CHAPTER 5

CAUSALITY BETWEEN PUBLIC EXPENDITURE AND STATE DOMESTIC PRODUCT IN KERALA

Introduction

The relationship between public expenditure and growth of income has been viewed from two different approaches, viz. the Wagnerian and the Keynesian approach. According to Wagner the growth of National Income is responsible for growth of public expenditure over the years (Wagner, 1890). While Keynesian Macro Economic theories assume that public expenditure causes National Income (Keynes, 1936).

The above two divergent views have different policy implications. Under the Wagnerian approach, public expenditure is a behavioural variable with a passive role. Under Keynesian approaches, public expenditure is treated as an exogenous policy variable and it is mainly formulated to ease out short run cyclical fluctuations. Hence, there is a need for an empirical testing before choosing between the two approaches. In addition, there is also a chance of a feedback pertaining to the relationship between public expenditure and National Income.

Empirical works such as Peacock and Wiseman (1965), Gupta (1967) and Gandhi (1971) have been conducted to examine the nature of relationship between public expenditure and National Income, by assuming national income
as an exogenous variable. Besides, their works did not investigate the causal direction between public expenditure and national Income, which addresses controversial approaches of both Wagner and Keynes. In this direction, the works of Mann (1980), Sahni and Singh (1984a, 1984b), Afxentiou (1986), Ram (1986, 1987), Singh and Sahni (1986), Sayed et. al (1989), Holmes and Hutton (1990), Afxentiou and Apostolos (1991), and Bhat et. al (1991) are worth mentioning. Results of these works are diversified in nature which may be due to the differences on the procedure of causality testing and inadequacy of data. Besides, the above works are pertaining to National and International level and its relevance to the state economy like Kerala is limited due to vast differences in their socio-economic and political features. In view of these, a more detailed investigation is called for to explore the causality between state expenditure and state domestic product. On this background, the present chapter attempts to examine the direction of causation between Public Expenditure and state income of Kerala for the period 1957-58 to 1996-97.

Methodology

Granger (1969), Sims (1972), and Multiple rank ‘F’ Test were employed to examine the causal nexus between state expenditure and state domestic product. A brief description of these tests, are presented below:-
Granger Causality Test

The Granger causality test assumes that the information relevant to the prediction of respective variables, is contained solely in the time series data on the variables. This means that if forecasts of variable X using both the lagged values of X and the lagged values of some other variable Y are superior to forecasts obtained using past values of X alone, then Y is said to Granger cause X. In the same way, if X can improve the forecast of Y in the presence of past values of Y, then X is said to Granger cause Y.

The test involves the estimating of following two regression equations:

\[ y_t = \sum_{i=1}^{n} \alpha_i X_{t-i} + \sum_{j=1}^{n} \beta_j Y_{t-j} + U_{1t} \quad \ldots (1) \]

\[ X_t = \sum_{i=1}^{n} \theta_i X_{t-i} + \sum_{j=1}^{n} \delta_j Y_{t-j} + U_{2t} \quad \ldots (2) \]

Where it is assumed that the disturbance terms \( U_{1t}, \text{and} \ U_{2t} \) are uncorrelated.

Now we distinguish four cases.

1. If \( \sigma^2 (Y_t / X_{t-i}, Y_{t-j}) < \sigma^2 (Y_t / Y_{t-i}) \) then X is said to cause Y.

\[ \sigma^2 (Y_t / X_{t-i}, Y_{t-j}) \] prediction error variance based on past value of X and Y and

\[ \sigma^2 (Y_t / Y_{t-i}) \] based on only Y.
2. If $\sigma^2(X_t/X_{t-i}, Y_{t-i}) < \sigma^2(Y_t/Y_{t-i})$ then $Y$ is said to cause $X$.

3. If both the above outcome occur simultaneously there is feedback or bilateral causality.

4. If $\sigma^2(Y_t/Y_{t-j}) < \sigma^2(Y_t/X_{t-i}, Y_{t-i})$ and $\sigma^2(X_t/X_{t-i}) < \sigma^2(X_t/X_{t-i}, Y_{t-j})$, then the two series are not temporarily related over time and are independent.

The necessary test is conducted by Joint ‘F’ test which is given by:

$$F = \frac{ESS_R - ESS_{UR}}{RSS_R / N-K}$$

Where,

$T = k - 1,$

$ESS_R = $ Explained sum of squares of restricted regression equation,

$ESS_{UR} = $ Explained sum of squares of unrestricted regression equation,

$RSS_R = $ Residual sum of squares of restricted regression equation,

$K = $ Number of parameters involved, and

$n = $ Number of observation.

