Employment Growth And Its Determinants In The Organized Manufacturing Sector In West Bengal And Bihar

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ABSTRACT

In the process of economic development of any nation, the rapid growth of industrialization is one of the essential conditions. The rapid growth of the industry of any country leads to the generation of more and more employment in the industrial sector in the economy. According to Collin and Clark, in the process of economic development, the percentage share or contribution to national income increases in the service and secondary sector from the primary sector. So, in the Indian national programme, one of the most important agendas is to generate more and more employment for the people in the different sectors of the economy, including the industrial sector. In the present paper, the author has analyzed the employment growth of labour and its determinants in the organized manufacturing sector in two major states viz. West Bengal and Bihar by using secondary sources of data from 1971-72 to 2009-10.

Keywords: Growth, Employment, Manufacturing Sector, Development, Statistics & Econometrics.

INTRODUCTION

The status of employment growth not only indicates output growth, but is also an important parameter of economic development. Historically, the development process across the world has established a shift of labour force from agriculture to the manufacturing and service sectors. So, in a huge labor surplus economy like India, the question of labour absorption in modern registered manufacturing is very important in framing a development policy. The manufacturing sector in India is important due to the fact that it has a significant role to provide employment opportunities for the growing labour force in the country and is vital in the growth of the economy. So, from the beginning of India's five-year plans, considerable emphasis was given to the growth of employment and national income.

To measure industrial employment, the researcher has used the definition from Annual Survey of Industries. By employment, we mean the number of workers employed in the organized manufacturing sectors. Workers are defined to include all persons employed directly or through any agency, whether for wages or not, and engaged in any manufacturing processes or in cleaning any part of the machinery or premises used for the manufacturing process or any other kind of work incidental to or connected with the manufacturing process. Labour engaged in repair and maintenance or production of fixed assets for factories, for generating electricity or for producing coal, gas, etc. are also included.

The present paper examines the rate of growth of employment and its major determinants in the two major states in India viz. West Bengal and Bihar during the period 1971-72 to 2009-10 with the help of Statistics & Econometrics tools.

REVIEW OF LITERATURE

There are many empirical studies that have been carried out for the determination of growth of employment in India both at the micro and macro level. At the same time, econometricians were interested in explaining the behavior of industrial employment for the Indian economy as a whole. Some of the prominent studies were done by Diwan and Gujrati (1968); Krishna (1974); Goldar (1987,2000), Gupta (1989), Seth & Seth (1991a,1991b), Fallon and Lucas (1991) and Roy (1998). Employment in the organized manufacturing sector in the Indian economy declined in the 1980s, which gradually recovered. There was a gradual increase in employment in this sector during 1980-81to 1990-91, 1990-91 to 1995-96 and 1990-91 to 1997-98. There were so many explanations of the stagnation of employment with the growth of net value added in this sector; the job security regulation by the government was one of the most important among them.

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There are specific econometrics studies on industrial employment behavior. Diwan and Gujrati (1968) estimated the employment function for 28 Indian industries using time series CMI data for the period 1946-58. In most cases, the estimated with respect to weal wage (both short run and long run) were less than unity. Krishna (1974) studied the employment behavior of the aggregate manufacturing sector based on time-series data for the period from 1951-56 from CMI and ASI and indicated that the short run elasticity was about one and the long run elasticity was above one.

Fallon and Lucas (1991) studied the employment situation in India by deriving the labour equation. They estimated a CES cost minimization function using 64 manufacturing industries from 1959-60 through 1981-82. The empirical estimation showed that there were no comparable reductions in labour demand in those small-scale plants that were not covered by job security regulations. On the other hand, among the large plants with stringent job-security provisions, the drop in labor demand was significant. The estimate of wage equation revealed that out of 67 industries, only 3 witnessed a drop in real wages with the imposition of job security regulations. There was no evidence of employers being able to offset the effects of new regulations by offering lower real wages to workers. It is evident from this study that employment growth in the organized segment would have been higher by 17.5 percent if rigid job-security provisions were not implemented.

