

The relationship between natural resource abundance and happiness for lower middle-income countries

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Abstract. The resource curse, a concept linking natural resource wealth to poor economic performance, is well-documented. Separately, emerging studies suggest economic growth correlates with increased happiness. However, the intersection of these two areas—natural resource abundance and happiness—remains underexplored. This paper investigates the relationship between natural resource abundance and happiness by employing linear regression analysis on data from 35 lower middle-income countries from 2017 to 2021. Using the Natural Capital Index and the World Happiness Report, this study addresses the question: "Is there a correlation between natural resource abundance and happiness?" by integrating theories from the Resource Curse and the Easterlin Paradox. Additionally, it compares the established correlations between (1) natural resource abundance and income, and (2) income and happiness. The findings reveal significant correlations between natural resource abundance and income, and between income and happiness, but the correlation between natural resource abundance and happiness is less conclusive. From a managerial perspective, these results suggest that policymakers in resource-rich lower middle-income countries should focus not only on economic metrics but also on well-being indicators when designing development strategies to ensure balanced and sustainable growth.

1 Introduction

The term "resource curse" was coined by Auty and Warhurst in 1993 [1]. It describes the paradox where countries rich in natural resources often underperform economically compared to those with scarce resources [1]. This phenomenon is attributed to economic dependency on resource exports, which can negatively impact income per capita, particularly in countries with weak governance or poor economic policies [2]. Consequently, economies reliant on natural resource exports often exhibit lower growth rates [3].

Income growth is a crucial determinant of happiness[4]. Richard Easterlin, pioneering the study of happiness data in 1974, initially proposed that happiness increases with income, both across and within nations [4]. However, he identified a paradox: beyond a certain point, further income growth does not correspondingly increase happiness [4]. This diminishing

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effect is known as the Easterlin paradox, where the positive correlation between income and happiness weakens as income levels rise.

Research on natural resource wealth and economic growth extensively explores the resource curse, which suggests that abundant natural resources can inhibit economic growth by crowding out other forms of capital, such as physical, social, and human capital [5]. This crowding out occurs when high demand for natural capital reduces the demand for other capitals. Conversely, some studies indicate that natural resource abundance can result in short-term economic growth, as seen in Indonesia [6] and Norway ([7]; [8]; [9]).

The Dutch disease phenomenon, another aspect of the resource curse, occurs when sudden resource discoveries or increased exports reduce competitiveness in other sectors [10]. Additionally, natural resource volatility poses risks, particularly during economic shocks like the COVID-19 pandemic [11]. Volatility negatively impacts economic growth by reducing physical capital accumulation [12].

Studies on natural resources and happiness, such as those by Ali, Murshed, and Papyrakis, show a negative relationship between oil dependence and happiness [13]. Similarly, Mignamissi and Flora Yselle found that the resource curse negatively affects happiness, particularly in weak democracies and developing economies [14]. Dizaji, Dehaghani, and Sadeghi revealed that while good governance positively correlates with happiness, its effect is outweighed by the negative impact of natural resources [15].

The resource curse concept, coined by Richard Auty in 1993, theorizes that countries with abundant natural resources often experience lower economic growth compared to those with fewer resources [16]. This over-reliance on resource revenues can lead to problems such as bad governance, corruption, and economic focus on resource industries at the expense of others, known as "crowding out" [5] and "Dutch disease" [10]. Additionally, rent-seeking behavior, where individuals or groups gain wealth without contributing to productivity, exacerbates these issues [16].

Countries rich in natural resources often face income inequality and conflicts due to uneven wealth distribution [17]. This results in poor public services and a low aggregate income status, despite high resource-generated income. The volatility and long-term loss of wealth associated with natural resources further complicate the economic scenario ([12]; [6]). This paradox, where resource-rich countries remain economically disadvantaged, is also known as the "paradox of plenty" [18].

In contrast, the Easterlin paradox suggests that while income growth is generally associated with increased happiness, this relationship weakens beyond a certain satiation point [4]. Studies show strong correlations between income and happiness in both low- and high-income countries (Stevenson & Wolfers, 2008). However, the Easterlin paradox contends that higher income yields diminishing returns in happiness [19].

The Easterlin paradox also differentiates between absolute and relative income. Absolute income relates to happiness by meeting individual needs, while relative income involves social comparisons and habituation [20]. This differentiation highlights that income's impact on happiness varies based on individual and societal contexts.

