The Developing Economies, XXXIV-1 (March 1996)

# LIBERALIZATION IN INDIA: QUALITY DIFFERENTIALS BETWEEN PUBLIC AND PRIVATE EMPLOYEES

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## I. INTRODUCTION

A mixed economic system is usually defined by the simultaneous prevalence of private sector industries which are motivated by profitability and productivity considerations, and a strong public sector which takes care of infrastructure, social justice, and welfare of the people. During the last four decades of planned development in India the professed role of the public sector has reached an extreme situation where the government has become a guarantor of employment security.[1] The last three five-year plans overstated the role of development plans mainly in creating employment without any practical policy for productivity growth [15] [16] [17]. The Sixth Five Year Plan (1980–85) has in fact gone one step further, "In the context of growing labor force (34 million over 5 years) and the mixed economy, the policy measures have necessarily to cover not only the direct employment generation in the public sector but also the entire gamut of economic activity in the public, cooperative and private sectors" [16, p. 207].[2]

It is not unexpected, therefore, that employment in the organized manufacturing sector (in general, about 14 per cent of total employment) grew only slowly during the 1980s compared to the 1970s at an average rate of 1.6 per cent (2.1 per cent in public sector and 0.3 per cent in private sector). There are three main reasons for this slow and contrasting employment growth. First, since employment generation is the most emphasized objective of planning through public industrialization,

We are indebted to Professors Amita Majumder and Satya Ranjan Chakrabarty for their valuable suggestions on some critical issues. Thanks are also due to Professor Mihir Rakshit for his comments on the earlier draft.

[1] There is a vast literature on the trade-off between employment expansion and output growth. Although the purpose of the present paper is slightly different, the reader can consult [36] [25] for further digression.

[2] See also [32] [35]. No plan has in fact ever given priority to Family Planning measures as an inseparable part of development policy for stemming the flow of labor force. It is obvious that a growth rate of about 2 per cent per annum on a population base of 900 million can jeopardize the success of ongoing market economics.

overmanning in these industries reached perhaps its limit during the 1970s, and a slowdown became inevitable during the 1980s. Second, growth rate of organized employment seems to have decreased because the relatively generous benefits offered to the regular permanent employees as well as the rigidity of the labor legislation and the faulty incentive system (i.e., absence of wage productivity linkage) have paved the way for generating employment in the informal sector—away from manufacturing [38]. Third, as an extension of neoclassical management supremacy, it was lately realized in LDCs that since it is easier to control the machine power as opposed to the labor power the process of labor-shedding had become a reality from the mid-eighties. Even within this context the public sector industries have been forced to keep on going just as employment-generating machines without any accountability for their economic viability. In the words of Prof. I. G. Patel, "In the name of social justice, we have downgraded individual efforts, initiative and responsibility" [27, pp. 44–45]. The general decay of public sector industries has been mainly caused by the general apathy of the public employees towards the necessary obligation to perform a job and the strong demand for higher wages with the help of organized trade unions.[3]

The changes initiated from 1991 onwards by the new government of which the exit policy is an inseparable part followed the realization that the public sector had failed to generate its own resources for further economic development. The dismal performance of the public sector industries in particular and of the industrial sector in general [1] [9] can be partly attributed to overstaffing and low productivity. Naturally the government was saddled with major "loss-makers" in the public sector [20]. The industrial culture in post-independence India (i.e., after 1947) has thus led to ensure a wage-employment security in public industries through "labor-bureaucratic-political" nexus[4] [5] from which a class of "labor aristocracy" has emerged. As a result, the work-culture has been replaced by "babu-culture." In fact, the role of the state in India was never felt as a promoter of efficiency in the economy as a whole. Thus the neglect of efficiency of labor in the public industries in particular and in the industrial sector as a whole has pushed India to a no-return zone where the recent liberalization process is thought to correct the present ineffi-

[3] For the role of unions and different wage-setting institutions, see [3, Chap. 6].

[4] In such a context it is neither desirable nor possible to bypass the works of Kalecki [19] on the class character of the state and its impact on growth and distribution through his revolting machinery of "intermediate regimes" in developing countries. But the reality of most Third World countries is such that a short-term compromise equilibrium is always shared by various interest and power groups. These very groups are relentlessly busy in squeezing the surplus from the state. Interestingly, these different conflicting groups independently work together to serve a common purpose: to reduce the efficacy of the system of economic administration away from optimality (see also [28]).

cient industrial regime [26].[5] This liberal economic policy is supposed to pave the way for higher productivity and higher growth rates in a self-sustained manner.[6] But it also makes many jobs in government departments and corporations redundant. This has already resulted in the "displacement effects" in every sphere of economic activity.

Another source of mismatch between job creation and output generation is the indiscriminate import of advanced capital-intensive and labor-saving technology from the developed nations and for an economy with unlimited supply of labor. Like any other LDCs India is characterized not only by an acute scarcity of capital but also by the failure to efficiently utilize the existing resources through appropriate adaptation of advanced technology under prevailing domestic factor endowments [9] [12].

The main thrust of the paper is to examine the existence of "labor quality differentials between public and private sector employment in some selected manufacturing industries." Within the limitations of the present framework, the results are conclusive: productivity of laborers in public sector industries is much lower than in private sector industries. This is in fact one of the fundamental causes of structural inefficiency in the mixed economic system of any LDCs like India. This could be cited as a case study for the necessity of implementing liberal economic policies in the present-day LDCs. Here two broad types of industries are selected due to the role played by these industries in the history of industrialization of India in the recent past. These are (1) "traditional" and (2) "sunrise" industries which will be clarified in the later section.

