FINANCIAL DEVELOPMENT AND HUMAN CAPITAL IN TURKEY: ARDL APPROACH

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Abstract

The impact of human capital on financial development has not been studied quite extensively in up-to-date studies. Hence, this article tries to fill in this gap by exploring the impact of human capital on financial development in Turkey. Human capital is expected to have a positive impact on financial development since it reduces information asymmetry. In addition, it is expected to increase demand for financial services and instruments. This article investigates the long-run and short-run relationship between financial development and human capital in Turkey using ARDL approach. Data are collected over 30-years period (1986-2015). In order to estimate the relationship between these economic terms, financial development is approximated using two proxy variables: broad money (% of GDP) and liquid liabilities (% of GDP). Two proxy variables of financial development are used in order to check for the sensitivity of the results. In addition, the impact of gross capital formation (% of GDP) is controlled. The obtained results indicate a significant positive impact of human capital on broad money (% of GDP) as well as on liquid liabilities (% of GDP) in both, short- and long-run. Control variable is not reported to be significant. Pesaran/Shin/Smith ARDL bounds test confirms the existence of a long-run relationship.

Keywords: *financial development, human capital, ARDL, bounds test*

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1. INTRODUCTION

Theoretical and empirical literature has comprehensively explored the relationship between financial development and economic growth. However, the literature on the financial development-human capital relationship is scarce in Turkey. Therefore, this article aims to extend the literature by exploring the aforementioned relationship in Turkey using ARDL approach over the period 1986-2015.

Theoretically, human capital development can promote financial development by reducing informational gaps and increasing demand for the different financial instruments (Hatemi-J and Shamsuddin, 2016). Financial development is considered to be as important as human capital in contributing to economic growth.

Sehrawat and Giri (2017) emphasize that physical capital combined with the poor human capital may produce low economic growth. Physical capital is expected to contribute to human capital only when finance is allowed "to do what finance can do". As a consequence, the efficiency is increased by transferring purchasing power from users with low return to users with high return. In addition, it is expected that finance attack poverty by increasing income and in the long run finance reduces poverty by improving health and education (Sehrawat and Giri, 2017). This is due to the role of investment in upgrading skills and in providing services and physical infrastructure that improves health and longevity. Taking into account these facts, this study controls for the impact of gross capital formation.

Since special attention is given to the case of Turkey there is a need to present some facts on human capital and financial development in Turkey. Owings and Kaplan (2013) indicate that Turkey has both high human capital potential and many human capital challenges. In terms of potential, it is important to notice that in 2007, the Lisbon Council ranked Turkey second (after Slovenia) among Central and Eastern European countries in its ability to develop and nurture its human capital (Owings and Kaplan, 2013).

As a possible reasons the authors mention a high birth rate, an increasing working-age population and no large-scale "brain drain". Owings and Kaplan (2013) have also noticed that, in 2050, the Lisbon Council predicts, Turkey's working–age population to be almost as large as all other Mediterranean countries taken together. This article uses school enrollment, secondary (% gross) as a proxy of human capital. Graph 1 indicates the value of this variable over the years. The positive trend supports aforementioned high potentials in Turkey.

In terms of challenges it is important to emphasize that Turkey experiences serious difficulties. These factors include low graduation rates and a large unskilled workforce with high youth unemployment, school-industry knowledge and skills mismatch, as well as cultural influences and social background inequities which impact children's educational quality and outcomes (Owings

and Kaplan, 2013). Therefore, there is a necessity to take these facts into account in order to use huge potentials in terms of human capital in Turkey.
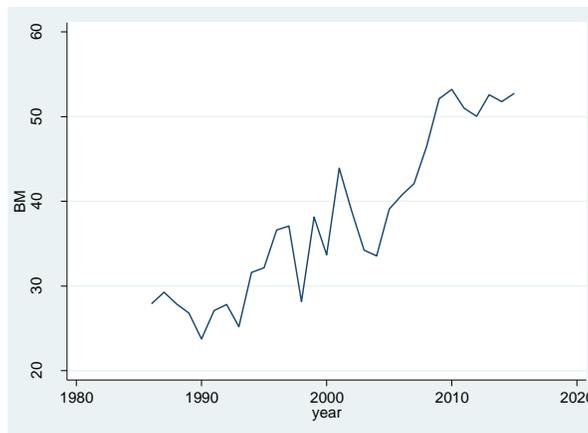
When it comes to financial development it is import to emphasize an increasing trend in the case when broad money (% of GDP) is used as a proxy variable. Graph 2 supports these findings.

