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# Evidence of Wagner law in India

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**Abstract**
The debate on public expenditure and income is not new. The purpose of this paper is to analyze the Wagner law for Indian economy. We give an attempt to find evidence for Wagner law in Indian economy using time series data, unit root test and vector autoregressive method for the period 1970-2015. We found that two versions of Wagner law i.e. Peacock-Wiseman version and Gupta version of Wagner law hold true for Indian economy.

**Keywords:** wagner law, evidence

## Introduction

In the literature of public finance Wagner law has achieved considerable attention and counted as one of the most debated theories in recent years.The study of the relationship between government expenditure and income is prerequisite to acquaint us with the knowledge of long term structural dynamics of public finance issues and the policy relevant issues (Arpaia and Turrini, 2008). Various studies provide us mixed evidence on the Wagner law and the debate is unending.

Narayan *et al*., (2012) [6] examined Wagner law using panel data for 15 major Indian states. Magazzino *et al*. (2015) [9] analyzed the relationship between public expenditure and income in European countries showing that the results were more Wagnerian than Keynesian. Srinivasanp (2013) confirmed the causality from economic growth to public expenditure both in short run and long run. Another result of this study was that this expansion was due to rise in non developmental expenditure. Ansari *et al*. (1997) [4] tested Wagner law for three African countries- Ghana, Kenya and South Africa. However their tests did not support Wagner law for these countries. Bansal and Shardha (2012) [5] using cross section data for 29 Indian states found that Wagner hypothesis does not hold true in India and public expenditure is growing at a lower rate than the economic growth. Gangal and Gupta (2013) [8] observed that public expenditure causes economic growth and vice versa. They suggested that the changes in government expenditure play an important role in achieving higher growth. Verma and Arora (2010) [11] using time series data for the period 1950-2007, provided empirical evidence for the Wagner law in long run.

This paper studies the Wagner law in India using time series data for the time period 1970-2015.

## Data sources

Annual data for the total expenditure and gross domestic product is obtained from handbook of statistics on Indian economy. Reserve bank of India provides data for both these variable tabulated in time series compiled from various budget documents. Time period for the study is 1970-2015.

## Methodology

To test the Wagner theory in case of Indian economy we have utilized two versions of wager law. The first version is Peacock-Wiseman version which shows a relationship between total public expenditure and total output. The second version is based on per capita expenditure and per capita output.

Regression equations can be defined as follows:

1. Peacock-Wiseman version(1961)

$$G_t = a_0 + a_1 Y_t + e_t$$

2. Gupta version(1967)

$$(G/P)_t = b_0 + b_2 (Y/p)_t + e_t$$

Here G is the total government expenditure, Y is the gross state domestic product of India and P represents population. G/P is per capita government expenditure and Y/P is per capita gross state domestic product

The methodology adopted for this analysis is;

1. Time series data for gross domestic product, total expenditure and population was taken from reserve bank of India database for the period 1970-2015 at base price 2004-05.
2. Converting the total expenditure data to the base price 2004-05 using wholesale price index as deflator.
3. Calculating per capita expenditure and per capita gross state domestic product by dividing the total expenditure and total GDP by population.
4. The augmented dickey fuller test is used to check the stationary condition of the series.
5. If the series is non-stationary it should be converted to stationary series.
6. In the end we use the vector autoregressive (VAR) method to regress the total expenditure and per capita total expenditure on gross domestic product and per capita gross domestic product respectively.

The total expenditure by the government is divided into two parts- development and non-development expenditure. These heads of expenditures can further be divided into revenue expenditure and capital expenditure. Our purpose in this paper is to analyze the Peacock-Wiseman and Gupta version of Wagner law in Indian economy using total expenditure and total income i.e gross domestic product.

In order to test for the Wagner law, both the series should be stationary. We tested the stationary condition by using augmented dickey fuller test. The results showed unit root at

level for all variable. We cannot utilize such series for empirical analysis as it will be a spurious regression. So we need to transform the data so that we get stationary condition satisfied. So we took the log transformation of all variables. The results of the augmented dickey fuller test for this transformed data set provided stationary time series at first difference.

