Bulletin of Business and Economics
http://rfh.org.pk/rfh/magazine-category/bbe

An Augmented Solow Growth Model: The Role of Agriculture Productivity and Institutional Quality in Pakistan

Muhammad Azam[1], Muhammad Irfan Chani[2] and Muhammad Wasif Siddiqi[3]

Abstract

This study evaluates the relationship of aagriculture productivity and an institutional quality with respect to economic growth in Pakistan using the time series data from 1974 up to 2010.The theoretical model is developed based on augmented Solow model is based on institutional quality and agriculture Productivity variables. The different econometric test were used for that include Phillips-Perron (PP) unit Root Test, Johansen Co integration Test in Pakistan. The results of this study is unique in context of income convergence in Pakistan considering the role of agriculture Productivity as well as institutional quality.The feedback from the study is stronger for policy implication related to agriculture sector as well as Institutional quality for Pakistan.This argued that agriculture Productivity as well as institutional quality are essential for accelerating the economic growth of Pakistan.

Keywords: Augmented Solow, Agriculture Productivity, Institutional Quality**,** Accelerating**,** Economic Growth

I. Introduction.

An agriculture sector is more crucial and plays an important role in less developed countries. The role of agriculture sector in Pakistan play an important role for economic development and it also remove poverty not only in ruler areas as well as in urban areas of Pakistan. The role of agriculture sector is undeniable because it is backbone of our economy, but the production potential relevant to agriculture sector in most of developing countries is unrealized. The under investment by government in research and development (R&D) of agriculture sector, irrigation sector, rural health and education as well as infrasture development decrease agriculture productivity. Thus low level of agriculture productivity deters the economic growth.

In recent era, role of Agricultural sector has become an important issue in context of economic development.it has attained tremendous attention in recent developing world. Fuglie (2008) argued that high level of international food prices has derived the attention

[1] Ph. D Scholar at Federal Urdu University, Islamabad, Pakistan
[2] Assistant Professor and Head of Economics Department at University of Lahore, Pakpattan, Pakistan
[3] Visiting Professor at GCU, Lahore, Pakistan

in developing world to realize the role of agriculture productivity for the better economic growth of the country.But,the agriculture sector in developing countries is also facing large of economic crises due to lack of significant consideration by their government (Diao et al., 2008). The role of agriculture sector is also realized by most of Development list economists (Rostow, 1960, Ranis and Fei, 1961) that have given significant importance agricultural productivity for industrialization.

Another strand of literature has emphasis the role institutional quality for economic growth. The institutional quality depends upon number of factors likeVoice and political risk, Regulatory quality, civil liberties etc. Institutional quality can be accessed by considering these factors in country environment (Jun and Singh, 1996). It is argued that high level of institutional quality level and government stability can play an important role for economic growth. A low level of burocratic institutional quality may become major cause for contract enforcement and procedural delays that effect negatively effect on agriculture productivity and ultimately low economic growth. Thus low levels of institutional quality also become major obstacles in process of economic growth in developing countries like Pakistan. Instead of focusing on traditional economic determinants we maybe consider the political factors that include institutional quality in context of economic growth in Pakistan.

The major bottlenecks faced by Pakistan economy are lower level of institutional quality, bad infrastructure system in rural areas that have enhanced the cost of doing business both in agriculture sector and industrial sector. A poor level of Law and order and political risk situation has generally enhanced the transaction cost for business. Similarly, civil liberties are challenging issues in Pakistan. Thus it may result in fluctuation in economic growth.

Based on this background, it becomes compulsory to evaluate following questions that include (1) **what is** role of agriculture productivity and institutional quality in context of economic growth of Pakistan (**2) what is** the rate of income convergence in consideration to agriculture productivity and institutional quality. To achieve this objective, we extend theoretical model developed by Solow (1956) neoclassical model of economic growth. Thus main motivation of this study is the lack of empirical work on institutional quality and agriculture productivity for economic growth in Pakistan.

The rest of the study is designed as follows. Section 2 describes the literature Review, Section 3 illustrate the Model Specification are given in section 3, Econometric Methodology and Data explain in section 4. The Empirical Results are discussed in section 5 and conclusion is given in Section 6.

