

Financial development and economic growth: A nonparametric analysis

Anil Bolukoglu^a

^a Assist. Prof., Nevsehir Haci Bektas Veli University, Turkey

E-mail: anil.bolukoglu@nevsehir.edu.tr

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Abstract

This work examines the relationship between average economic growth and average financial development in 83 countries over the period 1980-2018 and employs IMF Financial Development Index differently from other works on the relationship between financial development and growth in order to assess the multiple nature of financial development. Using quantile regression analysis to demonstrate the non-linear relationship between these variables the study demonstrates that various financial indicators are found ineffective on economic growth of slow growing countries. However, effects of various financial development indicators vary as it is moved up in conditional distribution of economic growth. According to estimation results, effect of financial market development is monotonically decreasing, while financial institutions' development is monotonically increasing.

Keywords: economic growth, quantile regression, financial development, cross country analysis

Jel Codes: H25, H26, H7, D41

1. Introduction

The relationship between financial development and economic growth has been a frequently discussed topic in empirical economics literature since seminal empirical work of King and Levine (1993). In a theoretical manner, roles of well-developed financial markets and institutions stressed in the literature as i) mobilizing savings and channel them toward most efficient investments, ii) easing the agency problems through financial surveillance which makes productive use of loans, iii) providing an efficient diversification of risks, and iv) increases research and development expenditures by reducing the cost of corporate governance (Schumpeter, 1934/1980; Greenwood & Jovanovic, 1990; Bencivenga & Smith, 1993; King and Levine, 1993).

Numerous empirical studies investigate the effect of financial development on economic growth through means of different estimation procedures associated with cross-country, time series and panel data¹. Plenty of empirical evidence indicate a positive impact of financial development on economic growth. However, with the exception of a few examples, the literature holds a traditional view that assumes a linear relationship between finance and growth. This view has flaws due to the heterogeneity of countries covered by empirical research. First of all is the changing effect of financial development on economic growth with respect to country's level of development. Deidda & Fattouh (2002) and Rioja & Valev (2004) showed that financial development is ineffective on economic growth in low-income countries, while it is effective in high-income countries. Secondly, differences in institutional development also matters in the relationship between finance and growth. Law et al. (2013) points that financial development is influential on growth only after a certain institutional development level. Non-linear estimations are successful in determining the conditions of an effective relationship between finance and growth. However, this literature do not show how finance is effective among rapid or slow growing countries. This work estimates a non-parametric quantile regression model in order to show the influence of financial development on economic growth at different quantiles to get over this problem.

Secondly, the literature emphasizes that financial institutions, financial markets have differential effects on economic growth, and hence the relationship depends on definition of financial development. Development of financial institutions such as banks, mutual funds, insurance companies etc. enhances economic growth through improving capital allocation and corporate governance by knowledge acquisition, risk management and making use of economies of scale (Diamond, 1984; Allen & Gale, 1999). However, development of financial markets reduce inefficiencies associated with financial institutions such as protecting established firms to compete with efficient new entrants, disrupting efficient corporate governance through collusion between financial institutions and firm managers against other creditors (Boot & Thakor, 1997; Allen & Gale, 1999). The question whether

¹ Ang (2008) presents a detailed theoretical and empirical literature review on the relationship between financial development and growth.

development of financial markets or institutions was more influential on economic growth is also investigated in this paper. The work employs IMF's financial development data set in order to estimate quantile regression estimates of differential effects of different notions of financial development.

The rest of this paper comprises of three sections. Section 2 provides a detailed analysis of data and a description of the estimation method and model. Section 3 shows results from quantile regression estimation to analyze the relationship between economic growth and finance and Section 4 provides the conclusion.

2. Data and Model:

This work employs Financial Development Index (*FD*) derived by IMF, which is a composite index compiled from institutional and market based indicators for financial development. Besides testing the relationship on the basis of overall financial development index, the work tests the relationship with Financial Institutions Index (*FI*) and Financial Markets Index (*FM*) in order to capture different effects of divergent indicators for financial development on economic growth. Both indices captures different aspects of financial development that include depth (size and liquidity), access (opportunities for companies and individuals to access financial services) and efficiency (cost effectiveness of financial services with sustainable revenues and activity level of capital markets)². Moreover, this work employs the Penn World Table (compiled by Feenstra et al. (2015) and updated at 2019) for income per capita growth, human capital index, population, volume of trade and government spending shares. This work uses data between 1980 and 2018 and from 87 countries, which are not offshore financial centers³ and do not have more than 10% of oil rent shares in their GDPs.

This work estimates the unconditional growth equation by using quantile regression, which minimizes an asymmetric linear penalty function as,

$$\min_{\beta \in \mathbb{R}^k} \left[\sum_{i \in \{i: y_i \geq x_i' \beta\}} \tau |y_i - x_i' \beta| + \sum_{i \in \{i: y_i < x_i' \beta\}} (1 - \tau) |y_i - x_i' \beta| \right] \quad (1)$$

Equation 1 can be estimated through varying quantile parameters $\tau \in (0,1)$ and thus the conditional growth distribution of y (dependent variable) on x (independent variable) can be obtained. Each member of the estimated β vector for each quantile can be interpreted as the marginal change in the dependent variable with respect to a marginal change in corresponding independent variable conditional on being the τ^{th} quantile.

