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Research Article

Linking and Delinking Aspects of Economic Growth and Employment in the Indian Economy: Granger Causality Approach

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Abstract

The purpose of this paper is to provide an overview of various economic growth and employment approaches that have been popular throughout economic history, with a focus on linking and delinking aspects of GDP and employment in the Indian economy. The semi-log quadratic model was used for the trends of GDP and employment across the selected countries. For the determination of the linkages between the variables, the Granger causality test promulgated by Engel and Granger (1987), and the maximum likelihood-based technique of Johansen and Julius (1990) and Johansen (1992) were used in the study. The results found that employment and GDP are two different aspects of an economy not only in the Indian economy but across the majority of the world economies. The results of model specification proved the presence of both long-run and short-run relationships between GDP and employment by the Johansen co-integration test in the Indian economy over the period. It has been found that the increase in GDP is negatively influencing the employment level by the VECM model as a 1 per cent increase in GDP results in 0.28 per cent of job losses in the Indian economy. This study aims to provide an overview of several approaches to economic growth and employment that have been popular throughout economic history up to the present, with an emphasis on linking and delinking aspects of economic growth and employment. In the context of an economy, economic growth and employment are two distinct aspects that should be tackled with separate economic strategies.

Keywords

Economic Growth, Employment, Johansen Co-integrating Test, Granger Causality Test, Indian Economy, Post-Reform Period

1. Introduction

Declining employment and stagnant economic growth in major labour absorption sectors particularly in Organised, manufacturing, and formal sectors is a major concern of re-thinking and revising the economic policies nowadays. Since the implementation of ‘new economic reforms’, the economic growth rate in terms of long-run has sunk to abysmal levels. Indian economy grew at a rapidly increasing rate from nearly 6 per cent in 2001 to 9.7 per cent per annum in 2006–07. The manufacturing sector is known as the engine of growth, but, in the 2000s, the service sector has taken over this role. The growth of employment during this period was comparatively less impressive [1].

While the organised manufacturing sector has seen jobless growth in recent years, employment generation is regarded as

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one of the strategies to achieve inclusive growth, particularly in industries. The results of the overall industry analysis demonstrate that recent economic changes have had a detrimental impact on employment growth [2]. During the period 2000-2010, employment growth improved significantly. The organised sector's employment growth is fast, so-called employment-intensive growth, which has attracted workers from the unorganised sector. The substantial improvement in the organised sector's employment intensity of growth is attributed to the strong expansion of the manufacturing and service sectors [3], which is contracting to Um, Vinoj and Joseph (2010) study. Organised sector employment did not grow for most of the post-reform period [4]. Not just in India as a whole, but also in individual states, rising economic development has been accompanied by a low rate of employment growth. As employment elasticity declines in high priority industries, more people lose their jobs, prompting economists to label the recent period as "jobless growth." [5].

In rural India, weaker output growth has resulted in job losses, employees withdrawing from the labour market (due to a lack of employment opportunities), a rapid rise in the open unemployment rate, and real pay stagnation [6]. Since India has an enormous supply of labour combined with a scarcity of capital and skilled labour, and because the labour supply is limitless, India used a multi-pronged strategy in the 1970s to convert labour excess into employment. Efforts were made to make development more employment-oriented by encouraging the growth of employment-intensive sectors, sectoral policies, and special employment programmes, but the introduction of new economic policies slowed the employment with the increasing pace of economic development by relying on more capital-intensive techniques in the secondary and tertiary sectors, which account for more than 70% of GDP in the Indian economy but absorb less of it. The unemployment rate is not entirely influenced by economic growth, i.e., only by 6%; the remaining is influenced by other key factors that are negatively connected [7].

Economic growth in emerging nations is inextricably linked to the dynamics of their production structures, which spur growth by increasing value-added and employment in higher-productivity sectors at the expense of lower-productivity sectors. When labour and other resources move from less productive to more productive activities, the economy grows even if there is no productivity growth within sectors and thus removes constraints from productivity growth [8]. But here people are moving unproductive sectors due to sluggish growth in secondary and using more capital-intensive techniques in manufacturing and service sectors and such structural transformations widened the divergences in terms of equalities, output, employment, human development within the interstate development process.

