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Causal Nexus between Public Debt and Economic Growth: The Case of India

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Abstract
The aim of this paper is to investigate the important issue of "cause-effect" relationship between public debt and economic growth for Indian economy over the period of 1980-81 to 2013-14. The statistical description provides evidence that the causal issue between these variables is undefined and inconclusive. To address this irresolvable issue, this paper employs the time series techniques like unit root test (ADF and PP), VAR lag selection criteria, Johansen cointegration test, VECM, and VEC granger causality test. The application of Johansen test on first order integrated variables like domestic debt, external debt and economic growth substantiates the presence of long-run cointegration among these variables. Besides, in the VECM model, the statistically significant and negative coefficient of error correction term in external debt equation represents the restoring of the long run equilibrium at the rate of 11.34 percent every year between external debt and growth. Moreover, the testing of the causality unveils the fact that there is no causal relationship between domestic debt and economic growth but a unidirectional causality exists from economic growth to external debt both in a short run and in a long run. Therefore, these empirical results suggest that reliance on debt for development purposes is not a safe option, even though the presence of no feedback relationship between the said variables. So, Indian economy should extend its efforts to increase the revenue to finance the development expenditure.
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Keywords: Public debt, Economic growth, Domestic debt, External debt

1.1 INTRODUCTION:

Nowadays, it has been seen that one of the thought provoking issue, that is, "what is the relationship between public debt and economic growth?" has been entrapping a noticeable consideration of the researchers, academicians, as well as policy makers. Before addressing the said burning issue, one question remained unsolved is that between debt and economic growth, "which one is the cause? And which one is the effect?". Some literature like Amoateg et al (1996), Karagol (2002), Butts (2009), Ferreira (2009), Egbetunde (2012), Wadad (2012) advocated that the debt is a cause of the economic growth. The causation of the public debt to the economic growth may be positive (Jayaraman et al., 2008; Putunoi et al., 2013; Barik, 2012; Fincke and Greiner, 2014) or adverse (Lin, 2000; Schclarek, 2004; Mohamed, 2005; Akram, 2011, Rais et al., 2012; Georgiev, 2012; Bal and Rath, 2015) depending upon the nature of expenditure of debt amount. On contrast, some literature like Dritsaki (2013), Ahmed et al (2000) were of the view that public debt is an effect of the economic growth. Higher or lower economic growth may necessitate the lower or higher incurring of public debt respectively. Hence, there is no concrete idea on this issue so far. Therefore, the "cause-effect" puzzle between the said variables is un-simplified and inconclusive. This inconclusive issue for the world economy in general and of the Indian economy, in particular, creates a huge debate among the intellectuals, researchers, academicians, and policy makers. Keeping this issue in consideration, the brief statistical description of the growth trajectory of total public debt (TPD), domestic debt (DD), external debt (ED) and GDP at market price (a proxy for economic growth) evidences the background of the emergence of the causal issue in Indian economy since 1980.

1.2 Statistical Evidence:

With reference to the figure-1, the whole period of study is segregated into four different phases viz. 1980-81 to 1990-91 entitled as pre-economic reforms, 1991-92 to 1996-97 as immediate economic reforms, 1997 -98 to 2002-03 as post economic reforms and 2003-04 to 2013-14 as post-FRBM Act[1] . This segregation is for providing better insight of the statistical evidence on the current issue for the Indian economy. During the first 30 years of independence spanning from 1950 to 1980, the fiscal position of the central, as well as the state governments, was under comfortable level. In that period, the country witnessed some sort of revenue surplus and moderate fiscal and primary deficit. However, in 1979-80, the revenue surplus turned into the deficit and fiscal condition of both governments went into a fiscal stress due to heavy automatic monetization of the fiscal deficit by RBI and reckless expenditure of both the government (Kaur et al, 2012). Because of these, the debt/GDP ratio started rising from 46.48 percent to 68.85 percent in pre-reform periods. In the same period, the compound annual growth rate (CAGR)

[1] The FRBM act brought the formalization in the fiscal discipline through the mechanism of slashing down the deficit in fiscal indicators like revenue deficit, fiscal deficit and primary deficit and, thereby, maintaining the sustainability and transparency in fiscal discipline.

