

Role Of Natural Resources In Economic Development: Evidence From Pakistan

Sabra Afzal¹, Faiza Malik², Ezzah Batul³,
Saira Mukhtar⁴, Dr. Hafsa Batool⁵

¹Associate Researcher at Lancerhop

²Researcher at Skyscrapers Pvt Ltd

³Lecturer, Cantt Board College for Women, Lahore

⁴Cornerstone School and College

⁵Department of Economics, Lecturer, Lahore

College for Women University, Lahore

Corresponding author; Dr. Hafsa Batool;

batool economics@gmail.com

Abstract

Natural resources can play an important role to boost the economic growth and to accelerate the pace of economic development. The study explores the role of natural resources in economic development including variables on mineral production, exports of natural resources, population, government expenditure on mining industries, employed labor force and impact of mineral industry on environment. Time series data used for the study has been taken from economic survey of Pakistan, statistical year book and world development indicators. Auto Regressive Distributive lag model is used to check the long run relation among variables. Stationarity for all variables is checked by employing Augmented Dickey Fuller test. There is an adverse nexus found between capital formation by Govt. and employed labor force and GDP.

Keywords: Economic Growth, Natural Resources, Govt. Expenditure

1. Introduction

Natural resources have long been recognized as a fundamental driver of economic development in nations

around the world. These resources encompass a wide range of assets, including minerals, fossil fuels, agricultural land, bodies of water, forests and more, each of which contributes to the economic well-being of a country in different ways. Pakistan, as a nation endowed with a diverse set of natural resources, provides an intriguing case study to investigate the crucial role these resources play in fostering economic growth and development. The economic development of any country depends on the efficient utilization of its available resources. Natural resources, often referred to as the backbone of economic growth, have the potential to have a significant impact on a nation's overall development trajectory. Understanding the intricate relationship between natural resources and economic development is paramount for policymakers and economists, as it informs strategies for sustainable growth, poverty alleviation, and environmental management.

Pakistan, a South Asian nation with a population of over 220 million people at the end of my knowledge in September 2021, is rich in natural resources. These resources encompass a rich tapestry of minerals, arable land, fisheries, water resources and a thriving mining industry. The country's geographical diversity, ranging from the fertile plains of Punjab to the mineral-rich regions of Balochistan, underlines the critical role that natural resources have played in shaping its economic landscape. The economic development of any nation depends on the effective utilization of its available resources. Natural resources, often considered the lifeblood of economic growth, offer significant potential to drive a country's development. Whether through mineral extraction, agricultural production or energy generation, these resources serve as the backbone of many economic activities and can act as catalysts for growth.

The role of natural resources in economic development is multifaceted and complex. These resources, including minerals, energy, arable land, water bodies and more, underpin various aspects of development. They drive industries, provide energy for industrialization, ensure food security through agriculture, generate export earnings and

offer opportunities for sustainable economic growth. However, their overdependence can lead to environmental vulnerabilities and challenges, requiring responsible resource management, economic diversification, and a shift toward renewable resources. Understanding the intricate role of natural resources is essential to achieving inclusive, resilient and sustainable economic development. While these resources offer significant growth opportunities, their mismanagement can lead to challenges, including environmental degradation and economic volatility. Effective resource governance, sustainable practices and economic diversification are essential strategies to harness the full potential of natural resources in a way that benefits current and future generations while promoting inclusive and sustainable economic development. Understanding the intricate interplay between natural resources and economic development is crucial for policymakers and stakeholders working toward a more prosperous and sustainable future.

This study aims to conduct a comprehensive analysis of the multifaceted connection between natural resources and economic development in Pakistan. To achieve this, several critical variables are considered, including mineral production, natural resource exports, demographic dynamics, government spending on mining industries, the size and composition of the workforce employed, and the environmental impacts of activities in the mining industry. To perform this in-depth analysis, we relied on time series data derived from authoritative sources, including the Pakistan Economic Survey, Statistical Yearbook, and World Development Indicators. The Auto Regressive Distributive Lag (ARDL) model, known for its suitability for examining long-term relationships between variables, is used as the main analytical tool. This model allows us to explore how natural resources impact various aspects of Pakistan's economic development over long periods of time. Furthermore, to ensure the robustness and reliability of the findings, this study employs the augmented Dickey Fuller test to assess the stationarity of all relevant variables. This statistical rigor provides confidence in the validity of the results, thus enabling a deeper understanding of the intricate interaction between natural resources and the

various facets of Pakistan's economic development. In particular, one of the key findings brought to light by this research is the complex relationship between government capital formation, the workforce employed, and their implications for GDP growth. This finding suggests that government policies regarding the allocation of capital resources can have profound implications for employment generation and, consequently, overall economic prosperity in Pakistan.

