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Exploring the Linkages Among Economic Growth, Openness, Income Inequality, Education and Health in Pakistan

EXPLORER LES LIENS ENTRE CROISSANCE ECONOMIQUES, L'OUVERTURE, L'INEGALITE DE REVENU, L'INEGALITE DE L'EDUCATION ET LA SANTE AU PAKISTAN

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Abstract

The present study is an attempt to investigate empirical linkages among economic growth, openness, income inequality, education and health in Pakistan during 1974-2009 by using annual time series data. Phillips-Perron (PP) unit root test is utilized to check stationarity of the variables. Long-run relationship is confirmed through Johansen and Juselius cointegration test. VECM is proposed to check short-run and long-run dynamics. Toda-Yamamoto causality test is utilized for observing the causality. Diagnostic tests are utilized to confirm the validity of the model. The results support strong positive impact of openness of trade, education and health on economic growth in the long-run whereas income inequality is negatively associated with economic growth. The study finds significant five uni-directional causalities and two bi-directional causalities among variables. For achieving higher economic growth in Pakistan attention must be directed towards decisive economic policies related to liberalizing trade, provision of education and health facilities and to reduce income inequality.

JEL Classification: F43, F13, I19, I29

Key words: Economic Growth; Openness; Income Inequality; Education; Health

Résumé

La présente étude est une tentative pour enquêter sur les liens empiriques entre croissance économique, l'ouverture, l'inégalité des revenus, l'éducation et de santé au Pakistan pendant 1974-2009 en utilisant les données annuelles de séries chronologiques. Phillips-Perron (PP) test de racine unitaire est utilisé pour vérifier la stationnarité des variables. Relation de long terme est confirmé par Johansen et Juselius test de cointégration. VECM est proposé de vérifier la dynamique de court terme et à long terme. Test de causalité Toda-Yamamoto est utilisé pour l'observation de la causalité. Les tests diagnostiques sont utilisés pour confirmer la validité du modèle. Les résultats confirment un fort impact positif de l'ouverture du commerce, de l'éducation et la santé sur la croissance économique à long terme tandis que l'inégalité du revenu est associée négativement à la croissance économique. L'étude constate significative cinq uni-directionnel et deux causalités bi-directionnel causalités entre les variables. Pour atteindre une croissance économique supérieure à l'attention du Pakistan doit être dirigée vers décisive les politiques économiques liées à la libéralisation du commerce, la prestation de l'éducation et les établissements de santé et de réduire les inégalités de revenus.

Classification JEL: F43, F13, I19, I29

Mots clés: Croissance économique; L'ouverture; L'inégalité de revenu; L'éducation et La santé

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INTRODUCTION

Pakistan's economic growth history remained highly volatile whereas the regional economies experienced persistent increase in savings and investment rates

accompanied with economic growth over the years. During 1971-2009 on average Pakistan's GDP growth rate was 4.9% with savings to GDP ratio 12% and investment to GDP ratio 16.6% therefore macroeconomic stabilization through achieving sustained economic growth always remained a fundamental objective of economic strategy of Pakistan. In this regard, policy makers and social scientists have made efforts to investigate growth inducing and growth retarding factors. This pointed out the existence of exponential increase in growth-openness, growth-inequality, growth-education and growth-health empirical literature. But it was observed that a few attempts had been made to explore interplay among these variables collectively. This study is conducted with the objective to contribute to the literature by analyzing causal relationship of economic growth with trade openness, income inequality, education and health.

According to trade-growth theories openness of trade regimes induced economic growth through increasing access to international markets, promoting competition, enlarging productive capacity and adoption of latest technologies.[4] Pakistan has taken various measures to liberalize its trade especially after accepting first IMF Structural Adjustment Programme (SAP) in 1988 and establishment of WTO in 1995. It substantially has reduced tariffs and subsidies in this context.