of the TPD, DD, and ED displayed in table-1 reported at 18.17 percent, 17.76 percent and 20.24 percent respectively, which are substantially higher than the growth rate of GDP (13.27 percent). However, the question remains whether the higher growth of debt variables causes a lower growth of GDP or vice-versa. But, in the immediate economic reform phase, the drastic deterioration in the annual average growth rate of TPD, DD and ED to 12.59 percent, 14.05 percent and 06.49 percent correspondingly and mild increase of the CAGR of GDP had brought down the debt/GDP ratio to 64.37 percent. The credit of the desirable change in the said variable are, along with LPG, a plethora of fiscal reforms like simplification of tax procedures, stimulus to strengthen the contribution of direct tax to the total tax revenue, conversion of excise into a VAT and improvement in tax administration etc (Rao & Rao, 2006). However, this improvement could not be sustained thereafter because of industrial slowdown, poor public sector performance, Fifth Pay Commission award and lower performance of tax buoyancy etc (Rao & Rao, 2006). The sharp decrease in growth rate of GDP to 09.33 percent and meager increment in growth rate during post-reform phase instigated the debt/GDP ratio to soar from 66.29 percent in 1997-98 and reached at second highest of 82.86 percent in 2002-03(highest 83.23 percent in 2003-04). A sincere effort was made in 2003-04 in the field of fiscal discipline i.e. the introduction of Fiscal Responsibility and Budget Management (FRBM) act in 2003-04, which slashed down the growth rate of the debt variables and facilitated the GDP to witness a higher growth of 14.18 percent. Since the growth rate of GDP is higher than the growth rate of TPD (11.50 percent), DD (11.78 percent and ED (07.37 percent), the debt/GDP ratio degenerated sharply to about 66 percent in 2013-14.

Here, the major finding from the annual growth analysis of the public debt variables and economic growth follows that there has been a reverse relationship between growth rate of public debt and growth rate of GDP. But, nowhere this reverse relationship mentions about the causality of both the variables, i.e. higher or lower growth of public debt leads to lower or higher GDP growth rate (economic growth) respectively, as well as the reverse causality i.e. low or high growth rate of GDP, is likely to induce or to deduce incurring of public debt. Therefore, the question of "cause-effect" between the concerned variables for India is yet to be answered and, in order to address this question, this paper takes two objectives such as,

1. To investigate the causal relationship between domestic debt and economic growth
2. To examine the causal relationship between external debt and economic growth

The paper has been organized into 5 sections. Besides the section-1 of introduction, Section 2 deals with the review of the literature focused on nature of the relationship between public debt and economic growth. Section-3 is about the brief description about the variable, data sources and proposed methodology used in the analysis. The results of the empirical analysis are explained in section-4. Lastly, the section -5 concerns with the conclusion and implication of the results.

2.1 Literature Reviews:

Over last three decades, numerous studies have been conducted on the relationship between public debt and economic growth. But, scanty literature is available in the present context of an Indian economy. The brief overview of the relevant literature is summarized below. To have a better insight into the same compatibility, the whole study of the literature are segregated between theoretical reviews and empirical reviews (based on causal, linear and non-linear nature of the relationship).

2.1.1 Theoretical Reviews:

Classical[1] and Neoclassical economist viewed the role of public debt in the area of economic growth differently on the basis of their faith in the role of the government in the economy. Classical, as well as the Neo-classical economist, considered debt as the degenerative aspects of the economic growth. Because the debt amount, which could have been used for productive purposes, was spume offered for unproductive in an exaggerating manner. Going by this Frame, Diamond (1965) postulated that both types of public debts (internal and external) make the reduction in the available lifetime consumption of taxpayers, as well as, their savings and, in turn, agitate capital stock and, then, economic growth adversely. Prof Buchanan (1958) in his book "Public Principles of Public Debt" holds that so long as the burden of debt can be transferred from the present generation, who subscribes the debt voluntarily, to the future generation, who pays taxes compulsorily to its return, public debt has a negative impact on the economy. Modigliani (1961), redefining the Buchanan's contribution, wrangled that posterity will be no longer a burden if the debt finance could bequeath to the real income of future generation. Elmendorf and Mankiw (1999), as an adherent to the crowding–out hypothesis, noticed that higher long-term interest rates, resulting from higher debt financed for government budget deficits, can crowd-out private investment and, thus, dampen the potential economic growth.

Completely different opinion proposed by Keynes expounded that the accumulation of public debt did not put any infliction on the path of the economic growth rather boosted the tempo of economic growth. According to him, through debt creation, the government can stimulate saving streams, put the unemployed resources into

[1] Classical economists like J. B. Say, Adam Smith, Ricardo, Malthus, J. S. Mill, Bastable, Paul Leroy-Beaulieu etc.

mobilization, and, thus, raise their productivity and capital formation, which ultimately increases the national income. This surplus national income, in turn, facilitates in tax collection to treat the debt. In a similar vein, A.P .Learner (1948) advocated that an internal debt does not create any burden on the future generation because of the transfer of incomes from one group to another within an economy. Therefore, it is rightly remarked as "the right hand owes to the left hand". Nevertheless, in the case of external debt, if used productively, it puts no more burdens to the further generation and becomes a stimulus to the economic growth and vice versa.

In the Ricardian Equivalence or Ricardo-De Viti-Barro Equivalence theorem, the ascendancy of government debt on the economy is neutral. Because, if the government will go for deficit financing through debt creation in the current period, consumers, acknowledging to be rational and far-sighted, can predict the imposition of higher taxation on them in future. Accordingly, they start saving in such a way that the present value of saving is equivalent to discounted future tax and thereto, discounted value of deficit financing through debt. Because of which there is no change in level saving and investment in the economy. So, this leads to a neutral impact on national income.

