

## **Natural Resource Management and Economic Growth in Pakistan: A Time Series Analysis**

Dr. Shahnawaz Malik, Dr. Imran Sharif Chaudhry and Shahzad Hussain\*

### **Abstract**

*Natural capital can play an important role to boost the economic growth and to accelerate the pace of development. Evidence is found that the countries having vast natural resources could not perform significantly compared with the countries deficient of natural capital. This paper empirically explores the contribution of natural resources to economic growth for Pakistan for the period of 1975-2006 using time series econometric technique. The results are very much similar with existing literature available on the subject. There is adverse nexus between exports related natural resources as ratio of GDP and economic growth. Our findings also indicate that inadequate attention has been paid to human resource development in Pakistan throughout our sample period.*

*Key Words: Natural Resources, Economic Growth, Human Capital*

*JEL Codes: O13, O15, O40*

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\* The authors are Professor and Chairman at Bahauddin Zakariya University Multan, Research Fellow at Asia Research Centre, London School of Economics and Political Science, U.K. and PhD Research Scholar in Economics at Bahauddin Zakariya University Multan, Pakistan, respectively.

## **I. Introduction**

Natural capital is one of the important pillars of good economic performance and development. It has been strongly believed from the time of Adam Smith and David Ricardo that the countries endowed with natural resources have an edge over countries that are not. Natural resource endowments can help countries to grow and diversify. Natural capital is considered an important source of wealth around the world but some studies (e.g. Sachs and Warner, 1995; Gylfason, 2000 and 2001; Kronenberg, 2004 etc.) found that abundance of natural capital is neither necessary nor sufficient for prosperity and economic development. The experience shows that natural resources played minor role in the development of the countries like United States and United Kingdom. Most of the Western European countries have few natural resources but developed on the basis of manufacturing and services (Kronenberg, 2004). Another example of the experience of Asian economies called Asian tigers that do not possess natural resource endowments. It can also be clearly observed that the countries enriched with natural capital could not sustain their economic growth.

The relationship between natural resource abundance and economic growth is controversial among the researchers throughout the world. So, it could not be settled among economists that natural resource abundance is either curse or blessing for the country endowed with vast natural resources.

The rest of the paper is organized as follows. Next section has a brief review of the economy in order to see the trends of natural resources and economic growth in Pakistan. Existing literature is discussed in section three. Fourth section has empirical results and discussion. The paper is concluded in the fifth section.

