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Relationship between Employment and GDP in Pakistan: Sector Wise Estimation of Output Elasticities

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Abstract

This paper examines the impact of employment level on GDP in Pakistan with the help of causality and cointegration analysis. Moreover, it provides the estimates of sector wise output elasticities with respect to employment. The period of analysis spanned over the years 1994-2019. Both variables were used in the form of natural-log. The econometric analysis revealed a positive and statistically significant long-run relationship between macroeconomic variables, that is, employment and GDP. Log-log model was used to estimate output elasticities of employment. Granger's causality test was used to determine causality. For cointegration analysis, bound test of ARDL was used. The estimated output elasticity of employment in Pakistan is 2.5. Furthermore, the causality test results indicated that there is a unidirectional causal relationship between employment level and total output (GDP).

Introduction

Employment in any country is considered a key macroeconomic indicator of economic growth. Sustainable economic growth can be measured using a spectrum of improved macroeconomic indicators, one of which is the employed labor force of a country. The creation of employment opportunities and the investment in human and physical infrastructure have a positive and significant impact on the economic growth of primary, secondary and tertiary sectors of the economy. In the socioeconomic

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domain, unemployment remains a major problem as compared to other economic problems. In many developing countries, unemployment or underemployment are considered as significant causes of widespread poverty.

Globally, several economic recessions have occurred in the 20th and 21st centuries. Resultantly, various developed and developing economies have experienced economic meltdown during which their labor force was affected adversely and unemployment increased. Currently, the whole world is affected adversely by the pandemic (COVID-19) and a huge economic crisis / loss has been reported by different economies. Pakistan has been affected also by the current pandemic and experienced negative economic growth in the fiscal year 2019-20[1]. Besides pandemic, there are other political and policy issues which remain significant causes of the recent negative growth of the country's economy. As the current pandemic is mostly an urban phenomenon, therefore, the industrial and service sectors of Pakistan reported negative growth in the sector wise analysis. More specifically, the industrial sector significantly declined (-5.6%) and the main cause of this decline was the reduced productivity of the manufacturing sector.

The comparison of fiscal years 2017-18 and 2018-19 showed that economic growth decelerated from 5.5% to 1.9%. According to the Planning Commission of Pakistan, the main cause of this decline were the highest ever macroeconomic imbalances and the resultant adjustments to regain the macroeconomic stability. They also reported that the four major commodity producing sectors, namely crops, mining, manufacturing and construction witnessed negative growth, which shows that economic growth was not consistent even before COVID-19. The purpose of this study is to find out causal linkages between employment and economic growth in Pakistan and the mutual correlation between employment level and economic growth.

Several studies have been carried out to explore the relationship between employment and economic growth, which has been the focus of scholarly attention in the field of macroeconomic research. Their aim was

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[1]See: Pakistan Economic Survey (PES)

to find out how growth in GDP contributes to employment growth. In this paper, the reverse, that is, the contribution of employment in economic growth and its significance are studied. For this purpose, this paper is based on an empirical analysis to calculate the output elasticity of employment, which is a key indicator and can be used to assess the labor market operation. This indicator provides information regarding how change occurs in economic output via any change in the employed labor force. Similarly, sector wise output elasticities are also helpful to assess the economy at micro level. Zulfiqar and Chaudhry (2008) stated that high employment elasticity is commonly considered as good for the economy since it indicates that the economy has a greater capacity to expand its output.

Economies of both developed and developing counties face the problem of unemployment; however, the intensity and nature of this problem varies between them. To analyze employment and its impact on the different sectors of the economy, it is necessary to be in the possession of comprehensive statistics of relevant human resources including population, total labor force, and the number of employed and unemployed persons. In Pakistan, unemployment indicator[2] is improving although it has historically remained high over the decades. In the first decade of the 21st century, the average unemployment rate was 6.8%. In 2010s, it remained 5.9%. As per the last Labor Force Survey (2017-18), the total population of Pakistan was around 207 million and the total labor force was 65.5 million, among them 3.8 million active workers were unemployed. On the other hand, the size of real GDP has been continuously increasing with the passage of time, although GDP growth rate has not stabilized over time.

**Sustainable Development Goals and GDP-Employment Association**

With reference to Goal 8 of Sustainable Development Goals (SDGs), Target 8.2 focuses to achieve higher levels of economic productivity through diversification, technological enhancement and innovation in labor-intensive sectors, such as agriculture and cottage industries. Metadata defines how Target 8.2 can be measured, as per definition it is the annual growth rate of GDP per employed person. The association between total

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[2]For details see: Pakistan Economic Survey (PES) 2019-20

output (GDP) and employment level plays an important role to achieve the SDG Target 8.2. As per report[3] on data gaps issued by SDG Support Unit, the per annum growth rate of real GDP per employed person in 2014-15 was 2.4%. In this paper, the time series of this indicator and the graph from 2000-01 to 2018-19 have been generated and presented below.

