Does Human Capital Reinvigorate the Relationship Between Financial Development and Economic Growth: Evidence from Pakistan

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Abstract

This study examines the threshold level of human capital necessary for the finance-growth nexus in Pakistan. For a deeper understanding of the finance-growth relationship, we have disaggregated financial development into financial institution development and financial market development. To achieve this, we have employed the threshold regression model over the period from 1980 to 2018. The results of this study indicate that economic growth responds negatively to overall financial development when the level of human capital surpasses the threshold of 1.489. Similarly, when financial market development falls below the aforementioned threshold, its impact on economic growth is found negative. This suggests that financial market development does not contribute favorably to economic growth. However, the development of financial institutions contributes positively and significantly to economic growth when conditioned on the level of human capital. Among the other variables, physical capital, trade openness, and government expenditure exert a positive impact on economic growth. In contrast, the inflation rate has an insignificant impact on economic growth. The findings of this study suggest the need for further reforms in the financial sector policies in alignment with international best practices. These policies should also take into consideration the importance of redesigning and strengthening the human capital skills necessary to stimulate the finance-growth nexus.

Keywords: human capital; finance-growth nexus; threshold regression; Pakistan

JEL Classification: C21; C24; F43; O47; J24

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1. Introduction

Financial development is integrated with the policies, processes, practices, and strategies implemented by the financial industry to enhance the financial access, depth, and efficiency of financial institutions and financial markets. The theoretical and empirical literature suggests that a well-developed financial system enhances economic efficiency by channeling scarce resources towards the most efficient uses that ultimately become a source for sustainable economic growth (Slesman et al., 2019). Over the past few decades, the investigation of the impact of finance on economic growth has been at the center of most policy debates (See please, Ang and McKibbin, 2007; Seven and Yetkiner, 2016; Rahman et al., 2021). In this respect, Levine (2005) concluded that financial development can promote economic growth through the pooling of savings, ensuring risk reduction policies, and implementing risk management techniques. Further, financial development facilitates exchange activities by reducing transaction costs, and through information sharing about investment opportunities. It also improves capital allocation and increases investors' willingness to finance new projects through monitoring corporate governance.

The financial sector requires innovations and creative work for the adoption, implementation, and execution of policies. This sector also implements and executes many plausible reform measures. The designed policies are implemented through the services of the human capital force employed in the financial sector. Therefore, the well-educated, technically skilled, and creative labor force may execute and implement the policies and reform measures in a better way. In this respect, Baumol (2005) rightly argued that higher education can impede the heterodox approach and provoke creative thinking necessary for innovations and the execution of policies. Similarly, Abubakar, Kassim, and Yusoff (2015) and Dutta and Sobel (2018) considered human capital as a decisive and pivotal factor in the finance-growth relationship. Besides, new growth theories also considered human capital as the main engine for economic growth. While explaining the endogenous growth models, Romer (1986) and Lucas (1988) emphasized the role of human capital in achieving sustainable economic growth targets. The empirical literature (for example, King & Levine, 1993; Rahman et al., 2020a, Tariq et al., 2020) generally established that finance has a positive association with economic growth. Notwithstanding, Rioja and Valev (2014) argued that the outcome of the finance-growth relationship is dissimilar among nations. However, besides other factors, the most common justification for the divergent relationship between finance and growth may be the difference in the level of human capital. Therefore, human capital is considered a pivotal factor in the finance-growth literature. In this respect, many studies have investigated the linkages between financial development, human capital, and economic growth. For example, Kilic and Ozcan (2018) investigated the said relationship in 33 emerging market economies, while Saroj et al. (2023) investigated the aforementioned relationship in India over the period 1993 to 2019. Similarly, Sarwar et al. (2021) investigated 83 emerging economies over the period 2002 to 2017, whereas Nguyen (2022) investigated similar relationships for 25 transition economies. Likewise, Ali et al. (2021) investigated finance-growth and human capital relationships for 12 developing countries over the period