I. Theoretical framework:

Pakistan is naturally endowed with huge natural resources. Economic development is measured in terms of gross domestic product. Pakistan is a developing country. Overall, in the world environmental resources are taken as important economic assets i.e. natural capital. It can be used efficiently for the better functioning of economic system, its production and overall welfare. This natural capital is taken in this study to assess the country's economic development. Manpower is the backbone for any country to progress. It is of two types: physical and mind manpower. Physical labor is called labor force. Labor force participation rate is the proportion of active population that is working in labor market, and engaged in goods production. Labor force participation is very important factor for the development and its relation with growth is estimated by looking on the participation of labor in different sectors of economy and to analyze the composition of human resources. More people employed in different sectors means economically active population, since working people is no more burden on economy so it leads to an increase in GDP of country, resulting in faster economic growth.

The theoretical framework surrounding natural resources in economic development encompasses a spectrum of economic theories and models. Classical economists like Adam Smith and David Ricardo stressed the significance of resources as wealth generators, advocating for efficient resource utilization. The Resource-Based View (RBV) theory emphasizes resource-driven competitive advantages at the national level. Conversely, Dependency Theory warns of vulnerabilities in resource-dependent

economies. Environmental Kuznets Curve (EKC) theory highlights the evolving relationship between resource use and environmental quality, and institutional economics underscores the role of governance in resource management. Modern growth theories, including endogenous growth theory, stress the importance of innovation and knowledge in development. The Detail about Theoretical framework as mentioned in **Figure 1**. The United Nations' Sustainable Development Goals (SDGs) provide a contemporary framework that links resource use, sustainability, and economic growth. Altogether, this framework informs the complex interplay of natural resources in economic development, guiding policy and sustainable development efforts.

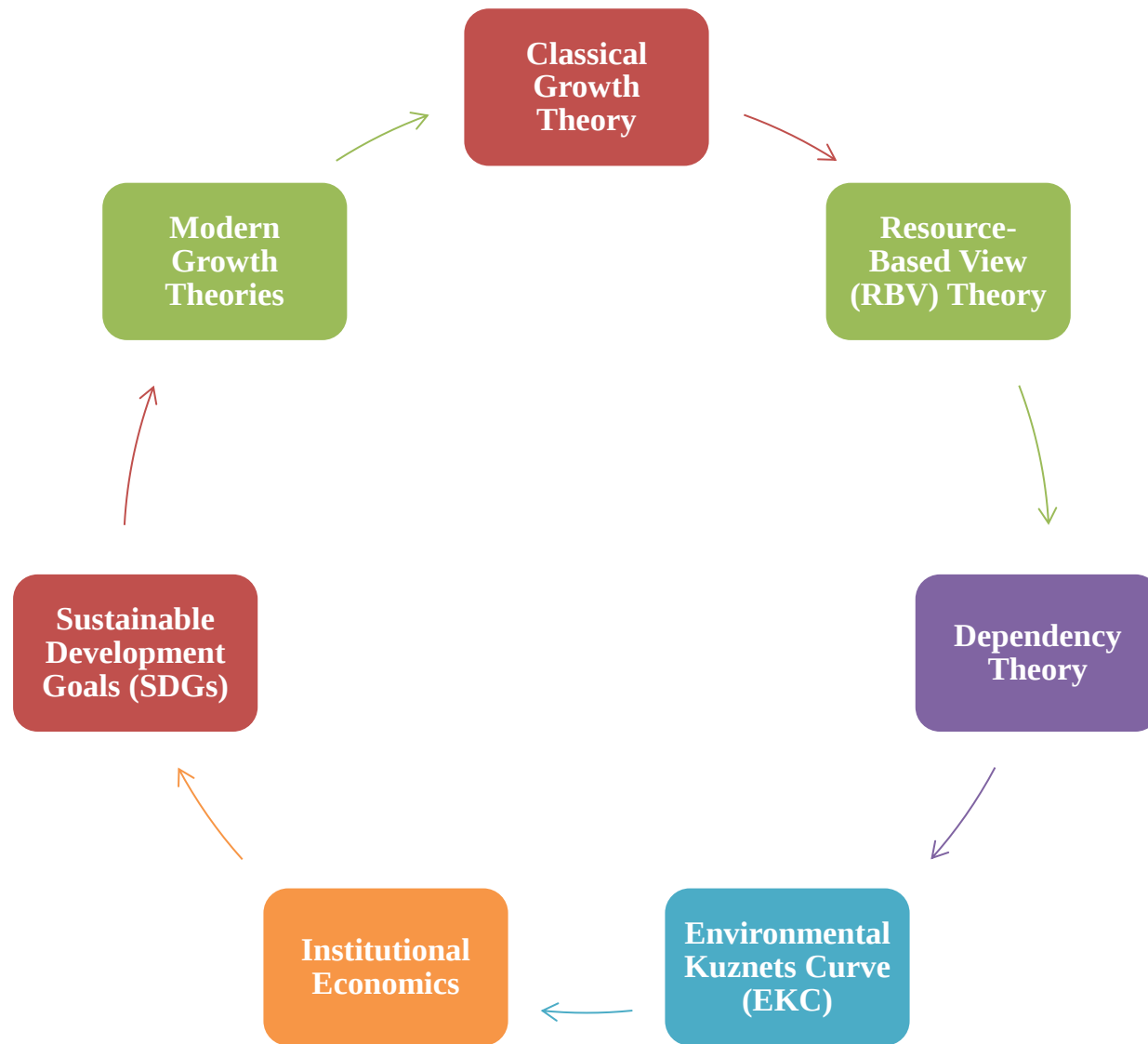


Figure 1: Theoretical framework in the context of natural resources in economic development

