CHAPTER IX

SUMMARY OF THE RESULTS AND CONCLUDING

REMARKS

Having analysed the growth, productivity and production Function of sugar industry in All India and the selected six regions for the period from 1973-74 to 1990-91, We enter into the stage of conclusion of this study.

The growth history of sugar industry is related with the proceeds of industrialisation of the Indian economy. This is mainly because of the important position the industry plays in transforming the rural economy and changing the traditional location pattern. There has been a phenomenal growth in the number of sugar factories in Operation in India. There were only 138 sugar factories with an installed capacity of 15 lakhs tonnes at the beginning of the first plan. It had increased to 393 with installed capacity of 141 lakh tonnes during 1992-93. Sugar factories are increasingly established in tropical region especially in Andhra Pradesh and Tamil Nadu than in the sub-tropical region. Over the study period the number of factories in operation had nearly doubled in tropical region. Sugar industry is dominated by the co-operative sector. At present 48 percent of the sugar factories are under co-operative sector and 34 and 18 per cent are under private and public sector management respectively.

The record of the industry during the plan periods paints a mixed picture. While it is true that sugar industry has surpassed the targets set for it in the various plan periods, it has been experiencing glut and shortages of sugar alternatively, which necessitated changes in sugar policy accordingly. Sugar industry has to compete with gur and khandasari factories in which there is no control on price and distribution. There is a notable shift from the utilisation of sugarcane for the production of gur and khandasari to sugar production. Even now nearly 34 percent of sugarcane cultivated is utilised for the production of gur and Khandasari.

The internal total consumption and per capita consumption of sugar in India had increased at an annual compound rate of growth of 7.16 and 4.84 per cent respectively over the study period. The average internal consumption of sugar has been higher in Maharashtra and Uttar Pradesh compared to other regions under study.

From the demand function for the free market sugar, it is clear that consumption of sugar is highly elastic with respect to free sugar price. That is 1 per cent increase in price of free sugar leads to a reduction in consumption by 2.03 per cent. The results of this study of free market demand function for sugar are comparable with Chetty (1981) and Annamalai (1986).

Over the study period the area under sugarcane cultivation increased at a higher rate in Maharashtra 5.66 per cent followed by Karnataka 4.95 per cent. Except in Karnataka the growth rate of sugarcane production is much better in the tropical regions compared to the sub-tropical regions over the study period. The average percentage rate of sugarcane production increased by 5.65 and 5.62 in Maharashtra and Karnataka respectively. The average yield of sugarcane was 100.5 tonnes per hectare in Tamil Nadu as against the All India average yield of 57.43 tonnes over the study period.

Sugarcane crushed in Maharashtra and Uttar Pradesh accounts for about 60 per cent of total cane crushed in India. The annual growth rate of sugarcane crushed is remarkably higher in Tamil Nadu, Maharashtra and Karnataka as compared to the other regions. Over the study period sugar production had registered an annual compound rate of growth of 7.35 and 5.69 per cent in Tamil Nadu and Maharashtra respectively which is remarkably higher compared to the other regions. The performance of the industry on the whole has been encouraging.

Among all the regions , Maharashtra recorded the highest recovery of 11.32 per cent in 1992-93 followed by Karnataka 10.79 per cent in 1974-75. Among the selected regions the average duration of factories had been higher in Tamil Nadu and

Maharashtra compared to other regions during the period under study. The rate of growth of capacity utilisation in Bihar had been higher than in other regions and All India during the period 1973-74 to 1990-91.

The growth rates of gross value of output and real value added were the highest in Tamil Nadu followed by Maharashtra and Karnataka. Real capital stock grew at annual compound rate of growth of 5.0, 7.5, 4.3, 7.6, 6.4, 11.1,and 8.2 per cent in Andhra Pradesh, Bihar, Karnataka, Maharashtra, Tamil Nadu, Uttar Pradesh and All India respectively during 1973-74 to 1990-91. Capital stock per factory grew annually at 10.93 per cent in Tamil Nadu, 9.18 per cent in Uttar Pradesh, 7.83 per cent in Bihar during the study period. Sugar industry has witnessed a tremendous increase in capital intensity. Capital intensity increased at a higher rate in Bihar and Uttar Pradesh. It is not surprising in view of the fact that when the number of factories remained more or less constant, capital stock increased remarkably with decline in the growth of employment. High capital intensity can not be taken to imply any kind of substitution of capital for labour in All India, Karnataka, Tamil Nadu and Uttar Pradesh as share of workers to total number of persons employed had increased. But in the case of Maharashtra there is some evidence for substitution of capital for labour since share of workers to total number of persons employed had declined. The employment in sugar industry in the selected states and All India had registered a declining trend over the study period.

The ranking of the regions with regard to sugarcane crushed and sugar production is Tamil Nadu, Maharashtra, Karnataka, Uttar Pradesh, Andhra Pradesh and Bihar respectively. In the over all performance of the sugar industry in the selected regions, Tamil Nadu ranks first and Maharashtra ranks second when compared to other regions.