The organization of the paper is as follows. A brief account of our data base and its limitations are described in Section II. Section III deals with the general charac-

[5] The present state of liberalization started on an experimental basis from 1980 and was actively promoted from the mid-eighties. That there was a pressure towards deregulation and de-bureaucratization in the Indian industry from the late-seventies is clear from the recommendations of the committees like Alexander (1978), Dagli (1979), Tandon (1980), Pandey (1980), Rajadhyaksha (1980), and also Narasimhan (1985). This was inevitable because during the first two decades of planning India's industrial control mainly relied on protective and quantitative measures such as licensing, import quota, virtual ban on direct foreign investment, excise and profit taxes, Monopoly and Restrictive Trade Practices Act (MRTP) and Foreign Exchange Regulation Act (FERA) regulations (see [6] [7] [29]).

[6] The salient features of the New Economic Policy package may be briefly outlined as follows: (i) to allow direct foreign capital in industries, trading companies, and banking up to 51 per cent of share capital; (ii) automatic clearance for capital goods imports; (iii) automatic approval of foreign technology agreements in high priority areas including small sector; (iv) setting up of Foreign Investment Promotion Board for negotiating with multinational corporations and granting single point clearance; (v) approval of private sector banking—both domestic and foreign; and (vi) other measures include the abolition of licensing, MRTP and FERA, closing down of chronically sick public sector units. See [30]; Government of India, Planning Commission, *Eighth Five Year Plan, 1992–97*, 2 vols. (New Delhi, 1992); and *The Hindu Survey of Indian Industry, 1991* (Madras: Kasturi and Sons, n.d.).

teristics of public and private sector employment. Section IV develops the model of labor quality differentials between public and private employment in a Cobb-Douglas framework. In Section V the empirical results are analized. Finally, in Section VI we have summarized the findings of the paper with some concluding remarks.

## II. THE DATA

The main data for our study have been collected from three principal sources: (1) *Annual Survey of Industries* (*Factory Sector*) (ASI) [14, various issues] and (2) *Employment Review* [13, various issues]—both published by the Government of India. This data set is supplemented by *Indian Data Base: The Economy* by H. L. Chandok and the Policy Group [8].

The ASI data relate to factory sector which includes "all factories registered under sections 2m(i) and 2m(ii) of the Factories Act 1948, which refers to the factories employing 10 or more workers using power, or those employing 20 or more workers but not using power on any day of the preceding 12 months" [14, 1986–87 ed., p. 1].

Our period of study includes the years covered by the three crucial five-year plans, from 1974–75 to 1988–89. As for the selection and classification of industries we have followed a new approach leading to "traditional" and "sunrise" industries. Based on the figures taken from the ASI [14, 1978–79 ed.] on the frequency distribution of the number of factories by years of initial production and by four-digit classification, it appears that up to 1950 food processing (20–21) and textiles (23–24) accounted for 59 per cent of all manufacturing establishments (except electricity) in India. That is, these industries have existed much before the planning era. Moreover, they have declined both in importance and in weight in later years (34 per cent of total establishments in 1979). As a result, the expansion of these industries is among the lowest during the period from 1950 to 1979. This is why we have designated them as traditional industries. In addition we have also separately taken into account some very modern industries which are referred to as sunrise industries consisting of chemicals, machinery and machine tools, and electrical appliances. The importance of these industries increased in terms of relative number from the late 1970s (from about 9 per cent of total establishment number by 1950 to about 20 per cent as early as in 1979). We have considered these two distinctly separate sets of industries in our present context because we want to determine whether the newer industries (namely, sunrise) are also affected by the planned aim of employment generation without any consideration for growth and productivity. Above all, one of the main purposes of such a selection is to homogenize the industries in terms of technological status—an assumption which is frequently criticized for aggregate industry-level work. Thus, there is reasonable justification for assuming similar types of technology (which is generally proxied by

capital-labor ratio) for both traditional and sunrise industries. We have taken thirty-two industries from the traditional sector (nineteen from food and thirteen from textiles), and twenty-six from sunrise (nine from chemicals, nine from machinery and machine tools, and eight from electrical appliances) (Appendix Tables I and II). In all the cases we have adopted the three-digit classification of International Standard Industrial Classification from ASI.

The gross measure of value added is obtained by adding the net value added and depreciation of the corresponding years given in ASI. Capital is taken as gross fixed capital stock (GFCS) estimated by the Perpetual Inventory Accumulation (PIA) method (see Appendix). Labor is represented by the total number of persons employed. The employment statistics for public and private sector industries used in our paper are collected from *Employment Review* [13, various issues] at three-digit classification.[7] These ASI figures all given in nominal terms are converted into real value using suitable deflators. Gross value added is deflated by the commoditywise wholesale price indices taken from *India Data Base* [8]. Estimated GFCS is deflated by wholesale price indices of machinery, machine tools and parts. The figures represent a total for all the firms in each group. We have divided them by the corresponding number of firms in each group thereby reducing them into average firm figure for each industrial code.[8]

The issue of aggregate production function may be briefly introduced at this stage. Problems of aggregation could have been avoided if firm-level data on such a massive scale for such a long period of time were available. In the absence of such data one has to use an aggregate production function approach for the proposed purpose. In fact, Solow used it as far back as in 1956 [33], and later with Arrow et al. [2] he carried out studies with aggregate time series data without microfoundation. He was, however, aware of the limitation of such an approach and designated it as "mere device for handling data, to be used so long as it gives good empirical results, and to be abandoned as soon as it doesn't, or as soon as something better comes along" [33, pp. 1259–60].

