

Does the Indian Economy Support Wagner's Law? An Econometric Analysis

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Abstract

The present study endeavors to examine the validity of Wagner's Law in India over the period 1950/51 to 2007/08. Six versions of Wagner's hypothesis given by different economists have been estimated which support the existence of long-run relationship between economic growth and growth of public expenditure. Two structural breaks have also been given to test the impact of structural changes in Indian economy on the growth of public expenditure. It has been found that the first structural break given for mild-liberalization period causes insignificant changes in the growth elasticity of public expenditure. However, the observed change in the elasticity due to the second phase of intensive liberalization is statistically significant. Nevertheless, the Wagner's law is still supported during the intensive phase of liberalization given a significant fall in the elasticity. Empirical evidences regarding the short-run dynamics refute the existence of any relationship between the economic growth and the size of the government expenditure.

Keywords: Wagner's Law, Public Expenditure, Economic Growth, Cointegration, Error Correction Mechanism (ECM).

JEL Classification Codes: H50, O10, C32

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1. Introduction

In the nineteenth century, public expenditure¹ under the influence of the classicals, played a limited role in economic activity. There was neither any sound classification of government expenditure nor any standard laid on which all such expenditures should be based. However, in the latter part of the nineteenth century, Wagner (1883) observed that there exists a relationship between economic growth and public spending later formulated as 'Wagner's Law of Increasing State Activities'. The fundamental idea behind this relationship is that the growth in public expenditure is a natural consequence of economic growth. In other words, the percentage share of public expenditure increases with an increase in gross domestic product. That is, the growth elasticity of public expenditure is greater than one. According to Wagner, the reason behind the expansion of state activities is a practical approach and is not based upon any formula. Rowley and Tollison (1994) in their study compared the Wagner's law with the principle of comparative advantage. In their opinion, 'Wagner's law explains the complementarity between the growth of the industrial economy and the associated growth in demand for public services of an economic character such as transport and communication networks, waste disposal, and the like, undertaken ordinarily by the government agencies. When the comparative advantage of government declines, the share of public expenditure in total GDP also declines' (quoted in Peacock and Scott, 2000).

However, a number of studies have empirically examined the Wagner's law and have given conflicting results that differ from country to country. In case of Turkey, either tested for an earlier period (i.e. 1950-1990) by Demirbas (1999), or for a later period (i.e. 1965-2000) by Bagdigen and Centinas (2003), no empirical support for Wagner's law was found. In case of Nigeria, for the period 1970-2001, Olomola (2004) confirms the Wagner's hypothesis both in short as well as in the long-run. But a study by Babatunde (2008) on a group of four countries including Nigeria for the period 1970-2005 did not find any empirical support for this law. In case of United Kingdom, Chrystal and Alt (1979) and Yuk (2005) found no empirical support for Wagner's law. But Mann (1980), in case of Mexico, using time series data for the period 1925-1976 found strong support for this law. Likewise, whereas the studies by Gupta (1967), Goffman and Mahar (1971) and Bird (1971) supported the Wagner hypothesis, the studies by Wagner and Weber (1977) and Ram (1986) refuted the validity of Wagner's inference. However, a few studies also endeavored to examine the validity of Wagner's law in case of Indian economy. Amongst these while some supported the existence of Wagner's law in case of Indian economy [see, e.g., Singh and Sahni (1984), Lalvani (1995), Singh (1997), Sahoo (2001)] and some refuted its existence [see, e.g., Bhat et al. (1991) and Mohsin et al. (1995)]. As

¹ Public expenditure is the expenditure incurred by the government authorities for the satisfaction of collective needs and economic and social welfare of the citizens of the country.

Henrekson (1992) pointed out, the test of Wagner's law should focus on time series behavior of public expenditure in a country for as long the time period as possible rather than on a cross-section of countries at different income levels. Therefore, the present study attempts to test the validity of Wagner's law in case of India using time series data spanning over the period 1950-2007.