The three alternative measures of labour productivity had shown a more or less similar trend over the period of study. Labour productivity, Q/L, had increased at an annual compound rate of 7.08, 10.57, 5.94, 5.29, 7.89 and 7.42 per cent in Andhra Pradesh, Bihar, Karnataka, Maharashtra, Tamil Nadu and Uttar Pradesh respectively during 1973-74 to 1990-91. Increase in labour productivity is more pronounced when output is measured in value terms. A higher rate of increase in labour productivity in Bihar was mainly attributed to high capital intensity, considering the fact that rate of growth of sugar production was comparatively low. Capital intensity had positive relationship with labour productivity, leading to the finding that the observed rates of increase in the average productivity of labour could not be attributed soley to the efforts by the labour as such, but might also include gains from economies due to higher mechanisation. Unaccountable factors like qualitative improvements in inputs, techno-managerial effects, maturity of the industry, etc., were

also found to contribute significantly towards the enhancement of labour productivity. Increase in capacity utilisation in sugar industry had also helped labour productivity to increase.

The share of real wages to real value added had declined in All India over the study period. It implies that increased labour productivity is not reflected in higher wages. But in the case of selected regions share of real wages to real value added had moderately increased, implying that increase in labour productivity had been reflected in increase in wages.

Capital productivity measured from Q/RCS had shown a negative trend in All India and selected regions except Karnataka. The alternative measure of capital productivity from RGVO/RCS and RVA/RCS had increased at a slower rate in Karnataka, Tamil Nadu, Andhra Pradesh and Maharashtra and declined in All India, Bihar and Uttar Pradesh over the study period. It might be due to the fact that output measured in value terms had increased faster than output measured in physical units. The latter measure of output suffers from over estimation due to unit price. In all the three methods of measurements of capital productivity, Bihar had experienced a significantly negative growth. This was mainly attributed to high capital intensity coupled with a slower rate of growth of sugar production. It is evidenced that a higher rate of increase in capacity utilisation had not prevented capital productivity from falling. Decline in capital productivity

implies **decline** in return on capital. It is evidenced from the fact that in some regions the share of real wages to real value added had increased.

A striking paradox is visible regarding the changes in the partial productivity ratios of the industry. The opposite tendencies in the partial productivity measure of labour and capital could be accounted for by the third factor, i.e., the capital intensity. It has already been noted that the capital-labour ratio had increased remarkably in sugar industry. Therefore , it appears that increase in labour productivity in sugar industry was achieved mostly through capital intensity. This increasing application of capital was not accompanied by a significant technical progress to have prevented the capital productivity from falling. The steady decline in the capital productivity indicates also to the probability of a diminishing returns to capital input. This may be due to an 'inefficient' use of capital leading to a decreasing margin for the input concerned.

Material productivity is assumed to be constant as material input has one to one correspondence with output. But sugar industry is a typical agro-based industry which has showed a slightly moderate (though insignificant) increase in material productivity over the study period. Material productivity is positively related to recovery ratio.

The technical efficiency of sugar industry is measured through total factor productivity. It had increased in All India and selected regions except Bihar, which had shown a negative trend in total factor productivity. Total factor productivity declined in Bihar at the annual compound rate of 3.04 per cent. This may be attributed to a higher rate decline in capital productivity. It is to be pointed out that in Bihar increase in labour productivity had been more than neutralised by a decrease in capital productivity which ultimately resulted in decline in total factor productivity. Even though the rate of growth of capital intensity is more or less same in Bihar and Uttar Pradesh, capital productivity declined at a faster rate in Bihar than in Uttar Pradesh. This may probably be attributed to inefficient use of machinery resulting from the existence of worn out and obsolete machines in sugar industry in Bihar.

Ranking of the regions on the basis of rate of growth of productivity shows that Bihar comes first in labour productivity which gets mostly attributed to capital intensity. Karnataka secured first place both in capital productivity and total factor productivity. It seems that the existing machines are efficiently utilised in Karnataka compared to Bihar and Uttar Pradesh. The evidence of inefficiency in use of capital in Bihar and Uttar Pradesh may be due to its age factor. In India it was only in Uttar Pradesh and Bihar, sugar industry started to come up first.

The regression function for total factor productivity and labour productivity has shown that expansion of scale of production has been generating growth in total factor productivity and labour productivity in All India and six selected regions. The negative and significant values of the coefficient of time indicate that various institutional factors such as labour-management relations and neutral technological progress, etc., have been adversely affecting total factor productivity in All India and six selected regions over the study period. The results of this productivity study are comparable with those of Singh (1966), Shivamaggi, Rajagopalan and Venkatachalam (1968), Mehta (1968), Banerjee(1971), Mehta (1980) and Sham Alam Khan(1984) and Annamalai(1986). The results of this study are contradictory to that of Ahluwalia (1991).