Figure 1

SDG Indicator of Target 8.2 (Growth Rate of GDP per Employed Person)
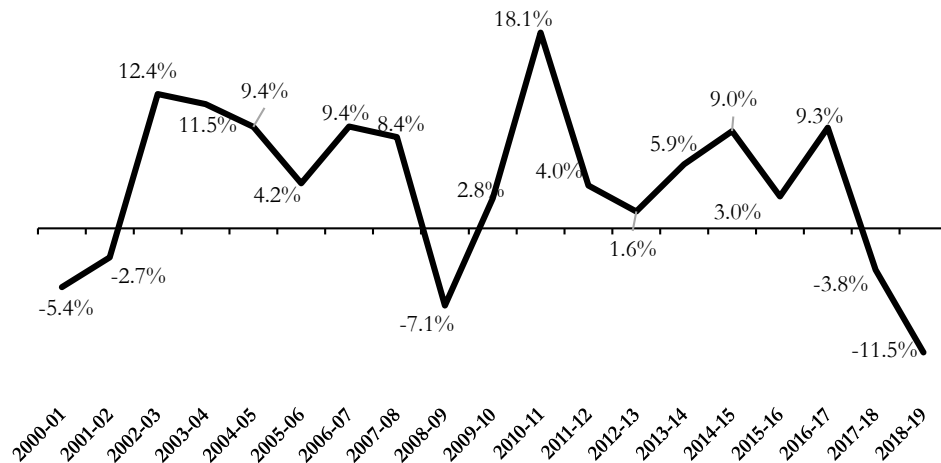
Source, Author's Construction

Figure 1 shows a significant negative growth in GDP per employed person reported in 2000-01 and 2008-09, although a significant decline occurred during the last decade in 2018-19. This situation persisted before the COVID-19 pandemic. Now, there is a high probability that this indicator may have further declined. For achieving the Goal 8 of SDGs, this indicator is significant and it is essential to grow the economy for its improvement. This study is based on the estimation of the output elasticity of employment, which could be helpful to gauge the expected amount of change in the country's output through change in employment.

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[3]Report: "Data Reporting Gaps" *produced by Federal SDGs Support Unit, Pakistan and UNDP (June, 2018)*

Objectives and Research Hypothesis

The current work aims to investigate the direction of causality and cointegration between employment and GDP, based on Granger's causality and ARDL methods. Furthermore, this paper estimates the sector wise output elasticities of employment, which helps the reader to analyze the sector specific impact of the employed labor force on economic output.

To hypothesize the relationship between GDP and employment level, comparative statistics of employment and the GDP growth rate of the neighboring countries of Pakistan are presented below in Table 01.

Table 1

Comparison of Employment and GDP Growth of Different Countries

Country	2016		2019	
	Employment to Population Ratio (%)	GDP Growth (annual %)	Employment to Population Ratio (%)	GDP Growth (annual %)
Bangladesh	54.1	7.1	56.5	8.2
India	47.6	8.3	46.7	4.2
Sri Lanka	52.7	4.5	51.7	2.3

Source: WDI

The above table provides two time-points data of employment and GDP growth rate, which clearly elucidates a direct relationship between employment level and GDP growth in different geographies. The data shows that in India and Sri Lanka, the employment to population ratio declined from 2016 to 2019 and these economies also experienced a significant reduction in their GDP growth rate in the same period. On the contrary, employment to population ratio rose from 2016 to 2019 in Bangladesh and this country also reported a 1.1 percentage point increase in its GDP growth rate.

According to the existing research, the causal relationship between economic growth and employment can be both bidirectional or unidirectional, depending on the economic situation of the country. In our data, the graph of both series is presented in the annexure, which shows that there is lag-impact of employment on the real GDP of Pakistan.

As per the employment statistics[4] of Pakistan, in the first decade of the 21st century the average employed labor force was 42.4 million, while in the last nine years, the mean employed force was 57.7 million. These numbers show that the employed labor force increased rapidly, especially in the last nine years the employed labor force increased 36.1% as compared to the previous decade. Simultaneously, significant technological advancement has also occurred during the last two decades. This review provides room for further research to reinvestigate the causal relationship and model building between employment and economic growth and also for the estimation of the output elasticity of employment. There are two major objectives of this research. The first is to find out the direction of causation between employment and economic growth using Granger's causality. The second is to explore whether long and short-run relationships exist between GDP and employed labor force with the help of the ARDL bound testing approach. These results will assist in policy formulation and its implementation in Pakistan.

