The Impact of Financial Sector Development on Agricultural Growth: Empirical Evidence from Pakistan

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Abstract

The paper examines the impact of financial sector development on agricultural growth in Pakistan. A Cobb-Douglas production function was used with two proxies for financial sector development, i.e. broad money M3 as proportion of GDP and agricultural loan disbursement. The study utilized annual data for the period 1981-2015. A VAR model was applied to explore the relationship between the performance of agricultural sector and improvement in financial services in the country. The results of the Johansen co integration test and VECM model reveals a significant positive relationship between agricultural growth and capital formation, farm credit disbursement and liquid liability in the financial sector. The relationship with rural labor force was mixed which may be attributed to the over employment of labor in the agricultural sector. The study is unique as it uses farm credit disbursement as an important dimension of financial services. The study recommends that for improving agricultural productivity, financial services have to be made more efficient.

Keywords: *Financial Sector Development, Agricultural Growth, Farm Credit Disbursement.*

Introduction

Agriculture is an important sector of the Pakistani economy as it constitutes 20.88% of GDP and employs 43.5% of the labor force (Pakistan Economic Survey, 2014-15). This sector in Pakistan is a key source of raw material to the industrial sector and it also contributes towards exports earnings. The climate of Pakistan is very conducive to agricultural activities having fertile land, favorable weather, vast irrigation system and a hardworking labor force (Hasan et. al., 2011). Pakistan is a prominent exporter of many agricultural commodities and ranks among the top ten producers of wheat, cotton, buffalo milk, mangoes, oranges and dates (FAO Reports, 2014-2015; Jalil & Ma, 2008).

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The agricultural sector in Pakistan faces several issues such as traditional methods of cultivation, extreme poverty, scarcity of water and power. The shortage of financial resources is a major hurdle in acquiring quality seeds, fertilizers and pesticides (Ansari, et al., 2011). These shortages are also a common problem in agricultural sectors across the world which adversely affects overall productivity. The per hectare yield of major crops in Pakistan is approximately 2747 kilograms which is lower than Bangladesh, India, China and Malaysia.

Farmers generally acquire financial assistance from money lenders for meeting their financial needs. These money lenders charge exorbitant interest rates which increases the hardship of farmers. In South Asia, money lenders are commonly called "Mahajan" who are known to exploit farmers in case of loan defaults (Mohammad et al, 2013; Khan and Senhadji, 2000). Affordable and accessible financial services are necessary to improve the productivity of the agriculture sector. However, these services are not readily available in Pakistan (Yaron, Benjamin and Charitonenko, 1998; Hicks, 1969). In addition, banks and financial institutions extend credit where the risk is low and loan recovery is high (Patrick, 1966). Therefore, agricultural loans are not always offered for meeting the financial needs of farmers (Binswanger & Khandker, 1995). In such circumstances, a fully developed financial sector may lead to financial stability and sustained economic growth.

Extensive research has been carried out to examine the relationship between development in financial services and economic performance/productivity. However, the role of financial sector development on agricultural output has remained largely unexplored. This study addresses this gap. The rest of the paper is structured as follows. The subsequent section contains a review of the literature followed by the research methodology. The results and discussion of the study are then presented followed by the conclusion.

Literature Review

An extensive literature is available on the effects of financial sector development on economic and business activities. This literature could be traced back to the nineteenth century when Bagehot (1873) created a link between the two. A pioneer in this field, Schumpeter emphasized the role of a developed financial system for mobilizing funds, managing projects, monitoring risk and promoting entrepreneurship. Growth theories have emphasized the importance of national saving as it leads to the formation of physical stock of capital and economic growth (Solow, 1956; Tenaw & Islam, 2009).

Studies have found that financial intermediation facilitates saving and resource allocation which play a significant role in promoting economic activities (Greenwood and Jovanovich, 1990; Jbili, 1997). Many studies have empirically validated unidirectional causality

between financial sector development and economic performance (King and Levine, 1993; Levine, Loayza and Beck, 2000; Christopoulos and Tsionas, 2004). On the contrary, other studies have found a two-way causality between financial sector development and economic performance (Blackburn and Hung, 1998; Khan, 2001).

A well-developed banking and financial services sector contributes positively towards economic growth and innovation. Binswanger and Khandker (1995) investigated the impact of financial sector development in 85 districts of India for the period 1972 to 1982. The study found that a developed financial system and increased lending led to a modest increase in crop output. Burgess and Pande (2005) using data from 16 Indian states over the period 1961-2000 found that progress in rural banking played a significant role in decreasing poverty and increasing farm output. Similarly, Yazdani (2008) found that a developed financial sector in Iran had enhanced capital accumulation and significantly improved farm output. Afangideh (2009) using a macro econometric model with aggregate data for a period of 1970 to 2005 found that the financial system had significantly improved the agricultural output in Nigeria.

Studies investigating the agricultural sectors of Bangladesh and Ethiopia found that banking and micro-finance services had improved the livelihood of the rural people of both countries (Tenaw & Islam, 2009). On the contrary, Khandker and Koolwal (2010) found that although a developed banking system had improved the irrigation system and electricity supply but failed to substantially reduce the poverty level in the country.

