Exploring the Linkages between Gender-specific Human Capital, Foreign Direct Investment and Economic Growth: Evidence from Pakistan

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Abstract

This study empirically examined the combined interaction of human capital and foreign direct investment on the economic growth of Pakistan as well as long and short term impact of foreign direct investment and human capital on the economic growth of Pakistan. For achieving the study objectives candidate variables annual time series data of thirty-nine years (1976-2014) were collected from the various publications of economic surveys, state bank of Pakistan (SBP) and world development indicator (WDI). To examines the long-term impacts, autoregressive distributed lag (ARDL) econometric techniques were employed, and to estimate the short tun association among variables vector error correction model (VECM) were used to find the study results. The study findings concluded that the interactive term human capital and foreign direct investment has a direct and significant contribution in encouraging economic growth of Pakistan. Moreover, results reveal that in the short run, gender-neutral interactive human capital and foreign direct investment have a significant and direct linkage with economic growth. However, in gender-specific human capital, male human capital and female human capital have an inverse association with economic growth perhaps because of the fact that lack of opportunities and underutilization of labor force in the short run. The outcomes of the study suggests that government should give its attention to promote more human development

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strategies that provide educated and highly qualified people. The productive utilization of this qualified and skilled human capital in those sectors where most foreign direct investment,along with modern technologies also stimulates economic growth. This, in turn, attracts more quality FDI for Pakistan for sustainable development.

Keywords: Human capital; foreign direct investment; female human capital; male human capital; autoregressive distributed lag.
JEL Codes: E22;E24;C49, F21; F24

Introduction

The concept of human capital (HC) is multidimensional. It can be expressed in many ways. In general, HCis a combination of resources that includes skills, education, training health, and other intellectual abilities. All of these resources collectively improves the citizen's personality which have a significant contribution in raisingthe economic growth (EG) of a country (Afridi, 2016). Moreover, HC is an important factor which augmenting the productivity of physical capital (Mujahid et al., 2014). It is used as a driving agent for the attraction of foreign capital inflows (FCI) from developed nations to developing nations. It does not only enhance the productivity of physical capital but also has the potential to increase FCI in the terms of aids, external debts, foreign direct investment (hereafter FDI) and remittances (Agbola, 2013). In developing nations, the saving-investment gap requires to attract more capital. Hence, this gap is shortened by attracting external finance from developed nations which contributestothe rising income level.

Numerous theoretical and empirical literatures consider HC is an important factor that plays a significant role in uplifting the economic growth of the economy. There are certain means to acquire HC in literature. Such as, educational attainment and health sectors significantly contribute to the accumulation of HC (Raza et al., 2015). Similarly, overall education and health status are termed as gender-neutral HC and contribute positively to EG. Conversely, there are conflicting associations of gender-separate HC on EG. In spite of it, it is widely accepted that female HC accumulation generates more benefits as compared to males. According to Knowles et al. (2002) high level of investment in education

and health sector encourages the growth rate of the economy comparatively higher than males. Broadly speaking, half of the women's of the world do not actively participate in the EG process. Moreover, it causes gender-based inequality that is a major obstacle in EG.

Since independence, both the education and health sectors in Pakistan are neglected. There is a lack of share of GDP allocated for these sectors. Pakistan budget share on education is very low as relative to other countries in South Asian region.Figure 1 showing the education expenditure (as a % of GDP) data for Pakistan from 1974-2014. In 2000, the education spending was 1.8 % of GDP, which increases by 2.2% in 2005 and from 2005 to 2010 spending rate was constant 2.2%, and in 2014 it increases by 2.4%. However, international standard spending on education is 4%.

Figure 1

Education on expenditure from 1976-2014 (Source: Economic Surveys of Pakistan 1976-2015).
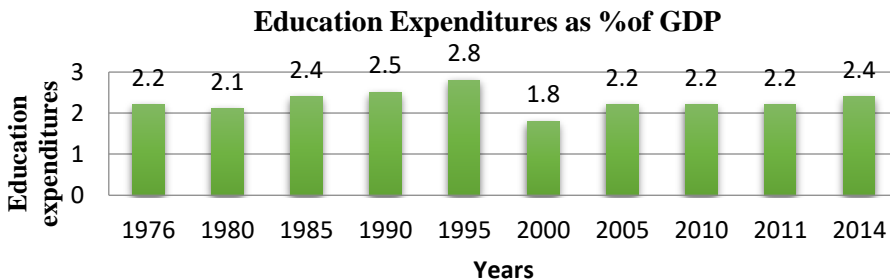
Similarly, figure 2 presenting the Pakistan GDP spending trend in the health sector. In 2014, expenditures on the health sector were just 1.01% for a very large population of Pakistan 185.5 million (World Bank data, 2014). This very low amount of GDP allocation in the health sector is the major cause of a rising number of diseases like Polio which is almost wiped out all over the world but it still persists in Pakistan. Insufficient services for women's and children's is the major cause of several impediments during the birth process.

Figure 2

Expenditure on health sector from (2005-2014) – Source (Economic Survey of Pakistan: 2005-2015).

Health expenditures (% of GDP)
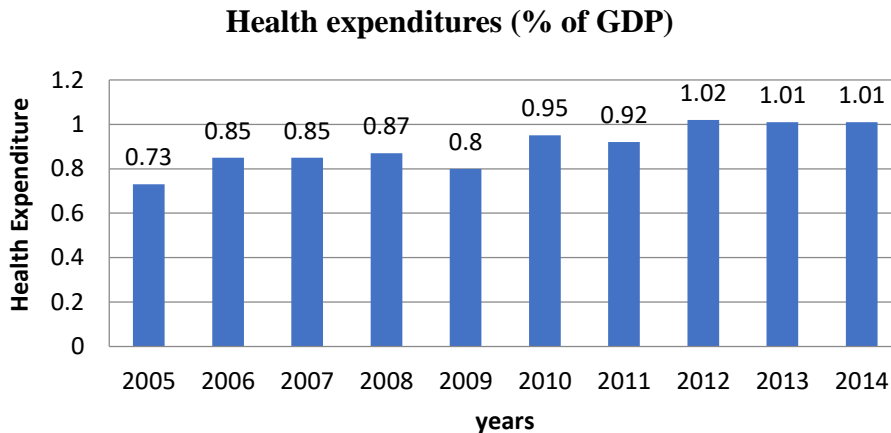
Further, bothHC and FDI make avital role in the prosperity of developed and emerging economies. Similarly, literature confirms the existence of two directional causal association among these two engines of EG (Ekanayake et al., 2003). (Haskel et al., 2007; Noorbakhsh et al., 2001) among others, claimed that FDI through its potential spillover effects enhances the capability and formation of HC. Moreover, the educated and skilled workforce of the host nation attains the externalities through the activities of MNEs along with the attraction of FDI inflows (Dunning, 1988). On the same ground, many empirical researchers found the significant role of HC for FDI inflows and the best optimum utilization of its externalities (Zhang & Markusen, 1999). According to Agbola (2013) more abundant areas and sectors of HC will attract more share of FDI. Along with this, the interaction term of HC and FDI raises the developing countries EG.

