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Financial Development and Poverty Reduction in Bangladesh: Evidence from the ARDL Bound Testing Approach

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I. Introduction

It is proven in many empirical studies that financial development has an influential role in the economic growth of a nation (Beck and Levine, 2004; Levine, 2005; King and Levine, 1993). A large body of studies has chiefly concentrated on finding the nexus between finance and growth, while the implication of finance on poverty has been uncharted. Specifically, in the developing nations where poverty is a predominant social problem, questing for better policy options to subdue poverty by focusing on the link between finance and poverty will be of paramount importance. In the SDGs ending poverty in all of its forms has been identified as the most prioritized goal (UN, 2019). Still, in this world, about 9.2 percent of the total population live below the international poverty line of $1.90 a day (World Bank, 2020a). And, the middle-income countries are mainly the host of this large share of the population. In 2016, about 14.3% of the total population was below the poverty line in Bangladesh. The country intends to bring the number to below 3% by 2030. The present study aims at unearthing the link between financial development and poverty in an error correction model so that the long run, as well as the short-run implication of finance on poverty reduction, can be better understood from the perspective of Bangladesh. The next section surveys the existing literature concerning the role of finance in poverty reduction, and the remainder of this paper is structured as follows. Section 3 provides a brief overview of poverty and the financial sector from the perspective of Bangladesh, and section 4 specifies and describes the model and the data. Section 5 and section 6 present the estimation method and analysis of the obtained results, respectively. Section 7 concludes the study.

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II. Literature Review

Financial development is indispensable for the healthy growth of an economy. The positive association between financial development and growth is empirically proven in many studies (Levine, 2004; Levine, 2005; Beck and Levine, 2004). But there is a dearth of literature on the nexus between financial development and poverty reduction. Jeanneney and Kpodar (2011), with a large sample of developing countries over the period 1966-2000, find a positive association between finance and poverty reduction. But their results are sensitive to the financial deepening variables, finance as measured by the ratio of M3 to GDP produces strong outcome-confirming the McKinnon 'conduit effect' (McKinnon, 1973) — as opposed to the ratio of credit to the private sector which has a rather weaker positive effect on poverty reduction. They also corroborate the findings of Akhter and Daly (2009) that financial instability as an outcome of better financial development hurts the poor. Beck *et al.* (2007) extensively examine the role of finance on the poor. They find that financial development can be both quite effective for the poor through the channel of aggregate growth and by reducing the income inequality amongst the poorest quintile. Also, utilizing the data on a fraction of the population living on less than $1 per day, they observe the favorable role of financial development in poverty alleviation. Donou-Adonsou and Sylwester (2016) use the data of 71 developing countries and find an overall positive effect of financial development mainly measured by the credit to GDP ratio on various poverty measures such as headcount ratio and poverty gap. Their study also reveals that microfinance institutions do not influence poverty. Rewilak (2017) separates financial development into four components and finds that financial deepening and greater access to finance significantly reduce poverty. Few studies focus on the income inequality and poverty nexus. For example, Clarke *et al.* (2006) find that financial development is

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inversely related to the level of the Gini coefficient. They make use of the data of a panel of countries ranging from the period 1960-1995. Omar and Inaba (2020), using the data of 116 developing countries between 2004 and 2016, observes that financial inclusion plays a favorable role in poverty alleviation and reducing income inequality.

Several studies investigate the country-specific link between financial development and poverty reduction, and these studies, in particular, examine the causal relation between the variables following a co-integration test. Odhiambo (2009) inspects the causality among financial development, poverty, and economic growth for the data of South Africa ranging the period 1960-2006 to find that both financial development and economic growth Granger-cause poverty reduction in the country. Kheir (2018), using the data covering the period 1980-2015, finds for another African nation, namely Egypt, that there exists bi-directional causality between financial development and poverty reduction both in the short-run and long run. The study uses the ratio of household final consumption expenditures to GDP as a proxy for poverty data. For financial development variables, it employs domestic credit to the private sector as a percentage of GDP, and the ratio of liquid liabilities to GDP (M3/GDP). Uddin *et al.* (2014), using quarter frequency data for 1975–2011, find that poverty, financial development, and economic growth are co-integrated and financial development contributes to poverty reduction. Abdin (2016) also discovers a favorable role of financial development in poverty reduction using the data of Bangladesh for the period 1974-2013.