1980-2016. These studies generally provided valuable insights into the complex relationship between human capital, financial development, and economic growth in developing, emerging, and developed countries. In totality, these studies suggested that both human capital and financial development are important factors in promoting economic growth and these factors may interact in a complex way. Unfortunately, in these studies, the relationship between economic growth and financial development using human capital as a threshold variable is missing, and generally overlooked in the empirical literature. Therefore, to bridge the missing gap, we have investigated the finance-growth relationship using human capital as a threshold variable. It is necessary since there must be a specific level of human capital beyond which it upsurges the finance-growth relationship. Thus, in existing finance-growth literature this study makes an important contribution by highlighting the role of human capital in mediating the impact of financial development on economic growth. In this respect, Ibrahim (2018) argued that the sustainability of the economy depends on both physical and human capital but the investment in human capital is comparatively more important for the welfare of the economy. Secondly, in this study, we have endeavored to determine the threshold level of human capital in the finance-growth process while controlling for other variables. Therefore, the objective of this study is to fill the research gap in Pakistan by examining the effect of financial development on economic growth by exhausting human capital as a conditional variable. The findings of said relationship will have potentially important implications for the financial managers and regulators for devising prudent financial sector policies that may contribute to economic growth. While policy formulation, they may consider maintaining a sufficient level of human capital in achieving optimal economic growth targets. The government of Pakistan may increase domestic output by encouraging investors to invest and allocate resources towards the most productive projects. Thus, this study reignites the identification of the complementarity function of human capital in the finance-growth nexus. For this purpose, we have selected Pakistan as a case study. Why we have selected Pakistan? It is very important since Pakistan has successfully introduced financial and economic reform measures in the 1980s and 1990s. Although financial institutions and financial markets in Pakistan are working in a competitive environment. But despite all these efforts, the economic growth trend shows spurts and reversals (for further details, see Rahman & Khan, 2023). These spurts and reversals are either due to gaps in policy formulation or a due to lack in implementation and execution of policies, which is on the part of human capital deployed. Therefore, it is necessary to investigate whether the financial sector or human capital, or other macroeconomic factors are responsible for not achieving sustainable economic growth in Pakistan.

The rest of the paper is organized as section 2 reviews relevant literature on the finance-growth nexus and discusses the role of human capital in the aforementioned relationship. Section 3 deals with the model, data, and econometric methodology. Section 4 discusses empirical results, while section 5 recapitulates concluding remarks and transpires policy implications for devising prudent financial sector policies.

2. Literature Review

The academic discussion on the finance-growth nexus began when Schumpeter (1912) recognized the role of finance in the economic growth process. He argued that financial development positively contributes to economic growth through capital accumulation and technological innovations. Afterward, McKinnon (1973) and Shaw (1973) asserted the positive role of financial development in the economic growth process. Regarding the finance-growth nexus, Patrick (1966) proposed the "Stages of Development" hypothesis that reckons with supply-leading hypotheses and demand-following hypotheses. The supply-leading hypothesis states that financial development plays an important role in sustaining economic growth through the pooling of resources, risk management, and intermediary functions (Levine, 1998). This hypothesis was empirically tested by several researchers using the panel, cross-sectional, and time-series data and found mixed results (for example, Robinson, 1952; Romer, 1986; Lucas, 1988; Khan, Qayyum, & Sheikh, 2005; Ang & McKibbin, 2007; Rehman & Cheema, 2013; Khan et al., 2019; Rahman et al., 2020a). This empirical literature provides mixed delineation about the impact of financial development on economic growth. Few studies emphasized that financial institutions specifically the banking sector can improve or deteriorate the economic growth process depending on the type of bank credit extended (Arestis & Demetriades, 1997; Beck et al., 2012; Sassi & Gasmi, 2014; Rahman et al., 2020b). Particularly in this respect, Beck et al. (2012) argued that the positive impact of financial development on economic growth is mainly determined by enterprise credit rather than consumer credit.

In extending the financial sector services, the role of human capital is very important for the economic growth process. In simple words, human capital is the knowledge, skills, and abilities that people acquire through education, training, and experience. It is a key factor in the finance-growth process, as it allows people to become more productive and innovative. Earlier studies have found that human capital is a significant driver of economic growth and that countries with higher levels of human capital tend to have higher rates of economic growth. The Solow growth model (1956) argues that economic growth is driven by the accumulation of capital, it may be in the form of physical capital (such as machines and factories) or human capital. Similarly, the endogenous growth model also documents that economic growth is not just driven by the accumulation of capital, but also by technological progress. It is added that technological progress is often driven by human capital, as more educated workers are more likely to be able to innovate. Many empirical studies (for example, Barro and Sala-i-Martin, 1995; Mankiw, Romer, & Weil, 1992; Card, 1999) found that human capital is a key driver of economic growth. As a result, countries that invest in human capital by providing quality education and training are more likely to achieve sustained economic growth.