II. Literature Review

In the neoclassical growth accounting framework, improvements in productivity or efficiency are treated as exogenous. According to the basic neoclassical model as expounded by Solow (1956), productivity exogenously by technology. There is no empirical study available in context of Solow model formations that have discussed the agriculture Productivity and institutional quality in Pakistan in a combined or disaggregate format. Similarly, there have been very few studies estimating TFP growth for the agriculture sector of Pakistan.

The pioneering among these is the study by Wizarat (1981). She used annual time series data for the period 1953-1979 to estimate arithmetic TFP index in the growth accounting framework. According to her estimates TFP growth in the agriculture sector of Pakistan remained at 1.1 percent.

Mirza et,al., (2010) identify that institutional environment of transition countries in Eastern Europe affects productivity growth in the agricultural sector. Situated in a neoclassical growth framework, a dynamic panel model for the period 1996-2005 provides evidence that poor institutional quality leads to a slowdown in agricultural productivity growth. Productivity growth is limited by a high degree of corruption that may deter the economic growth using linear regression model.

The role of institutions have been highlighted in most of empirical literature for developing and developed world for economic growth(North,1990).According to UNCTAD(1997) stable political environment is key for economic development and it may also attract more investment from outside the world within country(Mauro,1998).Kruger(1974) argued that profitable economic activity that is mismanaged by bad governance will results the high payoff to the economy and civil society also.Similarly,the counter arguments are also available that bad governance system or corrupt government may help in removing the procedural delays in any activity and it has positive effect on economic growth(Lui,1985). Based on these arguments it is unclear that institutional quality has positive or negative effect for our economy. By summarizing the empirical literature, main motivation of conducting this study is lack of empirical work in context of agriculture productivity and institutional quality in Pakistan.

III. Model Sepacification

For achieving the objectives of our study, we start the Cobb-Douglas production function .we formulate the augmented Solow model by starting from the Cobb-Douglas production function such as:

$$Y_t = (K_{(t)})^{\alpha}, (L_{(t)} A_{(t)})^{1-\alpha} \text{....................(1)}$$

Where: Y, K, L and A denote output, private capital stock, labor force, and technology respectively.

The production functions designed for study also include agriculture productivity that play an important role for economic growth.similarly, the role of institutional quality for economic growth is most important. Keeping into the consideration of these two factors that have prominent role in output of a country. The Solow model can be extended including these two factors .the per capita form of our model can be written as

$$Y_t = (K_{(t)})^{\alpha}, (A\text{p})^{\gamma} (IQ)^{\delta} (L_{(t)} A_{(t)})^{1-\alpha-\gamma-\delta} \text{.................................(2)}$$

$\alpha \succ 0, \gamma \succ 0, \delta \succ 0, 1-\gamma-\delta \succ 0$

The per capita form of our model can be written as

$$y_t = f(k_{(t)})^{\alpha}, (a\text{p})^{\gamma}(iq)^{\delta}(L_{(t)}A_{(t)})^{1-\alpha-\gamma-\delta} \text{..}(3)$$

The dynamics of change of capital over time can be written as

$$\frac{\partial k / \partial t}{k} = \frac{sf(k)}{k} - (n+g_A+\delta)k_t \text{.................}(4)$$

The equation can be written as

$$\dot{k}(t) = s_K y - (n+g_A+\delta)k_t \text{...................................}(5)$$

$$A\dot{\text{p}}(t) = s_{a\text{p}} y - (n+g_A+\delta)A\text{p}_t \text{....................................}(6)$$

In the above equation, **s**Ap is used for share of Agriculture productivity in output and $(n+g+\delta)A\text{p}$ is used for depreciation purpose. In, similar way the institutional quality accumulation can be shown as:

$$I\dot{q}(t) = s_{iq} y - (n+g_A+\delta)Iq_t \text{.....................................}(7)$$

