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IMPACT OF INVESTMENTS IN HUMAN CAPITAL DETERMINANTS ON ECONOMIC GROWTH: TIME SERIES ANALYSIS BASED ON SRI LANKA

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Abstract

The Impact of Human Capital on the Economic growth has always been a matter of discussion in the field of Economics. According to OECD "Human Capital is defined as the knowledge, skills, competencies and other attributes embodied in individuals acquired during their life and used to produce goods, services or ideas in market circumstances". The aggregate Human Capital of an Economy determined by national health and Education standards. Long term Economic growth increasingly on improvements in Human capital, better educated, healthy, innovative and creative workforce can help increase labour productivity in Economic growth. There for can be no significant economic growth in any country without adequate Human capital developed. In Sri Lankan context there is a controvational discuss on role of human capital in Economic growth process. Sri Lanka was achieved a higher level of education and health indicators relative to the other south Asian countries (HDI Reports 2014 – 2015). But there is a problematic situation regarding contribution of education and health sectors in economic growth of a Sri Lanka relative to the investments on both sectors. So far results of researches which was conducted on impact of human capital in economic growth is directly depend on variables and indicators they used in their researches. There for necessary to examine impact of the Human Capital on Economic growth of Sri Lanka consisting broad variables than before. This study examine the impact of Human capital determinants on economic growth in Sri Lanka incorporating both Health and Education which has not been considered in previous studies.

Keywords : *Human Capital, Economic Growth, Sri Lanka*

1. INTRODUCTION

1.1. Literature Review

Oyedele (2014) has found the relationship between human capital and economic growth using Sargen test and GMM method in Naigeria. In this research mainly focus about analysing effect of human capital on economic growth. Also this study conclude that policy makers should pay attention to bogth health and education sectors simultaneously. Further they emphasis government should increase their financing on both sectors.

Conversly, Acroglu and Ada (2014) argued that there government expenditure on human capital has no effect on economic growth. Also the results represented increasing quality of education and health sectors is caused to improving in GDP it directly caused to acceralate the economic growth.

A number of research were done in Sri Lanka on the topic impact of human capital on economic growth. However there is limited literature to understanding human capital contribution on economic growth which is considering both health and education simultaneously. According to that background this research is conducted to fill this research gap.

1.2 Research Problem

Human Capital is identified as a main indicator for explaining economic Growth of a country. In this case countries give specific consideration to both Health and education sectors. But in Sri Lanka there is a controvational discussion about contribution of human capital in economic growth. According to this background this study will address the question "How much effective simultaneous investments on health and Education for providing a role of Human Capital to improving Economic growth in Sri Lanka?

1.3 Research Objecive

According to research problem main objective of this study is identifying effectiveness of Investing simultaneously in both Health and education as a Human capital indicators for the achievement of sri lankan Economic growth thereby draw policy implications of the findings.

There is hardly to find any study on the effectiveness of the simultaneous investments in the human capital determinants for achievement the aim of economic growth of Sri Lanka. There for this study attempt to provide a foundation to conduct an empirical analysis on the particular issue.

2. METHODOLOGY

This study conduct a time series analysis to examine simultaneous investment in human capital determinants on economic growth in Sri lanka during 1990 – 2015. To develop the model the cobb – douglas production function was used ,which is explained particular functional form of the production function widely used to represent the technological relationship between the amounts of two or more inputs (particularly physical capital and labor) and the amount of output that can be produced by those inputs. The cobb duglas shows that there is a strong positive relationship between growth of production and investment on human capital. In this study to analyze impact of simultaneous investment in both health and education sectors, used new variable called Health Adjusted Education Index (HAEI) which was calculated by taking enrollment rate at primary level and then multiplied the value with expenditure on health as percentage of GDP. This study employed Sri Lankan annual data from 1990 – 2015 and co – integration techniques in the analysis. Considering Health and Education variables as a proxies for human capital following regression model was constructed.

