TAX REVENUE AND SUSTAINABLE INFRASTRUCTURAL DEVELOPMENT IN NIGERIA (2012 – 2022)

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Abstract
Government have a mandate to provide goods and service to their citizenry. Inadequate provision of infrastructure has always been a challenge for successive governments especially with declining tax revenue especially with the oil dependent economy. This study seeks to unveil the effect of taxes on infrastructural development in Nigeria. An ex-post facto design was adopted and data was obtained from the Central Bank of Nigeria (CBN), and the Federal Inland Revenue Services (FIRS) spanning the period of 2010 to 2020. Using Ordinary Least Square analytical technique combined with Granger Causality findings they revealed that taxes have a positive and insignificant effect on infrastructural development proxied by gross fixed capital formation. Moreover, the Granger causality reports a uni-directional causality running from capital gains tax to company income tax. The study concluded that tax collections by the government facilitate the accumulation of infrastructure. However, the magnitude remains insignificant in the short run.

Keywords; Infrastructural development, company income tax, petroleum income tax, capital gain tax, gross fixed capital.

Introduction
Every government mandate is to provide adequate and continuous infrastructure to its citizenry. Infrastructure is an umbrella term that represents investment in different goods, economic utilities, and activities under social overhead cost (SOC). Though not limited to telecommunication, sports, road, electricity, sanitation, power, health, and education, it varies in the dimensions of government, time, and place. To achieve transformed economies, sustainable development goals (SDG), growth and development would require functional and adequate, affordable and evenly distributed infrastructure investment (Mobolaji & Wale 2012, UNCTAD). There is a growing body of knowledge and debate on the quantification and contribution of infrastructural investment to income and growth (Aschauer, 1989). However, the nexus of taxes and infrastructural development is yet to be fully explored situated. Either because of inefficient collection method, utilization or leakages that come from tax collection to invest and expend on infrastructure is dependent on the revenue from various taxes and government willingness. According to the UNCTAD (2018) report, comparatively, there is inadequate infrastructure development in Africa, Nigeria in particular, as against developed and Western economies. This poses more challenges as to how to mobilize taxes and revenue for the yearning infrastructural needs.

Taxes are an instrument for government revenue. Tax mobilization is a crucial ingredient in sustaining any government expenditure and infrastructural development. Abnormal economic indicators of inflation, redistribution of income, young entrepreneurial boast, and balance of payment are managed by tax policy (Onoh, 2005). Consequently, there is a challenge and worry on how to assess, collect, and generate huge tax revenue from personal income tax, value-added tax, petroleum income tax, education tax, and capital gain tax. In recent years, there has been a progressive need to increase tax revenue (NSB,

2020), specially the huge burden of infrastructural development facing recent administration

Scholars are divided over the level of tax generation on one side; and the negative and judicious use for infrastructural development on the other side. Again, comparing recurrent expenditure, to gross fixed capital, the percentage of tax generated that is budgeted for infrastructural development in Nigeria significantly inadequate need to studied Though, there is a growing link between taxes and economic growth (Nwite, 2015), and the plethora of studies on taxes on infrastructural development (Anyaduba & Aronmwan, 2015); in a more recent one on geographic analysis (Adeleke, et al 2021). Despite this, there is still a paucity of recency in empirical studies linking taxes using these measures of (CIT, PIT, and CGT) to infrastructural development using (gross fixed capital). This study intends to fill this gap. This study seeks to allude to the fear and confirm the disagreement and discordant that trail tax revenue and infrastructural development empirically.

To confirm and achieve the aim, we hypothesize that;
Ho_1: Company Income Tax (CIT) has no significant effect on infrastructural development (gross fixed capital).
Ho_2: Petroleum Profit Tax (PPT) has no significant effect on infrastructural development (gross fixed capital)
Ho_3: capital gain tax has no significant effect on infrastructural Development (gross fixed capital).

