Causality between Government Expenditure and Domestic Output: A Case Study of Indian States

Sudipta Jha
Assistant Professor, Department of Economics, Vidyasagar University

Biswajit Nayak
Ph.D Scholar, Department of Economics, Vidyasagar University

Abstract

In this paper, the causality between different kinds of government expenditures and net state domestic products of 16 major Indian States is studied. This is to understand whether the Indian economy is showing evidence to the Wagner Hypothesis that states, with economic development the demand and thus supply of government services increases as against the Keynesian prescription where government expenditure is considered to be an effective policy tool to boost the domestic economy.Using time-series econometric tools like cointegration and long-run and short-run causality tests weak shreds of evidence of Wagner law for some of the Indian states are found. Overall a lack of concrete long-run (and/or even short-run) relationship between different kinds of government expenditures and Net State Domestic Products indicates an absence of a long-run comprehensive plan in designing of the government expenditures.

Key Words: *Government expenditure, Net State Domestic Product, Co-integration, Causality, Wagner Law*
JEL Classification: *H5. H7, H8*

1. Introduction

The relationship between government expenditure and overall economic performance in a capitalist society is one of the most controversial economic issues to date. The school of economics emphasising the importance of aggregate demand in determining the total output always points to fiscal policy as a macro-stabilising tool. But, on the contrary, the classical or rightist schools believe that government is a 'necessary evil'. The government's involvement in the economic activity must be as minimal as possible. They not only point to socio-political factors like rent-seeking or lack of competitiveness etc. but also from purely economic and financial grounds they say, it can actually crowd out private investment. But, due to the very nature of government expenditure, nobody denies that it plays a crucial role in the process of economic development through its structural intervention. The major part of Government expenditure consists of expenditure on physical infrastructures like roads, railways, pools, bridges, etc., social infrastructure like schools, colleges, hospitals, sports amenities, etc., and expenditure on services related to social wellbeing like education, health to other social requirements like housing, sanitation, clean water, etc. Now, with these structural changes/social improvements, we must have a commensurate improvement in the performance of economic growth. But, sometimes the question of causality also becomes a moot point. Over the past one and half centuries, we have seen much research on this subject

(Wagner 1883, Keynes 1936, Peacock and Wiseman 1961, Musgrave 1969, Rubinson 1977). So, apparently, in the literature, the two opposing views in this regard came out as the Keynesian view and the Wagner view. This is because the Keynesians say that with the increase in government expenditure in an underemployment situation we can increase the scale of economic activity through the multiplier effect while the Wagner law says that government expenditure increases with the increase in economic growth because of increased demand for government services and financing capacity.

There is also a debatable area of research on the subject matter of the efficacy or on the importance of government expenditures on Economic Growth and/or development. In this case, also some studies found the impact positive while others found it negative or inconclusive viz. Barro (1990), Baffes et. al. (1993), Sheehey (1993), Vedder and Gallaway (1998), Folster and Henreson (2001), Romer and Romer (2010) and Furceri and Ribeiro (2008), etc.

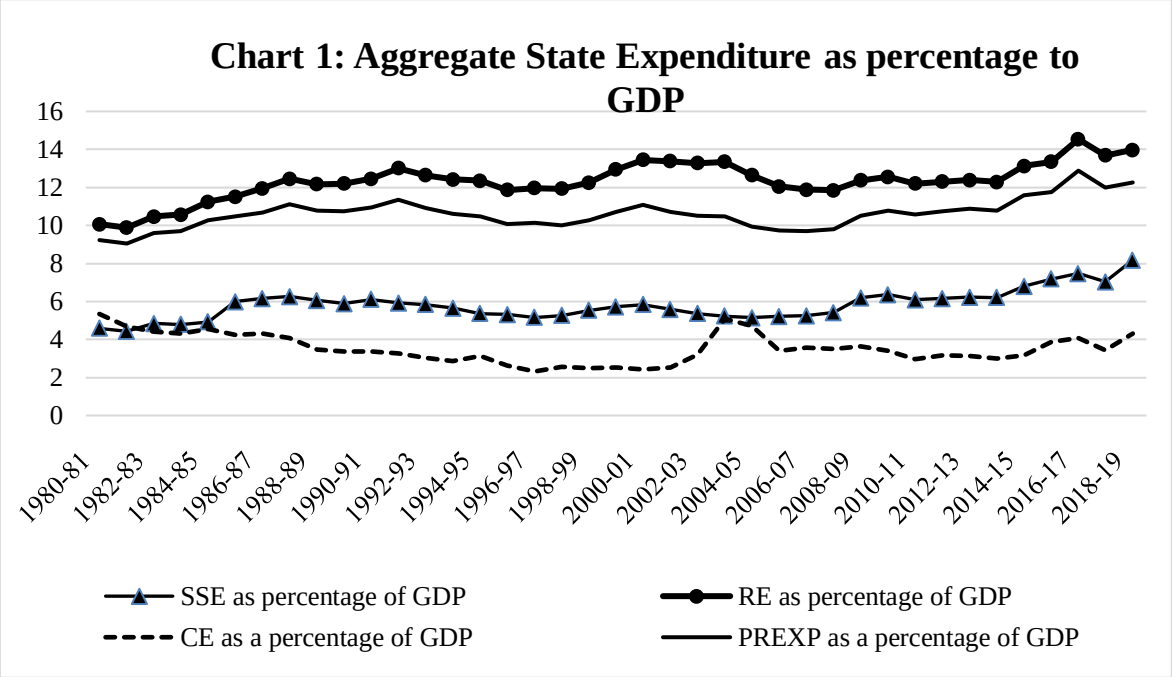
In this study, we have mainly concentrated on the causality issue stated above. This problem of causality becomes more severe when a developing economy simultaneously suffers from resource scarcity as well as increased demand for public services. Now, India is a developing economy with a federal structure, which requires an analysis of its State finances and their relation with the State's Domestic Products. The importance of State finance can be gauged from the fact that together the states spend on an average last ten years 67% of aggregate development expenditure while their own tax and non-tax revenue share in total government revenue is only 37%. So, keeping in mind this own resource scarcity at the sub-national levels, it's become very important to know whether the Indian economic structure at the state level exhibits the Keynesian rule or the Wagner rule in understanding the pattern of (and also the effect of) government expenditure. In this study, we will try to explain the long-run relationship (if any) and the directional causality among the different kinds of Government Expenditures and economic growth. If we find that government expenditures of any kind are actually causing the economic growth of the States of India, we can provide evidence for Keynesian rule while if we find that economic growth is actually causing a higher government expenditure then it will support the Wagner law. We have considered different kinds of government expenditures like Revenue Expenditure, Capital Expenditure, Social Sector Expenditure, Primary Revenue Expenditure, and Aggregate Expenditure because different expenditures are designed to affect the economy in different ways. The capital expenditure or particularly capital outlay is expected to have a more profound effect on the long-run economic growth of an economy through not only its direct infrastructural services it can provide but also through the crowding-in effect of the private investments. The revenue expenditure is also not only important in providing regular services but also actually complements the capital expenditures already done. The Social Sector Expenditure under both heads of capital and revenue expenditures are specially designed for the purpose of achieving social equality and particularly to cater to the underprivileged section of the society. Thus by uplifting the quality and quantity of human capital it can actually augment the economic growth of the economy. But due to the problem of resource mobilisation of the government sector in a capitalist society sometimes it can be difficult for the government to incur expenditures in all the areas stated above at a time. In that case, only economic growth can provide the government the opportunity to mobilise more resources to spend for the society according to its demand for public services. In this study, we would like to intervene on this particular point of the causal effect of growth and government expenditures for major Indian states.