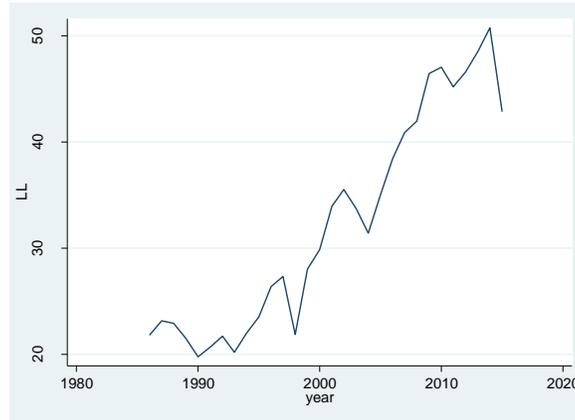**Graph 1:** School enrollment, secondary (% gross) over the period 1986-2015
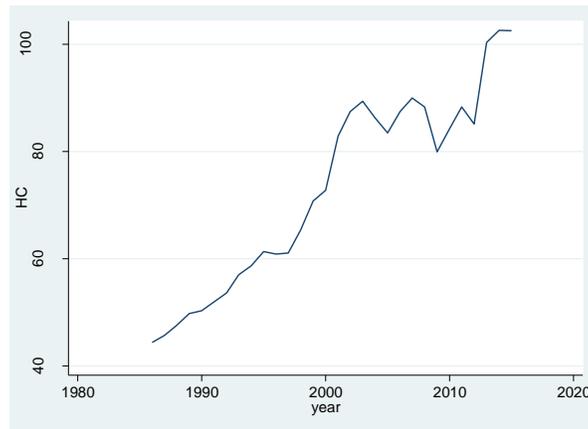
Source: Author

Graph 2: Broad money (% of GDP) over the period 1986-2015 in Turkey

Source: Author

Graph 3: Liquid liabilities (% of GDP) over the period 1986-2015 in Turkey

Source: Author

The increasing trend in terms of financial development is also confirmed in the case when liquid liabilities (% of GDP) are used as proxy of financial development in Turkey. Graph 3 gives the illustration. The rest of the article is organized as follows. Section II provides a literature review, Section III describes the data, variables and methodology, Section IV presents the empirical findings. Paper ends with the concluding remarks.

2. LITERATURE REVIEW

Recent studies in general indicate a positive impact of human capital on financial development since it reduces information asymmetry and increases demand for financial services and instruments. This part of the article summarizes the results of some of these studies.

Kargbo et al. (2016) indicates that the financial sector performance and human capital development have been weak in most Sub-SaharanAfrica countries since the 1970s to 2000s. The region has also suffered tremendously from low level of humanand physical capital accumulation leading to severe constraint on resources used for development of thefinancial sector and consequently impacted negatively on financial sector stability and hence economicgrowth. Given the relevance of finance and human capital on growth, they examine the link between financial development and human capital accumulation on economic growthin Sierra Leone from 1980-2012, using the Ordinary Least Squares (OLS) regression estimation technique. This study shows a positive relationship between the observed economic terms. The policy implication is that the decision makers should enable the environment for investment in the real as well as the financial sector. Therefore, the government should strive to ensure sound macroeconomic stability.

Human capital is considered as one of the major factors to promote economic stability, especially in developing countries in Nik et al. (2013). Furthermore, authors indicate the one of the most important factors in developing human capital to be taking the advantage of facilities and economic capabilities is education. Development of financial system provides such abilities for the prospective countries. This article studies the relationship between financial development and human capital in Iran over the period 1977-2010 with the application of a VAR model. The results indicate that the cash flow in Iran has a negative effect on human capital, which is the main cause of the increase in inflation. Education is a long term investment and when inflation hikes, people switch to alternative investments.

