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Trends in the Productivity in the Ayurvedic Industry in Kerala: Inferences for future

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Abstract

Industrialization is the most popularly tested antidote for development. The development experience of countries reminds that industrialization has provided the initial stimulus to development all over the world. The earliest form of Industrialization occurred at household levels where households converted inputs into output. As the process advances the system adopts division of labor, employs more capital, undertakes innovation and proceeds towards mass production. If we observe the stage of industrialization of different countries all over the world, it is found that it is not balanced within a country and between countries.

Introduction

Industrialisation is the most popularly tested antidote for development. The development experience of countries reminds that industrialisation has provided the initial stimulus to development all over the world. The earliest form of Industrialisation occurred at household levels where households converted inputs into output. As the process advances the system adopts division of labour, employs more capital, undertakes innovation and proceeds towards mass production. If we observe the stage of industrialisation of different countries all over the world, it is found that it is not balanced within a country and between countries. The earliest impetuous to industrialisation has always been triggered off by resource based industries. Among the resource based Industries the one that has created strides is the Ayurvedic Industry in Kerala. The present chapter attempts to estimate the productivity trends in the Ayurvedic Industry in Kerala. The paper is divided into six sections. The first section provides an introduction to the concept of productivity and its measurement. The section two deals with the data sources and methodology. Section three provides an insight into the empirical estimate of partial productivity. The estimate of total factor productivity is discussed in the fourth section. The section five deals with the production function estimates of Ayurvedic industry and final section provides the conclusion of the study

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I. Productivity Concept and Measurement

The output of an industry is a net result of an efficient combination of different factors of production. Productivity may be defined as the ratio between the production of a given commodity measured by volume and one or more of the corresponding input factors also measured by volume (Beri, 1962). The productivity of the industry can be measured in terms of the productivity of its consistent factors of production such as labour and capital. Partial productivity as they are called does not provide a complete picture of the growth. This aspect has been covered up by the total factor productivity growth (Ahluwalia, 2000). In precise terms, productivity measures the output per unit of input. Theoretically, there are a number of indices available to measure productivity. In this case, however the measurement of productivity will be confined to three indices of productivity namely i) Labour productivity ii) Capital productivity and iii) Total factor productivity.

Productivity is determined by several factors or several factors affect productivity. The

quality of labour, technological progress, capital intensity, availability of raw materials, natural conditions, socio-economic organisation and efficiency of firms affect productivity.

Labour productivity

Labour productivity is obtained by dividing the net value added by the total labour input. Labour is measured in terms of total number of persons employed. Thus, labour productivity is influenced by the capital investment, organization of work, skill of the worker, intensity of work and the innate ability of the worker and the natural resources used in production.

Capital Productivity

Capital productivity is obtained by dividing the net value added by the fixed capital input. In the present analysis for measuring, only fixed capital input has been considered.

Capital input is measured in terms of net fixed assets arrived at through a perpetual inventory accumulation method.

Capital Intensity

The above partial productivity indices will not give a fully clear picture of the productivity in the manufacturing sector. Productivity is primarily a function of three factors, namely capital intensity, labour productivity and wages. Labour productivity is generally linked to capital intensity since the productivity of labour is assumed to increase with an increase for capital invested per person. Excessive capital necessarily implies un-utilised capacity and wastage of capital. Therefore, a study of capital intensity is also of prime importance in an economy. Symbolically capital intensity can be written as

$$\text{Capital per person} = \frac{K}{L} = \frac{\text{Capital}}{\text{Labour}}$$

Thus K / L represent the average capital per person. Increase in any of the above partial productivity ratios means that over a period more output is possible with decreasing amounts of inputs and there is saving in the use of a particular input overtime.

II. Methodology, Data sources and Period of study

Secondary data required are collected from various sources such as Annual reports of leading Ayurvedic firms, Registrar of Companies, Kochi; Confederation of Indian Industry, Kochi; District Industries Centre, Trishur; Directorate of Ayurveda, Thiruvananthapuram; Drug Controller's Office, Thiruvananthapuram; Economic Review, Government of Kerala; Handbook of Statistics on Indian Economy, RBI; Reserve Bank of India Bulletins, publications of Indian System of Health and Homeopathy (ISM& H), New Delhi; and Ministry of Health and Family Welfare, Government of India. Secondary data for estimating productivity have been taken for the period 1996 - 97 to 2007 - 08.