The study is organised as follows: the next section gives a brief overview of the State finances of India. Then section III provides the literature review and research gap. The fourth

section details the data and methodology used and section V presents the results. The final section discusses the results and concludes.

2. State Finances of India

If you look at the pattern of India's aggregate state expenditure as percentage of Gross Domestic Product (GDP), we can see that from the 1980s to the present day, it remains more or less stagnant with occasional highs and a general trend of increasing revenue expenditure at the expense of capital expenditure (Chart 1). One important casual observation is that the aggregate government expenditure and capital expenditure in particular as percentage to the GDP started rising from 1996-97 to 2003-04 and then it started to decline while the revenue expenditure took a slight upswing in its path. Even though this type of graphical representations are very crude measures of causality, we can at least relate this to the FRBM act of 2004 after which states became more cautious in incurring expenditures as it put some restrictions on their budget. Also this phase of high capital expenditure may have some bearing on India's high growth phase of early 2000 if we allow some time lag to government expenditure to affect the economy. Now, if we look at the more disaggregated level of state finance for a more recent period we can observe some discrepancies among the states.



We have taken only the major 16 states for the purpose of our analysis viz. Andhra Pradesh (AP), Assam, Bihar, Gujrat, Haryana, Himachal Pradesh (HP), Karnataka, Kerala, Madhya Pradesh (MP), Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu (TN), Uttar Pradesh (UP) and West Bengal (WB). This is because the other states are special in regard to their geographical positions and/or political reasons. So, expenditure and receipts patterns are not directly comparable to those with the other major states we have taken due to the special demands for particular types of public expenditures and also various special kinds of grants they receive.

Now, for a quick look at the revenue and expenditure patterns of the major Indian states, we have presented the whole post-liberalisation scenario in the Table 1. As one of the most important institutional changes on the fiscal front is the enactment of the Fiscal

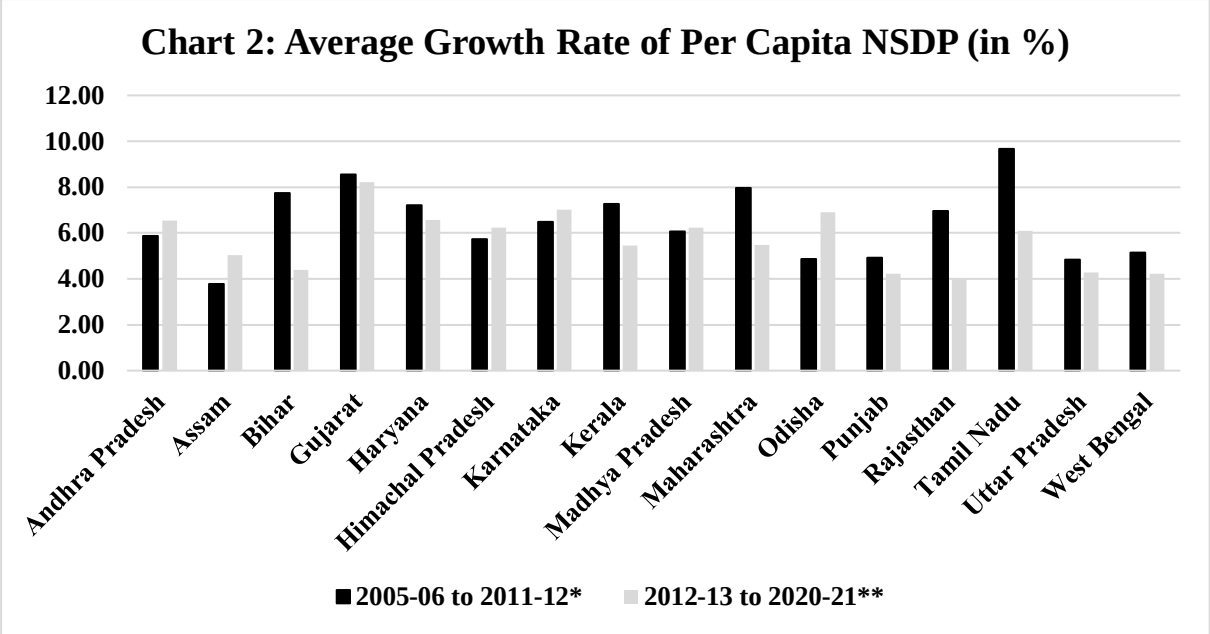
Responsibility and Budget Management (FRBM) act of 2003, we have subdivided the whole period into pre and post FRBM periods. But from the following table 1, we can see that in terms of revenue earning, no significant improvement is seen from the end of the states. Only states like MP, UP, Karnataka, and Haryana own tax revenue as a percent of their NSDP registered more than one percent increase. In terms of non-tax revenue, most of the states are showing a decline in their earnings as a percent of the SNDP. No significant change can be observed in terms of capital outlay also. Only Bihar, MP, UP, and Chhattisgarh have done relatively better in this regard. The impressive thing in the table is that almost all of the states have reduced non-development expenditure and increased that of development. But here, we must state that non-development expenditure includes interest payments whose decline can be attributed to the debt-restructuring programme associated with the enactment of the FRBM act. Social Sector Expenditure (SSE) on an average showed a slightly increasing trend for most of the states for the post FRBM period.