Notwithstanding, the relationship between financial development and economic growth is very complex. There are several factors that can affect the strength of this relationship. These variations in finance-growth outcomes mainly depend on the role played by human capital in the finance-growth expedition. Hence, the human capital role is important in the process of financial sector development

strategies.[1] However, most of the previous literature on financial development considered endogenous growth models while ignoring human capital as an important channel through which financial development can influence output. Following these thoughts, Outreville (1999) argued that well-educated people have better access to information and are most likely to behave risk-averse. Similarly, Kendall (2007) studied the effects of human capital on financial development. He found the negative effects of financial constraints that were reduced through human capital accumulation. Likewise, Oyinlola and Adedeji (2019) investigated Indian regions and found that human capital acts as a substitute for financial intermediation in the growth process and concluded complementary factors in promoting economic growth. Using the data from the Economic Community of West African States (ECOWAS), Abubakar et al. (2015) explored the joint effect of financial development and human capital on economic growth. They found that financial development behaves positively with economic growth in ECOWAS countries.

Many empirical researchers (few among others are, Pagano, 1993; Gregorio, 1996; Papagni, 2006; Ibrahim, 2015; Sethi et al., 2019) investigated the importance of human capital in the financial sector development. They examined the impact of liquidity constraints on human capital accumulation and concluded that borrowing constraints increase aggregate savings but reduce human capital accumulation and thus have negative effects on growth. Likewise, Evans et al. (2002) investigated 82 countries and suggested that both financial development and human capital are important contributors to economic growth. Similarly, Ibrahim (2015) found the interactive effect of human capital on financial development and economic growth in sub-Saharan African countries. The result shows the negative effect of human capital on economic growth. However, the joint effect of human capital and financial development on economic growth was found positive and statistically significant. Further, Sehrawat and Giri (2017) also found that both financial development and human capital contribute positively to the finance-growth nexus. They further observed that when financial development contributes to a low level of human capital, it reduces economic growth. Moreover, Sethi et al. (2019) showed that a higher level of financial development and higher scope of financial markets improves human capital. Furthermore, Zhou et al. (2018) and Oyinlola and Adedeji (2019) argued that human capital is an indispensable factor in enhancing the productivity of the economy and it works as an impetus in technological advancement and can affect the financial sector performance through spillover effects. The positive spillovers of financial openness mainly depend on the absorption capacity of the host country. To get these benefits, the host country must have to enhance the capacity of human capital for gaining productive use of advanced technology. Therefore, the employees of the financial sector must possess effective and efficient managerial skills to handle the technology and thereby enhance productivity. In this respect, Goldin (2016) rightly argued that human capital refers to intangible resources entrenched in the labor force that support enhancing productivity.

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[1] Human capital consists of the skills of people and knowledge which they acquire through consistent education, training and professional expertise.

From the above literature survey, we deduce that the majority of recent empirical work has predicted the finance-growth relationship by ignoring the role of human capital, especially in the case of Pakistan (for example, Naveed & Mahmood, 2019; Tariq et al., 2020; Rahman et al., 2021). Besides, the majority of existing studies (for example, Naveed & Mahmood, 2019) mainly used the linear econometric technique to predict the finance-growth relationship. However, Cuestas and Mourelle (2011) showed that using linear models to interpret non-linear relationships may lead to poor inferences. Since the financial sector of Pakistan adopted the financial sector reforms in the 1980s and 1990s, it is expected that economic growth does not respond monotonically in the pre-and post-reform periods (Rahman et al., 2021). Therefore, in this study, we have used the non-linear econometric technique instead of the linear econometric model. The reasons for using a non-linear model are: First, linear models assume that the relationship between two variables is linear. However, the effect of human capital and financial development on economic growth may not be linear. For example, the relationship may be U-shaped, meaning that there is an initial positive effect of financial development on economic growth, but after a certain point, the effect may become negative. Secondly, linear models are not able to capture the full complexity of the finance-growth nexus. The finance-growth nexus is a complex relationship that is affected by several factors, including the level of human capital. A linear model cannot take into account all of these factors, which can lead to inaccurate inferences. Lastly, linear models are not able to identify thresholds. The relationship between financial development and economic growth may be non-linear because there may be a certain level of thresholds. For example, there may be a certain level of human capital that is necessary for the positive effect of financial development on economic growth. A linear model will not be able to identify these thresholds, which can lead to inaccurate inferences. Lastly, after financial sector reforms, the finance-growth relationship in Pakistan becomes non-linear as concluded by Rahman et al. (2020a, 2021).