Sector Wise Average Productivity of Labor in Pakistan

Scatter and average productivity plots are drawn in Figure 2 and 3 to analyze the relationship between the employed labor force and GDP. Figure 2 depicts a significant positive relationship between output and employment. The average productivity of labor is plotted in Figure 3, which indicates that the average productivity of labor in Pakistan is increasing with the passage of time.
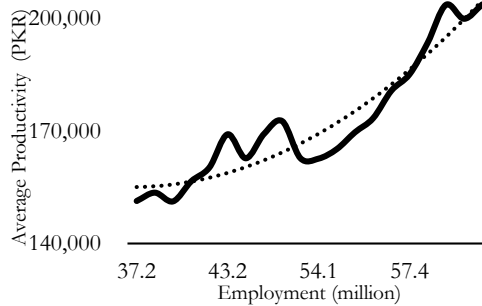
Figure 2

Scatter Plot (Real GDP and Employment)

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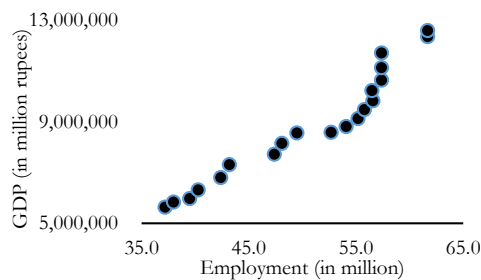
[4]Refer: Pakistan Economic Survey, 2019-20

Figure 3

Average Productivity of Labor

Source: Author construction, data used from the Pakistan Economic Survey and PBS

The graph of labor productivity has a significant upward slope and the fitted trend shows that the behavior of labor productivity curve is convex with a positive slope, which shows that the trend is increasing at an increased rate. The data of average productivity of employed labor shows that Pakistan remains in the first phase of production and the economy has sufficient capacity to produce more. Hence, the employment level can be increased.

Figure 4

Sector wise Average Productivity of Labor (2000-01 to 2018-19)
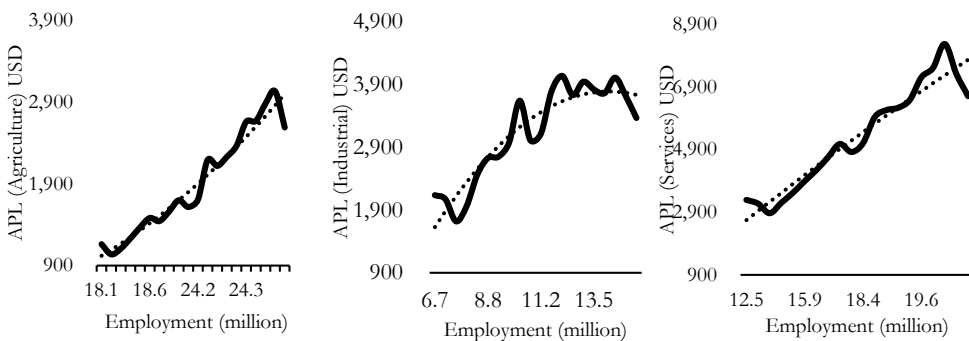
Source: Drawn by Author and data used from Pakistan Economic Survey & PBS

In the sectoral analysis of the average productivity of labor, agriculture and services sectors show an almost linear positive trend. It reflects that both sectors are in their first phase of development and need more investment to achieve the economies of scale and to give their optimal output. On the other hand, the industrial sector in Pakistan is undergoing the second phase of production and its average productivity curve reached its peak during the period of analysis.

Review of Literature

A number of studies have been conducted at both domestic and international levels on the relationship between economic output and employment status. Different authors have reached the conclusion that a long-run, positive and statistically significant relationship exists between these two important macroeconomic indicators (Akçoraoğlu, 2010; Awan & Aslam, 2015; Sodipe & Ogunrinola, 2011). These studies confirm the positive relationship between economic output and employment. Conversely, some studies, which contradict the economic theory, found an indirect or negative relationship between GDP and employment, such as the one conducted in Indonesia (Sudrajat, 1993).

For Pakistan, Zulfiqar and Chaudhry (2008) estimated the employment-based economic models and sector wise elasticities. They divided the overall economy in six sectors, namely agriculture, mining and manufacturing, trade, transport, electricity/gas and construction. They analyzed the contribution of each sector towards job creation in terms of employment elasticities. Their research projected in 2008 that in Pakistan, unemployment will increase rapidly. (Awan & Aslam, 2015) investigated the agriculture sector and analyzed the impact of employment on GDP. In their study model, all the variables were taken in the form of annual growth (%) and the main explanatory variables were employed labor force and gross fixed capital formation (used as the proxy of capital). However, some controlling factors were also adopted as independent variables, such as trade openness, inflation and agriculture-value-added. They concluded that agricultural employment and inflation have a significant impact on agricultural output (on the basis of consumer price index). Moreover, the impact of employment is positive, while Consumer Price Index (CPI) has an adverse impact on agricultural output. Most importantly, the variable

"capital for agriculture" was found to be insignificant in the model. It reflects that there is no impact of gross fixed capital formation in the agriculture sector on agricultural output.