III. Poverty and Financial Development in Bangladesh: An Overview

Table (1) provides a brief overview of the poverty scenario in Bangladesh between the years 1991 and 2016. Even though data on poverty headcount ratio is rare and usually observed with a 5-year interval, and so is the data on the Gini index—a measure of income inequality—we have compiled the available data to assess the progress Bangladesh has made concerning poverty reduction. During 1991, about 43.5% of the population in Bangladesh was living below the poverty line of $1.90 a day. By 2000, the scenario improved a lot. Since then, a host of targeted pro-poor policy actions and possibly the boom of export-oriented RMG sectors reduced the poverty figure dramatically.

Table 1: Overview of the Poverty Situation in Bangladesh

Time	Poverty headcount ratio at $1.90 a day (2011 PPP)	Gini index	GDP per capita (USD, PPP)	Households and NPISHs Final consumption expenditure, PPP (100 million)
1991	43.5	27.6	1534.5	1.58
2000	34.2	33.4	1937.7	2.04
2010	19.2	32.1	2883.5	3.24
2016	14.3	32.4	3920.3	4.28

Source: WDI 2020

By the year 2012, Bangladesh had already achieved the MDG goal of halving the proportion of people living below the poverty line. Despite achieving extensive success in poverty reduction, a bleak picture could be visible when it came to income inequality. Between the years 1991 and 2016, the Gini index was 31.3, indicating a moderate inequality existed in Bangladesh. Nevertheless, the picture concerning the economic development as measured by the level of per capita GDP in constant 2011 USD adjusted for PPP was superior. The level of per capita GDP increased by more than double to USD 3920.3 in 2016 from USD 1534.5 in 1991. Household expenditure, a measure of poverty reduction adopted in this study, also showed the same trait.

In gauging the performance of financial development in Bangladesh, we categorize the financial development variable into four components in line with the Cihak *et al.* (2013), namely financial deepening, financial access, financial efficiency, and financial stability. In this study, we have used domestic credit provided to the private sector by all financial intermediaries as a percentage of GDP to represent the financial deepening as well as the key financial development variable. The bank credit to deposit ratio and cost to income ratio represent financial stability, financial efficiency, respectively. Figure 1 illustrates the scenario that prevailed in the financial sector between the years 2004 and 2017. Only the data on credit to the private sector contains a decent number of observations, so we conduct our main regression analysis with it. Still, for assessing the overall condition of the financial sector, we make use of the available data on the financial stability and efficiency along with financial depth.

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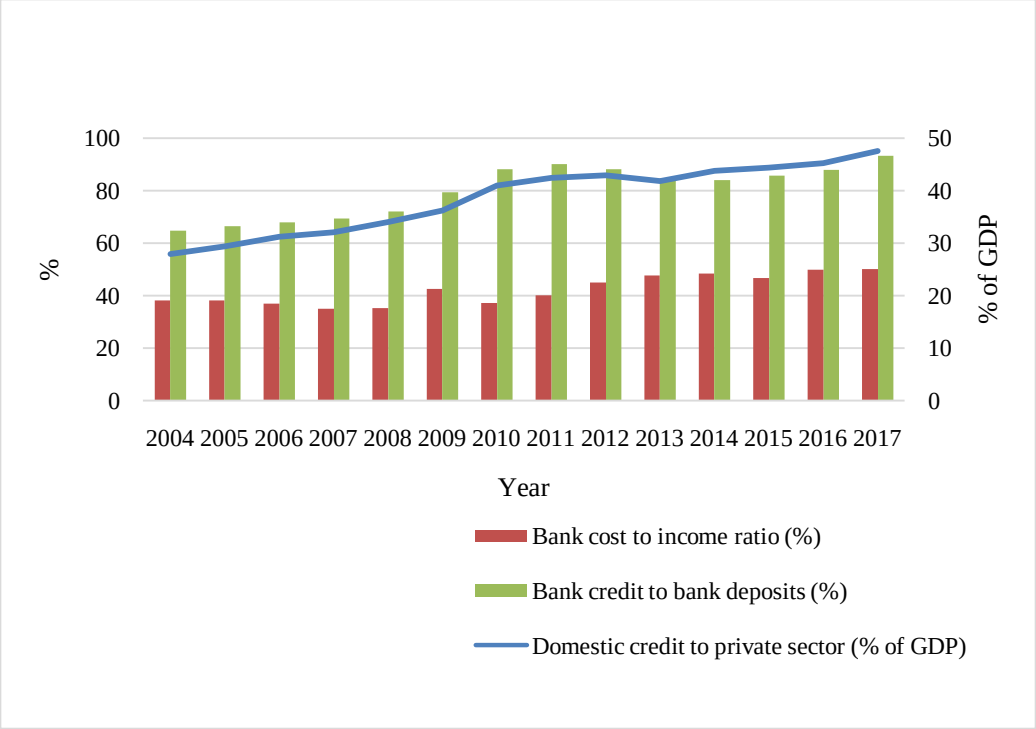

