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Natural Resource Endowment and Sustainable Development Linkage in Ethiopia

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Outline

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1. Introduction

- There is a growing awareness of the **increasingly sharp demands** that human societies place on their economies and their natural environment.
- And also there is **corrosion of many social and political institutions.**
- The sustainability movement calls for a **more sophisticated and inclusive view of development** and well-being.
- In more detail, the **three imperatives of sustainable development** are: Economic sustainability, Social sustainability and Environmental sustainability.

ECONOMY
ENVIRONMENT
SUSTAINABLE DEVELOPMENT
SOCIAL COMMUNITY

- Ethiopia's economy experienced strong, broad-based growth averaging 10.3 percent a year from 2006/07 to 2016/17.
- Agriculture, construction and services accounted for most of the growth, with modest contribution from the manufacturing sector.
- The top ten exports of the country mostly comprises of primary commodities.
- Although the country has geological potential for the discovery of new, sizeable oil, gas and mineral deposits, most of its extractive industries are infant.

- Previously, there is one large scale gold mine in operation, ‘Lege Dembi open pit mine’,
- while a growing number of large mining projects are under development and exploitations for oil and natural gas is intensifying after significant discoveries in neighboring countries (WBG, 2018).

The Problem !!!???

- **The question is what kind of relationship do exists between natural resources endowment and sustainable development?**
- **Can resource endowment matters for sustainable development?**
- **Mahatma Gandhi, rightly pointed out that, "The earth provides enough to satisfy everyone's need, but not everyone's greed" (Singh, 2006).**

- **The common economic understanding is that significant revenues from natural resources should generate wealth, improves economic growth and reduces poverty.**
- **However, existing studies end up with mixed results, viewing natural resources as both a curse and blessing.**
- **In particular, after Sachs and Warner (1995,1997,2001), assert that resource rich countries grow slower while Ross(2001,2004), states that oil hinder democracy and fuels civil wars, the resource curse given too much attention.**
- **There are, however, a few countries that have managed to avoid this paradox which referred as exceptions of resource curse (Gylfason, 2010).**

Two Opposing Views on Natural Resource Endowment

* **Resource led-growth**
  - staples theory and the vent for surplus theory
  - trade allows to foster exports and growth
  - mining promoted the establishment of prestigious educational centers and
  - diffused knowledge to other activities

* **Resource curse**
  - Dutch disease
  - periodic rises and falls of commodity prices results,
  - volatility in export and fiscal earnings

- Further, in a society with rampant corruption, more natural resources may hinder growth.
- In such countries more natural resources may stimulate predation, rent-seeking, and other destructive and/or non-productive activities, in turn creating negative externalities for the rest of the economy (Torvik, 2009)
- Institutional quality can help reduce the curse or may even turn it into a blessing, but it is not obvious what type of institutional qualities is most beneficial in reaping the benefits of natural resources (Moshiri, 2017).

- Empirical works conducted previously also strengthen this mixed result.
- Some refuted the resource curse hypothesis (Momodu, 2016; Moshiri et al., 2017; Oyinlola, 2015 and Ding, 2016), whereas, some accepted the resource curse hypothesis (Godfrey et al., 2014; Hussain et al., 2009; Nezhad, 2014 and Jalloh, 2013).
- Why this study? prior works that examines the link between natural resource endowment and economic growth or development, didn't purely consider the issue of sustainable development.
- Furthermore, as far as our literature covers no previous empirical works exist in Ethiopia on this area. Therefore, this study tries to fill this gap.

- **There are wide ranges of ambitious development visions in Ethiopia, in order to achieve those goals a systematic examination of the link between natural resource endowment and sustainable development is crucial.**
- **Specifically, the study seeks;**
  - **(1) To identify whether there is any co-integrating relationship between natural resource endowment and sustainable development in Ethiopia; and**
  - **(2) To investigate empirically the short run and long run relationship between natural resource endowment and sustainable development in Ethiopia.**

2. Methodology

2.1. Theoretical Framework

- In specifying the model of sustainable development to be estimated, the theoretical framework for this study closely follows the specification given in Ding et al. (2016).
- Following the resource curse literature, the empirical specification in Ding et al. (2016) captures the effects of natural resource endowment on development based on a variant of endogenous growth model specified as:

$$y_t = \beta_0 + \beta_1 Z_t + \beta_2 TNRR_t + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

- Where yt represents adjusted net national income, Z denotes a vector of control variables for sustainable development, (TNRR) represents total natural resources rents (% of GDP) which is a proxy for natural resource endowment, and $\sum$ is the error term that is assumed to be white noise.