Kitov and Kitov (2012) investigated the long-term data of the largest developed countries including USA, UK, Canada, France, Japan and Australia from 1970 to 2010. The results proved that the evolution of the employment rate can be predicted with a high accuracy by using a linear dependence model based on the logarithm of real GDP per capita. Their study was based on the modified Okun's law in which the change of unemployment '*du*' is regressed by the change of the log of per capita income '*dlnG*' as real GDP.

In 2014, Turkish economist Aktas (2014) calculated the employment elasticity of the output growth. He calculated that every one percent growth in GDP caused 0.28 percent growth in employment. However, his model also made explicit a weak relationship between economic growth and employment in Turkey for the period 1970-2012.

The relationship between economic growth as measured by real GDP and employment in Nepal was examined by Bhusal et al. (2012) for the duration 1975-2010. They found that the overall employment elasticity of Nepal is 0.48, keeping in view all the sectors of the economy. Furthermore, the authors concluded that there exists a uni-directional causality from output to employment. The model of this research was based on the nexus of employment and GDP in Nepal encompassing the three main sectors of its economy, namely agriculture, industry and services. In this research, both the time series of employment and GDP were integrated at a higher level *I(2)*. The results revealed that an increase in employment level does not have any adverse impact on GDP growth. So, as per causal direction and elasticity, employment opportunities in Nepal may increase with the corresponding increase in economic growth.

Malec et al. (2016) investigated the relationship of GDP with employment in Egypt and found a strong positive association between them. Furthermore, their research is based on female participation and their statistics show that the ratio of female employment is much lower than male employment. Moreover, unemployment in women is much higher than men.

They emphasized structural reform for greater and effective participation of women in the country's labor force. The study found the female labor force to be more dedicated than the male labor force, especially in the agriculture sector.

Kucis and Palic (2021) analyzed the elasticity of employment to output gap for Croatia using the time series of 2000-2020 in order to examine the effects of cyclical GDP activities on the labor market variables. They found that the impact of the variable of income gap on employment was negligible as compared to the impact of GDP growth on employment. The results showed a statistically significant and positive relationship between cyclical components of GDP and cyclical employment. The authors computed the elasticity of cyclical employment with respect to income gap as 1.39. They emphasized the forthcoming use of the monetary and fiscal policies of the country to provide the funds needed for employment creation during a period of cyclical recession.

Several studies have been conducted on the relationship between unemployment and GDP in order to understand the overall employment scenario of Pakistan, in association with economic growth. Some economists believe that the relationship between unemployment and economic growth is insignificant and the main cause of this insignificance is the instability of Okun's law. In other words, different economies have a different economic structure, according to the studies conducted by (Ahmed et al., 2011; Meyer, & Tasci, 2012; Batavia & Salam, 2012). Other economists found a strong, negative and long-term relationship between output growth and unemployment (Abbas, 2014). Similarly, Neely (2010) applied the Okun's law and found that U.S. output growth declined less than most other industrialized countries, while unemployment in the U.S. rose higher and faster in the same period. Further, he concluded that Okun coefficients can change over time because the relationship of unemployment to output growth is conditioned by laws, technology, preferences, social customs, and demographic conditions.

Ahmed and Samad (2019) wrote a research brief on employment in Pakistan with respect to trends, sectoral shares and elasticities. Their objective was to calculate employment elasticities with respect to the GDP of Pakistan. As per their results, the overall elasticities of the decades 2000-

2010 and 2011-2020 are 0.23 and 0.25, respectively. They found a significant positive relationship between employment and economic growth. Moreover, they recommended that the government should emphasize employment in the agriculture sector because this sector has the capacity to absorb excess and unskilled labor.

A recent study on employment and unemployment was published in Turkey. Chapter 8 of this study calculates the effects of male and female employment on economic growth in Turkey (Inal, 2021). This study is also based on sectoral analysis covering the sectors of agriculture, industry and services. It disclosed that the importance of women in the labor market of Turkey is increasing day by day due to its increasing competitiveness. Gender wise data of employment and GDP for the time series 1991-2019 was analyzed and the results showed that female employment has a significant role in the agricultural sector as compared to male employment. Despite the fact that the agriculture sector is a labor-intensive sector, its share in total employment is decreasing in Turkey with the passage of time, which may create employment insecurity for women.