Thus, we conclude that the linear econometric technique will not provide robust results. Therefore, this study considers a non-linear aspect of the finance-growth nexus through the channel of human capital in Pakistan using the threshold modeling approach. The purpose of utilizing the threshold regression technique is to determine the threshold value of human capital which is sufficient to support and spur the finance growth relationship.

3. Data and Methodology

Several empirical studies highlighted that financial development affects economic growth through capital accumulation and technological innovations. Our modeling approach is based on endogenous growth theories proposed by Lucas (1988), Romer (1986), and Pagano (1993). Following Ang (2011) and Chong, Mody, and Sandoval (2017), we have considered the aggregate production function given in Equation (1):

$$Y_t = A_t K_t^{\alpha 1} L_t^{\alpha 2} e^{\varepsilon t} \qquad (1)$$

In Equation (1), Y_t is real GDP at time t and is proxied for economic growth, and we used this variable following Samargandi et al. (2015) and Rahman et al. (2020a). The A_t is total factor productivity (TFP) at time t, K_t is physical capital at time t and L_t is employed labor force at time t. The K_t measures domestic investment level by utilizing the information on gross fixed capital formation as a percentage of GDP. The α_1 and α_2 are production elasticities and are respectively for physical capital and employed labor force, while ε_t is the error term. The log-linear form of Equation (1) can be written as Equation (2):

$$LnY_t = LnA_t + \alpha_1 LnK_t + \alpha_2 LnL_t + \varepsilon_t \qquad (2)$$

We assume that the total factor of production (A_t) is determined by the financial sector development, inflation, government expenditure as a percentage of GDP, and trade openness. Following Anwar and Sun (2011), we specify TFP determinants as given in Equation (3):

$$LnA_t = \gamma_0 + \gamma_1 LnFD_t + \gamma_2 INF_t + \gamma_3 LnGEX_t + \gamma_4 LnTO_t \qquad (3)$$

Substituting Equation (3) into Equation (2), we get Equation (4).[2]

$$LnY_t = \beta_0 + \beta_1 LnFD_t + \beta_2 LnK_t + \beta_3 LnL_t + \beta_4 LnTO_t + \beta_5 LnGEX_t + \beta_6 INF_t + \varepsilon_t$$
$$(4)$$

In Equation (4) FD_t measures the financial development at time t, INF_t is the inflation rate at time *t,* $LnGEX_t$ is government expenditures relative to GDP at time *t* and $LnTO_t$ is trade openness relative to GDP at time *t*. In Equation (4)**,** FD_t is likely to have a positive effect on economic growth since this sector facilitates both the demand side and supply side stakeholders in making viable saving and investment decisions. Besides, the financial sector also facilitates investment opportunities in the equity market. Other sectors such as the insurance sector, mutual funds, and debt and securities market also contribute to the financial sector development. Trade openness ($LnTO_t$) which is measured by the sum of exports and imports as a percentage of GDP is expected to exert a positive impact on TFP and hence also positively affect economic growth. However, there is also a possibility of the negative effect of trade openness on TFP and economic growth in the case of developing countries. The trade openness is expected to behave negatively with economic growth in Pakistan owing to a major share of exports relative to imports. Further, trade openness signifies international factors affecting economic activities (Huchet-Bourdon et al., 2018). The impact of $LnGEX_t$ on economic growth in developing countries is generally negative due to bureaucratic inefficiencies. In this respect, Durham (2004) argued that public spending financed through tax increases can

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[2] For simplicity, we changed elasticities into $\beta's.$ Following Ibrahim and Alagidede (2018), Swamy and Dharani (2020), we included the inflation rate instead of CPI. Inflation rate and government expenditures are included to capture the impact of monetary policy and fiscal policy on TFP, while trade openness is included to examine the effect of international competitiveness.

deteriorate economic performance due to an increase in input cost, which in turn exerts a negative impact on economic growth. The LnGEX_t measures the size of the government and bureaucratic efficiency. However, we expect positive signs of government expenditures due to bureaucratic reforms in Pakistan. An increase in INF_t rises macroeconomic uncertainty, which is expected to exert a negative impact on TFP, and hence on economic growth. The INF_t is calculated as the annual percentage change in the consumer price index and it captures macroeconomic stability.