Nevertheless, issue of inequality and its impact on economic growth has been extensively studied during last five decades after the pioneered work of Kuznet in late 1950s. According to Kuznet hypothesis, there is inverted U-relationship between economic growth and income inequality. It means that at early stages of development inequality increases and reaches at maximum level, but after that it declines with further surge in income level. Furthermore, number of academicians and researchers have tried to find the empirical association between growth and income inequality and come up with varying results. Some showed positive association between these two variables whereas others showed negative association. In Pakistan, several studies have been conducted for examining the impact of income inequality on economic growth which point out that there is a decline in income inequality as economic growth increases and *vice versa*.[5] Keeping in view the historical figures of GDP growth and gini coefficient (measure of income inequality) it can be observed that during 1990s growth slowed down and income inequality increased whereas during first half of 2000s (era of recovery of economic growth) decline in inequality was observed but after 2004-05 economic growth hampered accompanied with increase in income inequality.

Classical economists and human capital theorist both consider education and health as fundamental ingredients of economic growth. Friedman, Mincer, Becker, Mankiw *et al*. (1992), Barro (1996) and Grossman (1972) all have paid much emphasis on the contribution of human capital in economic growth through education and health. They stress a well educated and healthy population always plays pivotal role in economic growth. Micro level studies provide strong evidence on positive association between education and earnings as well as health and earnings whereas macro level studies results are inconsistent. The objective of the study is to contribute in the existing literature by exploring the impact of openness, income inequality, education and health on economic growth using time series data during 1974-2009.

The study is organized as follows: section II throws light on literature review, section III discusses research design, section IV presents results and discussions and section V concludes.

1. LITERATURE REVIEW

The existing literature related to growth-openness nexus can be classified into two categories, i.e. cross country studies and single country studies. The earlier cross country studies showed the existence of positive association between exports and economic growth. The recent cross country studies have used comprehensive measures of openness for exploring the relationship between openness and economic growth but the results were mixed.[6]

In the context of Pakistan, Khan *et al*. (1995) tried to examine the causal relationship between exports and economic growth and supported the conventional wisdom that exports spur economic growth. Musleh-ud-din *et al*. (2003) investigated the relationship between openness and economic growth for the period 1960-2001 using annual time series data. They employed granger causality test and error correction model but failed to find the existence of short-run relationship between openness and economic growth. Siddique *et al*. (2005) tried to explore impact of openness on economic growth for the period 1972-2002. They followed Sinha (2000) model which classified GDP growth rate into three components, *i.e*. investment growth rate, population growth rate and trade growth rate. The study found negative relationship between trade openness and economic growth. In the second model, the study segregated trade into two components, i.e. exports and imports and found positive association between economic growth, imports and exports but this relationship appeared to be insignificant.

[4]Proponents of this positive association between economic growth and trade openness are Edwards (1992), Harrison (1996), Iscan (1998) and Yanikkaya (2003) among others.
[5]For details, see Azfar (1973), Bergen (1967), Naseem (1973), Mahmood (1984), and Ahmad and Ludlow (1989).
[6]Dollar (1992) used two different indices of trade orientation and found negative association between these two variables whereas Edwards (1998) found positive relationship between output growth and openness.

There is a lot of literature available on the relationship between income inequality and economic growth but the results are varying. For example, Alesina and Rodrik (1994), Benabou (1996) and Perooti (1996) provided empirical support that excess inequality deters economic growth whereas Li and Zou (1998), Forbes (2000) supported positive association between economic growth income inequality.

Barro (2007) confirmed the presence of Kuznet's hypothesis across countries. His results showed that the overall impact of income inequality on economic growth was weak and insignificant. The study concluded that income inequality was bad for the growth of poor countries and good for the growth of rich countries.

