Research Paper
Impact Factor: 3.567
Peer Reviewed Journal

IJMDRR
E- ISSN –2395-1885
ISSN -2395-1877

STATE GOVERNMENT EXPENDITURE ON EDUCATIONAND ITS IMPACT ON NSDP IN TAMIL NADU: AN ECONOMETRIC APPROACH THROUGH LAG MODELS

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Abstract
In this paper, an attempt is made to identify the time lag required for the government expenditure on education to make its significant influence on NSDP through lag models, for the State of Tamil Nadu, under partial equilibrium frame work. The results of the lag models suggest that the government expenditure on education influences significantly NSDP in Tamil Nadu after a period of 14 years. The time period required for the government expenditure on education to make its contribution to the economic growth in various other states needs to be identified by further research work to know whether differences exist among the states in this regard.

I. Introduction
Education is an important and basic input required to improve the quality of human resources. In deed education is the most important factor required to make labour, a productive factor. Labour without education and skill cannot be graded as human resources. It becomes a hindrance to development. Therefore one of the necessary conditions for development is the improvement in the quality of human resources through education. Government expenditure on education is justified mainly on this ground and as a matter of fact an increased proportion of expenditure on education is advocated to achieve a higher rate of economic growth.

However, expenditure on education does not yield immediate return to the individual as well as to the economy. The time lag and the size of return depend on many economic and non-economic factors. Moreover, time lag and the size of return may also vary from time to time and from economy to economy.

The average time period required for the government expenditure to make its contribution to national income is an important aspects needs to be identified through research works. The available literature does not reveal any specific technique for this purpose conceptually. It becomes a research hypothesis to be verified.

In general, a number of factors influence the process of economic development. The identification of factors itself is a difficult task and the separation of the contribution and influence of each factor may become the toughest task, if not impossible. Hence the identification of the effect of expenditure on education on national income under the general equilibrium analysis becomes very difficult.

Therefore in this research work an attempt is made to identified the time lag required for the government expenditure on education to make its significant influence on national income through lag models, for the state of Tamil Nadu under partial equilibrium frame work.

II.Time Period of Analysis
The variables taken for analysis are the Net State Domestic Product of Tamil Nadu and the state government expenditure on education. The time period of NSDP taken for analysis is 1993-94 to 2015-16 and the data on state government expenditure on education are taken for the period from 1973-74 to 2015-16. The data on NSDP and the state government expenditure on education are deflated to 2004-05 prices so that the inflationary effect is removed from the data on both the variables. The data expressed in constant prices may become better indicator capable of representing the changes in the real values of the variables and therefore may help better to identify the time lag for the expenditure on education to have its influence on national income.

III. Sources of Data
The data required for analysis have been taken from the various issues of Economic Survey, Tamil Nadu State Government Report on Budget speech and the Statistical Outline of India. The data of NSDP and expenditure on education are expressed in crores of Rupees.

IV. Specification of the Lag Model Used
Let y_1 be the value of NSDP for the year t and X_t be the value of the state government expenditure in the year t. The relationship between Y_1 and X_t can be studied through a simple linear Regression model of the form:

$$Y_t = a + bX_t + u$$

However, this model assumes impliedly that the current year expenditure on education influences the current year NSDP and it has no time lag. However, to identify the time lag, through the explanatory power of the independent variable, namely, the government expenditure on education, we should run regression models with varying time lag. Hence, if a time lag of one year is used, the above model becomes

$$Y_t = a + bX_{t-1} + u$$

and if a time lag of K (K= 1, 2,3,……) years is used, the model becomes

$$Y_t = a + bX_{t-k} + u \qquad k= 1,2,3,\ldots..$$

Based on the data collected, the value of K has been varied from 4 to 20. Since the data on NSDP are taken for analysis from the year 1993-94, when k=0, NSDP is regressed on the government expenditure on education corresponding to each year. When k=1, the influence of the expenditure on education in the year t-1, (for example 2002-03) on the NSDP of the year t(2003-04) is studied through the model. Similarly if K=10, the influence of the government expenditure on education in the year t-10, (for example 1993-94) on the NSDP of the year t (2003-04) is studied.

