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NEXUS BETWEEN CAPITAL FORMATION, ECONOMIC GROWTH, AND UNEMPLOYMENT DURING POST ECONOMIC REFORM PERIOD IN INDIA

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Abstract: The relationship between investment and economic growth is far from being settled in the literature as the empirical studies mention divergent findings and the employment & economic growth nexus remains inconclusive. This study investigated the nature of investment, economic growth, and employment in India during the post-economic reform period (1990-2021) within the Vector Error Correction Model (VECM) framework. The results show that a long-run relationship exists between these variables, and suggests a piece of evidence in favor of bi-directional causality between employment and economic growth. Economic growth is also found to precede investment, rather than vice versa. It concludes that economic growth is an important driver of investment and employment in the long run in the Indian situation. The study also confirms the hypothesis of jobless growth in the post-economic reform period and suggests that a more favorable economic environment needs to be vigorously engineered through improved infrastructural facilities, and diversification of the economy in the labor-intensive sectors like agricultural and allied sectors to spur investment level in the country.

Keywords: Gross Fixed Capital Formation; Investment; Economic Growth; Employment; Granger Causality; VECM.

JEL Classification: E22; E24.

INTRODUCTION

Gross Fixed Capital Formation is the major component of domestic investment that is regarded as an important instrument to accelerate economic growth and employment in terms of macroeconomic policy. Theoretically, an increase in investment is expected to provide more jobs or increase employment levels. The meanwhile higher growth rate of the economy has also been argued to stimulate domestic investments. Thus, there exists bi-directional causality between investment and economic growth. However,

improvements in innovations, science & technology, which have resulted in manpower being displaced by machines and leading to a situation known as 'Jobless Growth' may undermine the role of investment in accelerating the growth of an economy {Coombs & Green (1981); Hodge (2009)}. Computerization and mechanization help to perform certain types of work more efficiently, enhancing productivity, but may result in job losses in the economy and consequently lead to jobless growth {Frey & Osborne (2015)}. Literature have limited empirical studies that consider the impact of investment on employment generation {Levine & Renelt (1992); Mankiw *et al.* (1992); De Long & Summers (1992)}. De Long & Summers (1992) established a positive relationship between investment and economic growth but asserts that the positive linkage represents a causal link running from investment to economic growth, that is, increased growth is triggered by higher investment rates in the form of investment in equipment. Summers & Heston (1991) investigated 101 OECD countries and observed that an increase in the level of investment is preceded by steady and long-term economic growth. Blomstrom *et al.* (1996) and Carroll & Weil (1994) found that economic growth Granger-cause investment, but investment does not Granger-cause economic growth.

2. INDIAN SCENARIO

The Indian economy has been growing smartly at an average of over six percent per annum during the last three decades when much-needed economic reform was introduced, yet unemployment has been surging alarmingly within that period. This paradoxical situation has led to several studies aimed at providing explanations and solutions to the phenomena. As with macroeconomics, an increase in unemployment reduces output and consequently retard growth. On the social side, it provides ideal minds and hands for indulging in criminal activities. Meanwhile, a reduction in the unemployment rate justifies public expenditure in social and economic infrastructure like education, health, transport, and communication because it is believed that this reduction has the potential of contributing positively to the performance of the economy and promoting higher productivity. Public expenditure has an active role to play in reducing regional disparities, creating infrastructure for economic growth in the form of transport and communication, education and training, growth of capital goods industries, basic and key industries, research and development, and many others. Economic growth comes from technological progress, which is essentially the ability of an economic organization to utilize its productive resources, especially manpower more effectively over time. The underlying reason for government intervention in the country is based on the recognition that the market mechanism, which is supposed to guide the private economic agents, has several inadequacies. One of the major purposes of public sector investment is to guarantee an economic climate in which the labor

needed to produce goods and services will be fully employed in various sectors of the economy.

