Employment and Productivity Trends in the Organised Manufacturing Sector of Tamil Nadu - 1983-2006

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Abstract

Examining the hypothesis of jobless growth in the organised manufacturing sector (OMS) in the State of Tamil Nadu (T.N.), the paper finds that there is some evidence of jobless growth in the post-reform years (1994-2006). However, in both the pre-reform period (1983-93) and the combined period of 1983-2006 there is growth with employment generation. The results of the test for structural change reveal that there is evidence of structural stability in respect of employment generation in the state. This means that the net effect of employment generation over a longer time frame has not been adverse for the state.

1. Introduction

1.1 The performance of organised manufacturing sector in India, for close to three decades now, is widely reported to be marked for its jobless growth status, meaning that growth in output was at the expense of job creation (i.e. negative employment growth). In the backdrop of such a growth process considered undesirable for a labour surplus economy like India, it is important to study the feature of jobless growth with a focus on individual states. This is because a certain trend prevailing at the 'all India' level may not necessarily prevail at the sub-national level as it bears a relationship with the effectiveness of state focused industrial and employment policies pursued. Against this background, the present paper analyses the employment and productivity trends in the fourteen 2-digit level industries of organised manufacturing sector (OMS) in Tamil Nadu during the period 1983-2006. The focus on only the OMS is guided by the two considerations of: (i) time series data availability for the OMS on the one hand and (ii) the need to focus on its (i.e. OMS's) own growth/performance in the light of current employment challenges in India on the other.[1] However, a study focused on limited data available on the larger unorganised manufacturing sector (UMS) in the state has supported the hypothesis of employment based industrial growth in the state.[2]

1.2 With this background in view, the present paper analyses the employment and productivity trends in T. N.'s organised manufacturing. In this, as many of the economic variables would generally be moving in the same direction over time, and therefore the growth profiles of these individual variables would by themselves not reveal the true

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performance of industries, the paper relies on the indicator of total factor productivity growth (TFPG).[3] Further, since the broader aim is to test for the hypothesis of jobless growth, the results of a test for structural stability, construed in terms of an empirical framework with employment as the focus is also presented in the paper.

2. Literature Review

2.1 The term productivity has many dimensions. In its two partial factor dimensions, it refers to the two concepts of labour and capital productivities. Defined as the ratio of output (or value added) to labour and capital inputs respectively, an improvement in either one of these two partial factor productivities would theoretically result in an increase in output. However, as there are a host of other factors also contributing to output (e.g. managerial relations, industrial climate, ease of conducting business, training of workers, etc.) consideration of these two partial factor productivities is often looked at as limited in their scope. In view of this, the concept of total factor productivity, which is defined as the residual growth of output after accounting for the weighted contributions to growth by labour and capital, has become a commonly employed yardstick. However, the TFP method too has its limitations. For instance, an increase in TFP does not mean increase in both labour productivity as well as capital productivity. Further, a rising TFP may mean rising capital productivity and declining labour productivity. Or, it may have differential rates of growth i.e. the growth in labour/capital productivities could both have a different direction (i.e. sign) as compared to the TFP growth. In view of these limitations, even the use of TFP growth has not been unambiguous in conveying the trends of industrial growth and performance. However, there appears to be a general consensus that labour productivity and 'technology' are too important factors to be focused upon. The latter i.e. technological progress is taken to be indicated by the TFP growth.

2.2 Neoclassical economists believe that an increase in productivity would prove beneficial for the employment market in the long run. However, in the short and medium run, an increase in labour productivity especially originating from a higher capital labour ratio decreases the demand for labour (Miron Wolnicki, et al 2006). The neoclassical economists dealing with growth theories hypothesized that the rate of per capita production is inversely proportional to per capita income (Solow, 1956). According to Harrod's growth model, in the long-run the employment rate is determined by the difference between the guaranteed rate of growth and productivity growth. Therefore, when gains in labour productivity are sufficiently high, economic growth is possible when there is no/zero growth in employment, and even when there is a negative employment growth. In other words, a rise in joblessness is entirely possible when labour productivity grows at a rate faster than by a 'stable' wage growth. According to Romer (2000), technology reduces the absorption of new labour. Therefore, if economic growth occurs as a result of productivity gains (as a result of technological progress), the resulting growth does not have to create demand for new workers as the individual productivity gains would be sufficient to reach higher output growth.

