Academic Journal of Economic Studies
Vol. 6, No. 3, September 2020, pp. 72–80
ISSN 2393-4913, ISSN On-line 2457-5836

The Empirics of Per Capita Income Growth, Resources Rents and Environmental Quality in Nigeria

Aderopo Raphael Adediyan[1], Uchenna Kingsley Chigozie[2], Oseremen ThankGod Ehisuoria[3]

[1,2,3] Department of Economics, University of Benin, Edo State, Nigeria
[1]E-mail: adediyan@yahoo.com, [2]E-mail: uchenomics@gmail.com, [3]E-mail: ehisuoriathankgod1@gmail.com (Corresponding author)

Abstract

This paper attempts to analyze the interaction among resources rents, per capita income growth and the environmental quality in Nigeria. Using annual time-series data between 1986 and 2018, the paper adopted the SVAR approach. The study suggests that per capita income growth (PCY) has a long-term negative and short-term positive impact on environmental quality (CO_2). Also, natural resources rent (NRR) has a short-term negative and positive impact, with roughly the same length of time, on the PCY, suggesting that its overall impact over the simulated period may be neutral. Nonetheless, the study further suggests that the dominant source of variation in PCY came from own shock and shocks in the CO_2. Additionally, while NRR had long term negative and short term positive impact on CO_2, the dominant source of movement in CO_2 asides own shock came from a perturbation in PCY. In conclusion, among others, policies designed to expand resources rents may not help a lot to promote per capita income growth and could contribute to a further deterioration of the state of the environment over time in Nigeria.

Keywords

Environmental Quality, Per Capita Income Growth, Natural Resources Rent, SVAR

JEL Codes: C01, O1, O11, O44, Q01

Received: 30 June 2020 **Revised: 11 July 2020** **Accepted: 21 July 2020**

1. Introduction

In spite of the raising population figure on a daily basis, the available statistical record from the World Bank showed that Nigeria economy is one of the largest economies in Africa in terms of Gross National Income (GNI) per capita. Accordingly, on the average of 4 years, Nigeria real GNI per capita grew, for instance, from roughly US$1185 between 1986 and 1990, US$1186 between 1996 and 2000, to US$2006 between 2006 and 2010 as showed in Figure 1.

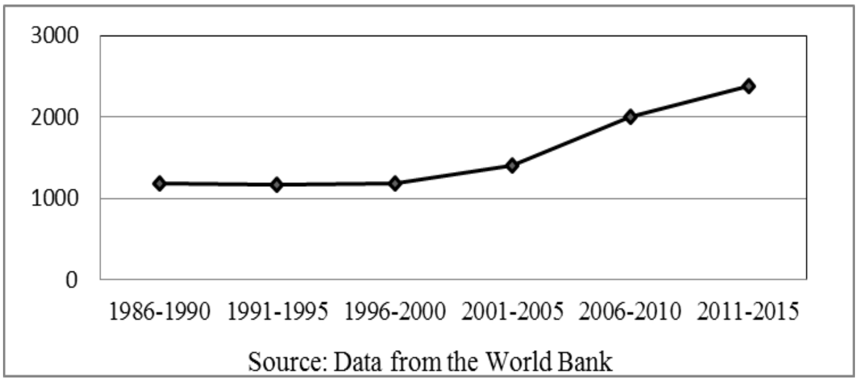

Figure 1. GNI Per Capita ($)

A question of concern, therefore, is on the possible contributing factors of Nigeria per capita income growth. For countries heavily endowed with natural resources like Nigeria, economic growth is largely driven by the existence of such resources. Although many economists believed that the presence of abundant natural resource in Nigeria, being a source of corruption and conflicts couple with the problem of ditch-disease created, is a curse rather than a blessing, the availability of abundant natural resources in the economy may not by itself the problem but the institutional quality of the economy, and more importantly, how the rent generated is being allocated, distributed or managed among the geo-political zones. On average, between 1986 and 1990, natural resource rent accounted for over 35 per cent of the Nigeria Gross Domestic Products (GDP), about 44 per cent between 1991 and 1995, and roughly 23 per cent between 2006 and 2010 as illustrated in Figure 2.