$$ln\, GDPPC_t = \beta_\circ + \beta_1\, ln(HAEI)_t + \beta_2\, ln(CEXP)_t + \beta_3\, ln(REXP)_t + \beta_4\, ln(HDI)_t + \varepsilon_t \qquad (1)$$

Where $GDPPC_t$ is the per capita gross domestic product, $(HAEI)_t$ is the Health Adjusted Education Index, $(CEXP)_t$ is the Capital Expenditure on the Human Capital, $(REXP)_t$ is recurrent expenditure on human capital, $(HDI)_t$ human development index and ε_t is the error term and the variables are relevant to Sri Lanka and secondary data were collected from world human development reports and central bank reports. ADF and PP unit root tests is used to examine the stationary of these variables. In order to identify the number of co- integrating relationships Johansson Co-integration technique is adopted. Granger causality test employed to evaluate the causality or dynamic relationship between variables and vector error correction model (VECM) is used investigate the short run and long run relationship as well as long run equilibrium of these variables.

3. RESULTS AND DISCUSSION

According to the unit root test results, all two unit root tests confirmed that all variables are stationary their first difference. According to lag length criteria, FPE, AIC, and HQ criteria were selected 2 lags. So lag length suggested 2 lags. Johansson co–integration rank test has detected one co-integrating relation in the system of equation at 5% level of significance which implies that there is a long run relationship between variables. In order to identify the nature of the long run relationship Johanson Co- Integration Technique is adapted and long- run adjustment and short run relationship are examined using Vector Error Correction Model. According to the co- integrating results, the long run relationship between the variables is shown in Equation 2.

$$L\_GDPPC = -12.79 - 7.06\, L\_HDI + 2.29\, L\_HAEI + 0.95\, L\_CEXP - 3.35 L\_REXP$$
$$[-21.0047\ ]\quad [21.9498]\quad [10.1959]\quad [-33.1399] \qquad (2)$$

As shown in Equation 2, mainly health adjusted education index (HAEI) and capital expenditure on human capital (CEXP) has a positive and significant impact on economic growth in long run. When capital expenditure on health and education increase by 1% Gross domestic per capita growth rate increase by 0.95% while other variables remain unchange. Also health adjusted education index increase by 1% gdp capita growth rate growth rate increasing by 2.29% in long run. then it is clear that simultaneous investments in both health and education is caused to advancing the economic growth of a country. All variables are significant in long run when HAEI and CEXP positively impact on GDPPC and HDI, REXP negatively impact on GDPPC.(Appendix 01)

Table 1 : VECM results of the long run adjustment

Error Correction	D(L_GDPPC)	D(L_CEXP)	D(L_REXP)	D(L_HDI)	D(L_HAEI)

	-0.067991	-0.786318	0.098243	0.054869	0.259096
	[-2.09832]	[-1.73537]	[0.44720]	[1.41037]	[1.82259]

Note : t- statistics are given in the brackets.

Above model shows the long run equilibrium of variables. Negative and significant error correction term revels that model is stable in the long run. Gross domestic per capita growth rate moves back to equilibrium path and the disequilibrium error is corrected by 6% each year following an exogenous shock.

Granger causality test used to test whether there is a causality relationship between variables. Results shows that there is no causality relationship with gross domestic per capita growth rate in Sri Lanka.

Table 2 : Short run relationship results between the variables.

	D(L_GDPPC)	**D(L_CEXP)**	**D(L_REXP)**	**D(L_HDI)**	**D(L_HAEI)**
D(L_GDPPC(-1))	-0.079159	-0.338357	-0.116374	-0.186820	-0.713430
	[-0.31101]	[-0.32800]	[-0.19243]	[-1.74441]	[-1.32293]
C	0.138298*	0.152456	0.062978	0.037586*	0.119050
	[3.67420]	[0.99933]	[0.70418]	[2.37312]	[1.49275]

Note : t- statistics are given in the brackets.

Table 2 shows the results of short run relationship between the variables. According to the results the value of intercept 0.138 shows the gross domestic per capita growth rate value when the other variables are constant. There is no any short run relationship is defined between gross domestic per capita growth rate and last year values of the other variables.