[7] It may be mentioned that there were a few gaps in employment data for a couple of industries which are supplied by interpolation as described below. Interpolations have been done by fitting a polynomial curve using least square. For this purpose we have used the ISML/Math package which computes estimates of the regression coefficients in a polynomial (curvilinear) regression model. Sequential sums of squares attributable to each power of the independent variables are used in assessing the importance of the higher order power in the fit. The $R^2$ statistics is the percentage of the sum of squares of $Y$ about its mean explained by the polynomial curve. Specifically,

$$R^2 = \frac{\sum (\hat{Y}_i - \bar{Y})^2}{\sum (Y_i - \bar{Y})^2} \times 100.$$

The values of $R^2$ in our cases are always higher than 70 per cent.

[8] There is not much variation in the number of firms in each of the groups. Therefore no serious question can be raised about the fact that each unit of observation is converted into average firm figures divided by the number of firms (on the issue of average firm, see [23]).

Later, many economists investigated the link between micro and macro production functions and confirmed that under certain conditions controlling the distribution of efficiency of firms, "we can obtain an aggregate production function with capital and labor aggregates" [31, p. xxiii]. The consensus emerging from all these studies is that the aggregate function should be used with caution and one should not stretch the interpretations of the findings too far.

## III. AN OVERVIEW OF PUBLIC VERSUS PRIVATE SECTOR EMPLOYMENT

The growth rate of employment in the organized sector of manufacturing, construction, transport and storage, and communication had declined in the 1980s. The policy of indiscriminate import of technology so far followed [21] [22] [11] along

TABLE I

A. Employment Situation in Public and Private Manufacturing Industries in India

| Industry | Year | No. of Firms | | Employment Size | | $N_g/N$ | % Change in Emp. | |
|---|---|---|---|---|---|---|---|---|
| | | Gov. | Pvt. | Gov. | Pvt. | | Gov. | Pvt. |
| Food | 1977–78 | 374 | 5,378 | 299 | 94 | 18.19 | –7.36 | –14.89 |
| | 1986–87 | 646 | 6,159 | 277 | 80 | 26.21 | | |
| Textiles | 1977–78 | 441 | 4,433 | 512 | 249 | 17.00 | 58.79 | –2.41 |
| | 1986–87 | 459 | 3,514 | 813 | 243 | 30.41 | | |
| Traditional total | 1977–78 | 815 | 9,811 | 414 | 164 | 17.38 | 20.53 | –15.34 |
| | 1986–87 | 1,105 | 9,673 | 499 | 139 | 26.96 | | |
| Chemicals | 1977–78 | 138 | 2,787 | 931 | 100 | 31.50 | –19.76 | –1.00 |
| | 1986–87 | 200 | 3,528 | 747 | 99 | 31.92 | | |
| Machinery & mach. tools | 1977–78 | 91 | 2,471 | 1,468 | 91 | 37.18 | –26.27 | –15.38 |
| | 1986–87 | 144 | 3,446 | 1,083 | 77 | 36.98 | | |
| Electrical appliances | 1977–78 | 74 | 1,330 | 1,480 | 149 | 35.61 | –36.12 | –14.09 |
| | 1986–87 | 160 | 1,952 | 935 | 128 | 37.36 | | |
| Sunrise total | 1977–78 | 303 | 6,588 | 1,226 | 107 | 34.57 | –26.83 | –9.34 |
| | 1986–87 | 524 | 8,926 | 897 | 97 | 35.15 | | |
| Manufacturing total | 1977–78 | 1,701 | 38,462 | 796 | 112 | 23.88 | –15.95 | –12.50 |
| | 1986–87 | 2,785 | 44,780 | 669 | 98 | 29.69 | | |

Notes: 1. $N$ = total employment; $N_g$ = government employment.
2. Manufacturing total is the sum of these five industry groups and the rest of the manufacturing industries.

TABLE I (Continued)

B. Sources of Productivity Variations
(Dependent variable = labor productivity = $Y/L$)

| Independent Variable | Sunrise | | Traditional | |
|---|---|---|---|---|
| | Linear | Log-linear | Linear | Log-linear |
| Constant | 13,170 | 4.6054 | 3,197 | 2.8064 |
| | (19.56) | (16.55) | (11.87) | (12.90) |
| $K/L$ | 0.0984 | 0.4653 | 0.1678 | 0.5822 |
| | (16.92) | (18.33) | (15.93) | (26.50) |
| $N_g/N$ | –4,911 | –0.0449 | –2,012 | –0.0343 |
| | (–4.51) | (–5.25) | (–3.13) | (–3.05) |
| $D_1$ | –4,162 | –0.2102 | –45.21 | 0.1328 |
| | (–5.68) | (–4.75) | (–0.16) | ( 3.20) |
| $D_2$ | 1,552 | 0.1924 | | |
| | (2.07) | (4.14) | | |
| $\bar{R}^2$ | 0.55 | 0.58 | 0.36 | 0.60 |

Notes: 1. $K/L$ = capital intensity.
$D_1 = 1$ for textiles in traditional industries; 0 otherwise.
$D_1 = 1$ for machinery and machine tools in sunrise industries; 0 otherwise.
$D_2 = 1$ for electrical apparatus in sunrise industries; 0 otherwise.
2. Figures in parentheses represent *t*-values.

with the relative liberalization experimented from the early 1980s had enhanced this decreasing trend of employment generation from the last quarter of the 1970s. In the private manufacturing sector, employment has stabilized at around 4.4 million since 1980, whereas in the public manufacturing industries it increased from 1.0 million in 1974–75 to 1.5 million in 1980–81 and 1.9 million in 1986–87.