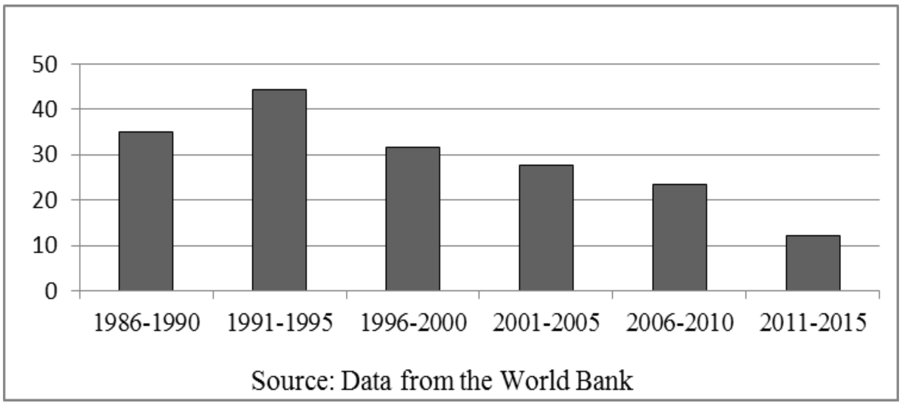

Figure 2. Natural Resources Rent (%GDP)

Hence, looking at the immersed level of funds generated from the natural resources in the time past, if the rent coming from the natural resource is properly utilized, it will be much feasible for Nigeria to build a prosperous modern economy. In Nigeria, natural resources in its wholesomeness still appear to be the dominant revenue base in Nigeria such that financing most of the public projects in the country depends on the amount of rent on natural resources collected. Indeed, growth in the level of rent collected purposely for the provision of public needs and boosting of the per capita income is desirable, but, at what cost? According to McConnell *et al.* (2009) resources depletion and environmental degradation are the probable inevitable end results of per capita income growth. This may be true if one considers the fact that modern industries in the course of carrying out their production activities created and released an impressive quantity of toxic substance into the environment. This is severe in the region with an intensive level of natural resource exploitation. For instance, although a good fraction of growth in the Nigeria GDP may be attributed to the exploitation of the natural resources in the Niger-Delta region, according to Ugochukwu (2008), the rate of environmental degradation in the region is highly disturbing. Figure 3 shows the growth pattern of Carbon dioxide (per capita) emission as one of the environmental quality indices in Nigeria.

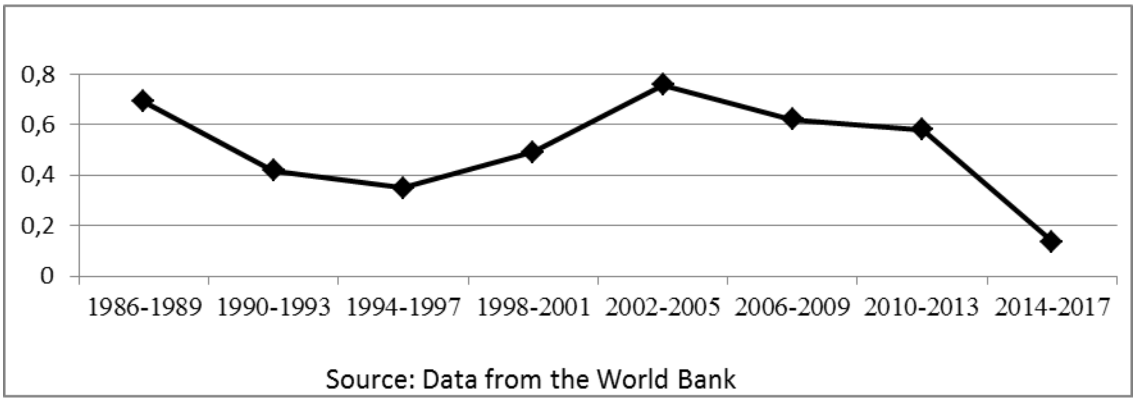

Figure 3. $C0_2$ per Capita (Environmental Quality)

A contrary view to the above argument is the opinion that economic growth enhances a better environment by enriching the people and enabling society to spend more on pollution abating and environmental protection technologies of which poor country may not be able to afford (Shafik & Bandyopadhya, 1992; Phimphanthavong, 2013). In sum, in spite of the fact that rent generated from the endowed natural resources appears to be crucial to the determination of per capita income growth, the means of generating such rent might be at a cost in the form of a reduction in the environmental quality. Subsequently, this research is geared towards establishing the dynamics of relations existing among the resources rent, per capita income growth and the quality of the environment in Nigeria. This paper is necessary on several grounds; for instance, a policy formulated to improve per capita income require apt consideration of issues like the rate of biodiversity loss in the course of increasing resource rent to enhance the living standard of the people.