2.2.2. The Empirical Model in ARDL Framework

- The study employed the ARDL model using a time serious data covering from 1981-2016.
- The methodological procedure in the ARDL framework involves
  - First, checking of order of integration, in order to do that, the augmented Dickey–Fuller (ADF) test is used.
  - Second step, the ARDL bounds testing approach to co integration developed by Pesaran et al. (2001) is applied. In order to do the bound test, the ARDL model used in this study is specified as

$$\Delta y_t = \alpha_0 + \beta_1 y_{t-1} + \beta_2 PGR_{t-1} + \beta_3 I_{t-1} + \beta_4 HCI_{t-1} + \beta_5 OP_{t-1} + \beta_6 DSR_{t-1} + \beta_7 TNRR_{t-1} + \sum_{i=1}^{p} \delta_1 \Delta y_{t-i} + \sum_{i=1}^{p} \delta_2 \Delta PGR_{t-i} + \sum_{i=1}^{p} \delta_3 \Delta I_{t-i} + \sum_{i=1}^{p} \delta_4 \Delta HCI_{t-i} + \sum_{i=1}^{p} \delta_5 \Delta OP_{t-i} + \sum_{i=1}^{p} \delta_6 \Delta DSR_{t-i} + \sum_{i=1}^{p} \delta_7 \Delta TNRR_{t-i} + \varepsilon_t \ldots\ldots\ldots (2)$$

The ECM is specified as follows:

$$\Delta y_t = \alpha_0 + \theta ec_{t-1} + \sum_{i=1}^{p} \delta_1 \Delta y_{t-i} + \sum_{i=1}^{p} \delta_2 \Delta PGR_{t-i} + \sum_{i=1}^{p} \delta_3 \Delta I_{t-1_{t-i}} + \sum_{i=1}^{p} \delta_4 \Delta HCI_{t-i} + \sum_{i=1}^{p} \delta_5 \Delta OP_{t-i} + \sum_{i=1}^{p} \delta_6 \Delta DSR_{t-i} + \sum_{i=1}^{p} \delta_7 \Delta TNRR_{t-i} + v_t \qquad (5)$$

2.3. Description of Variables and Source of Data

- **Dependant Variable (Sustainable development): In this study the proxy of sustainable development is adjusted net national income measured by GNI minus consumption of fixed capital and natural resources depletion. This data is extracted from world bank data base.**

Table 1: Summery of explanatory variables included in the study

Variables	Measurement	Expected sign	Source of data
Total Natural Resource Rents % of GDP (TNRR)	Sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents	?	World Bank
Population Growth Rate (PGR)	Annual population growth rate for year t is the exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage	Negative	World Bank
Investment (I)	Total investment measured in millions of birr represents gross capital formation	Positive	NBE
Human Capital Index (HCI)	Based on years of schooling and returns to education	Positive	pwt9
Trade Openness (OP)	Ratio of the sum of exports and imports to GDP ratio.	Negative	UNCTAD
Total debt service (% of exports of goods, services and primary income) (DSR)	Sum of principal repayments and interest actually paid in currency, goods, or services on long-term debt, interest paid on short-term debt, and repayments (repurchases and charges) to the IMF.	Negative	World Bank

3. Results and Discussion

3.1. Introduction

- **We analyzed the collected data using STATA 14 software.**
- **All the data series that are obtained are transformed into logarithms to tackle possible heteroscedasticity and autocorrelation problems.**

3.2. Pre-estimation tests

3.2.1. Test for Unit Root

- **We used the commonly used Augmented Dickey Fuller (ADF) (1981) unit root tests. The unit root tests results are presented in Table below.**

Table 2: Augmented Dickey-Fuller test statistic (ADF Test)

Variables	At level		At first differences		Critical Values			Remark
	With trend	Without trend	With trend	Without trend	1%	5%	10%	
LANNI			**-4.054*** **	**-3.740*** **	**-3.689**	**-2.975**	**-2.619**	**I(1)**
LTNRR			**-6.879*** **	**-6.969*** **	**-3.689**	**-2.975**	**-2.619**	**I(1)**
LPGR			**-5.515*** **	**-6.703*** **	**-3.689**	**-2.975**	**-2.619**	**I(1)**
LHC			**-3.575 ** **	**-3.006** **	**-3.689**	**-2.975**	**-2.619**	**I(1)**
LDTSR			**-6.335*** **	**-6.421*** **	**-3.689**	**-2.975**	**-2.619**	**I(1)**
LIT			**-5.465*** **	**-5.555*** **	**-3.689**	**-2.975**	**-2.619**	**I(1)**
LOP			**-6.199*** **	**-6.280*** **	**-3.689**	**-2.975**	**-2.619**	**I(1)**

Note: *, ** denotes stationarity at 1 percent and 5 percent level of significance respectively.**

3.3. Co-integrating Results

- In order to evaluate the ARDL bounds it is necessary to test for the existence of long-run relationship among the variables.
- The model was estimated by ARDL and the optimal lag was selected by Akaike Information criterion (AIC).
- After estimation we conducted an F-test on joint significance of the variables using ADRL bound Test the F-stat indicate there is a long run relationship at 1 percent, 2.5 percent, 5 percent and 10 percent between variables included in the model of sustainable development.