Source: WDI 2020

Figure 1: Scenario in the financial sector in Bangladesh (2004-2017)

According to the available data, it is apparent that the financial sector operated with a fair amount of efficiency between the years 2004 and 2017. In this period, banks' profitability measured by the cost to income ratio remained fairly constant, and the average was about 42.4%. The financial stability represented by the credit to deposit (CD) ratio also depicted a similar picture. Between the years 2004 and 2017, on average, the CD ratio was a little over 80% which was indicative of better financial stability during this period. Data on ATMs per 100,000 adults and bank accounts per 1,000 adults obtained from the WDI 2020 revealed that in terms of financial access, the country still needed to pave a long way to achieve decent success. In 2009, only one ATM was available per 100,000 adults, and around 2017, the number slightly increased to a mere eight ATMs. As to the bank account, about 248 people among 1000 adults had it in 2004, and the number slowly rose to 715 per 1000 adults in 2017.

IV. The Model and Data

The present study aims at unearthing the effect of financial development on poverty reduction. We formulate the following model, in line with Beck *et al.* (2007), Odhiambo (2009), and Kheir (2018) to assess the nature of the relationship.

$$pov_t = \alpha + \beta_1 y_t + \beta_2 fin_t + \beta_3 x_t + e \qquad (1)$$

In equation (1), *pov* corresponds to our poverty measure, *y* and *fin* represent the level of economic development and the financial development, respectively, *x* is a set of control variables. All the series considered in this study are annual and span the period 1990-2019. Table 2 provides the descriptive statistics of the variables.

Table 2: Descriptive Statistics of the Variables

	Household final consumption expenditure (100 million)	GDP per capita (PPP)	Consumer Price Index	Domestic credit to the private sector (% of GDP)	Military expenditure (% of GDP)
Mean	2.81	2554.98	83.57	30.33	1.31
Median	2.45	2225.61	66.88	28.63	1.30
Maximum	5.30	4753.73	179.68	47.58	1.58
Minimum	1.58	1517.73	32.25	14.55	1.06
Std. Dev.	1.11	940.83	45.60	11.37	0.16

Source. Author's calculation

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There is a substantial lack of data on the most common poverty measure headcount ratio. For Bangladesh, we observe data with only a 5-year interval. To circumvent this problem, we have employed the logarithm of household final consumption expenditure in constant 2011 USD adjusted by PPP. Studies such as Odhiambo (2009), Kheir (2018), Uddin *et al.* (2012) use household expenditure as a reliable proxy for poverty variable because usually, the income of the poor is consistent with their expenditure.