V. Conceptual Problems

Theoretically, the expenditure on education may have its impact on the NSDP in the succeeding years and therefore the distributed lag model can study the influence of the expenditure on education in earlier years on current NSDP. However, such a model has the same independent variable as different independent variables with a time lag of one or two. It leads to problem of multicollinearity and the results of the regression show a very high value of coefficient of determination, with insignificant coefficients. As such distributed lag models do not serve the purpose here.

In general the data on the NSDP and the expenditure will have an increasing trend due to the rising trend of economic activities. As a consequence, the expenditure on education may be capable of explaining the variations in NSDP by a higher degree. Therefore the value of coefficient of determination will be higher. However to identify the goodness of fit more effectively, along with the coefficient of determination, the standard error of the regression coefficient, the value of F statistic, the correlation coefficient are also used in this analysis.

In the case of time series data, there is a possibility for the error term serially correlated. In the presence of auto correlation, the OLS estimators are not efficient and they do not have minimum variance. The confidence interval therefore becomes unnecessarily wide and the test of significance becomes less powerful. Hence, the regression model should be checked for the presence of autocorrelation and the model which does not have autocorrelation among the error terms should be taken as a better model to explain the phenomenon. For all the lag models fitted, the Durbin- Waston statistic is also estimated to identify whether auto correlation is present or not in the model.

VI. Analysis and Results

The estimators of the parameters of the lag models have been fitted through OLS method. The estimated value of the regression coefficient, constant term, standard error of the regression coefficient, t value, level of significance, $R^{2,}$ adjusted R^2, karl Pearson coefficient of correlation, F statistic and Durbin- Waston statistic are given in Table. I.

Table 1,**Results of the lagged Regression Models**

Time Leg (k)	*a*	*b*	SE_b	*T*	R^2	R^2	*R*	*F*	*DW*
4	8-8568.36	57.37*	13.84	4.14	.656	.618	.810	17.18	.324
5	-25967.6	72.32*	16.53	4.38	.680	.645	.825	19.14	.532
6	-69875.7	105.66*	18.25	5.79	.788	.765	.888	33.51	.782
7	-73648.4	114.12*	16.68	6.84	.839	.821	.916	46.84	.769
8	-68933.8	116.63*	16.00	7.29	.855	.839	.925	53.12	.881
9	-46049.1	106.37*	13.15	8.09	.879	.866	.938	65.47	1.002
10	-26992.0	97.65*	10.24	9.54	.910	.900	.954	90.96	1.276
11	-15706.7	94.56*	10.40	9.09	.902	.891	.950	82.76	1.240
12	-3419.35	90.90*	9.56	9.50	.909	.899	.954	90.33	1.266
13	-68.23	95.68*	9.49	10.08	.919	.910	.959	101.76	.950
14	-8788.56	113.93*	10.64	10.71	.927	.919	.963	114.66	1.584

15	-26593.6	143.40*	15.09	9.50	.909	.899	.954	90.29	.920
16	-21576.7	146.63*	20.31	7.22	.853	.836	.923	52.13	.913
17	-17382.4	150.98*	23.71	6.37	.818	.798	.905	40.57	.751
18	-21230.9	168.34*	25.82	6.52	.825	.806	.908	42.51	.6
19	-40004.5	211.40*	27.24	7.76	.870	.856	.933	60.22	1.257
20	-52389.5	243.30*	32.44	7.50	.862	.847	.928	56.26	1.387

* Significant at one per cent level

1. Correlation coefficient

The correlation coefficient is around 0.8 in the beginning and as the time lag increases, correlation coefficient start exceeding 0.8 and it becomes higher and higher. It reaches 0.963 when the time lag is 14 years. As the time lag exceeds 14, again the correlation coefficient starts registering a general declining trend. Hence the degree of co-variation between the NSDP and the government expenditure on education is the highest when the time lag is 14.