Table I-A describes the employment situation of selected public and private sector industries covered in our study in two different periods, 1977–78 and 1986–87. Average employment size in public industries is much larger than that in private industries for the manufacturing sector as a whole. But it has been falling at a marginally faster rate in public industries. This phenomenon may be ascribed to the dominant role which the public sector played in the initial phase of planned industrialization. These industries were selected basically from the capital goods sector which is characterized by a very-large-scale, huge investments and long gestation period [6]. Total employment in these industries was very high ab initio compared to the private sector industries entrusted upon at that time. The private sector was mainly confined to consumer goods industries. But recently the government has also penetrated into the consumer goods sector. Naturally, the size of these industries is relatively smaller than that of heavy industries. As a result, the average size as a whole decreased in the later period. Even though the average size of the private sector was smaller in the beginning, the size was further reduced (rationality hypothesis) with a marginally slower pace. This general feature is reflected in the size

variations of the individual industries under the "sunrise" sector, while a slightly different picture is observed in the "traditional" industries.

The average size of the public industries in the traditional sector is again much larger than that in the private industries. More specifically, in the case of textiles the average size in the public sector increased by more than 50 per cent over the whole period. But in the case of food a decline of about 7 per cent was observed over the same period in the public sector, whereas an absolute fall in employment generation in the private sector to the extent of −14.89 per cent was recorded. Food and textiles taken together show a rise in average size in the public sector by 20.53 per cent.

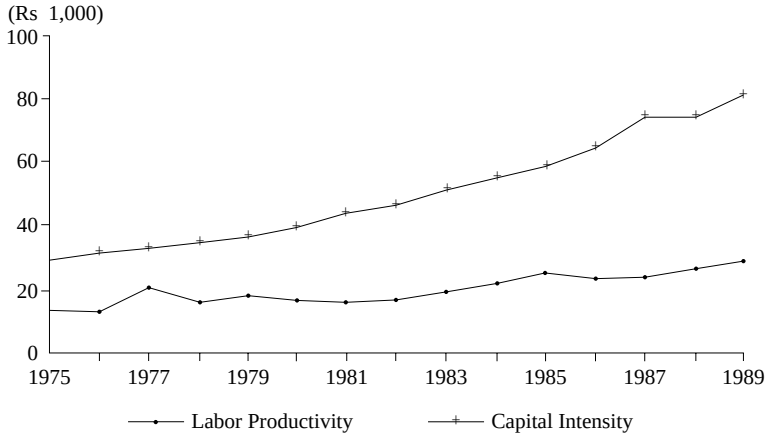
The most interesting aspect of this table is that for each of the industries under consideration and for the manufacturing sector as a whole the proportion of public employees to total employees has been rising over this period. On the whole, therefore, although the pace of employment generation has slowed down in recent years, the proportion of government employees in manufacturing has been rising at very fast rates—from 23.9 per cent to 29.7 per cent. This is in fact a result of the employment obligation policy enacted by the Union Government of India through the five-year plans without much consideration for productivity growth unlike the private producers.

The aforesaid arguments can be substantiated further with the help of Figure 1 and Table I-B. Figures 1-A and 1-B clearly indicate that the divergence between labor productivity (LPT) and capital intensity ($K/L$) has been strictly increasing over the period from 1974–75 to 1988–89. And in both groups, LPT has remained almost stagnant over time and also very low in absolute value compared to $K/L$. This low LPT may be due to a number of factors as outlined by Ghosh and Neogi [12]. We have considered here only a few factors which are presented in Table I-B. We have attempted two types of regressions, linear as well as log-linear, with time-series and cross-section pooled data for two separate groups of industries in order to reveal the importance of capital intensity, proportion of government employees, and types of industries in determining LPT in the aggregate. Almost similar results are obtained for linear and log-linear cases in both sunrise and traditional industries. In all the cases capital intensity played a significantly positive role. The most important finding in line with our present purpose is that the coefficients of the proportion of government to total employees are negative and statistically significant.

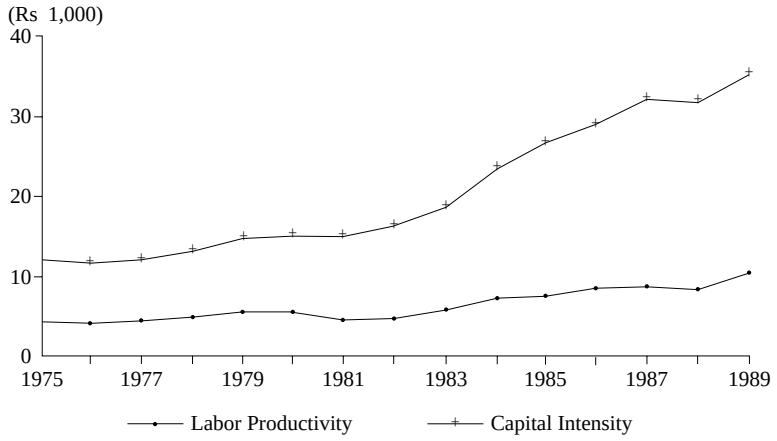
These findings regarding the proportion of government to total employees indicate productivity differentials between public and private sector employees. This is being studied in greater detail with the help of the following model in the next section.