Table 1: Average Figures for Major Revenue-Expenditure Indicators of Indian States

	Before FRBM act (1991-92 to 2003-04)							**After FRBM act (2004-05 to 2017-18)**						
NAME OF STATES	OTR	NTR	Cap. Exp.	Cap. Outlay.	Dev Exp*	Non Dev Exp.*	SSE	OTR	NTR	Cap. Exp.	Cap. Outlay.	Dev Exp**	Non Dev Exp.**	SSE
	1	***2***	***3***	***3.1***	***4(includes apart of 3 and 6)***	***5 (includes a part of 3)***	***6 (includes a part of 3)***	***1***	***2***	***3***	***3.1***	***4(includes apart of 3 and 6)***	***5 (includes a part of 3)***	***6 (includes a part of 3)***
Andhra Pradesh	10.2	3.0	5.9	2.7	17.7	10.0	10.4	11.4	2.6	6.6	3.7	13.4	4.9	10.7
Bihar	5.1	1.9	3.8	1.6	13.3	10.4	10.6	5.2	0.6	6.5	4.6	25.9	9.3	11.7
Chhattisgarh	4.9	2.0	2.8	1.6	11.2	4.8	6.0	6.8	2.4	4.0	2.9	21.5	5.0	9.7
Gujarat	6.8	2.4	3.4	1.8	10.0	5.4	5.6	6.5	1.2	3.3	2.4	8.1	3.4	4.9
Haryana	6.9	4.7	3.0	1.3	8.3	5.5	4.7	6.9	1.8	2.7	1.6	11.3	4.0	5.0
Jharkhand	4.5	2.1	4.3	3.0	13.7	5.8	8.7	4.8	2.3	5.2	3.4	21.0	6.4	9.2
Karnataka	6.0	1.2	2.4	1.5	8.5	4.2	4.7	7.3	0.8	3.1	2.3	10.1	3.0	5.3
Kerala	6.4	0.8	2.1	0.9	8.2	6.1	5.7	6.8	0.9	1.9	0.9	8.8	6.7	5.0

Madhya Pradesh	5.8	2.4	3.0	1.7	12.2	5.8	7.2	7.4	2.0	6.1	3.5	18.2	4.9	8.2
Maharashtra	5.9	1.5	2.3	1.4	7.7	5.1	4.5	6.5	0.9	2.3	1.5	8.2	3.4	4.7
Odisha	3.9	1.6	4.3	2.1	11.3	8.6	7.4	5.7	2.3	4.1	2.7	18.6	5.6	8.0
Punjab	6.0	3.6	3.2	1.1	7.3	10.6	4.0	6.9	2.2	3.2	1.0	18.7	6.9	4.3
Rajasthan	5.1	2.2	4.0	2.4	11.5	7.6	7.0	6.2	1.9	4.2	2.4	16.5	5.3	7.8
Tamil Nadu	7.0	1.0	2.0	0.8	8.5	5.2	5.5	7.4	0.9	3.1	1.8	11.2	4.3	5.5
Uttar Pradesh	4.7	1.2	3.7	1.4	8.9	6.9	5.7	6.6	1.7	5.4	4.0	17.3	7.8	8.2
West Bengal	4.8	0.5	2.9	0.8	7.6	7.7	5.8	4.8	0.5	2.7	1.0	11.7	5.9	6.7
Note: Figures are as per cent of SGDP.														
OTR: Own Tax Revenue; NTR: Non Tax Revenue; All the other notations have their usual meaning.														
* for year 2002-03; ** for the year 2016-17.														
Source: Own Calculation based on RBI data.														

Now, if we look at the growth performances of the major 16 Indian states we can see that some of the states like Orisha, Assam have improved in terms of per capita real NSDP growth while most of the others like Tamil Nadu, Rajasthan, Kerala, Bihar, etc. witnessed a decline in the per capita real NSDP growth rate (Chart 2).



*2004-05 base; **2011-12 base.

Source: Calculated from RBI data.

But whether changes in government expenditures (of any kind) have any bearing on this change in the growth pace, we need to use econometric techniques as discussed in the fourth section. This is because first of all government expenditures can affect the economy at varying time lag and also this is not the only factor that affects economic growth. So, casual observations will not be sufficient here to indicate causality.

3. Literature Review

On the issue of the prevalence of Wagner law or on the causality between government expenditure and economic growth there is ample research we can find both from the national and international grounds. Here in the following we are citing some of the research articles for different sets of countries, both advanced and developing:
Chang (2002), studied the Wagner law for three emerging Asian countries, Thailand, South Korea, and Taiwan along with three industrial countries namely, the USA, the UK, and Japan over a long period of time from 1951 to 1996. He employed ADF and KPSS tests for Stationary check and Johansen, Johansen, and Juselius test was used to check for the long-run relationship between income and government spending. He found a long-run relationship and an indication of Wagner law between income and government spending for all the selected countries except for Thailand.

Lamartina and Zaghini (2011) applied a panel cointegration analysis for 23 OECD countries to examine the said relationship. Empirical findings of a positive correlation between public spending and per-capita gross domestic product (GDP) are consistent with Wagner's law. They also found that the relationship is stronger for a lower-income groups of OECD countries.

Afonso and Alves (2017) checked the validity of Wagner’s law for the selected European countries over the period 1996 to 2013. They used panel data and SUR methods for this

study. They found Wagner's law validity for some kinds of government expenditures for some of the European countries.

Akitoby et al (2006) tried to investigate the short-run and long-run relationships between government spending and output for 51 developing countries. They found evidence of cointegration between the variables in 70% of countries for at least one kind of government expenditure. This relationship is consistent with Wagner's law.

Burney (2002) investigated empirically Wagner's and Keynesian hypotheses on EU-27 over the period 1970-to 2007. They used several time series tools to check correlations among the variables. They concluded that the result of the study supported Wagner's hypothesis.

