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Economic Contribution of Government Department Enterprises in India

M.Manonmani

This study analyzes the productivity and production function in India's manufacturing sector with particular reference to performance of government department enterprises. The data source for the study is Annual Survey of Industries (ASI) of the Central Statistical Organization (CSO), Government of India and covered the period 2001-02/ 2012-13. Cobb-Douglas production function was applied to measure the productivity ratios and technical progress. Marginal productivity of labor varied between 0.157 units and 8.416 units across the years. These enterprises recorded marginal productivity of capital of 2.1862 units. The average capital intensity ratio was found to be 3.919. Organizational efficiency in the sector was found high.

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Introduction

The economic development of a country depends mainly on industrial development. In manufacturing sector, the scope for internal as well as external economies is greater than in the other sectors. The sector acts as an instrument both for creating capacity to absorb excess labor power and for diversifying the market required to boost economic development. Since the early 1990s, the role of the government department enterprises has undergone a rapid change. Integration of the domestic economy with global markets has thrown up a plethora of opportunities and challenges. Some of the enterprises with strategic vision are actively exploring new avenues and have increased their activities to go in for mergers, acquisitions, amalgamations, take over's and creating new joint ventures. The present study attempts to analyze the productivity and production function in India's manufacturing sector with

In manufacturing sector, the scope for internal as well as external economies is greater than in the other sectors.

particular reference to the performance of government department enterprises.

Selection of the Variables

Net Value Added (NVA) was taken as output, since trends are not affected significantly by the use of net value added. Also ambiguity in the calculation of depreciation can be overcome if net value added is taken as a measure of output.

Labor input consisted workers directly involved in production while fixed capital was taken into account as capital input. Wages included remuneration paid to workers.

Data Base

The data source of the study was the Annual Survey of Industries (ASI) published by the Central Statistical Organization (CSO), Government of India and covered the period 2001-02 /2012-13. All the referred variables were normalized by applying Gross Domestic Product (GDP) deflator. The GDP at current and constant prices were obtained by referring to Economic Survey, published by Government of India, Ministry of Finance and Economic Division Delhi.

Cobb-Douglas Production Function

Production function approach to productivity measurement is more advantageous because it can handle the problems arising out of non-separability of inputs and output, non-neutral technical change, variable returns to scale and non-proportionality of input prices of their respective marginal productivity in an explicit manner. A production function shows the technological relationship between the maximum output obtained from a given set of inputs and between the inputs themselves in the existing state of technological change. In this approach to productivity measurement the components of productivity can be arrived at directly by econometric estimation. The production function can be used to measure the efficiency of production technology, returns to scale, the degree of economies of scale, the degree of capital intensity of technology and the degree of substitution between factors of production.

One of the most commonly estimated functional forms is the Cobb-Douglas production (C-D) function written as:

$$V = A(t)K^{\alpha} \quad L^{\beta} \quad e^{u}$$

Where α and β are the coefficients of labor and capital respectively, A (t) is the efficiency parameter and u is the stochastic disturbance term following usual properties. Before the production function can be estimated a functional form has to be given to the term A (t). The most commonly used in practice has been A (t) = Aeλt where λ is the measure of technical change in output per period [λ measures the proportionate change in output per period when input level are held constant]. It is very important here to point out the limitations of this representation of technical change. It assumes neutral technical progress and that it is exogenous and disembodied (this neglects the usefulness of investment for technical progress).

This function is linear in the logarithm of the inputs, output and time. Thus, We have:

$$Ln\ V = a + \alpha\, LnL + \beta LnK + \lambda t + \mu i$$

The estimation of this equation yields values of α, β, and λ, where λ provides estimates of Total Factor Productivity Growth (TFPG) and is the rate of exponential technological change. Sum of the partial elasticities ($\alpha + \beta$) indicates the extent of economies or diseconomies to scale. The returns to scale are constant, increasing or decreasing if the value of $\alpha + \beta$ is equal to unity, more than unity or less than unity respectively.

Marginal products of labor (MPL) and capital (MPK) can be obtained by applying the following formula:

$$MP_L = \delta V/\delta L = \alpha V/L$$

$$MP_K = \delta V/\delta K = \beta V/K$$

Since profit maximization entails that marginal productivity of labor is equal to the real wage rate and marginal product of capital is the price per unit of capital, it would imply that:

$$MP_L = w/p = \alpha V/L$$

or share of labor in total output:

$$\alpha = (w/p)(L/V)$$

Similarly

$$MP_k = r/p = (K/L)$$

Or share of capital in total output

$$\beta = (r/p)(K/L)$$

Results & Discussion

The technical progress in these sectors was analyzed by calculating marginal productivity of labor (MP_L), marginal productivity of capital (MP_K), marginal rate of technical substitution of labor for capital ($MRTS_{LK}$) and capital intensity (K/L). Marginal productivity or co-efficient of capital (MP_K) may be defined as the ratio between change in output in a given economy or industry for a given time period and change in gross block of that economy or industry. Marginal productivity of labor (MP_L) may be defined as the ratio between a change in output in a given economy or industry for a given period and change in amount of labor use. Capital intensity K/L is nothing but the state of technology. The $MRTS_{LK}$ explains the rate at which substitution was taking place between labor and capital.