Besides, we have used the human capital index following Barro and Lee's (2010) methodology which is based on the years of schooling and returns to education. We used human capital as a proxy of the labor force because various authors considered human capital as a key factor for economic growth. For example, Schultz (1961), Uzawa (1965), and Becker (1965) asserted that the productivity of the workforce can be improved through education, skills, and worker's health. The workforce who is equipped with high levels of skills and education and also have good mental and physical health will certainly adjust to advanced technologies as compared to workforce who is equipped with low skills and education and are physically sick. In the era of globalization, advancement in technology is accessible in developing countries like Pakistan and the better use of advanced technology needs a skilled workforce. Thus, we replace the labor force with human capital to examine the better role of a skilled workforce. Thus, we augment Equation (4) by substituting human capital for labour force following Ibrahim and Alagidede (2018). Now Equation (4) can be rewritten as Equation (5):

$$\text{LnY}_t = \beta_0 + \beta_1 \text{FD}_t + \beta_2 \text{HC}_t + \beta_3 \text{K}_t + \beta_4 \text{INF}_t + \beta_5 \text{LnTO}_t + \beta_6 \text{LnGEX}_t + \varepsilon_t \quad (5)$$

Following Ibrahim and Alagidede (2018) and Rahman et al. (2021), we can rewrite Equation (5) into Equation (6):

$$\text{LnY}_t = \beta_0 + \beta_1 \text{FD}_t + \delta_i \text{LnX}_t + \varepsilon_t \quad (6)$$

In Equation (6) X_t is a vector of non-financial variables such as physical capital proxied by gross fixed capital formation relative to GDP, inflation rate, trade openness, and government consumption expenditure relative to GDP. The purpose of this study is to determine the threshold level of the human capital necessary for gaining benefits through financial development and economic growth relationships. Therefore, in this study, we have used human capital as a threshold variable while the rest variables are considered non-threshold. Therefore, we hypothesize that human capital in the financial sector may have different effects on economic growth, which depends on the threshold level of human capital. To empirically investigate, the threshold model developed by Hansen (1999) is employed. This technique allows the non-linear relationship between dependent and independent variables, which is determined by the threshold level (Bilman and Karaoglan, 2020). The threshold model is superior as compared to other models of a similar class because this model not only computes nonlinear functions but also facilitates the estimation of threshold

values rather than fixing them at any arbitrary value (Swamy and Dharani, 2020). Following Hansen and Seo (2002), the functional form of Equation (5) in terms of the threshold regression model can be expressed as:

$$Y_t, q_t, X_t; \ 1 \leq t \leq T \tag{7}$$

In Equation (7), Y_t is the dependent variable at time t, q_t is a threshold variable, and X_t is a set of variables hypothesized to affect economic growth. The structural form of Equation (7) for a single threshold can be written in Equation (8):

$$Y_t = \begin{cases} \beta_0 + \beta_1 FD_t + \delta_i X_t + u_t & \text{if } HC_t \leq \lambda \\ \beta_0 + \beta_2 FD_t + \delta_i X_t + u_t & \text{if } HC_t > \lambda \end{cases} \tag{8}$$

In Equation (8), β_0 is the intercept term, u_t is the error term which is assumed to be independent and identically distributed (iid), λ is a threshold value, while HC_t is a threshold regime-dependent regressor. Once the threshold value is identified, we can test the significance of the threshold effect under the null hypothesis of no threshold effect $(H_0: \beta_1 = \beta_2)$ against the alternative hypothesis of one threshold $(H_1: \beta_1 \neq \beta_2)$ using the Likelihood ratio test. If the F-statistic is greater than the critical value, the null of no threshold is rejected.

To confirm the validity of the claim that the relationship between financial development and economic growth becomes asymmetric after financial sector reforms, we have checked the nonlinearity of the data. To this end, we have employed the BDS (Broock et al., 1996) test (see Table 1). We used the BDS test since it is useful in detecting non-linearity under the null hypothesis that residuals are independent and identically distributed (iid).

Table 1: Results of BDS Test

Dimension	BDS Statistic	z-Statistic	Bootstrap Prob.
2	0.195634	27.27103	0.0000[***]
4	0.418262	30.07685	0.0000[***]
6	0.544097	37.99382	0.0000[***]

Note: [***] indicates significance at a 1% level of significance. P-values are based on 100,000 bootstrap replications.

The results of the BDS test confirm that the finance-growth and human capital nexus is non-linear since selected dimensions 2, 4, and 6 are significant at a 1% level of significance. Therefore, data suggest that the use of linear statistical techniques may provide spurious outcomes. Therefore, the nonlinear statistical technique will provide appropriate results. Further, we have used human capital as a threshold variable and

divided the regimes into low and high human capital regimes. Therefore, to this end, the threshold regression model provides useful information related to the impact of low-HC and high-HC on economic growth.