The purpose of Outreville (1999) is to compare the level of financial development in severaldeveloping countries with different levels of economic development. The view that human resources development can be promoted only at the expense of economic growth poses a false tradeoff. It misstates the purpose of human development and underestimates the returns in education which in turn leads to more risk-taking by skilled and well-educated people. In this paper the empirical relationship between the level of financial development and socio-economic variables reflecting different levels of development in the light of the recent literature on the role of human capital in economic development is observed. The empirical results, based on a cross-sectional analysis of 57 developing countries, indicate that human capital and socio-political stability are important factors explaining the level of financial development of these markets.

Hatemi-J and Shamsuddin (2016) have investigated the causal relationship between financial development and human development. Financial development is approximated using the domestic credit to private sector (% of GDP) while human capital is approximated using Barro–

Lee index in Bangladesh. For this purpose the bootstrap causality tests with leverage adjustments are implemented in order to avoid any distributional assumption. The results indicate causal relationship running from human development to financial development. There is no evidence on bidirectional relationship.

The purpose of Sehrawat and Giri (2017) is to investigate the relationship between financial development indicators and human capital for Asian countries using the annual data from 1984-2013. The stationarity of the variables is tested using Levin-Lin-Chu, Im-Pesaran-Shin, Fisher-type augmented Dickey-Fuller and Philips-Perron panel unit-root tests. The long-run relationship among the variables is examined using the Pedroni's and Kao's panel co-integration approaches. To estimate the coefficients of co-integrating vectors, both panel dynamic ordinary least squares (PDOLS) and fully modified ordinary least squares (FMOLS) techniques are used. The short-term and long-run causality is examined by panel granger causality. Findings support the existence of the long-run relationship among the indicators of financial development, economic growth and human capital. The PDOLS and FMOLS estimators revealed that both financial development indicators and economic growth variable act as an important driver for the increase in human capital. The

results of panel granger causality indicate that causality runs from indicators of financial development, economic growth and public spending on education to human capital.

Jahfer and Abdul Rauf (2016) have examined the relationship between the financial development, human capital development investment and economic growth in Sri Lanka using annual data over the period 1961 to 2015. Johansen Co-integration Technique and Vector Error Correction Model were used to investigate the relationships. The results demonstrated that there is a long-run equilibrium relationship. Further, human capital development and financial development are reported to cause economic growth. Moreover, findings indicate that human capital development and financial development are matter for the economic growth of Sri Lanka.

3. DATA, VARIABLES AND METHODOLOGY

3.1. Data and variables

The data, used to estimate the relationship between financial development and human capital are collected over the period 1986-2015. The source of the data is World Bank (World Development Indicators, 2017). The main criterion to select a time frame was data availability. In addition, an attempt is made to include the most recent data. The first proxy variable of financial development is broad money (% of GDP - BM). It measures overall financial depth of the financial system. The World Bank defines this variable as: the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveler's checks; and other securities such as certificates of deposit and commercial paper. This variable is widely used in up-to-date studies (Nik et al. 2013, Sehrawat and Giri, 2017, Jahfer and Abdul Rauf, 2016, Kargbo et al. 2016) as a proxy variable of financial development. This is why it is accepted as an adequate proxy variable in this article as well. Liquid liabilities (% of GDP - LL) are used as a second proxy of financial development. This variable is calculated using the following deflation method: $\{(0.5)*[F_t/P\_e_t + F_{t-1}/P\_e_{t-1}]\}/[GDP_t/P\_a_t]$ where F is liquid liabilities, P_e is end-of period CPI, and P_a is average annual CPI. Liquid liabilities measure the extent of financial intermediation in the economy. This variable is suggested by Kargbo et al. (2016). Therefore, it is used in this article as well.

Human capital is believed to play an important role in financial development. However, adequate measuring remains controversial. The hypothesis that human capital plays an important role in the development process is theoretically well substantiated in the literature, but empirical results on the matter remain mixed. A major reason for the mixed evidence is that human capital has been poorly measured (Boustan et al. 2009). This concern, therefore, brought up a question - how to measure human capital adequately? Only when an adequate and consistent measure of human capital is used it can be understood how it affects the growth process. Boustan et al. (2009) and Hanushek and

Woessmann (2011c) among others use school enrolment rates as proxies for human capital. Such use is justified by the notion that the enrolled population represents the flow that adds to the existing stock of education to establish subsequent stocks. Therefore, school enrollment, secondary (% gross - HC) is used as a proxy of human capital. This measure is defined as total enrollment in secondary education, regardless of age, expressed as a percentage of the population of official secondary education age. It can exceed 100% due to the inclusion of over-aged and under-aged students because of early or late school entrance and grade repetition.