Agriculture, employing 45% of Pakistan's labor force, is central to its economic development and serves as a significant employment generator, making it a focus of this study (Pakistan Economic Survey, 2010). The manufacturing sector, contributing 13.2% to the GDP and involving 13.8% of the employed labor force, plays a vital role in economic growth due to its linkages with other industries like textiles, cotton, and fertilizers (Pakistan Economic Survey, 2012). This study combines employed labor forces in agriculture, mining, and quarrying sectors to examine their relationship with Pakistan's economic growth. Oken's law, indicating that a 1% increase in unemployment leads to a 2% decrease in real GDP, underscores the importance of effective labor policies for economic production (Minfow, 2002). Recognizing the high labor force proportion in Pakistan, policies akin to the progressive 1972 labor policy, with reformed labor laws, can enhance the labor-employer relationship and drive economic development (Saleem, 2004).

Trade is an important catalyst for economic growth, recognized since classical times through the works of Adam Smith and later neoclassical economists, with milestones such as Ricardo's theories of Absolute Advantage and Comparative Advantage (Mellor). , 1961). Previous research shows that economies that engage in trade experience long-term benefits, such as increased labor efficiency, increased output, and technological progress. Trade and development are intertwined and often linked to export-based growth strategies. This study focuses on exports of natural resources, measurement of agricultural commodities, exports of agricultural commodities and fuels, minerals and lubricants. Many studies confirm trade as a source of economic development (Faridi, 2012). Theoretical rationales include Keynesian theory suggesting that exports stimulate income growth through currency multipliers in the short term, while efficient management, increased competition, capacity utilization and economies of scale drive growth. Pakistan's major agricultural exports such as cotton, rice and wheat constitute about 74% of total agricultural exports. Increasing the export surplus requires improved processing and storage methods, reducing crop

losses and safeguarding farmers' job security and property rights. This study uses models to analyze the relationship between export behavior and economic development, to assess whether Pakistan's growth is export driven (Quddus, 2005).

Public expenditure, whether in the public or private sector, plays a crucial role in economic growth when it is consistently aligned with the development of these sectors and accompanied by a sustained increase in national income. Public expenditure, led by the government, meets the needs of society and covers areas such as pensions, infrastructure and development (Akrani, 2012). As the population grows, government spending increases to support education, maintain law and order, and invest in various economic areas. This study focuses on gross fixed investment in the mining sector, a concept supported by a German economist, which shows that different sectors contribute to the increase in GDP and total economic output. The relationship between public spending and national income is consistent with Adolph Wagner's theory, dating back to 1883, which provides a positive correlation between public spending and a country's GDP levels. This law has been applied and confirmed in several developed and developing countries as a long-term relationship. Gross fixed capital formation includes expenditure on capital assets, including fixed assets, additions or improvements, buildings, replacements, transport, machinery and infrastructure.

Paradox of mining

In Pakistan, no attention has been paid to mining and quarrying sector, since 1980. Demand for minerals for various productive industries, and welfare of mining workers is essential for the development of mining industry. In Pakistan main mining industries are coal industry, rock salt mines, precious stones mines, gold mines and other chemical and stones etc. There is very slow pace of development in mining sector due to remoteness of the mineral containing areas in low technology level, high cost of transportation and cost of exploration and bad law & order conditions. The mining industry in four provinces

needs a lot of foreign and domestic investment for its development and there is an extensive amount of mineral resources that if utilized fully can help to earn huge foreign exchange. Mining sector is underdeveloped, in spite of huge mining potential, because of minimal opportunities of investment and obsolete technology. Technology used in Pakistan is of Primitive nature with no proper allocation of funds, and the amount allocated is insufficient to keep up pace with modern techniques that are used by developed countries. It is observed from the period of mining since partition, that there is a less productive manner of mineral contribution in mining industry due to several reasons. One important reason is leasing out sites for private companies, which have less technical knowledge and scientific expertise, needed for the development of the sector. (Saleem, 2004) Small and medium sized mining groups operated mines before 1947, with less investment and low resources. Later on, in 1948 a panel of mines and oil fields decided to nationalize the mining industry for the betterment of the sector and to get rid of primitive methods of production. But still, now more than 90% mines are operated under private groups. Some of the mines under private ownership have low profile that makes a problem to their visit and finding. Majority of mines are located in very remote areas that cause a blockage in expansion of development. (Bose, 2012)