Theoretical Foundation

Several theories may underpin and are used to explain tax and infrastructural development, such as sacrifice theory, equitable Distribution of Tax Revenue, cost of service theory, and benefit theory, (Malik, 2022; https://www.academia.edu taxation). This study dwelt more on benefit theory. Although sacrifice theory explains a partial commercial relationship between the state and the citizens, citizens are not mandated to get any good but if they must get the good they must equally pay. It also states that the government should tax the people based on the cost and the service delivered. This is similar to the benefit theory. (Lindahl 1958) advocates that there should be an equilibrium of what individuals pay as taxes for the provision of public goods (infrastructure) to be equal to the marginal benefits, when equal it helps prove the level of efficiency and utilities derived from the provision of public goods. This theory of value exchange posits that there is a contractual agreement between the (state and citizen). The State- to provide public goods and the citizenry as they enjoy these public goods should bear the cost by way paying of taxes. This further elucidates the role of taxes in bringing about economic growth (Chigbu,et. al, 2012). It thus follows that there a social contractt and obligations for the both government and citizenry to so perform their part of the contract in paying tax first and then government in turn proving social goods.

Conceptual Framework

Tax Revenue

Tax is as old as biblical history, government, and civilization. Revenue is the actual quantity of money available for government expenditure. In as much as there is a social contract to provide certain responsibilities and run the government, one of the ways to achieve this is tax. Tax is an imposition and compulsory levy on the citizens for the running of government, provision of public goods, and security of the entire people (Nwezeaku, 2012; Inyiama1, et al. 2017). The measure of a nation's economic well-being is reflected in the amount of total tax revenue mobilized and efficiently used for economic growth and development (Mobolaji & Wale 2012). Recent studies showed the direct relationship of using taxes to improving human capital development (Monday, et al, 2022). Different taxes exist varying from country to country, policy to be achieved, need and urgency of the government, and agreement of the citizen. These taxes may be indirect, direct, proportional, Progressive, and progressive taxation. Also, it could be categorized into various tax resources namely: Value Added Tax, Petroleum Profit Tax (PPT), Education Tax and Company Income Tax (CIT), and capital gain tax (CGT) (Alinaghi & Reed, 2020). In this study, we are more concerned with only PPT, CIT, and CGT, they are the ones we could lay hands on the record and are the most operational researched in Nigeria.

Petroleum Profit Tax

This is the most important and usable tax in Nigeria since petroleum is the major stay of our economy. PPT is a specific percentage levy on the profit of oil companies, collected as tax for all oil exploration and production, sale, and marketing of crude and gas in Nigeria as stipulated in Petroleum Profit Tax Act (1959) as amended

(http://www.placng.org/lawsof nigeria/laws/P13.pdf). This further created a burden on all companies in oil and gas to publish an annual audited account as provided by Section 8, of the Petroleum Profit Tax Act (PPTA) (Okpe, 2003). The Petroleum profit tax cut across and directly applicable in both downstream and upstream sectors.

Company Income Tax

Apart from the tax imposed on oil companies, there is another levy imposed on the profit of companies in general. All registered companies pay a certain percentage as tax from profits and income levied by the federal government for doing business in Nigeria. This tax may not be paid if there are losses declared. This is provided by the Companies Income Tax Act (CITA), Cap C21, LFN 2004 (as amended). Company income tax is a driver of economic growth among many nations (Alinaghi et al (2021).

Capital Gain Tax

Once there is a sale of capital assets, the law imposes a levy on the difference between the sales proceeds and the initial cost of the assets. The gain is measured by the increases in market value (Enemaku, 2012). This is usually 10% of capital gains. This also allows for a deduction on the expenses made as incidental to the sale and transfer of the assets. So capital gain tax represents tax levied on the sale of chargeable assets. Capital gain tax is more used to balance in redistribution, moderate unscrupulous, materialist lifestyle consumption and is justified because it increases a person's spending from saving. Chargeable assets cover all kinds of properties; ranging from debts, land, buildings, property created by the person disposing of it, and or otherwise coming to be owned without being acquired (Enemaku, 2012).