Forgha et al. (2016) suggest the introduction of physical capital while analyzing the relationship between financial development and human capital, this is why this variable is introduced here. Gross capital formation - CF (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and work in progress.

3.2. Methodology

The autoregressive distributed lag (ARDL) model is being used for decades to model the relationship between (economic) variables in a single-equation time-series setup. Its popularity stems from the fact that cointegration of nonstationary variables is equivalent to an error-correction (EC) process, and the ARDL model has a reparameterization in EC form (Engle and Granger, 1987; Hassler and Wolters, 2006).

The existence of a long-run / cointegrating relationship can be tested based on the EC representation. A bounds testing procedure is available to draw conclusive inference without knowing whether the variables are integrated of order zero or one, I(0) or I(1), respectively (Pesaran et al., 2001). This is the first advantage of ARDL comparing to traditional cointegrationmethods. The second advantage is that it is more efficient in the case of small and finite sample data sizes. In addition, this technique provides unbiased estimates in long-run model.

Engle and Granger (1987) two-step approach for testing the existence of a long-run relationship can be summarized as follows under the assumption $(y_t, x_t)'$ is a vector of I(1) variables:

1. Run an OLS regression for the model in levels:

$$y_t = b_0 + \theta' x_t + v_t, \qquad (1)$$

and test whether the residuals $\hat{v}_t = y_t - \widehat{b_0} - \hat{\theta}'x_t$ are stationary.

2. Estimate an EC (error correct) model with the lagged residuals from the first step included as EC term (provided they are stationary):

$$\Delta y_t = c_0 + \gamma \hat{v}_{t-1} + \sum_{i=1}^{p-1} \omega_{yi} \Delta y_{t-1} + \sum_{i=0}^{q-1} \omega'_{xi} \Delta x_{t-1} + u_t, \quad (2)$$

and test whether $-1 \leq \gamma < 0$.

In order to obtain the long-run parameters from an ARDL model, Pesaran and Shin (1998) suggest that OLS estimators of the short-run parameters are $\sqrt{T}$-consistent and asymptotically normal. In addition, the corresponding estimators of the long-run parameters are super-consistent if the regressors are I(1), and asymptotically normally distributed irrespective of the order of integration.

Pesaran/Shin/Smith ARDL bounds test suggest that ARDL model should be estimated using OLS. In addition, F-statistics for the joint null hypothesis $H_0^F: (\alpha = 0) \cap \left(\sum_{j=0}^{q} \beta_j = 0 \right)$ should be computed and compared to the critical values. If H_0^F is rejected, t-statistics should be computed for the single null hypothesis $H_0^t: \alpha = 0$ and compared to the critical values. In the case both null hypotheses are rejected, the hypothesis on no levels relationship can be rejected.

4. EMPIRICAL RESULTS AND INTERPRETATION

The empirical results section starts by presenting descriptive statistics. Table 1 summarizes the obtained results.

Table 1: Descriptive statistics

stats	BM	LL	HC	CF
mean	37.853	32.289	72.958	25.128
sd	9.687	10.263	18.257	3.276
max	53.232	50.730	102.541	31.269
min	23.740	19.760	44.383	18.136
skewness	0.316	0.349	-0.060	-0.152
kurtosis	1.749	1.664	1.677	2.428

Source: Author

In terms of proxy variables of financial development it can be noticed that average BM exceeds average LL. The highest BM of 53.232% is reported for the year 2010 while the lowest of 23.74% is reported for the year 1990. The highest LL of 50.73% is reported for the year 2014 while the lowest of 19.76% is reported for the year 1990. On average, Turkey has a level of human capital of 72.96%. The highest recorded value of human capital of 102.541% is reported for the year 2014 while the lowest value of 44.383% is reported for the year 1986. The highest value of the control variable CF of 31.27% is reported for the year 2011 while the lowest value of 18.14% is reported for the year 2001. Standard deviation implies high volatility of all variables for the observed period. In order to ease the interpretation natural logarithm of both variables is calculated and is used in analysis to follow.