Empirical literature related to the impact of education and health on economic growth provides mixed results. Some researchers argued that education and health are positively associated with economic growth whereas others claimed that education and health are negatively related to economic growth. This variability of conclusions might be due to the use of different proxies for education and health. For example, Mankiw (1995) concluded that around 80 percent of GDP growth can be attributed to growth of both physical and human capital. According to him due to differences in physical and human capital accumulation countries even with same technology can substantially differ in their income levels. Pritchett (1997) found absence of significant association between output per worker and education. Behrman (1987), Dasgupta and Weale (1992) concluded that adult literacy rates were significantly and positively correlated with economic growth. Judson (1998) was of opinion that primary schooling had a positive association with economic growth than tertiary and secondary education. Aziz et al. (2008) studied the impact of higher education on Pakistan's economic growth for the period 1972-2008 using annual time series data. They employed Cobb-Douglas production function and supported the view that educated labour force strongly influence economic growth.

Bryant (1969) asserted that health services can increase and decrease economic growth. Sorkin (1977) indicated that reduced mortality rates positively associated with economic growth. Bloom and Canning (2000) described that health increases productivity through enhancing physical and mental energy. Following Solow model augmented with human capital, Bloom *et al*. (2001) also supported the positive impact of human capital in terms of education and health on economic growth.

The present study is different from previous studies as it uses recent econometric dynamic modeling in analyzing the relationship between economic growth, trade openness, income inequality, education and health. Therefore, it will be an addition to the existing literature on the subject matter. It helps the policy makers in addressing the problems faced by Pakistan economy through formulating and implementing appropriate development policies.

2. RESEARCH DESIGN

2.1 Data Set and Sources of the Variables

This study uses annual time series data from 1974 to 2009 for exploring the linkages among economic growth, openness, income inequality, education and health in Pakistan. Data has been taken from Pakistan Economic Surveys, various issues, and World Development Indicators.

2.2 Model Specification

In order to check empirical association among said variables following model is formulated.

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Where

PCY_t =Per Capita Income used as proxy for economic growth.

$Openness_t$=Trade volume as % of GDP.

$Gini_t$ =Gini used as proxy for income inequality.

Edu_t=Education expenditures in millions used as proxy for education.

Health=Life expectancy (in years) used as proxy for health indicator.

All variables are taken in log form and expected signs of the variables are given in the parenthesis.

2.3 Econometric Methodology

2.3.1 Unit Root Tests

For investigating the long-run relationship between the variables included in the model, it is considered to be imperative to determine the order of integration of the variables. This study uses Phillips-Perron unit root test for observing the order of integration of the variables included in the model. In order to conserve space and time, the study will not offer detailed explanation of unit root tests as they are well documented in the existing literature.

2.3.2 Cointegration Test

In order to check significance of long-run relationship among variables, the study uses Johansen and Juselius (1990) cointegration approach. Before applying this approach, there is a need to decide optimal lag length through Schwartz Baysian Criterion (SBC) or Akaik Information Criterion (AIC). For this purpose a VAR model including all variables in level is estimated. The study uses likelihood ratio methods proposed by Johansen (1995) for investigating the number of cointegrating vectors present in the model.

2.3.3 Vector Error Correction Model

VECM is suggested for co-integrated systems to capture short run and long run dynamics. VECM specification for this study is as follows.

$$\Delta \ln PCY_{1t} = \alpha_{10} + \sum_{i=1}^{p} \alpha_{11,i} \Delta \ln PCY_{1,t-i} + \sum_{i=1}^{p} \alpha_{12,i} \Delta \ln openess_{2,t-i} + \sum_{i=1}^{p} \alpha_{13,i} \Delta \ln gini_{3,t-i} + \sum_{i=1}^{p} \alpha_{14,i} \Delta \ln edu_{4,t-i} + \sum_{i=1}^{p} \alpha_{15,i} \Delta \ln health_{5,t-i} + \lambda_1 ECT_{t-1} + \varepsilon_{1t} \quad (1)$$