2. Literature review

2.1. Theoretical literature

The relations between the per capita income growth and natural resources rent, the quality of environment and growth in natural resources rent as well as per capita income growth and environmental quality had been an issue of discussion over decades with no definite headway owing to the complexity of their interactions. Per capita income growth could be a source of environmental degradation (Ominyi & Abu, 2017); growth in natural resource rent could imply a deteriorating environment (Kaznacheev, 2013) since more of natural resources has to be exploited. A rising rate of natural resources rent could be a source of per capita income growth (Lee & Gueye, 2015; Mehrara & Baghbanpour, 2015). In the realm of economic literature relating to natural resources and its use in the economy, Auty (2003) argued that rents from the natural resources are important for capital investment and the average income of a country. The rents or benefits from the abundance of natural resources could also be used to redeploy and engage labour into more productive activity and creates the conditions necessary for a swift convergence of per capita incomes. However, this is not the reality in many countries especially those that are heavily endowed with exhaustible natural resource like crude oil since, in many of these countries, the abundance of natural resources appears to be an impediment to economic performance either by means of institutional, economic channels or both (Kaznacheev, 2013). In addition, Amini (2018) opined that economies richly endowed with natural resources are noticeably poor particularly in terms of the living conditions of the people, thereby suffering from what Auty (2001) aptly described as "resource curse hypothesis".

To this end, Mohsen & Alireza (2007), and Murshed, (2004) identified rent-seeking, deficiencies in institutions or poor institutional setup, inappropriate policies, and neglect of invest in human capital as the key determinants of the resource curse. Notwithstanding, the endowment of abundant natural resources may not be the cause of economic woes, rather, the variant of the natural resources in terms of whether it is point-source or diffused in nature (Woolcock *et al*., 2001; Auty, 2001). Countries with concentrated or point-source natural resources like oil and diamonds or minerals increase the activities of rent-seeking as well as other unproductive dealings when likened to countries blessed with diffuse resources like fertile soils and plantations (Murshed, 2004). Citing Norway's oil natural resources, Murshed (2004) contends that resources may be point-source in production; nonetheless, this does not imply that the rents generated may not be diffused owing to the way in which the accrued rents is returned to the citizens or at least saved for generations to come. Abundant or rapid flows of natural resources rent may reduce the public and private incentives to save and invest and the diversification of economic resources from more socially benefited economic activities thereby slowing down of economic performance (Gylfason & Zoega, 2006). Linking underdevelopment or poor per capita income growth to resource-rich countries, Auty (2003) used the staple trap model of Auty & Gelb (2001) to argue that by distributing rents to gain political support, natural resource-abundant allows the government to abandon wealth creation that has a lasting impact on the populace. The spillover impact of natural resource rents also extends to the environment in which the natural resources are expropriated.

Ruttan (1993) illustrated this in the third wave of his "three waves" relations between the environment and the natural resources (rents). That is, the wave of changes in the global environment owing to increasing resources depletion to earn more rents and its consequence on the environmental quality for the current and future generations. In sum, whenever a natural resource is exploited, rent and income increased but the environment is damaged. Therefore, although natural resources rent may be contributing to per capita income growth at first, its spillover effect, as time passes by, appears to be a rising rate of environmental degradation along with per capita income growth unless effectively controlled. According to Olufemi & Peter (2016), the situation in many economies revealed a close correlation between the quality of the environment and per capita income growth. This is the focal point of the Environmental Kuznets Curve (EKC) hypothesis. According to the Environmental Kuznets Curve (hypothesis), proposed by Simon Kuznets, in the process of achieving growth in per capita income, the quality of environment initially degenerates, worsening along the growth path of per capita income, becoming constant at a certain point, beyond which it eventually improves with growth in the level of income. For this reason, an inverted-U shaped relationship between per capita income growth and environmental quality is suggested. However, the universality of the inverted-U shaped of per capita income and environmental quality relationship is questionable. In this spirit, Omay (2013) criticized the EKC and argued in favour of the N-shaped relationship between the environmental quality and per capita income rather than the inverted-U shape represented by the EKC.

2.2. Empirical literature

In this section, we consider some of the past empirical studies on the interplay of per capita income growth, natural resources rent and environmental quality. Lee & Gueye (2015) studied the impact of resources windfall (rent) on the living standard of people. The study uses a sample of 130 economies (including African economies) between 1963 and 2007. The key findings are that although in the whole sample, resources rent is a welfare booster particularly through growth in income, in Sub-Saharan Africa, the impact of resources rent on the size of welfare growth progressively decline up to the point of becoming zero. Mehar *et al.* (2018) studied the relationship between the total resources rent and economic growth using India and Pakistan as a case study. The study uses 45 years of annual observation between 1970 and 2017. The study finds that the total resource rent had a significant positive impact on GDP per capita in India and Pakistan.

Barbier (2007) conducted research on "borderlines and consistent economic development". The study concludes that the borderline exploitations of natural resources could lead to a perpetual low-income level in the long term, boom and stagnation cycles, and unpredictable economic development. On the relationship between per capita income and environmental quality, Phimphanthavong (2013) studied the relationship between environmental conditions and income per capita in Laos. The study adopted time-series data that spanned from 1980 to 2010. Least Square estimating technique was employed to obtain the coefficient estimates of the model. The study suggested that environmental degradation increases as income per capita increases at the early stage, but decreases after attaining a particular level of income per capita growth.

