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ANALYSIS OF GROWTH PATTERN OF LAC INDUSTRY

Jyoti Prakash Mandal*
Jaydeb Sarkhel**

Abstract

In order to study the growth pattern of the lac industry, we have measured trend rate of growth of production by taking three categories of firms namely big size firms, medium size firms and small size firms. For this, prominent five manufacturing firms under each category have been selected. During the period under consideration (i.e. 2000-01 to 2010-11) the production of five big manufacturers had an annual growth of 12.94%. The rate of profit for the big firms remained more or less stable during study period.

During the period under consideration (i.e. 2000-01 to 2010-11) the production of five medium manufacturers had an annual growth rate of 2.13%. In respect of five selected small size firms for the period from 2000-01 to 2010-11, it showed a positive but distinctly declining rate of profit. The trend rate of production over the period has been as high as 2.34%. If we consider the analysis by taking all the 15 firms together, then the analysis will give us the integrated picture of lac industry. From that we can derive the growth pattern of lac industry as a whole. The production of lac manufacturers grew at 10 percent per annum.

Key words : *Lac Industry of Purulia District (R); Big Size Firms, Medium Size Firms, Small Size Firms, C8); Growth Pattern (C2)Trend Rate of Production(C4)*

1. Introduction

Lac and its products have a hoary past in the soil of Purulia district. In view of prospect of this industry, the growth analysis has become necessary. Again lac has entered a new era when there are strong signals that Indian lac trade can get back its health and will stand on a strong footing after the second phase of economic reforms has been introduced. This paper analyses the growth pattern of lac industry in Purulia district.

There are three major classes of lac firms according to size: big manufacturer, medium manufacturer and small manufacturer. Those firms which have barrel washer in their possession but have no press machines are called medium size manufacturers. Those firms who have washers and press machines to process seedlac and machine-made shellac can be identified

*Assistant Professor in Economics, Raghunathpur College, E-mail-jyotiprakash1757@gmail.com
** Retired Professor, Department of Commerce, The University of Burdwan, E-mail-jaydebsarkhel@gmail.com

as big manufacturers. The small manufacturers have neither press machines nor washers. These units usually get their sticklac washed from other firms which have barrel washers on paying service charge.

2. Objectives of the Study

In this paper we shall try to assess the growth pattern of some selected lac firms which are categorized as large sized, medium sized and small sized firms. We have measured growth through the trend rate of growth assuming that an exponential trend is present in the time series data.

3. Data Source and Methodology

In Purulia big lac firms are mainly concentrated in Balarampur. We have selected all the big firms from Balarampur. Medium and small sized firms are located in three main manufacturing centers: Balarampur, Jhalda and Tulin. Among these 10 firms are from Balarampur, covering two small scale firms, three medium sized and five large scale processing units. Three firms are chosen from Tulin of which two are medium and one is small firm. Other two firms are selected from Jhalda. There are three organizations: Chapra Byaparik Sabha; Balarampur Khudra Lakksha Kutir Silpa Baybasayee Samity and West Bengal Lac artisan co-operative society. We took necessary help from these institutions during the survey for verifying the collected data and information. Shellac & Forest Products Export Promotion Council (SHEFEXIL) provided us necessary statistics in relation to monthly price of finished goods and its trend over the years. The survey has been possible with the help of appropriate sources such as D.I.C Purulia.

The key variables we study include output, price of the product, employment, different cost items (cost of raw materials, manufacturing cost), capital and its depreciation over time, profit and profit rate. The subject matter of this paper includes factors that determine both the levels of these variables and how the variables change over time: the exponential rate of growth of trend of the variable production.

A set of questionnaire was prepared for the purpose of detailed survey of the selected firms under the categories of big firm, medium firm and small firm. The questionnaire contained questions relating to the location of firm, ownership details, employment schedule, production schedule, capital investment, expenditure, annual production, storage and marketing and other relevant socio-economic queries. The information was collected from fifteen lac firms, five in each category over the study period 2000-2011. Regular survey of the 15 firms had been taken and several attempts were made to survey other firms from time to time to compare and

justify the information with those obtained from 15 selected lac firms over the study period. Given these data we have constructed quite a good number of tables to present the data in easily comprehensible form. From the official files of the firms we have also collected data. From these data we have computed average price per year for each category of firms. We have taken all the steps to show the growth rate of key variable.