The purpose of this study is to make reassessment of the Wagner's law in the Indian context by using advance econometric technique of cointegration. The study also takes into account the structural adjustment programmes introduced in early 1980's and 1990's. The reason behind the present analysis is the increasing Central government expenditure since the inception of planning. To pursue the aforesaid objective the present study has been divided into six sections. Including the present introductory one, Section-2 discusses growth and structure of public expenditure in India since the inception of planning. Section-3 provides theoretical exposition and mathematical formulations of different versions of Wagner's law. Section-4 brings out the sources of data and methodological framework utilized to test Wagner's hypothesis. Section 5 presents empirical evidences regarding the validity of Wagner's law in case of India. The final section concludes the whole study and provides some noteworthy policy implications.

2. Structure of Public Expenditure in India: Some Stylized Facts

A striking feature of public expenditure in India is its continuous increase since independence. After independence, India took the responsibility of establishing a welfare state based on a planned economic development. The main objective is to promote the economic and social well-being of the people which enforced the government to come forward and spend for enhancing economic and social welfare. Thus, a continuous upward trend has been observed in public expenditure of the Indian government. The visual inspection of Table 1 provides the trends in revenue² and capital³ expenditure of the Indian public sector. The share of the revenue expenditure to the total expenditure of the Government of India has increased from 65.41 percent in 1950-51 to 83.41 percent in 2007-08. Consequently, the share of the capital expenditure to total expenditure has decreased from 34.59 percent in 1950-51 to 16.59 percent in 2007-08.

² Revenue expenditure is incurred for the normal functioning of the government departments and various services, interest payments on debt incurred by the government, grants given to the state governments and other parties etc. and financed from the receipts of taxes and other revenues such as the contribution of railways, post and telegraphs and civil works, etc.

³ Capital expenditure consists of expenditure on creation of assets like land, building, machinery, investments in shares etc. and loans and advances granted by the Central Government to States and Union Territories governments, government companies, corporations and other parties and met out from the capital receipts which include market loans, external loans, small savings, government provident funds etc..

Table 1: Trends in Total Expenditure of Central Government (Rs. Crore)

Year	Revenue Expenditure	Capital Expenditure	Total Expenditure (2+3)	Gross Domestic Product
1	2	3	4	5
1950-51	346 (65.41)	183 (34.59)	529 [5.44]	9719
1960-61	916 (47.78)	1001 (52.22)	1917 [11.61]	16512
1970-71	3130 (55.65)	2494 (44.35)	5624 [13.08]	42981
1980-81	14410 (63.29)	8358 (36.71)	22768 [17.18]	132520
1990-91	73516 (69.81)	31782 (30.19)	105298 [20.44]	515032
2000-01	277839 (85.33)	47753 (14.67)	325592 [16.91]	1925017
2001-02	301468 (83.20)	60842 (16.8)	362310 [17.27]	2097726
2002-03	338713 (81.96)	74535 (18.04)	413248 [18.27]	2261415
2003-04	362074 (76.84)	109129 (23.16)	471203 [18.56]	2538170
2004-05	384329 (77.13)	113923 (22.87)	498252 [17.31]	2877701
2005-06	439376 (86.88)	66362 (13.12)	505738 [15.41]	3282385
2006-07	514609 (88.21)	68778 (11.79)	583387 [15.44]	3779384
2007-08	594433 (83.41)	118238 (16.59)	712671 [16.49]	4320892

Notes: Figures in Parenthesis of type () represent the percentage of Total Central Government Expenditure and of type [] represent the percentage of GDP.

Source: Authors' Elaboration from Handbook of Statistics on Indian Economy, Reserve Bank of India.