This review concludes that the relationship between unemployment and economic growth does not converge in many studies. Economic theory and the available literature posit the need that the long-term results of the relationship between employment and economic growth may be generalized in a better way.

Research Gap

Different studies on the relationship between GDP and employment have been conducted in Pakistan and in other countries, which were discussed in the above review. However, the nexus between employment and GDP (from employment level to GDP), which determines the country's economic growth through its employment level, has not been discussed in the literature. Hence, research on a model which uses the employment level of a given country to regress its GDP growth is not found in the domestic literature. Although, some studies, such as Kucis and Palic (2021) in Egypt and Bhusal et al. (2012) in Nepal, executed the regression model from both perspectives using a bi-directional approach between employment and economic output. Considering this research gap, the model from

employment to real GDP /was used for the time series 1994-2019 and the output elasticities for all the three sectors of the economy were computed, rather than simply computing employment elasticities.

Data and Research Methodology

Research Model and Time Series

To investigate the long-term effect of employment level on Pakistan's Gross Domestic Product (GDP), time series data from 1994 to 2019 of employment and GDP was collected from the published data sources of Pakistan Economic Survey and Pakistan Bureau of Statistics (PBS). In the current study, firstly data was analyzed to determine causality between employment and output on the basis of Granger's causality test. The possible relationship of these variables was mathematically expressed in functional form as follows:

$$gdp_t = f(emp_t) \tag{6.1}$$

In the above equation, gdp_t represents the annual GDP of Pakistan and emp_t stands for the total employed labor force for the period *t*. Generally, output is the combined function of labor and capital. For the variable 'labor', the series of total employment was used, while the proxy of gross fixed capital formation was used for the variable 'capital'. In our study, as per the general assumption of ceteris paribus, the variable capital was taken as constant and the impact of employment on economic output was studied. During the review of literature, it was also identified that the variable capital was found to be insignificant in a research conducted by Awan and Aslam (2015) on the relationship between the agriculture sector and employment. The basic econometric model of *log-log model* (6.2) was sued to calculate the output elasticity.

$$Lgdp_t = \beta_0 + \beta_1 Lemp_{t-1} + \mu_t \tag{6.2}$$

A graphical inspection of GDP and employment series (the first lag of employment) is introduced in equation (6.2), with the assumption that employment has a one-year lag impact on economic output. For the estimation of the sector wise output elasticities, equation 6.2 is modified as follows:

$$Lrgdp_{i,t} = \beta_0 + \beta_1 Lemp_{i,t-1} + \mu_t \tag{6.3}$$

where i shows the ith sector of the economy which includes agriculture, industries and services.

Unit Root Test

Usually, time series has the problem of unit root. In other words, the mean of time series does not remain constant over time due to trending. Unit root tests are performed to check the stationarity of the time series. Non-stationary time series gives spurious results. In this regard, augmented (Dickey & Fuller, 1979; Phillips, 1987) tests are applied for stationarity testing.

Granger's Causality Test

Granger's causality test was used to determine the causal relationship between employment and economic output. The test results may be concluded in three possible ways: no causation, one-way causation (unidirectional), or two-way causation (bi-directional).

$$Lgdp_t = \emptyset_1 + \sum_{i=1}^{n} \alpha_i Lemp_{t-i} \, u + \sum_{i=1}^{n} \beta_i Lgdp_{t-i} + \epsilon_{1t} \qquad (6.4)$$

$$Lemp_t = \emptyset_2 + \sum_{i=1}^{n} \gamma_i Lemp_{t-i} + \sum_{i=1}^{n} \delta_i Lgdp_{t-i} + \epsilon_{2t} \qquad (6.5)$$

where *t-i,* the *i* shows the number of lags used in the model.

In this paper, causality analysis was performed at different lags (1, 2 and 3 lags) to check consistency in the proposed relationship. The causation test provided the same conclusion at different lags, which conforms the consistency of the results.

ARDL Bound Testing and Error Correction Model (ECM)

The widely used Auto Regressive Distributed Lag model (ARDL) bounds testing (Pesaran et al., 2001) is the more appropriate approach in cointegration analysis. It provides efficient estimates for a small sample size. The general ARDL equation is presented as follows:

$$\Delta Lgdp_t = \alpha + \sum_{i=1}^{p} \beta_i \Delta Lemp_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta Lgdp_{t-j} + \lambda_1 Lemp_{t-1} + \lambda_2 Lgdp_{t-1} + u_t \qquad (6.6)$$