Theoretically, due to lack of HC in developing nations creates hindrances for the inflow of FDI (Lucas, 1990). However, in contrast to the prior role of HC, they are also found no significant links between HC and FDI attractiveness for poor nations (Lall & Narula, 2004). The

possible reason for this insignificance is that HC is only a good indicator when there is development in the country. In recent times, the flow of foreign capital towards poor nations is driven mainly through FDI, remittances, aid effectiveness that is consequence of easy financial policies and political relations at global level. Despite this, a tremendous shifting of foreign capital was observed from developed to developing nations in the form of FDI which was US\$95 billion in 1995 whereas; it increased in 2008 and reached to US\$593 billion (The World Bank, 2011). While a tremendous flow of remittances was observed developed economies to developing nations. For many developing nations, it is major source of external financing among all others. However, the statistics figures rises from US\$55.2 billion to US\$324.8 billion in 1995 and 2008 respectively. Both FDI and remittances are the major sources of external financing (The World Bank, 2011).

Unlike borrowing from external financial institutions, the importance of remittances received is tremendously increasing in the present era. Pakistan is among of largest remittances receiving nation in the Asian nations. Prior, remittances were used for domestic needs that now are utilized for productive investments. Nevertheless, being a larger amount receiving country, Pakistan needs appropriate measures to benefit from remittances. It helps to reduce the burden of external debt and its increasing services (Agbola, 2013).

It seems that there is a large debate on the transformation of external financing throughout the world. In the current economic and financial scenario, it is not confirmed the extent of the impact of economic events on FDI. However, a significantly increasing number of studies examined the impact of FDI on EG and FDI and HC causation. However, the interactive role of FDI and HC on EG is missing in literature. Whereas, empirical literature explains the direct significant impact of FDI and HC on EG. Hence, there is a need to examines the joint impact of FDI and HC on EG. In addition, not any prior study investigated the long and short-term impact of FDI and HC on the EG of Pakistan. Though, this study empirically examined the joint influence of HC and FDI on the EG of Pakistan by using the interaction term. Moreover, this studyexposed the gender-specific influence of HC on the EG of Pakistan. The study findings

reveal that the interactive neutral HC and FDI have long term significant association with the EG of Pakistan. Whereas, male and female human capital contribute positively in the long run and negatively in the short run. The outcomes of the study will be helpful for policy makers in making suitable policies for human development. Government will give attention to promote more human development strategies that provide educated and highly qualified people. Moreover, government will keep an eye on the development of strategies regarding the empowerment of females in making their decisions.

The structure of remaining paper is arranged as: Section 2 presents a brief review of literature, section 3 explains the data and econometric methodology. The empirical findings and discussions are explained in section 4. However, last section explained the study findings and also suggested some policy recommendations.

Literature Review

The review covers the studies following classical exogenous growth theories augmented with human capital to modern neo-classical endogenous growth theories. Many theoretical and empirical works has been carried out in uncovering the impact of human capital formation. Human capital formation is still at the center of attention for its multi-dimensional role because it contributes in the development of nations numerously. Furthermore, human capital augmented with knowledge, skills, training and better health is a key to open the door of foreign capital inflows.

The endogenous growth theories got importance for being included human capital variable as a factor of production with constant or increasing rate of returns. Based on the models followed by developed nations, developing countries are giving a considerable attention to invest in human capital via investment in enhancing higher education. Similarly, a study was conducted to emphasize the importance of education of its labor force in promoting the growth rate of Malaysian economy by (Sieng &Yusssof, 2014). This study used the annual time series data collected from World Bank and department of statistics of Malaysia covering the period 1981 to 2010. The study employed autoregressive distributed lag

model (ARDL) to check the long run relationship between variables. The empirical findings support the literature that educated labor force significantly contributed to growth. However, among all education levels, higher education affected more significantly than primary level of education. The study recommended following developed countries education model and more investment in higher education.

Further, Cooray ([2014](#)) used the extended Solow growth model to check the impact of gender disaggregated human capital on the economic growth of South Asian nations. The key variables of the study were human capital accumulation, trade openness, private investment accumulation, fiscal and financial development and inflows of capital along with per capita output. The data set carried out from world development indicator covering the period from 1970 to 2008. The econometric fixed effects model was employed to find to results of the study. The result concluded that male human capital interacted with openness had positive influence on the economic growth. However, female human capital interacted with openness had negative influence on primary and secondary enrollment level along with higher level of openness. The study recommends more investment in the education of females so there will be gender equality in education.

The standard Cobb Douglas production function augmented with human capital was used to unveil the role of public spending on education on economic growth of Algeria studied by (Mekdad et al., [2014](#)). The study used the annual time series data on gross domestic product, labor force, gross fixed capital formation and public education expenditure. Time span of the data was from 1974 to 2014 and collected from many statistical publications in Algeria. This study employed a Johansen co integration and Granger causality tests for empirical estimation. The results of the study confirmed the correlation among all variables and a strong positive relation between spending on education and economic growth the effect of government expenditure on education for economic growth was more significant.

