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A study on rubber products manufacturing industries in kerala in the liberallization period

Anish C Aniyan

Doctoral Research Scholars in Economics, Erode Arts & Science College (Autonomous), Erode-9.

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ABSTRACT

The New Industrial Policy (NIP) was introduced in 1991. The key elements of the NIP are the abolition of licensing of capital goods, reduced list of industries to be reserved for the public sector, increasing foreign equity ownerships in domestic industries, private investment in infrastructure, freer import of capital goods, reduced tariff for consumer goods, de-regulation in small scale industrial units and allowing greater inflow as well as outflow of foreign investment. These aim to enhance productivity and efficiency in Indian industries by increasing competition, creating level playing field among public, private and foreign business and generating environment which is conducive for technological growth. Manufacturing growth is important for achieving balanced growth of the economy and generating adequate employment. For this purpose, it is necessary to determine the manufacturing growth that would help a higher growth rate of the economy as well as ensuring longer employment.

Introduction

Economic propensity of a developing country like India is mainly dependent on the integration of agriculture with industry. After independence, the Government recognized the role and importance of rural and agro-based industries in the economic upliftment of the rural people.

Plantation preceded the emergence of the modern factory industry in India. The growth of the urban industrial sector transmits a number of significant dynamic impulses to the agricultural sector. The expansion of industries accompanied by growing urbanization provides a continuously expanding market for various agricultural products. When the stimulus is given for the expansion of certain cash crops, it helps in converting subsistence peasant agriculture into a commercialized one.

As the forerunners of the modern industries, the plantations have a prominent place in the industrial development of India. With the emergence of modern industrial sector in India, large scale capital intensive and small scale , labor – intensive industries have come to occupy a prominent role in the industrial scenario of the country and rubber based industries occupy a pivotal role in it. This is evident from the fact that rubber – manufacturing sector is the third largest contributor to the national exchequer by way of taxes and duties.

Kerala is the largest producer of natural rubber in India. Almost 90 percent of the total production of natural rubber is accounted by Kerala. But it consumes only nearly 17 percent. The rubber –based industries in Kerala are comparatively of recent origin. Kerala with its industrial backwardness and mounting unemployment rates hopes to solve to some extent its problem of unemployment and poverty through the industrial development of the state. Rubber –based industries have a vital role to play for industrial development of Kerala state because of easily available of natural rubber. Therefore it is important to study about the growth and developmental problem of a new industry, the rubber industry, especially in Kerala state. Almost all the previous studies were concentrated on the rubber plantations sector. Thus the present study attempts to analyze the growth and production of rubber-based industries in Kerala.

An attempt has been made in this paper to present a brief discussion on production function in rubber products manufacturing industries in the Kerala state during the period 1991-92 to 2007-08.

The paper is organized as follows. The present section gives a brief introduction of the study. A brief summary of relevant Indian economic reforms is presented in Section II, and the data sources and summary description of the variables is discussed in Section III. Section IV describes the various production function used in the present study. The results of production function in Indian rubber and rubber products industry are evaluated in Section V. Section VI contains conclusion.

New economic policy

Fundamental changes in the Indian economy policy were introduced in 1991. Industrial licensing has been abolished; large business are no longer required to take separate permission for investment and expansion; the list of industries reserved for the public sector has been rescued; equity in public enterprises is being divested; access to foreign capital and technology has been made freer; quantitative restrictions on imports have been virtually abolished; import duties have also been significantly reduced. The basic idea behind such economic reforms is that the reduction in the size of the public sector and the lifting of Government controls and regulations on production, trade and investment would usher in a more competitive environment, improve efficiency and hence growth. The pattern of industrialisation is expected to be not only internationally competitive but also “sufficiently labour intensive”. The problem of poverty was to be tackled through rapid and sustained growth in output and employment (Goldar, 1993)

A number of studies have been published on the impact of reforms or industry (Nambiar 1999; Mani 1998; Chandrasekhar

Tele:

E-mail addresses: meani38@gmail.com

1996; Mishra, 2001). These studies have analysed a number of critical issues and are in general critical about the reforms process. The focus of this paper is on the impact of economic reforms on rubber products manufacturing industries in Kerala state on industrial structure using production function.