The goal of achieving employment is the most important among the macroeconomic goals in India, where unemployment and underemployment have been major causes and consequences of widespread poverty. Despite the high-sounding electioneering promises of political leaders, the achievement of employment remains a mirage. The high rate of unemployment and poverty among the other miseries of the populace are the order of the day. Economic growth generally ameliorates unemployment concerns. India pushed the economy to grow at a faster rate by suitably structured policy to help employ its millions of workforce every year. Economic reforms introduced in 1991 were seen as a breakthrough in this strategy. Even while all growth indicators including the gross domestic product (GDP) imply a strong economic improvement, unemployment in the country continues to rise. While major economic indicators point to a fast rebound, the employment market as a whole is struggling hard and has not helped to alleviate its unemployment problem.

Unemployment in India is attributed to the negative development of economic activities; the substitution of labor for capital; and an increase in workforce supply. The country was facing the challenge as early as the 1980s when it was operating under a 'one-sector growth model. India took initiative in the 1990s in the form of Economic Reforms that characterized pro-market orientation that includes: (i) fiscal policy reforms, aimed at rationalization of the tax structure, and reduction of subsidies & fiscal deficit; (ii) financial sector reforms that included liberalization of interest rates, relaxation of controls on capital issues, freer entry for domestic and private foreign banks, and opening up of insurance sector; (iii) liberalization of industrial policies and abolition of industrial licenses; (iv) reforms in foreign trade and investment, liberalizing foreign trade in goods, services, and technology, eliminating import licensing, reducing non-tariff barriers ad liberalizing foreign direct and portfolio investment; (v) infrastructure sector reforms, encouraging private investment in infrastructure and telecommunication; and (vi) reforms in agriculture, relating mainly to both internal and external trade in agricultural commodities. Thus, the thrust of the reforms had been to open the Indian market to international competition, reduce government control, encourage private investment & participation, liberalize access to foreign capital and attract foreign capital. These reforms were aimed to curb the problem of capital inadequacy in the country for the stagnant growth, but the implication of these policies lagged behind the economic and employment growth leading to more unemployment, which economists are more concerned to portray the recent experience of one of the jobless growth (Padder, 2018). Michael, Emeka, & Emmanuel (2016) provides results regarding Granger causality between economic growth and unemployment in Nigeria. This study revisits

the relationship as the direction of causality between investment and economic growth on the one hand, and between investment and employment on the other. Thus the study would be contributing to empirical studies on the relationship between domestic investment, employment, and economic growth.

3. LITERATURE REVIEW

The theoretical position of the central role of domestic investment as the growth engine of the economy is mentioned in the Keynesian view of growth (Harrod - Domar model); the neoclassical growth theory (Solow & Denison) and the endogenous growth theories. These were also examined in the light of empirical studies. Bond *et al.* (2007) investigated 94 non-OECD countries to conclude that a major share of investment and economic growth generates a higher level of output per worker, as well as a higher rate of growth in the long term, but mentioned that investment does not Granger cause economic growth, such as Jones (1995) and Blomstrom *et al.* (1996). It merely says that investment is important in explaining the growth pattern of the economy {Mordecki & Ramirez (2000)}, but causality does not move from investment to economic growth, because investment levels depend on the preceding business cycle. Antelo & Valverde (1994) examined private investment in Bolivia to argue that investment affects economic growth positively and depends on the expected rate of return on capital. However, in developing countries with less developed financial markets, the level of interest rates is not a significant determinant of investment. But Attanasio *et al.* (2000), and Bond *et al.* (2004) provide evidence that investment Granger causes economic growth and suggested that a major share of investment in GDP generates a higher level of output per worker as well as a higher rate of growth in the long-run. Cheung *et al.* (2012) examined 188 rich and poor countries and suggested a negative association between investment and economic growth – particularly in developing countries. Ibarra & Moreno-Brid (2004) found that investment depends crucially on economic growth in real wages in Mexico. Mordecai & Ramirez (2014) found a long-term relationship between economic growth, investment, and employment in Uruguay and suggest that economic growth precedes investment and employment, while investment also precedes employment. Porreca & Carmecci (2001) and Bechet & Othman (2011) used panel data in European countries to establish the causality between investment and economic growth is bi-directional. The impact of capital formation on economic growth was investigated by Kanu & Ozurumba (2014) employing multiple regression analysis and a VAR model and found that total export, domestic investment, and lagged value of economic growth had a positive relationship with economic growth in the long-run, though no such relationship exists in the short-run; which was further confirmed by Suhail & Dania (2015)and Adeghiyga & Odusanga (2014). The empirical