Table 1 below compares the resource curse and the Easterlin paradox, highlighting their similarities and differences:

Table 1. Comparisons between the Resource Curse and the Easterlin Paradox

Factors	Similarities	Resource Curse	Easterlin Paradox
Variable	Income	Natural Resource Abundance	Happiness
Correlation	Association exists	Negative correlation	Positive correlation
Power	-	Strong for all	Stronger for countries below satiation point

The resource curse negatively correlates natural resource abundance with income, while the Easterlin paradox positively correlates income with happiness, though with varying strengths based on income levels. By combining these concepts, this paper analyzes the relationship between natural resource abundance and happiness, considering both the negative impacts of the resource curse and the nuanced correlations proposed by the Easterlin paradox.

This paper uses the resource curse and the Easterlin paradox concepts, both of which involve income, to investigate the relationship between natural resource abundance and happiness. Income serves two essential roles: as a connector between natural resource abundance and happiness, and as a baseline for comparison.

The resource curse theory posits a negative relationship between natural resource abundance and income—higher natural resource abundance leads to lower income. The Easterlin paradox, on the other hand, suggests a positive relationship between income and happiness—higher income leads to higher happiness. By linking these two theories through income, it logically follows that natural resource abundance negatively correlates with happiness. This inverse relationship forms a new correlation pattern, influenced by the resource curse and following the opposite direction of the Easterlin paradox.

The hypothesis to be tested is as per Fig. 1. below: the correlation between natural resource abundance and happiness is negative and more pronounced for countries with lower income than for those with higher income. The validity of this hypothesis will be assessed by comparing the direction and significance of two correlations: (1) between natural resource abundance and income, and (2) between income and happiness.

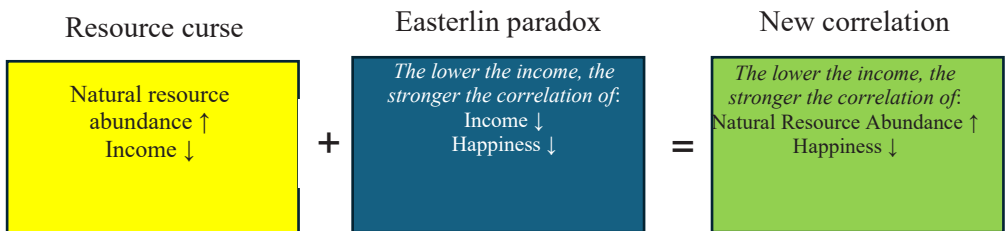


Fig. 1. The new correlation between natural resource abundance and happiness

2 Methods

This study employs linear regression analysis to explore the relationships between natural resource abundance, income, and happiness. The analysis is conducted using R software. Three key correlations are examined: (1) between natural resource abundance and income, (2) between income and happiness, and (3) between natural resource abundance and happiness. The first two correlations serve as benchmarks against which to test the third, exploring potential associations akin to the resource curse and Easterlin paradox phenomena. Confirming these established correlations in the data enhances the study's robustness.

The resource curse is tested across all 35 countries collectively, while the Easterlin paradox is examined by dividing the data into top and bottom halves of the income distribution: 18 countries in the top half and 17 in the bottom half. This division helps analyze how income influences happiness differently across income levels and serves as a basis for testing the new correlation between natural resource abundance and happiness.

Each variable is represented by an index, totaling 105 data points (35 for each index), and correlations are evaluated across multiple years from 2017 to 2021 to ensure the reliability and consistency of the findings.

1.3.1 Variables and Sample

The study utilizes data at the country level across 35 countries: Algeria, Kyrgyzstan, Morocco, Bolivia, Nicaragua, Sri Lanka, Ukraine, Ghana, Tajikistan, Senegal, Republic of Congo, Honduras, Egypt, Vietnam, Kenya, Zimbabwe, Mauritania, Cambodia, Myanmar, Cameroon, Philippines, Guinea, Benin, Bangladesh, Nepal, Tanzania, Zambia, Nigeria, India, Pakistan, Iran, Jordan, Mongolia, Tunisia, and Uzbekistan. Natural resource abundance, income (represented by Gross National Income), and happiness (from the World Happiness Report) are the variables of interest, each indexed for analysis.