Mining industry is very important natural resource asset that contributes to GDP. It constitutes 2% of total labor force, although it is a minimal percentage yet it has huge potential of investment to generate employment opportunities. Employed Labor force in Pakistan mining industries is in very miserable situation. It needs a separate section to discuss conditions of labor working in mining sector. In this study, only labor force contribution in GDP is concerned. Productive labor force is a milestone for development of mining sector and so contribution to economic development of economy. But unfortunately, there is a prevalence of bad circumstances involved with mining labor that badly affects their capabilities, and efficiency. Because mines are located in remote areas, having no other opportunity around, the labor from

surroundings is forced to opt this profession. Workers are employed on very meager wages, with non provision of most basic safety measures. In some areas, wage rate depends on the quality of material extracted from mines. All these conditions lessen the working capacity and lower morale of labor, hence a block in the way of development. If the said conditions are improved and appropriate facilities should provided to the labor, it would no doubt be fruitful for expansion in productive capacity of mining sector. (Kiani, 2004)

In this study gross fixed capital formation in mining industry by public and private activity is taken. Positive relation of capital formation with economic development is analyzed in some of the developed and developing economies. But it operates under specific circumstances. If the law does not work well in any economy, it depicts specific issues prevailing in that country. Another important variable included in the model is population which usually varies negative with economic development, as the said relation is found in the available literature.

More on population

Population is one of the central economic, social and political problems. Pakistan is ranked 6th in size by population growth. (Afzal, 2009) Rapid population growth in Pakistan has caused insurmountable social and economic problems i.e. poor law and order situation, low living standard, shelter problems, inadequate education, traffic congestion, limited health facilities and put at risk the growth of economy as number of dependents has increased. A balanced population growth is imperative to achieve Macroeconomic stability that in turn is necessary for economic growth. Relationship of population and economic development is well explained by a famous theory called Malthusian population theory. It states that human population grows in geometric ratio but on the other side, resources grow in arithmetic ratio that is subjected to law of diminishing returns.

It is observed in many economies that burden of population is crushing for economies and cause tightening

of job market, underemployment, poverty, non mobility of labor force low education and standard of living, hence retards economic development. If the population would grow at a slower pace as compared to the existing level, there would have been a substantial reduction in socioeconomic problems. There are three arguments generally: Some development economist thinks that rapid population is not a serious problem and it would be considered economic problem only if it is related to supply of material and natural resources. (Afzal, 2009) According to Marxist thinking, developed countries pressurize developing countries to control population and to limitize their development just to maintain their international status.

Third argument is about a changed vision that rapid population growth is desirable in its effects. For instance, an increase in population causes increased demand for food, shelter, health, social services. It also adds to physical and mental manpower and so supply of labor for industries that in turn accelerates development. Some developing countries have rural areas that are less populated, yet contained vast arable land but due to non availability of labor and agriculture facilities these areas are under developed. For this reason, third argument considers rapid population desirable. Population distribution over the region is causing problems. For example, in Pakistan over populated area is Punjab province and it is due to employment opportunities, rural urban migration, while under populated region is Baluchistan province due to low productive resource distribution there. Another important factor that increase population problem is lack of women's economic opportunity. Education of women and their status should be raised this would result in smaller families and less population growth. (Afzal, 2009)

These arguments although carry some weight but are contradictory to the arguments that are in the favor of less developed countries. As rapid population growth is considered harmful for economic development in developing countries. Increase in population in developing countries is usually termed as population explosion. There are many negative consequences due to rapid growth in

population particularly developing countries experiencing them. Lower per capita income, decrease in savings, affect on capital formation and investment situation, unemployment, inadequate education and health facilities, are common problems. While environmental degradation due to rapid population involves, urban congestion, deforestation, soil erosion etc. increased demand cause more industries, more infrastructure and more production that results in air and noise pollution.

By analyzing the relation of population and economic development, it is confirmed that both are incompatible in case of Pakistan, population growth should be reduced to accelerate the pace of development. Productive resources that can contribute to development are being eaten up by rapid population growth. (Afzal, 2009) Countries that have more number of Non productive members often hinders economic growth, and this occurs in developing countries like Pakistan where economy is burdened by non working community that are dependent on others. Govt. should direct the way of development by formulation sound policies to inhibit population and reduce the burden on economy that in turn opens the way channels of economic growth.

II. Existing Literature review

Natural resources contribute to economic growth of Pakistan from the area 1975 to 2006 with the help of time series techniques.(Shahnawaz et al.2007) Natural resource abundance is measured by exports related to agriculture, fuel and minerals.Other explanatory variables include expenditure on health and on education.Population, gross state product, employment in mining, interaction between growth in resource prices and resource sector employment were considered by Emery et al. (2010). It was examined that negative correlation between resource abundance and economic growth exist.Relationship of natural resource curse and growth of the country is analyzed byOyefusi (2007). Main focus was on the policies adopted by government for growth and development. The countries which were endowed with natural resources can perform better than those which were less endowed with natural

resources. It was found that the policies that were adopted at the time of mineral discovery and institutions that regulate these policies were much more beneficial to foster economic growth.