2. Regression coefficient

The regression coefficients are relatively smaller in the initial stages and they increase when the time lag increases. This is due to the fact that the values of the NSDP in recent years are relatively higher compared to the values of the expenditure on education in the earlier period. The regression coefficient increases from and varies around one hundred when K ranges between 6 and 14. When K exceeds 14, regression coefficient starts increasing from 143 and reaches 243 when K= 20.

3. Standard error

Standard error is an indicator of the variance of the parameter. An estimator is regarded as the best estimator if it has minimum variance. Therefore, the model in which the standard error is less will be the better model. The standard error is reducing as K increases and it becomes the least when K=13. The value of the standard error is 10.64 when K= 14 and as exceeds 14, standard error increases stage by stage and it touches the highest value 32.44 when K=20. Thus the variance and the standard error of the parameters is relatively less in the range $10 = K \leq 14$.

4. ‘t’ value and the level of significance

All the regression coefficients are statistically significant and in all cases, the level of significance is less than one percent. The value of ‘t’ statistic ranges between 4 and 10. It increases as K increases and touches the highest value 10.708 when K= 14. It starts declining when K exceeds 14.

5. Coefficient of determination

The value of the adjusted R^2 reveals the fact that the government expenditure on education is capable of explaining more than 60 percent of variations in NSDP whatever the time lag be. However, the value of adjusted R^2 shows an increasing trend when K increases. The highest value of adjusted R^2 is 0.919 when k= 4. This clearly indicates the fact that the explanatory power of the government expenditure on education reaches the highest level of 92 percent when the time lag is 14 years. After this stage, the value of adjusted R^2 starts declining. Therefore, the inference is that government expenditure on education has its impact on the national income at the highest level after a time lag of 14 years for the Tamil Nadu during the period under investigation.

6. ‘F’ Value

The F statistic also reveals this fact. It touches the highest value (114.66) when the time lag is 14. Thus the estimated parameters have the highest degree of significance when k= 14. In the beginning it is comparatively less and it increases as K increases. However, F statistic starts declining after K exceeds highly significant when the time lag is 14.

7. Durbin Waston statistic

The Durbin-Waston for one explanatory variable and for II observations at 5 percent level of significance is: $d_l = 0.927$ and $d_u= 1.320$. Hence if the calculated value of d lies in between 0.927 and 1.320, the test becomes inconclusive and if $d < d_l$, the error terms are positively auto correlated. In case if $d > d_u$, we need not reject the Null Hypothesis that the error term is independently distributed.

The calculated value of d is very low in the beginning and it indicates the presence of positive auto correlation till K =8. The error terms are positively correlated even in the range $15 < k < 18$. However, the error terms are not positively correlated when k=14. In this case the calculated value of d is 1.584 and it is greater than the $d_u = 1.320$.

Since $d < 4 - d_u$ (i.e.., 1.584 <2.68), the error terms are not negatively correlated also when the time lag is 14. Therefore, the lag model is free from autocorrelation when the time lag is 14. In this case, the OLS estimators become unbiased and the best parameters and hence can be used for prediction.

VII .Conclusion

The various indicators of the lag model invariably suggest that the government expenditure on education influences the NSDP after a period of 14 years, in a significance manner. Thus expenditure on education requires 14 years to make its contribution to the growth of the economy.

From an individual point of view, a person completes his high school education after 10 years and he requires a further period of 5 to 7 years to quality himself for a job. After a period of 15 years education, he wants to be employed and even if he does not get the best job suitable to him, he may get some transit job for a lower level of remuneration. In case if a person discontinues his education after high school level, he will be working in private sector or would be engaged in some business activities. In any case, a minimum period of 12 to 15 year education is required for a person to earn income through some economic activities.

Now this is reflected in the macro level analysis and the expenditure on education becomes a productive investment capable of yielding return and contributes to the national income in Tamil Nadu State after a period of 14 years. The regression analysis also suggests that an increase the NSDP of Tamil Nadu by Rs. 114 crores after 14 years.

The time period required for the government expenditure on education to make its contribution to the economic growth in various other states needs to be identified by further research work to know whether differences exist among the states in this regard. The findings of such analysis will be of much use to the policy makers and planners in designing the growth and budget policies of the State Governments as well as for the Central Government.

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