It has also been observed that in the initial two decades (i.e. from 1950-1970) capital expenditure increases at a very fast rate than the revenue expenditure. But from 1970 onward it has been declining continuously and its share in total expenditure has fallen from 44.35 percent to 16.59 percent, which is not a healthy trend for a developing country like India (Pethe and Lalvani, 1999). Further, the share of overall public expenditure to GDP has increased from 5.44 percent in 1950-51 to 16.49 percent in 2007-08. In sum, the given increase in the share of public expenditure to GDP has been attributable only to increase in the share of revenue expenditure. The major reasons behind an increase in the revenue expenditure of the Central government are defence expenditure, administrative expenditure, subsidies, grants-in-aid to states and expenditure on social and economic services⁴. Thus, such a phenomenal increase in the government expenditure over the years corroborates the expansion of public sector in India with economic growth.

3. Wagner's Law: A Theoretical Exposition

Wagner (1883) in his law of increasing state activities states that there is a persistent tendency both towards an 'extensive' and an 'intensive' increase in the functions of the state. New functions are continually being undertaken and old

⁴ Broadly, the revenue expenditure on social and economic services includes expenditure on social welfare services like education, health, water supply and sanitation, housing, urban and rural development, research and development, infrastructural development, tourism and foreign trade etc.

ones are being performed more efficiently and on an extended scale that increases the spending of the Government. Hence, more and more public expenditure is resorted for performing these activities. Thus, social progress brought an increase in state activity which in turn meant more government expenditure (Henrekson, 1993). Wagner had given three main reasons of increasing government expenditure with economic growth. Firstly, with economic growth industrialization and modernization would take place which will diminish the role of public sector for private one. This continuous diminishing share of the public sector in economic activity leads to more government expenditure for regulating the private sector. For example, to save the labor class from exploitation (in the private sector) would require additional expenditure on contractual enforcement as well as on law and order which will lead to increase in public expenditure. Secondly, the rise in real income would lead to more demand for basic infrastructure particularly education and health facilities and, as Wagner asserts, it is the government who provides these facilities more efficiently than private sector. Finally, to remove monopolistic tendencies in a country and to enhance economic efficiency in that sector where lumpy investment is required such as railways, government should come forward and invest in that particular area which will again increase government spending (Bird, 1971).

As has been noted by Dutt and Ghosh (1997), Wagner did not present his law in mathematical form. Wagner also was not explicit in the formulation of his hypothesis. Hence, over the years, different authors used different mathematical forms for testing this law. There are at least six versions of this law (see Table 2) which have been empirically investigated by different economists. The earliest and the simpler version of this law was given by Peacock and Wiseman in 1961 by using the following double log equation from which the elasticity estimates were derived.

$$LNGE = a + bLNGDP \quad (1)$$

Pryor (1969) gave similar explanation of this law by using government consumption expenditure (GCE) instead of total government expenditure (GE) as a dependent variable. These two mathematical versions, however, did not take into account the effect of increase in population. To account for the increase in population, Gupta (1967), while accounting for the increase in population, made use of the following relation for empirically testing the validity of Wagner's law.

$$LN(GE / P) = a + bLN(GDP / P) \quad (2)$$

According to him, Wagner's law may be interpreted as the one wherein growth in real per capita government expenditure (GE/P) is dependent upon the growth in real GDP per capita (GDP/P). In addition, Goffman (1968) gave the following mathematical form, known as the absolute version of the law:

$$LN(GE) = a + bLN(GDP / P) \quad (3)$$

In all models stated above, Wagner's law holds true in case the value of slope coefficient (b) i.e., elasticity, is more than unity.