The present study used annual data for the period from 1980 to 2018. The World Bank's World Development Indicators (WDI) and International Monetary Fund (IMF) are the main data sources. In this study, following Rahman et al. (2020a), we used the FD index developed by Svirydzenka (2016) and updated by IMF up to 2018. We have used the index since Adu, Marbuah, and Mensah (2013) and Rahman et al. (2020a) argued that a single proxy of financial development is not enough to capture the entire impact of financial development on macroeconomic variables. In this study, the FD captures the access, depth, and efficiency of financial institutions and financial markets. Financial institutions include the banking and insurance sector, while financial markets include equity and bond markets, and other non-banking financial institutions.

4. Results and Discussion

Regarding the empirical results, Table 2 reports summary statistics of the variables used in this study. The mean value of real GDP is 15.50, showing the importance of economic growth in Pakistan. The average value of FD is 0.25, indicating that financial development contributes positively to economic growth. While said value for financial institutions and financial markets is respectively 0.26 and 0.23. These statistics show that financial markets, financial institutions, and overall financial development contribute positively to the real sector growth of Pakistan. Similarly, the mean values of other variables are also found positive. The standard deviation of inflation is 0.48, indicating high volatility in consumer prices, which in turn causes to increase macroeconomic uncertainty. The value of standard deviation in the case of real GDP is also indicating volatility. Moreover, the standard deviation of financial development was observed to be 0.06 which reveals that financial development is less volatile than other variables under investigation. Whereas, among financial institutions and financial markets, the financial markets are relatively more volatile. The trade openness and inflation rates have relatively heavier tails as compared to other variables. The data is negatively skewed except for financial development, financial markets, financial institutions, and government expenditures.

Table 2: Summary Statistics

	LnY_t	FD_t	FI_t	FM_t	HC_t	$LnGEX_t$	LnK_t	INF_t	$LnTo_t$
Mean	15.50	0.25	0.26	0.23	1.55	2.40	2.86	1.93	3.50
Max	16.40	0.37	0.31	0.46	1.79	2.82	3.03	2.91	3.66
Min	14.52	0.16	0.20	0.03	1.26	2.05	2.64	0.91	3.23
Std. Dev.	0.53	0.06	0.02	0.12	0.20	0.17	0.09	0.48	0.10
Skewness	-0.10	0.75	0.14	0.61	-0.02	0.10	-0.59	-0.31	-0.86
Kurtosis	1.98	2.40	2.32	2.12	1.31	2.91	2.42	2.22	3.46
Jarque-Bera	1.75	4.29	0.87	3.66	4.62*	0.08	2.69	1.62	5.25*

Note: * indicates significance at a 10% level of significance.

In Table 3, the pair-wise correlation among the variables is reported. The real GDP has a negative correlation with physical capital, trade openness, and government expenditures, whereas all other variables have a positive correlation with real GDP. Interestingly, FD has a positive correlation with real GDP, which reveals that a better-quality financial system enhances economic growth. Human capital and physical capital have the highest correlation with real GDP.

Table 3: Correlation Analysis

	LnY_t	FD_t	FI_t	FM_t	HC_t	$LnGEX_t$	LnK_t	INF_t	$LnTO_t$
LnY_t	1.000								
FD_t	0.330**	1.000							
FI_t	0.736***	0.089	1.000						
FM_t	0.161	0.974***	-0.138	1.000					
HC_t	0.949***	0.467***	0.687***	0.308*	1.000				
$LnGEX_t$	-0.347**	-0.569***	-0.054	-0.554***	-0.544***	1.000			
LnK_t	-0.620***	0.041	-0.381***	0.127	-0.628***	0.406***	1.000		
INF_t	-0.116	-0.204	-0.132	-0.172	-0.074	0.198	0.267*	1.000	
$LnTo_t$	-0.573***	-0.155	-0.49***	-0.042	-0.521***	0.407***	0.637***	0.628***	1.000

Note: ***, **, and * indicate significance at 1%, 5%, and 10% level of significance respectively.

In this study, we have considered HC_t as a regime-dependent variable, while the rest of the variables are treated as regime-independent. Because of the limitation of the small sample size, we have assumed only a two-regime threshold model that coincides with the low-HC_t regime and high-HC_t regime. Intuitively, a two-regime model based on a single threshold may perform better and will easy to interpret the empirical findings. We have run several regressions using the Ordinary Least Squares (OLS) technique on Equation (7) to estimate the threshold parameter. Afterward, we obtained the sum of squares residuals $S(\lambda)$ and choose the threshold value that makes the $S(\lambda)$ smallest, that is, $\hat{\lambda} = \arg \min(\lambda)$. Thus, there exists a single threshold and the computed threshold parameter $\hat{\lambda}$ is found to be 1.489. The threshold value of 1.489 will split the data into two subsamples and will be named as low-HC_t regime and high-HC_t regime.