Besides other capital inflows from developed to developing nations in the form of external debt, remittances receipts and official development assistance, the share of foreign direct investment is mandatory. The

spillover external effects of foreign direct investment on host country human capital development is a matter of subject since augmentation of human capital in endogenous growth literature. Likewise, to empirically estimate the spillover effects of foreign direct investment in enhancing human capital was studied by Salim et al. (2014) for the economy of Malaysia. The study employed yearly data on human capital, trade openness and foreign direct investment. The appropriate proxy variable used for human capital development was labor force with certificates while imports and exports data was combined together for trade openness. The data set was carried out from 1982 to 2011, Granger Causality test and ARDL test was employed to find the study results. The study results confirm the long run and short run co-integration among variables. The results found a uni directional causality between foreign direct investment and human capital.

Dar et al. (2016) estimated the long-run relationship among HC, FDI, trade openness and EG for Pakistan. Johanson Co-integration technique was employed to examine the short run and long run relationships among variables. The study results determined the existence of long-termassociations among variables. Whileno relationship was found in the short-term. Moreover, this studypaying attentionto the role of education and health department in boosting up a country HC level which is a benchmark for capital flight from developed to developing countries to fill their saving-investment gap.

Further, Pegkas and Tsamadias (2016) explored the certain determinants of EG including HC, FDI, private investment trade openness for Greece and the empirical co-integration analysis confirms the long-run positive relation among EG and all of its determinants. Causality analysis confirms thatunidirectional granger causality running from foreign direct investment, private investment, human capital and exports to economic growth.

Similarly, Mankiw et al., (1992) empirically examine the causality among EG and its determinants by employing Granger causality test. The study results suggest that there is one-directional Granger causality going from FDI, private investment, HC and exports to EG.

Afridi ([2016](#)) investigated the effect of HC formation on EG via education and health sectors in Pakistan. ARDL econometric technique was used to find the study results. The results are consistent with the literature and find a direct associationamong birth rate and physical capital with EG. Though, the findings are not statistically favorable for a short time period. As there is gender inequality exists specifically for getting an education in Pakistan. Consequently, leads to inequality in the incomes of males and females. In addition, the literacy rate is very low in Pakistan (UNESCO). Keeping an eye on this issue, the impact of literacy and inequality on purchasing power parity was checked by (Habib et al., [2016](#)). The study results concluded that literacy rate positively associated with EG while the Gini coefficient has a negative association with purchasing power parity.

Similarly, Raza et al., ([2015](#)) examined the education and health sector role on EG for Pakistan. Johansen co integration approach was employed to check the long run association among variables. The empirical findings supported the previous literature as there found positive long run association among education human capital and economic growth while health human capital found to be negatively related with economic growth.

Further, Bahar ([2015](#)) empirically investigated the effect of HC development and foreign direct investment for each other at a micro level in India. Linear regression model was employed to find the study results.The results of linear regression model confirmed a positive and significant impact of human capital on the economic growth of India.

In the same way, the resource gap among developed and developing nations can be minimized not only by attracting the amount of foreign capital inflow but also the best productive utilization of foreign capital. FDI is measured as an engine in uplifting EG but the maximum benefits can be obtained when incorporated with highly qualified HC. Being considered the importance of HC formation of host nations, empirical research was conducted by (Rehman, [2016](#)). The current research examined the influence of FDI on the growth rate for Pakistan by using the interactive term HC and literacy rate and checked its effects on EG. The results of the study supported the previous literature and concluded

that the interaction term of HC with FDI negatively affected the growth rate.

Similarly, Agbola (2013) explores the fact that whether the significant contribution of FDI and remittances is attached toHC. The study findings are consistent with the theoretical endogenous growth model proposed by Romer (1990) and determined that HCimproves the effect of foreign capital in terms of remittances and FDI. Annual time series data was collected for Ghana from 1965 to 2008. The series of variables for analysis included two interaction terms of human capital with FDI and human capital with remittances. Fully Modified Ordinary Least Square (FMOLS) model was employed for empirical findings. The outcome of the study favors the theoretical model that human capital enhances the impact of foreign capital in the form of remittances and foreign direct investment. Pesaran et al., (1995) studied the role of those key factors which contribute more in foreign direct investment inflow into the country. Time series study was conducted on foreign direct investment, governance, human capital, trade openness and private investment. The time of the study was from 1984 to 2012 for Pakistan. For empirical analysis, auto regressive distributed lag technique was used. The study concluded both human capital and governance as key determinants of capital inflow in the form of foreign direct investment. The results showed both short run and long run significant relationship among variables.

The growth accounting theories exhibited constant returns to scale on both human capital and physical. To explore the role of human capital in stock and flow conditions on economic growth, a comparative study was conducted for Pakistan and India by (Abbas & Mukhtar, 2000). The study used multiple models to explore the role of human capital, enrollments with labor to construct effective labor input and human capital as a determinant of physical capital. Gross enrollments at primary, secondary and higher levels were used as proxy variables for human capital. However, the combination of enrollment and labor was used as effective labor to capture the effects of human capital as stock variable. Log linear model was used for all equations. The result of the study indicated that primary human capital negatively related to growth for Pakistan perhaps as an immense community live beneath the poverty line in Pakistan and

parents give their preference on work rather than study. While, in India Primary human capital is positively related as Indian economy spends a lot on primary school enrollments. The secondary human capital showed a positive association with growth for both India and Pakistan. Unlike the primary enrollments, the tertiary human capital found more in Pakistan than India and significantly associated with growth. Being considered human capital as stock variable the results are robust for all education levels. Despite of its tremendous role, human capital was not found a significant determinant of physical capital for Pakistan.

Overall, from the review of literature it can be seen that a significantly increasing number of studies examined the impact of FDI on EG and FDI and HC causation. However, not any prior study investigated the long and short term impact of FDI and HC on the EG of Pakistan. Therefore, this study empirically examined the joint influence of HC and FDI on the EG of Pakistan by using the interaction term. Moreover, this study exposed the gender-specific influence of HC on the EG of Pakistan.

Data and Methodology

Data Sources

This study employed the yearly time series data span covering the duration of 1976-2014. The data has been collected from various publications of Economic Surveys of Pakistan, 'Fifty Years of Economy of Pakistan' by Stat Bank of Pakistan (SBP) from the websites of World Development Indicators (WDI).