But there are few studies also which support the Keynesian law or oppose the Wagner law like Abizadeh and Yousefi (1998), Ahuja, D, and D Pandit (2020). Ahuja, D, and D Pandit (2020) use panel data set of 59 countries from 1990–to 2019. Their results of unidirectional causality from government expenditure to economic growth lend support to the Keynesian hypothesis.

Huang (2006), tried to examine the existence of Wagner's law for Chania and Taiwan. For this study, he considered time series data over the period 1979 to 2002. They used the Unrestricted Error Correction Model (UECM) to estimate the long-run relationship between government expenditure and output. But they concluded that there is no existing long-run relationship between government expenditure and output.

For India among many studies, Pradhan (2007) supports Keynesian law while Ray. et.al (2019) finds support for Wagner law. Also, Nirola, N., Sahu, S. (2020), using the second-generation panel unit root and cointegration tests found support for the Wagner law for both development and non-development expenditures for 15 non-special category Indian states. Ray, M., M. Saragi, and S. Mishra (2019) studied all 28 Indian states together and at their different level of development for the time span of 2003-to 2015. They applied the panel unit root test and panel co-integration, and the Toda–Yamamoto causality test and found the support of Wagner Law for developed to less developed states. But for least developed states they found bi-directional causality between government expenditure of both kinds, capital, and revenue, to growth.

Research Gap: From our brief survey of literature we find that there less consensus at the national or international level on the prevalence of Wagner or Keynesian law, though Wagner law attracts more empirical support. This is actually what is expected when we look at the long horizon. Keynesian prescription is more applicable for the short-run where the consensus is much less. So, we would like to intervene in this area.

Also, the individual states of India differ significantly not only in terms of their economic development, performance or size, but also, there exists a significant horizontal imbalance regarding public finance. The varying economic, social, and environmental conditions create such horizontal imbalances among the states. Also, it is difficult to club even the industrial states due to their heterogeneous nature. The industrialised states with high per capita income automatically enjoy a rich tax base. But this may not imply they all face lower demand for public services (e.g., the most advanced state Maharashtra contains the greatest slum within it). So, keeping in mind such differences, we have examined each of the states separately instead of using the most common method of pooling or panel data analysis. We have taken 1980-81 to 2019-20 as our study period.

Also, along with revenue and capital expenditure, we have used other sub-groups of expenditures like social sector expenditure, and primary revenue expenditure to analyse the causal effect on and of SNDP.

4. Data and Methodology

To find out the direction of causality, we have considered time-series data for 36 years from 1980-81 to 2018-2019 of 16 major states in India sourced from RBI. The variables we have taken are the log values of the following, Net State Domestic Product (LNNSDP), Revenue Expenditure (LNREXP), Capital Expenditure (LNCEXP), Social Sector Expenditure (LNSSEXP), Primary Revenue Expenditure (LNPREXP) and Aggregate Expenditure (LNAGEXP).
Firstly, we have performed the unit root test for all states' series to check whether the time series of each variable contain a stochastic trend or not. Then, the cointegration test among the time series has been done. As a third step, we have run the Error Correction Model to elucidate the long-run relationship among the cointegrated variables. Finally, we have used the Granger Causality test to ascertain the direction of causality mainly for those variables for whom co-integration was not found.

Unit root test: This test is used to determine the order of integration of a time series. There are a number of unit root tests available in the literature like Dicky-Fuller test (DF), the Augmented Dicky-Fuller test (ADF), Phillips-Peron test (PP), Kwiatkowski, Phillips, Schmidt, Shin test (KPSS), etc. In our present study, we have used only two of the popular tests: the Augmented Dicky-Fuller test (ADF) and the Philips-Perron test (PP).

Let us consider the linear regression model for unit root test. The two versions of ADF test used are as follows:

Without time trend:

$\Delta y_t = \theta + \gamma y_{t-1} + \sum_{i=1}^{n} \lambda_i \Delta y_{t-i} + \varepsilon_t$

With time trend:

$\Delta y_t = \theta + \delta t + \gamma y_{t-1} + \sum_{i=1}^{n} \lambda_i \Delta y_{t-i} + \varepsilon_t$; Where, y_t represent set of data at time t (t = 1, 2, 3, ……., T).

Here the Null Hypothesis is $(H_0) : \gamma = 0$ implies the series has a unit root while the Alternative Hypothesis is $(H_1): \gamma < 0$; imples the series does not contain any unit root i.e., the series is stationary.

Co-Integration Test:

The co-integration test identifies the presence of a long-run equilibrium relationship between two or more non-stationary time series. The most popular co-integration tests are the Engle-Granger test, Johansen test, and Philips-Ouliaris Test.

In this study, cointegrating relationships among the variables are tested using the Johansen cointegration test. Especially trace statistic and maximum eigenvalue statistic are used to find out the number of cointegrating vectors present in the system. The precondition for applying

the Johansen cointegration test is that variables must be non-stationary at the level and after the first difference all variables must become stationary i.e., all the variables should be integrated of order one.

The equations of the trace statistic and the max eigen value statistic are as follows:

γ_{trace} (r) = $-T\sum_{i=r+1}^{N}\ln(1-\widehat{\gamma_i})$

γ_{max} (r, r +1) = $-T\ln(1-\widehat{\gamma_{r+1}})$;where, T is the sample size.

The null hypothesis of the trace statistics is at most r cointegration vector against the alternative hypothesis of full rank r = n cointegration vector. Where n is the number of endogenous variables. The null hypothesis of the max eigen value statistics is at most r cointegration vector against the alternative hypothesis of r +1 cointegration vectors.

Error Correction Model:

After testing the cointegration among the time series variables for each state, to understand their short-run to long-run dynamics ECM are used where the optimum lag length is determined using different information criteria like, SIC, AIC, etc.

The bi-variate model of any kind of government expenditures like, LNREXP, LNCEXP, LNPREXP,LNSSEXP and LNNSDP can be written pair-wise as:

Model-1: $\Delta LNNSDP_t = \theta_1 + \sum_{i=1}^{n}\beta_{1i}\,\Delta LNNSDP_{t-i} + \sum_{i=1}^{n}\tau_{1i}\,\Delta LNREXP_{t-i} + \eta_1\,ECM_{t-1} + \varepsilon_{1t}$

Model-2: $\Delta LNREXP_t = \theta_2 + \sum_{i=1}^{n}\tau_{2i}\,\Delta LNREXP_{t-i} + \sum_{i=1}^{n}\beta_{2i}\,\Delta LNNSDP_{t-i} + \eta_2\,ECM_{t-1} + \varepsilon_{2t}$

In this way we can construct a model for each of the variables for each state.