Infrastructural Development

Infrastructure is defined as government goods and activities for the sustenance of the society. Fourie (2006) opined that infrastructure is capital goods (e.g. communication, health, road, railway, power, electricity, telephone, and human capital development that produce public utilities and services. Srinivasu and Srinivasa-Rao (2013) see it as basic facilities for capital equipment used for essential and sustenance of productive activities which are regarded as “Social Overhead Capital”, and “Economic Overheads. These services are meant to be provided at a reasonable and fair cost for all. The ‘all’ makes it developmental. Development here is differentiated from growth which is an increase in public goods, but development extends to incremental equitability, availability, and even distribution among the citizenry. Near proxies of infrastructural investment in government is gross fixed capital.

Gross fixed capital formation is a macroeconomic variable used for national accounting. It is used in the absence of a common indicator for measuring government infrastructural development and is a better proxy and measure of infrastructural development. Gross Fixed Capital Formation (GFCF), measures general government investments in fixed assets including the economic sector, governments, and social security funds. It is gross because it does not make room for deduction/ adjustment of depreciation. It excludes financial assets, inventories, and operating costs (Kanu & Nwaimo, 2015)

Empirical Review

Several studies have shown direct and indirect relationships between taxes and infrastructural development, from Meta-analysis, state, and individual analysis.

Okoror et al (2019) examined empirically, the impact of Value Added Tax (VAT) on infrastructural development in Nigeria. The variable measures are VAT (custom, and excise duty) ON capital expenditure, Through an ex post facto design and published data, with the scope from 1994-2017 with the help of Autoregressive Distributed Lag (ARDL) model approach to co-integration. It was found that an increase in VAT has a positive impact on infrastructural development in Nigeria with a 1% rise in VAT resulting in a 5.232% increase in infrastructural development. However, this only used VAT and capital expenditure.

Inyiama; Chinedu1 & Chukwuani, (2017) examined the effect of the Federal Government of Nigeria’s Tax resources on the infrastructural development of Nigeria. Income from Value Added Tax (VAT), and Petroleum Profit Taxes (PPT) were used as proxies for Tax revenues/resources against Infrastructural Development. Data were collected from ex-pos-facto of 10 years (2006-2015) and analyzed multiple linear regression techniques. The result reveals tax revenue resources (PPT, CIT, AND

VAT) had a positive and insignificant effect on Infrastructural Development in Nigeria. This study is significant but did not consider capital gain tax.

Mustapha,et al. (2022) assessed the nexus of tax revenue on health care infrastructural development in the nation from 2013 to 2020. Data were sourced from CBN, Statistical Bulletin and the Office of Federal Inland Revenue for analysis. Company income Tax (CIT), petroleum Profit Tax (PPT), Education Tax (EDT), and Value Added Tax (VAT) as proxies of tax revenue and Government expenditure on health infrastructure through the statistical tool of multiple linear regression. It unveiled that PPT and VAT positively affect infrastructural development in the healthcare sector in the Country.

Generally, the plethora of studies supports the link between taxes and infrastructural development at varying, degrees and coefficients, individually and in a meta-analysis. Given that, there is still a dearth of sufficient currency, and more fusion and unending agreement on whether it is direct or indirect; significant or insignificant. This study intends to increase the body of knowledge through its findings and bridge this gap by specifically using CIT, and CGT PPT and relating the same to GROSS FIXED CAPITAL as proxies of infrastructural development.

Methodology

It employed a macro analysis that covered the entire Nigeria. As such data were sourced and collected from already published data from the Central Bank of Nigeria CBN, Federal Inland Revenue Service (FIRS). Also, the source is government-recognized agencies and the report goes through audited scrutiny, the issue of validity and reality is settled. Ex-post facto design because data already exist covering the 2012-2022 10-year period. Note that the study is a function of only the availability of published data.

Taxes were measured: CIT, PPT, and CGT as proxies for independent variables while infrastructural development was measured by gross fixed capital (GFC). To show the contributory effect of tax revenue on infrastructural development the Ordinary Least Square and Granger Causality test was used to analyze the results.

