Advances in Consumer Research
ISSN (Print): 0098-9258
ISSN(Online): 3079-1766

Vol. 2, Issue 2 (2025) https://acr-journal.com/

Development, Sustainability, Equality and Environment: A Growth and Wellbeing Driven Analysis of Top Five Countries In The World

Dr. Pallabi Mukherjee[1], Dr. Nidhi Jhawar[*2], Dr. Priyanka Yadav[3]

[1]Associate Professor, IPS Academy, Institute of Business Management and Research, Indore, M.P.

[2*]Associate Professor, IPS Academy, Institute of Business Management and Research Indore, M.P.

[3]Assistant Professor, IPS Academy, Institute of Business Management and Research Indore, M.P.

***Corresponding Author:**

Dr. Nidhi Jhawar

Associate Professor, IPS Academy, Institute of Business Management and Research Indore, M.P.

Cite this paper as: Dr. Pallabi Mukherjee, Dr. Nidhi Jhawar, Dr. Priyanka Yadav, (2025) Development, Sustainability, Equality and Environment: A Growth and Wellbeing Driven Analysis of Top Five Countries In The World. *Advances in Consumer Research*, 2 (2), 412-422.

KEYWORDS

Growth, Development, Equality, Environment, Sustainability

ABSTRACT

Purpose: This paper aims to establish the impact of Growth on Sustainability in the world's Top five Economies according to Gross Domestic Product and validate a two-way causality between growth and sustainability parameters.

Methodology: The methodology involves Linear Regression, the ordinary least square method. Vector Auto regression model (VAR) followed by Granger causality Wald test (GC) to evaluate the causality between GDP and Sustainability parameters.

Findings: The primary findings portray the impact of growth on the environment and equality is both positive and negative which is country-specific. When estimating lagged relationships with VAR, growth has an impact on equality and environment, and equality and environment have an effect on growth hence there exists a two-way causality.

Practical Implications: Sustainability is an integral part of the development of countries and it should be more independent in a country and eventually be self-driven. Findings provide a comprehensive image of how growth has impacted sustainability parameters like equality and environment in developed and developing countries that are among the top in the world. The optimum lag length of 3 years found in vector autoregression also suggests the visible impact of growth on sustainability parameters.

Originality: Unlike prior research on growth and development, the present work included the added dimension of well-being through sustainability, equality, and the environment of countries demonstrating massive growth in the world. It is contributing to the much debated and important issue of development of countries along with growth.

1. INTRODUCTION

Experts have been thinking about sustainable development and growth for a long time. The concept of sustainability has been discussed since Malthus in 1798, although the term "sustainability" has only lately gained traction. The major objective of development is to raise the standard of living and income of people. Development that meets current needs without sacrificing the ability of future generations to do the same is known as sustainable development.

Since the beginning of human history, achieving healthy growth has been the most often discussed issue and has always been

of utmost importance to a nation. Every country's main concern is, and has always been, its economy's expansion and growth (Mukherjee & Ahuja, 2018). While the fight for growth is far from over, advancement is now a must for a country to survive and prosper in the world. The world's leaders are now primarily concerned with human development as the total development of the inhabitants of those countries has not kept up with the nations' expansion.

The Sustainable Economic Development Assessment (Sustainable Economic Development Assessment) was developed in 2012 by the Boston Consulting Group (BCG) as a novel way to assess advancement and well-being. In essence, SEDA is an objective metric that contrasts a nation's performance with that of the global population, specific peers, or groups. To provide ten dimensions as generic well-being indicators, SEDA thinks of starting with three key elements. SEDA performs this for about 143 countries across the globe, which are effectively frequently compared with peers. The widely held misconception is that industrialized countries do not undergo rapid economic growth. The countries that are expanding quickly are also growing at the same time (Mukherjee et al., 2020).

The three fundamental elements (dimensions) along with their sub dimensions are as follows:

- Economics – Income, Economic Stability and Employment
- Investment – Health, education and Infrastructure
- Sustainability – Equality, Civil Society, Governance and Environment

The study has taken an overall development value, expressed as SEDA (Sustainable Economic Development Assessment) by the BCG. Also we have used equality and environment as two sustainability parameters in our measurement.

Equality: Income distribution,Gini Index, Equality in Education and Life expectancy.