Kapos (2005) and Dopke (2001) found a significant relationship, in which economic expansion may generate new employment at varied levels throughout time and countries. This reflects varied labour market reactions to economic expansion [9, 10]. According to Schmid (2008), both extensive and intense growth models are significant for employment generation. As a result, economic growth in response to increases in aggregate demand can occur in a variety of ways, including improvements in inputs, factor productivity, or both [11].

The influence of economic development on employment generation is a contentious issue. In specific income ranges, some empirical studies indicate that there is a positive association between economic growth, per capita income, and some measures of employment. For economists, the employment concept is a vital question. The changes in aggregate employment levels linked with economic development have traditionally been recognised and explained by a range of reasons by economists of all traditions and schools. Of course, changes in employment and economic development, as well as their links and interconnections, are at the heart of the issue. This study aims to provide an overview of several approaches to economic growth and employment that have been popular throughout economic history up to the present day, with an emphasis on linking and delinking aspects of economic growth and employment.

2. Data and Methodology

This study used yearly time series data for the 28 years from 1991 to 2019 to examine the influence of economic growth on employment. The data is modified annually, and the data timeline was chosen based on the availability of data. The major indicators which are taken into consideration in the present study are total employment and the gross domestic product collected from the world development indicators. Total employment is the difference between the labour force and the total number of unemployed people in the labour force, as measured by the world development indicators. The gross domestic product derived from world development indicators at constant prices in 2015 is the other primary indicator included in this study.

To analyse the relationship between the variables, all variables were transformed into a natural logarithm and different methods and techniques can be used to determine the co-integrating relationship between the variables. The semi-log quadratic model was used for the trends of economic growth and employment across the selected countries. For the determination of the linkages between the variables, the Granger causality test promulgated by Engel and Granger (1987) [12], and the maximum likelihood-based technique of Johansen and Julius (1990) and Johansen (1992) were used. These approaches may have different advantages depending on the integration order of variables. The maximum likelihood suggested by Johansen and Julius is more advantageous when the analysed variables are of the same integration. Since the variables in this study are all 1(1), the results of cointegration were obtained using the Johansen test of cointegration. Detailed descriptions of the procedure of measuring the models are explained below.

2.1. The Semi-Logarithmic Trend Model

The purpose of this model is to evaluate the nature and direction of growth in terms of economic growth and employment across the selected countries and country groups as classified by the world development indicators from 1991 to 2019. For example, if the nature and direction of growth across the selected countries between the variables are moving together then there is some sort of linkages between the variables and there is no need to further analysis. However, if the variables are not possessing a similar direction and nature of growth, then how far the variables are cointegrated with each other. The average annual growth trend is analyzed by fitting the semi-log linear and quadratic trend model, which gives the overall scenario of a country's nature and growth of economic growth and employment. The model is essential and fit for the average growth of a country's performance in different periods. The semi-logarithmic quadratic trend model is expressed as:

$$\ln(y) = a + \beta t + \gamma t^2 + \mu_t \quad (1)$$

Where, $'\ln(y)'$is the dependent variable is in natural log and $'\alpha, \beta \; and \; \gamma'$ are the parameters. The coefficient 'β' is the average annual trend growth, and if the coefficient 'γ'is statistically significant, then the growth rate is either accelerating or decelerating, i.e., if the sign of parameter 'γ' is positive, then the growth is accelerating. If the sign of the parameter is negative, then the growth rate is decelerating. When the log-quadratic trend equation is used, the average growth rate can be computed by

$$Growth\ Rate = \sum \left[\frac{(\beta + 2\gamma t)}{n}\right] * 100 \quad (2)$$

An insignificant value of $'\gamma'$ indicates that the growth rate is constant over the period, wherein the Log-Linear model $'\ln(y_t) = a + \beta t + \mu_t'$ has to be fitted for computing the constant growth rate. Then the growth rate is given by: $[Anti\log(b) - 1] * 100$.

