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A Study on the Factor Substitution in Public Enterprises of Nepal

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Introduction

Given the fact that as much as 94% of the total labour force in Nepal is engaged in agriculture there is existence of massive under employment of the tabour force as some studies have pointed out. According to a study conducted in 1967 by the Ministry of Economic Planning of His Majesty's Government, 48% of the total agriculture labour force in Nepal was found surplus. [1]According to the recent survey[2] conducted by the National Planning Commission 63.01% of the available total family labour days are underemployed. On the one hand there is in acute problem of disguised unemployment, on the other, and more important, 40% of the people are below poverty line.[3] In such a situation there is an urgent need to increase both output and standard of living of the people by utilising the surplus labour force that exists in agriculture. Realising this fact the draft Sixth Plan (1980–85) aims at increasing both GDP and standard of living of the people by utilising the surplus labour force as far as possible and making use of

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1. Ministry of Economic Planning Mobility of Agriculture Labour in Nepal (HMG 1967) P. 73.

2. National Planning Commission — A Survey on Employment, Income Distribution and Consumption Pattern in Nepal, Summary Report IV (HMG-NPC 1978).

3. On the basis of national minimum subsistance level of per capital expenditure of Rs 2 daily or Rs 60 monthly households falling below minimum subsistance level of expenditure fall below poverty line.

available physical resources. Capital intensive method of production that is not in conformity with resource situation of the country will be completely discouraged.[4]

In this context the present study is important not only from the point of view of successful operation of public enterprises but also from the point of view of policy considerations. Since one of the objectives of planning is to manupulate the structural parameters of production function,[5] the planner should carefully analyse the substitution parameter while formulating national plans. Recognising the crucial importance of the elasticity of factor-substitution (SMAC) the propounders of Constant Elasticity of Substitution (CES) production function note that economic analysis based on unrealistic assumptions often leads to conclusions that are unduly restrictive such as **Knife-edge instability** of Harrad and Domar growth models, which is based on zero elasticity of substitution.[6] This study had attempted to find out relationship between inputs and outputs and relative productivity of each inputs of selected public enterprises in Nepal; to estimate the elasticity of factor substitution and to compare the estimated elasticity of substitution of mauufacturing sector to other sectors as well as with some developed and developing countries; and to survey the different types of production functions and find out the appropriate one for the public enterprises in Nepal.

Theoretical Framework

Production means creation of utility. Production is not limited to physical change in matter; but it covers the rendering of services as well. Production takes place by the combined forces of various factors of production (inputs) such as land, labour, capital, and organisation. In this connection there are two important theoretical variants namely the production function and the cost function. The production function shows the technical-relationship between inputs and output while the cost function represents the level of output and cost incurred. The production function is more general than cost function for if factor prices are given the cost function can be derived from the production function.[7] Such a production function can also be defined as a schedule of maximum output for given inputs.

4. National Planning Commission—The Sixth Plan draft (NPC 1978) P. 6-7.

5. Dr. P. C. Lohani-Industrial Policy in Nepal-Nepal in Perspective, Pasupati S. J. B. R. and K. P. Malla (ed.) (CEDA 1975) Chapter VIII P 211.

6. R. N. Solow, B. S. Minhas, K. J. Arrow and H. B. Chenry (SMAC). Capital-Labour Substitution and economic efficiency—the Review of economics and statistics No. 3 Vol. XLIII Aug. 1961. P. 225.

7. Klein: An Introduction to Econometrics (Prentic Hall 1965) P. 83.

A rational producer always tries to maximise output or minimise cost. The primary and secondary conditions for maximising output are given below:

a) The first order condition (or necessary condition) for maximising output is that the Marginal Rate of Technical Substitution (MRTS) i.e. the slope of the isoquant should be equal to the price ratio of the factors. This is a situation where the isocost[8] line in the graph is tangent to the isoquant.[9]

b) The strict convexity the isoquant at the point fo tangency with the isocost guarantees the satisfaction of second order condition (or sufficiency condition) for maximising output with given inputs. Conversely if the second order condition is satisfied, the isoquant must be strictly convex at the point of tangency.