We have used the log of the per capita GDP in constant 2017 USD adjusted for PPP to gauge economic development. A positive sign on the coefficient of GDP will point to the fact that an increase in the level of economic development will reduce poverty. Domestic credit to the private sector (% of GDP) is the proxy for financial development. This proxy is superior compared to the ratio of broad money (M2 or M3) to GDP as the domestic credit to the private sector as a percentage of GDP captures the movement of savers' money to the private firms. This measure is also reliable as it includes the activity of the other non-bank financial intermediaries involved in the financial sector, and at the same time, excludes credit to the public sector. We have also used military expenditure as a percentage of GDP to capture the fact that spending on the military may hinder the progress of poverty reduction. To capture the macroeconomic stability we make use of the log of consumer price index data. World Development Indicator (WDI) 2020 by the World Bank is the source of all the data series.

V. Method

This study employs the ARDL (autoregressive distributed lag) bound testing approach of cointegration developed by Pesaran and Shin (1995), Pesaran and Pesaran (1997), and Pesaran *et al.* (2001). ARDL technique to test for cointegration has several merits over the cointegration approach developed by Johansen (1998), Johansen and Juselius (1990), and Engle Granger (1987). ARDL approach is still applicable regardless of the variables being purely I (0) or I(1) or an admixture of both. It provides superior results even in the smaller sample size. The approach requires a single equation set-up as opposed to the other conventional methods, which need a system of equations. Additionally, the ARDL approach yields unbiased estimates of the long-run model, although some variables are endogenous (Odhiambo, 2009).

Our data involve the period 1990-2019, and the series are annual. Owing to this fact, we have kept the maximum lag length to two periods following Pesaran and Shin (1998), Narayan (2004), and Ahamad (2019). We express the model in the following ARDL form:

$$\Delta pov_t = \alpha + \sum_{i=1}^{k} \beta_i \Delta pov_{t-i} + \sum_{j=0}^{l} \beta_j \Delta y_{t-j} + \sum_{u=0}^{v} \beta_u \Delta fin_{t-u} + \sum_{m=0}^{n} \beta_m \Delta x_{t-m} + \delta_1 pov_{t-1} + \delta_2 y_{t-1} + \delta_3 fin_{t-1} + \delta_4 x_{t-1} + e_t \quad (2)$$

Here, e_t is the white noise error term, and Δ denotes the first difference operator. The variable pov represents our poverty measure. The chosen proxy is the natural log of households and NPISHs final consumption expenditure adjusted for PPP. And, *y* denotes the level of economic development for which the proxy is GDP per capita at PPP. Here, *x* is a vector of control variables that includes consumer price index (CPI) and military expenditure as a percentage of GDP.

The existence of a long-run relationship or cointegration among the variables of interest is confirmed by calculating joint F-statistic or Wald statistic. The null hypothesis, in this case, is H0=1=2=3=4=0 implying that there is no level form relationship or no cointegration among the variables. The alternative hypothesis is Ha1234≠0, which implies that there exists a long-run relationship among the variables or, more precisely, the variables are cointegrated. The computed F-statistic is compared against two sets of F-statistic critical values, namely, lower bound F_L: I(0) and upper bound F_U: I(1). If the computed F-statistic exceeds the upper bound value, then the null is rejected to confirm that there exists a long-run relationship among the variables. In case the computed value is smaller than the lower bound critical value, then the null cannot be rejected. If the computed F-statistic falls between the upper and the lower bound critical value, then the test will be inconclusive. The long-run and the short-run equation are as follows,

$$pov_t = \alpha + \sum_{i=1}^{a} \delta_i pov_{t-i} + \sum_{j=0}^{b} \delta_j y_{t-j} + \sum_{u=0}^{v} \delta_u fin_{t-u} \sum_{m=0}^{c} \delta_m x_{t-m} + \eta_t \quad (3)$$

$$\Delta pov_t = \alpha + \sum_{i=1}^{k} \beta_i \Delta pov_{t-i} + \sum_{j=0}^{l} \beta_j \Delta y_{t-j} + \sum_{u=0}^{v} \beta_u \Delta fin_{t-u} + \sum_{m=0}^{n} \beta_m \Delta x_{t-m} + \phi ECT_{t-1} + \epsilon_t \quad (4)$$

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Here, *ECT* is the error correction term and coefficient ϕ represents the speed of adjustment. More intuitively, it means how much of the disequilibrium in the previous period adjusts in the present period so that the system moves on to converge to the long-run equilibrium. The coefficient should be negative and statistically significant to meet the condition of convergence.