2.2. Model Specification

To determine the interaction between India's gross domestic product and total employment, the following VAR model was formulated.

$$lnemp_t = a_1 + \sum_{j=1}^{p} \alpha_j \, lnemp_{t-j} + \sum_{j-1}^{p} \beta_j \, lnincome_{t-j} + \mu_t \quad (3)$$

$$lnincome_t = a_2 + \sum_{j=1}^{p} n_j \, lnemp_{t-j} + \sum_{j-1}^{p} y_j \, lnincome_{t-j} + v_t \quad (4)$$

Where:

$lnemp_t$ – natural logarithm of total employment in India at time t,

$lnincome_t$ – natural logarithm of the gross domestic product at time t, and

a_n indicates the constant; α_j, β_j, n_j and y_j represent coefficients; μ_t and v_t are error term; t is current period and $t - j$ is lag period.

The estimation of the above equations is preceded by the unit root test (ADF), to ensure the stationarity of the variables. If variables are found to be stationary at level or 1(1), the VAR analysis is undertaken. However, if variables are not 1(0), these are differentiated and the co-integration test is used. The presence of co-integration among variables requires the estimation of Vector Error Correction (VEC). Assuming that one co-integrating relationship exists, the VECM derives from equations 3 to 5 can be represented as follows:

$$\Delta emp_t = a_1 + \sum_{j=1}^{p} \alpha_j \, \Delta emp_{t-j} + \sum_{j-1}^{p} \beta_j \, \Delta income_{t-j} + \omega_1 ect_{1t-1} + \mu_t \quad (5)$$

$$\Delta income_t = a_2 + \sum_{j=1}^{p} n_j \, \Delta emp_{t-j} + \sum_{j-1}^{p} y_j \, \Delta income_{t-j} + \omega_2 ect_{2t-1} + v_t \quad (6)$$

Where ω_1 to ω_2 are coefficients of the error correction ECT that captures the adjustment of fluctuations in variables towards the long-run equilibrium. The analysis of VECM was followed by the Granger causality tests, to determine the short-run direction among pairs of variables. Normality tests and autocorrelation were conducted to ensure the accuracy of the results obtained from the used model.

3. Results

3.1. Nature and Growth of GDP and Employment Across Countries

The average annual growth trend is analysed by fitting the semi-log trend model, which gave the overall scenario of the nature and growth of GDP (gross domestic product) and employment between the countries and country groups – like; the World economy, High-, Medium & Low-income countries, China, India, Indonesia, Japan, Pakistan and the USA as classified by world development indicators during 1991-2019. The results of the semi-log linear and quadratic model across the selected countries are portrayed in Table 1.

Table 1. *Trends in Economic growth and Employment across Global Economies during 1991-2019.*

Model: ln y = a + βt +γt^2 and / or ln y = a + βt

Economies	Variables	Coefficients			Significance		Growth Rate	Nature of Growth
		a	β	γ	β	γ		
China	GDP	27.672	0.107	-0.000	0.000	0.000	9.16	D
	Employment	20.263	0.014	-0.000	0.000	0.000	0.55	D
HIC	*GDP*	30.925	0.033	0.000	0.000	0.000	2.15	D
	Employment	19.910	0.009 0.000	-1.330	0.000 0.000	0.965*	0.05	C
India	*GDP*	26.815	0.057	0.000	0.000	0.000	6.33	A
	Employment	19.497	0.030	-0.001	0.000	0.000	1.50	D
Indonesia	*GDP*	26.444	0.024	0.001	0.000	0.000	4.43	A
	Employment	18.146	0.015 0.001	0.000	0.000 0.000	0.060	0.10	C
Japan	*GDP*	28.911	0.011 0.000	-9.057	0.000 0.000	0.112*	0.03	C
	Employment	17.999	-0.004	0.000	0.003	0.002	0.01	A
LIC	*GDP*	25.663	0.041	0.000	0.000	0.373*	4.47	A
	Employment	18.503	0.027 0.001	-8.789	0.000 0.000	0.447*	0.14	C
MIC	*GDP*	29.583	0.044	0.000	0.000	0.004	5.41	A
	Employment	21.221	0.020	-0.000	0.000	0.000	1.33	D
Pakistan	*GDP*	25.347	0.038 0.002	7.575	0.000 0.000	0.326*	0.15	C
	Employment	17.207	0.036 0.002	0.000	0.000 0.000	0.000	0.17	C
USA	*GDP*	29.874	0.040	-0.001	0.000	0.000	2.41	D
	Employment	18.608	0.014	-0.000	0.000	0.017	0.86	D
World	*GDP*	31.167	0.034 0.001	-9.837	0.000 0.000	0.015	0.10	C
	Employment	21.513	0.018	-0.000	0.000	0.000	1.34	D

*Indicated the coefficients are statistically insignificant at 5% level.
#A, D and C, Indicates the growth rate is Accelerating, Decelerating and Constant
Source: own elaboration.