Variables Description

The variables of the study we have selected by keeping in view the extended form of the theoretical model (Mankiw et al., 1992; Borensztein et al., 1998). The description of the variables is as follows:

Table 1.

Variables Description

	Variables	Explanation	Expected Sign	Reference
Dependent	**GDPpc**	Per Capita Gross	+	(Afridi, 2016;

Variable Independent Variables		Domestic Product		Afzal et al., 2011)
	MHC	Male HC Index	+	-
	FHC	Female HC Index	+	-
	OP	Trade Openness	+	Agbola (2013)
Control Variables	**GFCF**	Gross fixed capital formation used as a proxy for physical Capital.	+	(Raza et al., 2015; Ali et al., 2016; Abbas & Foreman-Peck, 2008)
	CPI	Inflation Rate calculated as yearly % change in price index.	-	Sarel (1996)
	REMI	Remittances Received	+	(Agbola, 2013; Borensztein et al., 1998; Cooray et al., 2014).
	HC*FDI	The interaction term (HC* FDI) used to cover the spillover effect of FDI	+	(Agbola, 2013; Borensztein et al., 1998; Velde, 2001).

We have disaggregated the HC into gender-neutral and gender-specific HC. Moreover, joint interaction of (HC* FDI) was used to check to strengthen host nations' absorptive capacity of external capital.

Econometric Methodology and Hypothesis Testing

To empirically examine the influence of HC on EG for Pakistan, this study follows the extended form of endogenous growth model previously developed by (Romer, 1994; Grossman & Helpman, 1991) and then extended by (Borensztein et al., 1998). Further, we have followed the model of Benavot (1989) to investigate the influence of gender-based HC on EG. Therefore, we have developed the time- series model in the following form:

$$LN\ GDPpc_t = \alpha_0 + \alpha_1 LNREMI_t + \alpha_2 LNOP_t + \alpha_3 CPI + \alpha_4 LNHC * FDI_t + V_t \dots\dots\dots\dots\dots\dots (1.1)$$

In equation (1.1) natural log of real GDP per capita is used as the dependent variable and the log of real remittances, consumer price index,

log real trade openness and log ofthe interaction term (HC *FDI) isused as the explanatory variables of the model.

$$LN\ GDPpc_t = \alpha_0 + \alpha_1 LNGFCF_t + \alpha_2 LNFHC_t + \alpha_3 LNMHC_t + \alpha_4 LNOP_t + V_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (\mathbf{1.2})$$

In equation (1.2) log of real GDP per capita is used as a dependent variable and this model for explanatory variables we have separated the HC into male and female HC. Whereas, log of trade openness and consumer price index and log of gross fixed capital formation are used as the controlled variable. α_0 is the constant term and$\alpha_1, \alpha_2, \alpha_3, \alpha_4$ are slope coefficients, v_t is the error term.

Hypothesis Testing

Keeping in view the theoretical and empirical literature this study established the following hypothesis:

H₁: Both HC and FDI jointly, significantly and directly contributed to EG.
H₂: Disaggregation of HC into male and female HC has a significant direct influence on EG.

Results and Discussion

Descriptive Statistics

The descriptive stats of the study are given in table 2.

Table 2:

Descriptive Statistics

	LGDPpc	LREMI	LOP	CPI	HC*FDI
Mean	4.06	19.57	23.71	8.50	17.76
Median	4.05	19.40	23.73	7.92	18.27
Minimum	2.79	17.36	22.11	2.91	15.57
Maximum	5.35	21.62	25.06	20.28	18.99
Std.Dev	0.63	0.99	0.80	3.61	1.06
Skewness	0.35	0.21	0.00	0.75	-0.72

Kurtosis	2.56	2.80	2.31	4.15	2.07
Jarque-Bera	1.11	0.34	0.77	5.90	4.77
Probability	0.57	0.84	0.68	0.05	0.09

Total Observation = 39

The descriptive statistics show that all of the variables series distribution is positively skewed. However, the interactive term series distribution is negatively skewed. Kurtosis results show that positively skewed series distribution is Platykurtic while negatively skewed series distribution is leptokurtic. Further, the Jarque-Bera (JB) test results reveal that all series of data follows the normal distribution.

Unit Root Test:

To examine the variables stationarity employed the standardized Augmented Dicky Fuller (ADF) proposed by Said and Dickey (1981) and Philippe Preen (PP) tests. Augmented Dickey-Fuller test and Philippe Preen tests proposed by Phillips and Perron (1988) are standardized tests among all due to their certain properties. Autocorrelation causes non-stationary series and it is removed by including lagged differences. These tests has been used in literature by (Afzal et al., 2011; Akram, 2008; Mohsin, 2005; Abbas, 2000; Amjad, 2005; Ali et al., 2016).

The Null Hypothesis

$H_0 : \rho = 0$ The data series are non-stationary

$H_1 : \rho < 0$ The data series are stationary

Both ADF and PP test results are given in table 3.

Table 3:

Stationarity Test Results

Variables	ADF Test with Trend & Intercept		PP Test with Trend & Intercept	
	I(0)	**I(1)**	**I(0)**	**I(1)**

LGDPpc	-2.96 (0.156)	-3.86(0.024)**	-2.50(0.324)	-3.77(0.029)**
LMHC	-3.03(0.137)	-5.94(0.000)*	-3.10(0.119)	-9.23(0.000)*
LFHC	-1.38(0.848)	-6.02(0.000)*	-1.63(0.761)	-6.03(0.000)*
LOP	-2.42(0.359)	-4.83(0.002)*	-2.53(0.308)	-4.86(0.001)*
LGFCF	-2.30(0.419)	-5.84(0.000)*	-2.46(0.340)	-5.85(0.000)*
CPI	-3.04 (0.040)**	-7.47(0.000)*	-3.09(0.034)**	-7.47(0.000)*
LREMI	-3.95(0.156)	-6.02(0.000)*	-3.02(0.140)	-7.91(0.000)*

Note. * Significant at 1% ** 5% & *** at 10%.