Each variable is assessed across multiple years from 2017 to 2021 to ensure consistency and reliability of findings. The Natural Capital Index (NCI), published annually by SolAbility, measures natural resource abundance [21]. SolAbility, a sustainable intelligence think-tank, defines natural capital based on a country's physical environment and sustainability indicators [21]. Income is represented by Gross National Income (GNI), adjusted for Purchasing Power Parity (PPP) to facilitate international comparisons [22]. Happiness is indexed using the World Happiness Report, an initiative by Gallup for the UN, highlighting societal quality's impact on happiness levels [23].

1.3.2 Analytical Approach

The study employs linear regression to test two critical aspects of its hypotheses: the significance and directionality of correlations. The P-value assesses statistical significance, with values <0.05 indicating meaningful relationships [24]. The slope of the regression line indicates the direction of the correlation: positive or negative [25]. The `lm()` function in R calculates both P-values and slopes automatically.

In addition to statistical tests, scatter plots using the `plot()` function in R visually depict correlations between variables. The regression line generated by `abline()` aids in interpreting whether relationships trend positively or negatively, offering a clear visual representation of the data's correlations.

1.3.3 Equation Models

The relationships are modeled using the generic formula:

$$Y = m X + b \tag{1}$$

where y represents the dependent variable (GNI or WHR), m is the slope, x is the independent variable (NCI or GNI), and b is the intercept.

When applied, they become as follows:

- Resource Curse

$$GNI = m NCI + b \tag{2}$$

- Easterlin paradox (Top Half and Bottom Half)

$$WHR = m GNI + b \tag{3}$$

- New correlation (Top Half and Bottom Half)

$$WHR = m NCI + b \tag{4}$$

3 Results

3.1 Data and Results

Before diving into the results, the data used in this paper will be presented. Table 2 provides a detailed summary of the dataset employed in this research, covering the years 2017 to 2021. It includes key variables such as the Natural Capital Index (NCI), Gross National Income (GNI) per capita adjusted for Purchasing Power Parity (PPP), and World Happiness Report (WHR) scores. The table presents mean, minimum, and maximum values for each variable, differentiated by the top and bottom halves of income groups. This layout offers a clear view of the distribution and variation in natural resource wealth, income levels, and happiness scores across different income brackets.

Table 2. Data used in this paper

Variable	Natural Resource Abundance		Income		Happiness		
Index	NCI		GNI Per Capita, PPP, Intl \$		WHR		
Source	SolAbility		World Bank		SDSN		
Data Type	Parametric		Parametric		Parametric		
Income Level Categorization	Top Half	Bottom Half	Top Half	Bottom Half	Top Half	Bottom Half	
<i>Mean</i>	2017	37.72	48.90	8887	3752	5.05	4.42
	2018	36.78	48.46	9322	3954	5.02	4.56
	2019	37.31	48.63	9594	4106	5.01	4.71
	2020	41.60	50.79	9363	3972	4.96	4.87
	2021	39.89	44.78	10007	4224	5.04	4.81

		Top Half	Bottom Half	Top Half	Bottom Half	Top Half	Bottom Half
<i>Min.</i>	2017	21.93	33.25	5000	2070	4.10	3.35
	2018	20.83	34.53	5250	2410	4.10	3.30
	2019	23.86	34.17	5390	2260	4.02	3.23
	2020	28.46	35.68	5190	2060	3.57	3.30
	2021	28.15	33.29	5700	2280	3.82	3.15
<i>Max.</i>	2017	56.80	63.85	15180	5010	6.07	5.27
	2018	56.98	63.28	15120	5160	6.14	5.47
	2019	56.06	63.98	14680	5340	6.17	5.65
	2020	64.09	64.95	15220	5160	6.26	6.14
	2021	67.91	58.12	16550	5640	6.18	5.92
Data Points		18	17	18	17	18	17

Meanwhile, Table 3 outlines the results of the regression analysis conducted to explore the relationships between natural resource abundance (NCI), income (GNI), and happiness (WHR) for the period from 2017 to 2021. It includes correlation coefficients and significance levels to illustrate how natural resource wealth and income levels relate to happiness. The table provides insights into the strength and direction of these relationships, allowing for a comprehensive understanding of how these variables interact within the studied timeframe.