ECM_{t-1} is the error correction term obtained from the cointegration model, the error coefficient η_i indicate the rate (speed of adjustment) at which the cointegration model corrects its previous period's disequilibrium or speed of adjustment to restore the long run equilibrium relationship. If the coefficient of error correction term is negative and significant then it implies any short run divergence among the dependent and independent variables will converge to the long run relationship.

Now, If τ_{11} = 0 REXP does not cause NSDP in short run and if β_{21} = 0, NSDP does not cause REXP in Short run and if both the conditions do not hold, bi-directional causality is present between REXP and NSDP.

Granger Causality Test:

If cointegration relation does not hold among the variables then for the causality test we have used the Granger Causality Test: this test is performed for a pair of stationary time series variable by estimating the following pair of ARDL regression Model:

Model-1: $\Delta LNNSDP_t = \theta_{11} + \sum_{i=1}^{n}\beta_{11i}\,\Delta LNNSDP_{t-i} + \sum_{i=1}^{n}\beta_{12i}\,\Delta LNREXP_{t-i} + \varepsilon_{1t}$

Model-2: $\Delta LNREXP_t = \theta_{21} + \sum_{i=1}^{n} \beta_{21i} \Delta LNREXP_{t-i} + \sum_{i=1}^{n} \beta_{22i} \Delta LNNSDP_{t-i} + \varepsilon_{2t}$

Where, Δ represent the difference term, n represent the number of lags, $\theta's$, $\beta's$ are represent regression parameters, $\varepsilon_t's$ represent the disturbance term. F test are executed to test the following hypotheses:

Model-1: H_0 : $REXP_t$ does not granger cause $NSDP_t$

H_1 : $REXP_t$ granger cause $NSDP_t$.

Model-2: H_0 : $NSDP_t$ does not granger cause $REXP_t$

H_1 : $NSDP_t$ granger cause $REXP_t$

5. Results:

Unit Root Test Result

In the Tables 2.1 to 2.4, we have presented the unit-root test results for all the variables we have taken. Most of the variables of all selected states for the period 1980-81 to 2018-19 are non-stationary at their levels and stationary at first difference. For Punjab, the log of state net domestic product is found to be *I(2)*. Log of revenue expenditure for Punjab is *I(0)* according to the ADF test, though PP test finds it as *I(1)*.Here, we have performed KPSS test which concludes that it is a trend stationary process (TSP) series. We have also performed this test for Haryana, Madya Pradesh and West Bengal for the log of capital expenditure series where inconclusiveness arises due to different results of ADF and PP tests. We have confirmed from KPSS test that these series are all TSP.Capital Expenditure for Assam, Himachal Pradesh, Maharashtra and Punjab are found to beTSP. Also for some other states we have found it TSP but at 5 per cent level of significance only. Log of social sector expenditure for all states except Punjab are DSP (Difference stationary process). For Punjab, it is found as TSP.

In the following tables we have presented the results we obtained from ADF and PP tests for log of NSDP, log of revenue expenditure, log of capital expenditure and log of social sector expenditure respectively. Here we have not shown the unit root test results for log of primary revenue expenditure whose results are not much different from that of revenue expenditure.

Table 2.1: Log (Net state Domestic Product)

	ADF					PP			
States	Cont.	Trend	1st Diff. (Cont.)	1st Diff. (Trend)	2nd Diff. (Cont.)	Cont.	Trend	1st Diff. (Cont.)	1st Diff. (Trend)
Andhra Pradesh	NS	NS	S***			NS	NS	S***	S***
Assam	NS	S**	S***			NS	S**	S***	
Bihar	NS	NS	S**			NS	NS	S***	S***
Gujarat	NS	NS	S***			NS	NS	S***	S***
Haryana	NS	NS	S***			NS	NS	S***	S***
Himachal Pradesh	NS	NS	S***			NS	NS	S***	S***
Karnataka	NS	NS	S***			NS	NS	S***	S***

Kerala	NS	NS	S***			NS	NS	S***	S***
Madhya Pradesh	NS	NS	S***			NS	NS	S***	S***
Maharashtra	NS	NS	S***			NS	NS	S***	S***
Odisha	NS	S*	S***			NS	S**		
Punjab	NS	NS	NS	S**	S***	NS	NS	S***	S**
Rajasthan	NS	NS	S**			NS	NS	S***	S***
Tamil Nadu	NS	NS	S***			NS	NS	S***	S**
Uttar Pradesh	NS	NS	S***			NS	NS	S***	S***
West Bengal	NS	S**				NS	NS	S***	S***

Notes: A. ***, ** and * represent significant result at 1%, 5% and 10% respectively.

B. NS stands for non-stationary and S stands for stationary.

C. Cont.: implies model at level with Intercept; Trend.:implies modelat level with Intercept and Trend; 1st Diff. (Cont.): implies model in 1st difference with Intercept; 1st Diff. Trend:implies model in 1st difference with intercept and trend, 2nd Diff. (Cont.):implies model in 2nd Difference with Intercept.

Table 2.2: Log (Revenue Expenditure)

	ADF					***PP***			
States	**Cont.**	**Trd.**	**1st Diff. (Cont)**	**1st Diff. (Trd)**	**2nd Diff. (Cont)**	**Cont.**	**Trd.**	**1st Diff. (Cont)**	**1st Diff. (Trd)**
Andhra Pradesh	NS	NS	S***			S*	NS	S***	
Assam	NS	S**	S***			NS	S**	S***	
Bihar	NS	NS	S***			NS	NS	S***	
Gujarat	NS	NS	S***			NS	NS	S***	
Haryana	NS	NS	S***			NS	NS	S***	
Himachal Pradesh	NS	NS	S***			NS	NS	S***	
Karnataka	NS	NS	S***			NS	NS	S***	
Kerala	NS	NS	S***			NS	NS	S***	
Madhya Pradesh	NS	NS	S***			NS	NS	S***	
Maharashtra	NS	NS	S***			S**	NS	S***	

Odisha	NS	NS	S***			NS	NS	S***	
Punjab	S***	NS	S***			S*	NS	S***	
Rajasthan	NS	S*	S***			NS	NS	S***	
Tamil Nadu	NS	NS	S***			NS	NS	S***	
Uttar Pradesh	NS	NS	S***			NS	NS	S***	
West Bengal	NS	NS	S***			NS	NS	S***	

Notes: A. ***, ** and * represent significant result at 1%, 5% and 10% respectively.