$$\Delta \ln openess_{2t} = \alpha_{20} + \sum_{i=1}^{p} \alpha_{21,i} \Delta \ln PCY_{1,t-i} + \sum_{i=1}^{p} \alpha_{22,i} \Delta \ln openess_{2,t-i} + \sum_{i=1}^{p} \alpha_{23,i} \Delta \ln gini_{3,t-i} + \sum_{i=1}^{p} \alpha_{24,i} \Delta \ln edu_{4,t-i} + \sum_{i=1}^{p} \alpha_{25,i} \Delta \ln health_{5,t-i} + \lambda_2 ECT_{t-1} + \varepsilon_{2t} \quad (2)$$

$$\Delta \ln gini_{3t} = \alpha_{30} + \sum_{i=1}^{p} \alpha_{31,i} \Delta \ln PCY_{1,t-i} + \sum_{i=1}^{p} \alpha_{32,i} \Delta \ln openess_{2,t-i} + \sum_{i=1}^{p} \alpha_{33,i} \Delta \ln gini_{3,t-i} + \sum_{i=1}^{p} \alpha_{34,i} \Delta \ln edu_{4,t-i} + \sum_{i=1}^{p} \alpha_{35,i} \Delta \ln health_{5,t-i} + \lambda_3 ECT_{t-1} + \varepsilon_{3t} \quad (3)$$

$$\Delta \ln edu_{4t} = \alpha_{40} + \sum_{i=1}^{p} \alpha_{41,i} \Delta \ln PCY_{1,t-i} + \sum_{i=1}^{p} \alpha_{42,i} \Delta \ln openess_{2,t-i} + \sum_{i=1}^{p} \alpha_{43,i} \Delta \ln gini_{3,t-i} + \sum_{i=1}^{p} \alpha_{44,i} \Delta \ln edu_{4,t-i} + \sum_{i=1}^{p} \alpha_{45,i} \Delta \ln health_{5,t-i} + \lambda_4 ECT_{t-1} + \varepsilon_{4t} \quad (4)$$

$$\Delta \ln health_{5t} = \alpha_{50} + \sum_{i=1}^{p} \alpha_{51,i} \Delta \ln PCY_{1,t-i} + \sum_{i=1}^{p} \alpha_{52,i} \Delta \ln openess_{2,t-i} + \sum_{i=1}^{p} \alpha_{53,i} \Delta \ln gini_{3,t-i} + \sum_{i=1}^{p} \alpha_{54,i} \Delta \ln edu_{4,t-i} + \sum_{i=1}^{p} \alpha_{55,i} \Delta \ln health_{5,t-i} + \lambda_5 ECT_{t-1} + \varepsilon_{5t} \quad (5)$$

Where "P" is the lag length, "Δ" is difference operator and "ECT_{t-1}" is the lagged error correction term.

2.3.4 Toda-Yamamoto Causality

Recently developed Toda-Yamamoto causality test is robust for stationarity and co-integration properties and is preferable over previous formal tests of causality, *e.g.* granger causality test and VECM based causality test. Following system of equations are specified in the line of Toda-Yamamoto causality test to check causal relationships among proposed variables.

$$\Delta \ln PCY_{1t} = \alpha_{10} + \sum_{i=1}^{p} \alpha_{11,i} \Delta \ln PCY_{1,t-i} + \sum_{i=1}^{p} \alpha_{12,i} \Delta \ln openess_{2,t-i} + \sum_{i=1}^{p} \alpha_{13,i} \Delta \ln gini_{3,t-i} + \sum_{i=1}^{p} \alpha_{14,i} \Delta \ln edu_{4,t-i} + \sum_{i=1}^{p} \alpha_{15,i} \Delta \ln health_{5,t-i} + \lambda_1 ECT_{t-1} + \varepsilon_{1t} \quad (1)$$

$$\Delta \ln openess_{2t} = \alpha_{20} + \sum_{i=1}^{p} \alpha_{21,i} \Delta \ln PCY_{1,t-i} + \sum_{i=1}^{p} \alpha_{22,i} \Delta \ln openess_{2,t-i} + \sum_{i=1}^{p} \alpha_{23,i} \Delta \ln gini_{3,t-i} + \sum_{i=1}^{p} \alpha_{24,i} \Delta \ln edu_{4,t-i} + \sum_{i=1}^{p} \alpha_{25,i} \Delta \ln health_{5,t-i} + \lambda_2 ECT_{t-1} + \varepsilon_{2t} \quad (2)$$

