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RESEARCH PAPER

Impact of Gender Specific Human Capital on Economic Growth: The Role of Financial Development

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ABSTRACT

This study examines the impact of gender-specific human capital on economic growth and explores how this impact depends on the level of financial development. There is considerable debate about the contribution of gender-specific human capital to substantial economic growth. This study utilized panel data from 57 countries spanning the period of 1980 to 2020 and employed pooled OLS and fixed effect techniques for empirical analysis. The results indicate that both male and female human capital exert a significant and positive impact on economic growth. Furthermore, the findings reveal that financial development undermines the positive impact of male and female human capital on economic growth, suggesting substitutability between human capital and financial development. Based on these findings, this study proposes that policymakers focus on controlling excess money supply to enhance the effectiveness of financial development.

KEYWORDS: Economic Growth, Financial Development, Human Capital

Introduction

Human capital stands as a key factor driving global economic growth. The critical elements of health and education emerge as key contributors to the development of human capital, thereby elevating living standards and individual well-being worldwide. Becker (1962) laid the foundation for the standard theory of human capital and economic growth, asserting that investments in education and training translate into future productivity rather than resource misallocation. Education, identified as a crucial tool, enhances human capital levels, acting as a principal driver for economic growth (Temple, 1999; Bils and Klenow, 2000). Gender-based disparities in human capital negatively impact societal well-being (Dollar and Gatti, 1999; King et al., 2008). However, Bradshaw et al. (2013) argue that gender equality promotes economic growth, cautioning that economic growth does not necessarily ensure gender equality.

Human capital, encompassing the skills, knowledge, and health of individuals, is a key driver of productivity and innovation. Both men and women contribute significantly to the pool of human capital, and ensuring equitable access to education, healthcare, and opportunities for both genders enhances the overall skill set of the workforce (King et al., 2008). Gender inclusivity in the labor market not only promotes social justice but also taps into the full potential of the population. Financial development, including access to credit, efficient banking systems, and robust capital markets, complements human capital by facilitating the efficient allocation of resources. When both men and women have equal access to financial services, they can participate more actively in economic activities, entrepreneurship, and investment. This inclusivity not only empowers individuals but also contributes to a more dynamic and resilient economy (Bogari, 2019).

In the late nineteenth and early twentieth centuries, considerable attention was devoted to revealing the relationship between finance and growth. This research originates from Schumpeter's notion, succinctly summarized as a well-functioning financial system that stimulates technological innovation by providing entrepreneurs with more opportunities to establish businesses and produce goods and services through the adoption of new technologies. Building on Schumpeter's idea, Levine (1997) and Bogari (2019) unveiled results indicating robust relationships between financial development and economic growth.

Numerous studies have delved into the impact of human capital on growth, exploring how gender-differentiated human capital, cultivated through education, propels the production of goods and services and consequently fuels economic growth (Alaoui, 2016; Sehrawat and Giri, 2017; Karaalp-Orhan, 2018). Despite these efforts, a debate persists regarding the relationship between gender-differentiated human capital and economic growth. Existing studies yield varied results, showcasing positive, negative, or ambiguous connections. This controversy underscores the absence of a direct relationship between these variables, prompting a call for consideration of other inconspicuous factors that may play an intermediary role in shaping their complex relationship.

Extensive literature has explored the individual impacts of human capital and financial development on economic growth and concluded that well-developed human capital and an efficient financial system contribute to societal prosperity by enhancing economic growth (Levine, 1997; Evans et al., 2000). However, to the best of our knowledge, no study has focused on the combined effects of gender-specific human capital and financial development on economic growth. Therefore, we explore the impact of gender-specific human capital on economic growth, specifically delving into the role of financial development. The motivation for this comprehensive analysis stems from recognizing economic growth as a crucial asset, with gender-specific human capital serving as a vital support system in diverse economies (Tembon and Fort, 2008).

Literature Review

Human Capital and Economic Growth

A vast body of empirical research investigates the impact of gender-specific human capital on economic growth. Within this literature, various studies present positive, negative, and insignificant effects of gender-specific human capital on growth. Among the positive impact studies, Asghar et al. (2012) examined the interrelation between human capital and economic recovery in Pakistan from 1974 to 2009. Their findings revealed a direct and significant relationship between education levels and economic sustainability, even in the context of Pakistan's lower GDP spending on the education sector. Eigbiremolen and Anaduaka (2014) utilized the theoretical structure of the Solow growth model and concluded that human capital is significantly and directly proportional to growth performance. A similar conclusion was drawn by Anyanwu et al. (2015), who employed endogenous growth theory, revealing a positive but insignificant link between human capital and economic growth. Alatas and Cakir (2016) suggested that human capital stock brings about direct and indirect changes in the economy, affecting growth through technological innovation domestically and indirectly through the acquisition of new technology from other countries.