Aye & Edoja (2017) empirically investigate whether CO_2 emission is being influenced by the level of economic growth in developing countries using a dynamic panel threshold model. The study was conducted using 31 developing countries. Findings of the study showed that the impact of economic growth on CO_2 emission is a positive effect during the high growth regime. However, a negative relationship was recorded in a regime with low growth.

3. Methodology of research

3.1. Methodological issues

This study adopted the Structural Vector Autoregression (SVAR) model. According to Enders (2014), the basic target of the SVAR is to recover, from the reduced form residuals, the structural innovations using economic theory. Given a two-variable VAR model of y and x below (where each of the variables is assumed to be endogenous and is determined by the lag value of other endogenous variables and itself).

$$y_t = \beta_{10} - \beta_{12}x_t + \delta_{11}y_{t-1} + \delta_{12}x_{t-1} + \varepsilon_{yt} \quad (1)$$

$$x_t = \beta_{20} - \beta_{21}y_t + \delta_{21}y_{t-1} + \delta_{22}x_{t-1} + \varepsilon_{xt} \quad (2)$$

Given the two equations describing a VAR model above, it is to be noted that the contemporaneous impact size of x_t on the endogenous variable y_t and that of y_t on x_t are represented by β_{12} and β_{21} while the ε_{xt} and the ε_{yt} are the structural error terms. A matrix representation of equation 1 and 2 is stated as:

$$\begin{bmatrix} 1 & \beta_{12} \\ \beta_{21} & 1 \end{bmatrix}\begin{bmatrix} y_t \\ x_t \end{bmatrix} = \begin{bmatrix} \beta_{10} \\ \beta_{20} \end{bmatrix} + \begin{bmatrix} \delta_{11} & \delta_{12} \\ \delta_{21} & \delta_{22} \end{bmatrix}\begin{bmatrix} y_{t-1} \\ x_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{xt} \end{bmatrix} \quad (3)$$

Of which may be compactly summarized as

$$Az_t = \varphi_0 + \varphi_1 z_{t-1} + \varepsilon_t \quad (4)$$

In this regard,

$$A = \begin{bmatrix} 1 & \beta_{12} \\ \beta_{21} & 1 \end{bmatrix}, \; z_t = \begin{bmatrix} y_t \\ x_t \end{bmatrix}, \; \varphi_0 = \begin{bmatrix} \beta_{10} \\ \beta_{20} \end{bmatrix}, \; \varphi_1 = \begin{bmatrix} \delta_{11} & \delta_{12} \\ \delta_{21} & \delta_{22} \end{bmatrix}, \; z_{t-1} = \begin{bmatrix} y_{t-1} \\ x_{t-1} \end{bmatrix}$$

However, because equation 4 represents the structural form of a VAR model, estimating its parameters cannot be directly done. Hence, the reduced form of the model must be solved. Subsequently, equation 4 must be pre-multiplied with the inverse of A, that is A^{-1}. Thus

$$(A^{-1})Az_t = (A^{-1})\pi_0 + (A^{-1})\pi_1 z_{t-1} + (A^{-1})\varepsilon_t \quad (5)$$

Equation 5 may be restated as:

$$z_t = \Omega_0 + \Omega_1 z_{t-1} + \epsilon_t \quad (6)$$

Where: $\Omega_0 = A^{-1}\pi_0, \; \Omega_1 = A^{-1}\pi_1 \; and \; \epsilon_t = A^{-1}\varepsilon_t$

Equation 6 described the standard VAR model. Awad (2011) in Abubakar (2016) noted that except appropriate restriction is imposed on the structural model, structural shocks identification from the estimated reduced form equation will not be possible. This method identified the structural model vis-à-vis restrictions imposition on the matrix of the contemporaneous relationship among the variables of interest such that it forms an upper or lower triangular. It worth to state that restrictions impositions as explained above also yield decomposition of residuals in a triangular pattern called “Cholesky decomposition" (Asteriou and Hall 2011). Accordingly, Forecast Error Variance Decomposition (FEVD) and the Impulse Response Function (IRF) are the two fundamental instruments of analysis under the SVAR model. Therefore, these become our basic instruments of analysis. In addition, the paper utilizes Augmented Dickey-Fuller (ADF) to examine the time series property of each of the variables of the model.

3.2. Specification of Model and Data

This study adopted the recursive identification scheme type of SVAR model as follows

$$\begin{bmatrix} \varepsilon_{PCY} \\ \varepsilon_{CO2} \\ \varepsilon_{GFCF} \\ \varepsilon_{NRR} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ \beta_{21} & 1 & 0 & 0 \\ \beta_{31} & \beta_{32} & 1 & 0 \\ \beta_{41} & \beta_{42} & \beta_{43} & 1 \end{bmatrix} \begin{bmatrix} \epsilon_{PCY} \\ \epsilon_{CO2} \\ \epsilon_{GFCF} \\ \epsilon_{NRR} \end{bmatrix}$$

Where PCY denotes per capita income growth, CO_2 (per capita) is the index of environmental quality, GFCF stands for gross fixed capital formation, and NRR represents natural resources rent. Data on these variables which spanned from 1986 to 2018 were obtained from the World Bank database.