In the above equation, ARDL determines the short-run relationship between GDP and the total employed labor force, where α is the intercept, β_i and γ_i are short-run coefficients, p is the lag length, λ_1 and λ_2 are long-

run coefficients and u_t represents the residuals. After the estimation of ARDL, coefficients λ_1 and λ_2 were used to test the null hypothesis of "no cointegration" (which is $\lambda_1 = \lambda_2 = 0$) against the alternative hypothesis of cointegration between the study variables (mean λ_1 and λ_2 are not zero). This hypothesis was tested by using the Wald test (*F-distribution*) to compare the critical bound values produced by (Pesaran et ., [2001]). If the calculated value of *F-Statistic* is higher than the upper bound, the null hypothesis is rejected and it shows that a long-run relationship between study variables exists. However, if the calculated *F-Statistic* value is below the lower bound, then the null hypothesis is accepted. On the other side, if the calculated value lies in between bounds (I(1) and I(0)), the results are considered inconclusive.

A short-run relationship between the total employed force and GDP can be estimated by the error correction version of ARDL bound testing. ECM can be econometrically expressed as follows:

$$\Delta Lgdp_t = a + \sum_{i=1}^{k} b_i \Delta Lemp_{t-i} + \sum_{i=1}^{k} c_i \Delta Lgdp_{t-j} + \phi ECM_{t-1} + e_t \quad (6.7)$$

where ECM is the error correction term and its coefficient shows the speed of adjustment of disequilibrium in the period *t*.

Empirical Analysis and Interpretation

Descriptive statistics of the time series of employment and GDP is presented in Table 02, which covers average total employment, average GDP and their standard deviations.

Table 2

Descriptive Statistics

Series	Unit	Mean	Standard Deviation	Observations
Employment	Million	46.6	10.2	25
Real GDP	Million (USD)	157,391	87,968	25

Correlation matrix shows the direction and nature of the relationship between the variables. Natural logs of both macroeconomic variables, that is, employment in millions and GDP are presented in Table 03. The results

of correlation show the symmetric matrix and the sign explains the direction of the relationship between the variables.

Table 3

Correlation and t-statistic

Variables	Employment	Real GDP
Employment(-1)	1.00	
GDP	0.98 (26.0232)	1.00

Correlation results exhibit a 98% linear relationship between the first lag of employment and GDP in Pakistan. The coefficient was also found to be significant and it led to the rejection of the null hypothesis of *no correlation* with *t-statistic* given in parenthesis.

Unit root results of ADF and PP tests (depicted in Table 04) show that both the variables are integrated at *I(1),* which means that the series is stationary at first difference.

Table 4

Integration Orders (P-Values)

Variables (Overall)	ADF				PP			
	Level		1st Difference		Level		1st Difference	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend	Intercept	Intercept & Trend	Intercept	Intercept & Trend
GDP	0.7931	0.7235	0.0011	0.0067	0.7877	0.7342	0.0013	0.0080
Employment	0.7539	0.8125	0.0001	0.0002	0.7184	0.8509	0.0001	0.0001

Stationarity results of sector wise employment and GDP are presented in the annexure. The results showed that in the agriculture sector, employment is stationary at level and GDP is *I(1)* . Both variables in the industrial sector are stationary at first difference; however, employment in the services sector is I(1) and GDP is stationary at the second difference.

In Granger's causality analysis, both series appear in natural log. Table 04 shows that the integration order of both series is one. The results are presented in Table 05. It elucidates a one-way causation, from employment to GDP, at different lags and all lagged models confirm that employment level increases economic output in Pakistan.

Table 5

Granger's Causality Results

Null Hypothesis:	Lags	F-Statistic	P-value
Employment does not Granger cause GDP (25 obs)	01	5.4283	0.0294*
GDP does not Granger cause employment (25 obs)	01	1.4533	0.2408
Employment does not Granger cause GDP (24 obs)	02	12.147	0.0004**
GDP does not Granger cause employment (24 obs)	02	0.4156	0.6658
Employment does not Granger cause GDP (23 obs)	03	10.500	0.0005**
GDP does not Granger cause employment (23 obs)	03	0.7100	0.5620

*and** show significant at 5% and 1% level, respectively

The estimated regression results of overall GDP and employment with one lag are presented in equation 7.1. The overall economic output was found to be most responsive to employment level. The results indicate that if the total employed labor force is increased by 1% in one year, the overall economic output increases by 2.5% in the next year.

Table 6

Long-run Estimates

Regressors	Coefficients	Standard Error	T-value	P-value
C	2.0592	0.3682	5.5919	0.0000
LEMP(-1)	2.5694	0.0966	26.5987	0.0000

*and** show significant at 5% and 10% level, respectively

For cointegration analysis, econometric technique ARDL with bound testing approach was used. The results are presented in Table 06. These results show that the value of F-statistic exceeds the upper bound, so the null hypothesis was rejected.