investigation by Mohsen & Maysam (2013) for the Middle East and North African countries suggests strong causality from economic growth to investment, but investment has no significant effects on economic growth in short-run and long-run; that is, the finding suggests that economic growth is the driver of investment. Rajni (2013), however, argued that a bi-directional causality between gross domestic capital formation and export growth in India and has evidence of unidirectional causality from capital formation to changes in export. The relationship between net capital investment and employment in Romania was examined by Iocovoin (2012), who concluded that net capital formation positively and significantly affects employment. Karim, Karim & Zaidi (2012) investigated within the framework of Structural Vector Analysis the relationship between economic growth, fixed investment, and household consumption in Malayasia and confirmed that fixed investment significantly affects economic growth in the short run. Neanywa & Makhenyane (2016) studied the impact of investment on the economic growth in South Africa and revealed that gross fixed capital formation has a positive relationship with economic growth in the short run as well as the long run and the causality was bi-directional. Kumo (2012) also revealed bi-directional causality relations between infrastructural investment and economic growth in South Africa. Meyer & Sanusi (2019) examined South African data within the framework of the Johansen Cointegration and Vector Error Correction Model to conclude that a long-term relationship exists between domestic investment, employment, and economic growth with causality running from economic growth to investment and not vice versa. It also shows that investment has a positive long-run impact on employment and suggests a bi-directional causality between employment and economic growth, while evidence of unidirectional causality from investment to employment was found. Thus, there is no conclusive evidence of the direction of causality between investment, economic growth, and employment. Lack of consensus in the literature between investment, economic growth, and employment motivated the investigation of the nature of the relationship between these variables in India within the framework of the Vector Error Correction Model for the post-economic reform period, that is, 1990-2021.

4. VARIABLES & DATA

The variables used in the study include economic growth with the real gross domestic product as the measurement; gross fixed capital formation for domestic measurement; and the number of people employed as employment. The relevant data were taken from the MOSPI and various related concerned Departments of the Government of India from 1990-91 to 2020-21 (31 observations) and converted to logarithms. Table 1 shows the variables that are used in the study.

Table 1: Description of Variables

Acronym of variable	*Variable*	*Measurement of variable*
LINV	Investment	Gross Fixed Capital Formation
LRGDP	Real GDP	The GDP is at a constant price.
LEMPL	Employment	The number of people employed.

Source: Researchers' compilations (MOSPI & Related Government Departments).

5. METHODS & PROCEDURES

A Vector Autoregressive (VAR) model with an error correction mechanism (VECM) was used to carry out the study. All three data series were converted to logarithms and to analyze the integrated degree of the series the augmented unit root testing was performed using the Dickey-Fuller (ADF) and Phillips-Perron (PP) tests for both levels and the first difference of all the variables. Both the ADF and PP unit root tests utilize the specifications of the following regression model used by Levin, Lin & Chu (2002):

$$\Delta x_t = \alpha + \beta x_{t-1} + \lambda_t + \Sigma_s \Delta x_{t-s} + \varepsilon_t \quad (1)$$