. Compound growth rate (CGR) is calculated to record the growth of the selected economic variables. Partial productivity indices such as capital and labour productivity are estimated. Total factor productivity is estimated using the Kendrick index. Cobb - Douglas production function has been estimated to find the relative contribution of inputs in total output.

III. Empirical Results

The present section attempts to analyse the empirical estimates of productivity trends. The empirical results are summarized in the table 1 given below. The partial productivity trends of the industry are discussed first. The labour productivity in the Ayurvedic industry has increased from 2.62 in 1996-97 to 3.74 in 2007-08.

However, the labour productivity showed considerable variations during the period of study. It reached all time high in 2007-08 and all time low in 1996-97. In between, labour productivity increased continuously until 1998-99 and started falling until 2003-04. From the 2004-05, the labour productivity showed a consistent rise. The compound annual growth rate in labour productivity in the Ayurvedic industry is estimated to be 0.8.

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Table 1
Labour Productivity, Capital Productivity and Capital Intensity in the Ayurvedic Industry during 1996-97 to 2007-08

YEAR	O/K	O/L	K/L
1996-97	4.07	2.62	0.64
1997-98	3.91	3.27	0.84
1998-99	4.36	3.9	0.9
1999-00	3.56	3.65	1.02
2000-01	4.21	3.46	0.82
2001-02	3.59	3.41	0.95
2002-03	2.71	3.21	1.19
2003-04	2.63	3.21	1.22
2004-05	2.55	3.23	1.27
2005-06	2.44	3.32	1.36
2006-07	2.04	3.42	1.68
2007-08	1.87	3.74	1.99
CGR	-7.9	0.8	8.7

O/K = Output-Capital Ratio, O/L = Output-Labour Ratio,
K/L= Capital- Labour Ratio
Source: Computed from Annual Reports of AMMU's, Various Years

The capital productivity also showed a decreasing trend during the period of study. From 4.07 in 1996-97, capital productivity has declined to 1.89 in 2007-08. Capital productivity reached all time high at 4.36 in 1998-99 and an all time low in the year 2007-08. It showed considerable variations until 2002-03 and since then declined continuously. The compound growth rate of capital productivity in the Ayurvedic industry is estimated to be -7.9. However, capital intensity showed signs of improvement during the period under study. It increased from 0.64 in 1996-97 to 1.99 in 2007-08. It showed considerable variations till 1999-00, but since then the capital intensity showed only marginal increase. It reached the all time high rate in 2007-08 at 1.99 and all time low of 0.64 in 1996-97. The compound growth rate is found to be 8.7. Thus, we can see that increase in the capital intensity has not improved the capital productivity but has improved the labour productivity marginally. This may be due to the under utilisation of capacity of the manufacturing units.

Having discussed the partial productivity trends of the industry, it is worthwhile to examine the partial productivity trends of the leading firms. Here three leading firms (AVS), Oushadi and Nagarjuna are selected for the analysis. The partial productivity trends are summarized in the table 2

The trends in labour productivity are discussed first. The labour productivity of AVS increased from 3.09 in 1996–1997 to 6.19 in 2007–08. Labour productivity showed consistent increase during the period of study. It reached all time high in the year 2007– 08 and all time low in 1996– 97. The compound growth rate of labour productivity of AVS is estimated to be 5.8.

In the case of Oushadi, labour productivity increased marginally from 0.84 in 1996–97 to 1.11 in 2007 – 2008 with significant variations during the period of study. It reached all time high during 2007 – 08 and all time low at the rate of 0.40 during 2003 – 2004. The compound growth rate is calculated to be 0.7. Finally, in the case of Nagarjuna, the labour productivity increased from 1.28 in 1996–97 to 1.63 in 2007–08. It showed considerable variations until 1999–2000 and since then it showed significant increase. The compound growth rate is estimated to be 4.

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Table 2
Labour Productivity, Capital Productivity and Capital Intensity in the Leading Ayurvedic Medicine Manufacturing Units during 1996-97 to 2007 -08