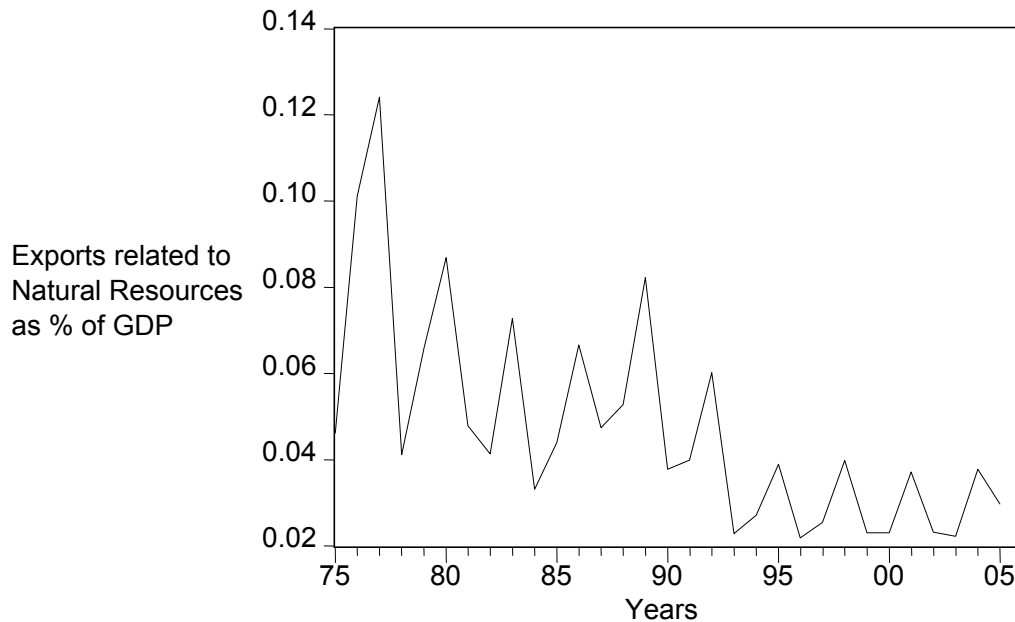
## **II. An Overview**

Pakistan is situated in a region where bulk of natural resources is found in its surroundings. Pakistan is one of those countries which are endowed by the natural resources. The fact is evidence from figure 1 which shows the trend of natural resources

(agriculture, fuel and minerals) as percentage of GDP. Overall trend of these types of exports is decreasing over time. It can be seen that such exports constituted over 12 percent in 1977 but it remained under 10 percent throughout our sample period.

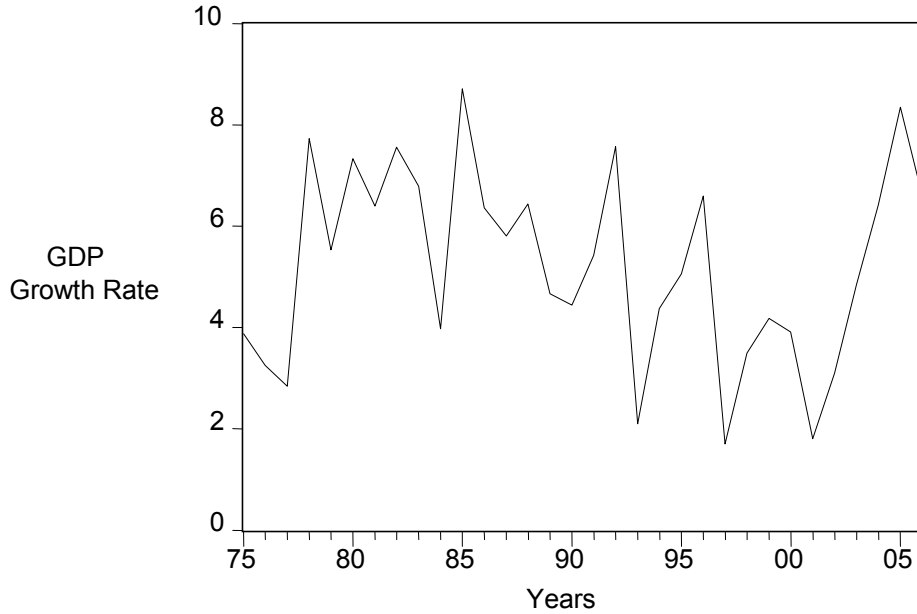
Pakistan is growing economy in terms of economic growth. Its growth rate of GDP has been impressive since last five years. According to figure 2, the decade of 90's showed poor performance in terms of GDP growth rate. If we take a look from 1977 to 1992, it never came below 4 percent. During this period, aggregate performance of the economy was satisfactory. If we take a look at our sample period, it can be concluded that Pakistan performed well in terms of growth rate.

**Fig. 1: Trends in Exports related to Natural Resources as Percentage of GDP (1975-2006)**



Source: Pakistan Statistical Year Book (various issues)

**Fig. 2: Trends in GDP Growth rate in Pakistan (1975-2006)**



Source: Pakistan Economic Survey (various issues)

### III. Existing Literature

Most of the studies undertaken on the subject have concluded that resource-rich developing countries underperformed as compare to resource-deficient countries. The cross-country analysis between natural resource abundance and growth has shown negative relationship. Sachs and Warner (1995) examine a sample of 97 developing countries from 1970 to 1989 and find a significant negative correlation between GDP growth and the ratio of natural resource exports to GDP.