2.1.2 Empirical Reviews:

The empirical analysis starts with the discussion of the linear nature of the relationship between debt and economic growth. Lin (2000), by analyzing the debt and economic growth nexus in both steady state equilibrium and comparative steady state equilibrium framework, remarked that the government debt will retard the growth rate of per capita output if the growth rate is less than the real interest rate and reverse explanation is also true. The empirical study of Mohamed (2005) and Akram (2011) for Sudan and for Pakistan specifically found that public debt (internal and external) and debt servicing treated the economic growth and investment adversely through twin debt problem of "debt overhang"[1] and "crowding out"[2] . Similarly, Schclarek (2004) and Rais et al. (2012) got negative and statistical significant bearing of both domestic and external debts on the economic growth. To boot, the outcome of Georgiev (2012) reveals a negative, significant, and indirect link between the concerned variables through the instrument of crowding out investment due to higher interest rate and higher debt servicing cost. On the other hand, some of the literatures like Jayaraman et al. (2008), Putunoi et al. (2013), Fincke and Greiner (2014) argued a significant and positive correlation between the debts to GDP. This result was so because the emerging market economies are on the transition path of high growth rates due to heavy public investment in growth-enhancing public sectors like infrastructure.

Some of the literature was of the view that there is, often, a non-linear nexus between the questioned variables with a threshold level of debt to GDP ratio, beyond which the reverse relation persists. Balassone et al (2010), covering the study period in Italy over 1961-2009, discovered a negative link between debt and growth with threshold level at above 100 percent of debt to GDP ratio. Checherita and rother (2010) made an empirical study in 123 euro area countries over a period of about 40 years of 1970-2008 and realized a non-linear concave link with a threshold at 90 to100 percent of GDP. Cecchetti et al (2011),practicing the new data set on debt levels in 18 OECD countries from 1980 to 2010, came with a non-linear nexus of debt-growth with the doorway at 85 to 90 percent of GDP. Again, Reinhart and Rogoff (2010) exhibited that average post-World War-2 economic growth was dramatically declining in advanced economies, once the debt to GDP ratio was above a 90 percent threshold level. Kumar and Woo (2012) also admitted same threshold level at 90 percent of GDP for the advanced and emerging economies.

Another contesting view is that of 'causal" relationship between debt variables and economic growth. The literature of Butts (2009) on panel data of 27 Latin American countries and Caribbean countries, Ferreira (2009) on OECD countries, Egbetunde (2012) on Nigeria inquired into the "cause and effect" nexus between public debt and economic growth and found the bidirectional causality between them. This bidirectional causality resembles the circumstances that the higher debt leads to lower economic growth and lower economic growth influence the evolution of higher debt. The research work of Karagol (2002) on Turkey for the period of 1956-1996 and Dritsaki (2013) on Greece over the vintage of 1960-2011, however, stumbled on unidirectional causality from debt to growth and from growth to debt respectively. Again, Choudhury (1994) and Tasos (2014) worked on Greece counted no causality between two concerned variables. In the case of ED, the scholars noticed the mix results. Wadad (2012), Amoateg et al (1996) and Ahmed et al (2000) recognized the bi-directional, unidirectional (from ED to growth) and no feedback between ED and growth correspondingly.

In an Indian context, Singh (1999) investigated the link between the domestic debt and economic growth

[1] **Debt overhang** is the condition of an organization (for example, a business, government, or family) that has existing debt so great that it cannot easily borrow more money, even when that new borrowing is actually a good investment that would more than pay for itself. Simply, it asserts that if there is a possibility that countries' future debt will be more than its repayment abilities.

[2] The **crowding out effect** is an economic theory stipulating that rises in public sector spending drive down or even eliminate private sector spending. Again, if govt will go for higher ED and if the greater share of public debt (foreign capital) is used to treat the debt obligations, then very little would remain available to finance investment and growth; this cannel is also known as the **"**crowding out effect" of ED.

in India by exercising cointegration test and Granger causality test for the period of 1959-1995.The study fortified the Ricardian Equivalence Hypothesis (neutral effect) between them. Barik (2012) determined the positive relationship between the public debt and economic growth, in India, through its (debt) potential impact on induced investment covering the period of 1981-2011. Kaur et al (2012) found that there is a statistical significant non-linear relationship between public debt and economic growth in India with threshold level at 61% of GDP implying its negative impact on economic growth at a higher level. Bal and Rath (2015) examined the both short run and long run effect of public debt on economic growth in India during 1980-2011. The finding of the study pointed out the significant negative relationship between the concerned variables.

After discussing both theoretical and empirical literature, it can be concluded that there is no concrete link between the concerned variables rather it differs with the different countries, period, and instrumental variables like socio-political, institutional and economic variables taken in the literature.

