Pakistan Journal of Social Research
Vol. 2, 2020, pp. 17-22
www.pjsr.com.pk

DETERMINANTS OF GDP GROWTH AND MODELING ISSUES: EVIDENCE FROM PAKISTAN

Dr. Shahzad Farid
Assistant Professor, Department of Sociology, University of Okara, Okara, Pakistan
Email: s.farid@uo.edu.pk

Sajjad Hussain
PhD Scholar, Department of Sociology, International Islamic University, Islamabad Pakistan

Muhammad Farooq Ahmad
PhD Scholar, Department of Sociology, Quaid-i-Azam University, Islamabad Pakistan
Email: farooqayaz@gmail.com

ABSTRACT
The study claimed that economic variables, exclusively, have been prioritized to determine GDP growth while social variables are comparatively vigorous for the determination. Therefore, the study determined GDP growth using economic variables which produced robust results whereas the social variables determined GDP growth concretely. This indicated the modeling issues in terms of economic variables to be used solely. I concluded that social variables to determine GDP growth (using Granger causality) satisfy the conditions of causality – necessity and sufficiency – and formulated a narrative equation (equation a) that reflected most effective predictor(s) of GDP growth.
Keywords: GDP growth, Modeling, Social factors, Economic factors

INTRODUCTION
Open economies of the world are being influenced by the surge of globalization (Afzal, Ehsan, Butt, & Fatima, 2013) that penetrated into economic policies. It is the expansion of globalization that effected GDP(Nunnenkamp, 2002; Rodrik, 2008), openness(Khan & Qayyum, 2007; Shahbaz, 2012), foreign directed investment(Kalim & Shahbaz, 2009; Nunnenkamp, 2002) and several other core economic catalysts of a country's wealth. There are various factors that determine the economic development of a nation in globalized world but GDP growth is an essential factor that has always been taken into account in this regard. There are several dynamics that effects GDP growth in global village e.g., openness(Baldwin, 2004; Edwards, 1993), foreign direct investment(Falki, 2009; Saqib, Masnoon, & Rafique, 2013), foreign aid(Fatima, 2014), inflation(Mubarik & Riazuddin, 2005; Qayyum, 2006), remittances(Adams Jr, 1998; Iqbal & Sattar, 2010), and education expenditures (Hill & King, 1995; Sylwester, 2000) and these variables have globally analyzed to determine the economic development of a country.

Although, a huge amount of literature and modeling to determine the economic development is available that explain GDP growth in relation with different influencing variable but, in the context of Pakistan, openness of economy has been neglected (Iqbal & Zahid, 1998) therefore, the neglected variable is also included into study. It was identified that though Iqbal and Zahid (1998) in their study on macroeconomic determinants of economic growth in Pakistan included the openness as one of the determinants of economic growth and empirically concluded primary education as a prerequisite to accelerate economic growth but they excluded the expenditures on education from their modeling. Hence, in the present study, expenditures on education were also selected as independent variable. Whereas, the other selected variables i.e., investment, FDI, currency exchange rates, aid, M_2 as percentage of GDP and personal remittances, have been used in various studies in relation with economic growth. Another variable, i.e. unemployment, which is included in this study, has not been selected in other studies to evaluate the GDP growth whereas unemployment was taken as dependent and GDP growth as

independent variable in different empirical studies in the context of Pakistan(Maqbool, Mahmood, Sattar, & Bhalli, 2013; Wajid & Kalim, 2013).

This paper deals with selected economic and social variables to determine either they effect GDP growth or not? The study is organized, analytically, into two sections. Section first aimed to identify the effects of selected economic variables on GDP growth (prior and after the unit root analysis). Section two dealt with the effects of selected social variables on GDP growth.