Until now static equilibrium was under consideration. By statics we mean the analysis of equilibrium. In a static analysis the equilibrium value of a dependent variable will remain unchanged so long as the magnitude of independent variables remain unchanged so long as the magnitude of independent variables remain unchanged. But a comparative statics explains how does the system move from one equilibrium position to another. Comparative statics therefore, compares the new equilibrium position to the old one.

One of the aspects of comparative statics assuming fixed input prices and successive increase in level of output and tracing the effect on least-cost combination is the expansion path. The other aspect of comparative statics is the elasticity of substitution between factors. Such a elasticity of substitution describes the effect of change in input prices (P_K/PL) upon the least cost input combination (Lo/Ko) producing the same level of output (.i,e. staying on the same isoquant). When $\frac{Pk}{PL}$ ratio rises it is expected that optimum input ratio $\frac{Lo}{Ko}$ also to rise, because labour, being relatively cheaper, will tend to be substituted for capital. The direction of substitution is clear, but the extent of substitution is not known. The elasticity of substitution represented by 'b' measures this extent of input substitution. Thus the elasticity of substitution can be defined as percentage change in factor quantity divided by the precentage change in factor price ratio.

According to Hicks, the relationship between output per labour (Y/L) and wage rate (W) arising from constant return to scale production function, under competitive condition, in

8. An isocost can be defined as locus of inputs combinations that entail the same total cost.

9. An isoquant can be defined as the curve which represents the different combinations of two factors of production which are capable of producing the same level of output.

factor and commodity markets, the elasticity of factor substitution between capital and labour results identically equal to the elasticity of Y/L with respect to W.[10]

Similarly elasticity of factor substitution can be interpreted in terms of factor shares. Under assumption of constant return to scale and perfectly competitive commodity and factor market, the share of the capital (rK) and share of labour (WL) in output becomes the indicator of elasticity of substitution. Mathematically $b=\frac{WL}{rK}$ where b= elasticity of factor substitution. If the elasticity of substitution is unity (WL=rK) the wage bill and the interest bill are each half of the total national product.

The value of elasticity of substitution determines the shape of the isoquant. The larger the value of 'b' the flatter is the isoquant and more slowly does marginal rate of technical substitution (MRTS) increase as one input is substituted for another. If capital and labour are perfectly substitutes (b= infinity) so that product is maintained by increasing labour in proportion to as capital is decreased then the insoquant is a straight line. But if capital and labour are entirely incapable of substitution (fixed proportion case where b=o), the isoquant has a right angle at the point concerned (i. e. L shaped isoquant as assumed by Harrod--Domar growth model). It should be noted that the shape of the isoquant shows the relative easiness for substituting one factor to another. Thus as elasticity of substitution increase from zero to infinity, the substitution between two factors becomes increasingly easier.

From these discussion on elasticity of substitution (b), the followed facts are explored about b:--

(i) b is independent of the units in which factors and product are measured.

(ii) b has a symmetrical relation between two factors i. e. elasticity of substitution-- between capital and labour is always-equal to elasticity of substitution between labour and capital.

(iii) b is positive for all normal combinations of inputs.

(iv) b varies from zero to infinity according to the case with which one factor can be substituted for the other in production.

10. J. M. Katz-Production Function, Foreign Investment and Growth (North Ho'lland Publishing Company, Amsterdam, London 1969) pp. 37-67.

Types of Production Functions

There are many types of production, probably the most popular production function which is widely used in econometrics is the Cobb-Douglas production function developed by C. W. Cobb and D. H. Douglas in late 1928. This production function has had a successfull life although not without criticisms due to following reasons:

(i) It permits the phenomenon of decreasing returns to come into evidence with the use of the least complicated function.

(ii) It yields elasticities immediately.

(iii) It provides a compromise between adequate fit of data and computational feasibility.

(iv) The most important merit of this production functiou is that it allows sufficient degrees of freedom for statistical testing. Thus it is the best known form[11] with Y measuring output, K the quantities of capital, L the input of labour, then we can write

$$Y = A K^{B} L^{a} \quad \text{where } Y > o \quad L > o \quad K > o \quad a > o \quad B > o \quad A > o.$$

Where the powers a and B show elasticities with respect to labour and capital. Though the function is nonlinear, it can be transformed into linear logarthmic form. In this production function, the sum of a and B give return to scale, where, labour and capital both are essential factors of production i. e. if one input is zero, the output will also be zero. Also the elasticity co-efficients are independent of any variable and elasticity of substitution is unity.