The view that higher job security regulations were behind the slowdown in employment, was, however, contested by Roy (1998), who analyzed the data from 1960-61 through 1993-94 and argued that job security regulations (both 1976 and 1982 amendments considered) did not have a significant adverse influence on employment growth. Many others, including Papola (1994), Ghosh (1994), and Bhalotra (1998), supported these views.

According to Papola (1994), the increase in productivity during the 1980s was much faster than the wage rate. He further observed that poor employment growth in the 1980s was mainly because of the decline in employment in two major industries- textiles and food products-following the large-scale closure of mills due to sickness and also due to investment in machinery to overcome obsolescence. Nagaraj (1994) and Bhalotra (1998) pointed out that though employment growth turned negative in 1980s, the total man-days in registered manufacturing units went up significantly, and hence, man-days per worker recorded a positive growth rate. They argued that the observed increase in earnings per worker represented greater effort and not necessarily implied an increase in wage rate. They argued that the observed increase in earning per worker represented greater effort and not necessarily, an increased in the wage rate. Nagaraj found that while the real earning per worker increased at 3.6% per annum, the growth rate of real earning per man-day was only 1.6% per annum. This view, however, did not find favour with Golder (2000), who argued that growth in man-days per employee was not a major cause of decelerating employment growth during the 1980s.

The approaches to measure productivity also varied a great deal. While some studies have estimated productivity growth assuming the Cobb-Douglas structure of production (Das, 2003), others, including Golder (2004), have assumed relatively flexible form for the estimate. Golder (2004) showed that more than the assumption of production function, the methodology of measuring input and output could be crucial to estimate the productivity. Hsieh (2000) showed that when elasticity of substitution between labour and capital is lower than 1, the standard growth accounting exercises tend to understate the role of productivity growth as a determinant of economic growth.

It needs to be mentioned here that the debates on both employment and productivity growth have largely been based on the assumption that the manufacturing industry exhibits a Cobb-Douglas production function, restricting the technical change to Hicks-neutral, and the elasticity of substitution between labour and capital to 1. Evidence, however, suggests that neither of the two assumptions is valid for manufacturing. There has been biased technical change as is evident from a sharp decline in the share of labor in the gross value added over the last few decades. Golder (2004) attributed this decline to the labour-saving feature of technical change. Using a trans log production (value added) function for the Indian manufacturing and panel data of 17 two-digit industries from 1980-81 through 1997-98, Golder showed that the downward trend in the income share of labour (in value added) in manufacturing in 1990s was largely a result of labour - saving technologies.

It is clear from the literature surveyed on industrial employment of the organized manufacturing sector in India that, though there exists sufficient information from perspectives at the all India level, both at aggregate as well as at disaggregate two digit industry level, very little work has been done to study the growth in performance of industrial employment in different states of the country. Measurement of employment growth and its determinants in India would be of considerable importance towards maintaining the equitable industrial growth of the country across different states. In fact, as a commitment to equity and social justice, planning in India sought to reduce the disparity

between regions. It may be quoted from the first plan that : *"The excessive concentration of Industries brings in its train certain economic and social disadvantages and a wider diffusion of industry is desirable from the larger point of view.Now, if industrial development across the states happens to be equitable, consequently, the growth of industrial employment will also be an equitable one. "*

Hence, a study of the growth of industrial employment across the major states of India could be a guideline for measuring the extent of interstate disparity of employment growth in the organized manufacturing sector, if it at all exists. Further, the overall growth in employment in the manufacturing sector is dependent on the growth and performance of the industries in different states in the country. Identification of the factor or factors responsible for the growth of employment for each state would be the helpline in prescribing policy matters for improving the situation if needed, or in formulating policies for employment in the manufacturing sector for the specific states that have so far been affected badly in terms of industrial employment. The present study has been made in this direction.

OBJECTIVES, DATA, AND METHODOLOGY

The objective of the present paper is to examine the growth rate of industrial employment of Bihar and West Bengal from 1971-72 to 2009-10.