Various forms of production functions at the regional and national levels have been estimated with the adjusted data on inputs and output for the period 1973-74 to 1990-91, in order to determine the relevant form of production function for the sugar industry. The VES production function with and with out time variable has been estimated by using the ordinary least squares method. The elasticity of substitution between capital and labour is either zero or constant. Thus our findings clearly rule out the possibility of VES production function in the Indian sugar industry both at the regional and national levels.

The estimates of the elasticity of substitution between labour and capital based on logarithmic regressions of value added per labour on the wage rate and time for sugar industry corresponding to All India and six selected regions covering the period from 1973-74 to 1990-91 show that the elasticity of substitution between capital and labour is unity. Thus from this findings it may be infered that there is an evidence of Cobb-Douglas production function for the sugar industry in the selected regions and All India. The results are comparable with Banerjee (1975) and Subramaniyan (1986). The results of this study are quite different from the ones obtained by Diwan and Gujarati (1968) and Sankar (1970). The variation in the estimates of elasticity of substitution between capital and labour may be due to differences in period covered and data used. From the time trend coefficients it is inferred that sugar industry as a whole has not experienced any technological change during the study period. These results are comparable with those of Mehta (1976).

From our findings the labour elasticity of output is found to be a more important factor than capital in terms of ` factor elasticity ', ` marginal productivity ' and ` relative contribution' to the output growth in All India, Andhra Pradesh, Karnataka and Tamil Nadu. The labour elasticity of the output is the highest in Tamil Nadu in terms of average marginal productivity (5.25) and relative contribution to output growth (63

per cent) followed by Karnataka (3.92 and 57 per cent) and Andhra Pradesh (3.41 and 51 per cent). Further increase in labour productivity in these regions is attributed to capital deepening. The capital elasticity of output is found to be a more important factor than labour in terms of factor elasticity, 'marginal productivity' and ' relative contribution to output growth in Bihar, Maharashtra and Uttar Pradesh.

Finally, the estimated value of the degree of returns to scale parameter, as obtained by the sum of the coefficients of labour and capital turns out to be an increasing returns to scale in All India, Andhra Pradesh, Karnataka and Tamil Nadu (tropical regions) and constant returns to scale in Bihar, Maharashtra and Uttar Pradesh (sub-tropical regions). The results of this study are quite comparable with those of Sengupta(1965), Yeh (1966), Diwan(1967), Mehta (1976), and Subramaniyan(1986).

Regarding regional efficiency the Cobb-Douglas production function with state dummy variables based on time series data for the period 1973-74 to 1990-91 and for the two time components 1973-74 to 1981-82 and 1982-83 to 1990-91 reveal that Tamil Nadu is the most efficient region and Uttar Pradesh is the least efficient region during the study period. Further the tropical regions (Tamil Nadu, Andhra Pradesh, Karnataka, Maharashtra) are relatively more efficient than sub-tropical regions (Uttar Pradesh and Bihar). As a result the installed production capacity has been growing in the tropical region compared to sub-tropical region.

This is indicative of the right investment policy of the government of India towards sugar industry. Further, F-test indicates the stability of the regions with regard to efficiency as the coefficients of state dummies remain stable between 1973-74 to 1981-82 and 1982-83 to 1990-91. Therefore it is inferred that the stability of the regional efficiency pattern remains unaltered between the period 1973-74 to 1981-82 and 1982-83 to 1990-91.

Contributions from this study

The study provides a comprehensive empirical analysis of growth, productivity and production function in sugar industry in All India and selected regions. This kind of regional level disaggregation enabled us to identify the regional variations in technical efficiency and production techniques. This study has also pointed out the relative efficiency of the factors, labour and capital, and on the basis of returns to scale the relative efficiency of the regions. A study at individual industry level in different regions has helped us to some extent understand the causes for falling efficiency. On the basis of regional efficiency ranking in sugar industry, this study has a valuable suggestion for the allocation of resources through proper investment policy by the government of India and guidelines for the future expansion of the Indian sugar industry.

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Limitations of the study

This study is subject to certain limitations. This study covers the period from 1973-74 to 1990-91. The basic data source for this study is ASI. So far ASI has published data only up to 1990-91. Data limitations are severe in the individual state level. Due to non availability of data on output, capacity utilisation etc., in ASI, they are collected from the Indian Sugar Journal for the present study which are not comparable with ASI data. ASI data relates only to those units submitting returns. This study has not analysed the productivity and production function on the basis of management namely, co-operative, private and public sector. This study has not analysed productivity at firm level in different regions. Consideration of analysis at firm level may reveal more facts about the productivity concepts and it may be possible to estimate the partial elasticities of output with respect to labour and capital, returns to scale, technological progress and the sources of output growth. From this a generalisation can be made for the progress of sugar industry at the regional and national levels. The study has been done through production function analysis. This may also be done with the cost function analysis. Cost function analysis relating to productivity could form an interesting topic for future research.

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