$$\Delta \ln gini_{3t} = \alpha_{30} + \sum_{i=1}^{p} \alpha_{31,i} \Delta \ln PCY_{1,t-i} + \sum_{i=1}^{p} \alpha_{32,i} \Delta \ln openess_{2,t-i} + \sum_{i=1}^{p} \alpha_{33,i} \Delta \ln gini_{3,t-i} + \sum_{i=1}^{p} \alpha_{34,i} \Delta \ln edu_{4,t-i} + \sum_{i=1}^{p} \alpha_{35,i} \Delta \ln health_{5,t-i} + \lambda_3 ECT_{t-1} + \varepsilon_{3t} \quad (3)$$

$$\Delta \ln edu_{4t} = \alpha_{40} + \sum_{i=1}^{p} \alpha_{41,i} \Delta \ln PCY_{1,t-i} + \sum_{i=1}^{p} \alpha_{42,i} \Delta \ln openess_{2,t-i} + \sum_{i=1}^{p} \alpha_{43,i} \Delta \ln gini_{3,t-i} + \sum_{i=1}^{p} \alpha_{44,i} \Delta \ln edu_{4,t-i} + \sum_{i=1}^{p} \alpha_{45,i} \Delta \ln health_{5,t-i} + \lambda_4 ECT_{t-1} + \varepsilon_{4t} \quad (4)$$

$$\Delta \ln health_{5t} = \alpha_{50} + \sum_{i=1}^{p} \alpha_{51,i} \Delta \ln PCY_{1,t-i} + \sum_{i=1}^{p} \alpha_{52,i} \Delta \ln openess_{2,t-i} + \sum_{i=1}^{p} \alpha_{53,i} \Delta \ln gini_{3,t-i} + \sum_{i=1}^{p} \alpha_{54,i} \Delta \ln edu_{4,t-i} + \sum_{i=1}^{p} \alpha_{55,i} \Delta \ln health_{5,t-i} + \lambda_5 ECT_{t-1} + \varepsilon_{5t} \quad (5)$$

2.3.5 Diagnostic Tests

This study uses three diagnostic tests to confirm the validity of the estimated model, i.e. Ramsey's RESET (1969) test, Jarque-Bera normality test and Breusch Godfrey (1978) LM test.

3. EMPIRICAL RESULTS AND DISCUSSIONS

3.1 Stationarity Results of the Variables

The order of integration is checked through PP unit root test.

Table 1
PP Test Statistic Results 1974-2009

Variables	PP test statistic (Adjusted t-stat)	
	c	c, t
ln PCY	–1.75	–2.76
Δ ln PCY	–4.46*	–4.39*
ln Openess	–2.14	–2.76
Δ ln Openess	–2.79*	–2.48*
ln Gini	–1.87	–0.69
Δ ln Gini	–6.63*	–7.28*
ln Edu	–1.73	–2.97
Δ ln Edu	–11.45*	–11.60*
ln Health	–1.47	–4.51
Δ ln Health	–6.64*	–6.74*

*shows significance of the variable. Δ is used as difference operator.

The results show that all the variables included in the model are integrated of order 1, *i.e.* I(1).

3.2 Cointegration Results

Since stationarity results indicate that all variables are first difference stationary therefore it may be expected that variables may have long-run relationship. Before investigating the long-run relationship VAR test is applied to determine the optimal lag length. The cointegration results are reported in Table 2.