2.3 There is a large body of literature on productivity growth, its components and determinants in the manufacturing sector in India. Recently, attention has shifted to examining the relationship between economic reforms and productivity in the

manufacturing sector. Krishna and Mitra (1998), Pattnayak and Thangavelu (2005), Unel (2003) among others find an acceleration in total factor productivity growth (TFPG) in the reform period. However, studies by Trivedi et al (2000), Srivastava (2000), and Balakrishnan et al (2000) find a deceleration in TFPG in the 1990s. A few studies (Unni et al 2001; Prakash 2006) have also analysed the productivity performance of the unorganised manufacturing sector (UMS), especially after the introduction of reforms. Using the data from the ASI and national accounts statistics (NAS), Prakash (2006) estimates the TFP growth in OMS, UMS and TMS at 1.8 per cent, 2.8 per cent and 2.5 per cent, respectively during 1985-95. For 1995-2001, there is negative TFP growth for all three sectors although the TMS has registered an employment growth of 1.7 per cent during 1995-01.

2.4 There is also a debate on whether value added or gross value of output should be considered for calculating the TFP growth. The use of value added for measuring TFP means the contribution of intermediate inputs is implicitly taken. As a result, the TFP growth based on the value added understates the TFP growth. Rao (1996) asserts that ss long as material inputs are separable from the other factors it does not matter as to which of the two measures of production (i.e. gross output or value added) is used for the measurement of productivity. However, if material inputs are not separable, gross output should be preferred to real value added. Pradhan and Barik (1998), however, suggest that the production functions for the aggregate manufacturing in India cannot be assumed to be separable in material and non-material inputs on the basis of statistical tests. Their results imply that till this issue is settled we must work with gross output rather than value added as the measure of output.

2.5 Kathuria et al (2010) analysed the productivity performance of both the organised and unorganised segments using unit level data for selected Indian states for the period 1994-95 to 2005-06. They employed a method developed by Levinsohn and Petrin (2003) to correct the endogeneity bias associated with the production function estimation. Their production function analysis shows that capital rather than labour played a significant role in the production process in both sectors. More surprisingly, 'labour' played lesser role in the production process of even in the unorganised sector. This is a cause for concern as this segment is a significantly larger employment provider particularly to the 'relatively low skilled'. TFP grew steadily in the organised manufacturing sector while there was a decline in the unorganised manufacturing sector. They, however, attribute the growth in GVA to be mostly productivity driven in both the sectors.

2.6 The literature is abundant with work related to the issue of structural change. Most of it is specifically designed for the case of single change. There are two approaches to examine a structural break. While one is based on an a-priori assumption, the other looks for evidence for a structural break by a sequential testing procedure. The first approach adopts the standard Chow's test (1960) which splits the sample into two sub periods, estimates the parameters for each sub-period, and then tests the equality of the two sets of parameters using the classical *F* statistic. The important limitation of the Chow test is that the break date must be known a priori (Hansen, 2001). There are, therefore, two choices: to pick up a break date based on a major policy change (e.g. introduction of reform measures in 1991) or to pick a break date based on observed feature in the data. In the first case, the

Chow test may be uninformative as the true break date can be missed. In the second case, the Chow test can be misleading as the observed break date is endogenous — i.e. correlated with the data — with the test likely to indicate a break falsely when none in fact may exist.

3. Database and Methodology

3.1 Data from annual survey of industries (ASI) for the period 1981-82 to 2005-06 (1982-2006) have been used in the study. Value based variables [viz. fixed capital (FC) and GVA] are suitably deflated[4] to make them temporally comparable. The series of net capital stock is generated by the perpetual inventory method (PIM)[5]. The database on the three key variables viz. employment (E_t), gross value added (GVA_t) and net capital stock (K_t) in year 't' (in addition to a fourth variable TFP_t discussed below) is first tested for 'stationarity'[6]. The dataset on the four variables, taken in their logarithmic form, are considered in their first difference in order to obtain a final database that is stationary.[7] With this, the original database stands transformed to the period 1983-2006. In order to facilitate the comparison of industrial performance between a moderately liberalised regime with that of a more liberalised policy regime, the period of 1983-2006 is divided into two sub-periods: 1983-1993 (first period or the pre-reform years) and 1994-2006 (second period or the post-reform years). Estimation of growth rates and TFPG for the combined period is made by the 'trend based' method[8] and for the two sub-periods by the Kinked exponential model.[9] The test for structural change is focused on examining whether the two exogenous variables viz. changing levels of output (GVA_t) on the one hand, and all other factors taken together represented by TFP_t[10] on the other, have impacted the process of employment generation significantly or not. This part of analysis is based on the results of the Chow test[11].