It has been analysed from the table, that among the ten selected countries and country groups the nature and direction of growth in terms of GDP and employment are same in only three individual countries like; China, Pakistan and the USA. In the remaining countries and country groups, the coincidence between the variables is contradicting each other. In terms of China, Pakistan and the USA there exists some sort of relationship between the variables either GDP is pulling the employment or vice versa. Both the variables have shown a deaccelerating trend while in

Pakistan, both remained constant over the period. Among the country groups like; HIC and MIC, the nature of growth of GDP has shown an upward trend while in terms of employment it has shown a downward trend. In the same way, among the LI countries, the GDP has shown an accelerated trend while employment has remained constant. It indicates that the majority of the countries among the country groups as classified by world development indicators have failed to bring both the variables on one platform. A similar analysis was found in terms of India and Japan over the period from table 1. Even the world economy has not shown any kind of linkages between economic growth and employment.

The above analysis indicates that in the majority of the countries of the world economy, GDP and employment are not moving together rather their direction is contradicting each other. Several studies have claimed a positive relationship between the two variables in most of the countries in different periods.

3.2. Unit Root Test (ADF)

In the VAR model, omitting the unit root might result in erroneous or irrational findings. To put it another way, without the unit root test, the results cannot be trusted or applied to build suitable policies. Furthermore, the unit root test has also been used to identify which variables are integrated in which order. The Augmented Dickey-Fuller test (ADF) and Butterworth (BW) tests were applied in this study, and the test results are presented in Table 2. The absolute values of ADF statistics are less than the absolute values at 5% at levels and are not stationarity, however, the absolute values of ADF statistics surpass the absolute values at 5% after detrending with the Butterworth filter, and they become stationarity at the first difference.

Table 2. *Results of Unit Root Tests (p-values).*

	Levels			After Detrending			
Variables	**ADF Statistics**	**5% Critical Value**	**10% Critical Value**	**ADF Statistics**	**5% Critical Value**	**10% Critical Value**	**Remarks**
Employment	-1.65	-2.994	-2.628	-4.349	-2.994	-2.628	1(1)
GDP	0.357	-2.994	-2.628	-5.792	-2.994	-2.628	1(1)

Source: own elaboration

However, it was better, before any estimation, to determine the optimal number of lags to be employed by the VAR approach. Log-likelihood (LR); Akaike Information Criterion (AIC) and Hannan-Quinn Information Criterion (HQIC) suggested the optimal 7 lag while, Schwarz Information Criterion (SIC) and Final Prediction Error (FPE) has suggested lag 4. Therefore, the maximum number have suggested lag 7 for a better outcome for the VECM.

3.3. Results of the Co-integration Test

To evaluate if there is a short-run or long-run connection between the variables of GDP and employment in the Indian economy, it is crucial to first estimate a system equation of a dynamic structure. The connectivity among the variables is a major aspect of this study, as reflected in the type and direction of growth by the semi-log linear and quadratic model. There should be no results if there is no relationship, and the co-integration test is a prominent method for evaluating a long-run relationship. The Johansen co-integration approach is one of the tests used to see whether variables have a long-term connection. The tests employ eigenvalue transformation to discover a maximum correlation of linear combination among variables.

Table 3. *Johansen Co-integration Test Results.*

Maximum Eigen test				Trace Test			
Rank	**LL**	**Statistic**	**CV (at 5%)**	**Rank**	**LL**	**Statistic**	**CV (at 5%)**
0	167.66	29.69	14.07	0	167.66	32.33	15.41
1	182.51	2.63	3.76	1	182.51	2.63*	3.76

Maximum Eigen test				Trace Test			
Rank	**LL**	**Statistic**	**CV (at 5%)**	**Rank**	**LL**	**Statistic**	**CV (at 5%)**
2	183.83			2	183.83		

Note: Results were estimated using deterministic trend specification.