Table 2
Johansen's and Juselius Cointegration Test Results 1974-2009
Variables: PCY, Openness, Gini, Edu and Health

Test	Null hypothesis	Alternative hypothesis	Cointegration test statistics	Critical value (5%)
Trace Statistic	H0 : r ≤ 0	HA: r > 0	118.7*	69.81
	H0 : r ≤ 1	HA: r > 1	55.65*	47.85
	H0 : r ≤ 2	HA: r > 2	28.36	29.79
	H0 : r ≤ 3	HA: r > 3	11.53	15.49
	H0 : r ≤ 4	HA: r > 4	2.311	3.84
Maximal Eigen Value Statistic	H0 : r = 0	HA: r = 1	63.06*	33.87
	H0 : r = 1	HA: r = 2	27.29	27.58
	H0 : r = 2	HA: r = 3	16.82	21.13
	H0 : r = 3	HA: r = 4	9.22	14.26
	H0 : r = 4	HA: r = 5	2.31	3.84

Note: * denotes rejection of null hypothesis at 5 percent level.

Trace statistic $\lambda_{trace}(r)$ indicates two significant co-integrating vectors by rejecting null hypothesis of at most 1 co-integrating vector whereas maximal eigen value

statistic $\lambda_m(r)$ indicates one significant co-integrating vector. This is an evidence of the significant long-run relationship among economic growth, openness, income inequality, education and health in Pakistan during the investigated period. The estimated long run function is reported below.

S.E.	(0.145)	(1.66)	(0.103)	(2.84)
t-statistic	[1.71]	[–8.95]	[9.41]	[9.91]

All variables have their expected signs and are highly significant except openness which is marginally significant at 10%.

With regard to long-run parameter of openness it can be asserted that openness positively contributes to economic growth. This finding is consistent with the experience of Pakistan as Pakistan gradually moved towards openness through liberalizing its trade especially after WTO in 1995 which stimulated economic growth. The positive association between the variables is marginally significant because Pakistan failed to get much benefit from trade openness due to slackening of export sector.

The existence of negative relationship between income inequality and economic growth in Pakistan truly depicts real situation of Pakistan economy. The ineffective policies formulated and implemented in the past for overcoming the problems of income inequality in Pakistan are mostly responsible for raising income inequality in the country over time.

The coefficients of health and education are positive and statistically significant which indicate that the resources allocated to education and health sectors contribute to economic growth.

3.3 Vector Error Correction Model Results

Table 3
VECM Estimates 1974-2009

Variables	Eq. 1 D(lnPCY)	Eq. 2 D(lnOpeness)	Eq. 3 D(lnGini)	Eq. 4 D(lnEdu)	Eq. 5 D(lnHealth)
Constant	0.04*	–0.03	–0.01	0.05*	0.00*
	[2.34]	[–1.62]	[–1.31]	[1.99]	[3.54]
$D(lnPCY_{t-1})$	0.13	0.51*	–0.08	–0.03	–0.02
	[0.71]	[2.94]	[–0.81]	[–0.81]	[–1.41]
$D(lnOpeness_{t-1})$	0.07	0.34*	–0.04	0.22	0.03*
	[0.49]	[2.55]	[–0.57]	[1.21]	[2.97]
$D(lnGini_{t-1})$	2.38*	1.76	–4.89*	–0.22	–0.14
	[1.82]	[1.44]	[–6.82]	[–0.13]	[–1.35]
$D(lnEdu_{t-1})$	0.01	0.09	0.06	–0.00	–0.00
	[0.17]	[1.22]	[1.37]	[–0.06]	[–0.90]
$D(lnHealth_{t-1})$	–0.81	–0.96	3.13*	0.04	–0.16
	[–0.39]	[–0.49]	[2.74]	[0.01]	[–0.97]
$(EC_{t-1})_{lt}$	–0.15*	0.04	0.29	–0.02	0.01
	[–1.84]	[0.52]	[6.52]	[–0.23]	[2.17]

Note: * denotes significance of the variable and t–values are reported in brackets

Table 3 presents the short-run dynamic adjustment of all the variables and not much interpretation could be attached to the short-run coefficients. The significant and negative error correction term is an indication of the existence of stable long-run relationship between the variables. The feedback coefficient shows that 15% of disequilibrium on average is corrected in the next years.