The results of the finance-growth nexus based on the human capital threshold estimations are reported in Table 4. At the less than 1.489 value of the threshold, we observed that in the low-HC_t regime, overall financial development has a negative and statistically significant effect on economic growth. The lower value of the human capital threshold represents the small number of skilled and educated labor force working in the financial sector in Pakistan. The coefficient of overall financial development in a low-HC_t regime is -14.165 which is statistically significant at a 1% level of significance. This suggests that a one unit-percentage point increase in financial development would reduce economic growth by 14.165%. On the other hand, the impact of overall financial development on economic growth has remained negative and statistically significant when it surpasses the threshold value of 1.489 in the high-HC_t regime. The result of this regime

reveals that economic growth decreases by 4.198% in response to a one unit-percentage point increase in financial development.

Table 4: Results of finance-growth nexus using the Threshold model (1980-2018)

Dependent Variable: LnY_t	Financial Development		
	Model-I Financial Institutions	Model-II Financial Markets	Model-III Overall Financial Sector
Regime 1	Low HC (HC_t< 1.489)		
FD_t	7.007***	-13.766***	-14.165***
	(2.372)	(1.526)	(2.462)
Regime 2	High HC (1.489 < = HC_t)		
FD_t	12.060***	-2.452***	-4.198**
	(1.927)	(0.810)	(1.747)
Non-threshold variables			
INF_t	-0.021	-0.031	-0.029
	(0.014)	(0.020)	(0.021)
LnK_t	1.049	3.274***	3.445***
	(0.622)	(0.974)	(1.033)
$LnGEX_t$	0.934**	1.165**	1.549***
	(0.378)	(0.553)	(0.515)
$LnTO_t$	2.271***	1.512*	1.263
	(0.558)	(0.790)	(0.791)
Model Parameters			
Adjusted R-squared	0.718	0.422	0.443
Sum squared resid	2.653	5.437	5.234
Durbin-Watson stat	1.046	1.170	1.075
Log-likelihood	-2.925	-16.918	-16.177
Akaike info criterion	0.457	1.175	1.137
Schwarz criterion	0.713	1.431	1.393
Hannan-Quinn criterion	0.549	1.267	1.229

Note: ***,** and * indicate significance at 1%, 5%, and 10% level of significance respectively. Values in (.) are standard errors.

These results also indicate the positive effects of human capital in the finance-growth nexus. When the level of human capital surpasses the threshold level, the magnitude of negative effects goes down from 14.165% to 4.198%. A higher level of better human capital leads to the introduction of new technology and innovations which may enhance the process of financial development and economic growth. Furthermore, with the increase in human capital through the high quality of educational attainment, the human force working in the financial industry becomes more skillful in doing credit and risk analysis and will be able to

mitigate credit risks and thereby channel funds into more sizeable investments (Ibrahim, 2018). These results are also consistent with theoretical studies (see please, Fischer, 1991; Mankiw et al., 1992; Young, 1995; Barro and Sala-i-Martin, 1995) and empirical outcomes (see please, Iqbal and Zahir, 1998; Evans et al., 2002; Azam and Ahmad, 2010; Cecchetti and Kharroubi, 2012; Neeliah and Seetanah, 2016; Munir and Arshad, 2018; Rosendo Silva et al., 2018). These empirical studies argued that better human capital can enhance the financial sector's development and economic growth by increasing skills and workers' productivity and through the provision of better health and education facilities.

Among the sub-components of financial development, the effect of financial markets on economic growth is negatively and statistically significant in both low-HC regimes and high-HC regimes. Whereas, financial institutions affect economic growth positively and significantly in both human capital regimes. The positive effect of financial institutions on economic growth in high-HC regimes is 12.060% while in low-HC regimes the impact is 7.007%. This shows that with the increase in the level of human capital, financial institutions contribute positively toward economic growth. The reasons behind the positive relationship between financial institutions and economic growth are based on the fact that Pakistan's major financial system is based on financial institutions as compared to financial markets. Besides, Pakistan has taken several reforms to create a competitive market and price mechanism for financial products. The results are consistent with the findings of Levine and Zervos (1998), Ozturk (2008), Adams et al. (2009), and Cavenaile et al. (2014).