Environment: air quality, terrestrial and marine protected areas, carbon dioxide intensity and electricity production from renewable sources.

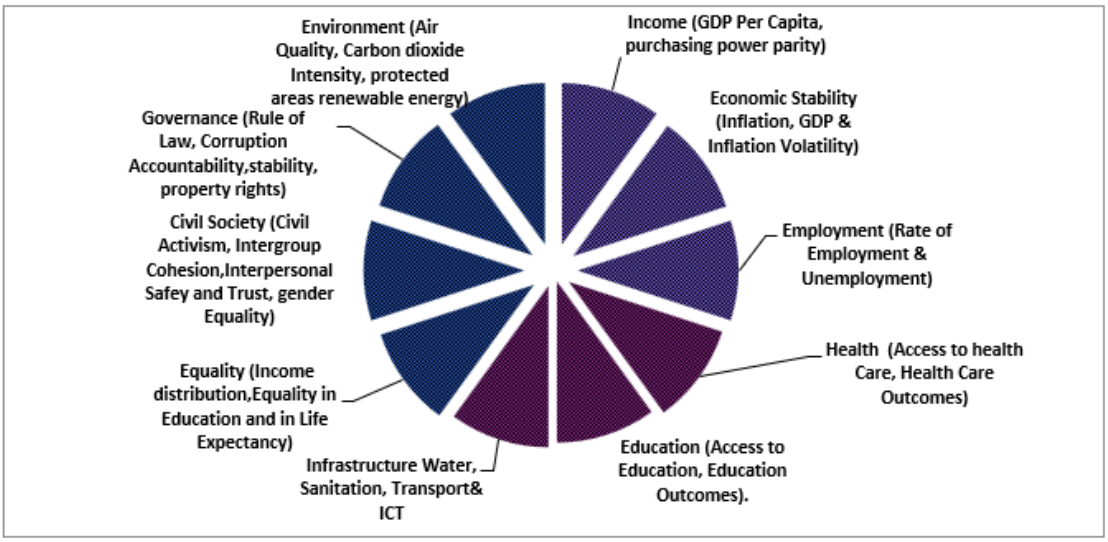
The three elements are further divided to provide a clear description of the particular features, which in turn helps to show the stage of development of a country. Understanding the function of dimensions in characterizing a country's developmental state requires a thorough explanation of each component. The economy of a nation is a good indicator of its condition, and SEDA attempts to quantify the important economic variables, such employment, income, and economic stability. However, the Gross Domestic Product—which also determines income per capita—determines purchasing power. These variables are given scores, and the outcomes indicate the nation's position with respect to that dimension (Income). The last criterion describing a country's economy and assessed by SEDA is employment, which shows a country's rate of employment and unemployment. Economic stability also includes inflation, GDP, and inflation volatility.

When the other two components are discussed in more detail, almost all of the elements will be included as well, completing the presentation of a complete picture of a nation's well-being. Following the economic component, three further aspects of investment—health, education, and infrastructure—also shed light on a nation's investment side. Water, sanitary conditions, transportation, and ICT are all considered aspects of infrastructure. Health is the outcome of receiving medical care as well as having access to it. Education also includes the means of obtaining education as well as its outcomes.

Sustainability, which includes civil society, the environment, governance, and income equality, is the last component. Aspects of income equality include life expectancy, educational fairness, and income distribution. Gender equality, civic society, intergroup cohesion, and interpersonal safety and trust are all interdependent. The environment also encompasses property rights, the rule of law, accountability, corruption, stability, and carbon dioxide intensity protected areas. These variables provide a clear picture of the development and state of well-being of a nation. The BCG's analysis of the SEDA to present a comprehensive picture is a commendable attempt to honestly discuss the most basic elements of a nation, such overall growth and other objective metrics.

We used the sustainability factors of equality and environment in our analysis. In order to establish causal relationships and assess impact, we have also taken the gross domestic product into consideration in our analysis.

Figure 1. Components and Dimensions of Sustainable Economic Development Assessment



In every nation on the planet, growth and development have always been vital concerns that are given top attention. But now that the focus has switched from growth to development and sustainability, it is critical to assess how well-positioned each nation is to turn its wealth into well-being. The relationship that exists between sustainability and growth is critical to the long-term well-being of economies, society, and the environment. They are often discussed in relation to a range of topics, including social development, business, economics, and environmental preservation.