3.1 Variables, Data Sources and Methodology:

The vibrant concept 'public debt' plays a pivotal and a pertinent role in the traditional as well as modern or contemporary public finance. Literarily, public debt demonstrates the loans or liabilities raised by the government with a corresponding commitment to the repayment within a stipulated time period. Total Public Debt (TPD) is the combination of Domestic Debt (DD) and External Debt (ED). Domestic Debt (DD), otherwise termed as National Debt, refers to the loans or borrowings raised by the public authorities within the legal jurisdiction of the economy. DD is not only composed of internal debt but also of small savings, provident funds & other accounts and reserve funds & deposits. The main internal sources from which the government can amass funds are individuals, non-banking financial institutions, commercial banks and central banks of the concerned economy. On the other hand, a debt is said to be external debt (ED) if/when a loan is floated outside the country. Its main sources are foreign financial institutions, foreign governments, and foreign multinationals and international organization such as IMF, IBRD, and ADB etc. In this study, GDP at the current price at market price is used as a proxy for economic growth[1]. Then, DEBT (or DD or ED) to GDP ratio, contemplated as the important variable to judge the relationship between public debt and economic growth, represents the amount of GDP required to be liquidated for the repayment of the debt.

The present study is exclusively based on a secondary source of annual time series data for India spanning from 1980-81 to 2013-14[2] . The data on GDP, TPD, DD, ED are sourced from Hand Book of Statistics (RBI), Indiastat, Budget Document (GoI). It should be noted that TPD i.e. Combined total liabilities of the center & states and DD i.e. Combined domestic liabilities of Center & States have been revised to include 'reserve funds', 'deposits and advances' and 'contingency fund' of State Governments. ED is evaluated at current exchange rate. Besides, Data in respect of TPD are inclusive of securities/treasury bills under Market Stabilization Scheme (MSS) and exclusive of NCT Delhi from 2005-06 onwards. The DEBT to GDP ratio is collected from Tradingeconomics and Indian Public Finance Statistics.

3.2 Specification of Methodology:

In this section, this paper proposes different methodologies to be appreciated for the empirical analysis of the stipulated objectives. As the paper is completely contingent upon the time series data, it generally applies various time series techniques like unit root test for checking the stationarity property of the interested series; lag selection criteria for determining the maximum lag in the series; Johansen- Juselius(JJ) cointegration test to verify long run relationship between the series; Vector Error Correction Model(VECM) to correct short run dynamics heading to long run equilibrium; and, finally, VEC Granger causality test owing to access the direction of causality.

3.2.1 Unit Root Test:

The result derived from the non-stationary series can't be used for generalization and can't be reliable for the prediction. Hence, it is customary to ascertain the stationarity property of the time series with a view to avoid spurious or redundant results. There are both informal tests like time series plots and correlogram as well as formal tests like Dickey-Fuller test, Augmented Dickey-Fuller test (ADF), Phillips-Perron test (PP), Kwiatkowski test etc available for testing the stationarity of the series. But, this paper engages both ADF and PP test to identify the order of integration of the underlying series.

The ADF unit root test procedure requires the estimation of the following equation,

$$\Delta X_t = \Upsilon + \alpha X_{t-1} + \sum_{i=1}^{k} \beta i \Delta X_{t-1} + \varepsilon_t \quad (1)$$

Where,

X_t is time series (here $LNGDP_t$ or $LNDD_t$ or $LNED_t$)

[1] Because all other variables such as TPD, DD, ED are expressed in current price.

[2] The paper has not incorporated the latest available actual data on the interest variables in India up to 2013-14. After 2014, data on these variables are either provisional estimates or budget estimates and experience, however, shows that they vary substantially from their actual values. Hence, the incorporation of these data may lead to misleading result.

Υ is the drift parameter
k is that lag value which ensures ε_t white noise series,
Δ is difference operator,
α and β are parameters to be estimated.

The Phillips-Perron unit root test requires the estimation of the following equation (without trend)

$$X_t = \Upsilon + \alpha X_{t-1} + u_t \quad (2)$$

Where, t = 1,2,3,…..T.
u_t is the random error term

The null and alternative hypothesis for the existence of unit root in the series X_t in eqn (1) and eqn (2) is $H_0 : \alpha = 0$ against $H_1 : \alpha < 0$. If the test statistic is not statistically significant i.e. $\alpha = 0$, then X_t is non-stationary while otherwise (i.e. $\alpha < 0$) is statistically proved, it will be inferred that the said series is stationary and can validly be used for any time series applications. However, the PP test has been undertaken as a preference to ADF test in the line of two reasons. Firstly, it (PP test) does not require an assumption of homoscedasticity of the error term and, secondly, it rectifies the serial correlation and autoregressive heteroscedasticity of the error term.

3.2.2 Lag selection Criteria:

The inevitable application, either directly or indirectly, of a famous time series technique termed as Auto regressive (AR) in the time series analysis necessitates the exercise of determination of the lag length of the time series. To have the determination satisfied, many lag selection criteria, such as Aikaike's Information Criteria (AIC), Schwarz Information Criteria (SIC), Hannan- Quinn Criteria (HQ), Final prediction error (FPE), Bayesian Information Criteria (BIC) are to be used in the present. By Guideline, the test selects the maximum lag at which either the majority of tests should be statistically significant or AIC and FPE should be significant at 5 percent level of significance (Liew, 2004).