The growth rate of capital stock, agriculture productivity and institutional qulaity can be written as respectively,

$$\dot{g}_k = \frac{\dot{k}}{k} - g_A - n - \delta \text{...................................}(8)$$

$$\dot{g}_{a\text{p}} = \frac{A\dot{\text{p}}}{A\text{p}} - g_A - n - \delta \text{.......................}(9)$$

$$\dot{g}_{iq} = \frac{I\dot{Q}}{IQ} - g_A - n - \delta \text{...................}(10)$$

While

$$\dot{g}_A = \frac{\dot{A}_t}{A}$$

$$n = \frac{\dot{L}_t}{L}$$

The economy converges to steady state levels that can be derived as

$$\overline{k_t} = [\frac{s_k^{1-\gamma-\delta} s_{a\text{p}}^{\gamma} s_{iq}^{\delta}}{n+g_A+\delta}]^{\frac{1}{1-\alpha-\gamma-\delta}} \text{...............................}(11)$$

$$\overline{ap}_t = [\frac{s_k{}^{\alpha} s_{ap}{}^{1-\alpha-\delta} s_{iq}{}^{\delta}}{n+g_A+\delta}]^{\frac{1}{1-\alpha-\gamma-\delta}} \text{.........................(12)}$$

$$\overline{Iq}_t = [\frac{s_k{}^{\alpha} s_{ap}{}^{\gamma} s_{iq}{}^{1-\alpha-\gamma}}{n+g_A+\delta}]^{\frac{1}{1-\alpha-\gamma-\delta}} \text{.....................(13)}$$

The steady state per capita output (yt) can be written such as:

$$\overset{*}{y} = [\frac{s_k{}^{1-\gamma-\delta} s_{ap}{}^{\gamma} s_{iq}{}^{\delta}}{n+g_A+\delta}]^{\frac{\alpha}{1-\alpha-\gamma-\delta}} [\frac{s_k{}^{\alpha} s_{ap}{}^{1-\alpha-\delta} s_{iq}{}^{\delta}}{n+g_A+\delta}]^{\frac{\gamma}{1-\alpha-\gamma-\delta}} [\frac{s_k{}^{\alpha} s_{ap}{}^{\gamma} s_{iq}{}^{1-\alpha-\gamma}}{n+g_A+\delta}]^{\frac{\delta}{1-\alpha-\gamma-\delta}} (L(t)A(t))^{1-\alpha-\gamma-\delta} \text{..........(14)}$$

After solving this equation, the per capita output can be written as at steady state level

$$\ln \overset{*}{y} = \ln A_0 + g_A(t) + \frac{\alpha}{1-\alpha-\gamma-\delta}\ln[s_k] + \frac{\gamma}{1-\alpha-\gamma-\delta}\ln[s_{ap}] + \frac{\delta}{1-\alpha-\gamma-\delta}\ln[s_{iq}]$$
$$-\frac{\alpha+\gamma+\delta}{1-\alpha-\gamma-\delta}\ln(n+g_A+\delta) \text{.....(15)}$$

The augmented form of Solow model can be used to make appropriate approximation around the steady state level .The speed of convergence around steady state level can also be approximated with growth equation of per capita output that can be specified as

$$\frac{d\ln(y_t)}{dt} = \lambda\{\ln \overset{*}{y} - \ln y_t\}$$

The convergence rate can be written as

$$\lambda = \{n + g_A + \delta\}(1-\alpha-\gamma-\delta)$$

The regression equation towards steady state convergence can also be specified as

$$\ln y_t = \{1-e^{-\lambda t}) \ln \overset{*}{y} + e^{-\lambda t}\ln(y_o)$$

In the above equation (y_o) represent the initial income level subtract on both sides of equation (22).thus equation can be written as

$$\ln(y_t - y_0) = (1-e^{-\lambda t})\ln \overset{*}{y} - (1-e^{-\lambda t})\ln(y_o) \text{..............................(16)}$$