Fig. 1. Time Trends on Labor Productivity and Capital Intensity

A. Sunrise Industries




B. Traditional Industries




## IV. MODEL SPECIFICATION

The dismal performance of the public sector can be attributed to overstuffing and lack of productivity considerations. This required the initiation of the New Industrial Policy in 1991 under which it was considered necessary to reduce the excess

manpower and improve productivity through a compulsory exit policy.[9] The crux of the matter is that no studies have yet been carried out to prove either that there is an excess manpower, or that the existence of excess manpower actually exerts a negative impact on productivity, or even that the employees in the public sector are less productive than in the private sector.

By using the following model we have tried to determine whether there are any productivity differentials between public and private sector employees and if so, in which direction these differentials exert their effects. In this regard and to the best of our knowledge this could be the first attempt to reveal one of the fundamental assumptions on which the justification of recent liberalization so crucially hinges.

Let us take a production function of standard Cobb-Douglas type where only two inputs, labor ($L$) and capital ($K$), produce a single output ($Y$) so that

$$Y = AK^{\alpha} L^{\beta}. \tag{1}$$

According to Deolalikar and Vijverberg [10] we assume that

$$L \equiv \theta N_p + (1 - \theta)N_g, \tag{2}$$

where $N_p$ and $N_g$ represent the number of laborers employed in private and public sector industries, respectively and $\theta$ represents the quality parameter so that $0 < \theta < 1$. The weighted average (linear combination) of the laborers employed in the two sectors allows only a quality differential but not imperfect substitution between the two. Naturally, labor is measured in terms of efficiency units.[10]

We also assume that there is no quality differential between capital in the two sectors. Equation (1) can now be written as

$$\begin{aligned} Y &= AK^{\alpha} [\theta N_p + (1 - \theta)N_g]^{\beta} \\ &= AK^{\alpha} [\theta N - \theta N_g + (1 - \theta)N_g]^{\beta}, \text{ since } N = N_p + N_g \\ &= AK^{\alpha} (\theta N)^{\beta} \left[1 + \frac{(1 - \theta)}{\theta} \times \frac{N_g}{N} - \frac{N_g}{N}\right]^{\beta} \\ &= AK^{\alpha} \theta^{\beta} N^{\beta} \left[1 + (\gamma - 1) \frac{N_g}{N}\right]^{\beta}. \end{aligned} \tag{3}$$

where $\gamma = (1 - \theta) / \theta$. Now if the laborers employed in the public as well as private

[9] The term "exit" is misleading. No worker is ever informed at the time of recruitment that he might become redundant. If an industrial enterprise employs more workers than are required by the production system, then the blame lies squarely on the employers. If the employer is the government and the objective is not "conventional rationality," then the performance criterion must be different; on the other hand, if the enterprise is to survive, then reduction of excess manpower and enhancement of productivity are absolutely necessary, given the upper limit of subsidy.

[10] Bardhan [4] considered a similar type of production function of Cobb-Douglas type in which total labor and the ratio of hired to total labor are separately included as explanatory variables. Using Indian farm-level data he indicated the labor quality differentials between hired and family labor in Indian agriculture.

sectors are equally productive, or in other words, the quality of the two types of labor is the same, then the value of the parameter $\theta$ would be 0.5, which implies that $\gamma = 1$. Equation (3) then can be reduced to the standard Cobb-Douglas form and after linearizing we obtain

$$\log Y = A_0 + \alpha \log K + \beta \log N. \tag{4}$$

On the other hand, if the laborers in private sector industries are more productive than those in the public sector, then the value of $\theta > 0.5$ which implies that $\gamma < 1$. And the reverse is true when $\gamma > 1$.

We have estimated the coefficients of equation (3) directly by the nonlinear maximum likelihood method and test for the value of $\gamma$, where the null hypothesis $H_0$ is $\gamma = 1$ and the alternative hypothesis $H_a$ is $\gamma < 1$.

## V. EMPIRICAL RESULTS

Let us have a brief look at Table II which presents some statistical aspects of the variables used in this study. All the variables are expressed in average firm-level figures. The differences in the values of the variables between the two types of industries could be anticipated. For example, the mean value of real GFCS is higher in the case of sunrise industries than traditional industries as the former is relatively more capital-intensive than the latter. On the other hand, the average employment size is larger in traditional industries compared to sunrise industries. Moreover, the proportion of government employees to total employees in both types of industries is almost similar. This phenomenon may represent a general tendency of job-creation by the government irrespective of the nature of industries. The very nature of traditional industries leads to heterogeneity in terms of coefficients of variations compared to the sunrise industries. Since the technology is relatively homogeneous in the sunrise industries, there are no substantial variations in the use of both capital and labor. The reverse is true for the traditional industries. It may be pointed out that some of the textile and food industries have managed to modernize their technology in very recent years. This has further deepened the heterogeneity problem in these industries.

Before considering further the hypothesis of "labor productivity differentials" (LPD) we have tried to determine whether the Cobb-Douglas production function fits well into the data set we used. The values of $\bar{R}^2$ for all the industries in both sunrise and traditional sectors (Table III) suggest that the Cobb-Douglas production specification is satisfied and the corresponding coefficients of capital and labor are statistically significant. Based on such fits we have relied on the Cobb-Douglas specification with some modifications for the test of LPD.