However, all the above mathematical formulations specify the Wagner's law in absolute sense. While reviewing the law, Timm (1961) concludes that Wagner had relative growth in mind. Therefore, the Wagner's law should be interpreted in a relative sense as one of predicting an increasing relative share of public expenditure as per capita real income grows (Henrekson, 1993). Thus, Musgrave (1969) has explained the growth in public expenditure in the relative sense by using the following relation:

$$LN(NGE / NGDP) = a + bLN(GDP / P) \quad (4)$$

According to him, the growth in the share of nominal government expenditures in nominal GDP (NGE/NGDP) depends upon the real GDP per capita (GDP/P). Mann (1980) also interpreted the law in relative sense. He used the real GDP instead of real GDP per capita as an independent variable. Thus, in case of both the versions (Musgrave and Mann Version), Wagner's law holds true in case the value of slope coefficient (b) exceeds zero i.e., the elasticity is greater than zero (Henrekson, 1993). However, there is no objective criterion to decide which of the six versions is the most appropriate. Therefore, following Demirbas (1999), all the six versions of Wagner's law in case of India during the period 1950-51 to 2004-05 have been tested in this study. The regression form of all six versions of Wagner's law is presented in Table 2.

Table 2: Regression Form of Six Versions of Wagner's Law

S.N.	Version	Regression Equation
Absolute Versions		
1	Peacock-Wiseman (1961)	$LNGE = a + bLNGDP + u_t$
2	Gupta (1967)	$LN(GE / P) = a + bLN(GDP / P) + u_t$
3	Goffman (1968)	$LNGE = a + bLN(GDP / P) + u_t$
4	Pryor (1969)	$LNGCE = a + bLNGDP + u_t$
Relative Versions		
5	Musgrave (1969)	$LN(NGE / NGDP) = a + bLN(GDP / P) + u_t$
6	Mann (1980)	$LN(NGE / NGDP) = a + bLNGDP + u_t$

Source: Demirbas, 1999.

4. Database and Methodology

The data for the present study covering the period 1950-51 to 2007-08 have been culled out from the databases entitled "International Financial Statistics (IFS)" and "Government Financial Statistics (GFS)" provided by the IMF. Whereas the GFS served as the data source for Government Expenditure (GE), all other variables

such as Government Consumption Expenditure (GCE), Gross Domestic Product (GDP), and Population (P) have been squeezed out from IFS. To neutralize the impact of increase or decrease in prices, all the variables have been deflated at 2000-01 prices by using appropriate deflators. For estimating the relative elasticity, the natural logarithms of all the variables have been utilized. An advantage of assorting the variables in natural logarithmic form is to achieve stationarity in the lower order of integration in case the logs of these variables are non-stationary at levels.

To consider the impact of structural shift in Indian economy on growth elasticity of public expenditure, following dummy variables have been introduced:

$$\text{Intercept dummies: } D_1 = \begin{cases} 1: & \text{if } 1980 \leq t \leq 1990 \\ 0: & \text{otherwise} \end{cases} \quad \text{and} \quad D_2 = \begin{cases} 1: & \text{if } t \geq 1991 \\ 0: & \text{otherwise} \end{cases}$$

$$\text{Slope dummies: } Z_1 = D_1 \times X_t \quad \text{and} \quad Z_2 = D_2 \times X_t$$

Where the dummy D_1 represents the first phase of economic liberalization (the so-called Mild-Liberalization phase⁵ i.e., from 1980-81 to 1990-91), and dummy D_2 represents the second phase of economic liberalization⁶ (the so-called Intensive-Liberalization phase i.e., from 1991 onwards).

To test the validity of Wagner's hypothesis, Granger cointegration approach (Engle and Granger, 1987) has been utilized to test the relationship between economic growth and growth in public expenditure. The estimation procedure involves three steps. The first step is to test for stationarity of the time series data with the help of unit root tests⁷. The presence of unit root makes the regression results spurious⁸ and thus disturbs the accuracy of the parameters estimated. An application of Augmented Dickey Fuller (ADF) and Phillip Perron (PP) tests is found suitable to detect whether the selected time series variables are stationary at their levels or not. If data are not stationary at their levels, as most of the time series variables are, then one way of achieving stationarity is to difference the time series data

⁵ The Mild Liberalization phase in India began in 1981 with the SDR 5 billion loan from the International Monetary Fund (IMF). The loan was conditional on an "adjustment programme" which aimed at mitigating the constraints against the growth of private sector; and to increase the leverage of the foreign sector. These policies were consolidated in 1985 by sharply reducing taxes (income and wealth taxes were slashed and estate duty was abolished), introducing modified value added tax (MODVAT), raising MRTP limit and liberalizing the terms and conditions for foreign capital. It continued in a sporadic manner until 1990.