Gylfason (2000) reviews the reasons behind the negative relationship between natural resources and economic growth. He concludes that the heavy dependence on natural resources and agriculture may result in corruption and policy failure and may, moreover, discourage education, external trade and genuine savings. In another study, Gylfason (2001) provides empirical evidence for the negative relationship between natural resources and growth via the education channel. Using public expenditure on education

as an indicator, Gylfason finds first a statistically significant relationship between natural resource abundance and low levels of educational effort. He then finds a positive relationship between secondary school enrolment and economic growth and concludes that about half of the natural resource curse works through the education channel.

Gylfason and Zoega (2002) conclude that natural capital may on average crowd out physical as well as human capital, thereby inhibiting economic growth. They provide empirical evidence from 85 countries from 1965 to 1998 and suggest that heavy dependence on natural resources can hurt saving and investment. Siddiqui (2004), using time series data for Pakistan, shows that energy expansion can boost economic growth while its shortage can be harmful for economic growth.

Kronenberg (2004) concludes that the prime reason for the curse of natural resources were corruption and neglect of basic education in transition economies. These countries should overcome corruption and pay special attention to basic education and this is the right way to convert the curse into blessing. If a country is endowed with right set of institutions and also adopts the right policies at the time of resource discovery, it is more likely to achieve rapid growth and perform in better way compared with other countries with equal endowments but without such resource (Oyefusi, 2007).

Some of the recent studies have contradicting results in the context of the relationship between natural resource abundance and economic growth. For example, Stijns (2001) uses different indicators as proxy of natural resource abundance than used by Sachs and Warner (1995) and concludes that there is no evidence found that the abundance of natural resources is detrimental for economic growth. Ding and Field (2004) also found that natural resources do not affect growth. They differentiate between natural resource endowments and natural resource dependence.

#### IV. Data Description and Methodological Issues

This paper includes the time series data for Pakistan for the period 1975-2006. Data has been retrieved from different sources like Pakistan Economic Survey (various issues), Pakistan Statistical Year Book (various issues) publish by Federal Bureau of Statistics, Handbook of Statistics on Pakistan Economy 2005 published by the State Bank of Pakistan.

In order to empirically analyze the association between natural resources and economic growth, Gross Domestic Product at current factor cost has been used as proxy variable for economic growth.

As far as the concern of explanatory variables, there are three types of variables used as explanatory to check the impact of natural resources on economic growth in the context of Pakistan. Exports related to agriculture, fuel and minerals as percentage of GDP have been taken as proxy for natural resource abundance. We have followed the method of Sachs and Warner (1995) for resource dependence measures (e.g. share of resource exports in GDP) as the proxies for resource abundance. The other type of the variables used as explanatory, is related to investment in human capital. Human capital is an important factor of economic growth. Expenditures on education as percentage of GDP and expenditures on health as percentage of GDP has been taken as explanatory variables to check the impact of investment in human capital on economic growth. The third type consists of the set of variables having controlling effect on economic growth. These variables are rate of inflation, trade openness and investment as percentage of GDP which shows the efficiency of government.

The models are constructed as follows:

$$\text{Log (GDP)} = \beta_0 + \beta_1(\text{NRX/GDP}) + \beta_4(\text{INF}) + \beta_5(\text{OPEN}) + \beta_6(\text{INV/GDP}) + \mu_{1i}$$

$$\text{Log (GDP)} = \beta_0 + \beta_1(\text{NRX/GDP}) + \beta_2(\text{EDU/GDP}) + \beta_3(\text{H/GDP}) + \beta_4(\text{INF}) + \beta_5(\text{OPEN}) + \beta_6(\text{INV/GDP}) + \mu_{2i}$$

where  $\text{Log (GDP)}$  is Log of Gross Domestic Product while on the right hand side  $\text{NRX/GDP}$  is Exports related to natural resources as percentage of GDP,  $\text{EDU/GDP}$  is Expenditures on education as percentage of GDP,  $\text{H/GDP}$  is Expenditures on health as percentage of GDP,  $\text{INF}$  is rate of inflation (percentage change in Consumer Price Index),  $\text{OPEN}$  is trade openness (measured by Exports + Imports/GDP),  $\text{INV/GDP}$  is total investment as percentage of GDP.