Furthermore, author has attempted to determine the number of lags needed in the case when BM is used as a dependent variable as well as in the case of LL. For this purpose information criterion procedures (Schwarz's Bayesian information criterion (SBIC), the Akaike's information criterion (AIC), and the Hannan and Quinn information criterion (HQIC)) are used. Table 2 summarizes the obtained results when BM is used as a dependent variable. The obtained results indicate that all three information criterion agree. Therefore, the selection is clear. The number of lags that is considered appropriate is 1. Similar conclusion can be drawn in terms when LL is used as dependent variable. Table 3 summarizes the obtained result.

Table 2: The number of lags needed (BM)

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-181.475				8121.840	14.678	14.705	14.776
1	-142.233	78.483	4	0.000	485.528*	11.8587*	11.9398*	12.1512*

2	-139.267	5.933	4	0.204	531.934	11.941	12.077	12.429
3	-138.921	0.692	4	0.952	726.781	12.234	12.423	12.916
4	-136.240	5.361	4	0.252	837.978	12.339	12.583	13.217
5	-130.874	10.733*	4	0.030	798.762	12.230	12.527	13.303

Source: Author

Table 3: The number of lags needed (LL)

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-177.292				5811.900	14.343	14.370	14.441
1	-132.960	88.664*	4	0.000	231.215*	11.1168*	11.1979*	11.4093*
2	-132.546	0.827	4	0.935	310.716	11.404	11.539	11.891
3	-129.263	6.567	4	0.161	335.630	11.461	11.650	12.144
4	-126.474	5.579	4	0.233	383.633	11.558	11.801	12.436
5	-123.663	5.622	4	0.229	448.628	11.653	11.951	12.726

Source: Author

After determining the optimal number of lags, we apply ARDL approach to investigate the relationship between human capital and financial developmentin Turkey. Table 4 summarizes the results of ARDL/EC model (BM dependent variable).

Results indicate a significant positive coefficient (for a 5% level of significance) with human capital in both, short- and long-run. Therefore, human capital is reported to have a significant positive impact on financial development approximated using broad money (% of GDP). Moreover, Pesaran/Shin/Smith ARDL bounds test indicates the rejection of hypothesis on no levels relationship. The interpretation of the regression coefficients can be given as follows: 1% increase in human capital leads to 0.89% increase in financial capital in long-run and 0.39% in the short-run. In order to test for the stability of the model, the impact of CF is controlled. This variable is not reported to have a significant impact on financial development. The introduction of this variable in extended model does not significantly change the original results. Therefore, the assumption on the stability of the model is confirmed. It is important to emphasize that, due to the assumptions of ARDL model the results can be interpreted as correlations as well as causations.

Table 4: ARDL regression (dependent variable lnBM)

	D.lnBM		Coef.	St. Error	t	P>t	95% Conf. Interval	
Initial model	ADJ							
		lnBM L1.	-0.436	0.160	-2.720	0.012	-0.765	-0.106
	LR							
		lnHC L1.	0.889	0.199	4.470	0.000	0.480	1.298
	SR							
		lnHC D1.	0.388	0.160	2.420	0.023	0.059	0.716
		_cons	-0.070	0.370	-0.190	0.852	-0.830	0.690
Extended model	ADJ							
		lnBM L1.	-0.390	0.169	-2.300	0.030	-0.740	-0.041
	LR							
		lnHC L1.	0.809	0.233	3.470	0.002	0.329	1.290
		lnCF L1.	0.325	0.526	0.620	0.543	-0.761	1.411
	SR							
		lnHC D1.	0.316	0.155	2.040	0.053	-0.004	0.636
		lnCF D1.	-0.286	0.213	-1.340	0.193	-0.726	0.155
		_cons	-0.330	0.635	-0.520	0.608	-1.640	0.981

Source: Author

Table 5 summarizes the results of ARDL/EC model in the case when LL is used as a dependent variable. Results indicate a significant positive coefficient (for a 5% level of significance) with human capital in both, short- and long-run. Therefore, human capital is reported to have a

significant positive impact on financial development approximated using liquid liabilities (% of GDP). Moreover, Pesaran/Shin/Smith ARDL bounds test indicates the rejection of hypothesis on no levels relationship. The interpretation of the regression coefficients can be given as follows: 1% increase in human capital leads to 1.17% increase in financial capital in long-run and 0.31% in the short-run. In order to test for the stability of the model, the impact of CF is controlled. This variable is not reported to have a significant impact on financial development. The introduction of this variable in the extended model does not significantly change the original results. Therefore, the assumption on the stability of the model is confirmed.