Sims Test

Sims test (1972) follows the logic that future cannot cause past. The causal nexus between $X_t$ and $Y_t$ may be identified by estimating the following equations:

$$y_t = \alpha + \sum_{i=1}^{m} a_i X_{t-i} + U_{1t} \quad ... \quad (3)$$
\[ X_t = \beta + \sum_{j=-n}^{n} b_j Y_{t-j} + U_{2t} \quad \ldots \quad (4) \]

Where \( \alpha, \beta, a_i \) and \( b_j \) are coefficients and \( U_{1t} \) and \( U_{2t} \) are mutually uncorrelated white noise series. Under the maintained hypothesis that \( X_t \) causes \( Y_t \) we have

(1) \( \sum a_i (i < 0) = 0 \)

(2) \( \sum b_j (j < 0) \neq 0 \)

For bi-directional causality (feed-back) between the two variables, it is to be satisfied that \( \sum a_i (i < 0) = 0 \) and \( \sum b_j (j < 0) = 0 \) and the condition of independence is that

\( \sum a_i (i < 0) \neq 0 \) and \( \sum b_j (j < 0) \neq 0 \).

**Multiple Rank 'F' Test**

It has been shown that inference drawn from the parametric test of causality in the Weiner -Granger frame work Viz. Granger and Sims test, have been sensitive to, among others, choice of functional form employed in the testing process. The imposition of a particular form has been viewed as a relatively strong restriction. It was then felt that an appropriate way of testing causal relation should recognize independence of causality and functional form as a necessary component of the concept of causality. Falling in line with the argument that causal relations imply functional dependence, and are invariant
with respect to monotonic transformations. Holmes and Hutton, (1990) proposed the rank transformation, under certain conditions, preserve causal orderings. Thus the use of rank transformation, renders the test procedure neutral to functional form and hence frees it (the test) from the strong restriction associated with the parametric tests.

The multiple rank F-test thus involves the rank transformation of the variables before being tested for causation. Following Holmes and Hutton causal relationship between $X_t$ and $Y_t$ may be examined using the following general linear regression models:

$$g(Y_i) = \alpha_0 + \sum_{i=1}^{k_1} \beta_i g(Y_{t-i}) + \sum_{j=1}^{k_2} h(X_{t-j}) U_{lt} \quad \ldots (5)$$

$$h(X_i) = \delta_0 + \sum_{i=1}^{k_1} \theta_i h(X_{t-i}) + \sum_{j=1}^{k_2} n_i g(Y_{t-j}) + U_{2t} \quad \ldots (6)$$

where $g$ and $h$ are functions of $Y$ and $X$, $\alpha_0$, $\beta_i$, $\sigma_i$, $\delta_0$, $\theta_i$, and $n_i$ are parameters, $U_{lt}$ and $U_{2t}$ are the white noise terms. It may be noted that equations 5 and 6 could be obtained as special cases of 1 and 2 respectively, by assuming that $g(Y_{t-i}) = Y_{t-i}$ and $h(X_{t-i}) = X_{t-i}$ now by assuming that $g(Y_{t+1}) = R(Y_{t-1})$, $h(X_{t+1}) = R(X_{t-1})$ for all $i$, Where $R$ denotes the rank transformation. Equation 5 and 6 represent a less restrictive general linear set up. Using (5) and (6) with rank transformation testing for causation would then give multiple rank F-statistics which are based on relatively less stringent assumption about
the functional relation between $X_t$ and $Y_t$. Following Suppes (1970) here $X_t$ is a prima facie cause of $Y_t$ if $\delta_j \neq 0$ at least for some $j$ and $nj = 0 \forall j$.

**Empirical Results and Discussions**

To examine the causal nexus between state domestic product and state expenditure, the Granger, Sims and multiple rank $F$ test were employed in this study. The necessary information is collected from various issues of State Annual Budget Report of Kerala. The observations are annual and referred to the period 1957-58 to 1996-97.

The results of Granger test are presented in Table 5.1. The experiment is conducted upto lag 3,3. The formulated null hypothesis that the sum of the lag coefficient is zero against the alternative hypothesis is that the sum of the lag coefficient is not equal to zero. The $F$ test results of table 5.1 is insignificant in respect of all the lags at 5 per cent level of significance. Hence, it is concluded that the relationship between State expenditure and State domestic product of Kerala are independent.

On the basis of Sims test, the formulated null hypothesis is that the sum of the lead co-efficient is zero against the alternative hypothesis that it is not equal to zero. The experimentation is conducted upto 3,3 lead and its results are presented in Table 5.2. The computed ‘$F$’ value of Table 5.2 is insignificant at 5 per cent level. Hence, the results of Sims test reveals bi-
directional relation between state expenditure and state domestic product of Kerala

On the basis of multiple rank ‘F’ test, null hypothesis is formulated that the sum of the lag coefficient is equal to zero against alternative hypothesis that it is not equal to zero. The computed ‘F’ test results of multiple rank ‘F’ test is presented in table 5.3. It also reveals that the ‘F’ value is insignificant at 5 per cent level in all the selected lags. Hence, it is concluded that there exist an independent relation between state public expenditure and state domestic product in Kerala.