As mentioned earlier we have estimated the model by applying the nonlinear maximum likelihood method. The production function represented by equation (3)

TABLE II

SOME STATISTICAL ASPECTS OF VARIABLES

| Variables | Sunrise | | | Traditional | | |
|---|---|---|---|---|---|---|
| | Mean | *S.D.* | Coeff. of Variation | Mean | *S.D.* | Coeff. of Variation |
| Gross value added (real) | 15.14 | 13.77 | 0.91 | 7.06 | 13.74 | 1.95 |
| $N_p$ | 24.79 | 31.51 | 1.27 | 25.61 | 50.88 | 1.99 |
| $N_g$ | 65.59 | 45.97 | 0.70 | 90.14 | 167.84 | 1.86 |
| $N$ | 90.38 | 47.45 | 0.52 | 115.75 | 208.79 | 1.80 |
| GFCS (real) | 45.38 | 81.87 | 1.80 | 22.76 | 49.13 | 2.16 |

Notes: 1. All the values are expressed in average firm-level figures.
2. Number of observations in sunrise industries and traditional industries are 390 and 480, respectively.
3. Gross value added and gross fixed capital stock (GFCS) are expressed in lakhs of rupees.

TABLE III

ESTIMATION OF COBB-DOUGLAS PRODUCTION FUNCTION

| Variables | Sunrise | | | | Traditional | | |
|---|---|---|---|---|---|---|---|
| | Total | Chem. | Mach. | Elec. | Total | Food | Textiles |
| Constant | 4.00 | 4.75 | 5.03 | 2.81 | 3.04 | 2.47 | 3.92 |
| | (15.29) | (9.44) | (12.15) | (5.58) | (13.28) | (7.82) | (12.07) |
| Capital | 0.41 | 0.43 | 0.27 | 0.58 | 0.56 | 0.63 | 0.44 |
| | (16.74) | (10.07) | (6.65) | (11.65) | (25.71) | (22.19) | (12.85) |
| Labor | 0.90 | 0.66 | 1.09 | 0.62 | 0.45 | 0.37 | 0.68 |
| | (18.62) | (6.16) | (17.02) | (8.52) | (15.37) | (10.20) | (14.32) |
| $\bar{R}^2$ | 0.84 | 0.73 | 0.89 | 0.89 | 0.86 | 0.84 | 0.90 |
| $F$ | 1,001.39 | 184.61 | 542.28 | 506.53 | 1,496.66 | 760.69 | 888.27 |
| Observ. | 390 | 135 | 135 | 120 | 480 | 285 | 195 |

Note: Figures in parentheses represent *t*-values.

has been estimated separately for traditional and sunrise industries and also for each of the subgroups. The estimation is executed on the basis of cross-section and time-series pooled data. The results of the estimated parameters along with corresponding maximum likelihood values are presented in Table IV. It may be emphasized that the coefficients of the variables are highly significant in all the cases.

Interestingly, the output elasticities of capital are in general lower in sunrise industries than in traditional industries, presumably due to the higher capital intensities in sunrise industries. Similarly, the reverse is true for output elasticities of labor. That is, due to the higher employment intensities in traditional industries the

TABLE IV

TEST OF LABOR PRODUCTIVITY DIFFERENTIALS

| Parameters | Sunrise | | | | Traditional | | |
|---|---|---|---|---|---|---|---|
| | Total | Chem. | Mach. | Elec. | Total | Food | Textiles |
| Constant | 4.0994 | 4.5667 | 5.2875 | 2.6317 | 2.8109 | 2.2576 | 3.6182 |
| | (16.41) | (10.17) | (12.82) | (5.34) | (12.10) | (6.93) | (10.98) |
| $\alpha$ | 0.4012 | 0.3884 | 0.2609 | 0.6008 | 0.5905 | 0.6467 | 0.4809 |
| | (17.30) | (10.07) | (6.73) | (12.58) | (26.13) | (22.15) | (13.30) |
| $\beta$ | 0.9094 | 0.8645 | 1.0579 | 0.6149 | 0.4404 | 0.3706 | 0.6296 |
| | (19.74) | (8.22) | (16.79) | (9.15) | (14.96) | (10.34) | (12.71) |
| $\gamma$ | 0.6253 | 0.3902 | 0.8214 | 0.6617 | 0.3508 | 0.3886 | 0.4523 |
| | (–7.05) | (–8.00) | (–2.74) | (–2.69) | (–5.36) | (–3.32) | (–3.57) |
| $\theta/(1-\theta)$ | 1.5991 | 2.5627 | 1.2174 | 1.5112 | 2.8503 | 2.5731 | 2.2110 |
| Log-likelihood value | –124.00 | –61.21 | 15.71 | –8.31 | –287.33 | –183.28 | –82.21 |
| Observ. | 390 | 135 | 135 | 120 | 480 | 285 | 195 |

Notes: 1. For coefficients $\alpha$ and $\beta$, the null hypotheses are $\alpha = 0$ and $\beta = 0$, and for $\gamma$, the null hypothesis is $\gamma = 1$.
2. Figures in parentheses represent *t*-values.

output elasticities of labor are lower in these industries compared to the sunrise industries.

The heterogeneity hypothesis according to which there are qualitative differentials in the laborers employed between public and private sector industries can be tested (as already mentioned in Section IV) from the value of the coefficient $\gamma$ in equation (3). The value of the coefficient being less than one, it is assumed that the productivity of employees in government industries is lower than that in the private industries. Strictly speaking, the values of the parameter, $\gamma$, in all the production functions we have estimated are less than unity and statistically highly significant. To be specific, this is true for each of the industries in both sunrise and traditional sectors, namely, chemicals, machinery and machine tools, and electrical appliances from the former, and food and textiles from the latter. Given these differentials, the ratios of marginal productivity of employees in private and public industries are greater than one in all the cases. Table IV shows that the productivity ratios are lower in the sunrise group total than in traditional group total. However, there are some variations in individual industries. The lower productivity differentials in sunrise industries may be ascribed to the fact that since these industries are relatively recent and since they are relatively technology-intensive, the problem of overmanning (existence of surplus manpower) has not yet seriously affected the production process of these industries. Another explanation may be that government participation in these industries is much lower than in traditional industries as evidenced by the establishment number in the public and private sectors given in Table I-A.