The relationship between exports and economic growth of Pakistan analyzed in a study by Saeed et al. (2005). Exports taken here consisted of primary commodities; semi manufactured goods and manufactured goods. Export led growth theory and its importance for Pakistan was checked using granger causality test, error correction mechanism and OLS. Natural resource capital can benefit economic growth if better policies will used and resource rents should put into direction to raise economic welfare and can be used to crowd out more capital and investment. (Auty, 2007). Resource abundance is measured in this study in terms of resource rents to analyze growth. (Konte, 2011) he investigated that resource curse for a country depends on the growth regime of that economy. Variables employed were; Resource abundance measured in resource rents, and primary exports of fuels, ores etc. education, population growth rate, investment, institutions were taken as political and economic and measured by democracy, and economic freedom (property rights) respectively. OLS methodology was used with fixed and random effects and found similar results for abundant resources i.e. negative relation with growth.

Resource dependence was measured by three variables i.e. exports of minerals, agriculture raw materials and of natural resources. (Bulte et al. 2008) he examined resource dependence, economic growth and impact of natural resources for 89 countries and used cross sectional data. Link of natural resource abundance and economic growth through investment and saving is discussed by Gylfason et al (2002). It is investigated that Physical and natural capital derives saving and investment in an economy and that in turn growth. Relationship of natural resource and economic growth of the economy and the basic question was to investigate whether resource curse be positive for resource abundant countries and such countries having appropriate resources also have good institutions that improve

development.(Pettersson et al. 2007) Mineral resource dependence has an impact on country's growth performance. Mineral resource dependence becomes a curse for developing countries due to low quality institutions that are failed to adopt appropriate policies for development is discussed byWeinthal and Luong (2006).

III. Data and Empirical evidences

he study examines the role of natural resources in economic development of Pakistan and annual time series data from 1979 to 2011 is used for the purpose. All variables are used in natural logarithmic form. The data has been taken from economic survey of Pakistan various issues, WDI (world development indicators), federal bureau of statistic, yearly hand book of statistics on Pakistan economy,and State bank of Pakistan. It was imperative to select such a model that explains short term and long term dynamics among all variables. To examine the long term relationship among real GDP, mineral production, natural exports, employed labor force and population, a co integration technique should be used. Economic development is measured in terms of GDP. EMP is employed labor force that covers the labor force working in agriculture, mining industry and manufacturing sector (Emery, 2010). FC is gross fixed capital formation by public and general govt. sectors by economic activity in mining & quarrying sector. Natural resource Exports(NXP) includes agriculture exports, minerals exports, exports of fuels and lubricants (Sachs & Warner, 2001). MIN is Mineral production and it is taken as the form of rents from mineralsoil rents and natural gas rents (Konte, 2011).Following regression model is being used in this study:

$$\ln(\text{GDP}) = \alpha_0 + \alpha_1 \ln \text{FC} + \alpha_2 \ln \text{Min} + \alpha_3 \ln \text{EMP} + \alpha_4 \ln \text{NXP} + \alpha_5 \ln \text{POP} + u_t$$

Where, LnGDP is Natural log of Gross domestic product at constant Factor cost, LnEMP is Natural log of employed labor force taken in agriculture, mining & manufacturing sector, LnFC is Natural log of Fixed capital formation by public and general govt. sectors by economic activity in mining & quarrying sector, LnNXP is Natural log of Natural resource Exports includes agriculture exports, minerals,

fuels and lubricants, LnMIN is Natural log of Mineral production is taken as rents from minerals, oil rents and natural gas rents, and LnPOP is Natural log of Population growth.

Estimation techniques:

A. Stationarity test

It is an augmented version where lagged dependent terms are used to get rid of autocorrelation. It also checks presence of unit root i.e. non-stationary, against the alternative that the series does not have a unit root i.e. stationary. The test is applied on three equations that are in level form, trend and intercept or drift and deterministic trend. ADF test uses same critical values as for simple DF test. Test statistic is compared with ADF critical values at 1%, 5%, and 10% level in absolute form. In this study, ADF is applied on the variables and it is estimated that null hypothesis of non-stationarity is rejected at 5% Level of significance, the results is given in the table:

Table 1. Augmented Dickey Fuller Test at Level and with Intercept & Trend

Variables	At level		At 1 st Difference		Order of integration
	With Intercept	With Intercept & Trend	With Intercept	With Intercept & Trend	
GDP	0.300	1.434	3.788	-4.469*	I(1)
EMP	2.040	-0.259	-5.170	-6.181*	I(1)
FC	-1.962	-3.947	-5.031*	-4.958	I(1)
NXP	5.372	4.739	0.676	-6.980*	I(1)

MIN	-1.949	-2.271	-6.780	-6.669	I(1)
POP	-0.995	-0.180	-1.130	-7.150*	I(1)

Source: calculation from Eviews

From the table it is clear that all variables are integrated to order one so it is better to apply ARDL technique.