	Labour Productivity			Capital Productivity			Capital Intensity		
Year	**AVS**	**Oushadi**	**Nagarjuna**	**AVS**	**Oushadi**	**Nagarjuna**	**AVS**	**Oushadi**	**Nagarjuna**
1996-97	3.09	0.84	1.28	19.4	0.52	0.25	0.15	1.6	5.07
1997-98	3.46	0.89	1.24	12.07	0.52	0.22	0.28	1.7	5.47
1998-99	3.75	0.95	1.15	7.56	0.35	0.24	0.49	2.63	4.72
1999-00	4.02	0.89	0.82	5.3	0.29	0.16	0.75	3.09	4.93
2000-01	4.04	0.76	0.87	7.65	0.2	0.2	0.52	3.76	4.23
2001-02	4.27	0.55	1.04	6.21	0.12	0.22	0.68	4.41	4.3
2002-03	4.36	0.41	1.162	6.93	0.03	0.26	0.63	5.56	4.37
2003-04	4.43	0.4	1.2	8.28	0.07	0.24	0.53	5.75	4.87
2004-05	4.6	0.86	1.28	11.26	0.09	0.28	0.4	8.8	4.45
2005-06	5.5	1.07	1.52	13.68	0.11	0.35	0.4	9.22	4.35
2006-07	5.93	0.94	1.81	7.29	0.08	0.4	0.81	10.5	4.45
2007-08	6.19	1.11	1.63	6.09	0.09	0.32	1.01	11.8	5.09
CGR	5.8	0.7	4	-3.2	-21.1	5.1	9.5	20.7	-0.9

Source: Computed from the Annual Reports of the AMMU's, various years

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The capital productivity of AVS has shown declining trend during the period of study. From 19.4 in 1996 – 97, capital productivity declined to 6.89 in 2007– 8. It declined significantly until 1999–00 and varied significantly since then. It reached all time high of 13.68 in 2005–06. The compound growth rate of capital productivity in AVS is estimated to be -3.2. The capital productivity showed a declining trend in the case of Oushadi. It significantly fell from 0.52 in 1996 -97 to 0.09 in 2007 -08. It reached the all time high rate during the first two years of the study. The growth rate is found to be -21.1. Finally, in the case of Nagarjuna, the capital productivity showed significant decrease during the period of study. Capital productivity increased marginally from 0.25 in 1996–97 to 0.32 in 2007-2008. It reached all time high at 0.40 during 2004–05 and all time low rate of 0.16 during 1999 – 2000. The compound growth rate is found to be 5.1.

However, the capital intensity figures showed better trends for AVS during the period of study. It increased from all time low figure of 0.15 in 1996 – 97 to an all time high rate of 1.01 in 2007 – 08. During the period of study, the capital intensity of AVS showed significant variations. The compound growth rate is estimated to be 9.5. In the case of Oushadi, the capital intensity showed better trend than AVS. It increased significantly from 1.6 in 1996-97 to 11.8 in 2007-2008 which is the all time high rate for Oushadi. Capital intensity of Oushadi showed marginal increase until 1997–98 and since then showed very significant increase for the rest of the years.. The compound growth rate of capital intensity of Oushadi is estimated to be 20.7. In the case of Nagarjuna, the capital intensity increased marginally from 5.07 in 1996–97 to 5.09 in 2007–08. It reached all time high rate of 5.47 in 1997 - 98 and all time low rates at 4.23 in 2000-01. The compound growth rate is found to be -0.9. Thus, we can see that remarkable increase seen in the case capital intensity has not improved the capital productivity of the firms but has improved the labour productivity marginally. This may be due to poor capacity utilisation of the three manufacturing units

Total Factor Productivity

Both labour and capital productivities are however only partial indices of productivity. Since both labour and capital jointly contribute to output, it is necessary to derive a total productivity index that will include both labour and capital inputs. The total factor productivity indices aim at relating the output to the combined use of all the resources. Interestingly among the usual indicators of growth performance of the industries in developing counties, the behavior of total factor productivity growth (TFPG) has received the least attention (Alai, 1986). Total factor productivity may be defined as the ratio of output to a weighted combination of inputs. Several TFP indices suggested differ from one another with regard to the weighting scheme involved. Stigler developed the concept independently in 1947 and suggested that a measure of real factor input could be obtained by weighing inputs by their marginal products to components of labour input. In majority of the empirical studies, either the Kendrick index or the Solow index has been used. The translog index, which is an approximation of the Divisia index, introduced by Christensen and Jorgenson (1970) and has been used in a number of studies on productivity. Production function estimates was done for all the above indices but Kendrick index was found significant. According to this method the total factor productivity index is a measure of the ratio between output and the sum of combined inputs of labour and capital, the inputs being weighted by their base year remuneration, all inputs and outputs being measured in real terms. Algebraically this may be expressed as follows:

$$KI_t = \frac{Q_t}{W_o L_t + r_o K_t}$$

Where KI_t is Kendrick index

Q_t = Value of Output in the year t

W_o = base year wage rate

r_o = base year return on capital.