4. Growth Profile in GVA and Employment

4.1 Employment in the combined period of 1983-2006 has grown by a marginal 0.1 percent (Table 1). Over the two sub-periods, there is a decline from 0.2 percent growth in the pre-reform period to -0.1 percent in the post-reform years. The corresponding trends in GVA is the opposite i.e. marginal negative growth of -0.1 percent during the combined period and an improvement in the growth profile during the two sub-periods from -0.4 percent to 0.1 percent. Although these percentages are not high, they yet provide an initial indicator for the inference of jobless growth. This inference is, however, valid only from a comparative profile of the two sub-periods as for the total period of study such a conclusion is not plausible. From a perspective of individual industries (i.e. in terms of the trend in employment growth and the number of industries registering such a trend), four industries have registered a turn around from negative growth rate to positive growth rate. However, there are also five industries which have suffered a reversal from positive growth rate to negative growth rate over the two periods of comparison. Three industries have retained their position in the positive growth segment (with a decline in their employment growth registered) with two others having remained in the negative growth slot during both the periods of comparison. On average, therefore, it is a mixed situation to be expected from the individual industry growth profiles. Since employment growth and variation therein depends very much on the role of capital[12] we now take a look at the trends in total factor productivity growth.

5. Total Factor Productivity Growth (TFPG)

5.1 The TFPG profiles (Table 2) for 'all Industries' suggest stability over the period of the study with the TFPG registered at a modest 0.2 percent per annum over all three periods of focus in the study. Three industries (viz. wood, paper and basic metals) have registered a turn around from the negative TFPG in the first period to positive TFPG in the second period. Three others (viz. tobacco, machineries and other manufacturing) have retained their position in the positive growth slot over both the periods. The remaining seven industry groups (viz. chemicals, metal products, transport, textiles, leather, rubber and non-metallic) have evidenced a relative position of distress having either remained in the negative segment during both the sub-periods of comparison or for having shifted from a positive segment to a negative one. The net effect on 'all Industries' is, however, one of overall relative stability. The TFPG trends are, however, suggestive of a stable overall efficiency in the performance of industries in which employment is a part. Since our focus is more on assessing the process of employment generation, we now turn towards a more decisive confirmation of this observed situation of stability by a specific test on an employment model considered for the purpose.

6. Structural Stability/Change

6.1 Comparison of the R-square values in the two regression models, one without including TFP_t and the other by including TFP_t, shows consistent improvement both for 'all Industries' as also for the thirteen individual industry groups[13]. This speaks for the significance of including TFP_t as an explanatory variable in the model. The results of the test for structural stability (i.e. the null hypothesis of 'no structural change') is accepted at the 'all Industries' level ($F = 2.3$; the critical value being 3.2) [Table 3]. By sub-industry groups, there is indication of 'structural change' for six industries viz. paper, chemicals, rubber, non-metallic, metal products and other manufacturing. The conclusion of structural stability for majority of industry groups (8 out of 14), with the cumulative impact at the 'all Industries' level also being one of structural stability, therefore, vindicates the earlier inference drawn on the basis of TFPG trends on the general performance of stability by the OMS industries in the State.

7. Policy Implications

7.1 Productivity, one of the major determinants of employment growth has not increased to any significant extent in the post-liberalisation period in T.N. The process of industrial growth during the post-reform period, manufacturing sector of the state has not attained any significant industrial efficiency and the growth was primarily due to growth in demand. It is imperative for the policy makers at the state level to look at an appropriate "competitiveness enhancement strategy" for the sustenance of long term growth of manufacturing industry in the state.

Notes

1. There is an argument on the current employment challenge in the country that in the dichotomised structure of the economy comprising of a small organised and a large unorganised sector presence, the latter with huge divergent income and efficiency characteristics, the employment challenge should focus on: (i) promoting the organised sector to grow with employment creation and (ii) policies to promote the unorganised sector to acquire at least some of the characteristics of the organised counterpart must be pursued (Ghose, 2010).

2. In other words, the growth of the UMS in the state was not jobless (Prakash and Balu, 2010).

3. Refers to the residual growth in output after discounting for the combined weighted contribution of labour and capital.

4. The deflation is effected by applying the wholesale price index for GVA and the index of material and machinery for fixed capital (FC).

5. Following the outline presented in Veermani and Goldar (2004), and using the same factor of 2.57 as used by them for arriving at the bench mark year estimate, the series of net capital stock (NCS) is constructed by following the five steps outlined below:

   Step 1**:** Book value of fixed capital/assets and the depreciation in year't' (i.e. B_t and D_t respectively) are both drawn from the ASI reports.