In the context of Pakistan, research suggests that private sector investment in the agricultural sector played a significant role in increasing the rate of economic growth (Ahmed et al, 2008). It has been argued that financial liberalization contributes towards the growth of the agricultural sector both in the short term and the long term (Hye and Wizarat, 2011).

Methodology

Model Specification

The study explores the effect of financial sector development on agricultural growth in Pakistan. A large number of proxies of financial development are available in the literature. Financial depth is measured as the ratio of broad money M3 to GDP. Financial development is measured using the real farm credit disbursement (Khandker and Koolwal, 2010). In addition, the labor force in rural areas is used as a measure of labor, while the real gross fixed capital formation is used as a measure of capital in the model.

The baseline model of the study is

Agricultural growth = f (Labor, Capital, Financial Development, Financial Access)
The econometric specification of the model is as follows:

$$lnY_t = \beta_0 + \beta_1 lnLab_t + \beta_2 lnK_t + \beta_3 lnM_{3t} + \beta_4 lnCr_t + \mu_t$$

Where,
Y_t = Agricultural growth in terms of major crops production index
Lab_t = Agricultural labor force
K_t = Real gross fixed capital formation in agricultural sector
M_{3t} = Ratio of broad money M_3 to GDP
Cr_t = Real farm credit disbursement to agricultural Sector
μ_t = Error term

Variables & Data Collection

Annual time series data from 1981 to 2015 was collected. The data includes the major crops production index, rural labor force, real gross fixed capital formation in the agricultural sector, ratio of M3 to GDP and real farm credit disbursement. To capture the growth in agricultural sector, crops production index (year 1999-2000=100) data was collected from the Pakistan Bureau of Statistics. The labor force data was also collected from the same source. The real gross fixed capital formation in agricultural sector data was collected from the State Bank of Pakistan. Moreover, the ratio of M3 to GDP was collected from the World Bank database. The real farm credit disbursement data was collected from the Pakistan Economic Survey, 2014-15.

Econometric Approach

First, the data was examined through descriptive analysis. The normality of the data was tested through the Jarque-Bera test. Second, we checked whether the time series data was non-stationary at level and stationary at first difference. This is a precondition for the Johansen test. The ADF test and the Phillips-Perron test were used to check whether the data was stationary or not (Phillips & Perron, 1988).

Augmented- Dickey Fuller Test

To check for unit roots or non-stationary data, the ADF-test was performed. The original Dickey-Fuller test does not take into account the possibility of autocorrelation in the error term. If unit roots are found then the data can be made stationary through differencing. The ADF equation is as follows:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + u_t$$

Where, β_1 is a constant; β_2 is the time trend coefficient; δ indicates the presence of unit root, and μ_t is an independent and identically distributed residual term.

The null hypothesis of the test is that the time series has a unit root or non-stationary. If the estimated value of the test exceeds the correct critical value at the 5% level, it implies that the time series is stationary (Gujarati and Porter, 2009).

Johansen Co-Integration Test

To determine the long run association between the variables, the Johansen co-integration test was applied. The test has a null hypothesis of no co-integration and an alternative hypothesis of one or more co-integrating relationships (Johansen, 1991).

Vector Error Correction Model

If co-integration has been identified through the Johansen co-integration test, then we can apply a VECM to evaluate the short-run dynamics.

Granger Causality Test

The causal relationship was examined using the Granger causality test. The test helps in understanding whether there is a one-way causal relation between the two variables (X→Y), two way relations (X↔Y) or no causal relation (Engle and Granger, 1987; Granger, 1969).

Results and Discussion

Descriptive Statistics

The normality test indicates that the data is normally distributed. In addition, the mean to median ratio is close to one and standard deviations are quite low reflecting low variability (Gujarati and Porter, 2009).

Unit Root Tests

The ADF and Phillips-Perron tests results indicate that the variables are non-stationary. The results are reported in Table 1. The normality test indicates that the data is normally distributed. In addition, the mean to median ratio is close to one and standard deviations are quite low reflecting low variability.

Table1: Results of unit root tests

	ADF-test statistics				Phillips-Perron test statistics			
	Constant		Trend		Constant		Trend	
	Level	1st.Dif	Level	1st.Dif	Level	1st.Diff	Level	1st.Dif
lnYt	-0.5	-7.5	-1.4	-6.4	-0.6	-9.2	-1.7	-10.3
ln Crt	0.4	-5.4	-1.8	-5.5	0.6	-5.4	-1.8	-5.6
lnKt	-0.8	-6.5	-1.6	-5.2	-0.6	-6.4	-1.6	-6.6
ln Labt	-0.3	-4.6	-1.7	-4.5	-0.3	-4.7	-2.8	-4.5
lnM3t	-2.3	-5.2	-2.4	-5.2	-2.1	-5.3	-2.3	-5.4

Note: Critical values (with constant) are -3.67 &-2.96 for 1% and 5% level,respectively. Critical values (with trend) are -4.26 and -3.52 for 1% and 5% level respectively.