Putting the value of ($\ln \overset{*}{y}$) the per capita output at steady state level from equation (15) into equation (23).Thus the final growth equation can be specified such as

$$gy=(1-e^{-\lambda_t})\left[\begin{array}{l}\ln(A_0+g_A(t))+\frac{\alpha}{1-\alpha-\gamma-\delta}\ln[s_k]+\frac{\gamma}{1-\alpha-\gamma-\delta}\ln[s_{ap}]+\frac{\delta}{1-\alpha-\gamma-\delta}\ln[s_{iq}]\\ -\frac{\alpha+\gamma+\delta}{1-\alpha-\gamma-\delta}\ln(n+g_A+\delta)\end{array}\right]-(1-e^{-\lambda_t})\ln(y_0)\text{........}(17)$$

III.I Econometric Model's specification

The above mention augmented form of model can be specified in econometric regression equation so that it can be empirically estimated .the final form equation can be written as

$$y_t=\beta_0(\ln A_0+t)+\beta_1\ln(y_0)+\beta_2\ln[HC]+\beta_3\ln[\mathbf{p}C]+\beta_4[\mathbf{p}R]+\beta_5[CL]+\beta_6[Tf\mathbf{p}i]+\beta_7\ln(n+g_A+\delta)+\varepsilon_t\text{........}(18)$$

The variables are explained below

$\ln(y_0)$ = log of initial level of per capita income

$\ln(HC)$ = Log of per capita human capital

$\ln(\mathbf{p}C)$ = Log of per capita physical capital

$(\mathbf{p}R)$ = Political Risk

(CL) = Civil liberties

(TFpI)=Total factor productivity index

$\ln(n+g_A+\delta)$ = log of combination of population growth rate ,technological growth rate and depreciation rate.

IV. Econometric Methodology and Data specification

The time series data normally face non stationary issues because of time trend. Thus regression findings may be spurious and become misleading for policy prescription point of view (Granger, Newbold, (1974)). Phillips (1986) argued that Ordinary Least Square (OLS) are not reliable in absence of co integration. To make economic results more reliable stationary checking and co integrating relationship is preliminary step.

IV.I Unit Root Test

The most of Time series data face problem of non-stationarity and time trend is included for. The application of OLS on non-stationary data may lead to spurious results (Granger and Newbold, 1974). Philips (1986) argue that most of regression results may be misleading in case of absence of long run co-integration. The Data stationarity preliminary requirement for long co-integration. In case of co integration, the Ordinary Least Square (OLS) results are most reliable.

Phillips and Perron (1988) introduce unit root tests used in financial time series analysis. The Phillips-Perron (PP) unit root tests are mainly different from ADF test on the serial bases of correlation and heteroskedasticity condition. ADF tests are most useful for parametric evaluation related to auto-regression for ARMA structure approximation related to errors that exist in regression estimation, the PP tests has property of ignoring serial correlation issue that exist in regression estimation. The PP tests is more preferable over ADF test because of robustness found in general formulation of heteroskedasticity that exist in error term u_t. Furthermore, pp–t statistics application do not need to lag length specification use for regression analysis.

IV.II. Johansen co-integration test

Phillips(1986) Point out that regression results may be misleading if co integration does not exists.thus for cointegration stationary of variables is Prequist condition obtained from ordinary least square (OLS) and OLS results will be reliable if variables are stationary.Johansen and Juselius (1990) developed new technique concerning to co-integration associated to evaluate the long run relationship concerning to multivariate equation.Johansen and Juselius (1990) test is based upon maximum likelihood test for evaluating the number of co-integrating vectors inform of Vector Autoregressive (VAR) indication .The VAR representation is given as

$$z_t = \mu + \alpha_t z_{t-1} + \dots\dots\dots + \alpha_k z_{t-k} + e_t \dots\dots\dots(4)$$

where *z* show $(n\times1)$ vector that is composite of variables having order of integration that is equal to 1, β is composite of $(n\times1)$ vector that indicate the constant terms, α show the parameters of the VAR model and e*t* is for error term that is identically distributed .Furthermore ,Johansen test is based upon maximum Eigen values and trace statistics .

IV.III Data specification

For empirical evaluation, the time series data of Pakistan is taken into consideration that starts from 1974 up to 2010. The Data for per capita income, Human capital, physical capital, population growth rate is taken from World Development Indicator (WDI).The data on Institutional quality that pertain the civil liberties and political Risk is taken from Freedom House Data source.