3.2.3 Johansen and Juselius (JJ) Cointegration Test:

Abstractly, JJ cointegration test not only verifies long run compatibility among the non-stationary variables but also explains the extent of deviation of the series from long run equilibrium. Here, the equilibrium relationship may be causal, behavioral or simply a reduced form affiliation among similar trending variables.

The specification of the test may, symbolically, be written as follows.

If $LNGDP_t \sim I(0)$, $LNDD_t \sim I(0)$ and $LNED_t \sim I(0)$, then the linear combination of these series can be inscribed as

$$LNGDP_t = \beta_0 + \beta_1 LNDD_t + \beta_2 LNED_t + u_t \quad (3)$$

The concept of cointegration includes the following cointegration test procedures.

Firstly, estimation of the unknown parameters in eqn (3)

Secondly, test to find out whether the estimated residuals $\hat{u}_t$ appears to be I(0) or not by running ADF test on $\Delta\hat{u}_t = \alpha\hat{u}_{t-1} + \sum_{i=0}^{k} \beta i \, \Delta\hat{u}_{t-1} + e_t$

Thirdly, if $\hat{u} \sim I(0)$ is proved, there exists cointegration among $LNGDP_t$, $LNDD_t$ and $LNED_t$.

Lastly, detection of the number of co integrating vectors through both trace statistics and maximum likelihood statistics.

Briefly, JJ cointegration test ascertains the imperative theoretical framework for analyzing the dynamics of instantaneous changes in a pair of the concerned variables along with their valuable long run information.

3.2.4 Vector Error Correction Model (VECM):

The cointegration theory provides a proper theoretical justification for error correction framework that short-run dynamics are influenced by the deviation from long-run equilibrium. So, the "Granger Representation Theory" states that once cointegration of one set of variables is conformed, there exists a valid error correction representation of the data and the reverse is true. Hence, two different sorts of equations arise

Long run equation which is the similar with the long run cointegrating equation i.e. equation(3)

(i) The short run model or the vector error correction equations.

$$\Delta LNGDP_t = \alpha_1 + \sum_{i=1}^{k} \Upsilon_{1i} \Delta LNGDP_{t-i} + \sum_{i=1}^{k} \delta_{1i} \Delta LNDD_{t-i} + \sum_{i=1}^{k} \xi_{1i} \Delta LNED_{t-i} + \theta_1 ECT_{t-1} + e_{1t} \quad (4)$$

$$\Delta LNDD_t = \alpha_2 + \sum_{i=1}^{k} \Upsilon_{2i} \Delta LNGDP_{t-i} + \sum_{i=1}^{k} \delta_{2i} \Delta LNDD_{t-i} + \sum_{i=1}^{k} \xi_{2i} \Delta LNED_{t-i} + \theta_2 ECT_{t-1} + e_{2t} \quad (5)$$

$$\Delta LNED_t = \alpha_3 + \sum_{i=1}^{k} \Upsilon_{3i} \Delta LNGDP_{t-i} + \sum_{i=1}^{k} \delta_{3i} \Delta LNDD_{t-i} + \sum_{i=1}^{k} \xi_{3i} \Delta LNED_{t-i} + \theta_3 ECT_{t-1} + e_{3t} \quad (6)$$

Where,

Δ shows the difference operator, k is the number of lags, e_{it} (i runs from 1 to 3) is the stochastic error term with zero mean and constant variance

$ECT_{t-1} = LNGDP_t - \beta_0 - \beta_1 LNDD_t - \beta_2 LNED_t$ i.e. one period lagged value of the error derived from the estimated equation(3).

θ_s required to be negative and significant depicts the speed of adjustment of short run dynamics tending to the long run equilibrium.

Thus, VECM reconciles the short run behavior of an economic variable with its long run behavior.

3.2.5 VEC Granger causality test:

Granger causality test, as a statistical hypothesis test for forecasting the time series from another time series, is

going to be applied in the present study with a view to recognizing the 'Cause and Effect" nexus among the $LNGDP_t$, $LNDD_t$ and $LNED_t$. It is said that once cointegration is conformed, causality must exist in at least one direction and the reverse is also true. The VEC Granger causality test, otherwise known as Block Exogeneity Wald Test, is contemplated as an amplified and comprehensive test of causality than standard causality test because the VEC approach to Granger causality incorporates the valuable information from the cointegrating properties of the variable of interest.

4.1 Result of Empirical Analysis:
This section deals with the results of the empirical analysis applied on the series of $LNGDP_t$, $LNDD_t$ and $LNED_t$ owing to address the stipulated objectives of the paper. The inferences drawn from each test already illustrated in the previous section are analyzed below.