4. Empirical results

4.1. Unit Root Test Result

From the summarized ADF unit root test results reported in Table 1, it is obvious that all the variables are of order one. That is, they are integrated of order one; hence, first difference-stationary series.

Table 1. Unit Root Test Results

Variables	Level			1st difference			Remark
	None	Constant	Constant & Trend	None	Constant	Constant & Trend	
CO_2	-1.564357	-1.371389	-1.438304	-5.588063	-5.641142*	-5.644835*	I(1)
PCY	1.601326	0.112452	-2.285085	-2.256102	-6.955852*	-6.871367*	I(1)
NRR	-0.800625	0.200378	-2.374586	-3.508882*	-7.025333*	-7.828418*	I(1)
GFCF	-1.347783	-1.904302	-1.812964	-2.765503*	-2.749757**	-2.447489	I(1)

NB: * and ** imply significant at 5 and 10 per cent respectively

Source: Authors' computation (2018)

4.2. Empirical Results from Structural Vector Autoregression

Figure 4 depicts the IRF between the per capita income (PCY) growth and the natural resources rent (NRR) simulated over a ten-period horizon. From Figure 4, the PCY in the first period does not show a response to a unit innovation in NRR, but in the second period, PCY response to NRR innovation is positive, increasing at a decreasing rate up to the fourth period, and thereafter continuously decline, reaching zero in the fifth period. In the sixth period through the tenth period, PCY responded negatively to NRR innovation; the response of PCY negatively increases between the sixth and the eight periods but converging to zero between the ninth and the tenth period. Consequently, one may deduce from the above that the impact of natural resource rent on per capita income is negative and positive, each observably off-setting the other, with the implication that NRR impact on PCY is likely to be neutral in the long-run.

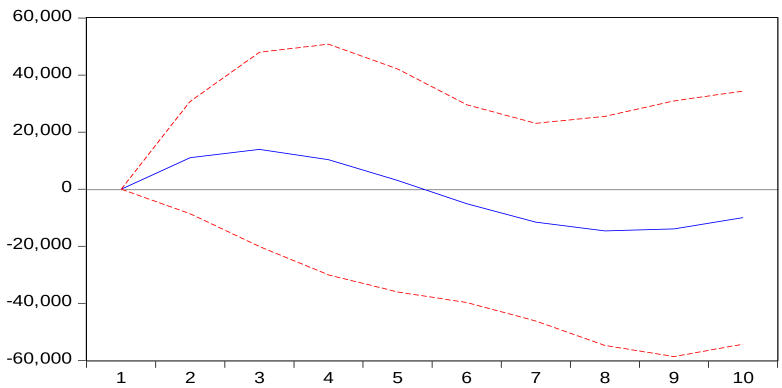

Figure 4. Response of PCY to NRR innovation

Figure 5 showed the IRFs response plots between CO_2 (environmental quality) to PCY. An observation of the plot showed that environmental quality (CO_2) exhibits a negative response to innovation in PCY from the last phase of the first period up to the later part of the seventh period, and positive from the eighth period throughout the tenth period. The positive range rises sharply in the first stage of the eighth period and continued up to the middle of the ninth period. Thus, there is a long-term negative and short-lived positive impact of PCY on CO_2.

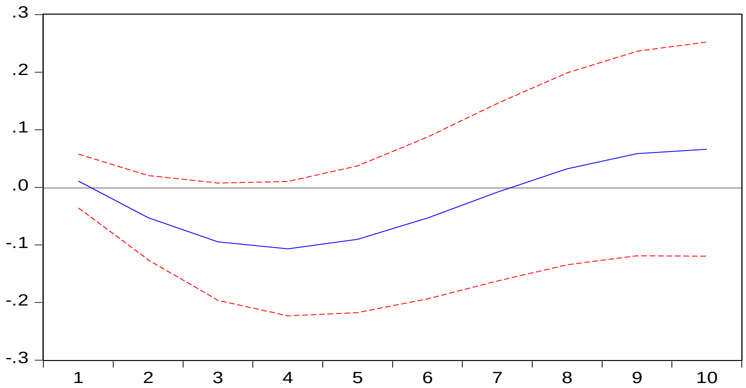

Figure 5. Respnse of CO_2 to PCY innovation

Also, from the IRF plot of CO_2 and TRR in Figure 6, it is evident that natural resources rents have a lasting negative impact on environmental quality. The peak of its impact is observed between the second period and the fourth period beyond which it showed convergence up to the tenth period.