Further supporting positive relationship, Aghaei et al. (2023) investigated Iran's provinces and found a positive influence of the human capital index on economic growth, with a greater impact in developed provinces. Sehrawat and Giri (2017) conducted research on the female human capital-growth nexus, concluding that economic performance is significantly and directly influenced by female human capital in both the

short and long run. Conversely, male human capital was found to have a positive but insignificant impact on economic growth. Tembon and Fort (2008) emphasized the powerful poverty-reducing synergies of female education, citing its positive correlation with increased economic productivity, robust labor markets, higher earnings, and improved societal health and well-being.

In contrast, some studies reported negative effects of human capital on economic growth. In this vein, Abugamea (2017) found a negative connection between school enrollment and economic growth in Palestine due to a weak economic system and lower labor productivity. Sajo (2017) raveled a negative correlation between education levels and economic growth, attributing it to insufficient government spending on the education sector. Moreover, Karambakuwa et al. (2019) highlighted a fragile relationship between human capital and economic development. They used interactive variables, including government spending, foreign direct investment, and urbanization, to explain the association between human capital and growth. Their results indicated a positive human capital-growth relationship with urbanization, while foreign direct investment contributed an insignificant effect, and government spending showed a negative relationship due to corruption and ineffective fiscal policies. Furthermore, Alaoui (2016) demonstrated in his research that female tertiary education positively influences economic growth, enhancing the quality of institutions and reducing gender discrimination. However, female secondary and primary educations were found to negatively impact the growth rate. Karaalp-Orhan (2018) revealed a negative correlation between female human capital and growth rate, attributing it to the underutilization of educated women's skills and abilities due to gender-specific occupational divisions.

In a different perspective, some scholars claim that improvements in gender-specific human capital insignificantly influence economic growth. Barro (2001) found that male primary education has an insignificant impact on growth, while female primary education indirectly enhances growth through a decline in fertility rate. At secondary and higher levels, male education significantly stimulates the growth rate through the adoption of new technology, whereas female education is insignificantly related to the growth rate due to the underutilization of female productivity in the labor market. The study by Ali (2017) concluded that female secondary enrollment has a positive but insignificant impact on the growth rate. Results also revealed bilateral bonding in the long run, while a unidirectional bonding exists in the short run from GDP to female secondary education.

Financial Development and Human Capital

Previous research provides evidence of positive, negative, and vigorous relationships among human capital and financial expansion. For example, Nik et al. (2013) examined that cash flows, considered as an indicator of financial development, have a negative association with human capital because it leads to inflation. Credit provided to the banking sector also has an adverse impact on human capital, as the banking system in Iran is often governed by the government, leading to non-development projects that negatively affect human capital development. In contrast, Satrovic, E. (2017) argued that human capital is anticipated to positively influence financial development, lessening asymmetric information and bolstering the demand for financial instruments and services.

Literature also demonstrates the linkages between financial progress and human capital, as Aluko et al. (2020) support the feedback hypothesis, reflecting that both financial progress and real sector growth have two-way relations. On the other hand, Opoku et al. (2019) utilized the frequency-domain spectral causality method, finding correlation among financial development and growth for short run, intermediate, and long run time periods during 1980 to 2016. They largely supported the neutrality

hypothesis and concluded that both financial development and growth rate were independent of each other.

Financial Development, Human Capital and Economic Growth

A bulk of studies focuses on exploring the impact of human capital and financial development on the growth rate (Kargbo et al., 2016; Ozcan, 2018). Some studies explore the finance-growth impact on human capital (Akhmat et al., 2014; Sehrawat and Giri, 2017). Additionally, a number of researchers use human capital as an interactive variable for exploring the finance-growth association (Abubakar et al., 2015; Ibrahim and Alagidede, 2018). In this vein, Ozcan (2018) pursues the unilateral association between tertiary education as a measure of human capital and financial development, asserting that educated students contribute to a strong financial system. The study also found a positive and significant interconnection between human capital and economic growth. In contrast, Akhmat et al. (2014) suggested that domestic credit provided to the economy, domestic credit given to the private sector, and broad money supply have a strong relationship with the level of human capital, while liabilities deposited in banks have a fragile relation with human capital. The results also demonstrated a significant association of economic growth with human capital due to the lower level of human capital in SAARC countries. Sehrawat and Giri (2017) found a unidirectional association in financial development with human capital.