B. NS stands for non-stationary and S stands for stationary.

C. Cont.: implies model at level with Intercept; Trend.:implies modelat level with Intercept and Trend; 1st Diff. (Cont.): implies model in 1st difference with Intercept; 1st Diff. Trend:implies model in 1st difference with intercept and trend, 2nd Diff. (Cont.):implies model in 2nd Difference with Intercept.

Table 2.3: Log (Capital Expenditure)

	ADF					***PP***			
States	**Cont.**	**Trd.**	**1st Diff. (Cont)**	**1st Diff. (Trd)**	**2nd Diff. (Cont)**	**Cont.**	**Trd.**	**1st Diff. (Cont)**	**1st Diff. (Trd)**
Andhra Pradesh	NS	NS	S***			NS	NS	S***	
Assam	NS	S**				NS	S**		
Bihar	NS	NS	S***			NS	NS	S***	
Gujarat	NS	S*	S***			NS	S*	S***	
Haryana	NS	S*	S***			NS	S**		
Himachal Pradesh	NS	S**	S***			NS	S**		
Karnataka	NS	NS	S***						
Kerala	NS	S*	S***			NS	S*	S***	
Madhya Pradesh	NS	NS	NS	NS	S***	NS	NS	S***	
Maharashtr	NS	S*	S***			NS	S*	S***	

a		**					*		
Odisha	NS	S**	S***			NS	S**	S***	
Punjab	NS	S***	S***			NS	S***		
Rajasthan	NS	S**	S***			NS	S**	S***	
Tamil Nadu	NS	NS	S***			NS	NS	S***	
Uttar Pradesh	NS	S*	S***			NS	S*	S***	
West Bengal	NS	NS	S***			NS	S***		

Notes: A. ***, ** and * represent significant result at 1%, 5% and 10% respectively.

B. NS stands for non-stationary and S stands for stationary.

C. Cont.: implies model at level with Intercept; Trend.:implies modelat level with Intercept and Trend; 1st Diff. (Cont.): implies model in 1st difference with Intercept; 1st Diff. Trend:implies model in 1st difference with intercept and trend, 2nd Diff. (Cont.):implies model in 2nd Difference with Intercept.

Table 2.4: Log (Social Sector Expenditure)

	ADF					***PP***			
States	**Cont.**	**Trd.**	**1st Diff. (Cont)**	**1st Diff. (Trd)**	**2nd Diff. (Cont)**	**Cont.**	**Trd.**	**1st Diff. (Cont)**	**1st Diff. (Trd)**
Andhra Pradesh	NS	NS	S***			NS	NS	S***	
Assam	NS	NS	S***			NS	NS	S***	
Bihar	NS	NS	S***			NS	NS	S***	
Gujarat	NS	NS	S***			NS	NS	S***	
Haryana	NS	NS	S***			NS	NS	S***	
Himachal Pradesh	NS	NS	S***			NS	NS	S***	
Karnataka	NS	NS	S***			NS	NS	S***	
Kerala	NS	NS	S***			NS	NS	S***	
Madhya Pradesh	NS	NS	S***			NS	NS	S***	
Maharashtr	NS	NS	S***			NS	NS	S***	

a									
Odisha	NS	NS	S***			NS	NS	S***	
Punjab	NS	S***	S***			NS	S***	S***	
Rajasthan	NS	NS	S***			NS	NS	S***	
Tamil Nadu	NS	Ns	S***			NS	NS	S***	
Uttar Pradesh	NS	NS	S***			NS	NS	S***	
West Bengal	NS	NS	S***			NS	NS	S***	

Notes: A. ***, ** and * represent significant result at 1%, 5% and 10% respectively.
B. NS stands for non-stationary and S stands for stationary.
C. Cont.: implies model at level with Intercept; Trend.:implies modelat level with Intercept and Trend; 1st Diff. (Cont.): implies model in 1st difference with Intercept; 1st Diff. Trend:implies model in 1st difference with intercept and trend, 2nd Diff. (Cont.):implies model in 2nd Difference with Intercept.

Now in the Table 3 we have presented the results of cointegration tests: Only in eight states we have found the evidences of cointegration when considering different types of government expenditures and NSDP. But all types of government expenditures for all these eight states are not being cointegrated with the states' net domestic product. For some states like AP, Maharashtra and TN only the social sector expenditure is being cointegrated with their net domestic product. For the other states like Bihar and MP the revenue and capital expenditure are being cointegrated with their domestic productionand for WB the primary revenue and capital exp. are being cointegrated with NSDP. Only for Gujrat and HP all types of expendituresare being cointegrated with NSDP. In the other states there was no cointegration among the variables, so we have not presented those test results here.

Table 3: Cointegration Test Results

		Trace Statistic	**P Value**	**Max- Eigen Statistic Statistic**	**P Value**
Andhra Pradesh	LNSDP <> LSSEXP	15.5	0.0	13.1	0.1
Bihar	LNSDP<> LREXP,LCEXP	30.2	0.0	23.8	0.0
Gujrat	LNSDP<> LPREXP LCEXP	33.7	0.0	21.1	0.1
	LNSDP <> LSSEXP	19.6	0.0	19.6	0.0
Himachal Pradesh	LNSDP<> LREXP,LCEXP	35.6	0.0	19.7	0.1

	LNSDP<> LPREXP LCEXP	33.5	0.0	17.8	0.1
	LNSDP <> LSSEXP	18.5	0.0	16.8	0.0
Madhya Pradesh	LNSDP<> LREXP,LCEXP	30.7	0.0	20.9	0.1
Maharashtra	LNSDP <> LSSEXP	18.3	0.0	15.0	0.0
Tamil Nadu	LNSDP <> LSSEXP	22.6	0.0	21.3	0.0
West Bengal	LNSDP<> LPREXP LCEXP	35.6	0.0	25.0	0.0

Now, to understand the direction of causality we have performed the ECM. The advantage of using this model is that, the error correction term will not only confirm the long run equilibrium relation but also indicates the direction of causality. From that equation, we can confirm the short-run causality also from the significance of the coefficient of the 1st differenced term. The sign of the coefficients except for error corrections are expected to be positive.