METHODS AND DATA

Initially, the study aimed to explore the relationship of economic variables i.e. openness, investment, foreign direct investment, foreign aid, average exchange rate, educational expenditures, money supply (M_2), unemployment rate and personal remittances (received in U.S dollars), with GDP growth. I used the annual time series data for the years of 1972-2012 which was collected from Economic Survey of Pakistan, Federal Bureau of Statistics, State Bank of Pakistan and World Bank. To avoid the spurious results, I evaluated stationarity of time series data. For this purpose, I applied Augmented Dickey-Fuller (ADF) test developed by (Dickey & Fuller, 1981) that measures the unit root problems of time series data which represents whether the data is non-stationary?. Non-stationary data is unpredictable and unable to be forecasted or modeled. The equation of the ADF is as follow:

$$(1\text{-L})Y_{t=a} + \mu Y_{t-1} + \sum_{i=1}^{k} \beta i\ (1\text{-L})\ Y_{t-i} + \text{ut} \quad \ldots\ldots\ldots\ldots\ldots (1)$$

Where, L is a lag operator, t denotes time trend, and u_t is a white noise error term. Y_t denotes the variables for which study is testing unit root problem. Y_{t-i} are the lagged values of variables of our study. β_i are the coefficients of lagged values of Y_{t-i} to capture the optimum lag length (k), k ensures that there is no correlation between error term and regressors of this equation. Lag length is selected by AIC criterion. The equation is only with constant α and includes also time trend γt afterward along with constant. ADF test checks the statistical significance of μ, if μ has statistically zero value then Y_t has unit root problem and is non-stationary. If μ is not statistically zero, then there is not a problem of unit root and Y_t is stationary.

Before Augmented Dickey-Fuller (ADF) test analysis, I conducted ordinary least square (OLS) regression on time series data (see table 2) that directed toward the unit root problems due its spurious outcomes. The unit root problem was solved by ADF test and the data was used for the ordinary least square (OLS) regression modeling with first difference. The OLS regression model was developed which is as follow:

$$\text{GDPG} = \beta_0 + \beta_1(\text{openn}) + \beta_2(\text{Invgdp}) + \beta_3(\text{Fdigdp}) + \beta_4(\text{Aid}) + \beta_5(\text{Excr}) + \beta_6(\text{Eexp}) + \beta_7(\text{M}_2\text{gdp}) + \beta_8(\text{Unemp}) + \beta_9(\text{Rem}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where:

OPENN: Trade Openness [exports (in million dollars) +imports (in million dollars) and divided the result by GDP (in million dollars)].
INVGDP: Investment as a percentage of GDP
FDIGDP : FDI as percentage of GDP
AID : Foreign AID in million dollars (last 2 values of 2011 and 2012 are approximate)
EXCR: Average exchange rate during the year of Pak. rupee with U.S dollar
EEXP : Education expenditures (in million rupees)
M_2GDP: M_2 (money supply including M_1) as percentage of GDP
UNEMP: Unemployment rate in percentage
REM : Personal remittances received in current U.S dollars

EMPIRICAL ANALYSIS AND RESULTS

Before conducting ordinary least square regression test, the stationarity properties of the variables have been checked by using Augmented Dickey-Fuller (ADF) unit root test. To determine the order of integration of time series, unit root test has been applied on level as well as first difference. The table-1

shows the results of ADF unit root test. Stationarity of all variables has been tested with intercept and trend. Results indicate the acceptance of the unit root hypothesis in the level, then time series become stationary in first difference, in other words all the variables are integrated of order one, I(1).