After checking for the unit root we do the regression analysis to test both the models.

**Regression analysis**

**1. Peacock-Wiseman version**

**Table 1:** ADF unit root test at level

| Variable | t-statistics | P-value* |
|---|---|---|
| Log(GDP) | -0.499978 | 0.8816** |
| Log (total government expenditure) | -2.022689 | 0.2764** |

*Mackinnon (1996) one sided p-value,
**denotes null hypothesis not rejected at 0.05 level

**Table 2:** ADF unit root test at first difference

| Variable | t-statistics | P-value* |
|---|---|---|
| Log(GDP) | -4.610370 | 0.0005** |
| Log (total government expenditure) | -5.925247 | 0.0000** |

*Mackinnon (1996) one sided p-value
** denotes null hypothesis rejected at 0.05 level

**Table 3:** Vector autoregressive model for peacock -Wiseman version

| Variable | Coefficient | t-statistics* | p-value |
|---|---|---|---|
| LogGDP(-1) | 0.533472 | 2.164124 | 0.0365 |
| LogGDP(-2) | -0.44424 | -1.878217 | 0.0677 |

**2. Gupta (1967) version**

**Table 4:** ADF unit root test at level

| Variable | t-statistics | P-value* |
|---|---|---|
| Log(per capita GDP) | 0.451726 | 0.9829** |
| Log (per capita government expenditure) | -1.077226 | 0.7163** |

*Mackinnon (1996) one sided p-value,
**denotes null hypothesis not rejected at 0.05 level

**Table 5:** ADF unit root test at first difference

| Variable | t-statistics | P-value* |
|---|---|---|
| Log(per capita GDP) | -4.582365 | 0.0006** |
| Log (per capita government expenditure) | -6.051408 | 0.0000** |

*Mackinnon (1996) one sided p-value,
**denotes null hypothesis not rejected at 0.05 level

**Table 6:** Vector autoregressive model for Gupta (1967) version

| Variable | Coefficient | t-statistics* | p-value |
|---|---|---|---|
| Log per capita GDP(-1) | 0.513087 | 2.044326 | 0.0481 |
| Log per capita GDP(-2) | -0.391521 | -1.573846 | 0.1240 |

Because the time series are non stationary at level but stationary at first difference we checked for the long term association between both the variables. Johansen cointegration test failed to show long term association between the variables in both models. If there is no cointegration between the variables it is advised to use vector auto regression (VAR) method. The results as summarized in the table showed that the coefficient of log(GDP) and log(per capita GDP) in the Peacock-Wiseman version and Gupta version are found to be positive and significant for the first lag lenth.This implies that the positive income elasticity of total expenditure and the per capita income for the first lag. This implies that Wagner law is valid for Indian economy.

We checked for the optimum lag lenth of our model by applying Akaike information criterion, Schwarz information criterion and Hannan-Quinn information criterion to check the optimum lag lenth of our models. They suggested 2 lag lengths which was used in our regression models.

Then we checked for the normality condition for the residuals of our models. We could not reject the null hypothesis that residual are multivariate normal which is always desirable for a good regression model for empirical analysis.

We tested for the VAR serial autocorrelation using autocorrelation LM test with 12 lag specification. There was serial autocorrelation.

We get high R-square value 0f 0.99. Even with a high R-square value our models are not spurious because the residuals in the models are normally distributed and the value of R-square is not greater than the Durbin Watson test statistics.

**Conclusion**

The aim of this study is to determine the relationship between public expenditure and income in Indian economy i.e testing the Wagner law. The results from our analysis confirmthat this law is applicable in Indian economy for the time span of 1970-2015. As the gross domestic product and the per capita gross domestic product increases, it leads to rise in public expenditure and per capita expenditure respectively.

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