IV.IV Construction of Total Factor productivity Index for Agriculture sector

Following Wen (1993), TFP Index can be calculated as:

$$TF\mathrm{p}I = \frac{GVAO*100}{\beta(Land)+\delta(ca\mathrm{Pital})+\phi(labor)+\eta(Materialin\mathrm{P}utindex)}$$

Where the output index is shown by Gross Value of Agricultural Output (GVAO). The input index in the denominator is a linear aggregation of cultivated land area, for capital is gross capital formation in agriculture sector is used, for labor inputs the total labor force participating in agriculture sector. For material inputs, the index is developed that include the fertilizers usages per square kilometer, the number of tractors used in agriculture sector, the raw material imports for agriculture sector. The material input index is developed following the first principal components method. The data for constructing this index is taken from different sources that include Hand book of statistics and the World Development Indicator (WDI) data sources .All the values are converted into same units that are inform of $ per Millions. The constructed index value is almost consistent to following previous studies (Wizarat, 1981; Khan, 1994; Ali, 2004).

V. Emperical Results

On the bases of data analysis, the empirical findings and results are discussed in this part of the paper. The main concern of the present study is to address the role of agriculture productivity and institutional quality role for economic growth of Pakistan. For this purpose, the augmented form of solow model is used that also contain the traditional solow variables along with the agriculture productivity and institutional quality. The institutional quality is empirically evaluated with the civil liberties as well as the political risk in Pakistan. The present study investigates at the first instance that either long run co-integration exist or not among the economic variables in the model. The data stationary is preliminary condition for co-integration analysis. Thus our estimation starts with testing the unit root problem found in the data. For analysis of co-integration, first of all we try to find out the stationary of the economic variables present in model and then further processes.

The stationary of variables is checked out through Phillips-Perron (PP) test. Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC) have been used for maximum lag selection. The PP test results are given in Table5. 1.

Table 5.1		
Phillips-Perron test statistic at level I(0)		
Variables	Adj. t-Stat	Prob.
CL	1.849017	0.9996
HC	-1.97222	0.2999
(n+g+d)	0.271060	0.9725
GDPP	-1.5060	0.5023
Pc	-0.315708	0.9108
Pr	-1.53333	0.4033
TFPI	-0.3056	0.9433

The above mention result indicate that neither variable is stationary at level I(0). So, the null hypothesis is rejected and alternative hypothesis is accepted that exist unit root. Consequently, all the variables are not stationary at level I(0). So for further analysis the first difference of all the variables is taken. The results of the PP test at I(1) are shown in the table5. 2.

Table 5.2		
Phillips-Perron test statistic at first difference I(1)		
Variables	Adj. t-Stat	Prob.
D(LC)	-7.54351	0.0000
D(HC)	-5.5006727	0.0006
D(n+g+d)	-5.091850	0.0003
D(GDPP)	-4.9509	0.003
D(Pc)	-7.52965	0.000
D(Pr)	-4.52965	0.0040
D(TFPI)	-5.79933	0.0020

The above results depict that all of our variables of the model are stationary at I(1). In Table:5. 3 given below, the criteria for variables lag order selection are presented. On the basis of these criteria, an optimal lag length has been selected.

Table.5.3

VAR Lag Order Selection Criteria
Endogenous variables: TFP CL GDPP HC NGD PC PR
Exogenous variables: C
Date: 07/01/12 Time: 18:29
Sample: 1974 2010
Included observations: 35

Lag	LogL	LR	FPE	AIC	SC
0	-66.87319	NA	1.61e-07	4.221325	4.532395
1	143.9012	325.1948	1.65e-11	-5.022926	-2.534370
2	249.9481	121.1964*	9.02e-13*	-8.282746*	-3.616702*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

In view of the number of variables to be studied, the number of observations and lags constraint of the co-integration test, the maximum two lags, are allowed to select the optimum lag length in Vector Auto-Regressive (VAR) process. Lag selection Criteria like Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), Final Prediction Error (FPE), Sequential Modified Likelihood Ratio (LR) and Hannan-Quinn Information Criterion (HQ) suggest an optimal lag length of 1 in Table 3. On the bases of above result we select the lag length 2 for further evaluation.