However the important limitations of this production function (a) include the problems associated with getting the accurate capital data of an industry concerned (b) and also the fact that Cobb-Douglas Prodnction Function assumes unit elasticity of substitution.

11. A. A. Walter: Production and Cost Functions: An Econometric Survey, Econometrica 1963 pp. 1-16.

In 1961, Arrow, Chenery, Minhas and Solow argued that the elasticity of substitution should be dictated by the ruling technology instead of being decided prior. They developed a new production function: the constant elasticity of substitution (CES) Production function in which elasticity of substitution is still constant but one is free to take any value between zero to infinity. Unlike Cobb-Douglas production function the elasticity of substitution in CES function is dictated by ruling technology. Mathematically CES Production function can be written as

$$Y=A\left[dK^{-P}+(1-d)\,L^{-P}\right]^{-V/P} \quad \text{where } A>0$$

A=Efficiency Parameter $\quad 0\geq d\geq 1 \quad P\geq 1$

d=Distributive Parameter

P=Substitution Parameter

V=Return to Scale Parameter.

The efficiency parameter changes the output for given quantities of inputs. The distributive parameter determines the division of factor incomes. It also shows the capital intensity and reflects the capital/labour ratio for given relative factor prices. The substitution parameter (P) is a single function of the elasticity of substitution $b=\frac{1}{1+P}$. The return to scale parameter shows the degree of homogeneity. It explains increasing return to scale, (IRS) decreasing return to scale (DRS) or constant return to scale (CRS) depending on $V>1$ $V<1$ or $V=1$ respectively.

Though the elasticity of substitution parameter in CES Production Function is constant along the isoquant, it can take different values for different industries.[12] When it is accepted, the inter-industry difference (those industries which have higher elasticity of substitution) becomes more capital intensive when wage rate rises and more labour-intensive when wage rate decreases. In this way the differences in elasticity of substitution among industries may affect the pattern and rate of economic growth. The elasticity of substitution is relevant to growth.

The major weakness of CES Production Function is that it emperically does not explain the productivity variation in a majority of industries. The other new production function named Variable Elasticity of Substitution (VES) with some changes in CES Production function explicitely permits the capital/labour ratio (K/L) to be an explainatory variable of productivity. Mathematically VES production function can be written as

12. C. A. Knox and Lovell, "Capacity Utilisation and Production Function Estimation in the Post war American Manufacturing" Quarterly Journal of Economics, May 1968, pp. 21-39.

$$Y=A\left[d K^{-P} + n_{L}^{K^{-u(1+P)}} (1-d) L^{-P}\right]^{-v/p}$$

where n=intensity parameter, and other variables as above.

The main difference between CES and VES production function is that CES function does not consider the capital variable though it removes the problem of measuring capital stock, overestimates the substitution parameter and uuderestimates the efficiency parameter for almost all industries.[13]

Some Uses of Production Function:

Cobb and Douglas[14] have been the pioneers and the proponent of reasearch into the laws of production. Assuming constant return to scale Cobb-Douglas fitted the U. S. time series data (1899-1922) into production functions and estimated $Y=1.01\ L^{0.75}\ K^{0.25}$. From this estimation, they concluded that the share of labour was $\frac{3}{4}$ of the total output in U. S.

With a sample of aggregate American time series data (1909-1949) Solow estimated Cobb-Douglas Production function assuming constant return to scale and neted that the share of labour was about 2/3 of total output.

Mr. Rahman [14] studied manufacturing industries in Bangladesh with time series data (1962-63 to 1969-70). He estimated the elasticity of substitution to be 0.61 which means that capital and labour in manufacturing industries in Bangladesh were used neither in fixed proportion nor in linear specification (perfectly substitutes) nor in Cobb-Douglas techonology (b=1).

From the study of manufacturing industries of Argentina Mr. Katz[15] found the large difference between time series and cross-sectional elasticities of substitution and also noted that the time series elasticities of substitution fluctuated between $\frac{1}{4}$ and 1/3 of the cross-sectional value.