Where x_t is the variable of interest, ε_t is the disturbance term, and t is the time trend. α, β, λ are parameters and summation extends over 1 to n Assuming that each of the variables contains unit roots in levels, but not in the first difference, we may proceed to determine the number of cointegrating vectors among the variables under consideration. Johansen (1991) suggested a method to test for cointegration by suggesting the following p-variable VAR model :

$$X_t = \mu + \Sigma\theta_i x_{t-i} + \eta_t \quad (2)$$

Where X_t is the (p, 1) vector of the variables under consideration, which is (3,1) in this case. Summation extends over 1 to k. η_t is the disturbance term assumed to be a normally and independently distributed Gaussian process with zero mean and variance φ. Although these variables are individually non-stationary, if there is a linear combination of these stationary variables, then they form a meaningful and stable long-run relationship. Thus exploiting the notion that they are cointegrated, we may parameterize equation (2) to obtain the VECM:

$$\Delta x_t = \mu + \Sigma\Gamma_i \Delta x_{t-i} + \pi x_{t-k} + \eta_t \quad (3)$$

Where Γ_i is the parameters; and π is the parameter matrix whose rank defines the long-run relationship between the various variables included in the model. Johansen (1992) formulated the test statistic to determine the r based on the maximum likelihood estimation method, firstly the trace test and secondly the maximum eigenvalue test. The causal relationship between investment and economic growth on one hand and

between investment and employment, on the other hand, were examined with the help of the Granger causality procedure based on VECM, which is attractive over VAR as it permits temporary causality to emerge from the sum of lagged coefficients if the explanatory differenced variables and the coefficient of the error correction terms. The VECM allows causality to emerge, even if the coefficient of the differences of the explanatory variables are not jointly significant {Anoruo & Ahmad (2001)}.

6. RESULT & DISCUSSION

6.1. Descriptive Statistics

Mean, Median, Standard Deviation, Skewness, and Kurtosis for employment, Gross Fixed Capital Formation, and real gross domestic product were computed for the post-reform period 1991-92 to 2020-21. These values are indicated in Table 2.

Table 2: Descriptive Statistics of LRGDP; LEMPL; and LPIV

Descriptive Statistics	*LRGDP*	*LEMPL*	*LPINV*
Mean	5.788	2.760	5.267
Median	6.596	2.655	5.304
Standard Deviation	3.221	0.308	0.457
Skewness	-2.882	3.567	3.122
Kurtosis	11.130	17.308	15.644

Source: Authors' computation.

The economic growth in India during the entire period of 1990-91 to 2020-21 is congregating around the mean value of 5.788 during the post-reform period 1991-92 to 2020-21 indicating a significant positive change in the growth rate of RGDP. The employment rate is congregating around the mean value of 2.760 during the post-reform period, also indicating a significant increment in the employment rate. The public investment in terms of gross fixed capital formation is congregating around the mean value of 5.267 during the post-reform period, also indicating a significant increment in the public investment. The movement of these series suggests that economic reform meets its basic objective of economic growth; enhanced public investment; and added more employment but far below the level of economic growth and investment in the economy to pull down the employment scenario, in the long run, creating numerous social problems. The standard deviation of the economic growth series is much higher than the employment and public investment series, implying more volatility in the economic series than in the employment and public investment series. The values recorded by skewness and kurtosis coefficients show that all these

series of growth rate, public investment, and employment are not normally distributed and are asymmetrical, as the values are greater or lesser than the absolute one.

6.2. The Unit Root test

The unit root test of the time series employed in the study was investigated through the application of the Augmented Dickey-Fuller (ADF) test, and the Phillips – Perrons test, the results of which are depicted in Table 3.

Table 3: Unit Root Results

Variables	*ADF test*		*PP test*	
	T-stat	*P-value*	*T- stat*	*P-value*
LINV	-0.96190	0.7635	-1.2073	0.6683
LRGDP	-1.4724	0.5428	-1.3265	0.5921
LEMPL	-0.4683	0.8912	0.4587	0.8931
ΔLINV	-5.2081	0.0001*	-5.2081	0.0001*
ΔLRGDP	-4.6708	0.0002*	-4.5917	0.0003*
ΔLEMPL	-4.6766	0.0002*	-7.4850	0.0001*

Source: Author's computation. Note: * implies the rejection of the null hypothesis at a 1% significance level.

Table 3 presents the results of the time series properties of the variables with both trend and intercept being significant. All three variables were non-stationary in level I(0) but stationary in level I(1) at a 5 percent significance level.