Growth of MP_L

The trends in the growth of marginal productivity of labor (MP_L) are presented in Table 1.

Table 1 MP_L Ratios of Government Department Enterprises

Year	Ratios
2001-2002	5.26
2002-2003	4.365
2003-2004	3.524
2004-2005	0.736
2005-2006	7.89
2006-2007	3.156
2007-2008	6.417
2008-2009	2.84
2009-2010	0.157
2010-2011	8.416
2011-2012	0.736
2012-2013	4.891
Average	3.9543
Standard Deviation(σ)	2.8378
Co-efficient of Variation (c.v)	71.76

Source: Calculations based on data from Annual Survey of Industries (ASI)

Average MP_L ratio of government department enterprises during the period was 3.9543. Wide variations were observed during the period under study. This is evident from the co-efficient of variation (c.v). MP_L ratio varied between 0.157 units and 8.416 units across the years. The variations in MP_L ratios might be due to wage differentials across the time.

Growth of MP_K

Table 2 presents details regarding MP_K ratios from 2001-02 to 2012-2013.

The MP_K ratios during the reference period were positive. This shows that capital contributed positively to output. These enterprises recorded the maximum productivity performance of 2.1862 units with maximum variation of 63.09 percent.

Table 2 MP_K Ratios of Government Department Enterprises

Year	Ratios
2001-2002	2.578
2002-2003	1.314
2003-2004	0.312
2004-2005	1.959
2005-2006	2.09
2006-2007	0.696
2007-2008	3.609
2008-2009	2.06
2009-2010	0.158
2010-2011	3.944
2011-2012	3.905
2012-2013	3.609
Average	2.1862
Standard Deviation(σ)	1.3794
Co-efficient of Variation (c.v)	63.09

Source: Calculations based on data from Annual Survey of Industries (ASI)

Growth of K/L

The capital intensity ratios (K/L) from 2001-02 to 2012-2013 are given in Table 3.

During the reference period the average capital intensity (K/L) ratio was found to be 3.919. The K/L ratios from the beginning of the period to the end had shown a decline from 4.850 to 3.9195, which shows that lower quantum of fixed assets had been accumulated for a given unit of labor.

Table 3 K/L Ratios of Government Department Enterprises

Year	Ratios
2001-2002	4.850
2002-2003	7.916
2003-2004	1.333
2004-2005	2.538
2005-2006	4.541
2006-2007	9.833
2007-2008	8.529
2008-2009	1.513
2009-2010	1.569
2010-2011	1.556
2011-2012	1.762
2012-2013	1.176
Average	3.9195
Standard Deviation(σ)	3.184
Co-efficient of Variation (c.v)	81.23

Source: Calculations based on data from Annual Survey of Industries (ASI)

Growth of $MRTS_{LK}$ Ratios

The estimated $MRTS_{LK}$ during the period 2001-02/2012/13 is presented in Table 4.

The $MRTS_{LK}$ ratios of government department enterprises during the period under study showed that all the ratios were positive. The mean $MRTS_{LK}$ was 3.2064.

Table 4 $MRTS_{LK}$ RATIOS

Year	Ratios
2001-2002	2.04
2002-2003	3.321
2003-2004	0.341
2004-2005	0.375
2005-2006	0.377
2006-2007	3.852
2007-2008	1.002
2008-2009	4.934
2009-2010	0.315
2010-2011	8.812
2011-2012	4.641
2012-2013	8.566
Average	3.2064
Standard Deviation(σ)	3.0685
Co-efficient of Variation (c.v)	95.69

Source: Calculations based on data from Annual Survey of Industries (ASI)

Table 5 Estimates of Production Function

Variables	Coefficients
A (constant)	10.835
	(0.987)
Capital(β1)	0.46**
	(2.578)
Wages(β2)	0.578
	(5.26)
Economics of scale(S)	1.038
R2	0.66
D.W Statistics	0.834
Percentage Share of Capital (β1/S)	44
Percentage Share of Labor(β2/S)	56

Source: Calculations based on data from Annual Survey of Industries (ASI) Figures in parentheses are the t-values
**Significant at 5% level

Across the years the growth of the ratios was not stable since the magnitude of variability was 95.69 percent.

Production Function Estimates

The estimated production function is presented in Table 5

Efficiency parameter 'A' is positive and statistically significant. The implication is that the organizational efficiency is high, positively contributes to output and its contribution was explicitly significant in output generation. Elasticity of capital with respect to output (β1) is positive and is statistically significant. An encouraging feature noticed from the results is that wage coefficient is positive and statistically significant. This implied that wage contributes significantly to output. The sum of the coefficients imply that it had recorded increasing returns to scale. The percentage share of factor inputs presented in the table indicated that share of wages was higher than the share of capital. This implied that these enterprises were labor intensive in their operation.

The sum of the coefficients imply that it had recorded increasing returns to scale.

Conclusion

Wide variations were observed in the growth rate of MP_L. Capital contributed positively to output based on MP_K ratios. Lower quantum of fixed assets had been accumulated for a given units of labor. The $MRTS_{LK}$ across the reference period was not stable since the magnitude of variability was 95.69 percent. Development of higher infrastructural facilities in the form of power, roads and telecommunication facilities has to be a top priority for the policy makers to raise the productivity and efficiency of the factors used in these enterprises. .