Table 1

Unit root test for selected variable from time series data

Variables	Augmented Dickey Fuller test		
	t	DW stat	*P*
GDPG	-4.492192[a]	2.079674	0.0009
*D(OPENN)	-5.712245 [a]	1.985884	0.0000
INVGDP	-4.375446 [a]	2.152266	0.0013
D(FDIGDP)	-4.749249 [a]	1.992384	0.0006
D(AID)	-6.182556 [a]	2.101007	0.0000
D(EXCR)	-6.157548 [a]	2.109119	0.0000
EEXP	-5.224296 [a]	1.758801	0.0002
M2GDP	-3.670573 [a]	1.982743	0.0087
D(UNEMP)	-7.411209 [a]	2.006175	0.0000
D(REM)	-9.053402 [a]	2.185037	0.0000

Note: *D shows first difference; a represents stationarity at 1%

Table 2

Ordinary least square regression on time series data

Variables	Coefficients	St. Error	t-value	*p*-value
C	13.14815	6.094421	2.157408	0.0397
OPENN	-3.167146	13.33753	-0.237461	0.8140
INVGDP	-0.719789	0.220245	-3.268128	0.0029
FDIGDP	2.276867	0.681555	3.340695	0.0024
AID	0.000320	0.000522	0.612681	0.5450
EXCR	-0.220126	0.042113	-5.227046	0.0000
EEXP	-3.46E-07	8.76E-07	-0.395463	0.6955
M2GDP	0.076973	0.093748	0.821067	0.4185
UNEMP	1.087295	0.314895	3.452878	0.0018
REM	0.000852	0.000286	2.976147	0.0060
R squared	0.559607	Adjusted R^2	0.418052	
Sum squared resid..	64.73035	Log likelihood	-64.03990	

Table 2 depicts the ordinary least square regression model without first difference. The multiple regression accounted 56% of variability as indexed by R^2statistic but the analysis represents the robust results because the analysis was conducted prior to the unit root analysis. Therefore, the same regression model was performed with first difference of the selected variables after the unit root analysis of selected variables.

Table 3 shows the computed results of OLS with first difference of the variables. The value of R^2 indicated that predictors explained 36% of variability (R^2=0.36, F=1.70, p<.05). The coefficients of these variables indicated that they predict GDP growth non-significantly but the coefficients of variables revealed the magnitude of effects of each variable on GDP growth as openness has non-significant effect on GDP growth (β=21.3, p>.05).

Table 3
Ordinary least square regression with first difference

Variables	Coefficients	St. Error	t-value	*p*-value
C	5.618184	0.441988	12.71117	0.0000
D(OPENN)	21.32455	17.14022	1.244124	0.2241
D(M2GDP)	-0.012026	0.101123	-0.118921	0.9062
D(INVGDP)	-0.234180	0.319947	-0.731934	0.4705
D(REM)	-8.53E-05	0.000681	-0.125357	0.9012
D(UNEMP)	0.047095	0.378615	0.124388	0.9019
D(EEXP)	-8.32E-07	8.54E-07	-0.974456	0.3385
D(EXCR)	-0.234528	0.161097	-1.455820	0.1570
D(FDIGDP)	1.148694	0.930956	1.233887	0.2279
D(AID)	0.000304	0.000491	0.620235	0.5403
R squared	0.362581	Adjusted R^2	0.150108	
Sum squared resid.	91.96962	Log likelihood	-69.34572	

Due to the robust time series and first difference OLS modeling inferences, the results directed toward the specification of Granger Causality Model which is as follow:

$$(GDPG)_t = \alpha + \sum_{i=1}^{m} \beta(GDP)_{t-I} + \sum_{j=1}^{n} \tau_j(POPG)_{t-j} + \mu_t \quad \ldots\ldots\ldots\ldots (3)$$

$$(POPG)_t = \alpha + \sum_{i=1}^{m} \beta(GDP)_{t-I} + \sum_{j=1}^{n} \tau_j(GDPG)_{t-j} + \mu_t \quad \ldots\ldots\ldots\ldots (4)$$

We specified the bilateral model of GDPG and POPG whereas the modeling equation can be more explicit if POP, LEXPT, HCR and LITR placed in both (3) and (4) as independent and dependent variables. The results of the Granger Causality Model are mentioned in table 4.