The model specifications are represented and looked like previous studies though with new modifications:

$$GFC_t = \beta_0 + \beta_1 CIT + \beta_2 PPT + \beta_3 CGT + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where:

GFC = Gross fixed capital used as a proxy for infrastructural development
CITt = Company Income Tax in year t
PPTt = Petroleum Profit Tax in year t
CGTt = Capital gain tax in year t
β_0 = represents the intercept
$\beta_0 - \beta_3$ = coefficient of independent variables.

Results and Discussions

Table 4.1Descriptive Analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
lngrossfix	44	9.401791	2.978591	7.554763	14.94953
lncapgain	44	.4670253	1.412824	-3.291446	4.215464
lncomptax	44	4.860419	1.153433	.0553401	6.241019
lnpetprofit	44	5.371298	.9587591	2.46648	6.511106

We present the descriptive statistics to examine the asymptotic distribution of the respective series with limited parameters from the table above the mean of gross fixed capital formation is 9.401791. The corresponding minimum and maximum values are 7.554763 and 14.94953. These values are within a reasonable range hence there is a tendency for the gross fixed capital

formation to have proper asymptotic distribution. The capital gains tax has a mean of 1.412824 with a negative minimum value, thus it has lower values across the series than higher values even though the maximum values are around 4.21564. In addition, company income tax and petroleum profit taxes have means of 1.15 and 0.958 with moderate minimum and maximum values.

Unit Root Test

This study employs Augmented Dickey-Fuller (ADF henceforth) test statistics to examine if the series is stationary. From the tables in Appendix 2 in the Petroleum tax section, the value of the ADF statistic is -7.292830 which is greater than the corresponding critical values. Hence, we reject the null if there is a unit root. This means the series collected on petroleum profit tax has no unit root after first differencing.

When company income tax is examined on the unit root basis, the table evidence shows that at 1%, 5%, and 10% critical values the ADF statistics -8.222054 exceeds every corresponding value, hence after first differencing the unit property vanished. Similarly, the ADF statistic on gross fixed capital formation is -6.162726 which exceeds all the critical values, hence we reject the null of there is a unit root in the company income tax series. Capital gains have an ADF series of -6.959119 which also exceeds all the critical statistics. Hence, we could not reject the alternative hypothesis.

Granger Causality Test

Table 4.2 Granger causality test

Granger causality test
Pairwise Granger Causality Tests
Date: 02/20/22 Time: 19:47
Sample: 2010Q1 2020Q4
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LNCOMPTAX does not Granger Cause LNCAP_GAIN	42	0.23742	0.7899
LNCAP_GAIN does not Granger Cause LNCOMPTAX		3.29558	0.0482
LNGROSS_FIX does not Granger Cause LNCAP_GAIN	42	1.76131	0.1859
LNCAP_GAIN does not Granger Cause LNGROSS_FIX		1.36077	0.2690
LNPETPROFIT does not Granger Cause LNCAP_GAIN	42	2.87790	0.0689
LNCAP_GAIN does not Granger Cause LNPETPROFIT		0.70348	0.5014
LNGROSS_FIX does not Granger Cause LNCOMPTAX	42	1.50064	0.2362
LNCOMPTAX does not Granger Cause LNGROSS_FIX		1.31306	0.2812
LNPETPROFIT does not Granger Cause LNCOMPTAX	42	1.34545	0.2729
LNCOMPTAX does not Granger Cause LNPETPROFIT		0.81447	0.4507
LNPETPROFIT does not Granger Cause LNGROSS_FIX	42	1.36464	0.2680
LNGROSS_FIX does not Granger Cause LNPETPROFIT		0.31197	0.7339

From the ganger causality output above we have applied a 5% level of significance to test causal tendencies existing amongst the variable. The tabular evidence shows that we could accept any alternative hypotheses in the Granger framework, but only in the causal relationship between capital gain tax and company income tax. The statistics show that there is a uni-directional causality running from capital gain tax to company income tax by the government. This is because the *F*-statistic has a value of 0.0482 probability. Every other relationship is seen to be neutral to each other. We further evaluate their corresponding relationship in the multiple regression below.