Table 3: ARDL Bounds test

ARDL Bounds Test		
Sample (adjusted): 1983 2016		
Null Hypothesis: No long-run relationships exist		
Test Statistic	**Value**	**K**
F-statistic	5.0497	6
Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10 percent	2.03	3.13
5 percent	2.32	3.5
2.5 percent	2.6	3.84
1 percent	2.96	4.26

Note: The F-statistic tests the null hypothesis of no co integration.

3.4. The Long Run and Short Run Model

Table 4: Estimated Results of Sustainable Development in ARDL Model

ARDL Co integrating And Long Run Form Dependent Variable: Δ(log of Adjusted Net National Income) Selected Model: ARDL(1, 2, 2 1, 1, 2, 0) Sample (adjusted) : 1983 to 2016			
Short Run Coefficients			
Variable	**Coefficient**	**t-Statistic**	**Prob.**
Δ(log of Total Natural Resource Rent)	-0.430***	-3.89	0.001
Δ(log of Population Growth Rate)	-4.185**	-2.36	0.030
Δ(log of Debt Servicing Ratio)	-0.075	-1.38	0.184
Δ(log of Investment)	0.077	1.89	0.074
Δ(log of Openness)	-1.242***	-4.77	0.000
Error-correction Term	-0.423***	-4.664	0.000

Long Run Coefficients

Variable	Coefficient	t-Statistic	Prob.
log of Total Natural Resource Rent	-0.277	-1.19	0.250 ???
log of Population Growth Rate	-5.016***	-3.04	0.007
log of Debt Servicing Ratio	-0.245**	-2.37	0.029
log of Investment	0.304**	2.75	0.013
log of Openness	-3.179***	-4.61	0.000
log of Human Capital	6.419***	3.19	0.005
Constant	-10.070***	-2.76	0.013

Note: *, ** and * indicates 1 percent, 5 percent and 10 percent level of significance respectively**

- **Almost all variables has the expected sign in line with theory.**
- **As shown in the above table, in the long run, 1 percent change in investment and human capital will result in 0.304 percent and 6.419 percent increase in adjusted net national income respectively while 1 percent change in population growth rate, debt servicing ratio and trade openness will result in 5.016 percent, 0.245 percent and 3.179 percent decrease in adjusted net national income respectively.**
- **The empirical ARDL model in our study shows that natural resource endowment measured by total natural resource rent as percentage of GDP has a negative impact on sustainable development of Ethiopia in the short run supporting the hypothesis in the resource curse literature.**

- Our findings are consistent with previous empirical works (Philip, 2007; Hussain et al., 2009; Jalloh, 2013; Godfrey et al., 2016) among others.
- The justification for the cause of resource curse are inefficient control of the government on the economy and mismanagement of natural resource rents through rent seeking, high rate of corruption in the public sector and frequent civil conflicts.
- However, in the long run a negative but statistically insignificant relationship observed, this may be due to the possibility to rule out the impact of natural resource dependence on sustainable development in the long run.
- The ECT is statistically significant at 1 percent and negative (-0.423) as expected showing that the deviation of adjusted net national income from equilibrium values is corrected by 42.3 percent in the following year.