The data was collected from various issues of *"Annual Survey of Industries: Summary Results for The Factory Sector"*, various official reports such as Report on Currency and Finance by RBI, Statistical Abstract of Government of India, National Accounts Statistics and Database of the Indian Economy published by Research and Policy Group, Census of India. However, the data on degree of urbanization was not directly available. To calculate this ratio, the researcher used the data provided by the Census of India. Since Census is held after an interval of 10 years, the researcher took the data for the census years 1971, 1981, 1991, and 2001 for two major states - West Bengal and Bihar. The population figures for 1971-81 and 1981-91, 1991-2001 and 2001-10 were obtained by the population projection. For doing this, the researcher used the following relation :

$$P_2 = P_1 (1+r)^n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where,

P_1 = total population of any state for the first census between any two successive census.

P_2 = total population of any state for the second census between any two successive census.

r = rate of growth of population per year.

n = the time interval between two census. It is obviously 10 for India.

After obtaining *r* found the relation (1), the researcher projected the population figure for any state and for each year using the compound rate formula. He did the same exercise for both - for total and urban population and hence derived the ratio specifying degree of urbanization.

Next, the researcher considered the real wage rate, which is basically the money wage expressed in terms of a general level of prices of a particular year (here 1970-71) taken as a base. These are obtained by dividing the money wage rate of the period 't' at current prices of any particular state, say X, by the corresponding year's Consumer Price Index number (CPI) for the industrial worker (base 70-71) of that state X and multiplying the result by the base-year index 100. The data on CPI for the industrial worker at the state level was not published directly. Rather, the researcher had collected data for the different centers for any particular state associated with the respective weights of the center. Therefore, the researcher first obtained the weighted average CPI figure of different centers to arrive at the CPI figure of any particular state by taking the weights of the respective centres as provided by the data. The data on CPI for the industrial workers was obtained from various issues of *Statistical Abstract (All India)*, Government of India publication. The money wage rate is nothing but the total wages paid to the industrial workers divided by the total number of workers. The data of money wage rate and industrial employment was collected from different issues of Annual Survey of Industries Summary Results for the Factory Sector. The variable NSDP and G are also expressed at constant (1970-71) prices. These data were collected from different issues of *National Accounts Statistics and Report on Currency and Finance*. The econometric literature on the measurement of growth suggests that growth of any variable over time can be measured by calculating either by year to year growth rate or, compound growth rate or, fitting trend equations of different types like linear, exponential trends etc. In the present paper, the researcher has calculated the rate of growth of employment in the manufacturing sector of West Bengal & Bihar by using three alternative specifications : (i) Year to year growth rate (ii) Linear growth rate (iii) Exponential growth rate. Year to

year growth rate may imply fluctuations of growth rate over the period under study. While measuring the growth by using either linear of exponential trend equation, the researcher has not assumed any particular form arbitrarily. Rather, he estimated both the trend equations, computed the simple correlation between observed and estimated value in each case, and chose that specification which yielded the highest degree of correlation.
The year to year growth rate is measured by the formula as given in relation (2) :

Growth rate of employment in period t for a particular state = (A/B)... (2)

Where,
A = Difference between the number of workers at period t and period (t-1) in that state;
B = Number of Workers in period (t-1) in that state.
The Linear trend in growth rate of a variable (say Y) can be determined from the specification :

$$Y = a+bt \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

Implying (dy/dt) = b;
Where, a= constant term;
b = coefficient of time;
t = time trend.
In this case, the linear rate of growth of the variable Y will be equal to :

$$(1/Y)\,(DY/dt) = (1/Y^{m})\,b \ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

In expression (4), for Y, we are representing mean value of income (Y^{m}).
The exponential trend in growth rate of variable Y can be measured by using the relation :

$$Y = ab^{t} \ldots\ldots\ldots\ldots\ldots \quad (5)$$

$$\text{Or, } \log Y = \log a + (\log b)\,t \ldots\ldots\ldots\ldots\ldots \quad (6)$$

To calculate the exponential rate of growth from this specification, the researcher first had to estimate the relation (6) and then had to take antilog of the estimated value of (Log b) and finally, had to subtract one from the resulting value.
In the context of determinants of employment growth, the researcher considered the following functional form :

$$N = f(W, O, NSDP, DR, G, T, U) \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (7)$$