Data sources and descriptive summary

This paper covers the period of 17 years, from 1991-92 to 2007-08. The principal data source utilized here in was the Annual Survey of Industries (ASI), published by the Central Statistical Organization of India. The ASI considers only registered manufacturing sectors. In the ASI, the rubber and rubber products industry is classified under three and four-digit industrial classification levels.

Value added was taken as a measure of output, which was deflated by the wholesale prices index of rubber and rubber products using 1991-92 = 100 as a base. Thus, the real value added was considered in this paper. The total number of persons engaged in industrial units is taken as the measure of labour input.

To construct capital stock, we used the gross fixed capital formation series. Capital stock was calculated as follows:

Where Ki,t is capital stock of sector i at period t, Iit is capital formation and is the depreciation rate. The series on fixed capital formation were deflated by the WPI of machine and machine tools, and we employed a uniform 5% depreciation rate.

The standard Perpetual Inventory Method has been used here in constructing the initial capital stock. The initial capital stock series is initialized via the following equation: where Ii,0 is the first-year investment data available in the sample, gi is the average growth in the sample years of the investment series, and is the depreciation rate.

Production function

Our analysis in this paper is based on the estimation of various forms of the aggregate production function viz. the Cobb-Douglas, CES and VES forms. In this section we may have a brief discussion on the approach to econometric estimation of production function.

Cobb-Douglas Production Function

To find out the input elasticities, neutral technical progress and returns to scale we employed the Cobb-Douglas production function

$$V = Aoe\lambda tL\alpha K\beta \quad (1)$$

Where V is output (value added), L is labour and K is capital, respectively and λ is the rate of Hicks – neutral disembodied technical progress. Its parameters are generally estimated by applying the logarithmic transformation to the original form. The parameter estimates of the transformed equation are, however, likely to be seriously affected by multicollinierity between explanatory variables. In order to avoid the same to some extent, therefore, we have estimated the Cobb-Douglas production function in the ratio form with time trend as given below.

$$Ln(V/L) = a + \beta Ln(K/L) + (\alpha+\beta-1) LnL + \lambda t \quad (2)$$

According to eqn.(2), the coefficient of LnL equals the sum of the output elasticities minus one, and its sign , therefore , indicates increasing or decreasing returns of scale. If the return to scale is unity, then coefficient of LnL should be insignificant. The parameter β in the above regression model gives the elasticity of output with respect to capital and λ the exponential rate of technical progress.

A restrictive form of the C-D production function explicitly assumes constant returns to scale (i.e. $\alpha + \beta = 1$) and is written as:

$$Ln(V/L) = a + \beta Ln(K/L) + \lambda t \quad (3)$$

This equation (4) is known as constrained C-D production function. Where V is Output, L is labour K is Real Capital Stock and t is Time, a, β, and λ are regression constants. In all the two specifications of C-D production function, the parameters are estimated by 'OLS' procedure.

Constant Elasticity of Substitution

To test whether elasticity of substitution is significantly different from one we are using the constant elasticity of substitution production function. The objective of using CES production function is to examine elasticity of substitution, returns to scale and technological progress in the rubber products manufacturing industries.

In this study we are using the CES production function of the following form.

$$Ln (V/L) = \alpha o + \alpha 1 Ln (w) + \alpha 2t + u \quad (4)$$

Where V is the output (here value added), L is labour, K is capital, t is time and w denotes wage rate. αo, α1 and α2 are constants and u is the error term.

Here α1 is the estimated elasticity of substitution; α2 is the estimate of the rate of constant neutral technological progress.

Alternative form of CES production function put forwarded by Arrow el. al. allowing non- constant returns to scale is also used in the study. The equation is as follows:

$$Ln (V/L) = \alpha o + \alpha 1 Ln (w) + \alpha 2 LnL + \alpha 3t \quad (5)$$

And,

Equation (5) without time trend CES estimation is also estimated,

$$Ln (V/L) = \alpha o + \alpha 1 Ln (w) \quad (6)$$

From equation (5) the measures of the returns to scale can be estimated as

$$M = [(\alpha 2 - \alpha 1) / (1- \alpha 1)]$$

Variable Elasticity of Substitution Specification

The following form of VES production function is used in this study

$$Ln (V/L) = a + b \ln (w) + c Ln (K/L) + u \quad (7)$$

Where V is value added, L is labour, K is capital, w is wage rate and a, b and c are constants. u is the error term. Using the parameters of the above equation, the elasticity of substitution may be obtained as:

$L = b/[1-(c/Sk)]$, where Sk is the share of capital.