Table 7

Bound Testing Results with Null Hypothesis, No Long-run Relationship Exists

F-Statistics	Lower-Bound I(0)	Upper Bound I(1)	Conclusion
4.8422*	4.04	4.78	4.84

* significant at 10% level of significance

On the basis of the evidence of cointegration between employment level and GDP, various diagnostic checks were applied on the model estimated in equation 7.1 and the results are given below.

Adjusted R-Square	0.9671	DW=1.5
Overall Significance	F-Stat=707.492	P-val=0.0000
Normality	JB=0.5270	P-val=0.7683
Ramsey RESET test	F-Stat=2.81	P-val=0.1080
Diagnostic Test	Chi-Sq Ver.	F Ver.
Hetroskedasticity	0.0719(0.7885)	0.0662(0.7994)
Serial Correlation	1.4769(0.4778)	0.6592(0.5276)

ARCH test of hetroskedasticity with the null hypothesis of "no hetroskedasticity" and Breusch-Godfrey (BG) serial correlation test with the null hypothesis of "no serial correlation" (Chi-Sq. and F versions) showed that the problem of autocorrelation and hetroskedasticity are not detected in the model. Normality test with Jarque Bera (JB) statistics revealed that the errors are normally distributed. Ramsey test with the null hypothesis of "no misspecification in model" identified that the model is correctly specified.

The estimated results of equation 6.3 for the sector wise output elasticities of employment are presented in Table 07. These results reveal

that employment has a positive and significant impact on the overall economy and all its sectors.

Table 8

Sector Wise Output Elasticities of Employed Labor Force

Sectors of Economy	Output Elasticity of Employment
Overall	2.51
Agriculture Sector	1.28
Industrial Sector	0.81
Services Sector	0.08

The overall economy is more responsive to the lag impact of employment level. The most responsive sector of the economy to employment level is agriculture. If agricultural employment is increased by 1%, economic output increases by 1.28%. The lowest output elasticity of employment was found in the services sector in Pakistan; however, the industrial sector is just as elastic, which means that it is near to unitary elastic.

Since a long-run relationship between study variables has been established, we can proceed for the short-run dynamics model ECM. Table 08 reports the estimated coefficients of the short-run model.

Table 9

Short-run Estimates (Error Correction Model)

Regressors	Coefficients	T-value	P-value
C	0.0513	2.1871	0.0439
DLGDP(-1)	0.5220	2.0966	0.0523**
DLGDP(-1)	-0.2028	-1.3889	0.1839
DLag_LEMP(-1)	0.9776	1.8189	0.0877**
DLag_LEMP(-2)	-1.2785	-2.0815	0.0538**
ECM(-1)	-0.43	-2.5927	0.0196*

*and** show significant at 5% and 10% level, respectively

The results of ECM indicate that the first lag of employment has a positive and significant impact on overall GDP in the short-run. However, it is less responsive in the long-run. GDP is autoregressive in the short-run and its first lag with natural-log also has a positive and significant impact. In this model, the coefficient associated with ECM is expected to be significant with a negative sign. Error correction term presented in Table 08 is significant at 5% level of significance with a negative sign and exhibits 43% rate of convergence toward equilibrium, which can be interpreted as 43% short-run disequilibrium, adjusted per year.

Adjusted R-Square	0.75	DW=1.9
Overall Significance	F-Stat=9.43	P-val=0.0002
Normality	JB=0.0206	P-val=0.9897
Ramsey RESET test	F-Stat=0.2834	P-val=0.6023
Diagnostic Test	Chi-Sq Ver.	F Ver.
Hetroskedasticity	0.0713(0.7894)	0.0647(0.8018)
Serial Correlation	0.3436(0.8421)	0.1110(0.8957)

For ECM, ARCH test and BG serial correlation test with both versions of Chi-Sq. and F-dist. showed no problem of autocorrelation and hetroskedasticity. Similarly, there is no misspecification in the model as per Ramsey's results and JB test concluded that the residuals of regression model are also normally distributed.

Conclusion and Recommendations

The results of the empirical analysis confirmed a one-way causal direction from employment to GDP. ARDL bound testing analysis showed that the employed labor force has a positive, long-term and significant impact on GDP in Pakistan. These results are consistent with economic theory and also with the results derived earlier by Akçoraoğlu (2010) in Turkey, Sodipe et al. (2011) in Nigeria, Awan and Aslam (2015) and Ahmed and Samad (2019) in Pakistan. The results of causality between employment level and economic growth are aligned with the study conducted in Nepal. Bhusal (2012) also found a one-way causation. However, the direction was reversed which shows that it may vary from country to country.