Table 3. Regression Results

Year	Correlation	Top Half Equation (p-value)	Bottom Half Equation (p-value)
2017	NCI & GNI	$GNI = -160.54 \cdot NCI + b$ (0.0022)	
	GNI & WHR	$WHR = -4.26E-05 \cdot GNI + b$ (0.4074)	$WHR = 0.0004 \cdot GNI + b$ (0.0027)
	NCI & WHR	$WHR = 0.0244 \cdot NCI + b$ (0.1590)	$WHR = -0.0202 \cdot NCI + b$ (0.1853)
2018	NCI & GNI	$GNI = -172.55 \cdot NCI + b$ (0.0013)	

Year	Correlation	Top Half Equation (p-value)	Bottom Half Equation (p-value)
	GNI & WHR	WHR= $-6.81E-05 \cdot \text{GNI} + b$ (0.1868)	WHR= $0.0004 \cdot \text{GNI} + b$ (0.0008)
	NCI & WHR	WHR= $0.0305 \cdot \text{NCI} + b$ (0.0860)	WHR= $-0.0206 \cdot \text{NCI} + b$ (0.1910)
2019	NCI & GNI	GNI= $-175.05 \cdot \text{NCI} + b$ (0.0016)	
	GNI & WHR	WHR= $-8.76E-05 \cdot \text{GNI} + b$ (0.1179)	WHR= $0.0004 \cdot \text{GNI} + b$ (0.0033)
	NCI & WHR	WHR= $0.0408 \cdot \text{NCI} + b$ (0.0441)	WHR= $-0.0229 \cdot \text{NCI} + b$ (0.1598)
2020	NCI & GNI	GNI= $-148.60 \cdot \text{NCI} + b$ (0.0146)	
	GNI & WHR	WHR= $-5.22E-05 \cdot \text{GNI} + b$ (0.3700)	WHR= $0.0005 \cdot \text{GNI} + b$ (0.0057)
	NCI & WHR	WHR= $0.0350 \cdot \text{NCI} + b$ (0.0672)	WHR= $-0.0101 \cdot \text{NCI} + b$ (0.6792)
2021	NCI & GNI	GNI= $-102.86 \cdot \text{NCI} + b$ (0.1532)	
	GNI & WHR	WHR= $-6.57E-05 \cdot \text{GNI} + b$ (0.1989)	WHR= $0.0004 \cdot \text{GNI} + b$ (0.0309)

Correlation	Top Half Equation (p-value)	Bottom Half Equation (p-value)
NCI & WHR	$WHR=0.0206 \cdot NCI+b$ (0.2454)	$WHR=0.0066 \cdot NCI+b$ (0.7722)

4 Discussions

The results from Table 2 and Table 3 reveal several key relationships between natural resource abundance (NCI), income (GNI), and happiness (WHR). To aid in understanding these findings, the Figure 2 below visually represents the core relationships explored in this study:

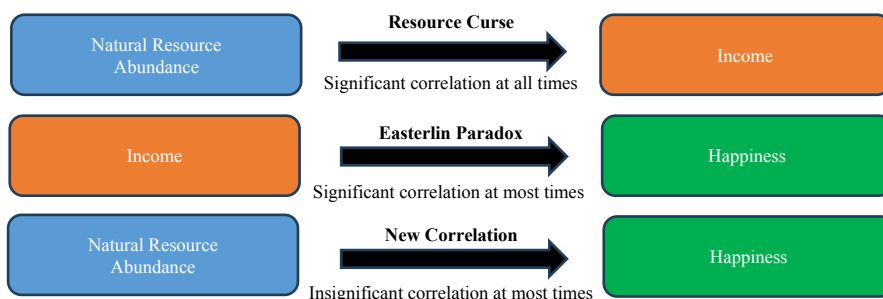


Fig. 2. Results of the Correlations Tested

It illustrates the following:

1. **Resource Curse:** The correlation between natural resource abundance and income shows a significant negative relationship consistently across all years (2017-2021). This aligns with the resource curse theory, indicating that countries with higher natural resource abundance tend to have lower income levels.
2. **Easterlin Paradox:** The relationship between income and happiness generally follows the Easterlin paradox. At lower income levels, there is a significant positive correlation between income and happiness. However, this relationship weakens at higher income levels, demonstrating diminishing returns on happiness as income increases.
3. **New Correlation:** The correlation between natural resource abundance and happiness is mostly insignificant across the observed years. This suggests that while natural resource abundance impacts income, its direct effect on happiness is not as pronounced or consistent. The correlation between natural resource abundance (NCI) and income (GNI), consistently exhibited a significant negative relationship throughout the study period (2017-2021). This supports the notion of the resource

course, indicating that countries rich in natural resources tend to have lower income levels.