Table 4: ECM Test Results

States	Variables	Long Run Causality Test	Short Run Causality
Andhra Pradesh	LNSSEXP => LNNSDP	No Causation	
	LNNSDP => LNSSEXP	**Causation*** **	No Causation
Bihar	LNREXP => LNNSDP	No Causation	
	LNCEXP => LNNSDP	No Causation	
	LNNSDP => LNREXP	**Causation** **	No Causation
	LNNSDP => LNCEXP	No Causation	
Gujrat	LNREXP => LNNSDP	No Causation	
	LNCEXP => LNNSDP	No Causation	
	LNNSDP => LNREXP	**Causation*** **	No Causation
	LNNSDP => LNCEXP	**Causation** **	No Causation
	LNPREXP => LNNSDP	No Causation	
	LNNSDP => LNPREXP	**Causation*** **	No Causation
	LNSSEXP => LNNSDP	No Causation	
	LNNSDP => LNSSEXP	**Causation*** **	No Causation
Himachal Pradesh	LNREXP => LNNSDP	No Causation	
	LNCEXP => LNNSDP	No Causation	
	LNNSDP => LNREXP	No Causation	
	LNNSDP => LNCEXP	**Causation*** **	
	LNPREXP => LNNSDP	No Causation	
	LNNSDP => LNPREXP	**Causation*** **	No Causation
	LNSSEXP => LNNSDP	**Causation*** **	**Causation***

	LNNSDP => LNSSEXP	**Causation*** **	No Causation
Madhya Pradesh	LNREXP => LNNSDP	No Causation	
	LNCEXP => LNNSDP	**Causation** **	No Causation
	LNNSDP => LNREXP	**Causation** **	No Causation
	LNNSDP => LNCEXP	No Causation	
Maharashtra	LNSSEXP => LNNSDP	No Causation	
	LNNSDP => LNSSEXP	**Causation*** **	No Causation
Tamil Nadu	LNSSEXP => LNNSDP	No Causation	
	LNNSDP => LNSSEXP	**Causation** **	**Causation***
West Bengal	LNPREXP => LNNSDP	No Causation	
	LNCEXP => LNNSDP	No Causation	
	LNNSDP => LNPREXP	**Causation*** **	No Causation
	LNNSDP => LNCEXP	**Causation*** **	**Causation***

Note: ***, ** and * represent significant result at 1%, 5% and 10% respectively.

From the Table 4 we can say that the states like AP, Gujrat, Maharashtra and TN for which we have found a cointegrated relationship between SSE and NSDP, the long run causality is running from NSDP to SSE, indicating the prevalence of Wagner law. Social sector expenditure in this case is not affecting the state domestic product. For Himachal Pradesh the ECM test results are indicating a both-way relation between the two.

Again relating to LR causal effect, Bihar, and WB indicating the prevalence of Wagner law. Though for Bihar no causations are found in case of capital expenditure and NSDP from the ECM. But as these series are cointegrated, we can infer that Bihar has a long-run simultaneous relationship in between capital expenditure and its NSDP. In this case we have estimated a VAR model in between these two variables in level from which we find that lag value (only 1 lag is selected based on most of the lag selection criterion) of GDP is affecting the capital expenditure in a significant way. But lag of capital expenditure is not becoming significant in the equation for GDP.

Only for MP, we have a statistical evidence also of NSDP being affected by the capital expenditure. But in this case also revenue expenditure is being affected by NSDP.

For the states like Gujrat and HP both, capital and revenue expenditures in the LR are being affected by the NSDP.

So, only for MP we have found some evidence of Keynesian law. For HP both way causality is found between NSDP and social sector expenditure which includes part of revenue and capital expenditure together.

Now, in the Table 5 we have presented the Granger causality test results. To perform this test we have first made all the relevant series stationary. DSP series are made stationary by taking their first difference. But as we find NSDP of Punjab is *I(2)*we take the 2nd difference of Punjab's NSDP in this case. We de-trended thoseseries which are found to be TSP to make them stationary. This results show that out of 16 major states, only the states like Haryana, HP, UP showing a strong evidence of Keynesian law where different government expenditures like SSE, RE, CE are affecting the growth of thesestates respectively. MP has such a relationship SSE to NSDP respectively but at 10% level of significance. There are other few states who are indicating a bi-directional causality namely Bihar, Orisha and TN. Except these, all the other states clearly pointing to the validation of Wagner law in India at

least when state finance is concerned. For States like Punjab, Andra Pradesh, Gujrat and Rajasthan no short-run causality is found.

Table 5: Granger Causality Test Results

States	Granger Causality	States	Granger Causality
Andhra Pradesh	No Causality	**Madhya Pradesh**	LSSEXP => LNNSDP* LCEXP => LNNSDP
Assam	LNNSDP => LNREXP LNNSDP => LNPREXP LNNSDP => LNSSEP	**Gujrat**	No Causality
Bihar	LNCEXP <=> LNNSDP* LNNSDP => LNPREXP	**Maharashtra**	LNNSDP => LNPREXP*
Haryana	LNSSEXP => LNNSDP	**Odisha**	LNCEXP <=> LNNSDP LNNSDP => LNSSEXP*
Himachal Pradesh	LNREXP =>LNNSDP LPREXP => LNSDP	**Punjab**	No Causality
Karnataka	LNNSDP => LNREXP LNNSDP => LNPREXP LNNSDP => LNSSEXP*		
Kerala	LNNSDP => LNREXP* LNNSDP => LNPREXP*	**Rajasthan**	No causality
West Bengal	LNNSDP => LNREXP* LNNSDP => LNPREXP*	**Tamil Nadu** **Uttar Pradesh**	LNSSEXP <=> LNNSDP LNNSDP => LNREXP LNCEXP => LNNSDP

Note: Significance level is High (1% to 5%) except for *, which indicates 10% level of significance.

We have also examined all the above relationships for aggregate expenditure and NSDP. We performed the cointegration test of aggregate expenditure, revenue receipts, capital receipts and NSDP for each of the states and found for all the states a strong evidence of cointegration as expected (results are not shown here).

