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IMPACT OF FDI ON HUMAN CAPITAL IN PAKISTAN

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ABSTRACT

The study finds the impact of foreign direct investment on human capital in Pakistan. It uses foreign direct investment, economic growth rate and government expenditure on education as independent variables and human capital index as dependent variable. ADF, PP, Ng-Perron and Zivot-Andrews unit root tests are applied to find the level of integration in time series. The ARDL and its error correction model are applied to find the long run and short run relationships. The study finds the long run and short run relationships in the model. Foreign direct investment and economic growth have positive and significant impact on human capital in Pakistan.

Key Words:FDI, Human Capital Index, Cointegration, Structural Break, Unit Root.

INTRODUCTION

Foreign direct investment can have bi-directional relationships with human capital. Firstly, FDI is attracted by cheap and educated labor force in a developing economy. Only cheap labor is not sufficient to attract foreign investment, rather skilled labor is also required to attract foreign investment in the host countries (UNCTAD, 2000). By using macroeconomic data, Borensztein et al. (1998) and Xu (2000) argued that host countries must need human capital up to some minimum threshold level in order to get benefit from FDI inflows. So, people do investment in education to get the benefit of better jobs offered by foreign firms and government of that country also helps in raising educational attainment to get the positive spillovers from FDI. Secondly, foreign investment increases the ability in having education through rising income level of labor. This rising amount of income can be spent on themselves and on their children to have better education.

Governments of the developing economies also initiate and invest in their human capital through education which could be possible with tax revenue. As foreign investment contributes in tax revenue, so it rises in spending power of government to improve their human capital as education; it is also a merit good. Ranis (2000) claimed that human capital is a key determinant of economic growth and economic growth cannot sustain without improvement in human capital. The ultimate objective of economic growth is to increase the

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welfare of human being. So, the study focuses on the impact of FDI on human capital. FDI contributes in economic growth directly and indirectly with development in human capital.

Model Specification and Methodology

To find the impact of FDI on human capital index, the study uses human capital index as dependent variable and uses FDI as percentage of GDP, government expenditure on education as percentage of GDP and GDP growth rate as independent variables. Government spending on education is necessary to improve the education level of a country. Education is a merit good and has positive spill over on society and economy. People will not attain education upto the optimal level if government does not spend on it or supports it. Government can also use optimal policy to promote education with equity and on merit basis. Private sector will not care about it due to their private and quick incentive. Impact of the government spending on education depends on the proportion of total government spending with respect to population and GDP. It is also helping to attract FDI because foreign investors would like to invest where they can have cheap and educated labor.

Economic growth and education have bidirectional relationship. Education improves the quantity and quality of economic growth. Education requires funds and rising growth would increase the spending power to people. So, people can be able to spend on education. Secondly, with economic growth, the competition amongst people increases to reap greater benefit of growth. So, the study uses government spending and economic growth both as control variable in human capital index model.

Model of study is as follows:

$$HCIP_t = f(FDIG_t, GEEG_t, GR_t)$$

where,

$HCIP_t$ = Human Capital Index as percentage of population at time t.
$FDIG_t$ = Foreign Direct Investment inflow in constant year 2000 US $ as percentage of GDP at time t.
$GEEG_t$= Government Expenditure on Education as percentage of GDP at time t.
GR_t= GDP Growth Rate annual percentage at time t.

At first, the study checks the stationarity of data by applying ADF, PP and Ng-Perron unit root test to check the order of integration of variables, then it applies Zivot-Andrews unit root test to check the stationarity of data with possible break and afterward the ARDL cointegration technique is applied on the basis of selected lag length for each variable in the model. The study uses the SBC to find the optimum lag length. To find the cointegration amongst human capital index, foreign direct investment, government expenditure on education and GDP growth rate, The ARDL model is as follows:

$$\Delta HCIP_t = \delta_0 + \delta_1 HCIP_{t-1} + \delta_2 FDIG_{t-1} + \delta_3 GEEG_{t-1} + \delta_4 GR_{t-1} + \sum_{i=1}^{p} \beta_{1i} \Delta HCIP_{t-i} + \sum_{i=0}^{q} \beta_{2i} \Delta FDIG_{t-i} + \sum_{i=0}^{r} \beta_{3i} \Delta GEEG_{t-i} + \sum_{i=0}^{s} \beta_{4i} \Delta GR_{t-i} + \lambda D_{HCIP} + \varepsilon_t \quad (2)$$