Results of Co-Integration Test

The Johansen co-integration test was performed to assess whether a long run relationship exists between the variables. The results are reported in Table 2 and 3. The trace statistics in Table 2 are statistically significant at the 5% level suggesting the presence of two co-integrating equations.

Table 2: Johansen Co-integration Test (Trace Statistics)

Trend assumption: Linear deterministic trend

Series: lnY_t, $lnCr_t$, lnK_t, $lnLab_t$, $lnM_{3\ t}$

Lags interval (in first differences): 1 to 2

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen Value	Trace Statistics	5% Cr. Value	Prob
None*	0.792965	100.8092	69.81889	0.0000
At most 1	0.558407	53.56331	47.85613	0.0132
At most2	0.487058	29.04231	29.79707	0.0609
At most 3	0.258281	9.014515	15.49471	0.3640
At most 4	0.001698	0.050977	3.841466	0.8213

Trace test indicates 2 co-integrating equations at 0.05 level
**MacKinnon-Haug-Michelis (1999) p values*

Table 3 shows the maximum-eigenvalue test results. The maximum-eigenvalue statis-

tic is statistically significant at the 5% level indicating the presence of one co-integrating equation. Thus, both the trace test and maximum eigenvalue test suggest the presence of co-integration (Johansen, 1991).

Table 3: Johansen Co-integration Test (Maximum Eigenvalue Statistics)

Hypothesized No. of CE(s)	Eigen Value	Maximum Eigenvalue Statistics	5% Cr. Value	Prob**
None*	0.792965	47.24602	33.87687	0.0007
At most 1	0.558407	24.52100	27.58434	0.1176
At most2	0.487058	20.02779	21.13162	0.0708
At most 3	0.258281	8.963538	14.26460	0.2892
At most 4	0.001698	0.050977	3.841466	0.8213

Maximum-Eigen Values test indicates 1 co-integrating equation at 0.05 level
**MacKinnon -Haug-Michelis (1999) p values*

Results of Vector Error Correction Model

The VECM results are reported in Table 4. The VECM indicates the presence of a long run association among variables in the model. The results show how credit disbursement to farmers, real gross fixed capital formation, rural labor force and liquidity in the banking system effects agricultural growth in Pakistan. There is a significant effect of farm credit on crop output. In addition, an increase in gross fixed capital formation enhances agricultural output. The VECM suggests a negative relationship between labor force and agricultural production. This may be due to oversupply of labor in the agricultural sector. The availability of liquidity in the banking system has a positive effect on agricultural growth.

Table 4: VECM Results

Dependent Variable: $\ln Y_t$

Variables	Coefficient	Std. Error	t-statistics	p-value
$\ln Cr_t$	0.243	0.046	5.20	0.003
$\ln K_t$	0.101	0.052	1.93	0.009
$\ln Lab_t$	-1.599	0.189	-8.45	0.161
$\ln M3_t$	0.906	0.153	5.896	0.000
ECM_{t-1}	-0.147	0.053	-2.77	0.001

R^2= 0.873, Adjusted R^2= 0.728, F-Statistic = 3.2861, Prob (F-stat) = 0.003

The error correction term is negative and statistically significant at the 1% level. The error correction term indicates the speed of adjustment towards the equilibrium. The coefficient of error correction is -0.147, which suggests an adjustment of approximately 14% in agricultural output in the first period.

The R-squared and adjusted R-squared values indicate that the model has a reasonable fit. The overall significance of the model was examined using the F-test. The overall model is statistically significant at the 5% level. In addition, the diagnostic tests did not indicate statistical violations such as non-normality, serial correlation and heteroscedasticity.

Granger Causality Test

The Granger causality test results are presented in Table 5. The results suggest that farm credit disbursement, labor force and real gross fixed capital formation cause agricultural growth. However, the results indicate that bank liquidity does not cause agricultural growth at the 5% level of significance.

Table 5:Granger Causality Test Results

Variable	Hypothesis	F-Statistics	p-value	Decision
ln Cr_t	ln Cr does cause Granger Causality	10.4205	0.0031	Rejected
lnK_t	ln K does not cause Granger Causality	5.1019	0.0507	Rejected
ln Lab_t	ln Lab does not cause Granger Causality	19.7514	0.0001	Rejected
ln M_{3t}	lnM_3 does not cause Granger Causality	0.0734	0.787	Not rejected

Conclusion

The study examined the impact of financial sector development on agricultural growth in Pakistan. Overall, the results indicate that development in the financial sector plays a crucial role in boosting agricultural growth. Agriculture is an important sector of Pakistan with linkages to economic and business activities. Agricultural growth requires investment in capital formation, infrastructure development and farm credit disbursement. In addition, it also requires the timely availability of inputs, cultivation, storage and transportation to the market. The study also found a negative relationship between the rural labor force and agricultural growth. The negative relationship is possibly due to the over employment of untrained labor in agricultural production.

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