Table 5: ARDL regression (dependent variable lnLL)

	D.lnLL		Coef.	St. Error	t	P>t	95% Conf. Interval	
Initial model	ADJ							
		lnLL L1.	-0.267	0.119	-2.250	0.033	-0.510	-0.023
	LR							
		lnHC L1.	1.170	0.252	4.650	0.000	0.653	1.688
	SR							
		lnHC D1.	0.312	0.149	2.090	0.047	0.005	0.619
		_cons	-0.400	0.331	-1.210	0.239	-1.080	0.281
Extended model	ADJ							
		lnLL L1.	-0.235	0.144	-1.630	0.117	-0.533	0.063
	LR							
		lnHC L1.	1.230	0.340	3.610	0.001	0.529	1.931
		lnCF L1.	-0.298	0.864	-0.340	0.733	-2.077	1.482
	SR							
		lnHC D1.	0.289	0.163	1.780	0.088	-0.046	0.624

	lnCF D1.	-0.070	0.176	-0.400	0.694	-0.432	0.293
	_cons	-0.184	0.639	-0.290	0.776	-1.499	1.132

Source: Author

The higher responsiveness of financial development to the change in human capital is reported in the case when LL is used as a proxy of financial development in the long-run. In terms of short-run higher responsiveness of financial development to the change in human capital is reported in the case when BM is used as a proxy of financial development. However, the sign and significance of the results does not change after introducing different proxy variables of financial development, therefore the estimated model is not appeared to be sensitive to the choice of measurement for financial development in Turkey.

5. CONCLUSION

This article investigates the long-run and short-run relationship between financial development and human capital in Turkey. For this purpose, ARDL approach is used. Data are collected over 30-years period (1986-2015). In order to estimate the relationship between these economic terms, financial development is approximated using two variables: broad money (% of GDP) and liquid liabilities (% of GDP). Two proxy variables of financial development are used in order to check for the sensitivity of the results. In addition, the impact of gross capital formation (% of GDP) is controlled.

Results initially indicate the increasing trend in terms of both proxy variables of financial development as well as of human capital in Turkey over the observed period. Therefore, there is a great potential in terms of human capital as well as financial development. This is why, the decision makers need to make effort in order to overcome challenges and to use a great potential of growth.

Findings of ARDL model indicate a significant positive coefficient with human capital in both, short- and long-run. Therefore, human capital is reported to have a significant positive impact on financial development approximated using broad money (% of GDP). Moreover, Pesaran/Shin/Smith ARDL bounds test indicates the rejection of hypothesis on no levels relationship. The interpretation of the regression coefficients can be given as follows: 1% increase in human capital leads to 0.89% increase in financial capital in long-run and 0.39% in the short-run. In order to test for the stability of the model, the impact of CF is controlled. This variable is not reported to have a significant impact on financial development. The introduction of this variable in extended model does not significantly change the original results, which indicates that the selected

model is stable. It is important to emphasize that, due to the assumptions of ARDL model the results can be interpreted as both correlations and causations.

Results of the model that uses LL as a dependent variable indicate a significant positive coefficient (for a 5% level of significance) with human capital in both, short- and long-run. Therefore, human capital is reported to have a significant positive impact on financial development. Pesaran/Shin/Smith ARDL bounds test indicates the rejection of hypothesis on no levels relationship. In order to test for the stability of the model, the impact of CF is controlled. This variable is not reported to have a significant impact on financial development. The introduction of this variable in extended model does not significantly change the original results, which indicates that the selected model is stable.

The higher responsiveness of financial development to the change in human capital is reported in the case when LL is used as a proxy of financial development in the long-run. In terms of short-run higher responsiveness of financial development to the change in human capital is reported in the case when BM is used as a proxy of financial development. However, the sign and significance of the results does not change after introducing different proxy variables of financial development, therefore the estimated model is not appeared to be sensitive to the choice of measurement for financial development in Turkey.

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