Multiple Regression Result

Table 4.3 Multiple regression using the Newey-West framework

Dependent Variable: LNGROSS_FIX
Method: Least Squares
Date: 02/20/22 Time: 16:43
Sample (adjusted): 2010Q2 2020Q4
Included observations: 43 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.110356	1.073932	-1.033916	0.3077
LNGROSS_FIX(-1)	0.949778	0.043435	21.86667	0.0000
LNCAP_GAIN	0.083439	0.106620	0.782588	0.4387
LNCOMPTAX	0.092252	0.099722	0.925088	0.3608
LNPETPROFIT	0.233871	0.219291	1.066486	0.2929

R-squared	0.911970	Mean dependent var	9.441384
Adjusted R-squared	0.902704	S.D. dependent var	3.002104
S.E. of regression	0.936426	Akaike info criterion	2.815451
Sum squared resid	33.32195	Schwarz criterion	3.020242
Log-likelihood	-55.53221	Hannan-Quinn criteria.	2.890972
F-statistic	98.41801	Durbin-Watson stat	2.054710
Prob(F-statistic)	0.000000	Wald F-statistic	873.7697
Prob(Wald F-statistic)	0.000000		

In the table above the dependent variable is gross fixed capital formation regressed against corresponding explanatory variables of petroleum profit tax, capital gains, and company income tax. The coefficient of capital gain tax is positive given a value of 0.0834 which is positive and in agreement with expectation. Therefore, it can be inferred that given a unit percent change in the value of the capital gain tax, gross fixed capital formation (proxy of infrastructure) changes by an insignificant magnitude of 0.0834%. The implication is that even though capital gains tax adds to the level of infrastructural accumulation it only adds an infinitesimal amount going by the probability statistic of 0.4387(i.e 43.87%).

We also find evidence of a positive and insignificant relationship between company income tax and gross fixed capital formation given a beta of 0.092252 and a corresponding probability of 0.3608. Similarly, petroleum profit tax has a beta of 0.233871 which is observed to be insignificant given a corresponding probability of 0.2929. This agrees with Inyiama; Chinedu1 & Chukwuani, (2017 study that taxes are positive but insignificant in Nigeria

Wald Test

Table 4.4 Wald test 4.4 Model Fitness test
Wald Test:
Equation: Untitled

Test Statistic	Value	Df	Probability
F-statistic	167.6710	(4, 40)	0.0000
Chi-square	670.6839	4	0.0000

Null Hypothesis: C(1)=C(2)=C(3)=C(4)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1)	0.256361	2.340791
C(2)	-0.462764	0.279885
C(3)	1.092374	0.358610
C(4)	0.754409	0.442598

Restrictions are linear in coefficients.

From the Wald test statistic, we examine the suitability of the model of the current research. From the table the corresponding explanatory variables are not equated to zero given an *F*-statistic of 167.6710 (*p*-value of 0.0000), hence the variables are the true candidates for the model building. Similarly, the Adjusted R-squared of 0.902704 implies that given some levels of adjustments, the coefficient of determination is tilting towards unity. This means that about 90.27% of the change in gross fixed capital formation is traceable to joint changes in corresponding tax variables in the model.

Conclusion

From the onset, we are set to find out the effect of tax revenue on infrastructural development. This study has made us apprehend and conclude that government tax collections facilitate the accumulation of infrastructural development,

Recommendations

This research has made the following recommendations:

a) Tax expertise FIRS and Policies should reposition, and intensify the collection of capital gain tax to provide for infrastructural development in Nigeria.
b) Stakeholders in the petroleum industry and FIRS, CBN should provide a modern and transparent way, (accounting software) to collect and remit PIT as this would provide revenue for infrastructural development.
c) Companies and FIRS should demonstrate social and moral responsibility to remit CIT as the government would use this to make available supporting and enabling infrastructure that would further boost their business operation and profit.
d) Policy makers and managers of tax should be more prudent in managing and investing in infrastructural development since taxpayers are also watching and hoping to get a reciprocal infrastructural development for their tax payment.

