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Government Expenditure and Economic Growth in India (1960 to 2000)

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Abstract

In the economies under transition there is a growing debate in favour of privatization rather than state owned enterprises. Government providing necessary public goods for which no competition exists from private sector can definitely lead to faster economic growth. But the onerous regulatory process, distortionary subsidies and taxes, delays in implementing projects, cost overruns are a limiting factor on economic growth. The paper examines the annual data on Government Final Consumption Expenditure and Gross National Product at market price in nominal and real terms of India for the period 1960-61 to 1999-00. The causal relationship between the two variables is investigated by using the Test of Integration, Cointegration and Error Correction Mechanism. The main result of the study is that in nominal terms higher economic growth invariably is accompanied by an increase in the Government Final Consumption Expenditure.

I. Introduction

IN THE ECONOMIES under transition there is a growing debate in favour of market driven economy rather than government managing and controlling the enterprises. The impression that the word "economic reform" in India suggests that there is urgency in downsizing the control over sectors which have been under the control of government. In India, governments, both Central and States, have been playing an important role in economic development through directly involving themselves into manufacturing activities and through framing regulatory tools. The strength of its direct involvement in manufacturing and service providing activities can be judged from the public sector's contribution to GDP. It was around 33 per cent in 1990-91 and declined to 28.7 per cent in 1997-98. At the beginning of 1970s, the share was around 14 percent. In some developed countries of the West,

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the public expenditure has been rising proportionately to the increase in their GDP. Hence the ratio of public expenditure to GDP has remained more or less stable. In India, both the extensive and intensive expansion in the activities of the government during the planning period has resulted in a spectacular rise in the public expenditure. It rose from Rs 2,631 crore in 1960-61 to Rs. 4,36,122 crore in 1997-98. At constant prices, the increase in public expenditure has been around twenty four fold over the last forty six years.

People in developed countries have attained a high per-capita income that can easily satisfy their individual wants. Whereas people in India with a sizeable percentage of population leaving below the poverty line, many people fail to procure even the basic minimum necessities of life. They hardly derive any benefit from the public expenditure. Most of the non-development expenditure is on interest payments, defence, subsidies, police, general administration and education, the benefit rarely percolates to the poorest sections of the society. Benefits of development expenditure have been appropriated largely by the urban and the rural elite.

II. Empirical Studies

It is important to know the impact of government size on the economic performance. The role of public expenditure in a developed country will be largely through economic stabilization, simulation of investment activity and so on. Whereas, in a underdeveloped country public expenditure has an active role to play in reducing regional disparities, developing social overheads, creation of infrastructure of economic growth in the form of transport and communication facilities, education and training, growth of capital goods industries, basic and key industries, research and development, stimulating saving, capital formation and so on. Despite this, theoretically it is believed that the government is less efficient than the private sector and hence a larger size of the government would contribute slower to economic growth. However government providing necessary public goods for which no competition exists from private sector can definitely lead to faster economic growth (Ram, 1986; Carr, 1989). The Wagner's "law of increasing state activites" based on the historical experiences propounded that the economies of the industrializing nations develop their public sectors grow in relative importance. Wagner pointed out three factors which would cause public sector to grow proportionately faster than the level of economic development. First, as the country's economy progresses so does the administrative and protective role of government expand. Secondly, with the expansion of economy government expenditures on cultural and welfare would rise, most notably, in education and health. Thirdly, the technological progress of the industrialized nations requires government to undertake certain economic services for which funds from the private sector are not forthcoming. He had assumed that the income elasticity of the demand for public good is more than unity. The government's role as a chief provider of social and physical infrastructure through public investment and expenditures on goods and services can generate externalities in the form of better investment opportunities for the private sector. Thus it is believed that resources can be optimally allocated. However the onerous regulatory process, distortionary subsidies and taxes, delays in implementing projects, cost overruns are a limiting factor on economic growth. Not only at theoretical level but also the empirical evidences suggests a mixed opinion on the effect of government size on economic growth. The diversity of the empirical studies can be attributed to the different measures adopted to represent Government size of involvement. Landau (1983) found a significantly negative correlation between government expenditure share in real Gross Domestic Product (GDP) and the growth rate of percapita real GDP. Landau (1986) classified government expenditures into five different types, consumption expenditures, educational expenditures, capital development expenditures, military expenditures and transfer expenditures, and found that all of them negatively affect economic growth. Barro (1989, 1990) used the growth of per capita GDP as their measure of economic growth, and observed that government size had a significantly negative influence on economic growth. Kormendi and Meguire (1985) and Ram (1986) used the growth rate of real GDP and inferred that government expenditures had insignificantly and significantly positive effects on the growth of real GDP, respectively. The work by Ashauer (1989) investigated the demand side hypothesis that a high marginal productivity of government spending would yield multiple expansions in output. The income effects arising from government expenditures feed into Wagner's Law that addresses the income elasticity of public goods. However his empirical study on U.S. government's investment in core infrastructure engendered productivity but betrayed the Wagner's hypothesis. Cashin (1995) found that distortionary taxes to be detrimental to growth while public transfers and capital expenditures (complimentary inputs to private production functions) were growth enhancing. Rubinson (1977) indicates that the positive effect of government size is more prominent in poorer developing countries. Levine and Renelt (1992) using a sensitivity analysis of cross country growth regressions concluded that a few findings are robust to alterations in the list of explanatory variables.