Therefore, the main assumption on which the present economic liberalization policy and, as an inseparable corollary the exit policy are based, namely, that the employees in public sector industries are less productive (and hence relatively unproductive) compared to those of private industries, could be validated by our analysis. This large reserve of unproductive manpower is in fact created by simple employment generation as a planned objective without any consideration for productivity, growth, and self-sufficiency. This phenomenon reached an unwarranted stage bounded by the limit of subsidy. And very recently it has been considered to be undesirable because the existence of such a phenomenon is at last recognized by many to be one of the fundamental causes of the present inefficient industrial regime. In a very recent study [26] the authors have shown that intertemporal efficiencies in Indian manufacturing industries have been strictly falling over the period from 1974–75 to 1987–88. Obviously, faulty incentive system with unconditional employment guarantee in public sector industries is one of the causes of the lower labor productivity in these industries than in private sector industries.

## VI. SUMMARY AND CONCLUSION

It is actually very difficult to make an authoritative statement on employment in Indian public and private sector industries due to the following reasons. First, a sizable proportion of employment which is being generated outside the organized sector is not covered by the published data. Second, since the hours of labor service are not available in disaggregated forms and since labor is measured in physical units, it is not possible to distinguish between qualitative traits of different kinds of labor in divisible units. Third, as a result of liberalization and privatization, relatively freer import of foreign technology has had a direct negative impact on employment in both sectors although with different intensities. On the other hand, the new industrialization policy generates a greater dynamism in the economy which creates further employment in other areas. That could possibly counterbalance the decline in employment in the public sector which is basically concentrated on capital goods industries. But since the current liberalization policy will take at least five years to exert its impact on employment and subsequent release of employment statistics, it is too early to draw any firm quantitative conclusions about the employment prospect of the economy.

However, within the limitations of this paper we have tried to understand the issue of qualitative differentials of employees in public and private industries. The main findings regarding the employment and productivity performance of selected public and private sector industries during the period 1974–75 to 1988–89 are as follows. First, it was observed that in all the industries covered by our study, although the pace of job creation has slowed down in recent years, the proportion of government employees to total manufacturing employees has been rising at very

high rates. Second, the proportion of government employees to total employees plays a negative (and statistically significant) role in determining labor productivity. Third, it was observed that the modern sunrise industries are more homogeneous in factor usage than the traditional industries. This result is very much expected because the sunrise industries generally adopt capital-intensive technology. Fourth, the output elasticities of capital are in general lower in sunrise than in traditional industries. And the reverse is true for the output elasticities of labor. Fifth, the most interesting finding is that the coefficient, $\gamma$, in each of the production functions is less than one and statistically significant, implying that the employees in public industries are definitely less productive than those in private industries. Finally, the ratios of marginal productivities of employees in private and public sector industries are higher than one in all the cases.

These findings have important implications for the success of both the liberalization and exit policies in India. The aforesaid analysis may be interpreted to support the ongoing exit policy. However, there is no definite proof that the execution of the exit policy as well as the privatization program will cure the inefficient industrial regime by themselves. In fact, there are various underlying causes beyond these productivity considerations for the dismal performance of the manufacturing sector in general and public sector industries in particular. In general, industrial performance of a developing economy like India should not always be evaluated based on pure profit-making considerations alone. In a public policy debate, it has often been argued that privatization of firms with market power tends to improve internal efficiency but usually at the cost of worsening the allocative efficiency, unless some of the effects of profit-seeking behavior are held in check by a rigorous regulatory mechanism imposed by the government [37].

Hence based on the findings of our paper, an industrial manpower restructuring policy (IMRP) is imminent. Therefore, the exit policy will become inevitable. However, in a country with 900 million population such a policy will lead to the release of a large unemployed labor force not only from the public sector but also from the private sector. As a result, various social tensions are bound to increase and the social cost may also become unsurmountable. Hence to avoid such a situation the government will have to implement immediate measures so as to make the public sector units viable by introducing the concept of productivity, profitability, and growth through competition. That is, there should be some sort of accountability in the performance of the public sector units through proper performance-incentive combination—which is remarkably lacking in India. Otherwise the deadweight cost may become so high as to render the liberalization process progress further impossible. Hence assuming that the privatization program in India is justified, the success of the Rao-Manmohan reforms will depend on a number of factors which are beyond the control of the government. The danger is that with the existing labor norms and political interference in economic decision-making, the corpo-

rate sector will increasingly adopt capital-intensive techniques of production thereby worsening the prospects of employment generation and income redistribution.

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## APPENDIX

There is no universal method of measuring capital stock. There are both theoretical and empirical problems in measuring capital over time. The main problem is to determine whether the gross fixed capital stock (GFCS) or net fixed capital stock (NFCS) should be adopted as the best measure of capital input for evaluating efficiency and productivity. Economists generally prefer the GFCS to NFCS for production function analysis. There are two reasons. (i) As pointed out by Leontief [24, pp. 21–22], "use of depreciated coefficients implies that capital stock decreases in efficiency in exact relation to depreciation charge," whereas "most available evidence indicates that this is not a reliable assumption." (ii) The other reservation is an empirical limitation: the available estimates of depreciation are either a tax-based accounting concept or based on certain rule of thumb. Naturally, it is preferable to work with GFCS.