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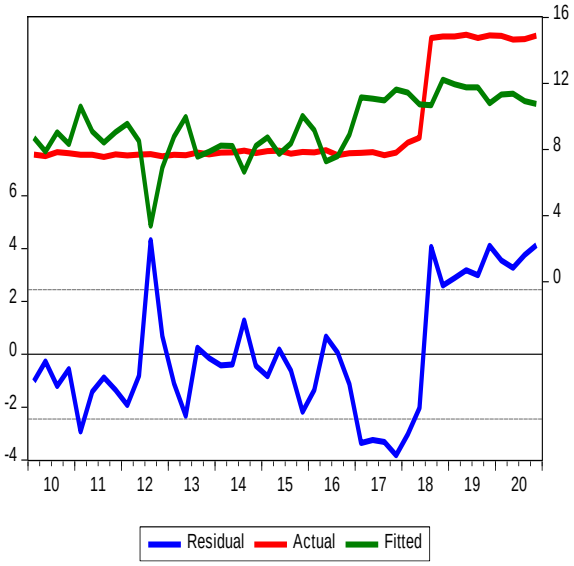
Appendices

Fitted graph




```
. regress lngrossfix lnpetprofit lncomptax lncapgain

      Source |       SS       df       MS              Number of obs =      44
-------------+------------------------------           F(  3,    40) =    7.83
       Model |  141.118365     3  47.0394549            Prob > F      =  0.0003
    Residual |  240.377934    40  6.00944836            R-squared     =  0.3699
-------------+------------------------------           Adj R-squared =  0.3227
       Total |  381.496299    43  8.87200696            Root MSE      =  2.4514

------------------------------------------------------------------------------
   lngrossfix |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+---------------------------------------------------------------
  lnpetprofit |   .7544091   .4425981     1.70   0.096    -.1401151    1.648933
   lncomptax |   1.092374   .3586104     3.05   0.004     .3675957    1.817153
   lncapgain |  -.4627642   .2798846    -1.65   0.106    -1.028432    .1029037
       _cons |    .256361   2.340791     0.11   0.913    -4.474555    4.987277
------------------------------------------------------------------------------
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Unit root test Analyses

Table 4.2 Augmented Dickey-Fuller Test

Null Hypothesis: D(LNPETPROFIT) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.292830	0.0000
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

*MacKinnon (1996) one-sided p-values.

In the table above the Value of the

Null Hypothesis: D(LNCOMPTAX) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.222054	0.0000
Test critical values:	1% level	-3.605593	
	5% level	-2.936942	
	10% level	-2.606857	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNGROSS_FIX) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.162726	0.0000
Test critical values:	1% level	-3.596616	
	5% level	-2.933158	
	10% level	-2.604867	

*MacKinnon (1996) one-sided p-values.
Null Hypothesis: D(LNCAP_GAIN) has a unit root
Exogenous: Constant
Leg Length: 2 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.959119	0.0000
Test critical values:	1% level	-3.605593	
	5% level	-2.936942	
	10% level	-2.606857	

*MacKinnon (1996) one-sided p-values.

Date: 02/20/22 Time: 17:12
Sample (adjusted): 2010Q3 2020Q4
Included observations: 42 after adjustments
Trend assumption: Linear deterministic trend
Series: LNGROSS_FIX LNCAP_GAIN LNCOMPTAX LNPETPROFIT
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.442786	49.80067	47.85613	0.0324
At most 1	0.357752	25.23885	29.79707	0.1531