4.2 Results of unit Roots:
As evident from table-4, the ADF test and PP test failed to reject the null hypothesis of "presence of unit root" in the $LNGDP_t$ series at the level. Because its approximate p-value of ADF test (0.9364) and PP test (0.8827) stand higher than the conventional significance level of 0.01 (1 percent) and 0.05 (5 percent). Hence, the testing of the series will be processed at its first difference in both tests. Then, at the first difference, the both tests rejected the null hypothesis at 5 percent level of significance because of lower P-value than 5 percent. Therefore, the series $LNGDP_t$ is integrated at its first difference. Similarly, in case of $LNDD_t$, both tests confirmed the stationarity at 1 percent level of significance at the first difference.

Again, at the first difference, the series $LNED_t$ attains the stationarity, in ADF test, at 1 percent level of significance. But, so far as the PP test is concerned, the null hypothesis is rejected at 5 percent level of significance at level and at 1 percent significance at its first difference. In nutshell, the unit root test says that all the series are integrated at its first difference.

4.3 Result of Lag Selection Criteria:
The findings of lag selection criterion depicted in table-5 substantiate the information that, at lag 2, LR test, FPE test, AIC test and HQ test are statistically significant at 5 percent level of significance. It implies the selection of lag 2 as the maximum lag in the series. Along with following the usual guideline, i.e. majority of significant criterion, of selecting optimum lag, FPE criterion and AIC test reckoned as superior test are also significant at lag 2.

4.4 Result of J-J Cointegration Test:
After affirmed the order of integration (depicting stationarity of the time series) of LNDD and LNGDP, the cointegration test with Trace test and Maximum Likelyhood test is used operating Johansen and Juselius(JJ) technique. The current analysis exploited these cointegrating tests and results are tabulated in Table-6.

Empirical results from Table-3 reveals that at r=0, both the trace statistics (32.4885) and max-eigen statistics (21.8689) exceed their corresponding critical vales of 29.7970and 21.1316. The result evidences the rejection of the null hypothesis of no cointegrating equations. The rejection is also supported by the MacKinnon-Haug-Michelis (1999) P-values of trace test (0.0239) and max-eigen test (0.0393) which is smaller than 0.05(5 percent level of significance). But, both test became failure to reject the "presence of at least one cointegrating equation" and, hence, are insignificant at $r \leq 1$. Hence, both tests authenticate one cointegrating equation in the series at 5 percent level of significance. Thus, it can be reckoned that the long run relationship exists between $LNGDP_t$, $LNDD_t$, and $LNED_t$.

4.5 Result of Vector Error Correction Model (VECM):
Once the determination of number of cointegrating equations is accomplished, and if a set of variables are found to have one or more cointegrating vectors, then VEC model is the suitable estimation technique to track the both short and long run association between the variables and also ascertain the rate of adjustment of deviations to the equilibrium. In our analysis, as cointegrating equation is one, the utilization of VEC model is inevitable.
The result of the VECM equation (4), equation (5) and equation (6) is documented below.

$$\Delta LNGDP = 0.0608^{**} + 0.4968^{**}\ \Delta LNGDP_{t-1} + 0.0661\ \Delta LNGDP_{t-2} - 0.0124\ \Delta LNDD_{t-1} - 0.0126\ \Delta LNDD_{t-2} - 0.0006\ \Delta LNED_{t-1} + 0.0003\ \Delta LNED_{t-2} - 0.0048\ ECT_{t-1} \quad (7)$$

$$\Delta LNDD = 0.0232 - 0.6307\Delta LNGDP_{t-1} + 1.3889\ \Delta LNGDP_{t-2} - 0.4652^{**}\ \Delta LNDD_{t-1} - 0.2387\ \Delta LNDD_{t-2} + 0.3042\ \Delta LNED_{t-1} + 0.8231\Delta LNED_{t-2} + 0.2032\ ECT_{t-1} \quad (8)$$

$$\Delta LNED = -0.1096 + 2.3487^{**}\Delta LNGDP_{t-1} - 0.5021\ \Delta LNGDP_{t-2} - 0.0913\ \Delta LNDD_{t-1} + 0.0003\ \Delta LNDD_{t-2} - 0.1045\ \Delta LNED_{t-1} + 0.0015\Delta LNED_{t-2} - 0.1134^{*}\ ECT_{t-1} \quad (9)$$

Note: * denotes 1 percent level of significance. ** encrypts 5 percent level of significance. Source: Author's estimation

Where, ECT_{t-1} = $LNGDP_{t-1}$ -1.4674 $LNDD_{t-1}$ + 1.4398 $LNED_{t-1}$ -11.0318 i.e. cointegrating equation

The results of the equations (7), (8), and (9) establish the fact that each variable are significantly influenced by their corresponding lagged values. Since the coefficient of ECT_{t-1} is not equal to zero in all equations, it can be inferred that the model is not out of the equilibrium. But, the statistical significant and negative coefficient of ECT_{t-1} in ΔLNED helps in restoring the long run equilibrium at the rate of 11.34 percent every year between $LNGDP_t$ and $LNED_t$.