Table 3 the results of both tests indicate that all of the data series are stationary in I(1) except CPI index representing inflation rate that is stationary at I(0). After taking the first difference of all series becomes stationary at one and 5 percent significance level. Therefore, both tests present the same results. However, the PP test is preferred on the ADF test because of no force and size issues.

Optimal Selection of Lags

The selection of optimal lag length is significant by applying the Autoregressive Distributed Lag (ARDL) model. The lag order is important because it provides information about the lag of each candidate variable which have been employed in the model, under the ADF test. It is checked after the VAR model. There are the different criteria of selecting the order of lags including Sequential modified LR test statistics (LR), Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion(SC) and Hannan-Quinn information criterion (HQ). These criterions results are different from each other. The sign of asterisk shows the optimal lag of each criterion. However, the smallest value gives more reliable results. The VAR lag order selection criterion findings of both models are given below tables 4.1 and 4.2.

Table 4.1

Optimal lag length Selection of Model 1

Lag	LR	FPE	AIC	SBC	HQ

0	NA	0.02	10.50	10.72	10.58
1	64.85*	3.03	3.68	6.10	3.52
2	19.29	1.50*	3.06*	4.38*	4.52
3	36.21	2.51	3.26	6.78	4.49

Note: Author's own complication

Table 4.2

Optimal lag length Selection of Model 2

Lag	LR	FPE	AIC	SBC	HQ
0	NA	2.44	3.33	-3.11	3.26
1	24.71	5.56	9.43	8.12*	-8.97
2	46.64*	3.76	9.91	-7.49	9.07
3	35.74	3.18*	-10.31*	6.79	-9.08*

Note: Author's own complications

In the above tables 4.1 and 4.2, the results of the optimal selection of lag orders are presented for both models. On the base of the Schwartz Binary criterion, optimal lags for the models are selected. In view of the first model, two is the optimal lag length. However, one is the optimal lag length for the second model.

Autoregressive Distributed Lag (ARDL) Method

To empirically estimate the short and long termassociation among variables we have employed the Autoregressive Distributed Lag (ARDL) approach. (Pesaran & Shin, 1999; Pesaran et al., 2001) introduced the ARDL bound testing approach. There isa number of advantages and characteristics of the ARDL bound testing approach. This technique is superior to other co-integration techniques because it gives consistent, unbiased and robust findings of short and long-run parameters. Similarly, for small sample size, it provides batter empirical estimation than Johanson co-integration application for in case of a big sample size (Narayan, 2005).

The existence of a high correlation among the explanatory variable and error term causes an endogeneity problem. ARDL bounds testing approach

model has no issue of endogeneity because it is free from the issue of residual correlation. Furthermore, the inclusion of the difference lag length of series can resolve serial correlation issues (Halicioglu, 2004).

Pesaran and Shin (1999) identified for asymptotically normal series, consistent estimates of log run parameters in the ARDL approach. This approach is used to test either all series are stationary at I(0), and I(1) or mutually integrated of I(0) and I(1). However, the necessary condition is that none of the series in the model should not I(2). The traditional methods demand common order of integration for all series in the model (Pesaran & Shin 1999). Nevertheless, the ECM is ARDL model specifies the speed of adjustment and convergence towards equilibrium. It shows that after the exogenous shocks and disequilibrium in the previous year, how quickly the model adjusts in present timeto long term equilibrium. It provides the short term relationship among variables..

However, after the descriptive statistics and selection of appropriate lag lengths, the next step in ARDL approach is to find the long term(permanent)association between the candidate variables. Here, the bound test F-statistics approach is used. However, there are no exact critical values determined for mutually integrated I(0) and I(1). For this, upper and lower bounds values are developed by (Pesaran et al., 2001). The lower bounds support I(0) and that of upper bounds support I(1). In addition to this, the appropriate order of lagged series is determined by applying ordinary least square techniques under unrestricted ECM approach. Along with this, further step is to explore the short and long term parameters. This approach is also beneficial for structural breaks in annual data series.

To examine the parameters stability, Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Square of Recursive Residuals (CUSUMSQ) are applied in ARDL (Pesaran et al., 2001). Prior, ADF and PP unit root tests are employed to confirm the series stationarity. As the series are stationary at mutual order of integration, so the appropriate technique for empirical outcomes is ARDL. Furthermore, not any series is stationary at 2nd difference, it supports to apply the ARDL.

Bound Test Results of ARDL

The standard ARDL bound testing approach is consist of two step procedure. The first step is to perform "Bound Test" declare that candidate

variables moving towards long run or not. The bound test is performed to check the existence of co-integration between variables. Therefore, F-statistics are accomplished to find out the long term (permanent) association between variables series. However, F-statistics values will no longer be valid for case of series integrated of I(2) (Pesaran et al., 2001; Narayan, 2005). Furthermore, lower and upper values are given for confirmation of co-integration. Though, the optimal lag length is designated on the basis of standard Schwarz Bayesian Criterion (SBC). The lag chosen for this study is 2 for annual data. The F-statistics results for both models of the study are shown below.

Table 4.3

Results of Bound Testing Method

Models	F-tabulated at 95 %		F-calculated	Conclusion
	I(0)	I(1)		
F(LGDPPC/LREMI,LOP,CPI,HC*FDI)	2.86	4.01	7.09**(0.004)	Co-integration
F(LRGDPPC/LGFCF,LFHC,LMHC,LOP)	2.86	4.01	4.65**(0.002)	Co-integration

Note: ** show that F stat value is higher than the upper bound at 5% significance level.

The study results reveal the existence of co-integration in both models. The variables are co-integrated at 5% significance level. In both models, the F-calculated values lying higher than the upper bound critical values which confirm the existence of co-integration association between variables. Therefore, the H_0 of no co-integration linkages exist between variables in this study is rejected at 5% level. However, this long termassociation between variables further extended the research to calculate short and long term estimates of parameters for both models.