Moreover, Abubakar et al. (2015) disclosed results indicating that financial sector development encourages economic performance in the ECOWAS region directly and indirectly through its impact on human capital. The empirical findings showed that access to credit for individuals through the domestic private sector and for enterprises through the private sector leads to effective financial and economic growth. Furthermore, the work of Ibrahim and Alagidede (2018) showed that a well-developed financial system encourages the growth rate through well-built human capital. Sound human capital leads to new innovation and improvements in technology, enriching financial mediation and fostering economic performance.

Hence, this research intends to cover the existing gap by presenting new dimensions regarding the impact of gender-specific human capital on the economic growth of a panel of 57 countries through the channel of financial development. Studying a vast literature, we have concluded that these studies have not emphasized their combined effect on growth. Thus, we weigh the relationship of gender-differentiated human capital and financial development over economic growth.

Material and Methods

The neoclassical growth modeling, pioneered by Solow (1956) explained economic growth in the United States by employing the neoclassical production function. Solow's model assumed that economies, facing constant returns to scale and diminishing returns to investment, would move towards a steady-state growth track given a specific magnitude of population growth and saving. According to Solow, this framework could be extended to differentiate the income levels of various countries. However, less attention has been given to exposing the empirical view for convergence, and the existence of numerous unidentified 'residual' elements in the function poses a significant challenge to these models.

The endogenous growth model, initiated by Romer (1986) and Lucas (1988), revitalized economic growth analysis. Romer introduced human capital as a crucial factor for growth. The fundamental assumption of the endogenous growth model is that an increase in both health and physical capital promotes new technology, leading to increasing returns to scale and mitigating the diminishing returns of capital, thus

fostering economic growth. An advantage of the endogenous growth framework is its ability to illustrate income divergence among different regions and countries. The model also addresses the residual factor in Solow's framework analysis. Various authors, including Barro (2000) and Barro and Sala-i-Martin (2003), made 'growth accounting' efforts using the Solow growth framework. Another distinctive feature of the endogenous growth model is the incorporation of different variables into the economic structure. Several studies have focused on 'conditional' convergence, where convergence depends on various institutions, including financial development, human capital, and an effective policy environment. Most empirical research has emphasized the role of institutions in shaping and implementing a robust economic policy system (Sachs and Warner, 1995; Barro, 2000). Similarly, we will revisit the role of gender-specific human capital in the level of growth by investigating the impact of financial development through panel data analysis.

So we adopt 'growth accounting approach' where we take economic growth to measure economic performance while we use financial development and gender specific human capital as input factors in the production function. We build up our model on the basis of endogenous growth theory. We began with revisiting the gender specific human capital and economic growth by adopting the Cobb-Douglas production function inspirit of Cooray et al., (2014). This type of production function is used for clearing up the production possibility set of different countries and it has constant returns to scale.

$$Y_{it} = A_{io} e^{(\varphi_1 MHC_{it} + \varphi_2 FHC_{it} + \phi_{it} z_{it})} k_{it}^{\alpha} \quad (1)$$

Where y represents output per unit of labor or Y/L while k represents capital per worker or K/L. Now by taking natural logarithmic transformation of equation (1), we get our baseline model.

$$GRW_{it} = \beta_o + \beta_1 FHC_{it} + \beta_2 MHC_{it} + \beta_3 k_{it} + \beta' Z_{it} + \mu_i + \rho_t + \varepsilon_{it} \quad (2)$$

In order to strengthen the gender-specific human capital growth relationship we look over financial development role in our model. So we augment model (2) with financial development by followed Kargbo et al., (2016).

$$GRW_{it} = \beta_o + \beta_1 FHC_{it} + \beta_2 MHC_{it} + \beta_3 FD_{it} + \beta_4 k_{it} + \beta' Z_{it} + \mu_i + \rho_t + \varepsilon_{it} \quad (3)$$

Some studies have explored the role of financial development in examining the connection between human capital and growth (Kargbo et al., 2016). Therefore, we enhance our model (3) by incorporating interaction terms of human capital and financial development. A well-developed financial system facilitates the accumulation of skills for both males and females, thereby fostering gender-specific human capital, which, in turn, collectively influences economic growth.

$$GRW_{it} = \beta_o + \beta_1 FHC_{it} + \beta_2 MHC_{it} + \beta_3 FD_{it} + \beta_4 k_{it} + \beta_5 (FHC_{it} * FD_{it}) + \beta_6 (MHC_{it} * FD_{it}) + \beta' Z_{it} + \mu_i + \rho_t + \varepsilon_{it} \quad (4)$$