At most 2	0.137830	6.642068	15.49471	0.6196
At most 3	0.009793	0.413347	3.841466	0.5203

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.442786	24.56182	27.58434	0.1163
At most 1	0.357752	18.59679	21.13162	0.1091
At most 2	0.137830	6.228721	14.26460	0.5840
At most 3	0.009793	0.413347	3.841466	0.5203

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LNGROSS_FIX	LNCAP_GAIN	LNCOMPTAX	LNPETPROFIT
0.026394	1.014829	-0.177148	0.850823
0.305042	0.249849	-1.200460	-0.342339
-0.000653	0.165531	0.760409	-1.119153
0.381636	0.009035	0.059526	-0.207662

Unrestricted Adjustment Coefficients (alpha):

D(LNGROSS_FIX)	0.083296	-0.227673	-0.108247	-0.073946
D(LNCAP_GAIN)	-1.006643	-0.224766	-0.161693	-0.005672
D(LNCOMPTAX)	-0.297584	0.415368	-0.172797	-0.039410
D(LNPETPROFIT)	-0.176569	0.110435	0.186080	-0.035029

1 Cointegrating Equation(s): Log-likelihood -222.8045

Normalized cointegrating coefficients (standard error in parentheses)

LNGROSS_FIX	LNCAP_GAIN	LNCOMPTAX	LNPETPROFIT
1.000000	38.44905	-6.711656	32.23532
	(7.33608)	(8.80907)	(10.0904)

Adjustment coefficients (standard error in parentheses)

D(LNGROSS_FIX)	0.002199
	(0.00393)
D(LNCAP_GAIN)	-0.026569
	(0.00558)
D(LNCOMPTAX)	-0.007854
	(0.00433)
D(LNPETPROFIT)	-0.004660
	(0.00295)

2 Cointegrating Equation(s): Log-likelihood -213.5061

Normalized cointegrating coefficients (standard error in parentheses)

LNGROSS_FIX	LNCAP_GAIN	LNCOMPTAX	LNPETPROFIT
1.000000	0.000000	-3.874962	-1.848335
		(0.93841)	(0.97219)
0.000000	1.000000	-0.073778	0.886463
		(0.23253)	(0.24090)

Adjustment coefficients (standard error in parentheses)

D(LNGROSS_FIX)	-0.067251	0.027647
	(0.04405)	(0.15036)
D(LNCAP_GAIN)	-0.095133	-1.077728
	(0.06371)	(0.21748)
D(LNCOMPTAX)	0.118850	-0.198218
	(0.04554)	(0.15545)
D(LNPETPROFIT)	0.029027	-0.151596
	(0.03376)	(0.11523)

3 Cointegrating Equation(s): Log-likelihood -210.3918

Normalized cointegrating coefficients (standard error in parentheses)

LNGROSS_FIX	LNCAP_GAIN	LNCOMPTAX	LNPETPROFIT
1.000000	0.000000	0.000000	-8.224135
			(2.55345)
0.000000	1.000000	0.000000	0.765070
			(0.21569)
0.000000	0.000000	1.000000	-1.645384
			(0.61473)

Adjustment coefficients (standard error in parentheses)

D(LNGROSS_FIX)	-0.067181	0.009729	0.176244
	(0.04370)	(0.15104)	(0.20440)
D(LNCAP_GAIN)	-0.095027	-1.104493	0.325195
	(0.06318)	(0.21834)	(0.29548)
D(LNCOMPTAX)	0.118963	-0.226822	-0.577312
	(0.04468)	(0.15441)	(0.20896)
D(LNPETPROFIT)	0.028905	-0.120794	0.040203
	(0.03240)	(0.11196)	(0.15152)

Granger causality test
Pairwise Granger Causality Tests
Date: 02/20/22 Time: 19:47
Sample: 2010Q1 2020Q4