13. Umar Kazi—Production Function with a variable Elasticity of substitution—Analysis and some emperical results Artha Vijnaya, June 1978. Vol. XX, No. 2, p. 169.

14. A. A. Rahman "Elasticity of substitution in manufacturing industries of Bangladesh—An international comparison"—Economic theory and practice in the Asian setling, vol. 2 (Micro Eco Willey Eastern Ltd. New Delhi 1975).

15. J. M. Katz op. cit., pp. 37-67.

Mr. Sicat[16] estimated the elasticity of substitution for Phillipines and compared the result with some developing and developed countries. From the comparison he has concluded that the elasticity of substitution was likely to be higher for less developed countries due to slow supply response.

Mr. Umar Kazi[17] fitted the Indian Cross section data for 1960, 1961 and 1962 obtained from Annual Survey of Industries published by Directorate of Commercial Intelligence into the CES Production function and noted the inverse relationship between substitution and efficiency parameter. He pointed out that CES production function overestimated substitution parameter and under-estimated efficiency parameter. Further, he found out that 56% of the industries in 1962 were displaying variable elasticity of substitution technology and the rest of the industries were operating with Cobb-Douglas type production function technology.

Case of Public Enterprises in Nepal

The present study estimates Cobb-Douglas Production Function and substitution parameters of constant elasticity of substitution and variable elasticity of substitution production function using cross-sectional data for the year 1974/75 in Nepal. This study is based on the secondary data produced by the office of the Corporation Co-ordination Council (CCC)[18]. All necessary statistics such as value added, capital stock, wage rate, and number of labcurers are taken for the year 1974/75. The data of these variables pertain to Aug. 1976. Since the employment figure is obtained only for 1976, it is used as a proxy for the year 1974/75. This can be justified on the ground that the number of employees may be changing and the point of time just after the selected year should be considered for the employment figure.

Out of 59 public enterprises of Nepal that existed in 1974/75, only 38 were selected for this study due to lack of suitable data of some of the enterprises. For example, the value added figure of the National Trading Limited was negative for the selected year.

16. G. P. Sicat—Capital labour substitution in manufacturing in a developing economy: The Phillipines—The Developing Economics Vol. VIII, No. 1 (March 1970).

17. Kazi-op. cit p 169.

18. See the office of the Corporation Co-ordination Council-Profiles of the Public Enterprises in Nepal (CCC 1978, Kathmandu).

According to United Nations International standard classification, the public enterprises in Nepal are classified into nine categories as given below:

a) Manufacturing.
b) Agriculture, Hunting, Forestry and Fishing.
c) Mining and Quarrying.
d) Construction.
e) Wholesale, Retail Trade, Restaurants and Hotels.
f) Transport, Storage, and Communication.
g) Financing Insurance, Real Estate and Business Services.
h) Community Serial and Personal Services.
i) Electricity.

In order to have sufficient degrees of freedom for statistical testing the present study classifies the several enterprises into four categories according to the nature of public enterprises. The number of the enterprises in each category is shown below:[19]

	Classification	Number of Enterprises
1.	Manufacturing	13
2.	Wholesale services (wholesale, retail trade, restaurant, agriculture, and construction)	8
3.	Financing Services (Financing, Insurance, Real Estate, Business Services and Electricity)	9
4.	Community Services (Community, Social, Personal Services and Transport Storage Communication)	8
	Total	38

In order to carry out the study, altogether three econometric models were designed. The regression equations of these models are given below:

1. Cobb-Douglas Production Function

$$\text{Log } Y = \log a + B \log K + d \log L + u \ldots \quad 4\text{-}1$$

19. For the name of PE's in each category see; S. R. Lohani–An Econometric Study on Factor Substitution in selected Public Enterprises of Nepal, Appendix VIII, M. A. Dissertation 1978.

2. CES Production Function SMAC model

$\log Y/L = \log a + b \log W + U \ldots \ldots$ 4-2

3. VES Production Function

$\log \frac{Y}{L} = \log a + b \log W + C \log K/L + u.$ 4–3

where

Y=value added K=Gross fixed capital stock

W=wage rate U=Error term.

L=Number of labour.