The consequences of economic expansion on development are a complex and multifaceted subject. Even though economic growth is occasionally seen as a key driver of development, the effects of growth can differ significantly based on a variety of factors, including the type of growth, how benefits are dispersed, and the context in which it occurs.

About Countries:

The United States continues to be the largest economy in the world and the richest nation, maintaining its dominant position from 1960 to 2023. Its economy, which is driven by significant industries including manufacturing, services, finance, and technology, has an impressive diversification. The US has a sizable consumer market, encourages creativity and entrepreneurship, has a strong infrastructure, and offers favorable business environment.

China's economic growth has accelerated, as seen by its rise from the fourth position in 1960 to the second position in 2023. The three main pillars of the Chinese economy are manufacturing, exports, and investment. It is pleased to have a large staff, strong support from the government, modern infrastructure, and a rapidly growing consumer base.

Japan's economy is noteworthy due to its advanced technology, manufacturing capabilities, and service sector. Leading industries include the automotive, electrical, mechanical, and finance sectors. In addition, Japan is known for its remarkable exports of high-quality goods, innovative technical breakthroughs, and steadfast work ethic.

Germany is known for its accuracy in the engineering, automotive, chemical, and pharmaceutical industries, and its economy is heavily focused on exports. It benefits from having a skilled workforce, strong R&D programs, and a strong commitment to innovation promotion.

In terms of GDP, India is placed fifth in the world as of 2023. India's economy, which is driven by important industries including manufacturing, services, information technology, and agriculture, is diverse and expanding quickly. The country makes use of its sizable home market, a young, tech-savvy work population, and a growing middle class.

2. REVIEW OF LITERATURE:

The relatively new notion that various groups of countries should be assessed and examined based on their income and well-being and how the countries are turning the first into the second proportionally has been investigated by a number of scholars. The Boston Consulting Company has been researching numerous countries since 2012 using its Sustainable Economic Development Assessment, according to a report by European Data Network Journalism dated October 2019.

The notion of sustainable economic growth is yet frightening, but Kruja, Alba (2013) claims that sustainability is largely considered as a synthesis of environmental, social, and economic performance. The degree of development is assessed using the population's distribution of economic advancement. The concept of economic development became widely accepted in modern culture in the twenty-first century.

Mukherjee and Ahuja (2018) attempt to highlight the most recent efforts to evaluate how successfully a nation translates GDP growth to well-being in terms of Sustainable Economic Development Assessment scores (SEDA) in their study paper from 2017. India's ranking as a high Sustainable Economic Development Assessment progress score, and our country support one of the top economies in the world has made significant strides in several BCG-measured indicators for measuring sustainable development. In July 2019, Y. Joao, Enrique, Lang, and Chin made this discovery. A variety of structural factors, such as the rapid speed of technological advancement and its conceivable connection to the source of inequality, pose threats to the world. Policymakers must now more than ever adopt and implement measures to account for this disturbance and work to enhance people's lives.

Objective:

The primary objective of the study is to assess the impact of growth on equality and environment of top five countries of the world in terms of GDP nominal. The study also aims to validate the existence of two-way causality between sustainability parameters and growth.The study also aims to find the existance of two qay causality between growth and development (Sustainable Economic Development Assessment) in the top five nations of the world.

Research Methodology:

The study is divided into three parts. The first part caters to finding the impact of growth on two sustainability parameters such as Equality and environment. Multivariate regression analysis is used to detect the impact with robust standard error and hence we rule out to test for heteroscedasticity. Ordinary least square estimation is used to evaluate the incidence; however, the estimation is robust with bias correction (n/n-k). The proxy of growth taken is Gross Domestic Product per capita.

In the second part vector autoregression has been used, after estimating the suitable lag length to estimate the impact of individual sustainability variables like equality and environment on growth and that of growth on the sustainability variables. Vector autoregression is followed by Granger Causality Wald Test to see the existence of 2-way causality between the variables. In the third part, vector autoregression has been used after estimating the suitable lag length to estimate the impact of development on growth and that of growth on development. Vector autoregression is followed by the Granger Causality Wald Test to see the existence of a two-way causality between the variables.