Where,

N=Industrial employment;
W=Real wage measured in terms of 1970-71 prices;
O=Measure of output variable of the manufacturing sector.
The researcher used two alternative measures of output variable,

1)Value of output (VO) at constant prices (1970-71);

2)Net value added (NVA) at constant prices (1970-71), and the researcher took that variable which gave the better fit.
NSDP = Per capita net state domestic product at constant prices (1970-71).
DR= Degree of urbanization measured by the ratio of urban population divided by the total population.
G=Per capita state government expenditure in revenue account at constant price (1970-71).
T=Index of time (in year).
& U = The error term which captures the influence of the variables on the dependent variable (employment growth) that was not included in the model.
To estimate the employment function, the researcher used multiple regression models, where the functional specification was in the log linear form. The researcher run stepwise regression to judge the explanatory power of the variables. This was done either from the general to specific or from specific to general, and the results report the final output of the regressions.Since the researcher was interested in explaining growth of labour employment in the manufacturing sector, all the variables are expressed in Logarithm.

ANALYSIS OF THE RESULTS

❖ **Case- A: The Variation Of "Year To Year" Growth Performance Of The Manufacturing Sector For West Bengal & Bihar :** It can be revealed that the rate of growth of employment in states like West Bengal and Bihar showed a

Table 1 : State Wise "Year To Year" Growth Rate Of Industrial Employment Of West Bengal And Bihar: From 1971-72 To 2009-10

Sl. No.	State	1971-72	1972-73	1973-74	1974-75	1975-76	1976-77
1	Bihar	0.0701	-0.0194	-0.0197	0.0788	0.1661	-0.0125
2	West Bengal	0.0344	0.0158	0.0155	-0.0360	0.3146	-0.0479

Sl. No.	State	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83
1	Bihar	0.0547	-0.0105	-0.0463	0.1041	-0.0302	0.0233

Sl. No.	State	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89
1	Bihar	-0.0179	-0.0408	-0.0234	0.0720	0.0336	0.0325
2	West Bengal	-0.0589	0.0260	-0.1143	-0.0350	-0.0181	-0.0185

Sl. No.	State	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95
1	Bihar	-0.0468	-0.0142	-0.0879	0.1045	-0.0690	0.0036
2	West Bengal	-0.0297	0.0032	0.0139	-0.0022	-0.0222	0.0157

Sl.No.	States	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01
1.	Bihar	-0.0524	-0.0267	-0.1506	0.0752	0.0726	-0.0757
2.	West Bengal	0.1201	-0.0895	0.1163	-0.3506	-0.1403	-0.0738

SL. No	States	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1	Bihar	-0.0038	0.1346	0.0594	0.0761	0.0918	-0.007
2	West Bengal	-0.0130	-0.0120	-0.0437	0.0051	-0.0035	-0.0104

Sl. No.	States	2007-08	2008-09	2009-10
1.	Bihar	0.1002	-0.0002	0.1759
2.	West Bengal	0.0103	0.0656	0.0402

Source: Author's Own Calculation from Data Collected through Various Issues of 'Annual Survey of Industries: Summary Results For The Factory Sector'.

Table 2 : Estimated Linear Trend Equations Of Industrial Employment For West Bengal And Bihar

Sl. No.	States	Estimated Coefficient for Y= a + BT		R^2	D.W.	DF
		Constant	Time (T)			
1	Bihar	241981 (23.605)a	1161.2 (1.8799)c	0.0859	1.6006	36
2	West Bengal	768342 (44.914)[a]	-6635.5 (-6.4381)[a]	0.5997	1.6053	36

Sources: Author's Own Calculation From Data Collected Through Various Issues Of 'Annual Survey Of Industries: Summary Results For The Factory Sector'.

Note: 1) Figures in brackets give the corresponding t-ratios.
2) R^{-2} = Goodness of the fit of the model (Adjusted)
3) D.W. = Durbin - Watson Statistics
4) D.F. = Degrees of Freedom.
5) a = Significant at 1% level of significance

fluctuating pattern during the period from 1971-72 to 2009-10. It can be noted that the growth rates were not only fluctuating over the entire period, but also showed a negative value in some of the financial years.