Long Term Coefficients

The long term estimated coefficients indicate the limited effects of HC on EG in Pakistan. The long term results of model 1 and model 2 are shown in Table 4.3 and 4.4 respectively. In both models, real per capital GDP is the dependent variable whereas explanatory variables vary in both models. However, in model 1 real remittances (LREMI), real trade openness (LOP), consumer price index (CPI) and interactive HC with foreign direct investment (LHC*FDI) are regressors.

Table 4.3

Long Term estimates of model 1 by ARDL approach

ARDL Long Run Results(1,1,0,1,0) based on Schwartz Binary criterion (SBC) LGDPPC is dependent variable				
Variables	**Coefficients**	**Standard Error**	**T Ratio**	**[Prob]**
LREMI	0.48	0.05	8.69*	[0.000]
LOP	0.49	0.07	6.60*	[0.000]
CPI	-0.04	0.01	-4.38*	[0.000]
LHC*FDI	0.23	0.06	3.47*	[0.001]
CONSTANT	21.12	3.25	6.48*	[0.000]

*Note: * Significant at 1% ** 5% *** 10%.*

The Table (4.3) shows that remittances have a direct and significant influence on real per capita GDP. The positive contribution of remittances inflows to EG is due to increasing level of income of recipient country. Remittances inflow stimulates EG by developing HC as providing finance to education sector and lowering the burden of external borrowings for Pakistan and it is similar with the results of (Qayyum et al., 2008). The estimated coefficient of LREMI describes that if LREMI is increased by 1% percent it will rise the per capita real GDP by 0.48 percent. On the other hand, trade openness is also a growth enhancing indicator as the removal of trade barriers since 1980 lead to liberalization of trade. The access of raw materials for imports substitutes and access to advance

technology as export oriented products accelerates the EGUmer (2014) for Pakistan and the coefficients reveal that as 1% increase in the LOP uplift the economy by 0.49 percent.

The variable inflation is also harmful for the economy as it negatively influences on the EG of a country. The economy faces higher cost of capital and the fluctuating prices create uncertainty about the expected profits of future investment projects(Ayyoub et al., 2011). The coefficient of CPI indicates that as 1% rises in inflation will decreases the real GDP by 0.04 percent. Furthermore, LHC*FDI is used as an interaction term of HC and foreign direct investment. Both FDI and HC are growth accelerating determinants and the interactive term identifies whether the new factor constrains or enhances the other key variable (Agbola, 2013). The coefficient of LHC*FDI describes that if there is 1% increase in LHC*FDI, the GDP will rise by 0.23 percent. HC accelerates EG along with attracting FDI and benefiting from the spillover and new technology (Romer, 1994). Similarly, the technological progress attached with FDI inflow raises the productivity and efficiency of labor which consequently positively contributes to EG (Grossman & Helpman, 1991). On the same ground, both HC and FDI strengthen each other. The increasing HC in the country is attracting more FDI inflows which increase competition and stimulate to more productive man power through technology diffusion. The result also supports the findings that the FDI inflows stimulate growth only when there is sufficient HC in FDI driven nation (Borensztein et al., 1998).

Table 4.4

Long run estimates of model 2 by ARDL approach

ARDL Long Run Results (2,2,2,1,1) based on Schwartz Binary criterion (SBC) LGDPPC is dependent variable				
Variables	**Coefficients**	**Standard Error (SE)**	**T-Ratio**	**P-value**
LGFCF	0.33	0.01	2.70*	[0.012]
LFHC	0.27	0.11	1.76*	[0.000]

LMHC	0.49	0.24	2.09*	[0.057]
LOP	0.46	0.08	5.48*	[0.000]
CONSTANT	7.39	1.99	-3.70*	[0.001]

Note: * Significant at 1% ** 5% & *** 10%.

In table 4.4 the long term estimates of gender differential HC are given along with controlled variables. GFCF used for private investment depicts a direct and significant association with EG. The coefficient of LGFCF indicates that a 1% increase in LGFCF will raise the per capita GDP by 0.33 percent. This direct and significant effect of physical capital is due to rise in the stock of capital of the country (Mekdad et al., 2014). On the other hand, composite female education index has been used to indicate the influence of female HC in stimulatingEG. Further, the coefficient of LFHC depicts that per capita GDP will raise by 0.27% because 1% increase in female HC. Female HC possesses a direct and statistically significant impact on EG. The positive impact is may be the reason that female HC plays a multivariate functions. Also, the provision of more opportunities regarding education, health, nutrition, jobs support female to contribute positively. Similarly, without appropriate utilization of this segment of society, a threshold level of HC cannot be achieved (Khan, 2016). However, the relationship is weak and influence of female HC in EG is small. The possible reason of this small contribution may be the underutilization and misallocation of female population. The other possible reasons are intra household disparities, lack of investment in females and lack of decision making in females. Nevertheless, the results are contrary to the findings of (Dauda, 2013) concluded a negative relationship among HC and EG. Besides to female HCLMHC indicated the composite education index for males. The estimated coefficient of LMHC is significant with positive sign which explains that as 1% increase in male HC will boost up the EG by 0.49 percent. The direct involvement of male HC is due to literacy rate of male is greater than that of females. Also, male members of society have more chances like education, skills and getting employment. This also supports the larger effects of male HC than that of female. The findings of positive and larger contribution of

male HC are supported by the findings of (Hassan & Cooray, 2015). The coefficient of LOP trade openness is directly statistically contribute to EG. Trade openness enhances the per capita GDP by 0.46 percent as a result of increase in LOP by 1 %.

The Error Correction (ECM) Model Results

The ECM version of OLS shows the short term findings of model. It explains the speed of adjustment with which a model moves back to its equilibrium position after any exogenous shock. The coefficient of ECM ranges from 0 to 1, where zeroshows no adjustment while onedesignates full adjustments after one time year later in the current year from the previous year disequilibrium. The estimated coefficient must be inverse and statistically significant. The short run results of both models are shown in given below table 4.5.