III. Data

The paper examines the annual data on Government Final Consumption Expenditure (which includes compensation of employees, net purchases of goods and services and consumption of fixed capital in government administration) as a measure of Government size, and Gross National Product at market price in nominal and real terms (Base: 1993-94 = 100), of India for the period 1960-61 to 1999-00. The data is reported in National Income Statistics (CMIE) January 2003.

IV. Formulation of Testable Hypothesis

The relationship between government expenditure and economic growth is directly investigated. Therefore, the testable hypothesis focuses on these two economic series. The long-term relationship between government expenditure and growth is explored using the concept of cointegration. The concept of cointegration is fundamental to an understanding of the long-run relationships amongst economic time series (Granger, 1988). If the two variables are cointegrated, they must obey an equilibrium relationship in the long run though they may drift apart in the short run. Thus, there is a steady-state relationship between the variables. Further, Granger (1988) observes that co-integration is present if the two series are causally related and that causality is concerned with short-run forecastability. The bi-directional causality government final consumption expenditure and economic growth is determined by using the Error Correction Mechanism.

4.1. *Tests of Integration, Cointegration and Error Correction Mechanism*

In the case of tests for cointegration, the Engle-Granger cointegration test has been employed, as suggested in Engle and Granger (1987). This test of cointegration is used in view of its simplicity to compute, and its widespread application in economic literature. In regressions involving time series data the time, or trend, variable *t* is often included as one of the regressors to avoid the problem of spurious correlation. Data involving economic time series often tend to move in the same direction because of a trend that is common to all of them. How does one find out whether the trend is in a series, such as data on Government Final Consumption Expenditure and Gross National Product (market price) are stationary? It is an exercise that involves the first-differenced ($\Delta Y_t = Y_t - Y_{t-1}$) time series of GFCE and GNPmp are regressed on lagged difference terms ($\Delta Y_{t-1} = Y_{t-1} - Y_{t-2}$) and lagged series ($Y_{t-1}$) and time (t). Further a restricted equation (omitting lagged series (Y_{t-1}) and time (t)) is determined after finding the optimum lag. The augmented dickey-fuller (ADF) test is applied in the following equation.