In order to study the growth pattern of the industries we have measured the trend rate of growth of total production of all firms taken together in any group. Expansion or growth of any firm very largely depends on its profitability. Rising profitability implies greater investment and faster expansion while declining profitability often leads to flight of capital. Thus to get an idea about future prospect of every category of lac industry we have computed rate of growth of profit rate of every group of firms.

For studying the growth rate as stated above, we have used exponential trend equations. We have fitted the exponential trend equation of the form $Yt=ab^t$ to the data in hand. Here (b-1) is the exponential rate of growth.

4. Big Sized Firms

Prominent five large size manufacturing firms are chosen. They are: *Bishwashankari Shellac Factory*, *Ankit Shellac Factory*, *Jagadamba Lac Udyog*, *Sanjay Agarwal Lac Industry* and *Parvati Lac Udyog*. These firms may roughly be stated as representative of big lac manufacturing firms in Purulia.

The basic data on production, revenue, cost and profit of big lac firms have been given in the following table, (Table-1). The second column of the table indicates that the quantum of production of lac finished products has increased from 341M.T. in 2000-01 to 985 M.T. in 2010-11, which was the highest yield during the period. The lowest production was achieved in the year 2001-02 (330 M.T.). To measure the percentage change we find the actual change, divide it by the initial value and multiply by 100 to express the result as a percentage. To get a more reliable indicator of growth we have computed exponential trend rate of growth of production.

Now we proceed to Table-2 where growth rate of total production of big manufacturing firms is considered. We have plotted the above data of production over the years on a semi logarithmic graph paper where we plot year on the horizontal axis and log y on the vertical axis. The dots on the scatter diagram form roughly a straight line which indicates the existence of an exponential trend in the time series data. Let ($y=ab^t$) be the equation of the exponential trend where t=time in years, y=production and a, b are constants.

Table 1: Indicators of Big Manufacturers

Year (1)	Total Production (y) (in M.T) (2)	Revenue (Rs. crore) (3)	Cost of Raw materials (Rs. crore) (4)	Manufacturing Cost (Rs. crore) (5)	Depreciation Cost (Rs. crore) (6)	Total Cost (Rs. crore) (7)= (4)+(5)+(6)	Profit (Rs. crore) (8)=(3)-(7)	Profit Rate (in percentage) (9)=(8)/(7)*100
2000-01	341	3.62	2.99	0.29	0.02	3.3	0.32	9.70%
2001-02	330	3.5	2.38	0.32	0.03	2.73	0.77	28.21%
2002-03	341	3.61	2.97	0.37	0.03	3.37	0.24	7.12%
2003-04	429	5.32	4.6	0.5	0.03	5.13	0.19	3.70%
2004-05	418	6.94	5.97	0.54	0.03	6.54	0.4	6.12%
2005-06	456	6.85	5.82	0.63	0.05	6.5	0.35	5.38%
2006-07	576	9.32	7.87	0.83	0.07	8.77	0.55	6.27%
2007-08	641	7.89	6.45	0.99	0.07	7.51	0.38	5.06%
2008-09	936	12.69	10.74	1.69	0.08	12.51	0.18	1.44%
2009-10	881	13.66	11.11	1.67	0.16	12.94	0.72	5.56%
2010-11	985	34.28	28.19	1.97	0.17	30.33	3.95	13.02%
Average	575.82	9.79	8.10	0.89	0.07	9.06	0.73	8.33%

Source: Official records of the five selected big manufacturers of Purulia District constituting the sample

Note, Profit rate of the certain year = (Total profit of that year / Total cost of that year) X 100

Let ($y_t=ab^t$) be the equation of the exponential trend where t=time in years, y=production and a, b are constants, which is non linear. N= number of years of the study period. Taking log on both sides we get $\log y = \log a + t \log b$

or, $Y = A + t B$, where $\log y = Y$, $\log a = A$ and $\log b = B$

Now to fit this linear equations by the method of least squares we get two normal equations $\sum Y = NA + B\sum t$ and $\sum tY = A\sum t + B\sum t^2$