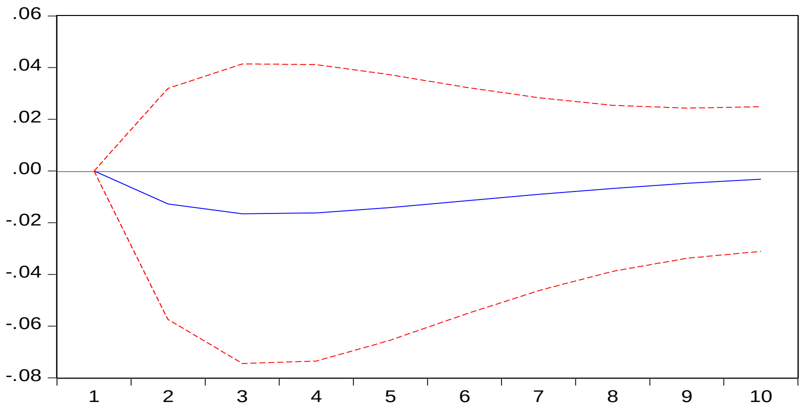

Figure 6. Response of CO2 to NNr innovation

Lastly, in Figure 7 on the other hand, the response of PCY to shocks in the gross fixed capital formation (GFCF) is negative throughout the ten-period horizon. Although the response of PCY to GFCF innovation is neutral in the early stage of the second period, the peak of the impact of GFCF on PCY is felt in the sixth and the seventh periods, tending to zero from the eight through the tenth period. As a result, there is an inverse relationship between PCY and GFCF.

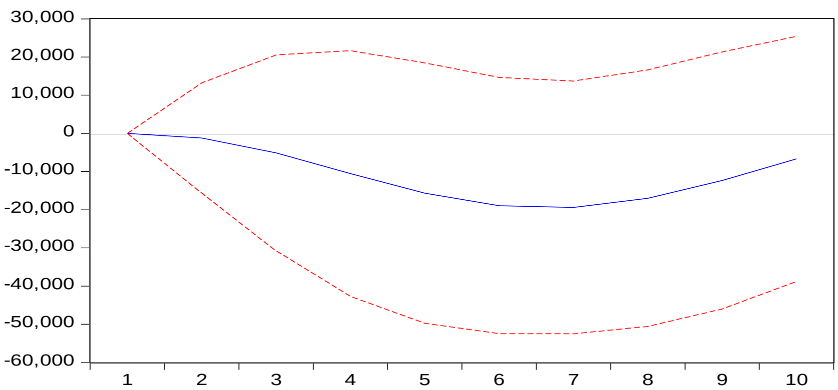

Figure 7. Response of PCY to GFCF innovation

4.3. The Simulated Result of the FEVDs

The results of the forecast error variance decomposition for each of the variables incorporated in the study are reported in Table 2 through 5. Starting with the per capita income (PCY) reported in Table 4, own shock contributed 100% variation in the first period; although reduces to about 80%, 59% and further reduces to 58% in the third, fifth and the tenth period, PCY maintains the lion's share for the entire period. The impact of the shock in CO_2 on variation in PCY improves from about 5% in the second period to roughly 35% in the fifth period but declined to 30% in the tenth period. Contrarily, both natural resource rent (NRR) and growth in gross fixed capital formation (GFCF) contributed only marginally to the movement in PCY with NRR accounting for the least especially in the sixth period through the tenth period.

Table 2. Variance Decomposition of PCY:

Period	S.E.	PCY	CO2	GFCF	NRR
1	59314.34	100.0000	0.000000	0.000000	0.000000
2	87606.70	92.81271	5.577950	0.018496	1.590843
3	106294.6	80.73342	16.22435	0.243915	2.798312
4	118120.9	68.13655	27.83394	0.991677	3.037831
5	126745.6	59.51156	35.40278	2.389365	2.696297
6	134995.2	57.03507	36.36973	4.075175	2.520025
7	143332.3	58.48440	33.18350	5.448370	2.883729
8	150518.0	60.08406	30.14481	6.212497	3.558627
9	155451.4	59.97509	29.43649	6.454061	4.134368
10	158255.1	58.58634	30.62239	6.405719	4.385542

Additionally, Table 3 details the FEVD of CO_2. From the table, in the first period, about 99.30% variations in CO_2 are attributed to itself while the remaining 0.7% came from the innovation in CPY with no response from growth in fixed capital formation and natural resources rent. Looking at the tenth period, own shocks reduce further to 43.98%, the contribution of shocks in NRR and growth in GFCF to the variation in CO_2 stood at about 6.41% and 6.41% respectively. The fraction of contribution of shock impact of CPY remarkably improves to about 44.92%, overtaking the impact of own sock. Subsequently, CPY is the dominant determinant of CO_2 in the period.