Table 4
Model 3: Pairwise Granger Causality Model

	Lag 1		Lag 2	
Null Hypotheses	F. Stat	*P*	F. Stat	*P*
POP does not Granger Cause GDPG	1.48460	0.2310	0.80118	0.4573
GDPG does not Granger Cause POP	0.37577	0.5437	0.87252	0.4273
POPG does not Granger Cause GDPG	1.31832	0.2585	1.03753	0.3656
GDPG does not Granger Cause POPG	0.94521	0.3374	0.07914	0.9241
POP does not Granger Cause HCR	0.27746	0.6016	0.01780	0.9824
HCR does not Granger Cause POP	0.95256	0.0123	6.81245	0.0033
POPG does not Granger Cause HCR	0.15964	0.6918	0.06985	0.9327
HCR does not Granger Cause POPG	0.12721	0.7234	0.00046	0.9995
POP does not Granger Cause LEXPT	2.57886	0.1170	1.49222	0.2397
LEXPT does not Granger Cause POP	4.64907	0.0378	2.86311	0.0714
POPG does not Granger Cause LEXPT	0.57881	0.0.4517	0.23143	0.7947
LEXPT does not Granger Cause POPG	10.9473	0.0021	1.50812	0.2362
POP does not Granger Cause LITR	4.41278	0.0427	5.10006	0.0117
LITR does not Granger Cause POP	8.63740	0.0057	7.26502	0.0024
POPG does not Granger Cause LITR	5.51629	0.0244	4.82977	0.0145
LITR does not Granger Cause POPG	60.6669	0.0652	6.06707	0.0057
POPG does not Granger Cause POP	1.94305	0.1719	4.23504	0.0231
POP does not Granger Cause POPG	43.7850	0.0000	4.24241	0.0229

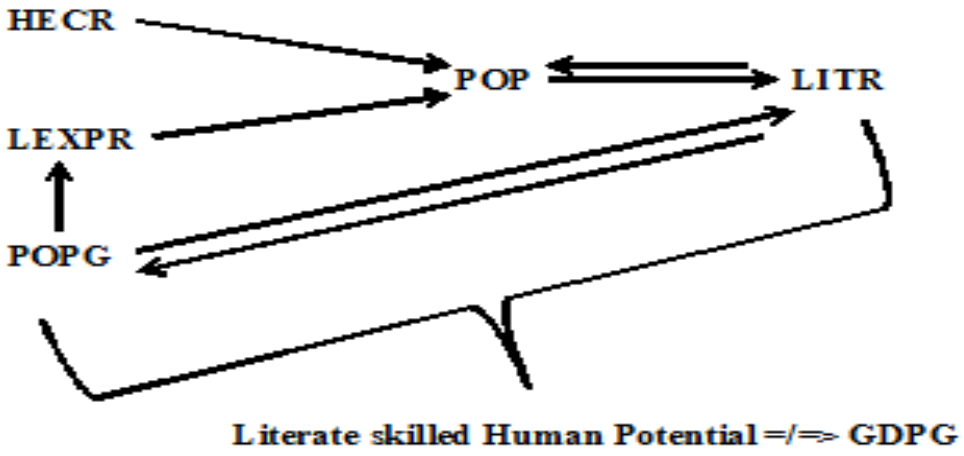

Fig 1. Simplifying Granger Modeling

As the result of Granger model (see Fig 1) reveals the bilateral causation of population growth and literacy rate in Pakistan. The model constructed on selected social determinants of GDPG that could be simplified by drew narrative equation for further modeling.

$$LSHP =/=> GDPG \wr UNEMP \ldots\ldots\ldots\ldots (a)$$

The equation extracted from the above-mentioned results that demonstrates that literate skilled human potential (LSHP) is not effecting GDP growth due to the increasing rate of unemployment. It is simple equation that can used for further explanation of the determinants of GDPG but other variables can also be included in the equation along with UNEMP if the regression modeling yields insignificant results of those variables which are not logically acceptable as ineffective on GDPG while LSHP is not causing on GDPG.