We have also observed from the above findings that financial development behaves differently in the high and low human capital regimes. Thus, the differential impact of the financial sector on economic growth in both human capital regimes confirms the existence of a non-linear finance-growth relationship in the case of Pakistan over the period 1980 to 2018. The magnitude associated with FD_t confirms that the negative impact of financial development in low-HC_t regimes are more severe than those with high-HC_t regimes. This suggests that Pakistan must attain a level of human capital above the threshold level for an effective role in the finance-growth process. These findings are in line with empirical outcomes (for example, Mishkin, 2007; Ang, 2007) which state that as the level of human capital deteriorates, financial sector policies may not be implemented efficiently and effectively, and also difficult to achieve the benefits of economies of scale from the lower costs and higher return of capital, thereby slowing the pace of economic growth. On the other hand, the higher level of human capital augments the finance-growth relationship positively. Financial development and human capital are considered a complement to each other in the economic growth process. A large financial system with low quality educated labor force may seriously hamstring growth by making uninformed alternatives and decisiveness. It is true since Ibrahim (2018) rightly identified that a country with a high level of human capital may gain benefits from the financial sector development like the country gets benefits from a large number of doctors, scientists, researchers, financial analysts, and accountants for good choices among options.

Now, we move to discuss the results of non-threshold variables, among these variables, physical capital, trade openness, and government expenditure exert a positive and significant impact on economic growth in Pakistan. The results of model-II indicate that the real GDP would increase by 3.274% in response to a 1% increase in physical capital while real GDP in a model-I would enhance by 2.271% in response to a 1% increase in trade openness, the results are statistically significant at 5% and 1% level of significance respectively. Particularly, an increase in physical capital may increase the productive capacity of goods and services at a lower cost, which leads to higher production hence this results in higher economic growth. Likewise, government expenditure also exerts a positive and statistically significant effect on economic growth in all three models investigated. The result indicates that a 1% increase in government spending would increase real GDP by 0.934% when financial institutions were modeled, 1.165% when financial markets were modeled, and 1.549% when the overall financial sector was modeled. This implies that government expenditure on public services and investment in infrastructure significantly enhances economic growth in all three models. The government expenditures are enhancing economic growth in Pakistan which signals that bureaucrats are utilizing public resources for better and more productive purposes. Through a more efficient bureaucratic role, government expenditures can further contribute to economic growth in Pakistan. The results of government expenditures are consistent with the findings of Easterly and Rebelo (1993). The result also indicates that the inflation rate exerts an insignificant negative impact on real GDP.

5. Conclusion and Policy Implication

This study provides new insights into the non-linear finance-growth relationship in Pakistan using human capital as a threshold variable from the period 1980 to 2018. We have studied the threshold impacts of human capital on the finance-growth relationship in three types of markets that is financial markets, financial institutions, and overall financial sector models. The other variables used in the study are inflation rate, government expenditures, trade openness, and capital stock.

To analyze the regime-dependent effects of financial development on economic growth we used a single threshold level of human capital. The said impact is found to be negative when human capital lies below the threshold value of 1.489 in the low-HC_t regime. However, overall financial development contributes negatively and statistically significant to economic growth when the level of human capital surpasses the threshold value of 1.489 in the high--HC_t regime. The magnitude of financial development in a high-HC regime is found low and vice versa. This finding indicates that overall financial development is ineffective in promoting economic growth in Pakistan if human capital is less than the threshold level. However, when human capital is above the threshold level, economic growth reacts less negative to financial development. These findings support the hypothesis that the relationship between finance and growth is non-linear. The negative impact of FD in a low-HC regime is more harmful than its impact in a high-HC regime. Therefore,

Pakistan may maintain a minimum threshold level of human capital for the positive contribution of the financial sector to the economic growth process.

This study has key policy implications for policymakers, which are: that financial development exerts an asymmetric impact on economic growth. Therefore, policymakers may consider the nonmonotonic relationship between the financial sector and economic growth while making financial sector policies. Further, we found that financial development and more specifically financial institutions enhance economic growth in Pakistan. Therefore, more concentration on perfect market mechanisms and a competitive environment for the banking sector is required so that the financial sector may provide better outcomes to enhance economic growth. The study confirms that human capital is the major factor that may help in formulating efficient financial sector policies and are capable of effectively implementing those policies to get the desired results. Therefore, Pakistan may revamp financial sector policies as well as policies of human capital to make the economy better and more resilient.

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