Table 3. Variance Decomposition of CO_2

Period	S.E.	PCY	CO2	GFCF	NRR
1	0.130227	0.700397	99.29960	0.000000	0.000000
2	0.176037	9.367263	88.36183	1.582009	0.688903
3	0.213392	25.97944	67.98668	3.613510	2.420375
4	0.244684	38.74319	51.95356	4.879164	4.424081
5	0.267020	43.93237	44.80887	5.291067	5.967690
6	0.280194	43.51812	44.54398	5.198089	6.739811
7	0.287681	41.36594	46.87796	4.956891	6.799202
8	0.294020	40.80254	47.89097	4.790194	6.516301
9	0.301595	42.55782	46.38150	4.728370	6.332307
10	0.309721	44.92298	43.98040	4.682255	6.414359

Similarly, the FEVD of NRR table showed that in the first period while about 96% of the variation in the NNR came from the own shock, innovation in PCY, CO_2 and GFCF contributed about 0.55%, 0.11% and 3.25% respectively. In the tenth period, although shocks in GFCF improved to about 10.15%, it remains the least source of movement in NRR. Furthermore, own shock reduces to 21.34%; hence, became the second-largest source of variation in NRR in the period.

Lastly, in the FEVD for GFCF reported in Table 5, shocks in PCY appeared to be the dominant factor contributing to the movement in the GFCF from the first period throughout the tenth period. Another important source of variation in the growth in GFCF came from the perturbation in CO_2 especially from the fifth period throughout the tenth period. The contribution of shocks in NRR to the variation in GFCF is minor compared to the effect of other factors in the model. Consequently, innovation in per capita income is the major driver of growth in the gross fixed capital formation.

Table 5. Variance Decomposition of NRR

Period	S.E.	PCY	CO2	GFCF	NRR
1	8.192720	0.553163	0.110270	3.249714	96.08685
2	9.985353	14.09262	0.294929	4.557873	81.05458
3	11.95010	37.33784	0.582136	4.482429	57.59759
4	14.05409	49.88274	4.176056	4.167295	41.77391
5	15.80324	50.62654	11.45026	4.337157	33.58605
6	17.06380	45.75392	19.92638	5.170845	29.14885
7	18.01941	41.08706	26.17685	6.568488	26.16759
8	18.89800	39.85221	28.12929	8.138359	23.88014
9	19.76237	41.54273	26.78270	9.406801	22.26777
10	20.51346	43.64895	24.85749	10.15076	21.34280

Table 5. Variance Decomposition of GFCF

Period	S.E.	PCY	CO2	GFCF	NRR
1	2.999169	61.85268	0.255991	37.89133	0.000000
2	4.123291	64.87729	2.464485	31.55246	1.105759
3	4.772344	61.54744	8.859280	27.45450	2.138782
4	5.121458	55.69339	16.99875	24.79932	2.508542
5	5.335694	51.52672	23.19266	22.90328	2.377330
6	5.540271	51.40849	24.98721	21.30644	2.297852
7	5.768610	53.94423	23.56392	19.86946	2.622394
8	5.982125	56.08337	22.03966	18.67344	3.203533
9	6.138197	56.29001	22.21069	17.80631	3.692987
10	6.234507	55.10891	23.73783	17.26064	3.892622

Cholesky Ordering: PCY CO_2 GFCF NRR

5. Conclusions

Previous researches had been mostly either on the impact of per capita income growth on the environmental quality or the effect of natural resources rent on economic growth with scare empirical evidence on the interfering role of resources rent. This study, therefore, considers the interactive impacts among the per capita income growth, the quality of the environment and the natural resources rent in Nigeria. The paper showed that policies designed to increase resource rent may not help to promote per capita income growth and could contribute to a further deterioration of the state of the environment in Nigeria over time as a result of the lasting negative impact of the resources rent on the quality of the environment.

References

Abubakar, A. B. (2016). Dynamic Effects of Fiscal Policy on Output and Unemployment in Nigeria: An Econometric Investigation. *CBN Journal of Applied Statistics,* (7)2, 102 – 122

Asteriou, D. & Hall, S. (2011). Applied Econometrics. 2nd Ed. Palgrave Macmillan. New York

Amini, A. (2018). Studying the Effect of Abundance of Natural Resources on Economic Growth. *European Journal of Sustainable Development.* (7)1, 201-208. Doi: 10.14207/ejsd.2018.v7n1p201

Auty, R.M., & Gelb A.H. (2001). Political Economy of Resource-Abundant States. In R.M. Auty (ed.) Natural Resources, Development Models and Sustainable Development. Environmental Economics Programme Discussion Paper 03-01, June

Auty, R.M. (2003). Natural Resources, Development Models and Sustainable Development. Environmental Economics Programme Discussion Paper 03-01. June

Auty, R.M. 2001. Resource Abundance and Economic Development. Oxford: Oxford University Press.