It should be noted that the coefficient of log W(b) in eq 4–2 represents the constant elasticity of substitution the co-efficient of log W in eq 4-3 shows variable elasticity of substitution. If the co-efficient of log $\frac{K}{L}$ (C) in eq 4-3 is not significantly different from zero then the substitution parameter estimated from equation 4–2 and 4–3 are identically equal.

By fitting the data into these equations by ordinary least square method of regression analysis the parameters of production function are estimated. In order to know the goodness of fit in regression equation, R^2 and F values are calculated. 'T' test is designed in order to test the significance in the stability of the co-efficient of estimated parameters.

Major Empirical Findings

In table I the results of regression analysis to estimate parameters of Cobb-Douglas Production Function are presented. The following conclusions can be drawn from this table–:

1. The regression equation provides a good fit to the data in each category at 10% level of significance which is not very weak. However, 'F' value is significant at 5% level of significance in each category except in Manufacturing and Financing Services. As the value of 'F' for overall case is significant at 5% level of significance, we are 95% sure in our analysis.

2. Output is elastic with respect to (w.r.t) labour in wholesale services and inelastic in other categories. If the number of labour is increased by 100% the output increases by 5% (a=.05), in Community Services, by 40% (a=.40) in Manufacturing, by 76% (a=.76) in Financing Services, and more than 100% in wholesale services. (a=1.27)

Table : I

Results of Cobb-Douglas Production Function

$Y = AK^B L^a$ or $\log Y = \log A + B \log K + a \log a + u$.

Category	B	a	R^2	F	Efficiency A	Return to scale a+B	MRPk	MRPl	Share of K%	Share of L%	K/L	Y/L	Y/K	Number of observations
1. Over all	.42 (3.01) ‡	0.32 (1.78)§	0.56	22.001 *	13.1	0.74 (DRS)	0.398	0.44	57.09	42.91	13.70	9.70	0.71	38
2. Manufacturing	0.65 (2.81)§	0.40 (1.12)	0.81	3.88§	0.51	1.05 (IRS)	0.544	0.519	61.98	38.01	20.53	5.88	0.29	13
3. Whole-Sale Services.	0.16 (0.48)	1.27 (2.52)*	0.93	12.28*	1.03	1.43 (IRS)	0.172	1.908	11.34	88.66	9.91	15.64	1.58	8
4. Financing Services.	0.049 (0.21)	0.76 (2.47)*	0.71	7.23§	76.71	0.712 (DRS)	N	1.07	–	–	11.33	11.79	1.04	9
5. Community Services.	0.52 (2.48)§	0.05 (0.14)	0.93	34.45*	27.47	0.58 (DRS)	0.51	0.075	90.88	9.12	12.76	10.22	0.80	8

Note: The figures in parenthesis are 't' values.
N=MRP is negative.
IRS=Increasing return to scale
DRS=Decreasing return to scale.

§ =Significant at 10% level
* =Significant at 5% level
‡ =Significant at 1% level

3. The co-efficient of labour is significant in each category except in Manufacturing and Community Services at 10% level of significance. In Wholesale services and Financing services, the Co-efficient of labour is significant at 5% level.

4. The elasticity of output w.r.t. capital is less than one in each category. If the quantity of capital is increased by 100% output increases by 65% (B=0.65) in manufacturing, by 52% (B=.52) in Community Services by 42% in overall case (B=.42), by 16% in wholesale services (B=.16) and output decreases by 4.9% in Financing services (B=.049).

5. The negative Co-efficient of capital: (B=-0.049). The case of Financing Services implies negative marginal product of capital which violates the assumption of rational behaviour (Profit Maximising behaviour) of the producer in the laws of production, for a rational producer never employs additional units of a factor if its marginal product is negative. This negative Co-efficient of capital can be explained in the following points:-

(a) As the Co-efficient is not significantly different from zero (t=0.21), the Marginal Product of capital is not different from zero which means the production is operating at the boundary line of econmic region.

(b) The negative Co-efficient of capital may have occurred due to substitution of more capital for labour-beyond the certain limits dictated by technology. The Co-efficient of labour (a=0.76) in financing services which is greater than the Co-efficient of labour in overall case (a=0.32) explains the substitution of more capital for labour increasing labour productivity and decreasing capital productivity.