The reason for incorporating lagged models in this test is to establish the well-known fact that while assessing the impact of growth on development and that of development and growth, it is better to consider the role of time lags to establish a significant relationship and impact. Data on sustainability has been taken from the Boston Consultant Group (BCG) SEDA (Sustainable Economic Development Assessment) statistics. Data on GDP has been taken from the World Bank. As the BCG has published data for the time period 2008 to 2020, our analysis has been done accordingly.

Model 1: Multivariate Regression

$Equality_t, Environment_t = \beta_0 + \beta_1 GDPperCap_t + \mu$

Modified Model:

$Equality_t, Environment_t = \beta_0 + \beta_1 Ln\ GDPperCap_t + \mu$

Model 2: Vector Autoregression and Granger Causality

$Equality_t = \beta_0 + \beta_1 Equality_{t-j} + \beta_2 Growth_{t-j} + \mu_t$

$Growth_t = \beta_0 + \beta_1 Growth_{t-j} + \beta_2 Equality_{t-j} + \mu_t$

$Environment_t = \beta_0 + \beta_1 Environment_{t-j} + \beta_2 Growth_{t-j} + \mu_t$

$Growth_t = \beta_0 + \beta_1 Growth_{t-j} + \beta_2 Environment_{t-j} + \mu_t$

Model 3: Vector Autoregression and Granger Causality

$Development_t = \beta_0 + \beta_1 Development_{t-j} + \beta_2 Growth_{t-j} + \mu_t$

$Growth_t = \beta_0 + \beta_1 Growth_{t-j} + \beta_2 Development_{t-j} + \mu_t$

Here t-j indicates the optimal lag that is considered in the vector autoregression model and then establishes two-way causality by granger causality wald test.

Data Analysis

Initially the multivariate model with two independent variables as equality and environment was considered and the regression was run accordingly. Moreover significant impacts were found. For better result the modified version of model 1 was used and the result declared was significant.

Table 1: Multivariate model for 5 top countries

Multivariate (Indp GDP per cap) : USA				**Multivariate (Indp GDP per cap) : China**			
Dependent	Coeff	Robust Std Er	P	Dependent	Coeff	Robust Std Er	P
Equality	-0.0004	0.0003	0	Equality	0.002	0.0003	0
Environment	0.0006	0.00006	0	Environment	0.0002	0.0001	0.21
R sq	0.9			R sq	0.73		
Multivariate (Indp GDP per cap) : Japan				**Multivariate (Indp GDP per cap) : Germany**			
Dependent	Coeff	Robust Std Er	P	Dependent	Coeff	Robust Std Er	P
Equality	0.0007	0.0002	0	Equality	-0.0002	0.0002	0.31
Environment	0.0006	0.0006	0	Environment	0.0001	0.0001	0.91
R sq	0.55			R sq	0.09		
Multivariate (Indp GDP per cap) : India							
Dependent	Coeff	Robust Std Er	P				
Equality	0.007	0.004	0.13				
Environment	-0.002	0.002	0.02				
R sq	0.9						

The modified model has used log linear of the growth model and the result is significant. In case of USA, the impact of growth on equality is negative and that on environment is positive. The result is significant. In case of China , Impact of growth on equality is positive and significant, however the impact of growth on environment is not significant. In Japan, the impact of growth on equality and environment is positive. The impact on Germany is not significant. In case of India the impact of growth on equality is insignificant, but that on environment is negative and significant.

Table 2: Multivariate model (modified) for 5 top countries

Multivariate (Indp LnGDP per cap) : USA				**Multivariate (Indp LnGDP per cap) : China**			
Dependent	Coeff	Robust Std Er	P	Dependent	Coeff	Robust Std Er	P
Equality	-23.27	1.87	0	Equality	12.5	3.04	0
Environment	35.4	3.63	0	Environment	1.38	1.1	0.29
R sq	0.93			R sq	0.6		
Multivariate (Indp LnGDP per cap) : Japan				**Multivariate (Indp LnGDP per cap) : Germany**			
Dependent	Coeff	Robust Std Er	P	Dependent	Coeff	Robust Std Er	P
Equality	30.18	11.1	0	Equality	-10.8	10.3	0.32
Environment	27.06	7.05	0	Environment	0.84	6.9	0.9
R sq	0.57			R sq	0.09		
Multivariate (Indp LnGDP per cap) : India							
Dependent	Coeff	Robust Std Er	P				
Equality	10.4	7.55	0.19				
Environment	-4.2	1.7	0.03				
R sq	0.35						

The above analysis has given a base for further research and we have moved on to the second model.