Since the origin of t may be taken at the middle of the period, $\sum t = 0$; so these equations may be written as

I. $\sum Y = N A$ or $A = \sum Y/N$

II. $\sum tY = B\sum t^2$ or $B = \sum tY/\sum t^2$

Table 2 : Computation of Trend Values of Production

Year	Total Production (y)					Trend Values
	(in M.T)	t	t^2	Y=logy	t.Y	$y_t=ab^t$
2000-01	341	-5	25	2.5327544	-12.66377189	288.8356263
2001-02	330	-4	16	2.5185139	-10.07405576	326.2082701
2002-03	341	-3	9	2.5327544	-7.598263137	368.4165866
2003-04	429	-2	4	2.6324573	-5.264914584	416.0862666
2004-05	418	-1	1	2.6211763	-2.621176282	469.9239599
2005-06	456	0	0	2.6589648	0	530.72775
2006-07	576	1	1	2.7604225	2.760422483	599.3989851
2007-08	641	2	4	2.806858	5.613716059	676.9556393
2008-09	936	3	9	2.9712758	8.913827546	764.5474034
2009-10	881	4	16	2.9449759	11.77990363	863.4727271
2010-11	985	5	25	2.9934362	14.96718115	975.1980677
Total		$\sum t=0$	$\sum t^2=110$	$\sum Y=29.97359$	$\sum tY=5.812869217$	

Source: Derived from Table 1

Putting the values from table we have A=29.97359/11 = 2.724871783

So, a =antilog of 2.724871783 = 530.72775

Again B= 5.812869217/110 =0.052844266

Or, b = antilog of 0.052844266 = 1.1293909

Now the trend equation is $y_t=ab^t = 530.72775* (1.1293909)^t$. Trend values as obtained from this trend equation are shown in the last column of the above table. Here (b-1) is the exponential rate of growth of trend. During the period under consideration (i.e. 2000-01 to 2010-11) the production of five big manufacturers had an annual growth of 12.94%. Consequently profit rate is also high which is steady around 8.33% on an average during this study period. In order to show the goodness of fit, we find R-squared value, co-efficient of determination. The value is 0.881396, this shows that out of 100% variation of production 88% can be explained by the trend equation.

During the period total revenue was in broad range from Rs.3.5 crore to Rs.34.28crore, recording lowest value in 2001-02 and highest value in 2010-11. Now we consider the cost, which has great importance in this analysis. Adding the corresponding elements of fourth, fifth and sixth columns of the table we get total cost over the period 2001-2011. During the period total cost was the lowest at Rs2.73 crore, in the year 2001-02 and the highest in the year 2010-11 at Rs 30.33crore. To find out the effect of this rapid increment of cost on profit rate we proceed to compute the amount of revenue earned per unit of rupee invested in terms of cost. Because Profit Rate= {(Revenue-Cost)/Cost} X 100

This implies that the rate of profit for the big firms remained more or less stable during the study period. Except for the years 2001-02 and 2008-09 the rate of profit remained more or less stable in the range of 4% to 13% (see from Table-1).

5. Medium Sized Firms

We consider the case of medium sized firms at Balarampur, Jhalda and Tulin Efforts were made for data collection on the basis of questionnaire prepared for lac firms. Table-3 gives the figures of production of the five firms over the years. We see the production of shellac has increased from 134040 kg. in 2000-01 to 175340 kg in 2010-11.

Total production increased by 10.44% in the year 2008-09 and in the year 2009-10 it was increased by 4.73%. But it decreased by 1.05% in the next year due to shortage of production. In the year 2010-11 average number of *bhatta* operated was as low as 18. We see the rate of increment of total production is dwindling from 23.58% to -12.03% over the year and fixed the average rate of increase at 3.18%. To get a more vivid picture we have computed exponential trend rate of growth in production.

Like the trend of big manufacturer's production the series of production of medium sized firms is also increasing over the year. So, the exponential curve is best fitted for the trend analysis. The equation is given by $Y_t=ab^t$ where Y_t=Trend values of production, t=time period,y=production and a, b are constants.