(c) The output/labour ratio (Y/L=11.79) and capital labour ratio (K/L=11.33) in Financing Services show that the enterprises in this category are using more capital in proportion to labour than required. Since the efficiency is high (A=76.71), the level of output is naturally high and therefore capital turnover ratio come to be greater than untiy (Y/K=1.04). In manufacturing (A=0.51, Y/K=.20) Community Services (A=27.47, $\frac{Y}{K}$=.80) and in overall case (A=13.1, Y/K=0.71) due to low efficiency capital turn over ratio come to be less than one. But in wholesale services output/capital ratio is greater than one even though efficiency is less (A=1.03, Y/K=1.58).

(d) It could also be said that a negative co-efficient of capital may have due to the inaccuracy of input-output data published by the Corporation Co-ordination Council.

(e) The negative co-efficient of capital may have occurred due to cross-sectional data representing input-output relationship at a point of time. The time services data can be helpful to explain such a co-efficient. As time services data were not available the question remained unsolved. So further study is needed in this aspect.

6. Regarding rerurn to scale all categories except manufacturing and wholesale services show decreasing return to scale. High efficiency parameters explain the decreasing return to scale in case of Financing Services (76.71) and Community Services (27.47). But due to low efficiency parameters manufacturing (0.51) and wholesale services (1.03) have increasing returns to scale.

7. MRP of capital is below unity in each category and even negative in case of Financing Services. With regards to labour MRP is below unity except in wholesale services and Financing Services. MRP of labour below unity in Manufacturing and Community Services and in overall categories can be justified with output/labour ratio. Since output/labour ratio is higher in case of Financing Services (11.79) and wholesale services (15.64) than in the case of manufacturing (5.88) and Community Services (10.22), MRP of labour is above unity only in Financing and Wholesale Services.

8. Share of labour ranges from 9.12% in case of Community Services to 88.66% in wholesale services. Share of labour in Financing Services is more than 100%. It should be noted that share of labour is greater in those categories where production is operating with increasing return to scale.

Table-II presents constant Elasticity of substitution parameter for each category estimated from SMAC model. From this table following facts are explained:-

1. The co-efficient of log W which shows constants elasticity of substitution (b) is not significantly dfferent from unity (Cobb-Douglas assumption). The elasticity of substitution ranges from 1.065 in Manufacturing to 1.349 in Financing Services.

2. 'F' value is significant at 10% level of significance in each category, This shows that the data serves a good fit in the estimated regression equation.

Table : II

Results of CES Production Function

ACMs Model

$\log Y/L = \log a + b \log W + U.$

Category	log a	b	R^2	F	Significant level for b. diff. from 1	0	n
1. Overall	0.579	1.11 (1.39)→→→	0.61	54.685→→	n. s.	1%	37
2. Monufacturing	0.537	1.065 (4.67)→→	0.65	21.82→→	n. s.	1%	12
3. Wholesale Service,	0.706	1.125 (2.65)→→	0.54	7.045→	n. s.	5%	8
4. Financing Services	0.556	1.349 (3.24)→→	0.60	10.507→	n. s.	5%	9
5. Community Services	0.201	1.33 (4.476)→→	0.77	20.03→	n. s.	1%	8

n. s. =not significant

b=Constant elasticity of substitution

The figures in parenthesis are 't' values.

Table III shows the variable elasticity of substitution for each category. Following facts should be noted from the table:–

1. The Co-efficient of log W which shows variable elasticity of substitution is significantly different from zero in each category except in Manufacturing. Since the variable elasticity of substitution for manufacturing is not significantly different from zero, public enterprises in manufacturing sector reveal fixed proportion case as assumed by Harrod-Domar growth model. However, the variable elasticity substitution for overall category (1.099) is significantly different from zero. Therefore, public enterprises as a whole do not show fixed–proportion technology.

2. The Co-efficient of log W is not significantly different from zero in each category except in community services. This shows that the variable elasticity of substitution is not significantly different from constant elasticity of substitution for the selected public enterprises. But in community services CES overestimated substitution parameter.
3. 'F' value is significant in each category except in wholesale and Financing Services.