Table 4.5

Error Correction (ECM) Result of Model 1

ARDL Short Run Results(1,1,0,1,0) based on Schwartz Binary criterion (SBC) LGDPPC is dependent variable				
Variables	**Coefficients**	**Std. Error**	**T-Ratio**	**[Prob]**
dLREMI	0.716	0.050	4.189*	[0.000]
dLTO	0.366	0.063	5.788*	[0.000]
dCPI	-0.015	0.007	1.940***	[0.061]
dLHC*FDI	0.174	0.039	4.43*	[0.000]
ECM(-1)	-0.733	0.133	-5.48*	[0.000]
R-square	0.962	**DW- statistics**	2.193	
Adj. R-square	0.954	**F-statistic**	11.061	[0.000]

*Significant at 1% ** 5% *** 10%.

Table 4.5 narrates the short term findings of neutral HC with interactive FDI. The findings brought out that remittances and trade openness have positive while inflation has an inverse effects on EG in short term. However, the interactive HC and FDI contribute positively in stimulating EG in short term. The positive contribution is because of the

fact that being an open economy the country, the existing HC stock benefits from the new ideas and technical progress of leading nations which promote their growth (Agbola, 2013). The estimated coefficient of ECM is negatively significant at 1% level. The value of coefficient is -0.73 which shows a high level of adjustment towards long term equilibrium. It implies that 0.73 percent disequilibrium in the previous years due to exogenous shocks is adjusted in the present year towards the long term equilibrium.

Table 4.6

Error Correction Result of Model 2

ARDL Short Run Results (2,2,2,1,1) based on Schwartz Binary criterion (SBC) LGDPPC is dependent variable				
Variables	**Coefficients**	**Standard Error**	**T-Ratio**	**[Prob]**
dLRGDPPC(-1)	0.588	0.132	4.450*	[0.000]
dLGFCF	0.155	0.010	-1.441	[0.162]
dLGFCF(-1)	0.109	0.007	-1.201	[0.241]
dLFHC	-0.598	0.212	-2.820*	[0.009]
dLFHC(-1)	0.359	0.149	2.405*	[0.024]
LMHC	-0.110	0.175	-0.631	[0.534]
LOP	0.452	0.077	5.877*	[0.000]
ECM(-1)	-0.649	0.150	-4.317*	[0.000]
R-square	0.814	**D-w statistic**	2.269	
Adj. R-square	0.721	**F-statistic**	8.780*	[0.000]

*Significant at 1% ** 5% & *** 10%.

The short-run results of the second model possess that female HC shows an inverse link with per capita real GDP in the current year whereas

its lagged term shows a direct association and supports the conventional analysis. Though, male HC has an inverse link with per capita real GDP in the short term perhaps may be the reason is that in a short period the labor force is not fully productive and may not be efficiently utilized in the growth processes. The estimated coefficient of ECM is -0.64 which is inversely and statistically significant. It shows a modest speed of adjustment towards long-term stability in the present time period and from the instability of the lag year because exogenous shocks.

The Diagnostic Test

This test is employed to examine that the estimated model which is save from the certain econometric issues including autocorrelation, heteroscedasticity, misspecification and non-normality of data. The first model diagnostic test is given in table 4.7.

Table 4.7

Result of Diagnostic Test of Model 1

Test Applied	$\chi2$ [Prob]
Serial Correlation	0.151[0.697]
Functional Form	0.972[0.324]
Normality	0.355[0.837]
Heteroscedasticity	0.870[0.351]

The empirical findings indicate that the estimated model is the best fit. It is free from the problem of autocorrelation and heteroscedasticity. Moreover, residuals are distributed normally and no misspecification of the functional form exist in the estimated model. Furthermore, the P-values of all tests is insignificant in model 1 which is required.

Table 4.8

Result of Diagnostic Test of Model 2

Test Applied	$\chi2$ [Prob]
Serial Correlation	0.146[0.702]
Functional Form	1.518 [0.218]

| Normality	0.090 [0.956]
Heteroscedasticity	0.161[0.687]

Note: Author own compilation

In table 4.8 the empirical results of diagnostic tests for model 2 indicate that this model is also free from serial correlation and heteroscedasticity and there is no misspecification of model functional form. Furthermore, residuals normal dispersion also shown in this table and the probability values of all tests are insignificant which is required.

Stability Test

The estimated parameters stability is important and is inspected through CUSUM and CUSUMSQ tests. The estimated parameters stability can be established through the graphics of CUSUM and CUSUMSQ tests. On the same ground, the graphic line of these stability tests lying between upper and lower critical boundaries accepts the null hypothesis of parameter stability. While the crossing of CUSUM and CUSUMSQ graphics from higher and lower bounds at a 5% level of significance accepts the alternative hypothesis of no parameter stability. The graphics of CUSUM and CUSUMSQ are presented here.

Figure 3

Plots of Stability test

Model 2: Plot of CUSUM	Model 2: Plot of CUSUMQ
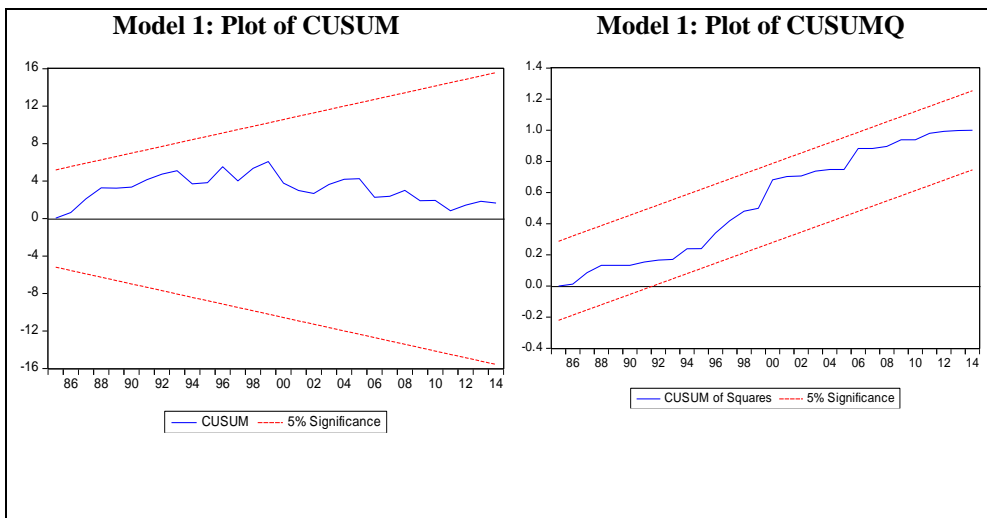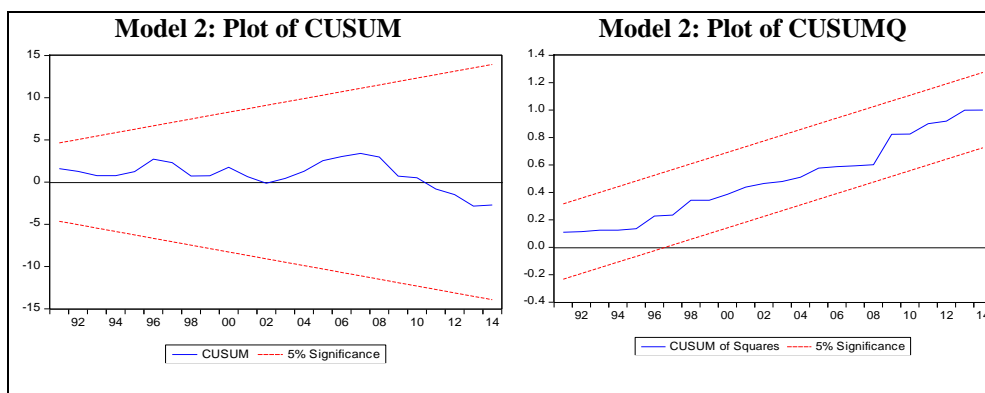
Conclusion and Policy Implications