The Kendrick index of total factor productivity corresponds to the linear production function of form $Q = \alpha L + \beta K$ where Q, L, K are value of output labour and capital inputs respectively and α and$\beta$are co-efficient oflabour and capital which are constants. In the Kendrick index 'W_o' is obtained by dividing total salaries, wages and benefits by the average number of persons employed. r_o is obtained by subtracting salaries, wages and benefits from the value of output and dividing the result by the value of fixed capital. It is to be noted here that the whole amount of non- wage and salary part of the value output does not accrue to capital alone. There are items such as managing agents, remuneration and depreciation on capital which have to be deducted. Those items however consists only a small part of the value output divided by the net assets (both at constant prices) and is taken as a broad indicator of the rate of growth of return on capital. Kendrick index is based on the assumption of competitive equilibrium, constant returns to scale and Hicks neutral technical change.

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Empirical Results

The TFPG results according to Kendrick method is summarized in the table 5.3. This is calculated for the industry as a whole and specifically for the three large manufacturers. The three firms selected for the individual productivity estimation represent three kinds of owners. AVS, the leader of the industry in terms of all parameters is owned by a private trust,Oushadi is the only large public sector enterprise and Nagarjuna represents the key player in the private sector.

According to the Kendrick index only total factor productivity in the firm Nagarjuna showed an increasing trend, subject to minor variations. The Kendrick TFPG index reached an all time high of 147.25 in 2006-07. In 2007-08 total factor productivity index of Nagarjuna stood at 127.06. The compound annual growth rate in total factor productivity of Nagarjuna Herbal Concentrates Limited is worked out to be 4.3.

In the case of AVS the Kendrick index of factor productivity showed a declining trend. It reached as low as 28.35 in 1999-00. In 2007-08 the total factor productivity index in AVS stood at 32.26. It is to be mentioned that during the period under study, considerable variations in total factor productivity is noticed. The total factor productivity reached all time high at 72.51 in 2005-06. The decline in the growth rate is estimated to be -3.

Table 3
Total Factor Productivity Indices in the Ayurvedic Industry
In Kerala from 1996-97 to 2007-08 (Kendrick Index)

Year	Ayurvedic Industry	AVS	Oushadi	Nagarjuna
1996-97	100	100	100	100
1997-98	98.36	63.44	100	93.99
1998-99	110	40.23	73.74	92.04
1999-00	91.35	28.35	60.6	65
2000-01	105	40.76	43.17	71.93
2001-02	91.55	33.18	27.29	82
2002-03	70.06	36.99	16.04	94.87
2003-04	68.08	44.1	15.44	95.23
2004-05	66.3	59.68	21.86	104.07
2005-06	63.75	72.51	26.2	125.12
2006-07	53.74	38.99	20.22	147.25
2007-08	49.77	32.66	21.33	127.06
CGR	-7.3	-3	-18	4.3

Source: Computed from the Annual Reports of AMMU's, Various Years

In the case of Oushadi, it is noted that the TFPG showed very evident variations from 63.44 in 1997-98 to 21.33 in 2007-08. However, the trend illustrated that the TFPG followed significant decline until 2003-04. Since then the figure showed a marginal increase till 2005-06 and began to decrease further. The total factor productivity decreased as low as 15.44 in 2003-04. The decline in the growth rate during the period was found to be-18.

Kendrick index of total factor productivity in the Ayurvedic industry declined during the period of study. After minor variations till 2000-01 the total factor productivity declined incessantly reaching as low as 49.77 in 2007-08. The decline in the growth rate is found to be -7.3.

When we cross compare the TFPG of the Ayurvedic industry with that of the firms we find that the TFPG of the industry as a whole showed significant variations till 2001-02. This variation is reflected in all the three firms. Similar trend is witnessed in the last two years of study. Thus to conclude, the Kendrick index of TFPG showed significant variations under the period of study.

Production Function Estimates

In the economic theory production function is generally a concept used to explain quantitatively the technological relationship between the output and various factor inputs used in production. There are a number of production function estimates in Economic theory, however due to the restrictive nature of the data, the present study is confined to the Cobb - Douglas production function alone.