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \alpha_2 Y_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta Y_{t-1} + e_t \qquad (1)$$

where, Δ is the first difference operator, t is the linear time trend. The null hypothesis is $H_0 : \alpha_2 = 0$ against the alternative hypothesis $H_1 : \alpha_2 \neq 0$ is tested by comparing the calculated F value with the critical value from the table. If the computed F values exceed the DF critical values, then we do not reject the hypothesis that the given time series is stationary. If a time series is differenced once and the differenced series are stationary, we say that the original series is integrated of order 1, denoted by I (1). Similarly, if the original series has to be differenced twice (i.e., take first difference of the first difference) before it becomes stationary, the original series is integrated of order 2, or I (2). In general, if a time series has to be differenced *d* times, it is integrated of order *d* or I (*d*). By convention, if d = 0, the resulting I (0) process represents a stationary time series. The terms a stationary process and I (0) process are synonymous.

4.2 *Final Prediction Error*

The selection of the appropriate lag length of the variables in the equation is important, as it is sensitive to the lag length. Hsiao (1981) suggests a solution to the lag selection problem through the use of final prediction error (FPE) of Akaike (1969). The Final Prediction Error, which selects the model order p minimizing the function FPE (p), defined as:

$$FPE\,(p) = s^2\,(p) \times (N+p+1)/N-p-1) \qquad (2)$$

where, N is the number of samples, and s(p) is the estimated variance of the white driving noise (i.e., the prediction error), a decreasing function of p. The term (N+p+1)/ (N-p-1) increases with p and represents the inaccuracies in estimating the AR parameters. In the above specification p is the number of lags on Y variables. Essentially, lag specifications are selected on the basis of equations which yield minimum FPEs. The first step in this method consists of treating Y as a one-dimensional autoregressive process. The FPEs are computed by varying the order of lags. The specification which yields the minimum FPE is then chosen for purposes of further statistical analysis; i.e., this minimum FPE specification determines the "optimal" lag structure of the controlled (dependent) variable. If the FPE (1) obtained is less than FPE (2), and then the optimum lag is one.

4.3 *Cointegration*

After determining that the series of variables to be stationary and integrated of I(0), it is also important to test for the long run relationship between the variables before testing for causality so the next step of our analysis is to test for cointegration. A set of variables is said to be cointegrated if a linear combination of their individual integrated series I(d) is stationary.

This procedure needs an estimation of the cointegrating regression equation.

$$Y_t = \beta^* X_t + e_t \qquad (3)$$

If the residuals, e_t from the regression are I(0) i.e. stationary, then the variables are said to be cointegrated and hence interrelated with each other in the long run.

4.4 *Error Correction Mechanism*

If the series are found to be cointegrated, then we construct standard Granger causality test by augmenting with an appropriate error correction term derived from the cointegrating equation. The error correction models that incorporate information from the co-integrated properties of time-series variables. Two (or more) variables are co-integrated (have an equilibrium relationship) if they share common trend(s). To test for causality when variables are co-integrated, one uses following error-correction equation.

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{q} \beta_1 \Delta X_{t-1} + \sum_{i=1}^{q} \beta_1 \Delta X_{t-2} + \sum_{i=1}^{n} \theta_1 \Delta Y_{t-1}$$

$$+ \sum_{i=1}^{n} \theta_1 \Delta Y_{t-2} + \delta\, u_{t-1} \qquad (4)$$

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{n} \theta_1 \Delta Y_{t-1} + \sum_{i=1}^{n} \theta_1 \Delta Y_{t-2} \qquad (5)$$

Where, Δ is the first difference of the variables and the inclusion of u_{t-1}, is the error correction term lagged one period derived from the cointegrating equation:

$$Y = a + bX + e_t \tag{6}$$

The error-correction model introduces an additional channel through which Granger causality can emerge. Further we apply the Augmented Dickey Fuller test, if the calculated F value is greater then the Dickey Fuller critical values then the null hypothesis that y does not cause x is rejected. Similarly, we use an equation to test whether causality runs from x to y; here u_{t-1} is the error correction term from reverse cointegrating equation

$$\Delta X_t = \alpha_0 + \sum_{i=1}^{q} \beta_1 \Delta X_{t-1} + \sum_{i=1}^{q} \beta_1 \Delta X_{t-2} + \sum_{i=1}^{n} \theta_1 \Delta Y_{t-1} + \sum_{i=1}^{n} \theta_1 \Delta Y_{t-2} + \delta u_{t-1} \tag{7}$$

$$\Delta X_t = \alpha_0 + \sum_{i=1}^{q} + \beta_1 \Delta X_{t-1} + \sum_{i=1}^{q} \beta_1 \Delta X_{t-2} \tag{8}$$