6.3. Long – run analysis

The Johansen cointegration test for long-run relationships was performed after having determined the stationarity of the time series to test for any linear combination of the variables that have a common stochastic trend. The Johansen test is quite sensitive to the lag length selected. Consequently, a lag selection test was conducted to determine the optimal lag length. A lag length of 2 was selected because this was supported by all the lag selection criteria. In a three-variant system consisting of economic growth, employment, and investment; the maximum number of the cointegrating vector is 2 so the null hypothesis is that there is no cointegrating vector and the alternative is that there is at least one cointegrating vector. The cointegrating results are presented in Table 4.

The null hypothesis of no cointegration is rejected at a 5% significance level in all the cases. However, the alternative hypothesis that there are at most two cointegrating vectors could not be rejected for all the cases. The fact that the variables are cointegrating suggests that there is a long–run equilibrium relationship between the variables in the

Table 4: Johansen Cointegrating Results.

Trace Test				*Maximum Eigen. Test*			
H_0	H_1	*Trace Stat.*	*P- value*	H_0	H_1	*Max. Eigen Stat.*	*P-value*
r=0	r>0	64.9647	0.0040*	r=0	r>0	36.8905*	0.0035*
r<1	r>1	28.0740	0.2380	r<1	r=1	14.2595*	0.4385
r<2	r>2	13.8146	0.3924	r<2	r=2	10.5980	0.2829

Note: Both the Trace test and Maximum Eigen test results show cointegrating at the 5% significance level. Source: Author's computation.

time series as well as the existence of at least one direction. The results of the long-run relationship between the variables at a 5% significance level lead to the following equations:

$$LEMP = 7.07 - 0.486\ LRGDP + 0.2763\ LINV \quad (4)$$

$$LRGDP = 14.53 + 0.567\ LINV - 0.255\ LEMP \quad (5)$$

Equations (4) and (5) show that there is a positive long-run relationship between employment and investment, while economic growth is found to have a negative long-run impact on employment. This confirms the hypothesis of jobless growth in the post-economic reform period in India, and the unemployment rate tending unacceptably high. A positive long-run relationship between economic growth and investment is revealed by equation (5), which is consistent with the previous findings { Kanu & Ozurumba (2014); Mordecai & Ramirez (2014); Ugochukwu & Chinyare (2013); Neanywa & Makhenyane (2016); and Meyer & Sanusi (2019)}. The observed negative relationship between economic growth and employment could be associated with an inefficient use of fixed available factors of production and inadequate technological advancement.

6.4. Causality Tests

Results of cointegration tests lead to the estimation of equation (3), the VECM, to determine the direction of causality between investment, employment, and economic growth. The results are reported in Table 5.

Table 5: VEC Granger Causality test results

Dependent Variable	*Independent variables*			
	DLINV	*DLRGDP*	*DLEMPL*	*All variables*
DLINV	-	9.7779 (0.0028***)	0.5322 (0.7662)	10.1084 (0.9472)
DLRGDP	5.5582 (0.0621)	-	3.9625 (0.1379)	9.1118 (0.0850*)
DLEMPL	10.2534 (0.0059***)	1.0555 (0.5859)	-	12.2411 (0.0011***)

Note: * imply a 10% significance level; *** implies a 1% significance level; Source: Author's computation.

Table 5 reveals that a unidirectional causality exists between GDP and investment, with causality running from GDP to investment and not the other way round (only at a 10% significance level) in India during the post-economic reform period. This position supports the earlier studies that have argued that investment does not Granger cause economic growth. In addition, there is a unidirectional causality running from GDP to employment, and not vice versa as indicated by Rajni (2013) for India. The standard pairwise Granger causality test was conducted to check the robustness of the results, which is indicated in Table 6.

Table 6: Pairwise Granger Causality Test.