VES production function with time trend is also estimated

$$Ln(V/L) = a + b \ln(w) + c Ln(K/L) + d(t) + u$$

Where 't' is time trend

Estimates and discussion of production function

In order to examine factors substitution, returns to scale and technical progress in rubber products manufacturing industries in Kerala state over 1991-92 to 2007-08. We have fitted the Cobb-Douglas production function, CES and VES production function to aggregate ASI data available for the period. The results of the estimation with and without time trend of the Cobb-Douglas production function have been given in table 1 and table 2 respectively.

In Kerala state the Cobb-Douglas production function gives a statistically significant and numerically high coefficient of capital. The higher capital (1.46) in our study however, finds support in many industries in the country for varying periods. For example Sastry in his study of sugar industry in India during 1951-61 estimated much higher capital coefficients (3.63 & 2.3) in the Cobb-Douglas production function for sugar industries of U.P and Bihar respectively. In a case study of the Chittoor Co-operative sugars Ltd, A.P, Mani & Sathyanarayana also estimated 0.7154 value of the coefficient of capital in Cobb-Douglas production function during 1964-65 to 1984-85.

The return to scale parameter found positive in state level for this industry and found statistically significant. The coefficient of time trend found to be negative showing a decline on technical progress in the Kerala state.

The negative trend in the coefficient of time, which measured the rate neutral technological progress was, however, not found to be statistical significant in this industry in Kerala state. The labour coefficient was negative but found significant for industry in Kerala state. This indicates the industry in Kerala state experience variable returns to scale. The estimated returns to scale parameter were –2.67 which is significantly below one, indicating the absence of economies of scale in the industry. The high values of R2 and F indicated that the regressions were good –fit.

A restrictive form of Cobb-Douglas production function explicitly assumes constant returns to scale. The results of this specification are presented in table 2. The capital intensity parameter was found positive and found statistically significant in Kerala state. The explanatory power of the model was satisfactory. The time trend which explains technological change founds to be insignificant but shows a negative trend.

The estimated values of the parameters of the CES production function are given in table 3. The elasticity of substitution given by the coefficient of Ln(w) was found to be significantly different from zero but not significantly above unity in the first regression in rubber products manufacturing industries in Kerala state.

Incorporation of time variable in model 2 (table 4) resulted in a nominal improvement in overall fit. The coefficient of wage rate is found to be significant in Kerala state and coefficient of wage rate was found to be positive and significant. The total factor productivity of the industry in Kerala registers a negative growth and it was significant.

We have also fitted regression model to the data for the aggregate level for the period so as to estimate the returns to scale parameter (m) in the CES production function as suggested by Forgnsion . Results of the estimation have been presented in table 5. The value of m as shown in the table stands out to be negative indicating the decreasing returns prevailing in the industry. We may therefore arrive at a definite conclusion regarding the prevalence of decreasing returns to scale in the industry.

The estimated values of the parameter of the VES production function are given in table 6. The constant elasticity of substitution given by the coefficient of Ln(w) was found to be positive but not statistically insignificant at 5 percent level.

The inclusion of time (t) in the second regression yielded positive and statistically significant coefficient in this industry. The coefficient of (w) wage rate which represents constant elasticity of substitution was found to be positive and statistically significant, the time variable which represents the technological change found to be negative and significant which shows that the industry experiences a decline in technological progress.

Conclusion

An attempt was made in the present section to study production function in rubber products manufacturing industries in Kerala state level during 1991-92 to 2007-08 periods. For this purpose different forms of production function were fitted to the ASI data in order to examine returns to scale, elasticity of substitution during the period under investigation.

Our estimates of Cobb-Douglas production function revealed that the hypothesis of unitary elasticity of substitution between capital and labour could be rejected for this industry. Both the functions clearly indicated that the industry experienced decreasing returns to scale. The statistically insignificant value of time trend in the Cobb-Douglas production function and negative significant small value of coefficient of time in the CES and VES production function indicates a low level technical deterioration in the industry at Kerala state.

