



Mediation or Moderation:
*Analyzing the Role of Environmental Protection
in the Relationship between
Economic Growth and Societal Happiness*

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Introduction

- Examines the relationship between economic growth, environmental protection, and societal happiness.
- Key research question: Does environmental protection mediate or moderate the effect of economic growth on happiness?
- Data: 122 countries (2020 and 2022).

Objectives and Theoretical Framework

- Investigate mediation and moderation using GNI (economic growth), EPI (environmental protection), and WHR (societal happiness).
- Theoretical Basis:
 - Mediation: EPI partially transmits the effect of GNI on WHR.
 - Moderation: EPI influences the strength/direction of the GNI-WHR relationship.



Figure 1. Full mediation

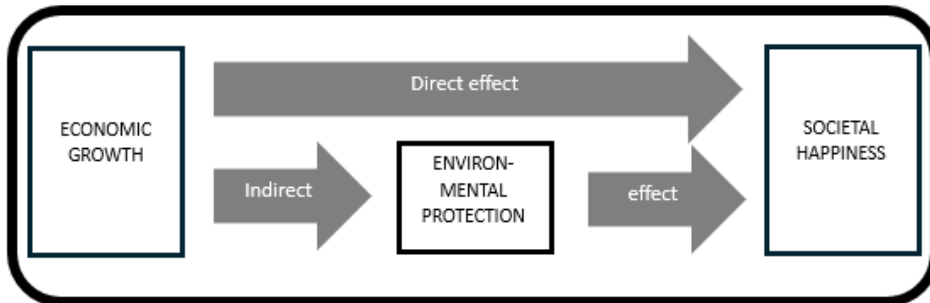


Figure 2. Partial mediation

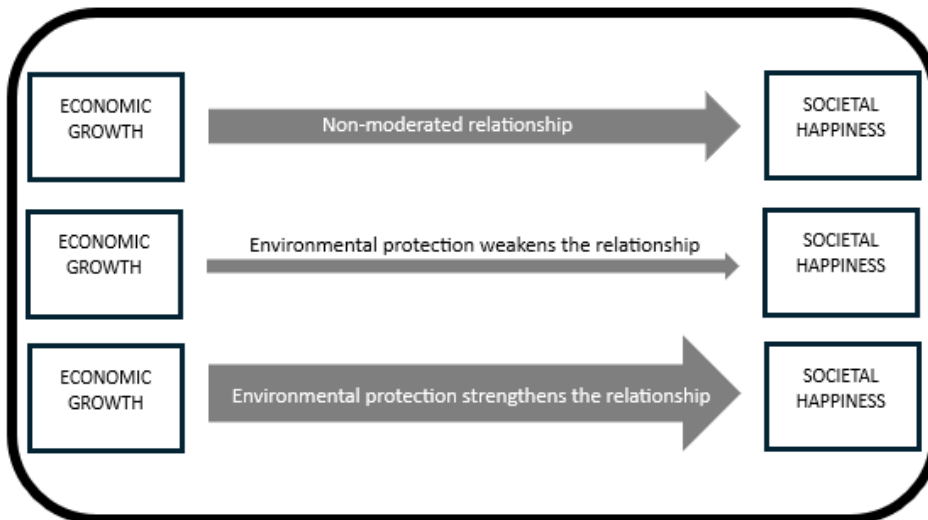


Figure 3. Moderation



Methodology

- Variables:
 - GNI (World Bank)
 - EPI (Environmental Performance Index, Yale)
 - WHR (World Happiness Report)
- Statistical analysis in R:
 - Linear regression: $GNI \rightarrow WHR$.
 - Mediation analysis: $GNI \rightarrow EPI \rightarrow WHR$.
 - Moderation analysis: $GNI * EPI \rightarrow WHR$.

Results

- Mediation Findings:
 - Partial mediation of EPI in the GNI-WHR relationship.
 - Indirect effect significant (Sobel test: $p < 0.05$).
- Moderation Findings:
 - Interaction term (GNI:EPI) not significant ($p > 0.05$).

Below is the data used in this paper:

Year		GNI	WHR	EPI
2020	Max	86,640	7.809	82.5
	Min	1,230	3.299	25.1
	Mean	23,031	5.625	49.7
2022	Max	118,470	7.821	77.9
	Min	1,210	2.995	18.9
	Mean	28,083	5.649	44.4

Table 1. Data used in this paper

Below are the results:

Year	Models			Variable s	Coefficient		
	Name	R ²	P-Value		Estimate	Standard Deviation	P-Value
2020	Model 1	0.6215	2.200e-16	GNI	4.074e-05	2.902e-06	2.000e-16
	Model 2	0.7561	2.200e-16	GNI	6.795e-04	3.524e-05	2.000e-16
	Model 3	0.6743	2.200e-16	GNI	1.983e-05	5.473e-06	0.00043
				EPI	3.076e-02	7.004e-03	2.450e-05
	Model 4	0.6766	2.200e-16	GNI	3.150e-05	1.384e-05	0.02460
				EPI	3.433e-02	8.014e-03	3.770e-05
				GNI:EPI	-1.882e-07	2.050e-07	0.3604
2022	Model 1	0.63930	2.200e-16	GNI	3.286e-05	2.253e-06	2.000e-16
	Model 2	0.57700	2.200e-16	GNI	3.844e-04	3.005e-05	2.000e-16
	Model 3	0.65920	2.200e-16	GNI	2.608e-05	3.381e-06	4.150e-12
				EPI	1.762e-02	6.681e-03	0.00946
	Model 4	0.66220	2.200e-16	GNI	3.690e-05	1.104e-05	0.00111
				EPI	2.366e-02	8.890e-03	0.00886
				GNI:EPI	-2.112e-07	2.051e-07	0.30525