We separately observing the impact of male and female human capital on level of economic growth with the transmission network of financial development for significance results, so we got two model which takes the following form:

$$GRW_{it} = \lambda_o + \lambda_1 FHC_{it} + \lambda_2 FD_{it} + \lambda_3 (FHC_{it} * FD_{it}) + \lambda_4 k_{it} + \lambda_5 POP_{it} + \lambda_6 TRA_{it} + \lambda_7 INF_{it} + \mu_i + \rho_t + \varepsilon_{it} \quad (5)$$

$$GRW_{it} = \Upsilon_o + \Upsilon_1 MHC_{it} + \Upsilon_2 FD_{it} + \Upsilon_3 (MHC_{it} * FD_{it}) + \Upsilon_4 k_{it} + \Upsilon_5 POP_{it} + \Upsilon_6 TRA_{it} + \Upsilon_7 INF_{it} + \mu_i + \rho_t + \varepsilon_{it} \quad (6)$$

In the above equations, we separately capture the impact of male and female education on the level of growth with the combination of financial development. Here GRW_{it} represents aggregate output growth for which we used GDP per capita growth (Cooray et al., 2014). GDP per capita growth is the growth rate of gross domestic product divided by the semiannual population. MHC_{it} represents the stock of male human capital which is captured by male secondary enrollment ratio and we used male secondary enrollment ratio as a proxy for this, while FHC_{it} represents the stock of female human capital which refers to female secondary enrollment ratio and we used proxy female secondary enrollment ratio for this. We captured the significant impact of FD_{it} through broad money supply which reflects the overall financial depth (Akhmat et al., 2014). It includes narrow money along with other liquid assets used for buying goods and services in the economy. For example, currencies, bank deposits, check deposits etc. as the % of GDP. k_{it} represents the stock of physical capital per unit of labor which is determined by gross capital formation as percentage of GDP. It is the investment, includes expenditures in addition to fixed belonging to the economy and net change in the inventories measures as a share of % of GDP. POP_{it} reflects the rate of population growth. Trade is the sum of imports plus exports of goods and services in the country (% of GDP). Trade openness (TRA_{it}) revealed the impact of trade as the percentage of GDP. Inflation is captured as a consequence of macroeconomic policies. For inflation rate (INF_{it}), we used the consumer price index for ith country in the time period t. μ_{it} reflects country fixed effect; ρ_{it} represents time fixed effect while ε_{it} shows all other effects in this model.

We further explore the marginal effect of female human capital on economic growth, which is estimated by taking the partial differential of equation (5) at different level of financial development with respect to female human capital as follow:

$$\frac{\partial \mathrm{GRW}_{it}}{\partial \mathrm{FHC}_{it}} = \lambda_1 + \lambda_3 FD_{it} \quad (7)$$

If $\lambda_3 > 0$, financial development complement or strengthen the female human capital-growth association.

If $\lambda_3 < 0$, financial development substitutes or weakens the female human capital-growth association.

Similarly, we take the partial derivative of equation (6) with respect to male human capital to explore the role of financial development on male human capital growth- relationship, as follow:

$$\frac{\partial GRW_{it}}{\partial MHC_{it}} = \Upsilon_1 + \Upsilon_3 FD_{it} \quad (8)$$

If $\Upsilon_3 > 0$, financial development strengthens or complements the male human capital-growth association.

If $\Upsilon_3 < 0$, financial development weakens or substitutes the male human capital- growth association.

To achieve the objective of how financial development treats the gender-specific human capital-growth relationship, this study uses the pooled OLS, fixed effect (FE) and random effect (RE) models. The Hausman test helps choose between using FE or RE in a study. It indicates that if there's no correlation between the error term and regressors, both FE and RE techniques are suitable. However, if the test shows correlation between

the error term and any regressors, RE might produce unreliable outcomes, making FE more suitable for the study.

Data and Variables

For empirical analysis of the above models, we utilize panel data from 57 countries spanning the period of 1980 to 2020. We primarily concentrate on the 57 countries based on the data availability within the specified timeframe. In addition, all variables are sourced from World Development Indicators (World Bank, 2021) except gender-differentiated human capital that is collected from Barro and Lee (2015). The details of variables and data sources are presented in Table 1.

Table 1
Variable Description and Data Source

Category	Variable	Definition	Expected sign	Data sources
Dependent Variable	Growth	GDP per capita growth (annual %)	N/A	WDI
Independent Variables	Human Capital	(i) Female human capital refers to female secondary enrollment ratio. (ii) Male human capital is captured by male secondary enrollment ratio.	(+/-) (+/-)	Barro and Lee (2015)
	Financial Development	Proxy of broad money supply is used. It includes narrow money along with other liquid assets used for buying goods and services in the economy. For example, currency, bank deposits, check deposits etc. (% of GDP).	(+/-)	WDI
Control Variables	Initial	Initial income is the lag of GDP per Capita.	(+)	WDI
	Physical Capital	Gross capital formation (% of GDP)	(+)	WDI
	Population	Population growth (annual %)	(-)	WDI
	Inflation	Consumer price index (CPI).	(-)	WDI
	Trade	Trade (% of GDP)	(+)	WDI