This work estimates average growth⁴ in per capita GDP (*GRW*)⁵ of countries between 1980 and 2018 through average financial development index/financial institution index/financial markets index and other conventional control variables in growth regressions which are logarithm of initial per capita GDP ($\ln(y_{1980})$), logarithm of average human capital index ($\ln(HAC)$)⁶, average volume of trade as percentage of GDP (*VOT*), average population growth (*POP*) and lastly average government expenditure share in GDP (*GOV*).

3. Results:

Table 1 illustrates the regression estimates for four different quantiles of the average growth in per capita GDP distribution and each equation in the table shows results for three different financial development indices. According to results, overall financial development index (*FD*) is insignificant for 20th quantile while it is significant for other quantiles. However, the effect of financial development diminishes as countries grow faster. This result means financial development has not much explanatory power on rapid growing countries. The result is compatible with Equation 3 that uses financial market development (*FM*) indicators. These two results are

² More information about financial development index and about its methodology is available at

³ List of offshore financial centers is gathered from EUROSTAT and available at https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:List_of_offshore_financial_centres

⁴ Average growth is equal to natural logarithm of the ratio of final observation and last observation divided by number of observations. $\left(\frac{\ln y_{2018}}{\ln y_{1980}} \right) / n$

⁵ Expenditure side real GDP per capita at chained purchasing power parity (in mil. 2017 US \$)

⁶ Based on years of schooling and returns to education. For further information https://www.rug.nl/ggdc/docs/human_capital_in_pwt_90.pdf

evidence of financial development's association with decreasing pace of growth rate, which shows the trade-off between financial development and economic growth (Arcand et al., 2015).

Results for Equation 2 contradicts with others, which means that development of financial institutions (*FI*) positively affects rapidly growing countries more than slower ones. However, this effect is not significant for lower quantiles while it becomes significant for upper quantiles of the conditional distribution. According to results, slow growing countries are not in an association with higher financial development, but better financial institutions affect faster growing ones increasingly (Arestis & Demetriades, 1997).

Table 1. Quantile Regression Estimates (Dependent variable: average growth rate in real GDP per capita for 1980-2018)

Variable	τ	Equation 1	Equation 2	Equation 3
<i>Constant</i>	0.20	0.0586	0.0312	0.0529
	0.40	0.1571***	0.1548***	0.1570***
	0.60	0.1570***	0.1561***	0.1568***
	0.80	0.1573***	0.1733***	0.1559***
<i>FD</i>	0.20	0.0100	-	-
	0.40	0.0302**	-	-
	0.60	0.0276***	-	-
	0.80	0.0207**	-	-
<i>FI</i>	0.20	-	-0.0081	-
	0.40	-	0.0221	-
	0.60	-	0.0235*	-
	0.80	-	0.0256**	-
<i>FM</i>	0.20	-	-	0.0087
	0.40	-	-	0.0227**
	0.60	-	-	0.0197***
	0.80	-	-	0.0184**
$\ln(y_{pc}^{1980})$	0.20	-0.0101*	-0.0061	-0.0095**
	0.40	-0.0190***	-0.0179***	-0.0180***
	0.60	-0.0179***	-0.0184***	-0.0179***
	0.80	-0.0176***	-0.0207***	-0.0165***
$\ln(HAC)$	0.20	0.0430***	0.0434***	0.0428***
	0.40	0.0342***	0.0355***	0.0322***
	0.60	0.0270***	0.0342***	0.0313***
	0.80	0.0311***	0.0405***	0.0262***
<i>VOT</i>	0.20	0.0021	0.0032	0.0036
	0.40	0.0017	0.0003	0.0034
	0.60	0.0089	0.0101	0.0117
	0.80	0.0140*	0.0131**	0.0158**
<i>POP</i>	0.20	-0.2215	-0.1050	-0.1564
	0.40	-0.7448***	-0.7925***	-0.8089***
	0.60	-0.6842***	-0.4593**	-0.6445***
	0.80	-0.5703***	-0.4770***	-0.6396***
<i>GOV</i>	0.20	0.0310	0.0137	0.0300
	0.40	-0.0023	-0.0406	-0.0165
	0.60	-0.0165	-0.0444	-0.0226
	0.80	-0.0429	-0.0499*	-0.0497**

Number of observations: 87
legend: * p<.1; ** p<.05; *** p<.01¹

¹ p-values are calculated through bootstrapped standard errors.

4. Conclusion:

The aim of the paper is to estimate the non-linear relationship between financial development and economic growth through quantile regression model. The findings in this paper suggests that financial development indices show no evidence for a relationship between economic growth and financial development among countries that are in the bottom of 20% of the conditional distribution of the average GDP growth rate. Additionally, effect of financial institutions development index on economic growth is found significant among countries in the bottom 40th quantile of average growth. However, financial development index for markets has decreasing coefficients as it moves up the conditional distribution of average GDP growth. In contrary to this fact, development index for financial institutions has an increasing positive impact among higher quantiles.

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