In equation (2), first difference of $HCIP_t$ is the dependent variable, the null hypothesis is (H_0: $\delta_1=\delta_2=\delta_3=\delta_4=0$) and alternate hypothesis is (H_a: $\delta_1\neq\delta_2\neq\delta_3\neq\delta_4\neq 0$) which shows existence of

long run relationship in the model, δ_{b0} is a constant and ε_{bt} is error term. D_{HCIP} is included in equation for possible structural break and to complete information. This is also shown as $F_{HCIPt}(HCIP_t/FDIG_t,GEEG_t,GR_t)$. If cointegration exists in the model, then long run and short run coefficients will be calculated. Error correction term can be used to find the short-run relationship in the model. Error correction model is as follows:

$$\Delta HCIP_t = \gamma + \sum_{i=1}^{p} \beta_{1i} \Delta HCIP_{t-i} + \sum_{i=0}^{q} \beta_{2i} \Delta FDIG_{t-i} + \sum_{i=0}^{r} \beta_{3i} \Delta GEEG_{t-i}$$

$$+ \sum_{i=0}^{s} \beta_{4i} \Delta GR_{t-i} + \phi\, D_{HCIP} + \varphi\, ECT_{t-1} + \zeta_t \qquad (3)$$

φ is showing the speed of adjustment from short run disequilibrium to long run equilibrium. Afterwards, the diagnostic tests will be used to check the normality, functional form, heteroscedasticity and serial correlation in the model. The CUSUM and CUSUMsq statistics will be used to ensure the stability of parameters.

Data Sources

Data on foreign direct investment, government expenditure on education, GDP growth rate, population and total enrollments are taken from World Bank (2011). Human capital index is generated by taking weighed average of total enrollments in educational organizations at all levels from primary schooling to university level. A number of years of education are used as a weight.Data is taken from 1972 to 2010.

EMPIRICAL RESULTS

The study uses the ADF, Phillip-Perron and Ng-Perron tests to check the unit root problem in all variables in the model. Results are given in the table as below.

Table-1.Unit Root Tests at Level

Variable	ADF	PP	Ng-Perron			
			MZ_a	MZ_t	MSB	MPT
Model Specification: Intercept						
$HCIP_t$	1.208(0)	2.316(7)	1.903(1)	1.323	0.695	42.981
$FDIG_t$	2.961(6)	-0.777(3)	6.168(1)	22.064	3.570	17.080
$GEEG_t$	0.873(1)	0.618(1)	2.514(1)	1.838	0.331	5.139
GR_t	-5.258**(1)	-5.269**(1)	-15.489**(1)	-2.707**	0.178*	0.643**
Model Specification: Intercept & Trend						
$HCIP_t$	-1.789(1)	-1.478(4)	-3.555(0)	-1.147	0.323	22.651
$FDIG_t$	-0.379(4)	-1.919(3)	-12.050(1)	-1.339	0.152	5.962
$GEEG_t$	-2.703(4)	-2.528(3)	-4.350(4)	-1.253	0.288	9.012
GR_t	-5.471**(0)	-5.470**(1)	-14.559(0)	-2.878	0.173*	5.505*

Note: * and ** and show stationarity of variables at the 0.05 and 0.01 level respectively. Brackets contain the optimum lag length.

Table (1) shows that all the variables at level with all tests used in analysis are non-stationary except GR_t, which is stationary at 1% level of significance with individual effect and with

both intercept and trend in ADF and PP tests. Ng-Perron test shows that GR_t is stationary at 5% level of significance with MSB and MPT test and non-stationary with MZ_a and MZ_t tests with both intercept & trend. Afterward, the study applies the Zivot-Andrews unit root test to see level of integration with including one unknown structural break.

Table-2. Unit Root Tests: Zivot-Andrews

Variable	K	Year of Break	α	t_α	Type of Model
$HCIP_t$	0	2003	-0.585	-3.510	A
	2	1982	-0.881	-3.695	B
	0	2000	-0.688	-3.757	C
$FDIG_t$	1	1999	-0.657*	-4.692	B
	4	1995	-1.718*	-5.392	C
$GEEG_t$	5	2000	-2.085	-4.401	A
	0	2003	-0.511	-2.647	B
	0	2000	-0.616	-3.484	C
GR_t	5	1985	-1.618*	-4.902	A
	3	1986	-0.837*	-4.515	B
	0	1986	-1.159*	-5.159	C

Note: * and ** and show stationarity of variables at the 0.05 and 0.01 level respectively.