Results and Discussion

In Table 2, descriptive statistics, including the mean, minimum, maximum, and standard deviation, provide an overview of the data for each variable. The output results indicate that some variables are clustered around their minimum values, except for GDP per capita growth. The mean of the initial variable (8.287) is closer to its minimum value (5.754). Additionally, the mean of female human capital (2.311) is closer to its minimum value (0.041) than its maximum value (5.903). The mean of male human capital is 2.573, which is closer to its minimum value (0.172) than its maximum (6.039). Furthermore, the mean of broad money supply (55.251) is closer to its minimum (7.029) than its maximum value (253.947), and the mean of gross capital formation (24.159) is closer to its minimum value (5.231) than its maximum (71.281). The mean of the population growth rate is 2.001, which is closer to its minimum (0.206) than its maximum value (12.449). Moreover, the mean of trade openness is 63.698, closer to the minimum (12.354) than the maximum value (209.694). The mean of the consumer price index (72.573) is also nearer to its minimum value (9.57e-09) than its maximum (396.803).

The Table 2 also reveals that some variables have low values, while others exhibit high variance. Among all variables, the population growth rate has a low level of standard deviation (1.202), while the consumer price index has a high level of standard deviation (47.472).

Table 2
Summary Statistics

VARIABLES	N	MEAN	S.D	MIN	MAX
GRW	447	1.478	2.718	-15.149	10.944
INIT	445	8.287	1.437	5.754	11.622
FHC	424	2.311	1.455	0.041	5.903
MHC	424	2.573	1.299	0.172	6.039
FD	449	55.251	39.572	7.029	253.947
K	449	24.159	7.140	5.231	71.281
TRA	456	2.001	1.202	-0.206	12.449
POP	449	63.698	33.519	12.354	209.694
INF	446	72.573	47.472	9.57e-09	396.803

Source: Author's own calculation.

In Table 3, correlation matrix analyzes the expected correlation among dependent and explanatory variables. It reveals that female human capital, male human capital, broad money supply, gross capital formation and consumer price index are positive while population growth rate and trade openness have negative relationship with GDP per capita growth.

Table 3
Correlation Matrix

VRL	GRW	INIT	HCF	HCM	FD	K	POP	TRA	INF
GRW	1.000	-	-	-	-	-	-	-	-
INIT	-0.111	1.000	-	-	-	-	-	-	-
HCF	0.042	0.786	1.000	-	-	-	-	-	-
HCM	0.060	0.704	0.946	1.000	-	-	-	-	-
FD	0.152	0.507	0.569	0.592	1.000	-	-	-	-
K	0.327	0.146	0.164	0.152	0.330	1.000	-	-	-
POP	-0.379	-0.356	-0.452	-0.441	-0.375	-0.108	1.000	-	-
TRA	-0.018	0.194	0.159	0.096	0.189	0.222	0.199	1.000	-
INF	0.024	0.194	0.422	0.417	0.308	0.135	-0.195	0.091	1.000

Source: researcher's own calculation.

Results of pooled regression and fixed-effect models are displayed in Tables 4, 5, 6 and 7. All models exhibit similar effects, but there is a difference in the magnitude of all coefficients. Both tables indicate that female human capital and male human capital are statistically significant and positively affect growth at a 1 percent significance level in all columns. The estimated outcomes suggest that gender-specific human capital plays a crucial role in expanding the growth rate.

The significance of gender-specific human capital indicates that an increase in female education lowers the fertility rate and child mortality rate but enhances the education of the next generation, thereby boosting economic performance. In contrast, male education contributes to the creation of skilled labor in the economy and the adoption of new technologies, uplifting marginal productivity and economic growth. These results align with the research of King et al. (2008), Barro (2001), Alaoui (2016), and Karaalp-Orhan (2018).

The coefficient of financial development holds statistical significance and has a direct impact on economic growth. The rationale behind this concept is that an increase in money supply means more money in the hands of the common people, along with a decrease in the price of borrowing money (interest rate), which stimulates investment. This fluctuation spurs the growth rate (Robert, 2004; Dingela and Khobai, 2017; Doan Van, 2020).