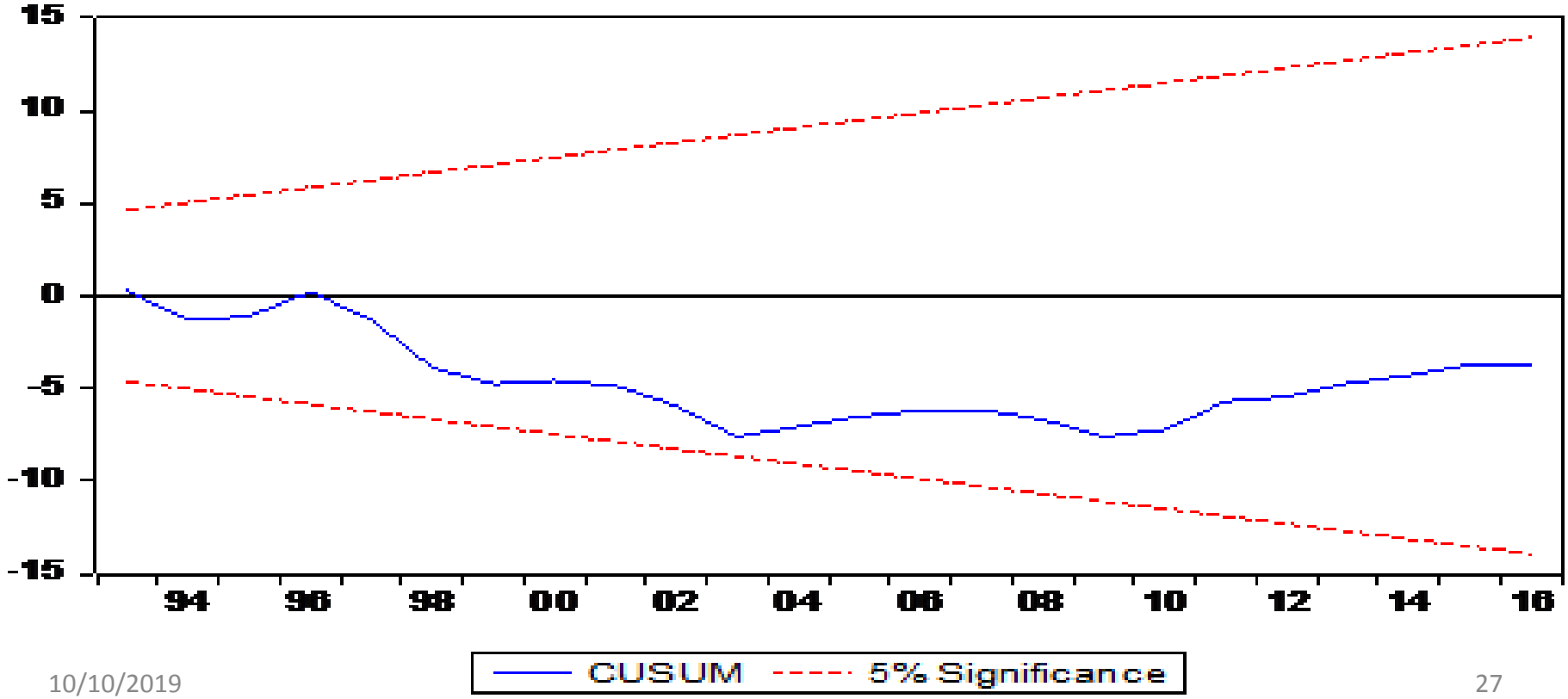
3.5. Diagnostic and Model Stability Tests

Table 5: Model Diagnostic Tests

Problems	Applicable Tests	Probabilities
Goodness of fit	R-squared	0.853
	Adjusted R-squared	0.733
Serial correlation	Breusch-Godfrey Serial Correlation LM Test	0.260
Functional form	Ramsey RESET Test	0.180
Normality	Skewness and Kurtosis of residuals	0.162
Hetroscedasticity	White's test	0.258

3.5.1. Test of Model Stability

- **The stability of long run estimates has been tested by applying the cumulative sum of recursive residuals (CUSUM) such tests are recommended by Pesaran (2001). CUSUM test indicate the model is significant at 5 percent critical value.**



4. Conclusion and Policy Recommendation

4.1. Conclusion

- The relationship between natural resources and economic growth can be expected to be complicated and controversial.
- Our results are not different from previous work done by different authors on this subject.
- The results of the study show that there is a significant negative short-run relationship between natural resource endowment and sustainable development in Ethiopia during the sample period which supports the hypothesis in the resource curse literature.

- **However, there is no significant relationship in the long run.**
- **Moreover, previous empirical findings also support our results that the countries that are relatively abundant in natural resources unsuccessfully performed to sustain their development paths.**
- **Robustness of estimates has been checked for reliability of results.**

- **Among the other variables included in the model of sustainable development, investment (gross capital formation) and human capital are found to have a significant positive effect while debt servicing is found to affect sustainable development in Ethiopia negatively in the long run.**
- **On the other hand, population growth and trade openness are found to have a statistically significant negative effect on sustainable development in Ethiopia both in the long run and short run.**

4.2. Policy Recommendations

- Based on the empirical analysis it is observed that in the short run natural resource endowment has a negative link with sustainable development implying the existence of resource curse in Ethiopia. Based on this finding we recommend that:-
  - Policies towards increasing the human capital stock in the country is the best policy options that the government could work on so as to tackle the possible problems of natural resource curse and achieve sustainable development goals in the country.
  - The government better improve the way and method of collecting natural resource rents and rents from natural resources should be directed in to more productive investments to achieve sustainable development goals but rather than concentrating on the natural resource rents it is better to diversify the economy by improving other sectors.

- **There is a need to establish an independent institutions in the natural recourse sector that are free from government authorities influence so as to improve the management of natural resources.**
- **Strengthening of the gross capital formation (investment) process is highly vital to achieve long run sustainable development goals of Ethiopia.**

"The future will be what we make it"

Thank You for Your Time and Attention!!!