Our first model does not include indicators of investment in human capital but only analyze the impact of natural resources on economic growth along with additional variables which affect growth. In the second model, we have included the Education and Health expenditures as percentage of GDP separately.

In order to estimate the two models, we perform the unit root test to all the variables to check the stationarity so that we can confidently interpret the results because without performing unit root test results can be misleading. If the conclusion of the unit root test is found to be same, we can proceed further for long-run relationship between the concerned time series otherwise models can be estimated on the basis of unit root test.

### **V. Empirical Evidence**

#### **a) Test for Stationarity**

Augmented Dickey Fuller unit root test has been used to establish the stationarity status of the variables. The results of the unit root test applied on the data sets are presented in table 1 and 2. This test has been performed with intercept and with trend and intercept both. According to the results of Augmented Dickey-Fuller test, our dependent variable is stationary time series at 1<sup>st</sup> difference with intercept and with trend and intercept both.  $\text{NRX/GDP}$  is stationary time series at level in both tables.  $\text{EDU/GDP}$ ,  $\text{H/GDP}$  and  $\text{OPEN}$  are stationary time series when checked with and without trend both.  $\text{INF}$  is found to be stationary even at 1% level of significance.  $\text{INV/GDP}$  is not stationary at level without

trend but stationary with trend. So, we can not proceed for co-integration because our results from ADF test have not identical conclusion.

**Table 1: Augmented Dickey-Fuller Test with intercept**

Variables	Level	1 <sup>st</sup> Difference	Conclusion
LGDP	-0.50	-5.27	I(1)
NRX/GDP	-3.49	--	I(0)
EDU/GDP	-1.06	-5.67	I(1)
H/GDP	-0.94	-4.11	I(1)
OPEN	-2.46	-5.26	I(1)
INF	-5.62	--	I(0)
INV/GDP	-1.06	-6.86	I(1)

Source: Authors calculations using E-views.

**Table 2: Augmented Dickey-Fuller Test with Trend and intercept**

Variables	Level	1 <sup>st</sup> Difference	Conclusion
LGDP	-2.6	-5.19	I(1)
NRX/GDP	-6.33	--	I(0)
EDU/GDP	-1.92	-5.57	I(1)
H/GDP	-1.20	-4.27	I(1)
OPEN	-2.04	-5.58	I(1)
INF	-5.12	--	I(0)
INV/GDP	-4.00	--	I(0)

Source: Authors calculations using E-views.

## b) Estimation results

OLS methodology has been used in order to check the contribution of natural resources to economic growth in the context of Pakistan for the period 1975-2006. First, we have estimated effect of natural resources on economic growth without including human capital indicators. The results are reported in table 3. According to these results

NRX/GDP is negatively related to Log (GDP) which confirms the results of some previous studies i.e. Sachs and Warner, 1995, Gylfason, 2000 and 2001, Kronenberg, 2004 etc. NRX/GDP is also statistically significant at 10 percent level which confirms that it has some impact on economic growth. INF and INV/GDP are positively related to GDP and significant at 1 percent level each. OPEN has significant but negative relationship with economic growth.

As far as the second model concerned, NRX/GDP is found to be negatively associated with economic growth after including human capital variables. But human capital variables are not statistically significant and have positive signs. Our central focus is on natural resource abundance variable which clearly indicates that exports related to natural resources could not make positive contribution to economic growth. The results remained the same when we include the variables related to investment in human capital. Our additional variables have also same impact as it was when we did not include human capital variables. But an interesting aspect is that our variables related to human capital are positively related with economic growth but not significant even at 10 percent level of significance. So, it is obvious that there is no attention devoted to education and health in Pakistan. There is another implication behind this negative relationship that there may be negligence towards the access to technologically expertise services. Some countries have larger known reserves of some minerals, not because they are better endowed than other countries, but because they have had earlier access to geological expertise (Stijns, 2000).