   Step 2: Gross investment for year 't' (GI_t) at constant prices is computed as:

   $GI_t = [(B_t - B_{t-1}) + D_t] \div P_t$ where P_t is the price index in year 't' for capital goods used as the deflator to convert the book values to a constant base.

   Step 3: Capital Stock in bench mark year (1981-82) is obtained as: $K_0 = 2.57 * B_0$ where B_0 is the book value of FC in 1981-82;

   Step 4: Real investment (I_t) is obtained as $I_t = GI_t - \delta K_{(t-1)}$ where δ is the rate of depreciation taken as 5 percent.

   Step 5: The Net Capital Stock (NCS) series for subsequent years is obtained as

   $K_t = K_0 + \Sigma I_t$; t = 1, 2,…,23.

6. This is done by applying the unit root test i.e. by comparing the ADF statistic with the Mackinnon Asymptotic critical values.

7. The variables taken in natural log and in first difference are thus: $dLnGVA_t$, $KLnE_t$ and $dLnK_t$. For TFP_t it is simply $dTFP_t$. The results of a MWD test for assessing the appropriateness of the form of model are supportive of the form of the model considered with the sign of individual co-efficients and other summary statistics being of the expected sign/magnitude.

8. The growth rate of variable 'Y_t' for the combined period is obtained by fitting the equation $Ln\ Y_t = A + b\ T$. Likewise, the TFPG for the combined period is obtained by fitting the equation: $Ln\ GVA_t = b_0 + b_1\ Ln\ E_t + b_2\ Ln\ K_t + b_3 T$; the coefficient b_3 taken as the TFPG for the combined period.

9. The sub-period growth rates are obtained by fitting the equation:
   $Ln\ Y_t = \beta_0 + \beta_1 (D_1 t + D_2 k) + \beta_2 (D_2 t - D_2 k)$ where for the sub-period 1983-93, $D_1 = 1$ and $D_2 = 0$ and for the sub-period 1994-2006, $D_1 = 0$ and $D_2 = 1$. β_1 and β_2 are the growth rates for the first and the second sub-periods respectively.

Likewise, the TFPG for the two sub-periods are obtained by fitting the equation: $\text{Ln } GVA_t = b_0 + b_1 \text{ Ln } E_t + b_2 \text{ Ln } K_t + (D_1t + D_2k)\, T_1 + (D_2t - D_2k)\, T_2$; the coefficients of T_1 and T_2 are respectively taken as the TFPG for the first and the second sub-periods. The advantage of using this method for the two sub-periods is that the assumption of continuity in time series (i.e. there is no structural break in the time series used) is methodologically relaxed. The layout of values for the time variable 't', the two dummies, the constant 'k' and other terms used in these equations are as shown in the Table below.

Year	t	D_1	D_2	D_1t	D_2t	K = 23 ÷ 2	D_2k	D_1t+D_2k	D_2t-D_2k
1982-83	1	1	0	1	0	11.5	0	1	0
1983-84	2	1	0	2	0	11.5	0	2	0
1984-85	3	1	0	3	0	11.5	0	3	0
1985-86	4	1	0	4	0	11.5	0	4	0
1986-87	5	1	0	5	0	11.5	0	5	0
1987-88	6	1	0	6	0	11.5	0	6	0
1988-89	7	1	0	7	0	11.5	0	7	0
1989-90	8	1	0	8	0	11.5	0	8	0
1990-91	9	1	0	9	0	11.5	0	9	0
1991-92	10	1	0	10	0	11.5	0	10	0
1992-93	11	1	0	11	0	11.5	0	11	0
1993-94	12	0	1	0	12	11.5	11.5	11.5	0.5
1994-95	13	0	1	0	13	11.5	11.5	11.5	1.5
1995-96	14	0	1	0	14	11.5	11.5	11.5	2.5
1996-97	15	0	1	0	15	11.5	11.5	11.5	3.5
1997-98	16	0	1	0	16	11.5	11.5	11.5	4.5\
1998-99	17	0	1	0	17	11.5	11.5	11.5	5.5
1999-00	18	0	1	0	18	11.5	11.5	11.5	6.5
2000-01	19	0	1	0	19	11.5	11.5	11.5	7.5
2001-02	20	0	1	0	20	11.5	11.5	11.5	8.5
2002-03	21	0	1	0	21	11.5	11.5	11.5	9.5
2003-04	22	0	1	0	22	11.5	11.5	11.5	10.5
2004-05	23	0	1	0	23	11.5	11.5	11.5	11.5
2005-06	24	0	1	0	24	11.5	11.5	11.5	12.5

10. The TFP_t values are obtained by first fitting the equation $\text{Log } GVA_t = b_0 + b_1 \text{ Log } E_t + b_2 \text{ Log } K_t$. In the second step, using the estimated values of the regression co-efficients, the expected values of GVA is obtained. The difference between the observed and expected values of GVA [i.e. the unexplained residual of output net of input] is taken as TFP_t.