Table 3: Computation of Trend Values of Production of Medium Sized Firms

Year	Total Production (y) (in M.T.)	t=Year-mid values	t^2	Y=Logy	t.Y	Trend Values ($y=ab^t$)
2000-01	134	-5	25	2.127105	-10.6355	140.98
2001-02	166	-4	16	2.220108	-8.88043	143.98
2002-03	146	-3	9	2.164353	-6.49306	147.05
2003-04	144	-2	4	2.158362	-4.31672	150.18
2004-05	142	-1	1	2.152288	-2.15229	153.38
2005-06	156	0	0	2.193125	0	156.65
2006-07	168	1	1	2.225309	2.225309	159.99
2007-08	153	2	4	2.184691	4.369383	163.40
2008-09	169	3	9	2.227887	6.68366	166.88
2009-10	177	4	16	2.247973	8.991893	170.44
2010-11	175	5	25	2.243038	11.21519	174.07
Total		$\sum t=0$	$\sum t^2=110$	$\sum Y=24.14424$	$\sum tY=1.007407$	

Source: From Table 4

Using the values shown in Table 3 we get

1. $24.14424 = 11 \log a$; $\log a = 2.194931$;

2. $1.007407 = 110 \log b$; $\log b = 0.0091582$

To obtain a and b, we look up the anti-logarithms of log a and log b and we can then write the trend equation in natural form Y_t=(156.65)(1.02131)^t origin 2005-06, t units 1 year. Here again we find out the value of r^2 which is most commonly used measure of the goodness of fit of a trend equation. Verbally, r^2 measures the proprtion or percentage of the total variation in Y explained by the regression equation Y_t. According to the value of r^2 only 56% is explained. The Yt trend values are shown on Table 3. Production grows at a rate 2.13% over the study period. Throughout this paper our concern has been to analyse the situation of lac industry from growth perspective. In this process Table 4 is an attempt to furnish the year-wise data of production, cost and profit rate during the period under study. This table is largely compilation of data regarding different economic variables of five medium sized firms. The second column of the table shows that total production has fluctuated very sharply over the period 2001-2011. It is found from the table that peak level of production was reached in the year 2009-10 when annual production was 177 M.T.. During the entire period 2000-01 to 2010-11 the quantum of production averaged about 157 M.T. per year. But during the last few years 2008-09 to 2010-11 this quantum increased around 175 M.T. a year.

Table 4: Indicators of Medium Sized Firms

Year	Total Production	Cost of Raw Materials	Manufacturing Cost	Depreciation Cost	Total Cost	Revenue	Profit	Profit Rate =(profit/cost)*100
	(In M.T.)	(Rs in lakh)	(Rs. In lakh)	(Rs. In lakh)	(Rs. In lakh)	(Rs. In lakh)	(Rs. In lakh)	(%)
(1)	(2)	(3)	(4)	(5)	(6)= (3)+(4)+(5)	(7)	(8)= (7)-(6)	(9)=(8)/(6)*100
2000-01	134	234.28	14.74	2.63	251.65	278.11	26.46	10.514604
2001-02	166	131.92	21.59	2.67	156.18	187.81	31.63	20.252273
2002-03	146	184.97	20.45	2.77	208.19	212.04	3.85	1.8492723
2003-04	144	213.99	20.82	2.93	237.74	246.58	8.84	3.7183478
2004-05	142	275.4	22.75	3.08	301.23	334.44	33.21	11.024798
2005-06	156	273.9	26.52	3.27	303.69	328.1	24.41	8.0378017
2006-07	168	266.93	33.6	3.42	303.95	330.82	26.87	8.8402698
2007-08	153	228.24	35.24	3.56	267.04	288.28	21.24	7.9538646
2008-09	169	260.43	42.3	3.73	306.46	304.14	-2.32	-0.7570319
2009-10	177	307.96	51.39	3.87	363.22	343.23	-19.99	-5.5035516
2010-11	175	609.45	61.37	4.12	674.94	1412.08	737.14	109.21563
Average	157.272727	271.58818	31.888182	3.2772727	306.75364	387.78455	81.030909	15.922389