4.5 *F – Statistics Calculation*

The following is the approximate F-Statistic, which has been calculated under the hypothesis that the coefficients of the lagged or lead values are jointly zero.

$$F = (SSE_2 - SSE_1) / (DF_2 - DF_1) \div SSE_1 / DF_1 \tag{9}$$

where, SSE_1 and SSE_2 are the residual sum of squares of with and without lagged values, respectively for the ADF test. DF_1 and DF_2 are degrees of freedom with and without lagged or lead values, respectively. If the F value calculated is greater than the Dickey Fuller critical values then we reject the hypothesis of non-stationarity of the series in the favour of the alternative hypothesis that the series is stationary.

V. The Empirical Results

To begin with the empirical investigation, it requires examining the basic times series properties of the data on government final consumption expenditure (GE) and gross national product at market price (Y). The main reason for this that the integration and cointegration properties of the data are critical in the subsequent analysis.

5.1 *Order of Integration*

Table I and Table II summarises the findings, in Table I. the data set is stationary and integrated of order I(0), when the series is first-differenced and third-differenced. Whereas in Table II, the time series is stationary and integrated of order I(0), only when the series is third-differenced. For cointegration test both the time series should be stationary and integrated of the same order. The optimum lag is one. Again in case of Table V and Table VI, the results of the data set at constant prices it can be noticed that both the series are stationary and integrated of order I(0) when first and third-differenced. The results in Table V for first differenced are significant at 5 percent and significant at 1 percent when third differenced. In case of the results in Table VI are significant at 1 and 5-percent level. The optimum lag is one in each of the case.

Table I

Time-Series Properties of Government Final Consumption Expenditure (GE) for the period 1960-61 to 1999-00 at Current price.

No of lags	Differences	Dependent Variable	Constant	ΔGE_{t-1}	GE_{t-1}	t	R^2	ADF
1	First-order	ΔGE	671.94	-0.25	0.23	-119.87	0.93	
				(0.21)	(0.04)	(75.61)		
		ΔGE	624.58	1.04				
				(0.06)			0.86	
								17**
1	Second-order	ΔΔGE	-405.58	-0.99	0.33	27.57	0.31	
				(0.31)	(0.16)	(86.74)	•	
		ΔΔGE	1187.88	-0.24				
			(0.17)			0.04		
								6.24
1	Third-order	ΔΔΔGE	-1761.45	0.31	-1.81	200.25	0.67	
				(0.25)	(0.32)	(63.98)		
		ΔΔΔGE	135.87	-0.84				
				(0.19)			0.36	
								7.75**

Note: The figures in the parenthesis are Standard Error.
Calculated F Value compared to Critical Values tabled by Dickey and Fuller.
* at 5 percent significance level
** at 1 percent significance level

Table II

Time-Series Properties of Gross National Product at Market price for the period 1960-61 to 1999-00 at Current price.

No of lags	Differences	Dependent Variable	Constant	ΔY_{t-1}	ΔY_{t-2}	Y_{t-1}	t	R^2	ADF
2	First-order	ΔY	-4950.89	0.25	0.45	0.03	709.1	0.96	
				(0.23)	(0.23)	(0.03)	(387.9)		
		ΔY	3126.04	0.47	0.64				
				(0.17)	(0.19)			0.95	
									3.2
1	Second-order	ΔΔY	-4689.31	-0.60		0.006	718.07	0.32	
				(0.18)		(0.07)	(387.36)		
		ΔΔY	7110.1	-0.35					0.1
				(0.17)					
									5.33
1	Third-order	ΔΔΔY	-4969.3	0.009		-1.61	786.14	0.73	
				(0.230)		(0.33)	(265.5)		
		ΔΔΔY		786.28		-0.93			0.54
						(0.14)			
									11.25**