Table 3 : Estimated Exponential Trend Equations Of Industrial Employment For West Bengal And Bihar

Sl. No.	States	Estimated Coefficient For Log y= Log a+ (Log b) t		R^{-2}	D.W.	DF
		Constant	Time (T)			
1	Bihar	12.389 (297.78)c	0.0123 (1.9279)c	0.004	1.7783	36
2	West Bengal	13.558 (523.25)[a]	-0.0101 (-6.4269)[a]	0.5988	1.7057	36

Sources: Author's Own Calculation From Data Collected Through Various Issues Of 'Annual Survey Of Industries: Summary Results For The Factory Sector'

Note: 1) Figures in brackets give the corresponding t-ratios.
2) R^{-2} = Goodness of the fit of the model (Adjusted)
3) D.W. = Durbin- Watson Statistics
4) D.F. = Degrees of Freedom.
5) a = Significant at 1% level of significance
6) c = Significant at 10% level of significant

❖ **Case B: The Case Of Linear And Exponential Growth Rate Of Industrial Employment In The Manufacturing Sector :** The results of estimation of linear and exponential growth rate are presented in the Table 2 and Table 3 respectively.

Since, one relation is linear and the other is non-linear, the value R^2 or adjusted R^2 of these two relations are not directly comparable. Therefore, in order to obtain which fit is better, the researcher calculated simple correlation coefficient between the predicted value and the observed value of the variable, which are presented in the Table 4.

Table 4 : Simple Correlation Coefficient Between Observed Value And Predicted Value Of Industrial Employment For West Bengal And Bihar

Sl.No.	States	Liner Trend Equations Of Employment	Exponential Trend Equations Of Employment
1	Bihar	0.2625	0.3794
2	West Bengal	0.1073	0.7437

Sources: Author's Own Calculation From Data Collected Through Various Issues of 'Annual Survey Of Industries: Summary Results For The Factory Sector'

Simple correlation coefficient between the observed value and the predicted value suggests that exponential fit is better than linear fit for the states Bihar and West Bengal as compared to linear fit. From the analysis, it may be inferred that the growth rate of employment in two different states is not uniform, there exists a wide range of diversity. This prompted the researcher to analyze the determinants that are responsible for this diversity.

❖ **Case C: Determinants Of The Growth Of Industrial Employment :** The behavior of industrial employment is determined by the demand, supply and policy factors. Some of the variables influencing the demand for labour in the manufacturing sector of a particular state may be the output of the manufacturing sector and also the per-capita net state domestic product of the state. The variable influencing supply of labour may be the degree of urbanization. Here, the idea is that higher the degree of urbanization of a state, the higher will be the influx of supply of industrial labor to that state. The behavior of employment in the manufacturing sector in a particular state also depends upon the magnitude of real wage rate prevailing in the state. The real wage rate can affect manufacturing employment either from the demand side or the supply side. Further, to capture the effect of policy factors, one can study the impact of per-capita state government expenditure on industrial employment. Obviously, the above - mentioned variables may not be the only variables explaining the employment in the manufacturing sector of a particular state. The results of the log-linear analysis are presented in the Table 5.

The analysis of Bihar suggests that real wage rate and degree of urbanization were two major significant variables for

Table 5 : Estimated Multiple Regression Equations For Industrial Employment In West Bengal & Bihar: Log Linear Specification

States	Explanatory Variables								R^2	D.W.	D.F.
	Constant	Real Wage Rate	Real Value of Output	Real Net Value Added	Per Capita Real Net State Domestic Product	Degree of Urba-nization	Per Capita Real State Government Expenditure	Time			
Bihar	15.518 (26.212)[a]	-00912 (-3.2215)[a]	-	-	-	1.5486 (5.0689)[a]	-	-	0.5047	1.990	35
West Bengal	16.021 (7.3106)[a]	0.4932 (-5.0391)[a]		0.1446 (2.4812)[b]		4.3779 (2.575)[a]	0.0313 (1.5292)[a]		0.7571	1.3806	33

Sources: Author's Own Calculation From Data Collected Through Various Secondary Sources