Source: Official files of the selected medium sized firms

6. Small Sized Firms

In this section the growth rates, trend of production and profit rate during the past eleven years (2000-01 to 2010-11) have been studied for five selected small lac firms. The small

units are mostly technologically backward and lacking in competitive strength. Notwithstanding their lack of competitive strength small firms in Purulia could survive due to product isolation (Rangeeni seedlac and buttonlac) from big and medium sized firms and policy of protection to some extent. Besides this it has been observed that the small entrepreneurs mostly suffer from traders-mentality and do not venture into taking risk whenever the question of investment comes. This type of firm is exceptionally self-reliant from collection of sticklac to the delivery of the finished product with substantial value addition at each stage of processing of finished products. The firms are financed mainly by family's capital and administered by the head of the family. Compared to other categories of lac firms these firms being the largest employment provider (including family labour) have immense significance in rural economy.

The basic data providing the state of the small lac firms has been given in Table-5. The table gives us a perspective for evaluation of the growth analysis of this industry. The second column of the Table indicates that the production of lac has increased markedly between 2000-01 and 2010-11 from an annual production of 30 M.T. to 38M.T. at the annual rate of 2.7%. The lac production in 2001-02 (28 M.T.) was substantially lower compared to other years. Various factors were responsible for such fall in production. The main cause is shortage of sticklac production due to very adverse weather conditions.

Exponentials relations are useful in this case in describing time path of production. Exponentially increasing level of production through time implies a constant growth rate. Here the trend equation has been taken to be of exponential form ($y_t=ab^t$) or, $\log y_t = \log a + t \log b$

Table 5 : Indicators of Small Firms

Year	Total Production	Cost of Raw Materials	Manufacturing Cost	Depriciation Cost	Total Cost	Revenue	Profit	Profit Rate
	(M.T.)= y	(Rs in Lakh)	(Rs in Lakh)	(Rs in Lakh)	(Rs in Lakh)	(Rs in Lakh)	(Rs in Lakh)	(%)
(1)	(2)	(3)	(4)	(5)	(6)=(3)+(4)+(5)	(7)	(8)=(7)-(6)	(9)=(8)/(6)*100
2000-01	30	10	2	0.5	12.5	30	17.5	140
2001-02	28	10	2	0.5	12.5	28	15.5	124
2002-03	35	25	5	0.3	30.3	52.5	22.2	73.267327
2003-04	40	55	5	0.7	60.7	80	19.3	31.795717
2004-05	45	55	12	0.3	67.3	85.5	18.2	27.043091
2005-06	35	20	2.5	0.5	23	52.5	29.5	128.26087
2006-07	42	20	2.7	0.5	23.2	50.4	27.2	117.24138
2007-08	40	40	5	0.3	45.3	72	26.7	58.940397
2008-09	35	40	5.5	0.3	45.8	77	31.2	68.122271
2009-10	40	50	7.5	0.8	58.3	88	29.7	50.943396
2010-11	38	98	9	1	108	152	44	40.740741
Average	37.1	38.45	5.29	0.52	44.26	69.81	25.54	78.21

Source: Compiled data from official files of five small lac firms

Table 6 : Fitting a Exponential Trend to the Data on Production

Year	**Total Production (in Terms of M.T.)= y**	**t**	**t^2**	**Y=logy**	**t.Y**	**Trend Values ($y_t=ab^t$)**
2000-01	30	-5	25	1.477121	-7.38561	32.7506
2001-02	28	-4	16	1.447158	-5.78863	33.51555
2002-03	35	-3	9	1.544068	-4.6322	34.29838
2003-04	40	-2	4	1.60206	-3.20412	35.09948
2004-05	45	-1	1	1.653213	-1.65321	35.9193
2005-06	35	0	0	1.544068	0	36.75827
2006-07	42	1	1	1.623249	1.623249	37.61683
2007-08	40	2	4	1.60206	3.20412	38.49545
2008-09	35	3	9	1.544068	4.632204	39.39459
2009-10	40	4	16	1.60206	6.40824	40.31473
2010-11	38	5	25	1.579784	7.898918	41.25636
Total		$\sum t=0$	$\sum t^2=110$	$\sum Y=$ 17.21891	$\sum t.Y=$ 1.102956	

Source: Derived from table 5

The constants a and b are determined by the least square method.