Table-3. Unit Root Tests at First Difference

Variables	ADF	PP	Ng-Perron			
			MZ_a	MZ_t	MSB	MPT
Model Specification: Intercept						
$dHCIP_t$	-5.159**(0)	-5.165**(2)	-17.212**(0)	-2.933**	0.171**	1.428**
$dFDIG_t$	-5.067**(4)	-3.421**(6)	-139.200**(1)	-26.35**	0.018**	0.032**
$dGEEG_t$	-8.545**(0)	-8.563**(2)	-14.989**(0)	-2.729**	0.182*	1.644**
dGR_t	-6.296**(2)	-9.367**(7)	-15.195**(4)	-3.236**	0.106**	0.635**
Model Specification: Intercept & Trend						
$dHCIP_t$	-5.529**(1)	-6.638**(7)	-17.488*(1)	-2.938*	0.167*	5.326*
$dFDIG_t$	-6.983**(4)	-4.281**(5)	-212.840**(1)	-10.295**	0.048**	0.483**
$dGEEG_t$	-8.774**(1)	-8.949**(2)	-18.522*(0)	-2.964*	0.105**	4.248**
dGR_t	-6.189**(2)	-9.145**(6)	-17.356*(0)	-2.769*	0.093**	4.942**

Note: * and ** and show stationarity of variables at the 0.05 and 0.01 level respectively. Brackets contain the optimum lag length.

Table (2) shows that $FDIG_t$ become stationary at 5% level of significance with significant break in trend for the year 1999 and with significant break in both intercept and trend for the year 1995. $HCIP_t$ is non-stationary and has significant break in intercept for the year 2003,

has significant break in trend for the year 1982 and has a significant break in both intercept and trend for the year 2000. $GEEG_t$ is non-stationary with significant break in intercept for the year 2000, with significant break in trend for the year 2003 and with significant break in both intercept and trend for the year 2000. GR_t is stationary at 5% level of significance with significant break in intercept for the year 1985, with significant break in trend for the year 1986 and with significant break in both intercept and trend for the year 1986.

Table (3) shows that all variables of model are stationary with all tests at 1% level of significance except GR_t and $GEEG_t$ which are stationary at 5% level of significance with Ng-Perron tests (MZ_a and MZ_t). There is evidence for mix order of integration I(0) and I(1). So, the ARDL model is suitable to apply here. The study finds the optimum lag length for the ARDL model by using SBC and then includes dummy variable D_{HCIP} in the ARDL model to complete the information in the model. Optimum lag length is 1 for $dHCIP_t$, 0 for $dFDIG_t$, 0 for $dGEEG_t$ and 1 dGR_t. The study selects year 2000 as break period where $HCIP_t$ has a significant break with both intercept and trend and puts 0 from 1972 to 2000 and 1 afterwards in D_{HCIP}. The calculated F-statistic for selected the ARDL model is given in table (4).

Table-4.ARDL Bound Test: Using ARDL(1,0,0,1)

VARIABLES (when taken as a dependent)	F-Statistic (Calculated)	At 0.05		At 0.01	
		I(0)	I(1)	I(0)	I(1)
$D(HDIP_t)$	9.254**	3.615	4.913	5.018	6.610

** Means at 1%, 5% significant levels reject the null hypotheses of no cointegration

Table (4) shows that F-statistic is 9.254 which is greater than upper bound at 1% level of significance that indicates that null hypothesis of no cointegration is rejected. So the long run relationship exists in the model.

Table-5. Long Run Results: Dependent Variable is $HCIP_t$

Regressor	Parameter	S. E.	t-Ratio	P-value
$FDIG_t$	0.364***	0.098	3.717	0.000
$GEEG_t$	0.156	0.173	0.899	0.375
GR_t	0.048**	0.022	2.134	0.032
C	1.303***	0.348	3.742	0.000
D_{HCIP}	0.445	0.184	2.422	0.021

Note: *, ** and *** show statistically significance of parameter at the 0.10, 0.05 and 0.01 respectively. S. E. is standard error.