Table : III

Results of VES Production Function

$$\log Y/L = \log a + b \log W + L \log K/L + U$$

Category	b	C	R^4	F	Level of significance of Co-efficient of K/L	CES estimated from ACMS model	
1. Overall	1.099 (7.041) ↑ ↑ ↑	.03 (.352)	0.61	26.72 ↑ ↑	n.s.	1.11	37
2. Manufacturing	0.438 (1.14)	0.449 (1.76)	0.73	12.38 ↑ ↑	n.s.	1.065	12
3. Wholesale Services	1.138 (2.08) ↑	–0.622 (0.07)	0.54	2.94	n.s.	1.125	8
4. Financing Services	1.347 (2.97) ↑ ↑	–0.006 (0.04)	0.60	4.505	n.s.	1.349	9
5. Community Services	1.327 (5.966) ↑ ↑	0.156 (2.39) ↑	0.89	20.74 ↑ ↑	Significant at 10% level	1.33	8

The figures in parenthesis are 't' values.

As VES is found not significantly different from CES and CES estimated from SMAC Model is not significantly different from unity, it can be concluded that the public enterprises in Nepal are operating as dictated by Cobb-Douglas technology.

Table IV shows the elasticity of substitution for manufacturing sector of selected countries:-

Table IV

Elasticity of substitution for Manufacturing of selected Countries.

Country	Constant Elasticity of substitution	Type of data
1. Nepal[21]	1.06	Cross sectional 1974/75
2. Bangladesh (all manu)	0.6165	Time series (1962/63-1969/70)
3. India	0.9871 1.0394	Cross sectional 1961 " " 1962
4. Argentina	0.71 0.73	Time series Cross sectional 1954
5. Bangladesh (Leather Industry)	1.4	Time series 1962/63-1969/70
6. U.S.A.	0.33	Time series from Dhyrmes model.

21. The constant elasticity of substitution (1.11) is estimated form SMAC model. It represents elasticity of substitution for the public enterprises in manufacturing sector.

The above table shows that there is a great variation in elasticities among countries. For example the elasticity of substitution in the case of leather industry varies between 1.4 in Bangladesh to 0.33 in the U.S.A.

It is generally contended that the elasticity of substitution is likely to be higher for less developed country due to slow supply response. It is not possible to compare the cross sectional elasticity of substitution for manufacturing sector of Nepalese public enterprises (which is around unity) with time series elasticity of substitution of developed countries like U.S.A. So, Sicat's contention that elasticity of substitution is likely to be higher for less developed countries can not be examined by this cross sectional study. However, it can be said that the elasticity of substitution for Manufacturing sector in Nepal follows the pattern of developing countries like India where the cross sectional estimaies of elasticity of substitution for manufacturing was 1.0394 for 1962.

It is also contended that the contral value of cross sectional elasticity of substitution exceeds unity by a small amount (Brown). The cross-sectional elasticity of substitution for manufacturing in Nepal conforms to such a contention. But the examination regarding Brown's next hypothesis that the time series elasticity of substitution is half of the cross-sectional elasticity of substitution is beyond the scope of this study.

In view of the secondary data on whieh the present study depended, it is hard to know exactly the level of accuracy of the estimation of elasticity of substitution. These estimates should be regarded only a study estimates which may be helpful for further reaserch in this area.

Recommendations

1. Public enterprises should made more labour intensive substituting labour for underutilised capital stock as dictated by Cobb-Douglas technology. In overall case the MRP of labour (0.44) is greater than MRP of capital (0.398). In a developing economy like ours the MRP of a scarce factor (Capital stock) should be increased to the maximum extent possible by increasing available factor (labour). Such a labour intensive technique is in conformity with the resource situation of the country.

   It should also be remembered that we can not substitute labour for capital infinitely for the estimated elasticity of substitution for public enterprises is not the infinity. As our elasticity of factor substitution is unity (1.11) we can substitute labour for capital to some extent.

2. In a developing economy due to lack of accurate statistics, planners are generally tempted to assume constant capital/output ratio (b=0) for estimating growth rate. But since the public enterprises in Nepal are displaying Cobb-Douglas technology (b=1) and not the fixed proportion specification (b=0) as found in the positive models (i. e. Harrod Domar models) the capital output ratio should not be kept constant, if possible in formulating public projects so that necessary adjustment to changes in the technology employed should be incorporated in the projects concerned.