4. CONCLUSION AND POLICY RECOMMENDATION

The empirical results indicate that there is a positive and significant relationship between gross domestic per capita growth rate and health adjusted education index in the long run it reveals that

important to investing in both Education and Health sectors simultaneously in order to achieving healthy economic growth. Results show that there is no relationship between human capital determinants and gross domestic per capita growth rate in short run. Because of that policy makers should turn to long run investment based policies to bring countries economic to up level. Also results conclude that capital expenditure on human capital determinants has positive relationship when recurrent expenditure on human capital determinants has negative relationship with gross domestic per capita growth rate. In order to improving stock of human capital Sri Lanka should invest more on the capital expenditure of health and education sectors. Up to now Human capital defined only based on education in Sri Lanka. But in order to achieving the goal of economic growth Sri Lanka should give priority to interactive benefits of the both health and education sectors.

5. REFERENCES

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CONFLICTS OF INTEREST AND PLAGIARISM: The authors declare no conflict of interest and plagiarism.

6. APPENDIX

Appendix No.01 **Results of unit root test**

	ADF		PP	
Variable	**Level**	**1st difference**	**Level**	**1st difference**

	Intercept	T & C	Intercept	T & C	Intercept	T & C	intercept	T & C
L_GDPPC	0.9513	0.0533	0.4059	0.8171	0.0095**	0.6891	0.0005*	0.0031*
L_HAEI	0.1882	0.5023	0.0002*	0.1938	0.2293	0.6405	0.0003*	0.0009*
L_HDI	0.2614	0.3496	0.0000*	0.0001*	0.0762**	0.4288	0.0000*	0.0000*
L_CEXP	0.9279	0.2938	0.0001*	0.0008*	0.9464	0.2256	0.0001*	0.0009*
L_REXP	0.5553	0.0667	0.0017*	0.0088*	0.6589	0.4214	0.0045*	0.0231*

*indicates that significance in 5% and ** *indicates that significance in 10%

Appendix No.02 **Results of granger causality test**

*indicates significant at 10% level
** indicates significant at 5% Level

Hypothesis	**F - statistics**	**P – Value**
L_HDI does not Granger Cause L_GDPPC	0.15793	0.8550
L_CEXP does not Granger Cause L_GDPPC	1.40012	0.2709
L_HAEI does not Granger Cause L_GDPPC	3.37378	0.0557*
L_REXP does not Granger Cause L_CEXP	3.09427	0.0687*
L_GDPPC does not Granger Cause L_CEXP	3.77413	0.0417**

Appendix 03 : **Results of co integration test**

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.819118	78.06928	69.81889	0.0095

At most 1	0.452862	37.03140	47.85613	0.3460
At most 2	0.411408	22.55809	29.79707	0.2685
At most 3	0.267237	9.837565	15.49471	0.2934
At most 4	0.094226	2.375181	3.841466	0.1233

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Appendix 04: **Results of Vector Error Correction Model**

Vector Error Correction Estimates
Date: 10/07/17 Time: 10:06
Sample (adjusted): 4 26
Included observations: 23 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
L_GDPPC(-1)	1.000000
L_HDI(-1)	-7.063216 (0.33627) [-21.0047]
L_HAEI(-1)	2.288210 (0.10425) [21.9498]
L_CEXP(-1)	0.950593 (0.09323) [10.1959]
L_REXP(-1)	-3.352419 (0.10116) [-33.1399]
C	-12.79741

Error Correction:	D(L_GDPPC)	D(L_HDI)	D(L_HAEI)	D(L_CEXP)	D(L_REXP)
CointEq1	0.103190 (0.20840) [0.49515]	0.109818 (0.08552) [1.28417]	-0.908190 (0.34298) [-2.64792]	-0.778701 (0.80977) [-0.96163]	-0.503027 (0.46305) [-1.08634]
D(L_GDPPC(-1))	-0.058087 (0.47601) [-0.12203]	-0.280972 (0.19533) [-1.43844]	0.579393 (0.78341) [0.73958]	0.269101 (1.84961) [0.14549]	0.879800 (1.05765) [0.83184]
D(L_GDPPC(-2))	0.494691 (0.47905) [1.03265]	0.043767 (0.19658) [0.22265]	-1.395564 (0.78842) [-1.77009]	-0.124281 (1.86143) [-0.06677]	-1.666338 (1.06441) [-1.56551]
D(L_HDI(-1))	0.886392	0.031964	-5.918635	-4.655267	-4.003736