4.1 Analysis of Correlation between NCI and GNI

Figure 2 confirms that the correlation between natural resource abundance (NCI) and income (GNI) shows a consistently significant negative slope, supporting the resource curse theory. This result is in line with the research by Sachs & Warner [3] and Arezki & van der Ploeg [2], which argue that economies rich in natural resources often experience lower income levels due to various economic and governance issues.

4.2 Analysis of Correlation between GNI and WHR

Figure 2 also reflects the Easterlin paradox, where the correlation between income (GNI) and happiness (WHR) is significant in lower income levels but not in higher income levels. This finding is consistent with Easterlin's (1995) observations that income has a stronger impact on happiness at lower income levels, but additional income provides diminishing returns in happiness beyond a certain threshold. The results affirm the complexities noted in the introduction regarding the diminishing returns of income on happiness [4].

4.3 Analysis of Correlation between NCI and WHR

Figure 2 illustrates that the correlation between natural resource abundance (NCI) and happiness (WHR) is mostly insignificant. This finding challenges the hypothesis that higher natural resource abundance negatively impacts happiness, particularly in lower-income countries. The lack of a clear significant correlation suggests that while natural resource wealth influences economic indicators like income, its effect on happiness is less direct and may be influenced by other factors not captured in this study. This observation aligns with the introduction's discussion on the need for further exploration of the relationship between natural resources and happiness (Ali et al., 2019; [14]).

4.4 Insights and Challenges

Figure 2 provides a visual summary that contextualizes the results within the broader theories of the resource curse and the Easterlin paradox. It helps to illustrate how these theories apply to the observed data and highlights the complexities of interpreting the effects of natural resources on happiness. The findings reinforce some aspects of the resource curse and Easterlin paradox while also revealing nuanced aspects that require further investigation. The subjective nature of happiness and the influence of various contextual factors beyond economic indicators are emphasized, supporting the need for additional research to capture these complexities.

4.5 Evaluations of Hypothesis

The hypothesis posited that the correlation between natural resource abundance and happiness would be negative and more pronouncedly so for lower-income countries. The significant negative correlation between natural resource abundance and income supports the

resource curse theory, while the findings on income and happiness align with the Easterlin paradox. However, the hypothesis regarding the negative impact of natural resource abundance on happiness was not supported by the data, as the correlation between NCI and WHR was generally insignificant.

These findings contribute to our understanding of economic development and subjective well-being, reflecting the intricate interplay between natural resources, income, and happiness. The diagram and analysis together highlight that while natural resources significantly affect economic indicators like income, their direct impact on happiness is less clear and requires further exploration.

4.6 Policy Recommendations

The study underscores the need for managers in resource-rich countries to diversify their business models and invest in human capital to counteract the long-term challenges posed by the resource curse, such as economic instability and lower income levels. Enhancing governance and reducing economic volatility are also crucial strategies for effectively leveraging natural resources and ensuring sustainable growth.

For policymakers, it is essential to focus on economic diversification and invest in sectors beyond natural resources to stabilize income levels and foster sustainable development. Improving governance and reducing corruption will help manage resource revenues more effectively. Additionally, adopting broader well-being metrics, beyond income alone, and implementing targeted social safety nets can enhance overall happiness and quality of life, addressing both economic and non-economic factors that contribute to well-being.

5 Conclusion

This study explored the relationship between natural resource abundance and happiness, integrating the resource curse and the Easterlin paradox theories. The resource curse theory suggests a negative correlation between natural resource abundance and income, while the Easterlin paradox indicates a positive link between income and happiness. Our analysis of 35 lower middle-income countries confirmed the robustness of these theories, revealing significant negative correlations between natural resource abundance and income, and positive correlations between income and happiness. However, the anticipated negative correlation between natural resource abundance and happiness was not statistically significant, challenging the hypothesis that natural resource wealth negatively impacts happiness, especially in lower-income contexts.

These findings emphasize the complexity of linking economic metrics with subjective well-being. They suggest that while natural resources can negatively affect income (as per the resource curse), their influence on happiness is less straightforward. Policymakers should adopt comprehensive development strategies that balance economic growth with social and environmental well-being, ensuring that the benefits of natural resources enhance overall societal happiness. This approach aligns with sustainable development goals and encourages more nuanced, inclusive policies.

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