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Table 4

Regression Co-efficient of the Cobb- Douglas Production Function

Model	Coefficients	Ayurvedic Industry	AVS	Oushadi	Nagarjuna
$Q=A_1K^{\alpha}L^{\beta}$	Constant	1.7727 (1.3377)	-5.06217* (-8.3481**)**	-4.1181 (-1.2255)	-3.4671* (-4.2598)
	α	0.248543 (1.433)	0.071563*** (1.901914)	0.07932 (0.496)	1.4965** (2.5469
	β	0.5673 (1.0471)	2.6930* (12.81906)	-1.1542 (-0.068517)	0.6088 (1.1531)
	R^2	0.888	0.979	0.058	0.896
	$\overline{R^2}$	0.864	0.9746	0.0015	0.873
$Q=A_1K^{\alpha}W^{\beta}$	Constant	2.3689* (10.1568)	1.5318* (8.3914)	0.8979 (1.1014)	-3.92298** (-2.8861)
	α	0.5438** (2.3663)	0.0173 (0.2701)	-0.4404 (-1.1116)	2.12329* (3.8543)
	β	-0.069835 (-0.2936)	0.8879* (8.0339)	0.9386 (1.3079)	-0.00475 (-0.01967)
	R^2	0.866	0.95	0.167	0.880
	$\overline{R^2}$	0.8358	0.940	0.0119	0.853

Source: Computed from the Annual Reports of AMMU's, various years and ASI Data, 2007

Note: * significant at 1 percent level; ** significant at 5 percent level; *** significant at 10 percent

Empirical Results

The estimates of the function (1) and function (2) are presented in the table 4. The table gives estimates of labour and capital elasticity duly tested for their significance along with values of R^2 and $\overline{R^2}$.

In the case of AVS, the unrestricted Cobb-Douglas production function yielded a positive estimate of the labour and capital coefficients with the share of capital seem to be statistically insignificant in the first model. This may happen due to the underutilization of capacity in AVS. The coefficient of determination is quite high. When wages was introduced as an input, in the second model the coefficient of determination was found to be 0.95. Here the wage component showed positive results but capital turned out to be less significant.

The production function estimates for Oushadi also showed the capital coefficient to be negative, however labour coefficient seem to be high. Here the coefficient of determination is also very low. It can be inferred that the capacity utilization of Oushadi is not at all satisfactory. In the case of the second model the capital coefficient showed negative results. Labour coefficient showed much better performance in this model. The coefficient of determination is estimated to be 0.167

In the case of Nagarjuna the Cobb–Douglas production function yielded positive and significant estimate for capital and less significant estimate for labour. The coefficient of determination is also very high. The results pinpoint

the good use of capital by the firm. In the second model using wages, the contribution of capital component showed better performance. However the wage component showed negative results. The coefficient of determination was estimated to be 0.88.

When we take the industry as a whole, we can find that only labour coefficient turned out to be significant in the first model. The capital coefficient has a positive sign but not significant. The coefficient of determination is found to be 0.88. When wages was introduced into the model as an input R^2 value decreased slightly from 0.88 to 0.86. But this results in better values for capital and negative values for wage component.

The production function estimates for the industry as a whole also shows that the labour is the major component that determines the output. The under utilization of capital is very evident when we observe the values for capital coefficient.

Conclusion

The partial productivity growth exposed some interesting fundamental insights. The result shows that only labour productivity showed increasing trend. The increase in the capital intensity did not support the growth of capital productivity.The firm wise estimation of partial productivity showed increasing rates for AVS, Oushadi and Nagarjuna. Whereas the rate of growth of capital productivity showed negative results for AVS and Oushadi. Capital intensity showed better rates for Nagarjuna. Total productivity estimation using the Kendrick index showed increasing trend for Nagarjuna alone. The variations seen in total factor productivity of the industry is reflected in the case of all three firms. This implies that growth of Ayurvedic industry in the state was mostly labour driven, where labour contributed significantly to the total output. The Neo-Classical Cobb- Douglas production function also substantiated this. Interestingly the contribution of capital to total output has not been significant. The production function estimates for the industry as a whole also shows that the labour is the major component that determines the output. The under utilization of capital is very evident when we observe the values for capital coefficient

References

Radhakrishnan Nair, (2010) *Life Skill Training for Positive Behaviour,* Sriperumbudur: Rajiv Gandhi National Institute of Youth Development.

UNESCO (2003) *Understanding life skills, Gender and Education for all* Paris: UNESCO.

WHO (1994) *Life skill education and adolescents in schools,* Geneva: WHO.

https://wikieducator.org/Life_skills_education_teaching_methodology

https://www.thoughtco.com/higher-order-thinking-skills-hots-education-3111297

https://en.wikipedia.org/wiki/Higher-order_thinking

https://www.readingrockets.org/article/how-increase-higher-order-thinking

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