This research examined the impact of gender-neutral and gender-disaggregated HC on the EG of Pakistan. The financial capital flow and HC role to strengthen or weaken each other is analyzed by using the interaction term of HC and FDI. Yearly time series data covering the span from 1976 to 2014 has collected and the ARDL co-integration bound testing approach is employed to estimate the study results. The results reveal that the interactive neutral HC and FDI have long term significant association with the EG of Pakistan and these findings are consistent with the result of (Agbola, 2013; Nkechi & Okezie, 2013). Similarly, male and female HC have a direct and significant correlation with per capita real GDP and these findings are consistent with (Khan & Khattak, 2014).

In the short run, gender-neutral interactive HC and FDI have a significant and direct link with per capita real GDP. However, in gender-specific HC, male HC and female HC have an inverse association with EG perhaps because of the fact that lack of opportunities and underutilization of labor force in the short run. In the same way, the other independent variables show a direct association with GDP excluding for CPI that has an inverse long- and short-run relation to real per capita GDP. Remittances, gross fixed capital formation, and trade openness have a significant and direct link to real per capita GDP.Overall, the long-term interactive role of HC and FDI is directly connected with EG. Whereas, male and female HC has an inverse linkages with EG in the short run.

Policy Recommendations

This study has some policy recommendations which are based on the empirical outcomes of above both models where the interaction of HC with FDI and gender-specific male and female HC has a direct and significant influencetoEG in Pakistan.

1. The government should give its attention to promote more human development strategies that provide educated and highly qualified people. The productive utilization of this qualified and skilled HC in those sectors where most FDI, along with modern technologies also stimulates EG. This, in turn, attracts more quality FDI for Pakistan for sustainable development.

2. The government should make HC more supportive by provision of equal quality education without any discrimination of province, class, and culture and ethnic along with narrowing the knowledge gap.

3. The government should develop strategies in order to empower females in decisions making. Also, the social, economic and political independence is important for women to play their role in uplifting economy. Public policies should be consistent with the provision of counseling and guidance for females while choosing different educational programs that will be effective in rendering employment and jobs. Moreover, long term policies and planning are required forHC formation via quality educational programs.

4. The government must allocate a significant portion of the budget in the education sector to promote education.

Future Research

The empirical findings of the study have opened further areas of research such as: Sector-wise analysis can be done for further insights regarding the HC formation and FDI inflows. Further, by constructing regional male and female HC indexes, the impact can be checked as the regional level.

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Appendix

Table A1. Literature Review

S.#	Authors	Country	Data	Estimation Technique	Results
01	Sieng and Yousaf (2014)	Malaysia	1981-2010	ARDL	Long run relationship found among education level of the labor force and economic growth
02	Cooray et al., (2014)	South Asia	1970-2008	System GMM	Male human capital interacted with openness had positive influence on the economic growth.
03	Salim et al., (2014)	Malaysia	1982-2011	ARDL	The results found a uni-directional causality between foreign direct investment and human capital.
04	Mekdad et al., (2014)	Algeria	1974-2012	Johanson Co-integration	Public spending on education affects positively economic growth.
05	Dar et al., (2016)	Sudan	1990-2017	Johanson Co-integration	Long-run relationship determined among the role of education and health department in boosting up a country HC level.
06	Pegkas and Tsamadias (2016)	Greece	1970-2012	Granger Causality	Unidirectional long-run and short run Granger causality running from foreign direct and domestic investments, exports and human capital to economic growth;
07	Mankiw et al., (1992)	Oil producer and OECD	1960-1985	Estimate Solow model with OLS regression	Poor countries tend to grow faster than rich countries. The evidence indicates that, holding population growth and capital accumulation

		counrties			constant, countries converge at about the rate the augmented Solow model predicts.
08	Afridi (2016)	Pakistan	1972-2013	ARDL	Human Capital role is significant for economic growth
09	Raza et al., (2015)	Pakistan	1977-2014	Johanson Co-integration	Strong positive association found among human capital and economic growth.
10	Rehman (2016)	Pakistan	1970-2012	Vector error correction model (VECM)	The interaction term of HC with FDI negatively affected the growth rate.
11	Bahar (2015)	India	1980-2015	OLS Regression	Confirmed a positive and significant impact of human capital on the economic growth of India.
12	Agbola (2013)	Ghana	1965-2008	Fully Modified ordinary least square (FMOLS)	Human capital enhances the impact of foreign capital in the form of remittances and foreign direct investment.
13	Pesaran et al., (1995)	Pakistan	1984-2012	ARDL	human capital and governance as key determinants of capital inflow in the form of foreign direct investment.