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Table 1 Cobb-Douglas Production Function for Rubber products manufacturing industries in Kerala

$$Ln(V/L) = a + \beta Ln(K/L) + (\alpha+\beta-1) LnL + \lambda t$$

Region	Regression coefficients				R^2 (percent)	F
	Constant	(K/L)	Labour (L)	Time		
All India	2.75 (0.69)	0.37 (1.57)	-0.25 (-0.73)	0.02 (1.80)	83	21.76
Kerala	20.68 (4.91)	1.46 (4.42)*	-2.21 (-4.97)*	-0.023 (-0.296)	83	21.07

Source: Computed using Stata.
Figures in parenthesis are 't' values
* denotes significance at 5 percent level

Table 2 Cobb-Douglas Production Function for Rubber products manufacturing industries in Kerala Ln(V/L) = a + βLn(K/L) + λt

Region	Regression coefficients			R^2 (percent)	F
	Constant	(K/L)	Time		
All India	-0.13 (-0.72)	0.32 (1.43)	0.02 (1.94)	82	33.51
Kerala	-0.22 (-1.2)	1.21 (2.26)*	-0.025 (-0.73)	51	7.16

Source: Computed using Stata.
Figures in parenthesis are 't' values
* denotes significance at 5 percent level

Table 3 Constant Elasticity of Substitution for Rubber products manufacturing industries in Kerala Ln (V/L) = αo+ α1Ln(w) + u

Region	Regression coefficient of		R^2 (percent)	F
	Constant	Wage rate (w)		
All India	2.02 (5.00)	1.39 (3.71)*	82	32.20
Kerala	-10.52 (4.92)*	1.07 (3.65)*	47	13.35

Source: Computed using Stata.
Figures in parenthesis are 't' values
* denotes significance at 5 percent level

Table 4 Constant Elasticity of Substitution for Rubber products manufacturing industries in Kerala Ln (V/L) = α_o+ α_1Ln(w)+ α_2t + u

Region	Regression coefficients			R^2 (percent)	F
	Constant	Wage rate (w)	Time		
All India	-0.54 (-0.97)	-0.52 (-1.19)	0.05(5.15)	82	31.86
Kerala	2.55 (2.22)*	1.74 (2.23)*	-0.037 (-0.93)	50	7.04

Source: Computed using Stata.
Figures in parenthesis are 't' values
* denotes significance at 5 percent level

Table 5 Constant Elasticity of Substitution for Rubber products manufacturing industries in Kerala Ln (V/L) = αo+ α1Ln(w)+ α2 LnL + α3t + u

Region		Regression coefficients			R^2 (percent)	F
	Constant	Labour (L)	Wage rate (w)	Time		
All India	1.32 (0.34)	-0.21 (-0.60)	0.75 (1.34)	-0.011 (-0.25)	83	20.60
Kerala	15.18 (2.10)	-1.48 (-1.76)	0.8 (2.51)*	-0.01 (-1.76)	60	6.44

Figures in parenthesis are 't' values
* denotes significance at 5 percent level

Table 6 VES production function for Rubber products manufacturing industries in Kerala Ln(V/L) = a + b ln(w) + c Ln(K/L) + u

Region		Regression coefficients		R^2 (percent)	F
	Constant	Wage rate (w)	(K/L)		
All India	-0.15 (-0.26)	0.44(1.94)	0.19 (0.70)	83	33.53
Kerala	0.63 (0.87)	0.56 (1.18)	0.51 (1.37)	53	8.01

Source: Computed using Stata.
Figures in parenthesis are 't' values
* denotes significance at 5 percent level

Table 7 VES production function for Rubber products manufacturing industries in Kerala Ln(V/L) = a + b ln(w) + c Ln(K/L) + d(t) + u

Region	Regression coefficients				R^2 (percent)	F
	Constant	Wage rate (w)	(K/L)	Time		
All India	-0.63 (-1.15)	0.23 (0.29)	0.24 (0.72)	0.014 (0.28)	83	22..91
Kerala	3.05 (3.98)	2.31 (4.32)*	1.6 (4.36)	-0.16 (-4.11)*	72	11.04

Source: Computed using Stata.
Figures in parenthesis are 't' values
* denotes significance at 5 percent level