Table 4
Female Human Capital, Financial Development and Economic Growth Using Pooled Regression

	(1)	(2)	(3)	(4)
Variables	**Baseline**	**(FHC+FD)**	**(FHC+FD+Control)**	**(FHC+FD+Control+ Interaction)**
INIT	-1.021***	-1.046***	-1.002***	-1.061***
	(0.000)	(0.000)	(0.000)	(0.000)
FHC	0.611***	0.511***	0.308*	0.731***
	(0.000)	(0.002)	(0.084)	(0.002)
FD	-	0.009**	-0.000	0.023***
		(0.060)	(0.926)	(0.017)
FHC*FD	-	-	-	-0.006***
				(0.005)
K	-	-	0.125***	0.105***
			(0.000)	(0.000)
POP	-	-	-1.092***	-1.031***
			(0.000)	(0.000)
TRA	-	-	0.008**	0.006
			(0.089)	(0.183)
INF	-	-	-0.005**	-0.007***
			(0.041)	(0.010)
Obs.	413	408	398	398
Countries	53	53	53	53
Wald-test	26.11***	30.19***	147.89***	158.75***
(P-value)	(0.000)	(0.000)	(0.000)	(0.000)
R-square	0.065	0.057	0.238	0.252

Note: Dependent variable is growth, FHC is female human capital, FD is financial development, K is physical capital, POP is used for population growth rate, TRA is trade openness, INF is inflation rate. In parentheses p-value is given, *,**,*** suggest level of significance respectively, 10%, 5% and 1% level.

Table 5
Male Human Capital, Financial Development and Economic Growth using Pooled Regression

	(1)	(2)	(3)	(4)
Variables	**Baseline**	**(MHC+FD)**	**(MHC+FD+ Control)**	**(MHC+FD+Control+ Interaction)**
INIT	-0.877***	-0.926***	-0.912***	-0.922***
	(0.000)	(0.000)	(0.000)	(0.000)
MHC	0.558***	0.449***	0.232	0.565***
	(0.000)	(0.010)	(0.196)	(0.015)
FD	-	0.010**	-0.000	0.021**
		(0.054)	(0.924)	(0.050)
MHC*FD	-	-	-	-0.006**
				(0.026)
K	-	-	0.124***	0.109***

			(0.000)	(0.000)
POP	-	-	-1.106***	-1.062***
			(0.000)	(0.000)
TRA	-	-	0.008**	0.007
			(0.072)	(0.120)
INF	-	-	-0.005**	-0.005***
			(0.073)	(0.034)
Obs.	413	408	398	398
Countries	53	53	53	53
Wald-test	22.60***	27.13***	146.04***	152.74***
(P-value)	(0.000)	(0.000)	(0.000)	(0.000)
R-square	0.059	0.054	0.235	0.243

Note: See table 4 for details on the significance level and descriptions of the variables.

Regarding the interaction of gender-differentiated human capital and financial development, all the tables demonstrated that their combination brings significant and negative effects on growth for the reason that if money supply increases in the economy, it results in inflation which lowers the purchasing power of common people. So they pay less attention on male and female secondary education which ultimately slows the economic growth. Thus, we can say that financial development weakens or substitutes gender-separated human capital-growth nexus.

Table 6
Female Human Capital, Financial Development and Economic Growth: Fixed Effect Regression

Variables	**(1)**	**(2)**	**(3)**	**(4)**
	Baseline	**(FHC+FD)**	**(FHC+FD+ Control)**	**(FHC+FD+Control+ Interaction)**
INIT	-3.279***	-3.744***	-4.576***	-4.738***
	(0.000)	(0.000)	(0.000)	(0.000)
FHC	0.897***	0.791***	0.459***	1.019***
	(0.000)	(0.002)	(0.014)	(0.002)
FD	-	0.017*	0.008	0.036***
		(0.060)	(0.323)	(0.017)
FHC*FD	-	-	-	-0.007***
				(0.005)
K	-	-	0.125***	0.104***
			(0.000)	(0.000)
POP	-	-	-1.014***	-0.947***
			(0.000)	(0.000)
TRA	-	-	0.015**	0.015
			(0.053)	(0.183)
INF	-	-	0.004	0.001***
			(0.202)	(0.010)
Obs.	413	408	398	398
Countries	53	53	53	53
F-stat	25.35***	30.19***	24.62***	23.00***
(P-value)	(0.000)	(0.000)	(0.000)	(0.000)
R-square	0.124	0.057	0.338	0.353
Hausman test			60.33***	64.80***
			(0.000)	(0.000)

Note: See table 4 for details on the significance level and descriptions of the variables. The Hauseman test indicates that the fixed model is better suited for this study.

In relation to the set of control variables, the estimated results indicate that gross capital formation and trade openness exert a positive and significant impact on growth. As suggested by several scholars (Romer, 1990; Grossman and Helpman, 1991; Khalid, 2016; Zahonogo, 2016), trade openness facilitates specialization and technological innovation in the economy. This, in turn, enables a country to shift its focus from limited resources to more effective and efficient sectors, leading to improvements in productivity, increased employment, poverty reduction, price stability, enhanced purchasing power, higher consumption, and, consequently, the fostering of economic growth.