⁶ The economic reforms initiated in 1991 under "Structural Adjustment Programme (SAP)", constitute the second phase of liberalization so-called 'Intensive-Liberalization phase'.

⁷ For detailed discussion on 'Stationarity of Time-Series Data' see Asteriou and Hall, 2007, p.288.

⁸ A problem of spurious regression can occur when two time series variables in a regression are highly correlated whereas there is no actual relationship between them. High correlation is due to the existence of time trends in both time series variables (Granger and Newbold, 1974).

until stationarity is achieved. However, this solution is not ideal. If we difference the variables, the model can no longer give a unique long-run solution (Asteriuri and Hall, 2007). Also this will result into loss of one degree of freedom. To resolve this problem, the methodology of cointegration and Error Correction Mechanism (ECM) seem very useful.

In case the time series variables are non stationary at their levels, then they are said to be cointegrated if any linear combination of these non-stationary variables provides a series which is stationary at levels. This type of relationship is known as long-run relationship between the variables. Granger (1981) introduced a remarkable link between non-stationary processes and the concept of long-run equilibrium. This link is the concept of cointegration. Engle and Granger (1987) further formalized this concept by introducing a very simple test for the existence of cointegrating (i.e. long-run equilibrium) relationships. In such a case, after testing for the existence of cointegration, in case it exists, it becomes necessary to form the model in the equivalent ECM (Error Correction Model) to get causal relationship between time series variables. The Granger representation theorem established that any cointegrated series have an ECM and its converse is also true (see Engle and Granger, 1987). Therefore, cointegration is a necessary condition for an ECM to hold (see Engle and Granger, 1991). To test for long-run relationship between economic growth and public expenditure, the study adopts the Engle-Granger approach of cointegration for single equation case.

According to this approach, if the time series variables are integrated⁹ of same order, then the next step is to estimate the long-run equilibrium relationship via estimating Cointegrating regression equation and obtain the series of estimated residuals (\hat{u}_t). As per our analysis, the Cointegrating regression would be:

$$Y_t = a_0 + b_0X_t + a_1D_1 + a_2D_2 + b_1Z_1 + b_2Z_2 + u_t \quad (5)$$

In order to determine the existence of cointegration, a check is made of on the estimated series of residual for the order of integration by performing Augmented Dickey Fuller (DF) test of unit-roots. The form of ADF test to check for stationarity of the residuals without any constant or time trend is given in equation (6):

$$\Delta u_t = a_1\hat{u}_{t-1} + \sum_{i=1}^n \delta_i \Delta \hat{u}_{t-i} + v_t \quad (6)$$

Note that the critical values for testing stationarity of residuals are more negative than the standard ADF values because the asymptotic distribution of the test statistic differs from the one for standard series. If \hat{u}_t is stationary at levels, i.e.,

⁹ Integrated of order one means that time series variables are stationary when taken at first difference.

$\hat{u}_t \neq I(0)$ then we can reject the null hypothesis that the variables X_t and Y_t are not cointegrated. This series of residuals (estimated from equation 5) can be used to estimate the Error-Correction Model to analyze the long-run and short-run dynamics of the variables. The advantage of using an error correction specification is that, on the one hand it allows for testing short-run relationship through the lagged differenced explanatory variables and, on the other hand, for long-run relationship through the lagged error correction term. As per our analysis the ECM specification is given as under:

$$\Delta Y_t = \alpha_0 + \beta_0 \Delta X_t + \alpha_1 D_1 + \alpha_2 D_2 + \beta_1 Z_1 + \beta_2 Z_2 - \Pi u_{t-1} + v_t \quad (7)$$