We have estimated the GFCS by using the Perpetual Inventory Accumulation (PIA) method. The GFCS up to 1971 (up to which data sets are available consistently without any break) has been calculated using the figure of GFCS for the bench mark year 1964 taken from the study of Hashim and Dadi [18]. We have taken the NFCS and the depreciation for those years from ASI census sector at four-digit level and added the figures up to two-digit level depending on our requirements. Then the gross-net ratio for 1971 was used in 1974 to calculate the GFCS in 1974 assuming that the ratio did not change significantly. For the remaining years we have calculated GFCS by the PIA method. We have assumed that the gross-net ratios for the census and sample sectors are the same for each industry group. Moreover, since we have estimated the gross-net ratio from Hashim-Dadi estimates of GFCS at bench mark year, we have extended those two-digit industries into our three-digit classification whenever required.

APPENDIX TABLE I

LIST OF SUNRISE INDUSTRIES

| Serial No. | ISIC | Name of Industries |
|---|---|---|
| 1. | 310 | Mfr. of basic and industrial chemicals, organic and inorganic chemicals and gases. |
| 2. | 311 | Mfr. of fertilizers and pesticides. |
| 3. | 312 | Mfr. of paints, varnishes, and lacquers. |
| 4. | 313 | Mfr. of drugs and medicines. |
| 5. | 314 | Mfr. of perfumes, cosmetics, lotions, soaps, etc. |
| 6. | 315 | Mfr. of inedible oils. |
| 7. | 316 | Mfr. of turpentine, resins, plastic materials, etc. |
| 8. | 318 | Mfr. of explosives, ammunition, and fireworks. |
| 9. | 319 | Mfr. of chemical products NEC. |
| 10. | 350 | Mfr. of agricultural machinery, equipment, and parts. |
| 11. | 351 | Mfr. and repair of drills, coal-cutting machines, etc. |
| 12. | 352 | Mfr. of prime movers, boilers, etc. |
| 13. | 353 | Mfr. of industrial machinery for food and textile industries. |
| 14. | 354 | Mfr. of industrial machinery for other items than food and textiles. |
| 15. | 355 | Mfr. of refrigerators, airconditioners, fire fighters, etc. |
| 16. | 356 | Mfr., alteration, and repair of nonelectrical machinery. |
| 17. | 357 | Mfr. of machine tools, parts and accessories. |
| 18. | 359 | Mfr. and repair of nonelectrical machinery, equipment, etc. |
| 19. | 360 | Mfr. of electrical industrial machinery and parts. |
| 20. | 361 | Mfr. of insulated wires and cables. |
| 21. | 362 | Mfr. of dry and wet batteries. |
| 22. | 363 | Mfr. of electrical apparatus, appliances, and parts. |
| 23. | 364 | Mfr. of radio and television sets, taperecorders, telephones, etc. |
| 24. | 366 | Mfr. of electronic computers, control equipment, etc. |
| 25. | 367 | Mfr. of electronic components and accessories NEC. |
| 26. | 369 | Mfr. of electrical machinery, apparatus, appliances, etc. NEC. |

Note: NEC = not elsewhere classified.

APPENDIX TABLE II

LIST OF TRADITIONAL INDUSTRIES

| Serial No. | ISIC | Name of Industries |
|---|---|---|
| 1. | 200 | Slaughtering, preparation, and preservation of meat. |
| 2. | 201 | Mfr. of dairy products. |
| 3. | 202 | Canning and preservation of fruits and vegetables. |
| 4. | 203 | Canning, preservation, and processing of fish and fruits. |
| 5. | 204 | Grain mill products. |
| 6. | 205 | Mfr. of bakery products. |
| 7. | 206 | Mfr. and refining of sugar. |
| 8. | 207 | Production of indigenous sugar, *khandsari*, *gur*, etc. |
| 9. | 208 | Production of common salt. |
| 10. | 209 | Mfr. of cocoa, chocolate, and sugar confectionery. |
| 11. | 210 | Mfr. of hydrogenated oils, vanaspati, ghee, etc. |
| 12. | 211 | Mfr. of other edible oils and fats, e.g., mustard oil etc. |
| 13. | 212 | Tea processing. |
| 14. | 213 | Coffee curing, roasting, and grinding. |
| 15. | 214 | Cashewnut processing. |
| 16. | 215 | Mfr. of ice. |
| 17. | 216 | Mfr. of prepared animal feeds. |
| 18. | 217 | Mfr. of starch. |
| 19. | 219 | Mfr. of food products NEC. |
| 20. | 230 | Cotton ginning, cleaning, and baling. |
| 21. | 231 | Cotton spinning, weaving, etc. and finishing of cotton textiles in mills. |
| 22. | 232 | Printing, dyeing, and bleaching of cotton textiles. |
| 23. | 234 | Production of khadi. |
| 24. | 235 | Weaving and finishing of cotton textiles in hand-looms other than khadi. |
| 25. | 236 | Weaving and finishing of cotton textiles in power-looms. |
| 26. | 239 | Cotton textiles NEC. |
| 27. | 240 | Wool cleaning, baling, and pressing. |
| 28. | 241 | Wool spinning, weaving, and finishing in mills. |
| 29. | 242 | Wool spinning and weaving (other than in mills). |
| 30. | 243 | Dyeing and bleaching of woollen textiles. |
| 31. | 245 | Spinning, weaving, and finishing of silk textiles. |
| 32. | 246 | Printing, dyeing, and bleaching of silk textiles. |

Note: NEC = not elsewhere classified.