Null Hypothesis	*P-value*
LINV does not Granger cause LRGDP	0.3513
LRGDP does not Granger cause LINV	0.0006***
LEMPL Does not Granger cause LRGDP	0.0586*
LINV does not Granger cause LEMPL	0.0157**
LRGDP does not Granger cause LEMPL	0.0003***
LEMPL does not Granger cause LINV	0.0816*

Note: *** implies rejection of the Null Hypothesis at a 1% significance level; ** implies the rejection of the Null Hypothesis at a 5% significance level; and * implies the rejection of the Null Hypothesis at a 10% significance level. Source: Author's computation.

It appears from Table 6 that GDP causes investment but not vice versa, indicating that economic growth drives investment in India. There exists a bi-directional causality between GDP and employment as well as between investment and employment in India, which affirms the previous results by Rajni (2013). Table 7 presents the result of VECM estimation. The significance of the coefficient of real GDP from the VECM estimation is that the real GDP adjusts in the short term to the long-run relation deviations, while the decision criteria for the other variables regarding the coefficients and t-values suggest that they do not adjust in the short-run to long-run relationship deviations.

Table 7: VECM estimation results

Error Correction	*D(LINV)*	*D(LRGDP)*	*D(LEMPL)*
Cointegration Equation 1	0.0197	-0.0153	0.0154
	(0.0165)	(0.0044)	(0061)
	1.1952	-3.5118	2.5157
D{LINV(-1)}	0.7743	-0.04612	0.3254
	(0.4673)	(0.1232)	(0.1734)
	1,6567	3.7398	1.8767

contd. table 7

Error Correction	*D(LINV)*	*D(LRGDP)*	*D(LEMPL)*
D{LINV(-2)}	1.2230	-0.1669	0.3314
	(0.4960)	(0.1309)	(0.1840)
	2.2264	1.3751	1.8610
D{LRGDP (-1)}	0.3712	-0.0134	-0.0036
	(0.1154)	(0.0304)	(0.4285)
	3.2148	-0.4392	-0.0854
D{LRGDP (-2)}	-0.1373	-0.0579	0.0404
	(0.1117)	(0.0294)	(0.0414)
	-1.2300	-1.9646	0.9768
D{LEMPL(-1)}	0.1520	0.1314	0.0218
	(0.3138)	(0.0828)	(0.1164)
	0.4846	1.5868	0.1876
D{LEMPL(-2)}	-0.1574	-0.0200	0.1580
	(0.3942)	(0.0800)	(0.1128)
	-0.5127	1.2877	0.1406

6.5. Stability Tests

Table 8 presents the diagnostic tests, whose results indicate an absence of serial correlation and heteroscedasticity.

Table 8: Diagnostic Test Results

Item	*Applied Test*	*P-value*	*Decision*
Serial Correlation	LM Test	0.4214	No serial correlation
Normality	Jacque- Bera Test	0.1976	Variables normal
Heterocedasticity	Breusch Pagan Godfrey Test	0.2699	No heterocedasticity

Source: Author's computation.

The null hypothesis of no serial correlation, no heteroscedasticity, and normal distribution was accepted because of the insignificance of the probability values as they were greater than the 5% significance level as mentioned in Table 8.

7. CONCLUSION

It is commonly believed that investment plays a pivotal role in the economic growth process, and economic growth is assumed to spur employment generation, which is crucial for the labor surplus Indian economy. The relationship between investment and economic growth is far from being settled as the empirical studies mention divergent findings, and the employment & economic growth nexus remains inconclusive. This study investigated the nature of investment, economic growth, and employment in

India during the post-economic reform period (1990-2021) within the framework of the Vector Error Correction Model (VECM). The results show that a long-run relationship exists between these variables, and suggests a piece of evidence in favor of bi-directional causality between employment and economic growth. Economic growth is also found to precede investment, rather than vice versa. It concludes that economic growth is an important driver of investment and employment in the long run in the Indian situation. The study also confirms the hypothesis of jobless growth in the post-economic reform period and suggests that a more favorable economic environment needs to be vigorously pursued through improved infrastructural facilities, and diversification of the economy in the labor-intensive sectors like agricultural and allied sectors to spur investment level in the country.

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