While the coefficient of the population growth rate has a significant and inverse impact on economic growth. This is due to the fact that a higher population tends to result in increased consumption and decreased savings among the general populace. As a consequence, per capita income declines because individuals need to support more children. Consequently, this leads to a slowdown in investments, a rise in the unemployment rate, and ultimately, a deceleration in the overall growth rate.

Table 7
Male Human Capital, Financial Development and Economic Growth using Fixed Effect Regression

	(1)	(2)	(3)	(4)
Variables	**Baseline**	**(MHC+FD)**	**(MHC+FD+ Control)**	**(MHC+FD+Control+ Interaction)**
INIT	-3.040***	-3.609***	-4.495***	-4.552***
	(0.000)	(0.000)	(0.000)	(0.000)
MHC	0.859***	0.759***	0.379*	0.795***
	(0.000)	(0.000)	(0.106)	(0.010)
FD	-	0.018**	-0.009	0.033***
		(0.024)	(0.272)	(0.019)
MHC*FD	-	-	-	-0.006**
				(0.035)
K	-	-	0.124***	0.109***
			(0.000)	(0.000)
POP	-	-	-1.021***	-0.973***
			(0.000)	(0.000)
TRA	-	-	0.015**	0.016**
			(0.052)	(0.044)
INF	-	-	-0.005*	0.003*
			(0.102)	(0.264)
Obs.	413	408	398	398
Countries	53	53	53	53
F-stat	22.48***	17.36***	24.28***	22.02***
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)
R-square	0.112	0.129	0.335	0.343
Hausman test			61.61***	61.44***
			(0.000)	(0.000)

Note: See table 4 for details on the significance level and descriptions of the variables. The Hauseman test indicates that the fixed model is better suited for this study.

Inflation rate also has a negative effect at 10 percent level of significance, as it erodes the purchasing power and promotes the consumption which results in a falling down of saving and investment and raises unemployment rate consequently slower the growth rate.

Table 8
Interactive Effect of Female Human Capital and Financial Development on Growth

Variables	POLS	FEM	REM
INIT	-1.061***	-4.738***	-1.061***
	(0.000)	(0.000)	(0.000)
FHC	0.731***	1.019***	0.731***
	(0.002)	(0.002)	(0.002)
FD	0.023***	0.036***	0.023***
	(0.017)	(0.017)	(0.017)
FHC*FD	-0.006***	-0.007***	-0.006***
	(0.005)	(0.005)	(0.005)
K	0.105***	0.104***	0.105***
	(0.000)	(0.000)	(0.000)
POP	-1.031***	-0.947***	-1.031***
	(0.000)	(0.000)	(0.000)
TRA	0.006	0.015	0.006
	(0.183)	(0.183)	(0.183)
INF	-0.007***	0.001***	-0.007***
	(0.010)	(0.010)	(0.010)
Obs.	398	398	398
Countries	53	53	53
F-stat	158.75***	23.00***	158.75***
(P-value)	(0.000)	(0.000)	(0.000)
R-square	0.252	0.353	0.252
Hausman test		64.80***	
		(0.000)	

Note: See table 4 for details on the significance level and descriptions of the variables. POLS shows pooled regression results, FEM shows fixed effect results while REM reflects random effect outcomes. The Hauseman test indicates that the fixed effect model is better suited for this study.

Despite the overall similarity between the results derived from the fixed-effect model and those from the pooled regression, a noteworthy distinction arises in column 4 of tables 8 and 9, where a positive relationship is observed between inflation and economic growth. As argued by Sidrauski (1967), at the level of steady state (or long-run) equilibrium, the growth of output is zero. Therefore, an increase in inflation carries an insignificant or neutral impact on the output level, a perspective also supported by Faria and Carneiro (2001). Tobin (1965) claimed that an increase in inflation brings about a positive change in output because, if inflation increases less than the nominal interest rate, people hold less in cash and more in other assets. This shift encourages increased investment, production, and economic growth.

Table 9
Interactive Effect of Male Human Capital and Financial Development on Growth.