Where β_0 is the impact multiplier that measures the immediate impact that a change in X_t will have on a change in Y_t , Π is the feedback effect, or the adjustment coefficient, and shows how much of disequilibrium is being corrected, i.e., the extent to which any disequilibrium in the previous period effects any adjustment in Y_t . In this case, \hat{b}_0 (estimated value of b_0 from equation (5)) will be the coefficient of long-run relationship between cointegrated variables. From the same equation, we can also examine the long-run elasticity in the post reform period. It is calculated by adding the coefficients of slope dummies (b_1 and b_2) separately in the coefficient of exogenous variable (b_0).

i.e., i) $(b_0 + b_1)$... For the period 1980 to 1990; and

ii) $(b_0 + b_2)$... For 1991 onwards.

But if the series of residuals obtained after estimating equation (5) are not stationary at levels then simple Granger Causality test at first differences (as we suppose that our time series variables are integrated of order one) is applied to know the short-run two way relationship between time series variables (Mahdavi et al., 1994).

5. Empirical Results

The first step of Granger approach of cointegration is to test the presence of unit root in time series variables used in the present study. Two alternative tests, Augmented Dickey Fuller (ADF) and Phillip Perron (PP), have been implemented to check for the existence of unit root in the time series data. The results of both these tests are presented in Table 3.

Table 3: Testing the Order of Integration by Applying Unit Root Test

Variable	Test Applied	
	Augmented Dickey Fuller (ADF)	Phillip Peron (PP)
LNGDP	I(1)*	I(1)*
LNGE	I(1)*	I(1)*
LNGCE	I(1)*	I(1)*
LNGDP/P	I(1)*	I(1)*
LNGE/P	I(1)*	I(1)*
LNNGE/NGDP	I(1)*	I(1)*

Notes: i) * denotes the significance at 1% level; ii) LN stands for Natural Logarithms.

Source: Authors' Calculations

Both of the tests conclude that all the variables are integrated of order one I(1), i.e., the data are non-stationary at levels but stationary after differenced once. Since, all the variables are integrated of the same order, we can test for the existence of a long-run relationship between economic growth and public expenditure via applying Granger cointegration approach on all six versions of Wagner's law. For testing validity of Wagner's hypothesis, we have estimated six regressions (see Table 2) separately including dummy variables to calculate the residuals of each regression equation. The results of estimated regression are presented in Table 4.

Table 4: Results of Cointegration Regression

Version of Wagner's Law	Intercept (a_0)	Long-Run Income Elasticity (b_0)	Structural Break				ADF Test Statistic for Residual Series
			Coefficients of Intercept Dummy (D_1 and D_2)		Coefficients of Slope Dummy (Z_1 and Z_2)		
			a_1	a_2	b_1	b_2	
I	II	III	IV	V	VI	VII	VIII
1	-26.589** [0.000]	1.829** [0.000]	4.819 [0.555]	21.782** [0.000]	-0.164 [0.549]	-0.732** [0.000]	(-)4.424**
2	-21.429** [0.000]	3.082** [0.000]	7.766 [0.109]	18.231** [0.000]	-0.835 [0.104]	-1.944** [0.000]	(-)5.261**
3	-14.946** [0.000]	4.565** [0.000]	13.803** [0.009]	28.172** [0.000]	-1.480** [0.008]	-2.993** [0.000]	(-)6.189**
4	-18.303** [0.000]	1.540** [0.000]	-0.264 [0.956]	13.817** [0.000]	0.007 [0.966]	-0.464** [0.000]	(-)5.585**
5	-21.429** [0.000]	2.081** [0.000]	7.766 [0.109]	18.231** [0.000]	-0.835 [0.103]	-1.944** [0.000]	(-)5.261**
6	-26.589** [0.000]	0.829** [0.000]	4.820 [0.555]	21.782** [0.000]	-0.164 [0.549]	-0.732** [0.000]	(-)4.424**

Notes: i) * and ** represent that the coefficient is significant at five and one percent level of significance respectively; ii) Figures in parentheses of type [] represent the p-value of the respective coefficient in the estimated regression; and iii) The critical value used for ADF test statistic for residual series is (-) 3.17 and (-) 3.73 at five and one percent level of significance, taken from Mackinnon (1991).