Aye, G.C. & Edoja, P.E. (2017). Effect of Economic Growth on CO2 Emission in Developing Countries: Evidence from a Dynamic Panel Threshold Model. Cogent Economics & Finance, 5: 1379239. Available at: https://doi.org/10.1080/23322039.2017.1379239

Barbier, E. (2007) Frontiers and Sustainable Economic Development. *Environmental and Resource Economics*, 37, 271–295.

Enders, W. (2014). *Applied Econometric Time Series*. New Delhi: Wiley India Pvt Ltd.

Gylfason, T. & Zoega, G. (2006). Natural Resources and Economic Growth: The Role of Investment. World Economy 29, August 1091-1115. https://doi.org/10.1111/j.1467-9701.2006.00807.x

Kaznacheev, P. (2013). Resource Rents and Economic Growth. A report for RANEPA. December. Retrieved from: ftp://ftp.repec.org/opt/ReDIF/RePEc/rnp/rpaper/repkz1.pdf
Kılıç, C. & Balan, F. (2018). Is there an Environmental Kuznets Inverted-U Shaped Curve? Panoeconomicus, 2018, Vol. 65, Issue 1, pp. 79-94.https://doi.org/10.2298/PAN150215006K
Lee, M. & Gueye, C.A. (2015). Do Resource Windfalls Improve the Standard of Living in Sub-Saharan African Countries? Evidence from a Panel of Countries. IMF Working Paper. WP/15/83
McConnell, C.R., Brue, S.L. & Flynn, S.M. (2009). *Economics: Principles, Problems, and Policies*. 18th Ed. New York. McGraw-Hill Companies, Inc.
Mehar, M. R., Hasan, A. Sheikh, M. A. & Adeeb B. (2018). Total Natural Resources Rent Relation with Economic Growth: The Case of Pakistan and India. *European Journal of Economic and Business*. 3(3), 14 – 22.
Mehrara, M. & Baghbanpour, J. (2015). Analysis of the Relationship between Total Natural Resources Rent and Economic Growth: The Case of Iran and MENA Countries. *International Journal of Applied Economic Studies.* 3(5), 1–7. Retrieved from: http://sijournals.com/IJAE/
Mohsen, M, & Alireza, K. (2007). Institutions, Oil and Economic Growth in Oil-based Countries during the period 1975-2005: A Panel Cointegration. *Quarterly economic value*, (2), 55-79.
Murshed, S. M. (2004). When does Natural Resource Abundance lead to a Resource Curse? Environmental Economics Programme Discussion Paper 04-01. March
Olufemi, S.M & Peter, M.E. (2016). Environmental Quality and Growth Effects of Foreign Direct Investment in Nigeria. *Iran. Econ. Rev*. (20) 2, 125 – 140.
Omay, R.E. (2013). The Relationship between Environment and Income: Regression Spline Approach. *International Journal of Energy Economics and Policy*. Vol. 3 (Special Issue), pp.52-61
Ominyi, S. O. & Abu, J. (2017). Sustainable Economic Development and Environmental Degradation: Evidence from Nigeria. *IIARD International Journal of Economics and Business Management*. Vol. (3)3, 33 – 45.
Phimphanthavong, H. (2013). The Impacts of Economic Growth on Environmental Conditions in Laos. *International Journal of Business Management and Economic Resource*, Vol 4(5), 766-774. Available at www.ijbmer.com
Ruttan, V.M. (1993). Population Growth, Environmental change, and Innovation: Implication for Sustainable Growth in Agriculture. In: Mensah, A.M & Castro, L.C. (eds), Sustainable Development: A Contradiction?, Zentrum Fur Entwicklungsfourschung (ZFE) Centre for Development Research, University of Bonn.
Shafik, N. & Bandyopadhy, S. (1992). Economic Growth and Environmental Quality: Time-Series and Cross-Country Evidence. World Development Report Policy Research Working Paper Series 0904.
Ugochukwu, C.N.C. (2008). Sustainable Environmental Management in the Niger Delta Region of Nigeria: Effects of Hydrocarbon Pollution on Local Economy. The Brandenburg University of Technology Cottbus. M.Sc Thesis. Retrieved from https://opus4.kobv.de/opus4-btu/files/438/Collins_Ugochukwu_PhD_Dissertation.pdf
Woolcock, M. Pritchett, L. & Isham, J. (2001). The Social Foundations of Poor Economic Growth in Resource-rich Countries. In RM Auty (ed.) Resource Abundance and Economic Development, Oxford: Oxford University Press, pp. 76-91.
World Bank (2018), World Bank Development Indicator. Retrieved from https://data.worldbank.org/