Variables	POLS	FEM	REM
INIT	-0.922***	-4.552***	-0.922***
	(0.000)	(0.000)	(0.000)
MHC	0.565***	0.795***	0.565***
	(0.015)	(0.010)	(0.015)
FD	0.021**	0.033***	0.021**
	(0.050)	(0.019)	(0.050)

MHC*FD	-0.006**	-0.006**	-0.006**
	(0.026)	(0.035)	(0.026)
K	0.109***	0.109***	0.109***
	(0.000)	(0.000)	(0.000)
POP	-1.062***	-0.973***	-1.062***
	(0.000)	(0.000)	(0.000)
TRA	0.007	0.016**	0.007
	(0.120)	(0.044)	(0.120)
INF	-0.005***	0.003*	-0.005***
	(0.034)	(0.264)	(0.034)
Obs.	398	398	398
Countries	53	53	53
F-stat	152.74***	22.02***	152.74***
(p-value)	(0.000)	(0.000)	(0.000)
R-square	0.243	0.343	0.243
Hausman test		61.44***	
		(0.000)	

Note: See table 4 for details on the significance level and descriptions of the variables. POLS shows pooled regression results, FEM shows fixed effect results while REM reflects random effect outcomes. The Hauseman test indicates that the fixed model is better suited for this study.

The regression analysis using POLS, FEM and REM indicated a clear, positive relationship between gender-differentiated human capital and growth and confirmed the endogenous growth theory. Additionally, it highlighted that financial development exerts a positive and statistically significant impact on growth rate. To find the collective influence of variables using percentile analysis, with respect to female and male in table 10 and 11 is built.

Marginal impacts of female and male human capital on economic growth in the presence of financial development are presented in Table 10 and 11.

Table 10
Conditional Analysis of Financial Development on Female Human Capital-Growth Nexus

Percentiles	POLS	FEM	REM
P25=26.862	0.566***	0.825***	0.566***
	(0.004)	(0.001)	(0.004)
P50=44.684	0.456***	0.696***	0.456***
	(0.013)	(0.003)	(0.013)
P75=72.067	0.287	0.498**	0.287
	(0.103)	(0.025)	(0.103)

Note: POLS, FEM and REM represent pooled regression, fixed and random effect models respectively. P25 is 25th percentile, P50 represents 50th percentile whereas, P75 is 75th percentile. Additionally, *,**,*** depicts 10, 5 and 1% levels of significance respectively.

All three models in table 10 expose that, at a low level of financial development, secondary education of females brings positive and statistically significant effects on growth. In contrast, at a high level of financial development, secondary education brought an insignificant effect on growth (in POLS and REM) while the fixed effect model reflects the significant effect of secondary education on growth.

Table 11
Conditional Analysis of Financial Development on Male Human Capital Growth Nexus

Percentiles	POLS	FEM	REM

P25=26.862	0.414**	0.629***	0.414**
	(0.034)	(0.016)	(0.034)
P50=44.684	0.315*	0.519**	0.315*
	(0.083)	(0.032)	(0.083)
P75=72.067	0.162	0.350	0.162
	(0.371)	(0.134)	(0.371)

Note: See table 4 for details on the regression models, percentile description and the significance level.

Marginal impacts in table 11 demonstrates that low percentile of financial development brings positive and significant effect of male secondary qualification on growth at 1, 5 and 10 percent level. In contrast, this impact becomes insignificant for high percentiles of financial development.

Conclusion

Human capital stands as a pivotal factor driving global economic growth. The critical elements of health and education emerge as key contributors to the development of human capital, thereby elevating living standards and individual well-being worldwide. The objective of this study is to examine the impact of gender-specific human capital on economic growth and explores how this impact depends on the level of financial development. The study utilized panel data from 57 countries spanning the period of 1980 to 2020 and employed pooled OLS and fixed effect techniques for empirical analysis. Additionally, percentile analysis is utilized to capture the marginal impact of the interaction term.

Our findings from both the pooled and fixed-effect models indicate that gender-specific human capital has a positive and statistically significant impact on economic growth. This implies that the development of gender-specific human capital contributes positively to overall economic performance. As the educational levels of women increase, there is a simultaneous decrease in both fertility and child mortality rates. Moreover, this improvement in female education positively affects the education of future generations, thereby enhancing economic performance. Conversely, male education is found to contribute significantly to the formation of a skilled labor force within the economy. Furthermore, it is associated with the adoption of new technologies, leading to an increase in marginal productivity and fostering economic growth. These results underscore the importance of addressing gender-specific human capital development as a key driver of economic growth. Furthermore, the findings reveal that financial development undermines the positive impact of male and female human capital on economic growth, suggesting a substitutability between male and female human capital and financial development.

Policy Recommendations

To optimize economic growth, policymakers should prioritize investments in gender-specific human capital development. Our research demonstrates a positive and statistically significant impact of both female and male education on economic performance. Enhancing female education correlates with decreased fertility and child mortality rates, benefiting future generations. Meanwhile, male education contributes to a skilled labor force and technological adoption, fostering productivity and growth. It is crucial to recognize the potential trade-off between gender-specific human capital development and financial development. Therefore, policies should focus on balancing these factors, emphasizing inclusive education and skill-building initiatives to unlock the full economic potential of both genders.

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