**Table 3: Results of OLS Estimates**

Dependent Variable: $\Delta \text{Log}(\text{GDP})$			
Method: OLS			
Sample: 1975-2006			
Variables	Coefficient	t-statistics	
Constant	0.1006	13.1554	
NRX/GDP	-0.1812	-1.6359***	
$\Delta \text{OPEN}$	-0.3872	-1.6056***	
INF	0.0057	5.4137*	
$\Delta \text{INV/GDP}$	0.0163	3.4559*	
AR(1)	-0.2371	-1.3215	
MA(1)	-0.9799	-2941.964	
R-squared	0.7359	Mean dependent var.	0.1357
Adjusted R-squared	0.6639	S.D. dependent var.	0.0395
S.E. of Regression	0.0229	Akaike info criterion	-4.5077
Sum Squared resid	0.0116	Schwarz criterion	-4.1776
Log Likelihood	72.361	F-statistic	10.2185*
Durbin-Watson stat.	2.0532	Prob.(F-statistic)	0.0000

Source: Authors calculations using E-views.

Note: \*, \*\*, \*\*\* indicates the level of significance at 1%, 5% and 10% respectively.

**Table 4: Results of OLS Estimates**

Dependent Variable: $\Delta \text{Log}(\text{GDP})$			
Method: OLS			
Sample: 1975-2006			
Variables	Coefficient	t-statistics	
Constant	0.1058	11.907	
NRX/GDP	-0.4632	-4.2998*	
$\Delta \text{EDU}/\text{GDP}$	0.0091	0.6879	
$\Delta \text{H}/\text{GDP}$	0.0798	1.3164	
$\Delta \text{OPEN}$	-0.3877	-1.4703	
INF	0.0067	5.4255*	
$\Delta \text{INV}/\text{GDP}$	0.0208	4.5716*	
MA(2)	-0.9799	-2375.432	
AR(1)	-0.1128	-0.5421	
R-squared	0.7384	Mean dependent var.	0.1357
Adjusted R-squared	0.6337	S.D. dependent var.	0.0395
S.E. of Regression	0.0239	Akaike info criterion	-4.3790
Sum Squared resid	0.0114	Schwarz criterion	-3.9547
Log Likelihood	72.496	F-statistic	7.0553*
Durbin-Watson stat.	2.0410	Prob.(F-statistic)	0.0002

Source: Authors calculations using E-views.

Note: \*, \*\*, \*\*\* indicates the level of significance at 1%, 5% and 10% respectively.

R-square in both models is near about the same and these imply that 74 percent of the total variation in dependent is due to explanatory variables. There is no change in the goodness fit of the second model after including human capital variables. Moreover, both models are good fit at 1 percent level of significance. The problem of autocorrelation has been removed with the help of different techniques of auto regressive and moving average as indicated in both tables.

## **VI. Conclusions**

The paper provides evidence of the contribution of natural resources to economic growth for Pakistan, using time series data from 1975 to 2006. The relationship between natural resources and economic growth can be expected to be complicated and controversial. Our results are not different from previous work done by different authors on this subject. So, this paper has also documented that there is statistically significant but adverse relationship between natural resources and economic growth during our sample period. First, we estimated this relationship in the presence of additional variables only but when we include some variables relating to human development like total expenditures on education as percentage of GDP and total expenditures on health as percentage of GDP, the result of the association between natural resources and economic growth remained the same.

It is also apparent that indicators of investment in human capital made no contribution towards positive direction. It may be due to neglect of development of human resources in the country. Our findings also indicate that inadequate attention has been paid to human resource development in Pakistan throughout our sample period. The study undertaken here is preliminary investigation. However, this subject can never be concluded here and there is severe need to explore the association between natural resources and economic growth and also to investigate the reasons behind this negative relationship especially in the context of Pakistan. Nevertheless the debate on the subject is still controversial and complicated among researchers.

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