In that case, ECMs long-run causality is running from NSDP to aggregate expenditure for 11 out of 16 major states of India. For Rajasthan, TN and UP we find the opposite direction of long-run causality i.e. from aggregate exp. to NSDP at the 5% level of significance. For theGranger causality test between aggregate expenditure and NSDP only AP, TN and MP are providing evidences of Keynesian law. All the other 13 states are indicating the prevalence of Wagner law for Indian states.

6. Conclusion

So, from the above results, we can conclude that all the major states of India are showing strong evidence of cointegration when revenue and capital receipts are combined together with NSDP and aggregate expenditure and in the majority of the states the NSDP is affecting the aggregate government expenditure except for Rajasthan, Tamil Nadu, and Uttar Pradesh. But when we consider different types of government expenditures distinctly we find out of 16 major states only 8 states are having a long-run relationship between some kinds of government expenditures and their NSDP. But in this group of 8 states, 6 states, namely Andra Pradesh, Bihar, Gujrat, Maharashtra, Tamil Nadu, and West Bengal are showing evidence of Wagner law where Himachal Pradesh and Madhya Pradesh are having bi-directional causality. No evidence of pure Keynesian law was found where government expenditures are considered at the disaggregated levels.

The Granger Causality tests also find inconclusive results: For aggregate expenditure, 13 states are showing the prevalence of Wagner Law while in cases of disaggregated government expenditure only 6 states are validating to some extent the Wagner law. For the 4 states, no short-run causality is found at all from the Granger causality test. For another 4 states, we find that some kinds of government expenditures are affecting their income in the short run. States like Tamil Nadu and Uttar Pradesh are showing bi-directional causality but for different kinds of government expenditure.

So, we can say on the whole we have found evidence for the Wagner law in more cases but the overall results remain inconclusive. One important observation in this regard is we are having different types of causality with different types of government expenditures even for the same State. Actually, causalities whenever are found, are in a very irregular manner. So, it becomes very difficult to conclude which kind of government expenditure is having a causal relationship with state domestic product. This may result from an absence of long-term planning or vision in designing the expenditure pattern of most of the state governments in India.

We know, that government expenditures particularly revenue and social sector expenditures can affect the economy in a significant way particularly in the long run when all types of expenditures are being designed in a commensurate way so that the society gets support in an all-encompassing manner. Any lacuna in a particular area not only gets exaggerated over time but also starts affecting the other sectors of the economy adversely. In general, in prioritising different kinds of government expenditures, given its resource scarcity, more emphasis is given to capital expenditure. But here are two things we should note: one, in India, we have seen a general shift towards revenue expenditure at the expense of capital expenditure and secondly, with every new and old capital expenditure we must incur/ combine some revenue expenditures to make the capital expenditure productive or at least running e.g. while building new schools and hospitals we must employ new education and health workers on a regular basis also, otherwise, this types of capital expenditure will not be fruitful in affecting

the NSDP in a favourable way over the long-run. Studying in detail these kinds of loopholes in the pattern of government expenditures, if any, of different states of India and its implication is our future research agenda.

Acknowledgement: We are indebted to Prof. Debasish Mondol, Vidyasagar University for his helpful comments and suggestion.

References:

Abizadeh, S and M Yousefi (1998): "An Empirical Analysis of South Korea's Economic Development and Public Expenditures Growth," The Journal of Socio-Economics, Vol 27, No 6, pp 687–700.

Afonso, A and J Alves (2017): "Reconsidering Wagner's Law: Evidence from the Functions of the Government," Applied Economics Letters, Vol 24, No 5, pp 346–50.

Akitoby, B et al (2006): "Public Spending, Voracity, and Wagner's Law in Developing Countries," European Journal of Political Economy, Vol 22, No 4, pp 908–24.

Barro, R J (1990): "Government Spending in a Simple Model of Endogenous Growth," Journal of Political Economy, Vol 98, No 5, Part 2, pp S103–25.

Baffes, J, A Shah, and B Mundial (1993): "Productivity of Public Spending, Sectoral Allocation Choices, and Economic Growth," Policy Research Working Paper Series, Vol 1178, Public Economic Division, Policy Research Department, World Bank

Burney, N A (2002): "Wagner's Hypothesis: Evidence from Kuwait Using Cointegration Tests," Applied Economics, Vol 34, No 1, pp 49–57.

Chang, T (2002): "An Econometric Test of Wagner's Law for Six Countries Based on Cointegration and Error-Correction Modelling Techniques," Applied Economics, Vol 34, No 9, pp 1157–69.

Fölster, S and M Henrekson (2001): "Growth Effects of Government Expenditure and Taxation in Rich Countries," European Economic Review, Vol 45, No 8, pp 1501–20.

Furceri, D and M P Ribeiro (2008): "Government Spending Volatility and the Size of Nations," Working Paper Series, No 924, European Central Bank.

Huang, C (2006): "Government Expenditures in China and Taiwan: Do They Follow Wagner's Law?" Journal of Economic Development, Vol 31, No 2, p 139.

Keynes, J M (1936): General Theory of Employment, Interest and Money, London: Macmillan.

Lamartina, S and A Zaghini (2011): "Increasing Public Expenditure: Wagner's Law in OECD Countries," German Economic Review, Vol 12, No 2, pp 149–64.

Peacock, A T and J Wiseman (1961): The Growth of Public Expenditure in the United Kingdom, Cambridge: US National Bureau of Economic Research and Princeton: Princeton University Press.

Pradhan, R P (2007): "Wagner's Law: Is It Valid in India?" The IUP Journal of Public Finance, Vol 5, No 2, pp 7–20.

Ray, M. et.al. (2019): "Public Expenditure and Economic Development: Regional Analysis of India", *EPW,* Vol lIV, No 10, pp 50-56.

Romer, C and D H Romer (2010): "The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks," American Economic Review, Vol 100, No 3, pp 763–801.

Sheehey, E J (1993): "The Effect of Government Size on Economic Growth," Eastern Economic Journal, Vol 19, No 3, pp 321–28.

Vedder, R K and L E Gallaway (1998): "Government Size and Economic Growth," Joint Economic Committee.

Wagner, A (1883): "Three Extracts on Public Finance," translated and reprinted in RA.