Source: Authors' Calculations

As discussed in the previous section that the estimated regression will demonstrate long-run relationship between the two variables only when the residuals become stationary at levels, otherwise these results are not reliable to interpret because of the problem of spurious regression. Therefore, it is necessary to check the order of integration of the residuals before interpreting the long-run coefficients. The study uses simple Augmented Dickey Fuller unit root test 'with no intercept and time trend' to verify the existence of long-run relationship. Table 4 presents the results of ADF test for the residual series of six regression versions of Wagner's law (see Column VIII). The negative and significant test statistic at levels confirms the presence of cointegration among time series variables in all the six regression versions of Wagner's law. The direct connotation of these results is that, in case of India, there exists long-run relationship between economic growth and growth in public expenditure. Since the variables are cointegrated in all the six versions of Wagner's law, therefore, the estimated results given in Table 4 should be regarded as reliable to explain the long-run relationship between economic growth and the growth in public expenditure. As depicted in Table 4, the real income elasticity for all the versions are greater than zero (i.e., more than one in case of absolute versions and more than zero in case of relative versions) which confirm the validity of Wagner's law in case of India. In other words, we can say that in the long-run one percent increase in GDP will lead to more than one percent increase in total government expenditure. In addition, the significant coefficient of dummy D_2 and Z_2 in all the cases confirms that, in the long-run, the impact of economic reforms initiated in the intensive liberalization phase on the growth of public expenditure is significant. Table 5 presents the impact of structural break on long-run elasticity of public expenditure via calculating period wise elasticity. As it is evident from Table 4, the impact of mild-liberalization on long-run income elasticity of public expenditure is insignificant. Therefore, the change in elasticities during the second sub-period (i.e. intensive liberalization phase) has been reported.

Table 5: Period-Wise Long-Run Elasticities

Version of Wagner's Law	Whole Period (1950-2007) (b_0)	Intensive Liberalization Phase (1991-2007) ($b_0 + b_2$)
1	1.829	1.097
2	3.082	1.138
3	4.565	1.572
4	1.540	1.076
5	2.081	0.137
6	0.829	0.097

Source: Authors' Calculations

It is evident from Table 5 that during the post reform period, there has occurred, irrespective of the versions of Wagner's law, a decrease in the long-run income elasticity of public expenditure. However, it still validates the Wagner's law in case of India as the elasticity coefficient is greater than one for absolute versions and greater than zero for relative versions.

The presence of cointegration implies that there exists short-run dynamics, which will lead to equilibrium in long-run. Therefore, it is possible to estimate an Error Correction Model to know the short-run dynamics between economic growth and the growth of public expenditure in case of India. Table 6 presents the results of an error correction model (ECM).

Table 6: Results of Error Correction Model (ECM)