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LNCOMPTAX does not Granger Cause LNCAP_GAIN	42	0.23742	0.7899
LNCAP_GAIN does not Granger Cause LNCOMPTAX		3.29558	0.0482
LNGROSS_FIX does not Granger Cause LNCAP_GAIN	42	1.76131	0.1859
LNCAP_GAIN does not Granger Cause LNGROSS_FIX		1.36077	0.2690
LNPETPROFIT does not Granger Cause LNCAP_GAIN	42	2.87790	0.0689
LNCAP_GAIN does not Granger Cause LNPETPROFIT		0.70348	0.5014
LNGROSS_FIX does not Granger Cause LNCOMPTAX	42	1.50064	0.2362
LNCOMPTAX does not Granger Cause LNGROSS_FIX		1.31306	0.2812
LNPETPROFIT does not Granger Cause LNCOMPTAX	42	1.34545	0.2729
LNCOMPTAX does not Granger Cause LNPETPROFIT		0.81447	0.4507
LNPETPROFIT does not Granger Cause LNGROSS_FIX	42	1.36464	0.2680
LNGROSS_FIX does not Granger Cause LNPETPROFIT		0.31197	0.7339

QUARTER	Petroleum profit tax	Company income tax	Capital gain tax	Gross fixed capital
2010Q1	234.6797	76.153	2.3291	2,206.77
2010Q2	225.4372	35.3163	2.1568	2,019.37
2010Q3	406.3465	68.985	2.1892	2,569.59
2010Q4	394.8653	19.7928	0.5158	2,387.33
2011Q1	366.8677	54.6791	0.0372	2,173.48
2011Q2	293.8855	87.1963	2.0319	2,173.48
2011Q3	348.0806	52.5642	3.4226	1,909.82
2011Q4	365.3151	45.4044	0.6619	2,248.68
2012Q1	286.7721	87.5361	0.7163	2,093.78
2012Q2	223.3787	158.8401	18.6272	2,220.64
2012Q3	49.5659	1.0569	0.7435	2,256.02
2012Q4	18.2365	74.04144	1.6833	1,986.79
2013Q1	190.6515	83.4061	1.7667	2,177.31
2013Q2	157.3835	314.3753	2.2621	2,110.21
2013Q3	112.9147	31.234	1.0334	2,476.90
2013Q4	99.9065	65.0511	2.496	2,248.82
2014Q1	113.2911	80.9706	2.3039	2,484.42
2014Q2	24.0587	421.0244	9.4288	2,534.03
2014Q3	11.7809	51.7438	0.6128	2,805.53
2014Q4	104.3029	85.775	2.329	2,437.13
2015Q1	55.563	281.8346	4.6394	2,727.60
2015Q2	206.9068	142.4567	67.72556	2,788.39
2015Q3	202.3942	150.5153	19.3214	2,329.74
2015Q4	208.2049	283.0649	2.4739	2,586.50
2016Q1	110.7207	273.6652	5.0758	2,530.41
2016Q2	70.2932	61.8419	4.3606	2,873.30
2016Q3	163.1262	41.1498	3.3415	2,129.45
2016Q4	266.0284	112.6235	4.7874	2,380.38
2017Q1	338.299	152.4191	0.1106	2,453.84
2017Q2	297.8715	364.2424	0.8258	2,554.16
2017Q3	390.7045	384.9345	1.8449	2,129.26
2017Q4	493.6067	313.4608	0.399	2,494.43
2018Q1	644.7751	199.1143	0.3142	4,578.69
2018Q2	523.8523	421.8009	6.1663	6,083.72
2018Q3	626.3839	348.097	5.8435	2,568,949.76
2018Q4	672.5694	371.3172	0.2707	2,799,691.71

2019Q1	493.2199	229.828	0.0964	2,798,505.79
2019Q2	502.9935	506.9517	0.9752	3,108,123.30
2019Q3	592.5475	513.3815	1.2986	2,565,487.78
2019Q4	525.5075	354.5373	3.6068	2,976,480.11
2020Q1	522.334	278.6499	0.6433	2,920,580.34
2020Q2	440.3014	324.3219	0.6174	2,319,390.85
2020Q3	353.1125	390.6746	1.7837	2,396,979.75
2020Q4	201.2455	281.7342	0.4742	2,944,319.35