B. Estimation results

In order to check the long term relationship of natural resources to economic development, ARDL is used. Auto regressive distributive model is a bound testing approach of co integration and is capable to differentiate among endogenous and exogenous variables. In this approach, a dependent variable is taken as function of its lagged and current values of one or more exogenous variables

$$\Delta \text{LnGDP}_t = \alpha_0 + \alpha_1 \sum_{t=1}^k \Delta \text{LnGDP}_{t-j} + \alpha_2 \sum_{t=1}^k \Delta \text{LnEMP}_{t-j} + \alpha_3 \sum_{t=1}^k \Delta \text{LnNXP}_{t-j} + \alpha_4 \sum_{t=1}^k \Delta \text{LnMIIN}_{t-j} + \alpha_5 \sum_{t=1}^k \Delta \text{LnPOP}_{t-j} + \alpha_6 \sum_{t=1}^k \Delta \text{LnFC}_{t-j} + \delta_1 \text{LnGDP}_{t-1} + \delta_2 \text{LnEMP}_{t-1} + \delta_3 \text{LnNXP}_{t-1} + \delta_4 \text{LnMIN}_{t-1} + \delta_5 \text{LnPOP}_{t-1} + \delta_6 \text{LnFC}_{t-1} + u_t$$

where α_0 is the drift, Δ is the first difference operator, Ln is natural log, $\alpha_i = 1, 2, 3, 4, \dots$ are short run dynamic coefficients and $\delta_i = 1, 2, 3, 4, \dots$ are long run multipliers and u_t is white noise term.

There are three steps involved in it: first of all long run relationship is analyzed. This long-term association is determined among the variables with the help of bound testing approach. This can be done by using Wald test i.e., f-statistic, also called test of joint significance of the variables. It is conducted to analyze the long run relation among variables in the model. Long run model of ARDL is shown as:

$$\text{LnGDP}_t = \beta_0 + \sum_{t=1}^k \beta_{1j} \text{LnGDP}_{t-j} + \sum_{t=1}^k \beta_{2j} \text{LnEMP}_{t-j} + \sum_{t=1}^k \beta_{3j} \text{LnNXP}_{t-j} + \sum_{t=1}^k \beta_{4j} \text{LnMIN}_{t-j} + \sum_{t=1}^k \beta_{5j} \text{LnPOP}_{t-j} + \sum_{t=1}^k \beta_{6j} \text{LnFC}_{t-j} + \epsilon_t$$

Where $\beta_i = 1, 2, 3, \dots$ are long run coefficients, $\ln$ is natural log, and ϵ_t is white noise term.

The null hypotheses of f stat is

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$$

A null hypothesis is defined as co integration among the variables does not exist among variables.

While the alternative hypotheses against null hypotheses is

$$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$$

Alternative is defined as that co integration or a long run relationship among all variables exists.

After checking the stationarity of variables, next step is to apply Wald test to see the long run relationship among dependent and exogenous variables. Lag length selection is based on Schwarz Bayesian criterion and order is (1, 0, 2, 0, 0) F stat is computed and the result is given in the table:

Table2.Critical Bounds of F Statistics

Critical values	F stat	4.53 (0.03)
	Lower bound I(0)	Upper Bound I(1)
1%	3.06	4.15
5%	2.39	3.38
10%	2.08	3.00
Critical values are derived from pesaran and smith(2001) Restricted intercept and no trend (k=5)		

From computed f value it is clear that it is greater than upper bound at 1, 5 and 10% suggesting a stable long run relationship among the variables. It is a clear rejection of Null hypothesis of no cointegration. We can say that economic development has a long term relationship with the said variables i.e., mineral production, gross fixed capital formation, employed labor force, natural resource exports and population.

C. Diagnostic test:

ARDL model is presented in the form of equation and its results are given in the table, where stability of the parameters is obtained by diagnostic tests.

$$\begin{aligned} \Delta \text{LnGDP}_t = & \alpha_0 + \alpha_1 \sum_{t=1}^k \Delta \text{LnGDP}_{t-j} + \alpha_2 \sum_{t=1}^k \Delta \text{LnEMP}_{t-j} + \\ & \alpha_3 \sum_{t=1}^k \Delta \text{LnNXP}_{t-j} + \alpha_4 \sum_{t=1}^k \Delta \text{LnMIIN}_{t-j} \\ & + \alpha_5 \sum_{t=1}^k \Delta \text{LnPOP}_{t-j} + \alpha_6 \sum_{t=1}^k \Delta \text{LnFC}_{t-j} + \delta_1 \text{LnGDP}_{t-1} + \delta_2 \\ & \text{LnEMP}_{t-1} + \delta_3 \text{LnNXP}_{t-1} + \delta_4 \text{LnMIN}_{t-1} + \delta_5 \text{LnPOP}_{t-1} + \delta_6 \text{LnFC}_{t-1} \\ & + u_t \end{aligned}$$

Cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUM SQ) are used to check stability of short and long run parameters. Its graph shows two boundary lines of 5% significance level, if their value lies within two bounds then the model is said to be stable in long run and null hypothesis of coefficient cannot be rejected.