11. The Chow test uses the residuals of the three regressions viz. the residual of the combined period (R-1), of the pre-reform period (R-2) and of the post-reform period (R-3). We obtain R-4 as [(R-2) + (R-3)] and R-5 as [(R-1) – (R-4)]. The null hypothesis of structural stability (i.e. there is no structural change in the employment model considered) is rejected if the statistic $F = [(R\text{-}5) \div k]/[(R\text{-}4) \div (n_1 + n_2 - 2k)]$ is greater than the critical value of F-distribution with 'k' and '$n_1 + n_2 - 2k$' d.f.

12. The series of NCS has registered consistent negative growth rate (GR) for all three periods both at the 'all Industries' level as also at the individual industry level except for some positive turn around for wood, non-metallic, metal products and transport sectors from the pre-reform

years to the post-reform years. We have, therefore, not discussed the trends of GR in the NCS series but discussed the TFPG trends as it takes into account the net contribution of both the factor inputs viz. labour and capital to output i.e. GVA.

13. In particular, the values of R-square for 'all Industries' has increased from 16 percent to 66 percent between the two situations of 'without TFP_t' and 'with TFP_t'. The one exception to this trend is 'food products'.

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Table 1: Growth Rates (%) in Employment and GVA: 1983-2006

Industry	GVA			Employment		
	1983-93	1994-06	1983-06	1983-93	1994-06	1983-06
Food	-1.1	0.3	-0.4	0.8	-0.4	0.1
Tobacco	-1.3	0.3	-0.4	0.2	-0.4	-0.2
Textiles	-0.02	-0.1	-0.1	0.5	-0.1	0.2
Wood	-2.3	4.7	1.6	-0.6	1.4	0.5
Paper	-0.02	0.2	0.1	0.1	0.0	0.03
Leather	-0.8	-0.8	-0.8	-0.4	-0.3	-0.4
Chemicals	3.3	-0.6	-0.4	-0.1	-0.5	-0.3
Rubber	-0.8	-0.8	-0.8	0.1	-0.1	0.01
Non-metallic	-0.3	-0.4	-0.3	-0.2	0.3	0.1
Basic metals	0.5	0.6	0.5	1.3	0.1	0.7
Metal prods.	1.4	-0.4	0.4	0.8	0.2	0.5
Machineries	-0.9	1.0	0.2	-0.5	0.1	-0.2
Transport	0.8	0.8	0.8	-0.7	0.8	0.1
Other manfg.	0.5	-1.4	-0.6	1.7	-1.2	0.1
All Industries	***-0.4***	***0.1***	***-0.1***	***0.2***	***-0.1***	***0.1***

Table 2: TFPG by Industries

Sl. No.	Industry	TFPG (%)		
		1983-93	1994-06	1983-06
1	Food	-2.1	-0.3	-1.0
2	Tobacco	0.1	1.0	0.7
3	Textiles	-0.6	-0.1	-0.2
4	Wood	-2.1	2.9	0.9
5	Paper	-0.1	0.2	0.1
6	Leather	-0.1	-0.7	-0.7
7	Chemicals	2.7	-0.3	0.7
8	Rubber	-0.1	-0.7	-0.5
9	Non-metallic	-0.04	-0.5	-0.3
10	Basic metals	-0.4	0.5	0.1
11	Metal prods.	3.8	-0.9	0.4
12	Machineries	1.3	0.9	1.0
13	Transport	4.4	-0.8	1.1
14	Other manufacturing	0.4	0.3	0.3
15	***All Industries***	***0.2***	***0.2***	***0.2***

Table 3: Results of Test for Structural Stability 1983-2006

Industry	1	2	3	4	5	6	7	8	9	10	11	12	13	14	**15**
F-value	0.3	2.6	3.0	0.5	4.0	2.3	3.7	4.9	4.5	0.3	4.1	2.8	1.7	4.7	**2.3**

Note: The industries indicated chronologically carry the same description as in Table 2.