	(1.43968)	(0.59077)	(2.36941)	(5.59411)	(3.19885)
	[0.61568]	[0.05410]	[-2.49793]	[-0.83217]	[-1.25162]
D(L_HDI(-2))	0.329286	0.286365	-3.458758	-0.865250	-3.229248
	(1.11110)	(0.45594)	(1.82864)	(4.31736)	(2.46877)
	[0.29636]	[0.62808]	[-1.89144]	[-0.20041]	[-1.30804]
D(L_HAEI(-1))	0.051763	-0.066813	-0.189066	0.000504	-0.263530
	(0.34443)	(0.14134)	(0.56685)	(1.33833)	(0.76529)
	[0.15029]	[-0.47272]	[-0.33353]	[0.00038]	[-0.34435]
D(L_HAEI(-2))	0.128295	0.079528	0.130088	-0.007457	-0.054797
	(0.21371)	(0.08770)	(0.35173)	(0.83042)	(0.47485)
	[0.60031]	[0.90684]	[0.36985]	[-0.00898]	[-0.11540]
D(L_CEXP(-1))	-0.195744	-0.005464	0.757431	0.935500	0.522421
	(0.17241)	(0.07075)	(0.28375)	(0.66992)	(0.38308)
	[-1.13535]	[-0.07723]	[2.66939]	[1.39644]	[1.36375]
D(L_CEXP(-2))	-0.050786	-0.074313	0.633261	0.215062	0.583150
	(0.18758)	(0.07697)	(0.30871)	(0.72885)	(0.41678)
	[-0.27075]	[-0.96546]	[2.05132]	[0.29507]	[1.39919]
D(L_REXP(-1))	0.236937	-0.016173	-1.050386	-1.025769	-0.624268
	(0.41181)	(0.16898)	(0.67774)	(1.60013)	(0.91500)
	[0.57536]	[-0.09571]	[-1.54983]	[-0.64105]	[-0.68226]
D(L_REXP(-2))	0.050975	0.015257	-0.822097	-0.360366	-0.802111
	(0.31358)	(0.12868)	(0.51609)	(1.21847)	(0.69675)
	[0.16256]	[0.11856]	[-1.59294]	[-0.29575]	[-1.15122]
C	0.065307	0.040167	0.194068	0.063146	0.211582
	(0.08415)	(0.03453)	(0.13850)	(0.32698)	(0.18698)
	[0.77606]	[1.16320]	[1.40126]	[0.19312]	[1.13159]
R-squared	0.344525	0.646886	0.610208	0.323938	0.313202
Adj. R-squared	-0.310951	0.293773	0.220416	-0.352125	-0.373596
Sum sq. resids	0.036072	0.006074	0.097704	0.544621	0.178082
S.E. equation	0.057265	0.023499	0.094245	0.222511	0.127237
F-statistic	0.525610	1.831949	1.565471	0.479154	0.456032
Log likelihood	41.62842	62.11559	30.16942	10.41075	23.26599
Akaike AIC	-2.576385	-4.357877	-1.579949	0.138196	-0.979651
Schwarz SC	-1.983953	-3.765445	-0.987517	0.730628	-0.387220
Mean dependent	0.134108	0.007073	0.003297	0.048182	0.043442
S.D. dependent	0.050014	0.027962	0.106740	0.191356	0.108564

Determinant resid covariance (dof adj.)	2.07E-13
Determinant resid covariance	5.17E-15
Log likelihood	215.1250
Akaike information criterion	-13.05435
Schwarz criterion	-9.845341