4.6 Result of VEC Causality Test:

Having conformed to the stationarity and presence of co integration among $LNGDP_t$, $LNDD_t$ and $LNED_t$, it is said that there must exist causal relationship in at least one direction. Here, testing of causal relationship will be made between one dependent variable with an independent variable jointly with its current as well as its lagged value. The analysis of the short causality depicted in table-7 reports that there is no causality in either direction between $LNGDP_t$ and $LNDD_t$, between $LNGDP_t$ and $LNED_t$, and between $LNDD_t$ and $LNED_t$. But, there is a significant causality from $LNGDP_t$ to $LNED_t$ in short run at 5% level of significance. Then, turning to the t-statistics of the coefficients for the ECT_{t-1}, it can been visualized that there is no long run causality in ΔLNGDP and ΔLNDD equations. But, the coefficient of the one period lagged error-correction term in the ΔLNED equation is statistically significant at 5% level of significance. This means there is a long run unidirectional causality from $LNGDP_t$ to $LNED_t$. Briefly, the VEC Granger causality test unveils the statistics that there is no causal relationship between economic growth and domestic debt, but there exist the unidirectional causality from economic growth to external debt in short as well as in long run.

5. CONCLUSION AND IMPLICATION OF THE RESULTS:

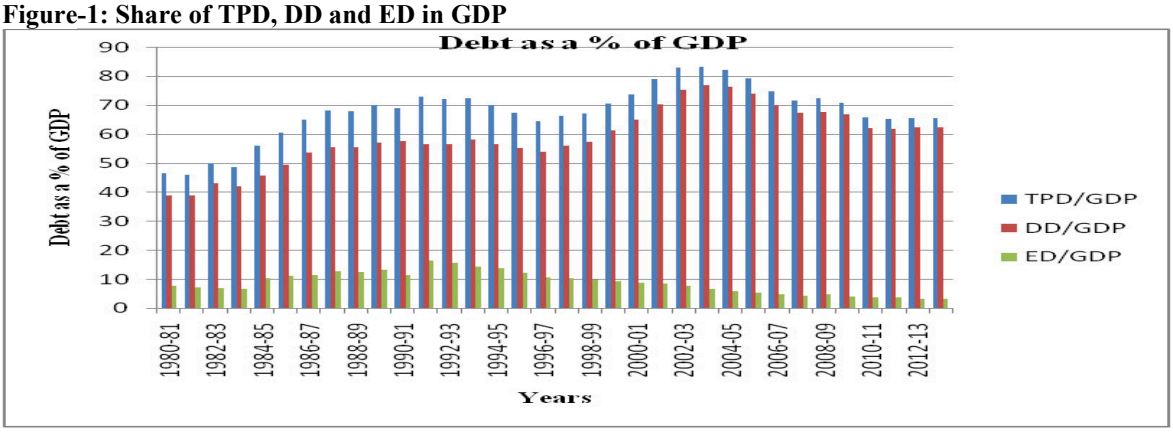
Investigation of the causal relationship between LNDD and LNGDP as well as between LNED and LNGDP for India over more than three decades starting from the fiscal year 1980-81 follows a series of empirical tests like unit root test, lag selection criteria, Johansen co-integration test, VECM, and finally VEC Granger causality test. The result of unit root tests like ADF test and PP test confirms the integration of these variables at their first difference at the different level of significance. With regard to the selection of maximum lag, the study chooses the optimum of lag 2 through VAR model by following LR, FPE, AIC and HQ criterion. Then, Johansen co-integration test authenticates one cointegrating equation in the series at 5 percent level of significance and, thus, there is the long run relationship existing between LNGDPt, LNDDt, and LNEDt. Besides, the finding of the VECM reveals that the statistically significant and negative coefficient of ECTt-1 in ΔLNED helps in restoring the long run equilibrium at the rate of 11.34 percent every year between LNGDPt and LNEDt. Lastly, the infliction of the VEC Granger causality test found that there is no feedback relationship between domestic debt and economic growth, but there exist the unidirectional causality from economic growth to external debt in short as well as in long run.

The result of unidirectional causality from economic growth to external debt is supported by the findings of the literatures of Choudhury et al (1994), Amoateng et al (1996), and Karagol (2002). Hence, it can be inferred that causality running from economic growth to external debt may head to two circumstances, where either higher economic growth leads to lower the need for external debt accumulation (inverse relationship) or higher growth stimulates the heavy incurring of ED for the strategic investment (positive relationship). Moreover, another finding i.e. no joint feedback between domestic debt and economic growth is in confinement with the findings of Singh (1999) and Tasos (2014). Therefore, it can't be just said that there is no evidence of "debt has an influence on the economic growth in India", rather it could be viewed that there is the evidence of "debt has no influence on economic growth in India". It doesn't mean that Indian economy can sustain any level of public debt.

It has been observed that the contribution of the DD to TPD has been increasing over the years. It implies that Indian government is sourcing the debt within the economy more so that its repayment will treat as a crowding-in-effect, which will further stimulate economic growth. Moreover, two lethargic problems associated with ED like "debt overhang" and "crowding out effect" can be avoided to a larger extent. Since the reliance on debt, either DD or ED for financing deficits should not be considered as a risk-free option, systematic thing and comprehensive analysis is crucial in the time of acquiring both DD and ED to finance deficits in fiscal indictors. In addition, the government of India should opt for the better reimbursement policy, which can ensure the productive use of the resources generated through debt. Both fiscal and monetary authority should take care of debt accumulation and its productive utilization so that the debt accumulation paves a path of economic growth rather than dampens the tempo of economic growth.