3.4 Toda-Yamamoto Causality Results

This study uses Toda Yamamoto causality test which is considered to be more stable approach as compared to Error Correction Modelling (ECM), for details see, Yamada and Toda, 1998. Modified Wald test statistic, their probabilities and critical values of $\chi 2$ are presented in Table 4. The optimal lag length was determined as 1 through SBC and the order of integration of the variables was determined as 1 through PP test. So the VAR(2) was estimated through SUR estimation technique.

Empirical estimates of causality test indicates two significant two-way causations between per capita GDP and openness as well as between health and income inequality which in turn indicates that openness and per capita GDP both expected to reinforce each other in the long run. The same is true in case of health-inequality nexus during the investigated period 1974-2009. Both two-way causal flows are highly significant as represented by the probability values reported in parenthesis.

Table 4
Toda-Yamamoto Causality Estimates 1974-2009

Dependent Variable	Sources of Causation				
	ln PCY	ln Openess	ln Gini	ln Edu	ln Health
	Mwald test (x^2)	Mwald test (x^2)	Mwald test (x^2)	Mwald test (x^2)	Mwald test (x^2)
ln PCY	–	4.72 (0.02)*	1.75 (0.18)	0.59 (0.43)	5.17 (0.02)*
ln Openess	8.01 (0.00)*	–	93.22 (0.00)*	1.78 (0.18)	0.02 (0.86)
ln Gini	0.05 (0.80)	0.15 (0.69)	–	1.77 (0.18)	13.17 (0.00)*
ln Edu	0.03 (0.85)	5.98 (0.01)*	0.03 (0.85)	–	0.62 (0.43)
ln Health	0.92 (0.33)	5.46 (0.01)*	39.32 (0.00)*	19.43 (0.00)*	–

Note: * denotes significance of the causation. p values are given in parenthesis.

Furthermore results also support five highly significant uni-directional causalities, i.e. from health to per capita GDP, from income inequality to openness, from openness to education, from openness to health and from education to health. The study finds that direction of causality between economic growth and health is from health to per capita GDP. However, there is absence of two-way causation between these two variables. Openness have significant causal impact on education and economic growth because more open economies often attract investment, increase pace of economic growth which in turn have favorable impacts for education and health.

3.5 Diagnostic Tests Results

Three diagnostic tests are used to check validity of the empirical results whose results are given in the following table 5.

Table 5
Diagnostic Test Estimates 1974-2009

Test	Statistic	Prob.	Conclusion
Ramsey RESET test	0.04	0.83	Model is correctly specified.
Breusch Godfray LM test	1.46	0.23	Residuals are free from serial correlation.
Jarque-Bera normality test	16.92	0.07	Residuals are normally distributed.

All diagnostic results are satisfactory therefore empirical estimates can be used for the policy inferences.

CONCLUSION AND POLICY SUGGESTIONS

The study has been conducted to reveal empirical association among economic growth, trade openness, income inequality, education and health in Pakistan using annual time series data for 1974-2009. The empirical results are aligned with theory and consistent with the experience of Pakistan. The results of the study reveal that trade liberalization, income inequality, education and health are responsible factors which affect economic growth in Pakistan.

The significant and stable long-run relationship between the variables is confirmed through Johansen and Juselius cointegration test. Trade openness, education and health all have favourable impact on economic growth whereas income inequality has negative impact on economic growth. Two bi-directional and five unidirectional causations are confirmed through Toda Yamamoto causality test.

The results of this study lead to formulate export expansion policy for getting maximum benefits from international trade through competitiveness. There is a need to tackle problems of income inequality. For this purpose, effective policies need to be followed which ensure fair distribution of wealth. The government should introduce policy for encouraging private sector to invest more in education and health and government should allocate more resources to the social sector for raising labour productivity.

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