Maximum Eigen and Trace tests indicate a single co-integrating equation at 5%.

The results of the Johansen test of co-integration on the two variables using the VAR approach are shown in Table 3. The null hypothesis states that there is no long-run relationship between variables or co-integration. At the 5% level of significance, both the eigenvalue and trace test statistics surpass their critical values, indicating that at least one cointegrating vector exists (H0; rank = 0). For more than one cointegrating equation (H0; rank = 1 or rank 1), both eigenvalue and trace test statistics are smaller than the critical values at the 5% level of significance. This indicates that only one cointegrating equation exists. As a consequence, the research indicated that there is a long-run relationship between GDP and employment in the Indian economy. The long-run relationship equation is generated by normalising coefficients and making one of the endogenous variables a function of another:

$$lnemp = -12.064 - 0.281 lnincome \quad (7)$$

Equation 7 indicates the presence of a negative relationship between GDP and employment in India, as a 1 per cent increase in GDP results in 0.28 per cent of job losses. It is concluded that an increase in the gross domestic product has a long-term negative impact on employment. The estimation of the Vector Error Correction Model is based on the presence of a long-run relationship between GDP and employment (VECM). The error correction term has to be negative and significant and meets the requirement of long-run equilibrium adjustment. By testing the linear hypothesis, the VECM results also suggest the presence of a short-run relationship between employment and GDP, with all lagged short-run differences equaling zero.

Table 4. *Results of Diagnostic Tests.*

Test	H_0	P-value	Decision	Conclusion
LM Test	No Serial correlation	0.789	Fail to reject H_0	There is no serial correlation in the model
Jarque-Bera	Residuals are normally distributed	0.530	Fail to reject H_0	Residuals are normally distributed

Source: own elaboration

When employing econometric tools to do a regression analysis, it is easy enough to make flaws that lead to erroneous findings. The normalcy test and serial correlation were utilised in the study to confirm the accuracy of the results. To accomplish this objective, the null and alternative hypotheses were chosen, and the findings are reported in Table 4. Since the results of VECM passed all the necessary diagnostic tests, the conclusion is certainly that the results are reliable.

3.4. Granger Causality Test

The preceding analysis demonstrates that a rise in GDP has a negative impact on employment in the long term, as well as the existence of a short-run association between the variables in the Indian economy. The Granger Causation Test, which determines the direction of causality, can be used to accomplish this. The results of Granger Causality are portrayed in Table 5.

Table 5. Results of Granger Causality.

H_0	F-Statistic	Prob.	Remarks
Employment does not cause GDP	0.60238	0.4450	Accepted
GDP does not cause Employment	6.4086	0.0180	Rejected

Source: own elaboration

Table 5 shows that there is unidirectional causation that flows from GDP to employment, with a probability value less than a 5% level of significance. While employment does not influence GDP in the short run, the probability values are greater than a 5% level of significance in the short run.

4. Discussions

It has been analysed that the direction of growth rate among the countries of the world economies is not moving in the same path, rather their direction between the GDP and employment contradicts each other in most of the countries. Among the countries and country groups as classified by world development indicators, the relationship between GDP and employment is positive only in China, Pakistan and the USA portrayed in Table 1. Similarly, a positive and significant positive relationship were found between economic growth and employment level while a negative relationship was found between GDP growth rate and employment growth in Nigeria [13, 14]. There is a long-run relationship between aggregate expenditure and job creation while consumer spending has negatively affected employment in the South African manufacturing sectors [15]. Moreover, economic growth has negatively influenced the unemployment rate, but not that much as other factors are influencing the USA [16]. Based on the shreds of evidence and the results on the table 1 shows that the link between GDP and employment among the majority of the countries and country groups are opposed to each other. It has been also found that the structural transformation path among the countries is also distinct from each other; that is the transformation path of developed countries are different from the developing countries [17, 18].