Note: The figures in the parenthesis are Standard Error.
Calculated F Value compared to Critical Values tabled by Dickey and Fuller.
* at 5 percent significance level
** at 1 percent significance level

5.2 *Cointegration*

It is important to test for the long run relationship between the variables before testing for causality so the next step involves the residuals from the regression of variables on each other to be tested for the same order of integration. The Table III shows the residual from the regression of GE on Y and Y on GE are stationary and integrated of order I(0). The results are significant at 1 percent and 5 percent level. The optimum lag is 2 in each of the case. Whereas in case Table VII, the residuals from the regression of the variables at constant price is non-stationary hence no causality can be tested.

Table III
Cointegration Test between Government Final Consumption Expenditure and Gross National Product at Market price at Current Price.

No of lags	Error term of	Dependent Variable	Constant	Δe_{t-1}	Δe_{t-2}	Δe_{t2}	t	R^2	ADF
2	GFCE	Δe_t	1151.87	1.03	0.76	-0.8	-66.66	0.67	
	regressed on			(0.14)	(0.25)	(0.16)	(44.45)		
	GNPmp	Δe_t	352.4	0.69	-0.07				
				(0.17)	(0.27)			0.35	
									15.51**
2	GNPmp	Δe_t	-12117.9	0.99	0.73	-0.81	665.56	0.66	
	regressed on			(0.14)	(0.24)	(0.15)	(381.43)		
	GFCE	Δe_t	-2758.08	0.69	-0.07				
				(0.17)	(0.27)			0.35	
									14.58**

Note: The figures in the parenthesis are Standard Error.
Calculated F Value compared to Critical Values tabled by Dickey and Fuller.
* at 5 percent significance level
** at 1 percent significance level

5.3 *Causality*

The next step of our analysis is to test for bi-directional causality between Government Final Consumption Expenditure and Gross National Product at Market Price at Current Price. Table IV reports our findings for causality,

Table IV
Test Statistics for the Error-correction Model based on Cointegrating Regressions between Government Final Consumption Expenditure and Gross National Product at Market price at Current Price.

Dependent Variable	Constant	ΔGE_{t-1}	ΔGE_{t-2}	ΔY_{t-1}	ΔY_{t-2}	Δu_{t-1}	R^2	ADF
ΔGE	307.35	0.65	0.99	-0.16	0.12	-0.40	0.95	
		(0.19)	(0.28)	(0.03)	(0.04)	(0.21)		
ΔGE	-94.48	0.33	1.03					
		(0.19)	(0.26)				0.90	
								15.5**
ΔY	-781.81	0.75	1.03	-1.04	-3.60	-0.30	0.96	
		(0.21)	(0.26)	(1.20)	(1.73)	(0.15)		
ΔY	3126.04	0.47	0.64					
		(0.17)	(0.19)				0.95	
								3.87

Note: The figures in the parenthesis are Standard Error.
Calculated F Value compared to Critical Values tabled by Dickey and Fuller.
* at 5 percent significance level
** at 1 percent significance level

based on error correction models, the tests are conducted with residuals from cointegrating equations regressing (GE) on (Y) and the residuals from the reverse cointegrating regressions. However the results show there is uni-directional casuality from GNP mp(Y) to Government Final Consumption Expenditure (GE).