VI. Results Analysis

a) Unit root test

Although the ARDL bounds testing approach to cointegration does not require the pretesting of the data series for unit root, it is customary to eliminate the possibility of any I(2) series among the variables considered in the study. The presence of I(2) series produces spurious regression and renders the whole process futile. Augmented Dicky-Fuller (ADF) and Phillips-Perron unit root tests check the order of integration I(d) among the variables of interest. Table (2) reports the test results on the unit root test.

Table 2: Unit-root Test of the variables

Variables	ADF Statistics (with trend)	PP Statistics (with trend)	5% Critical Value	10% Critical Value
y	-0.25	0.31	-3.58	-3.23
Δy	-3.49*	-3.55*	-3.58	-3.23
pov	0.96	1.99	-3.58	-3.23
Δpov	-4.49**	-4.39**	-3.58	-3.23
fin	-2.45	-2.52	-3.58	-3.23
Δfin	-4.74**	-4.68**	-3.58	-3.23
cpi	0.61	0.38	-3.58	-3.23
Δcpi	-3.97**	-3.97**	-3.58	-3.23
mil	-1.59	-1.86	-3.58	-3.23
Δmil	-3.62**	-3.64**	-3.58	-3.23

Notes. Δ denotes first difference operator, ** and * denotes statistical significance at 5% and 10% respectively

According to the output of ADF and PP unit root tests, it is apparent that all the variables are stationary after taking their first differences. We have included trend and intercept while carrying out the tests. The null hypothesis of the unit root test of both ADF and PP is the time series is non-stationary. We have not reproduced the mathematical details of the testing process to conserve spaces.

b) Cointegration test

The next step involves estimating equation (2) for cointegration among the variables. Two ARDL models are estimated. The first one includes only the level of economic development and financial development and the second one contains both of the variables as well as the control variables such as CPI, which is a proxy for macroeconomic stability in the country, and military expenditure as a percentage of GDP to capture the spending by the government in non-developmental avenues.

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Table 3: F-Bounds Test to Cointegration

	Model	Optimal Lag Length	F	LM Test χ^2	ARCH χ^2	JB Test χ^2
1	Sample (1990-2019)	ARDL(2,1,1)	3.73	2.96(0.22)	0.82(0.31)	0.23(0.89)
2	Sample (1990-2019)	ARDL(2,0,1,1,1)	7.39	5.73(0.06)	1.01(0.31)	0.71(0.69)

Finite Sample: n=30 k=2 (Model 1)			Finite Sample: n=30 k=4 (Model 2)		
Significance level	*I(0)*	*I(1)*	Significance level	*I(0)*	*I(1)*
10%	2.915	3.695	10%	2.525	3.56
5%	3.538	4.428	5%	3.058	4.223
1%	5.155	6.265	1%	4.28	5.84

Notes. The null hypothesis of bound test: no levels relationship, I(0) and I(1) denote lower and upper bound critical value respectively. For the LM, ARCH, and JB tests, inside the parentheses, P-value associated with the corresponding χ2 value is attached.

To choose the optimal lag length, this study makes use of the Akaike information criterion (AIC). For both of the models, the lag-lengths that minimize the Akaike information criterion (AIC) are ARDL (2, 1, 1) and ARDL (2, 0, 1, 1, 1). Table (3) contains the cointegration test results. For model 1, the computed F-statistic is 3.73 that exceeds the upper bound critical value for finite sample size n=30 at the 10% level. That is, in model 1, the variables are cointegrated or, there is a long-run relationship among the variables.