Version of Wagner's Law	Intercept (α_0)	Short-run Income elasticity (β_0)	Structural Break				Adjustment Coefficient (Π)
			Short-run Coefficient of Intercept Dummy (D_1 and D_2)		Short-run Coefficient of Slope Dummy (Z_1 and Z_2)		
			α_1	α_2	β_1	β_2	
1	0.053* [0.014]	0.497 [0.212]	2.020 [0.745]	-1.702 [0.467]	-0.068 [0.744]	0.055 [0.474]	-0.431** [0.000]
2	0.039* [0.019]	0.715 [0.070]	0.978 [0.780]	-0.801 [0.447]	-0.104 [0.778]	0.078 [0.464]	-0.491** [0.000]
3	0.056** [0.001]	0.983* [0.016]	1.320 [0.700]	-0.671 [0.515]	-0.140 [0.698]	0.064 [0.541]	-0.498** [0.000]
4	0.038** [0.008]	0.468 [0.079]	0.260 [0.950]	-1.199 [0.439]	-0.008 [0.951]	0.039 [0.442]	-0.607** [0.000]
5	0.039* [0.019]	-0.285 [0.464]	0.978 [0.780]	-0.801 [0.447]	-0.104 [0.778]	0.078 [0.464]	-0.491** [0.000]
6	0.053* [0.014]	-0.503 [0.207]	2.020 [0.745]	-1.702 [0.467]	-0.068 [0.744]	0.055 [0.474]	-0.431** [0.000]

Notes: i) * and ** represent that the coefficient is significant at five and one percent level of significance respectively; ii) Figures in parentheses of the type [] represent the p-value of the respective coefficient in the estimated regression.

Source: Authors' Calculations

The adjustment coefficient, as expected, is negative and statistically different from zero, thus suggesting that any deviation of public spending from the value implied by the long-run equilibrium relationship with per-capita GDP brings about a correction in the opposite direction. In particular, the error correction coefficient is -0.431 both for the 1st and 6th version suggesting a relatively slow adjustment to long-run equilibrium in about two years and four months (i.e., $1/0.431$). In case of 2nd and 5th version the same coefficient is -0.491 suggesting the quicker adjustment towards long-run equilibrium in about 2 years (i.e., $1/0.491$). The same coefficient is slightly larger (i.e., -0.498) in case of 3rd version, suggesting that the adjustment towards long-run equilibrium is possible in 2 years (i.e., $1/0.498$).

However, the 4th version suggests quicker adjustment in between about one year and eight months (i.e., $1/0.607$). Moreover, given all the insignificant short-run income elasticities and coefficients of dummy variables, the short-run relationship is found to be absent in case of all the versions of Wagner's law.

6. Conclusion and Policy Implications

The present paper provides empirical support to the strict version of the Wagner's law in case of India for the period 1950-51 to 2007-08. Two structural breaks have been given (i.e. one for the period of mild liberalization and other for the period of intensive liberalization) to test the validity of Wagner's law. To test the hypothesis i.e., whether the growth elasticity of public expenditure is greater than one or not, the popular six mathematical models of Wagner's law have been estimated. An econometric based cointegration analysis has been utilized to identify the long-run relationship between the time series variables. This is the best suited technique to find out short-run as well as long-run relationships between time series variables. It also tells us about the short-run dynamics of error correction, which helps to achieve equilibrium in the long-run.

The overall conclusion that emerges from the empirical analysis is that there exists long-run relationship between economic growth and growth of public expenditure in case of India. Thus, the results provide a strong empirical support for the existence of Wagner's law in pre and post reforms period. It has also been found that the impact of second phase of liberalization is statistically significant and supports the Wagner's law even when a significant fall in the elasticity in the post reform period had taken place. Empirical evidences regarding short-run impact of economic growth on public expenditure is insignificant which confirms the absence of any instantaneous impact of increasing GDP on the size of government expenditure.

In sum, it is evident from the empirics that the public expenditure is growing more rapidly than the income of the economy and hence validates Wagner's law in case of India. The observed increase in the share of public expenditure to GDP is the result of continued growth in the revenue expenditure on subsidies, interest payments, administrative and defence services which are non-developmental in effect. Since the non-developmental expenditure from revenue account consists of expenditure on administrative services, pensions and grants to states and union territories to finance their non-developmental expenditure and the most important item in this category is defence expenditure. Therefore, the Indian government must thoroughly scrutinize the unnecessary expenditure, which is non-development in nature and focus on that type of activities which has more developmental effect.

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