Table V

Time-Series Properties of Government Final Consumption Expenditure for the period 1960-61 to 1999-00 at Constant Price. (Base : 1993-94 = 100)

No of lags	Differences	Dependent Variable	Constant	ΔGE_{t-1}	GE_{t-1}	t	R^2	ADF
1	First-order	ΔGE_t	-621.81	0.50	0.08	-129.84	0.63	
				(0.19)	(0.05)	(151.69)		
		ΔGE_t	817.96	0.87				
				(0.13)			0.55	
								6.89*
1	Second-order	$\Delta\Delta GE_t$	-708.95	-0.28	-0.13	92.32	0.19	
				(0.21)	(0.20)	(50.07)		
		$\Delta\Delta GE_t$	505.33	-0.32				
				(0.15)			0.10	
								1.83
1	Third-order	$\Delta\Delta\Delta GE_t$	-1046.13	0.04	-1.47	89.46	0.70	
				(0.17)	(0.28)	(42.88)		
		$\Delta\Delta\Delta GE_t$	18.50	-0.68				
				(0.12)			0.46	
								12.80**

Note: The figures in the parenthesis are Standard Error.
Calculated F Value compared to Critical Values tabled by Dickey and Fuller.
* at 5 percent significance level
** at 1 percent significance level

Table VI

Time-Series Properties of Gross National Product at Market price for the period 1960-61 to 1999-00 at Constant Price (Base: 1993-94 = 100).

No of lags	Differences	Dependent Variable	Constant	ΔY_{t-1}	Y_{t-1}	t	R^2	ADF
1	First-order	ΔY_t	-13057.6	-0.11	0.08	-162.2	0.66	
				(0.18)	(0.03)	(677.84)		
		ΔY_t	10048.97	0.67				
				(0.14)			0.39	
								13.5**
1	Second-order	$\Delta\Delta Y_t$	-2693.7	-0.05	-0.82	1441.54	0.42	
				(0.18)	(0.24)	(437.69)		
		$\Delta\Delta Y_t$	2812.06	-0.46				
				(0.15)			0.21	
								6.18
1	Third-order	$\Delta\Delta\Delta Y_t$	-1621.65	0.33	-1.96	283.26	0.76	
				(0.17)	(0.29)	(286.88)		
		$\Delta\Delta\Delta Y_t$		656.90	-0.65			
					(0.12)		0.42	
								9.37**

Note: The figures in the parenthesis are Standard Error.
Calculated F Value compared to Critical Values tabled by Dickey and Fuller.
* at 5 percent significance level
** at 1 percent significance level

Table VII
Cointegration Test between Government Final Consumption Expenditure and Gross National Product at Market price at Constant Price (Base: 1993-94 = 100)

No of lags	Error term of	Dependent Variable	Constant	Δe_{t-1}	Δe_{t-2}	e_{t-1}	T	R^2	ADF
1	GFCE	Δe_t	-65.58	0.38		0.32	16.61	0.23	
	regressed on			(0.16)		(0.11)	(41.77)		
	GNPmp	Δe_t	290.74	0.22					
				(0.17)				0.046	
									4.06
2	GNPmp	Δe_t	309.66	0.38	0.31	-0.39	-117.00	0.28	
	regressed on			(0.16)	(0.19)	(0.12)	(342.45)		
	GFCE	Δe_t	-1616.14	0.21	0.057				
				(0.17)	(0.19)			0.04	
									5.17

Note: The figures in the parenthesis are Standard Error.
Calculated F Value compared to Critical Values tabled by Dickey and Fuller.
* at 5 percent significance level
** at 1 percent significance level

VI. Conclusions

By using the methods of Integration, Cointegration, Error Correction models to indicate bio-directional casuality between Government Final Consumption Expenditure (GE) and Gross National Product at Market Price (Y) at Current and Constant price. The data at Current Price reflects uni-directional casuality from Gross National Product at Market Price to Government Final Consumption Expenditure. However the data in real terms could not confirm the test for causality. The main result of the study is that in nominal terms higher economic growth invariably is accompanied by an increase in the Government Final Consumption Expenditure. This is well supported by the trend observed in India, from 1950-51 to 1998-99, i.e. the ratio of public expenditure to the GNP rose considerably in response to the rise in per capita GNP. Under the circumstances, the government is not only expected to expand its traditional activities, but to undertake new activities. Once an economy is in early stages of development, the public expenditure rises at an increasing rate in response to a rise in per capita income. Only after reaching a fairly developed stage a stable ratio between the public expenditure and the national income will be obtained.

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