Since $\sum$ t=0 the normal equations are 17.21891= 11* log a

and 1.10296= 110* log b

so that log a = 1.565355, or a= antilog of 1.56355 = 36.75827

and log b = 0.10027, or b= antilog of 0.10027 = 1.023357

The trend equations is therefore $y_t = ab^t = 36.75827(1.023357)^t$

The trend values for the different years are shown in the last column of the Table 6. Growth rate is 2.34% over the years. Here the value of r^2 is 0.253687. R-squared value measures the goodness of fit, so the trend equation tells the estimated production will not be closed to their actual values. The trend equation can merely explain the total variation of output.

Expansion or growth of any industry very largely depends on its profitability. Rising profitability induces greater investment and faster expansion while declining profitability often leads to flight of capital. However the responses may not be immediate nor be assured especially when alternative opportunities are not adequate or sufficiently remunerative. The rate of profit in five small firms has been described in the last column of Table 5. There was no strong indication that the profit rates over the years had taken a downward swing. On the other hand the rates of profit were very high and fluctuated widely.

Next we are concerned about the aspect of cost. Adding the corresponding elements of third, fourth and fifth column of Table 5 we get total cost over the period 2000-11. Our data in the table tells us that cost increased rapidly. Actually the business profile of the small firms is captured in the above table by the variables cost and proportion of revenue to cost. Thus for the rapid growth of cost, revenue earned per unit of rupee invested in terms of cost falls and this has led to fall in profit rate. That will make the small lac firms to be languished day by day.

7. Sample lac firms taken as a whole

In the Purulia district there are 148 lac processing units. Out of these 13 are large manufacturers and 31 are medium sized firms. The remaining 104 firms fall into the category of small firms. So far discussion in this paper deals with the growth patterns of selected five manufacturers of each category big, medium and small separately. If we consider the analysis by taking all the 15 firms together, then the analysis will give us the integrated picture of lac industry. From that we can derive the growth pattern of lac industry as a whole.

Now we take the sum of production, revenue, cost of each category of firms yearwise. We get time series data of production, revenue and cost of lac industry. From the integrated revenue and cost we calculate revenue/cost, profit and profit rate which are shown in Table-7. Lowest profit and profit rate is observed in the year 2008-09 corresponding amount is Rs 46.88 lakh and 2.92% respectively. On the other hand highest profit is achieved in the year 2010-11 amounting to Rs 179.76 lakh. In this year highest profit is earned by all the three types of manufacturers (as seen in Tables 2, 4 and 5). In consequence profit rate is the highest i,e 30.82% in this year. Average figures of all variables are also given in the last row of the table. We see that average figures of each variable are too low compared to the maximum figures of those variables. For instance maximum amount of production, revenue and cost are 1198 M.T. (2010-11), Rs4992.08 lakh and Rs3815.94 lakh respectively, whereas averages of the variables over the years are 770.18M.T. Rs1436.50 and Rs 1256.75 respectively. That clearly indicates the fluctuating tendency of the variables. Now exponential trend analysis will be taken to find out the growth rate of production over the years 2000-01 to 2011-12 (Table 7 & Table 8).

Table 7: Indicator of Sample Lac Firms

Year	Production(in M.T.)	Revenue (in Lakh)	Cost (in Lakh)	Profit (in Lakh)	Revenue/Cost	Profit Rate (in %)
2000-01	505	670.11	594.15	75.96	1.127847	12.78465
2001-02	524	565.81	441.68	124.13	1.281041	28.10406
2002-03	522	625.54	575.49	50.05	1.086969	8.696937
2003-04	613	858.58	811.44	47.14	1.058094	5.809425
2004-05	605	1113.94	1022.53	91.41	1.089396	8.939591
2005-06	647	1065.6	976.69	88.91	1.091032	9.103195
2006-07	786	1313.22	1204.15	109.07	1.090578	9.057842
2007-08	834	1149.28	1063.34	85.94	1.080821	8.082081
2008-09	1140	1650.14	1603.26	46.88	1.02924	2.924042
2009-10	1098	1797.23	1715.52	81.71	1.04763	4.762987
2010-11	1198	4992.08	3815.94	1176.14	1.308218	30.82176
Average	770.1818	1436.503	1256.745	179.7582	1.117351	11.73514

Source: Table 1, 4 and 5

The exponential curve $y_t=ab^t$ where a and b are constants will be good fit to the time series data of production, which is reducible to the linear form.