N.B. Figures in brackets gives the corresponding t-ratios, and
a = Accepted at 1% level of significance
b = Accepted at 5% level of significance
c = Accepted at 10% level of significance
d = Accepted at 10% level of significance, one tail test
And R^{-2} = Indicates goodness of the fit of the model
D.W. = Durbin Watson Statistics
D.F. = Degrees of Freedom

determining 50.47% of the total variation of employment growth, and both are significant at 1% level. The elasticity of industrial employment growth with respect to both the variables- degree of urbanization and real wage rate are 1.548 and (-0.0912) respectively. This, in turn, implies one percentage increase in the degree of urbanization, and real wage rate will bring 1.548% and -0.0912% increase (decrease) of industrial employment growth rate respectively. While considering the state of West Bengal, the real wage rate, net value added, degree of urbanization and per-capita state government expenditure appeared to be the significant factors in determining industrial employment. The variables are significant at 1%, 5% and 10% level, and explain 75% of the total variation of employment growth. The elasticity of employment with respect to net value added at constant prices, degree of urbanization, and per-capita net state domestic products at constant prices are 0.1446, 4.3779 and 0.0313 respectively. The estimated results, therefore, suggest that 1% increase in net value added, degree of urbanization, and per-capita net state domestic product will imply 0.1446%, 4.3799% and 0.313% increase in industrial employment in West Bengal.

CONCLUSION, SUGGESTIONS, AND LIMITATIONS OF THE STUDY

The present study was concerned with the estimation of growth of industrial employment and also the determination of the factor or factors responsible for such growth in two major states of the country. Through the measurement of growth, it can be inferred that the growth rate of employment in two different states of the country is not uniform, which necessitated the multivariate analysis to determine the influence of explanatory variables on the dependent variable viz. the employment growth of the country. The explanatory variables like real wage rate, value of output at constant prices, or net value added at constant prices, per-capita net state domestic product at constant prices, degree of urbanization and per-capita government expenditure at constant prices were taken into consideration. From the multivariate analysis, it is clear that the determinants of growth of industrial employment in two different states of the country are not similar and vary over two different states.

Employment in the organized manufacturing sector is influenced both by demand side variables, as well as by supply side variables. The demand-side variables are per-capita government expenditure at constant prices, per-capita net

state domestic product at constant prices, net value added at constant prices, and the value of output at constant prices. Whereas, the supply-side variable is the degree of urbanization. Since the sign of the parameter corresponding to the variable real wage rate is negative and statistically significant, we consider this as a demand-side variable.

In the study, it is evident that employment is positively influenced by per capita state government expenditure at constant prices for a state like West Bengal, and hence, industrial employment in the organized manufacturing sector can be improved by increasing per capita state government expenditure for this state. However, it may not be applicable for the state Bihar, as for this state, employment growth is not sensitive to per capita state government expenditure. An important point can be noted here, that though there exists a positive influence of per-capita state government expenditure at constant prices on employment growth in some of the states like West Bengal, an increase in per-capita state government expenditure by an equal magnitude for these states may not generate growth of employment to an equal extent because there may be an existence of large variation in the elasticity of employment with respect to Government expenditure among different states . For supply side variables, the degree of urbanization is significant for the state of West Bengal. In these states, people migrated from rural to urban areas and got employment in different industries, because the demand for labor was good. Finally, for some of the states, the negative relationship between real wage rate and employment, as postulated by the earlier authors, seems to be valid for the present study. For example, the relationship between real wage rate and employment is negative and statistically significant for the states like Bihar and West Bengal.

However, the study also has limitations. First of all, the researcher only took two states viz. West Bengal and Bihar purposely as these two states are more or less adjacent states. Secondly, no structural model like Caldor, Solow, etc. was used for the present study. Thirdly, productivity growth viz. average productivity of labour growth and its determinants are more meaningful than only the employment growth analysis. Finally, although some explanatory variables are statistically significant in explaining dependent variable i.e. employment growth, but in reality, it may not be true. For example, the explanatory variable degree of urbanization should be meaningful if rural-urban migration occurred due to industrialization of those urban areas. So, Granger-Causality test in time series analysis is essential in this regard.

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