For testing co-integration among Per capita income, agriculture Productivity, Institutional quality variables for Pakistan Johansen co-integration methodology is used. Trace statistics λ_{trace} and Maximum Eigen value statistics are utilize for co-integration. The rejection of null hypothesis (no co-integrating vector) is basically acceptance of alternative hypothesis (co-integration exists). The initial steps test the null hypothesis ($R = 0$) mean no co integration found in economic variables. The trace-test value 307.911 that is above critical value of 125.61and it is statistically significant at 5% level. Thus null hypothesis is rejected $R = 0$ and alternate hypothesis is accepted $R \geq 1$. Thus null of

$R \leq 1$ can be rejected in against alternate hypothesis $R \geq 2$. Overall results indicate that there exist five co integrating vectors in our model. The Maximum Eigen statistics are also reported in Table 5. 4.

The coefficients on initial level of per capita income have the expected negative sign and are indicating strong evidence of unconditional convergence. Thus in considering the role of agriculture Productivity and factors for institutional quality the per capita income of Pakistan economy converges at rate of 9 Percent and is consistent to the study (BAROSSI, 2005).The sign of Per caPita human capital is Positive but insignificant. The logical argument in this context have been discussed by (Barro, et.al, 1996) who argue that labor force available in developing countries is not so much trained or having more efficient skills that may contribute significantly through usage of latest technological development. Thus human capital in developing world has no significant contribution in economic growth. The one Percent increase in Population growth rate deteriorate the Per capita income with 0.52 Percent. .the one Percent increase in per capital Physical capital increase the Per capita income with 0.82 Percent. Similarly, the one unit increase in total factor productivity increase the Per capita income with 0.003units. The one unit change in political risk the per capita income deteriorated with 0.017 units in Pakistan. While civil liberties have negative sign but it is insignificant.Thus it predicts that agriculture productivity and the high level of political risk or low institutional quality have effect (positively and negatively respectively) on per capita income in long run in Pakistan. Furthermore, in consideration the role of agriculture productivity and institutional quality the Per capita income converges at rate of 9 Percent which is high level of sPeed of convergence.

Table 5.4.

Date: 07/01/12 Time: 13:42
Sample (adjusted): 1977 2010
Included observations: 34 after adjustments
Trend assumption: Linear deterministic trend
Series: CL GDPP HC NGD PC PR TFP
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.964709	307.9110	125.6154	0.0000
At most 1 *	0.883042	194.2103	95.75366	0.0000
At most 2 *	0.742618	121.2484	69.81889	0.0000
At most 3 *	0.593302	75.10381	47.85613	0.0000
At most 4 *	0.548416	44.51451	29.79707	0.0005
At most 5 *	0.399981	17.48470	15.49471	0.0248
At most 6	0.003456	0.117701	3.841466	0.7315

Trace test indicates 6 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.964709	113.7007	46.23142	0.0000
At most 1 *	0.883042	72.96192	40.07757	0.0000
At most 2 *	0.742618	46.14455	33.87687	0.0011
At most 3 *	0.593302	30.58929	27.58434	0.0199
At most 4 *	0.548416	27.02982	21.13162	0.0066
At most 5 *	0.399981	17.36700	14.26460	0.0157
At most 6	0.003456	0.117701	3.841466	0.7315

Max-eigenvalue test indicates 6 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

After confirmation of co integration vectors, we estimate long run coefficients through (OLS) regression equation. The long run coefficients results are given such as in Table 5.5

Table 5.5

Variable	Coefficient	t-Statistic
C	3.218228	4.919363*
@TREND	0.016733	0.002487
GDPP(-1)	-0.094593	-1.396305***
HC	0.001952	0.016690
NGD	-0.521851	-1.663829**
PC	0.820692	16.57458*
TFP	0.002906	5.257196*
PR	-0.010706	-2.566522*
CL	-0.000259	-0.032716
R-squared	0.997011	
Adjusted R-squared	0.995935	

The*,**,*** shows the level of significance respectively at 5%,10%,and 20% level.