We have seen from the VECM and Granger Causality analysis, that both long- and short-run relationships exist between GDP and employment in the Indian economy. It was found that GDP has negatively affected employment while we have only one-way causation between the variables i.e., GDP granger causes employment after the new economic reforms. The economic growth has destroyed the employment level in the Indian economy after the 1990 reforms. In recent years, the remarkable drop in the absolute number of employees in the Indian economy has been a source of controversy and public concern. A detailed examination of the data for the years 2001 to 2018 reveals that it is the result of a dynamic job creation and destruction process [19]. Despite the pride of position acquired by manufacturing as the "engine of growth," the declining employment elasticity in the organised sector will not able to mend the gap between growth and employment [20]. The stagnation of employment growth appears to be mostly due to a scale effect, in which the slowdown in economic increase, particularly in labour-intensive sectors like agriculture, construction, and business, has constrained employment growth [21]. There is a relation between GDP and employment, but the relationship tends to be negative after the post-reform period, and it became more severe after the pandemic.

Economic development strategies can be divided into two categories. The first is to maximise the output growth rate, while the second is to maximise the employment growth rate. Almost all planned economies prioritise output growth, while almost all developed market economies prioritise employment growth. China has followed the first model for a long time. However, China has inevitably moved toward the second model as a result of the transition to a market economy, changes in the economic structure, and high unemployment. The Chinese government's primary economic development goal is to create more jobs for China's massive labour force. The employment structure has shifted significantly [22]. Similarly, economic growth has a positive and significant impact on employment growth in the USA. Between 1990 and 2003, the number of workers employed in the tertiary industry increased dramatically, outpacing all other industries in terms of job growth in both countries [23, 24].

Though economic growth has a strong impact on employment growth, the direction and growth of both the variables have shown decelerating trend over the period. Whereas the nature and growth of GDP and employment have remained stagnant in Pakistan during the same period. There is an imperative need to boost economic growth. The most important requirement for increasing employment is long-term growth. Macroeconomic stability, investment-oriented policies, and political stability will be the catalysts for achieving a healthy growth rate in Pakistan [25]. However, since the initiations of the new economic reforms, a strong sectoral structural transformation of output was seen moved towards the services sectors from the agriculture and industry. In other words, the growth of secondary and tertiary sectors has increased rapidly and sluggish the growth of employment in the Indian economy.

The increased growth of the GDP in India is incapable to create jobs, even in the high growth sectors. Labor intensive policies must be adopted to maximise the employment growth rate with output growth rate.

5. Conclusion

This analysis delves at a variety of GDP and employment approaches that have been prominent throughout economic history, with a focus on linking and delinking aspects of GDP and employment. The results of the analysis proved that employment and GDP are two different aspects of an economy not only in the Indian economy but across the majority of the world economies. From the semi-log linear and quadratic model, it has been found that only in three individual countries there is some sort of linkages between GDP and employment as both the variables are coinciding with each other over the period; like China and USA have shown decelerating trend among both the variables and the growth of GDP and employment in Pakistan has remained stagnant. However, in the Indian economy, the growth of GDP has shown an accelerated trend at 6.33 per cent while employment has shown decelerated trend at 1.50 per cent over the period. In the remaining analysed countries and country groups (classified by WDI), the direction of growth trend between the variables is deviating from each other. Therefore, from this model, we have not seen positive linkages between the variables across the majority of the world economies.

The results of model specification proved the presence of both long-run and short-run relationships between GDP and employment by the Johansen co-integration test in the Indian economy over the period. It has been found that the increase in GDP is negatively influencing the employment level by the VECM model as a 1 per cent increase in GDP results in 0.28 per cent of job losses. Similarly, in the short-run, GDP Granger causes employment and conversely, employment does not Granger causes GDP. Therefore, it can be concluded that the Indian economy is incapable to generate additional employment rather than losing the jobs with an increase in the economic output. The policies which were framed to make the Indian economy more labour intensive has failed to generate employment, rather they are focusing to boost the output level only. This is the time for the policymakers to rethink and revise the economic policies to delink the GDP and employment in the Indian economy in a more productive way so that the bottleneck of the employment problem will curb with the increase in economic output.

Author Contributions

Altaf Hussain Padder is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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