CONCLUSION

Conclusively, OLS regression models produced robust results that directed toward Grander Causality model for bilateral causation of GDPG, POPG, LITR, LEXPT and HCR. These variables were preferred over OPENN, INVGDP, FDIGDP, AIDEXCREEXP, M_2GDP, UNEMP and REM in model 3 due to their illogical relation and effects on GDPG; and the former variables almost satisfy the conditions of causality: Necessity and sufficiency. An assumptive result were extracted (see equation a) after the analysis of these entire variable in three different modeling. The assumptive equation denotes that LSHP (this variable was assumptive extraction from the bilateral causation of POPG and LITR) is not granger cause of DGPG due to severe issue of unemployment.

REFERENCES

Adams Jr, R. H. (1998). Remittances, investment, and rural asset accumulation in Pakistan. *Economic Development and Cultural Change, 47*(1), 155-173.

Afzal, M., Ehsan, M., Butt, A. R., & Fatima, K. (2013). Openness, inflation and growth relationship in Pakistan: An application of ARDL bounds testing approach. *Pakistan Economic and Social Review, 51*(1), 13-53.

Baldwin, R. E. (2004). Openness and growth: what's the empirical relationship? *Challenges to globalization: Analyzing the economics* (pp. 499-526): University of Chicago Press.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica: Journal of the Econometric Society*, 1057-1072.

Edwards, S. (1993). Openness, trade liberalization, and growth in developing countries. *Journal of economic Literature*, 1358-1393.

Falki, N. (2009). Impact of foreign direct investment on economic growth in Pakistan. *International Review of Business Research Papers, 5*(5), 110-120.

Fatima, F. (2014). Impact of Foreign Aid on Economic Growth of Pakistan. *Available at SSRN 2407348*.

Hill, M. A., & King, E. (1995). Women's education and economic well-being. *Feminist Economics, 1*(2), 21-46.

Iqbal, Z., & Sattar, A. (2010). The contribution of workers' remittances to economic growth in Pakistan. *Working Papers & Research Reports*, RR No. 187.

Iqbal, Z.,& Zahid, G. M. (1998). Macroeconomic determinants of economic growth in Pakistan. *The Pakistan Development Review*, 125-148.

Kalim, R., & Shahbaz, M. (2009). *Impact of foreign direct investment on stock market development: the case of Pakistan.* Paper presented at the Global Conference on Business and Economics, ISBN.

Khan, M. A., & Qayyum, A. (2007). Trade, financial and growth nexus in Pakistan: Economic analysis working papers.

Maqbool, M. S., Mahmood, T., Sattar, A., & Bhalli, M. (2013). Determinants of unemployment Empirical Evidences from Pakistan. *Pakistan Economic and Social Review, 51*(2), 191-207.

Mubarik, Y. A., & Riazuddin, R. (2005). *Inflation and growth: An estimate of the threshold level of inflation in Pakistan*: State Bank of Pakistan.

Nunnenkamp, P. (2002). Why economic growth trends differ so much across developing countries: the globalization debate and its relevance to Pakistan: Kieler Arbeitspapiere.

Qayyum, A. (2006). Money, Inflation, and Growth in Pakistan. *The Pakistan Development Review*, 203-212.

Rodrik, D. (2008). *One economics, many recipes: globalization, institutions, and economic growth*: Princeton University Press.

Saqib, N., Masnoon, M., & Rafique, N. (2013). Impact of foreign direct investment on economic growth of Pakistan. *Advances in Management & Applied Economics, 3*(1), 35-45.

Shahbaz, M. (2012). Does trade openness affect long run growth? Cointegration, causality and forecast error variance decomposition tests for Pakistan. *Economic Modelling, 29*(6), 2325-2339.

Sylwester, K. (2000). Income inequality, education expenditures, and growth. *Journal of Development Economics, 63*(2), 379-398.

Wajid, A., & Kalim, R. (2013). *The impact of inflation and economic growth on unemployment.* Paper presented at the Proceedings of 3rd International Conference on Business Management.