. Feminist Economics, 9(2-3), 33-59.
Qizilbash, M. (1996), Capabilities, well-being and human development: A survey. Journal of Development Studies, 33(2), 143-162, 1210.
Pesaran, M.H. (1997), The role of economic theory in modelling the long run. The Economic Journal, 107(440), 178-191.
Pesaran, M.H. (2004), General diagnostic tests for cross section dependence in panels. Working Papers in Economics, 435, Cambridge.
Pesaran, M.H. (2007), A simple panel unit root test in the presence of cross section dependence. Journal of Applied Econometrics, 22, 265-312.
Pesaran, M.H., Shin, Y., Smith, R.J. (1999), Pooled mean group estimation of dynamic heterogeneous panels. Journal of the American Statistical Association, 94, 621-634.
Pritchett, L. (2001), Where has all the education gone? World Bank Economic Review, 15(3), 367-391.
Ranis, G. (2004), Human development and economic growth. Economic Growth Center Discussion Paper, 887, Yale University.
Ranis, G., Stewart, F., Ramirez, A. (2000), Economic growth and human development. World Development, 28(2), 197-219.
Ravallion, M. (1997), Good and bad growth: The human development reports. World Development, 25(5), 631-638.
Raya, R.R. (2001), An alternative measure of poverty and human capability. Social Watch 2001 Report, Philippines. p96-120.
Rebelo, S. (1991), Long-run policy analysis and long-run growth. Journal of Political Economy, 99(3), 500-521.
Romer, P.M. (1986), Increasing returns and long-run growth. The Journal of Political Economy, 94(5), 1002-1037.
Romer, P.M. (1990), Endogenous technological change. Journal of Political Economy, 98(5), 71-102.
Roth, F., Thum, A.E. (2013), Intangible capital and labor productivity growth: Panel evidence for the EU from 1998-2005. Review of Income and Wealth, 53(3), 486-508.
Sachs, J., Warner, A.M. (1997), Fundamental sources of long-run growth. American Economic Review, 87(2), 184-188.
Schultz, T.W. (1961), Investment in human capital. The American Review, 51(1), 1-17.
Seers, D. (1969), The meaning of development, Institute of Development Studies Communication Series 44.
Sen, A. (2005), Human rights and capabilities. Journal of Human Development, 6(2), 151-166.
Sen, A. (1984), Resources, Values and Development. Oxford: Basil Blackwell Publisher Ltd.
Sen, A. (1987), The Standard of Living. Cambridge, Great Britain: Cambridge University Press.
Sen, A. (1990), Development as capability expansion. In: Griffin, K., Knight, J., editors. Human Development and the International Strategy for the 1990's. London, Great Britain: MacMillan Academic and Professional Ltd. p43, 52.
Sen, A. (1997), Editorial: Human capital and human capability. World Development, 25(12), 1959-1961.

Shahbaz, M., Rahman, M.M. (2014), Exports, financial development and economic growth in Pakistan. International Journal of Development Issues, 13(2), 155-170.
Shome, S., Tondon, S. (2010), Balancing human development with economic growth: A study of ASEAN 5. Annals of the University of Petroşani, Economics, 10(1), 335-348.
Shou-Fu, L., Zhao, D. (2009), Empirical analysis on determinants of the country level economic growth in China's central region. International Conference on Management Science & Engineering, Moscow, Russia.
Söderbom, M., Teal, F. (2003), Openness and human capital as sources of productivity growth: An empirical investigation. Working Paper, 2003-06, Centre for the Study of African Economies Department of Economics, University of Oxford.
Stephan, K. (1997), Which level of schooling has the greatest economic impact on output? Applied Economics Letters, 4, 177-180.
Stern, S., Wares, A., Orzell, S. (2014), Social Progress Index 2014 Methodological Report. Social Progress Imperative.
Stewart, F. (1985), Basic Needs in Developing Countries. Baltimore: Johns Hopkins University Press.
Streeten, P. (1984), Basic needs: Some unsettled questions. World Development, 12(9), 973-978.
Suri, T., Boozer, M.A., Ranis, G., Stewart, F. (2011), Paths to success: The relationship between human development and economic growth. World Development, 39(4), 506-522.
Temple, J. (2001), Generalizations that aren't? Evidence on education and growth. European Economic Review, 45(4-6), 905-918.
Tridico, P. (2009), Human capital and capabilities as leading variables for growth: A comparative analysis among emerging and transition economies, XVII Conference of the Italian Association for the Study of Comparative Economic Systems.
United Nations Development Programme. (1990). Human Development Report, 1990. Available from: http://www.hdr.undp.org/en/humandev. [Last accessed on 2013 Oct 07].
Uzawa, H. (1965), Optimum technical change in an aggregative model of economic growth. International Economic Review, 6(1), 18-31.
van Zon, A., Muysken, J. (2001), Health and endogenous growth. Journal of Health Economics, 20(2), 169-185.
van Zon, A., Muysken, J. (2005), Health as a principal determinant of economic growth. In: López-Casasnovas, G., Rivera, B., Currais, L., editors. Health and Economic Growth. Findings and Policy Implications. Cambridge MA: MIT Press.
Yanikkaya, H. (2003), Trade openness and economic growth: A cross-country empirical investigation. Journal of Development Economics, 72(1), 57-89.
Weil, D. (2007), Accounting for the effect of health on economic growth. The Quarterly Journal of Economics, 122(3), 1265-1306.
Westerlund, J. (2005), Testing for panel cointegration with multiple structural breaks. Oxford Bulletin of Economics and Statistics, 68(1), 101-132.
Wigley, S., Akkoyunlu-Wigley, A. (2006), Human capabilities versus human capital: Gauging the value of education in developing countries. Social Indicators Research, 78(2), 287-304.
World Bank. (2006), Where is the Wealth of Nations? Measuring Capital for the 21st Century. Washington, DC: World Bank. p155-157.
Zhang, C., Zhuang, L. (2011), The composition of human capital and economic growth: Evidence from China using dynamic panel data analysis. China Economic Review, 22(3), 165-171.