Table 3: Vector Autoregressive model and Granger Causality for USA

VAR & Granger Causality Wald Test Equality & Growth (TWO WAY CAUSALITY)					**VAR & Granger Causality Wald Test Environment & Growth (TWO WAY CAUSALITY)**				
Variable		R-sq	chi-sq	p>chi-sq	**Variable**		R-sq	chi-sq	p>chi-sq
1	Equality	0.88	74.91	0	**1**	Environment	0.95	202.9	0
2	Growth	0.95	206.48	0	**2**	Growth	0.098	839.6	0
Vector Auto Regression					**Vector Auto Regression**				
	(Dep variable) Equality		(Dep variable) Growth			(Dep variable) Environment		(Dep variable) Growth	
Lag3	Equality	Growth	Equality	Growth	**Lag3**	Environment	Growth	Environment	Growth

Coefficient	3.4	-0.01	-29.76	0.9	**Coefficient**	0.68	49.5	-0.011	1.52
Granger Causality Wald Test					**Granger Causality Wald Test**				
		Chi sq	df	Prob>Chi-sq			Chi sq	df	Prob>Chi-sq
Equality	GDP	28.5	3	0	**Environment**	GDP	29.94	3	0
GDP	Equality	23.32	3	0	**GDP**	Environment	22.47	3	0

- $Equality_t = \beta_0 + 3.4\ Equality_{t-3} - .01\ Growth_{t-3} + \mu_t$
- $Growth_t = \beta_0 + .9\ Growth_{t-3} – 29.7\ Equality_{t-3} + \mu_t$
- $Environment_t = \beta_0 + .68\ Environment_{t-3} + 49.5\ Growth_{t-3} + \mu_t$
- $Growth_t = \beta_0 + 1.52\ Growth_{t-3} - .011\ Environment_{t-3} + \mu_t$

There exists a two-way causality between equality and growth and environment and growth. Also, there is a negative impact of growth on equality and positive impact of equality on growth. There is a positive impact of growth on environment and positive impact of environment on growth. Also the model is strong with high rates of r square

Table 4: Vector Autoregressive model and Granger Causality for Japan

VAR & Granger Causality Wald Test Equality & Growth (TWO WAY CAUSALITY)					**VAR & Granger Causality Wald Test Environment & Growth (TWO WAY CAUSALITY)**				
Variable		R-sq	chi-sq	p>chi-sq	**Variable**		R-sq	chi-sq	p>chi-sq
1	Equality	0.97	454.45	0	**1**	Environment	0.67	20.6	0
2	Growth	0.99	1557.33	0	**2**	Growth	0.99	849.5	0
Vector Auto Regression					**Vector Auto Regression**				
	(Dep variable) Equality		(Dep variable) Growth			(Dep variable) Environment		(Dep variable) Growth	
Lag3	Equality	Growth	Equality	Growth	**Lag3**	Environment	Growth	Environment	Growth
Coefficient	.15	-51.8	-.007	0.85	**Coefficient**	-.705	-33.99	-0.019	.31
Granger Causality Wald Test					**Granger Causality Wald Test**				
		Chi sq	df	Prob>Chi-sq			Chi sq	df	Prob>Chi-sq
Equality	GDP	88.33	3	0	**Environment**	GDP	15.95	3	0
GDP	Equality	19.74	3	0	**GDP**	Environment	63.25	3	0

- $Equality_t = \beta_0 + .15\ Equality_{t-3} – 51.8\ Growth_{t-3} + \mu_t$
- $Growth_t = \beta_0 + .85\ Growth_{t-3} -.007\ Equality_{t-3} + \mu_t$
- $Environment_t = \beta_0 -.705\ Environment_{t-3} -33.9\ Growth_{t-3} + \mu_t$
- $Growth_t = \beta_0 - .31\ Growth_{t-3} - .019\ Environment_{t-3} + \mu_t$

There exists two-way causality between equality and growth and environment and growth. There exists a negative impact of growth on equality with a high coefficient and negative impact of equality on growth. However there exists a negative impact of growth on environment with a high coefficient and negative impact of environment on growth. The optimum lag length is 3 years. Also the model is strongly established.