As for model 2, the variables are also cointegrated as the computed F-value is 7.39, which is greater than the upper bound critical value for finite sample n=30 at the 1% level of significance. An array of diagnostic tests implemented in this study checks for the presence of autocorrelation, heteroscedasticity, and normality of the error terms. As indicated by the test results, both models are free from the problems posed by autocorrelation, heteroscedasticity, and non-normal residuals.

c) The Short-run and the Long-run findings

Table (3) reports the long-run estimation results. The results indicate that in the long run, the level of economic development reduces poverty. In both models GDP per capita at PPP, which is a proxy for the level of economic development registers a highly significant positive coefficient.

Table 3: Long-run Estimation

Dependent Variable: log of poverty variable (*pov*)				
	Model 1		Model 2	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic
y	0.792604	(8.710862)***	0.961633	(12.80859)***
fin	0.006022	(2.329256)**	0.005012	(2.331573)**
mil			-0.06643	(-3.141236)***
cpi			-0.05224	(-0.652512)
c	19.84848	(31.62293)***	18.92711	(56.85097)***

*In the parentheses, a t-statistic is provided for the corresponding coefficient. ***, ** denote significance at the 1% and 5% level respectively*

The key variable of interest, financial development indicator, for which the proxy is domestic credit to the private sector (% of GDP), appears with a significant positive coefficient in both models. The positive sign confirms that financial development indeed has a positive role in the poverty reduction in Bangladesh. The most interesting finding here is that the positive link between financial development with poverty reduction holds even when controlling for other relevant variables. Also, the long-run elasticities are nearly the same across the two specifications we have tested here. On average, in the long run, a 1 percent increase in the domestic credit to the private sector may contribute to a 0.6 percent decline in poverty. The coefficient on the military expenditure is negative and highly significant to imply that military expenditure increases poverty.

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Perhaps, it is because military expenditure takes away funds that can otherwise be invested in the development of health and education.

Table (4) reports the short-run findings on the two models. According to the results, the financial development variable replicates the same trait in the short run, just it does in the long run. In the short run, the elasticities are also almost the same across the two specifications. That is, on average, a 1 percent increase in the domestic credit to the private sector in the short run will favorably enhance the household final expenditure by 0.4 percent, i.e. reduce poverty by 0.4 percent.

Table 4: Short-run Results

Dependent variable: *Δpov*				
	Model 1		Model 2	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic
Δpov(-1)	0.275259	(1.593674	0.507119	(5.665513)***
Δy	1.962343	(7.514775)***		
Δfin	0.004166	(2.529394)***	0.003012	(1.907131)*
Δmil			-0.00561	(-0.20221
Δcpi			0.262591	(3.239281)***
ECT(-1)	-0.59624	(-4.12826)***	-0.93794	(-7.52602)***

*In the parentheses, a t-statistic is provided for the corresponding coefficient. ***, **, and * denote significance at the 1%, 5%, and 10% level respectively.*

Military expenditure shows no significant impacts on poverty in the short run, as indicated by the findings. The error correction terms in both models appear with the correct negative sign and the level of significance. The speed of adjustment to the long-run equilibrium in model 1 is 59.6%, whereas it is 93.8% in model 2. This higher speed of adjustment in model 2 justifies the inclusion of relevant control variables in its specification.

VII. Conclusion

This paper attempts to find the link between financial development and poverty reduction in a developing nation by taking Bangladesh as a case. The findings in this paper corroborate the results of many past studies concerning the role of financial development in poverty reduction. In particular, the error correction model employed in this paper reveals that both in the short-run, as well as in the long run financial development reduces poverty. The study also provides valuable insight regarding military expenditure and its role in poverty reduction. Despite showing no significant effect in the short-run on poverty, military expenditure, in the long run, exerts a detrimental negative role in poverty reduction. The findings of this paper can be used as an important policy guide. The government in a developing nation can always reduce poverty by enhancing the depth of the financial sector and by ensuring easy access of the people who need credit the most. We should also bear in mind that excessive government interventions may divide the credit facilities in the financial market in such a way that the most influential borrowers obtain credit at subsidized rates of interest. In contrast, less advantaged groups often need to acquire credit at a higher interest rate from the informal market (Kirkpatrick 2000). If policy-makers address this issue, finance may not appear as a growth-limiting factor and play a progressive role in poverty reduction.

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