Table (5) shows the results of long run coefficient of estimated the ARDL model. The coefficient of $FDIG_t$ is positive and significant at 1% level of significance. So, FDI has positive and significant impact on human capital index. The coefficient of $GEEG_t$ is positive and insignificant. So, government expenditure on education has insignificant impact on human capital index in this model. The coefficient of GR_t is positive and significant at 5% level of significance. So, rising economic growth rate has positive and significant impact on human capital index. Intercept (C) is positive and significant. The coefficient of $HCIP_t$ is

positive and significant at 1% level of significance. Hence, intercept has changed after the year 2000.

Table-6. Error Correction Model: Dependent Variable is $dHCIP_t$

Regressor	Parameter	S. E.	t-Ratio	P-value
$dFDIG_t$	0.017**	$7.28E^{-3}$	2.322	0.025
$dGEEG_t$	0.027	0.094	0.291	0.773
dGR_t	0.005	0.016	0.315	0.755
dC	0.032	0.036	0.911	0.369
dD_{HCI}	0.063	0.085	0.733	0.469
ECT_{t-1}	-0.134**	0.062	-2.151	0.030

Note: *, ** and *** show statistically significance of parameters at the 0.10, 0.05 and 0.01 respectively. S. E. is standard error.

Table (6) shows that all coefficients of differenced variables at specified lagged are insignificant except $dFDIG_t$. So, FDI has positive and significant impact on human capital index in short run. Coefficient of ECT_{t-1} is negative and significant at 5% level of significance. So, there is an evidence of short run relationships amongst variables in this model. Negative and significant value of ECT_{t-1} is showing short run relationship at 5% level of significance, it is also showing the long run equilibrium after short run disequilibrium in the model and speed of adjustment from short run disequilibrium to long run equilibrium is 13.4% in a year.

Table-7. Diagnostic Tests

	LM version	P-value
Serial Correlation (χ^2)	0.241	0.623
Functional Form (χ^2)	0.039	0.843
Normality (χ^2)	0.143	0.847
Heteroscedasticity (χ^2)	0.287	0.592

Results of table (7) show that p-values of serial correlation, functional form, normality and heteroscedasticity are greater than 0.10. So there is no problem of serial correlation, functional form, normality and heteroscedasticity in the model.

Figure-1.CUSUM Test

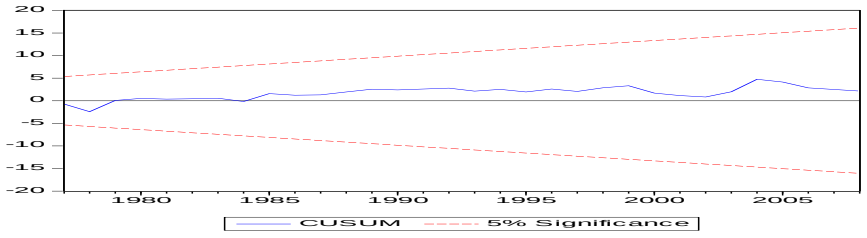
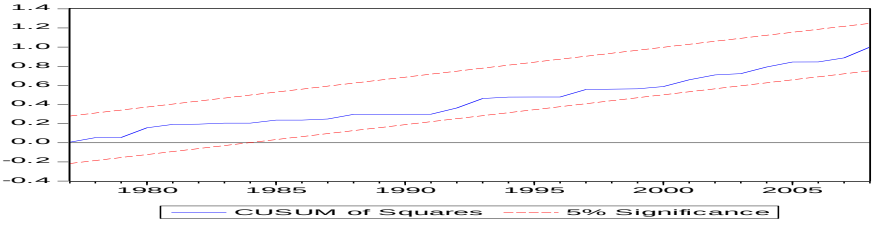


Figure-2.CUSUMsq Tests



The figures1 and 2 show that CUSUM and CUSUMsq do not exceed the critical boundaries at 5% level of significance. This means the model of human capital index is correctly specified and long run coefficients are reliable.

CONCLUSIONS

To check the consequence of FDI on human capital index, the study uses FDI, government expenditure on education and GDP growth rate as independent variables and human capital index as dependent variable. The ARDL cointegration and its error correction model are used to find the long run and short run relationships in the model. Results of human capital index model show that long run as well as short run relationships exist in the model. FDI and economic growth have positive and significant impact on human capital index. Government expenditure is not sufficient enough to raise human capital index.

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