Table 8: Fitting of Exponential Trend of the Production Data

Year	Production (y)	t= year-midvalue	t^2	Y=log y	t.Y	Trend Values($y_t=ab^t$)
2000-01	505	-5	25	2.703291	-13.5165	454.52219
2001-02	524	-4	16	2.719331	-10.8773	500.04268
2002-03	522	-3	9	2.717671	-8.15301	550.12205
2003-04	613	-2	4	2.78746	-5.57492	605.21688
2004-05	605	-1	1	2.781755	-2.78176	665.82947
2005-06	647	0	0	2.810904	0	732.51243
2006-07	786	1	1	2.895423	2.895423	805.8737
2007-08	834	2	4	2.921166	5.842332	886.58211
2008-09	1140	3	9	3.056905	9.170715	975.37348
2009-10	1098	4	16	3.040602	12.16241	1073.0573
2010-11	1198	5	25	3.078457	15.39228	1180.5242
Total	8472	$\Sigma t = 0$	$\Sigma t^2 = 110$	$\Sigma Y = 31.51297$	$\Sigma t.Y = 4.559693$	

Source: Table 7

Now taking logarithm we get log y = log a + t log b. A straight line trend to log y and t may be fitted and obtain the least square estimates of log a and log b

log a = $\sum$ Y/11 = 2.864815, or a = antilog of 2.864815 =732.51243

Similarly, log b = $\sum$ t.Y/ $\sum$ t^2 = 0.041452 , or b = antilog of 0.041452 =1.1001502

Putting the values of a and b in the equation $yt=ab^t$ we get the trend equation. Thus the trend equation is $y=732.51243(1.1001502)^t$. Now putting the values of t for different years, trend

values of t for different years can be obtained. As we know (b-1) is the exponential trend rate of growth. So we can conclude that production of lac in the sample firms grew at 10 percent per annum. It is also seen that the rate of profit is highly volatile, fluctuating from as low as 2.9% to as high as 30.8%. The value of r^2 of 0.892492 means that about 89% of the variation in output explained by the trend eqation. So far as goodness of fit is concerned it is satisfactory.

8. Conclusion

In the study period 2000-2011 lac industry have developed in Purulia district and created large opportunities of expansion of employment is validated to some extent because, production and employment are increasing in all the big, medium and tiny lac firms. If the performance of these three types of lac firms is any indicator then the future development prospects of the lac industries of Purulia is not much hopeful because the industries are growing with very low rate of profit. If this trend continues over time it may lead to flight of capital from this industry which is also not favourable to the future growth of this industry.

As remedial measure we suggest the need for Government enquiries about policy proposition in favour of all types of lac industry. The technical guidance should be provided for cost effective production of all types of firms. These activities will provide enhance employment of local unemployed people through directly and indirectly. Hence the owner of the industrial units, small or large has to sustain themselves by improving the commercial viability in this context. In the lac industry irrespective of all sizes, growth of cost conscious specialization among firms is required since increasing cost is the burning problem of all firms. Although big firms have adopted special effort to reduce cost in order to counter the problem. But success in the development of cost consciousness among the medium size farms has been sporadic. Problem is aggravated where the smallest lac units utilized their factory only for three months in a year. When supply of raw material is scanty they closed down their factory temporarily. Thus over-head cost of these categories of firm always high.

There is need to encourage and assist quality control at the manufacturing stage and also guiding all types of entrepreneurs to manufacture lac based products and value added shellac products, products diversification. In such case Government should assist and guide the interested entrepreneurs by technical know-how for manufacturing and marketing value added shellac and lac based products. We have seen certain discrepancies in extending helps toward this oldest industry have crept in inadvertently by the District Industrial Center, Purulia. So, it has to make every effort to incorporate all the available policy on lac development as a special case like Sericulture and Tassar industry.

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