V. Conclusion

This study gives us new evidential detail concerning to relationship among agriculture productivity and institutional quality the Per caPita income of Pakistan. The main evaluation of the study is that there is long-run relationship among variables mention the above model for Pakistan. Furthermore, the development of new theoretical augmented

Solow model for understanding the role of agriculture Productivity and institutional quality variables for Per caPita income of economy of Pakistan. The agriculture sector which is backbone of Pakistan economy is neglected sector for having no significant investment for its betterment is taken Place in Pakistan.Similarly,the role of Political economy that include the institutional quality level is new Paradigm that must be taken into consideration. The overall result suggests that in considering these two sectors the agriculture sector and by improving the quality of our institutional system through rectifying the Political risk factor, we can accelerate the Per caPita income with rate of 9 Percent that converge towards equlibrium.Thus Policy makers should seriously concerned in rectifying or designing such Policies that are for betterment of agriculture sector as well as bring Political stability in Pakistan.

The future research work will be worthwhile if this augmented Solow model is tested by analyzing the Provincials level data of Pakistan. The conditional and unconditional model can be testified for Provincials level data that may give better Picture of Pakistan economy among different Provinces.

VI. References

Ali, S. (2004). Total Factor Productivity Growth in Pakistan's Agriculture, 1960-96. *The Pakistan Development Review*, 43(4), 493-513.

Barro, R. J. and Lee, J. W. (1996). International measures of schooling years and schooling quality. *American Economic Review*, 86, 218-223.

Diao, X. Fan, S. Heady, D. Johnson, M. Nin, P. A. and Yu, B. (2008). Accelerating Africa's food production in response to rising food prices – Impacts and requisite actions. ReSAKSS Working Paper No.3. Washington DC: International Food Policy Research Institute.

Fuglie, K. (2008). Is a slowdown in agricultural productivity growth contributing to the rise in commodity prices? *Agricultural Economics*, 39, 431–441.

Granger, C. W. J. and Newbold, P. (1974). Spurious Regression in Econometrics. *Journal of Econometrics*, 2(1), 111-120.

Jun, K. W. Singh, H. (1996). The determinants of foreign direct investment: new empirical evidence. *Transatlantic Corporations* 5, 67–106.

Johansen, S. and Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration – with Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics*, 52, 169-210.

Khan, M. H. (1994). The structural adjustment process and agriculture change in Pakistan in the 1980s and 1990s. *The Pakistan Development Review*, 33(4), 533-591.

Krueger, A. (1974). The Political Economy of the Rent-Seeking Society. *The American Economic Review*, 64, 291-303.

Lui, F. T. (1985). An equilibrium queuing model of bribery. *Journal of Political Economy*, 93, 760-781.

Mirza, K. U. Ahamed, N. M. Rahmatullah, N. Akhter, K. N. and M. L. Rahman. (2010). Plant growth characters and productivity of wetland rice (Oryza sativa L.) as affected by application of different manures. *Emir. J. Food Agric*, 22(1), 46-58.

Mauro, P. (1998). Corruption: Causes, Consequences, and Agenda for Further Research. *Finance and Development*, 35, 11-14.

Phillips, P. (1986). Understanding spurious regressions in econometrics. *Journal of Econometrics*, 31, 311-340.
Phillips, P. C. B. and Perron, P. (1988). Testing for a Unit Root in Time Series Regressions. *Biometrika*, 75, 335-346.
Rostow, (1960). *The Stages of Economic Growth: A Non-Communist Manifesto*. Cambridge: The University Press, 1960.
Ranis, G. and Fei, J. C. H. (1961). A Theory of Economic Development. *American Economic Review*, 51, 533-565.
Robert M. and Solow F. (1956). A Contribution to the Theory of Economic Growth. *The Quarterly Journal of Economics*, 70(1), 65-94.
UNCTAD (1997). Trade and Development Report, 1997. New York and Geneva, United Nations.
Wizarat, S. (1981). Technological Change in Pakistan's Agriculture, 1953-54 to 1978-79. *The Pakistan Development Review*, 20(4), 427-445.

Appendix

Total Factor productivity Graph