On the whole, the Granger and Multiple Rank ‘F’ test reveals an independent relationship between state expenditure and state Domestic product in Kerala. While Sims test shows bi-directional relationship between the two. Since larger number of test reveals an independent relationship between the two, it is concluded an independent relation between state expenditure and state domestic product in Kerala. The possible reasons are:

(i) Generally, expansion of public expenditure is on the basis of populistic measures and to enhance the vote bank of the elected representatives with the objective of satisfying the interest group. Hence, Economic growth may not have much link on the expanding public expenditure in Kerala.
The impact of government size on Economic growth is positive as well as negative. It is positive due to (a) Government will play a role of harmonising the complex between private and social interest, (b) There is a prevention of exploitation of the country by foreigners and (c) Securing an increasing productive investment and providing a socially optimum direction of growth and development. The government size is likely to be hindrance to economic growth due to (a) Government operations are not often conducted efficiently (b) Many of Government public expenditure policies tend to distort economic incentives and lower the productivity of the system. The above two conflicting way of influencing public expenditure on Economic growth will nullify the actual influence of public expenditure on Economic growth.

Concluding Remarks

The present chapter examines causal nexus between public expenditure and state domestic product of Kerala state for the year 1958-59 to 1996-97. Granger, Sims and Multiple Rank ‘F’ tests are employed to examine the objective.

The analysis reveals that there is an independent relationship between public expenditure and state domestic product in Kerala. The possible reasons behind an independent relationship between the two are:-

113
i) Economic growth is not having an impact on public expenditure due to the vested interest of elected representatives. Expansion of public expenditure is on the basis of populistic measures and enhancement of vote bank of elected representatives.

ii) The positive and negative impact of public expenditure on economic growth will nullify the actual influence of public expenditure on economic growth. The impact of government expenditure is positive due to (a) government will play a role of harmonising the complex between private and social interest, (b) there is a prevention of exploitation of the country by foreigners, and (c) securing an increasing productive investment and providing a socially optimum direction of growth and development.

The government size is negatively acting on economic growth due to :-
(a) government operations are not often conducted efficiently, (b) many government expenditure policies tend to distort economic incentives and lower the productivity of the system.
References

1. Wagner A (1890), Finenziissensehtft Leip Zig.


Table – 5.1

RESULTS OF GANGER CAUSALITY TEST BETWEEN PUBLIC EXPENDITURE AND STATE DOMESTIC PRODUCT

<table>
<thead>
<tr>
<th>Lag</th>
<th>PE → SDP ‘F’ Value</th>
<th>SDP → PE ‘F’ Value</th>
<th>Inference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1</td>
<td>0.1949</td>
<td>0.4215</td>
<td>Independent</td>
</tr>
<tr>
<td>2,2</td>
<td>1.1580</td>
<td>0.2155</td>
<td>Independent</td>
</tr>
<tr>
<td>3,3</td>
<td>0.7112</td>
<td>0.2427</td>
<td>Independent</td>
</tr>
</tbody>
</table>

Table – 5.2

RESULTS OF SIMS CAUSALITY TEST BETWEEN PUBLIC EXPENDITURE AND STATE DOMESTIC PRODUCT

<table>
<thead>
<tr>
<th>Lag/Lead</th>
<th>PE → SDP ‘F’ Value</th>
<th>SDP → PE ‘F’ Value</th>
<th>Inference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1</td>
<td>0.3640</td>
<td>0.1622</td>
<td>Bidirectional causal nexus between public expenditure and state domestic product.</td>
</tr>
<tr>
<td>2,2</td>
<td>0.3461</td>
<td>0.6422</td>
<td>-do-</td>
</tr>
<tr>
<td>3,3</td>
<td>0.3973</td>
<td>0.7458</td>
<td>-do-</td>
</tr>
</tbody>
</table>

Table – 5.3

RESULTS OF MULTIPLE RANK F TEST BETWEEN PUBLIC EXPENDITURE AND STATE DOMESTIC PRODUCT

<table>
<thead>
<tr>
<th>Lag</th>
<th>PE → SDP ‘F’ Value</th>
<th>SDP → PE ‘F’ Value</th>
<th>Inference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1</td>
<td>1.3628</td>
<td>1.2747</td>
<td>Independent</td>
</tr>
<tr>
<td>2,2</td>
<td>1.1140</td>
<td>1.5156</td>
<td>Independent</td>
</tr>
<tr>
<td>3,3</td>
<td>0.6289</td>
<td>1.0336</td>
<td>Independent</td>
</tr>
</tbody>
</table>