List of Figures and Tables:

Figure-1: Share of TPD, DD and ED in GDP



Source: Author's Estimation

Table-1: Result of Compound Annual Growth Rate

Periods → Variables↓	1980 to 2013	1980 to 1990	1991 to 1996	1997 to 2002	2003 to 2013
GDP at MP	12.95%	13.27%	15.04%	09.33%	14.18%
TPD	13.90%	18.17%	12.59%	14.02%	11.50%
DD	14.43%	17.76%	14.05%	15.46%	11.78%
ED	09.52%	20.24%	06.49%	03.81%	07.37%

Source: Author's Estimation

Table-2: Result of Descriptive Statistics

	LNGDP	LNDD	LNED
Mean	14.16813	13.62716	11.59609
Median	14.26811	13.68870	11.99175
Maximum	16.34454	15.89210	12.90105
Minimum	11.91600	10.97257	9.332381
Std. Dev	1.327469	1.472718	1.031570
Skewness	-0.048507	0.187663	-0.938676
Kurtosis	1.843572	1.849951	2.723881
Jarque-Bera	1.963991	2.134243	5.251008
Probability	0.374563	0.343997	0.072403
Sum	495.8846	476.9506	405.8633
Sum Sq. Dev.	59.91392	73.74257	36.18067
Observations	35	35	35

Source: Author's Estimation

Table-3: Result of Correlation Matrix

Correlation	LNGDP	LNDD	LNED
LNGDP	1.000000		
LNDD	0.997310	1.000000	
LNED	0.939849	0.950640	1.000000

Source: Author's Estimation

Table-4: Results of Unit Root Test

Result of Augmented Dickey Fuller Test:

Variables	t-Statistic	P-Values	Decision
LNGDP	-0.1396	0.9364	Non-stationary
Δ LNGDP	-3.4124**	0.0179	Stationary
LNDD	-0.9159	0.7700	Non-stationary
ΔLNDD	-9.4972*	0.0000	Stationary
LNED	-2.9135	0.0545	Non-stationary
ΔLNED	-5.0898*	0.0002	Stationary

Results of Phillips Perron Test:

Variables	Adj t-Statistic	P-Values	Decision
LNGDP	-0.4806	0.8827	Non-stationary
Δ LNGDP	-3.4340**	0.0170	Stationary
LNDD	-0.9575	0.7566	Non-stationary
ΔLNDD	-29.1308*	0.0001	Stationary
LNED	-3.1011**	0.0362	Stationary
ΔLNED	-5.2813*	0.0001	Stationary

Note: * denotes 1 percent level of significance. ** encrypts 5 percent level of significance. P-value depicts MacKinnon (1996) one-sided p-values. Δ is the first difference operator. Source: Author's estimation Source: Author's estimation

Table-5: Result of Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-58.6625	NA	0.0122	4.1108	4.2509	4.1556
1	81.7538	243.3885	1.93e-06	-4.6502	-4.0897**	-4.4709
2	93.2370	17.6075**	1.67e-06**	-4.8158**	-3.8349	-4.5020**
3	97.0110	5.0319	2.49e-06	-4.4674	-3.0662	-4.0191
4	108.5129	13.0354	2.34e-06	-4.6341	-2.8126	-4.0514

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Table-6: Result of J-J Cointegration Test

Null Hypothesis	Eigen Value	Statistics		5% Critical Value	
LNGDP, LNDD, LNED (K=3)		Trace Test	Max-Eigen	Trace Test	Max-Eigen
$r^{**} = 0$	0.4951	32.4885(0.0239)	21.8689(0.0393)	29.7970	21.1316
$r \leq 1$	0.2804	10.6191(0.2360)	10.5304(0.1794)	15.4947	14.2646
$r \leq 2$	0.0027	0.0887(0.7658)	0.0887(0.7658)	3.8414	3.8414

Note: ** indicates rejection of null hypothesis at 5% level of significance. Figures in the parenthesis show MacKinnon-Haug-Michelis (1999) p-values. Source: Author's estimation

Table-7: Results of VEC Granger Causality

Dependent Variables	Sources of Causality			
	Short run Causality			Long run Causality
	Chi-square Statistics (Prob)			t-statistics
	ΔLNGDP	ΔLNDD	ΔLNED	ECT_{t-1}
ΔLNGDP	-	1.7876 (0.4091)	0.0004 (0.9998)	-0.6325
ΔLNDD	0.0970 (0.9526)	-	1.3430 (0.5109)	1.2657
ΔLNED	7.3975** (0.0248)	4.7299 (0.0939)	-	-3.2786**

Note: ** indicates rejection of null hypothesis at 5% level of significance. Source: Author's Estimation

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