The model used in the present study, stability is checked through (CUSUM) & (CUSUM SQ) tests and model remained stable in Cumulative sum of recursive residuals as the test statistic did not exceed the bounds of 5% significance level. But in cumulative sum of squares of recursive residuals (CUSUM SQ) test, result is violated as value crossed 5% significance level for some period of time, but then it came back within bounds, indicating that equilibrium is restored back after some adjustment.

Next the stability and goodness of fit is checked by diagnostic tests. Serial correlation of residuals is checked by Lagrange multiplier (LM) test. To check the functional form of model Ramsay's test is used, Jarque Bera (JB) is used for Normality of data and white test is employed for Heteroscedasticity based on regression of squared residuals. Each of these tests has chi-square statistic which is to be compared with critical values, to see whether it is fulfilling requirement or not. If we fail to reject null hypothesis of either test that means these tests are valid & our model is a good fit. In our study the variables have passed all the diagnostic tests.

Table 3: DIAGNOSTIC TESTS

Regressors	Dependent variable $\Delta \text{LN} \text{GDP}$			
	Coefficients	T-ratios	Std Error	[p-value]
LnFC	-.024962	-0.930	0.0268	0.36
LnMIN	-.16401	-2.663	0.0615	0.01
LnMln(-1)	-.18879	-3.138	0.0601	0.00
LnMln(-2)	.11052	1.933	0.0571	0.06
LnNXP	.22664	3.310	0.0684	0.00
LnEMP	.29284	1.016	0.2879	0.32
LnPOP	-.46268	-2.222	0.2082	0.37
Constant	4.8947	2.986	1.6389	0.00
Test statistic		LM Version		
A. Serial correlation ¹		.1450E-3[0.99]		
B. Functional form ²		1.3770[0.24]		
C. Normality ³		4.5663[0.10]		
D. Heteroscedasticity ⁴		5.3072[0.02]		

D. Short run dynamics:

Short run elasticities and ECM result shows impact of exogenous variables on dependent variable in short period of time.

$$\begin{aligned} \Delta \text{LnGDP}_t = & \alpha_0 + \alpha_1 \sum_{j=1}^k \Delta \text{LnGDP}_{t-j} + \alpha_2 \sum_{j=0}^k \Delta \text{LnEMP}_{t-j} + \\ & \alpha_3 \sum_{j=0}^k \Delta \text{LnNXP}_{t-j} + \alpha_4 \sum_{j=0}^k \Delta \text{LnMIIN}_{t-j} \\ & + \alpha_5 \sum_{j=0}^k \Delta \text{LnPOP}_{t-j} + \alpha_6 \sum_{j=0}^k \Delta \text{LnFC}_{t-j} + \lambda \text{ECM}_{t-1} + u_t \end{aligned}$$

Short run results of ARDL model is shown in the table:

Table4: ECM REPRESENTATION FOR THE SELECTED ARDL MODEL

Regressors	Dependent variable $\Delta \text{LN} \text{GDP}$		
	Coefficients	T-ratios	[p-value]
dLnFC	-.024962	-.93078	0.36
dLnMIN	-.16401	-2.6639	0.01
dLnMIN(-1)	-.11052	-1.9332	0.06

dLnNXP	.22664	3.3103	0.00
dLnEMP	.29284	1.0169	0.32
dLnPOP	-.46268	-2.2220	0.03
dC	4.8947	2.986	0.00
ECM(-1)	-.46143	-3.3243	0.00
R Squared	0.64		
R Bar Squared	0.51		
F- STAT	5.7096[.001]		
DW –Statistic	1.9945		

ECM (-1) = -.46143 (0.00), $ecm = \ln GDP + .054096 * \ln FC + .52506 * \ln MIN - .49116 * \ln NXP - .63463 * \ln EMP + 1.0027 * \ln POP - 10.6076 * C$

Value of ECM shows how quickly or slowly a variable restores its equilibrium position. The coefficient associated with lagged ECM term is 0.4614; it means that in each period 46% of shocks are justified as a long run trend or from previous year's shock 46% of disequilibria in GDP's growth adjust back to the long run equilibrium in the current year. Coefficient of ECM has expected sign and statistically significant, it confirms the results of bound test of co integration.

E. Long run results:

Long run parameters' values and signs are very important to analyze the results of model and to see whether methodology fits the data well or not. Following model is estimated and long run results for Pakistan are given in the table:

$$\ln GDP_t = \beta_0 + \sum_{j=1}^k \beta_{1j} \ln GDP_{t-j} + \sum_{j=0}^k \beta_{2j} \ln EMP_{t-j} + \sum_{j=0}^k \beta_{3j} \ln NXP_{t-j} + \sum_{j=0}^k \beta_{4j} \ln MIN_{t-j} + \sum_{j=0}^k \beta_{5j} \ln POP_{t-j} + \sum_{j=0}^k \beta_{6j} \ln FC_{t-j} + \epsilon_t$$

Description of all variables has been given in previous section.