The results of the Log-log model elucidate that economic output at aggregate level is more responsive to total employment. Moreover, higher elasticity indicates that economic growth is more responsive to employment change and the economy has a great potential to increase its output as employment opportunities increase. During sectoral analysis, the output elasticity of employment in the agriculture sector proved to be higher among all three sectors. The possible reason behind this higher elasticity is the labor intensivity of this sector. The review of literature shows that in this sector, women comprise the major portion of the employed labor force and they are also more dedicated workers than men. Similarly, recent research conducted in Turkey by Inal (2021) on the impact of male and female employment on economic output suggests that the development of the agriculture sector of the economy should be a priority of the government since it can help in two ways: firstly, by improving economic growth and secondly, by providing the opportunities of employment for women.

The calculated elasticity of the industrial sector is less than one, so an increase in labor input in this sector may produce a decreasing return, as 1% increase in industrial labor raises industrial output by less than one percent. It may be noted that the average productivity curve of the industrial sector is concave to the axis of labor input. Therefore, the slope of the curve increases at decreasing return. A plausible reason behind low output elasticity may be that the industrial sector and more specifically, the manufacturing sector uses more capital intensive techniques. Improvement is needed in employment generation regarding the industrial sector. For this purpose, fruitful policies may be formulated for the small and medium manufacturing enterprises and cottage industries. These are not usually capital intensive and can absorb more labor, which can help to reduce unemployment.

The services sector has been the largest sector of Pakistan's economy for decades and the share of this sector is increasing, gradually. In the financial year 2019-20, the share of the services sector was reported to be 61% of the overall economy of Pakistan. Hence, a higher output elasticity of employment in this sector may be very helpful to reduce unemployment in the country, though this sector depends on the use of more capital intensive techniques, as well as the availability of skilled and trained labor.

Therefore, it was found to be least responsive to employment among all three economic sectors.

The findings suggest that as the country's economy is responsive to employment level, so it has the potential to increase its output. Therefore, an increase in employment opportunities in different sectors may lead to an increase in the country's overall output. Using sectoral analysis, targeted operations for increasing employment opportunities may be carried out in the services and manufacturing sectors at the initial level. In this regard, both monetary and fiscal policies can be designed to increase employment opportunities, which may have a significant positive impact on economic growth, along with inducing constant growth of autonomous capital. Once, this process is started and growth begins and accelerates gradually, bi-directional causation between employment and economic growth sets in, allowing them to mutually reinforce each other as well as the economy. It is concluded here that the development of strategies / policies for an immediate increase in employment and investment to raise economic growth significantly in Pakistan is imperative, in both short- and long-run.

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Annexure

Figure A1

GDP and Employment in Pakistan
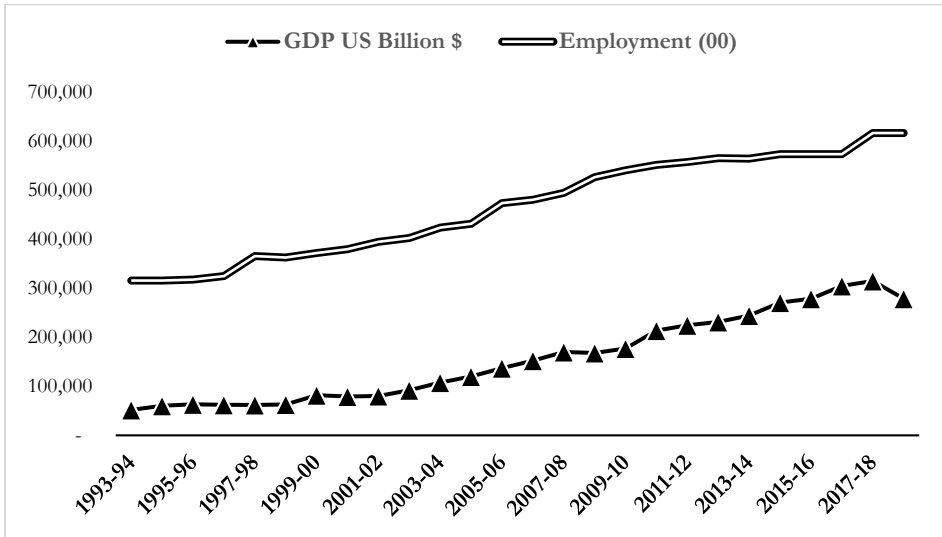
Source: Author's production

Table A1

Integration Orders (P-Values) Sector Wise GDP and Employment

Variables (Overall)	ADF (Intercept & Trend)					
	Agriculture		Industrial		Services	
	Level	1st Diff	Level	1st Diff	Level	1st Diff
GDP	0.9993	0.0218	0.9871	0.0024	0.9885	0.2100
Employment	0.0043	-	0.3541	0.0007	0.2557	0.0050