Table 2. Results of regressions analysis

Year	Indirect Effect	Sobel Test	
		Z-Value	P-Value
2020	0.00000677	2.583004	0.009794409
2022	0.00002089	4.282109	0.000018513

Table 3. Results of indirect effect calculation and sobel test analysis

$$Model_1 = GNI \rightarrow WHR$$

$$Model_2 = GNI \rightarrow EPI$$

$$Model_3 = GNI + EPI \rightarrow WHR$$

$$moderation = GNI * EPI \rightarrow WHR$$

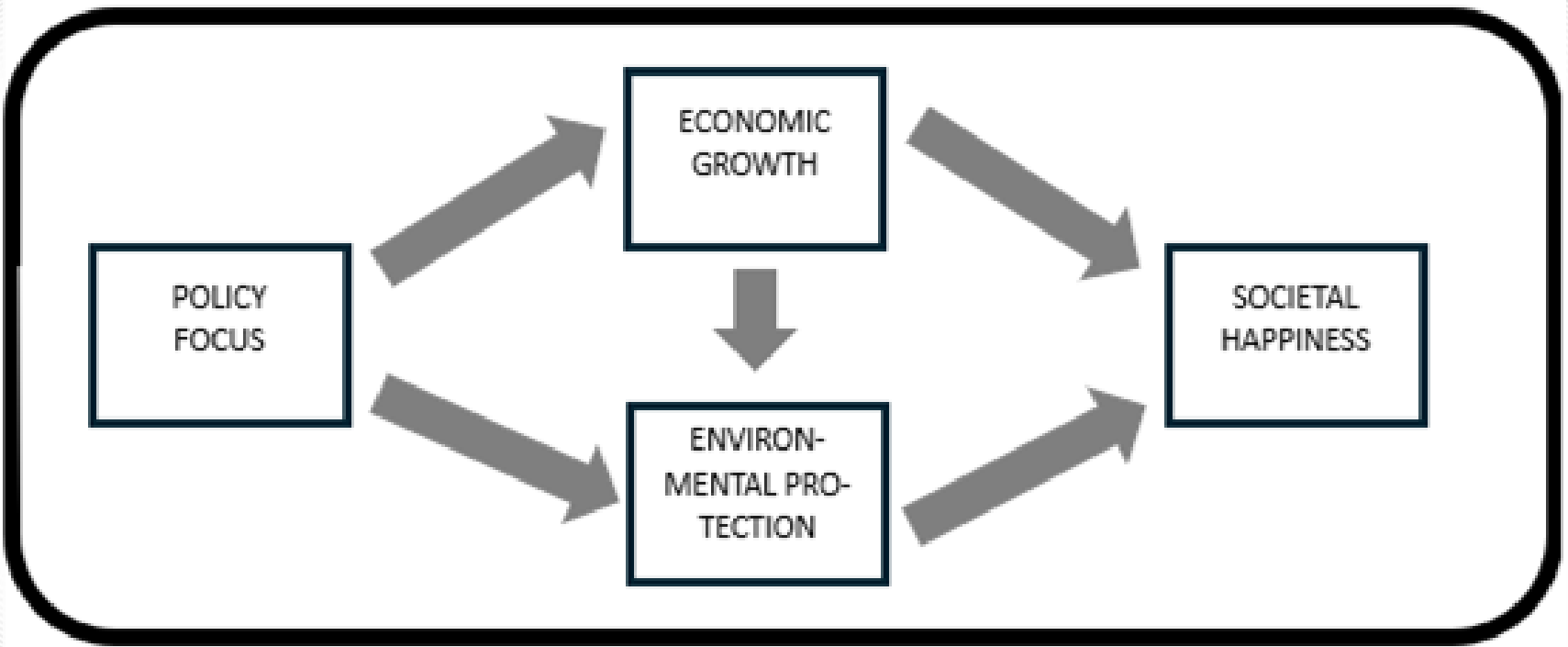


Results Explained

- Evidence of mediation:
 - **R² of Model 3 is higher than of Model 1**
- Why partial, not full, mediation?
 - **The coeff. est. of GNI in Model 3 is lower than in Model 1**, indicating that there is an effect that is shifted from purely GNI to EPI-mediated GNI.
 - **The coeff. est. of GNI in Model 3 remains significant**, same as in Model 1. For full mediation to occur, the Model 3 one needs to become insignificant.
- Indirect effect:
 - **P-value of Sobel Test is < 0.05** which shows there is significant indirect effect
- No evidence of moderation:
 - **P-value of GNI:EPI is > 0.05** which shows there is no moderation effect

Discussions & Policy Implications

- EPI enhances societal happiness but does not conditionally alter GNI's effect.
- Recommendations:
 - Separate policies for economic growth and environmental sustainability.
 - Invest in infrastructure and renewable energy.
 - Promote environmental awareness through education.



Conclusion

- Environmental protection (EPI) partially mediates the relationship between economic growth (GNI) and societal happiness (WHR).
- No evidence of EPI moderating GNI's effect on WHR.
- Policies should address economic and environmental goals independently.