Table 5. ESTIMATED LONG RUN COEFFICIENTS USING THE ARDL APPROACH

Regressors	Dependent variable LNGDP			
	Coefficients	T-ratios	Std. Errors	[p-value]
LnFC	-.054096	-.97695	0.0553	0.33
LnMIN	-.52506	-4.6095	0.1139	0.00
LnNXP	.49116	3.1124	0.1578	0.00
LnEMP	.63463	1.1427	0.5554	0.26
LnPOP	-1.0027	-3.4380	0.2916	0.00
Constant	10.6076	7.6641	1.384	0.00
R Squared	.98777			
R Bar Squared	.98332			
F- STAT	222.1209			
DW –Statistic	1.9945			

R square imply that 98 percent of total variation in dependent issue to explanatory variables.

IV. Conclusion

Most empirical studies find evidence of negative relationship of natural resources and economic development. There is a difference in modeling technique and measuring variables and proxies among all studies. In this study some variables are used in different way from previous studies. The present research concludes that there is a long run relationship exists among variables employed in the study and natural resources contribute to economic development of economy during the sample period. On the basis of empirical findings, it is analyzed that when additional variables are included, results are some different than many studies. This paper has documented there is an adverse but significant relationship between natural resources and economic development.

Natural resource exports showed significant contributions towards development and is confirmed by many studies. Mineral production has significant but negative relationship with economic development, due to low quality of institutions. Fixed capital formation is insignificant showing no contribution in GDP of the economy. Further, employed labor force is significant and contributing in economic development of the economy, confirming Okun's law. Population is contributing significantly and confirming Malthus population theory. ECM results are significant and sensitivity analysis ensured robustness of results. Stability of parameters has shown that equilibrium is restored back. This study investigated many factors but still it is of limited scope. This topic is intense and need proper attention by Government Institutions.

V. References:

- Afzal, M. (2009). Population growth and economic development in Pakistan. *The Open Demography Journal*, 2(1), 1–7.
<https://doi.org/10.2174/1874918600902010001>
- Anderson, K. (1998). Are resource-abundant economies disadvantaged? *The Australian Journal of Agricultural and Resource Economics*, 42(1), 1–23.
<https://doi.org/10.1111/1467-8489.00034>
- Barbier, E. B. (2003). The role of Natural Resources in Economic Development. *Australian Economic Papers*, 42(2), 253–272. <https://doi.org/10.1111/1467-8454.00198>
- Boyce, J. R., & Herbert Emery, J. C. (2011). Is a negative correlation between resource abundance and growth sufficient evidence that there is a “resource curse”? *Resources Policy*, 36(1), 1–13.
<https://doi.org/10.1016/j.resourpol.2010.08.004>
- Brunnschweiler, C. N. (2006). Cursing the blessings? natural resource abundance, institutions, and economic growth. *SSRN Electronic Journal*.
<https://doi.org/10.2139/ssrn.928330>
- Czelusta, J., & Wright, G. (2010). The myth of the resource curse. *Oil Is Not a Curse*, 322–336.
<https://doi.org/10.1017/cbo9780511779435.010>
- Ding, N., & Field, B. (2004). Natural Resource Abundance and economic growth. *SSRN Electronic Journal*.
<https://doi.org/10.2139/ssrn.564567>
- Frankel, J. (2010). The Natural Resource Curse: A Survey. <https://doi.org/10.3386/w15836>

- Hausmann, R., & Rigobon, R. (2003). An Alternative Interpretation of the "Resource Curse": Theory and Policy Implications. <https://doi.org/10.3386/w9424>
- Huang, Y., Faraz Raza, S. M., & Usman, M. (2023). Asymmetric role of natural resources dependence, industrialization, and foreign direct investment in China's economic growth. *Resources Policy*, 85, 103932. <https://doi.org/10.1016/j.resourpol.2023.103932>
- limi, A. (2007). Escaping from the resource curse: Evidence from Botswana and the rest of the world. *IMF Staff Papers*, 54(4), 663–699. <https://doi.org/10.1057/palgrave.imfsp.9450020>
- Karabegović, A. (2009). Institutions, Economic Growth, and the "Curse" of Natural Resources. *Studies in Mining Policy*, Fraser Institute.
- Klein, K. K., & Kaushik, K. K. (2008). Export Growth, Export Instability, Investment and Economic Growth in India: A Time Series Analysis. *The Journal of Developing Areas*, 14(2).
- Papyrakis, E., & Gerlagh, R. (2007). Resource abundance and economic growth in the United States. *European Economic Review*, 51(4), 1011–1039. <https://doi.org/10.1016/j.euroecorev.2006.04.001>
- Rambaldi, A. N., Brown, R. P. C., & Hall, G. (2006). Re-testing the Resource Curse Hypothesis Using Panel Data and an Improved Measure of Resource Intensity. *REPEC*.
- Zaib-un-nisa, Z., & Faridi, M. (2020). Contribution of agricultural exports to economic growth in Pakistan. *Journal of Advances in Economics and Finance*, 5(4). <https://doi.org/10.22606/jaef.2020.54001>