Table 5: Vector Autoregressive model and Granger Causality for Japan

VAR & Granger Causality Wald Test Equality & Growth (TWO WAY CAUSALITY)					**VAR & Granger Causality Wald Test Environment & Growth (TWO WAY CAUSALITY)**				
Variable		R-sq	chi-sq	p>chi-sq	**Variable**		R-sq	chi-sq	p>chi-sq

1	Equality	0.78	37.38	0	**1**	Environment	0.93	152.19	0
2	Growth	0.85	57.78	0	**2**	Growth	0.92	126.83	0
Vector Auto Regression					**Vector Auto Regression**				
	(Dep variable) Equality		(Dep variable) Growth			(Dep variable) Environment		(Dep variable) Growth	
Lag3	Equality	Growth	Equality	Growth	**Lag3**	Environment	Growth	Environment	Growth
Coefficient	-1.608	42.32	.02	0.98	**Coefficient**	1.45	34.03	.018	-.97
Granger Causality Wald Test					**Granger Causality Wald Test**				
		Chi sq	df	Prob>Chi-sq			Chi sq	df	Prob>Chi-sq
Equality	GDP	15.005	3	0	**Environment**	GDP	53.98	3	0
GDP	Equality	14.56	3	0	**GDP**	Environment	39.58	3	0

- $Equality_t = \beta_0 + .1.6\ Equality_{t-3} + 42.32\ Growth_{t-3} + \mu_t$
- $Growth_t = \beta_0 + .98\ Growth_{t-3} + .02\ Equality_{t-3} + \mu_t$
- $Environment_t = \beta_0 + 1.45\ Environment_{t-3} – 40.7\ Growth_{t-3} + \mu_t$
- $Growth_t = \beta_0 - .97\ Growth_{t-3} + .018\ Environment_{t-3} + \mu_t$

There exists two way causality between equality and growth and environment and growth. The impact of growth on equality in Japan is significant, strong and positive , however the impact of equality on growth is positive too. The impact of growth on environment is positive, but the impact of environment on growth is positive. The optimum lag length is 3 years. Model is strongly established as well

Table 6: Vector Autoregressive model and Granger Causality for Germany

VAR & Granger Causality Wald Test Equality & Growth (TWO WAY CAUSALITY)					**VAR & Granger Causality Wald Test Environment & Growth (TWO WAY CAUSALITY)**				
Variable		R-sq	chi-sq	p>chi-sq	**Variable**		R-sq	chi-sq	p>chi-sq
1	Equality	0.95	220.9	0	**1**	Environment	0.34	5.18	.52
2	Growth	0.28	4.04	0.67	**2**	Growth	0.46	8.51	.1
Vector Auto Regression					**Vector Auto Regression**				
	(Dep variable) Equality		(Dep variable) Growth (insignificant)			(Dep variable) Environment (insignificant)		(Dep variable) Growth	
Lag3	Equality	Growth	Equality	Growth	**Lag3**	Environment	Growth	Environment	Growth
Coefficient	.98	-4.5	-.01	-.06	**Coefficient**	.79	-4.2	.036	-.07
Granger Causality Wald Test					**Granger Causality Wald Test**				
		Chi sq	df	Prob>Chi-sq			Chi sq	df	Prob>Chi-sq
Equality	GDP	7.53	3	0.05	**Environment**	GDP	1.35	3	.71
GDP	Equality	2.52	3	.47	**GDP**	Environment	6.5	3	0.09

- $Equality_t = \beta_0 + .98\ Equality_{t-3} -4.5\ Growth_{t-3} + \mu_t$
- $Growth_t = \beta_0 -.06\ Growth_{t-3} -.01\ Equality_{t-3} + \mu_t$ (Insignificant)
- $Environment_t = \beta_0 + .79\ Environment_{t-3} – 4.2\ Growth_{t-3} + \mu_t$ (Insignificant)
- $Growth_t = \beta_0 - .07\ Growth_{t-3} + .036\ Environment_{t-3} + \mu_t$

Impact of growth on equality is significant, but impact of equality on growth is not established. So with lag length of 3 years, we could not establish a two way causality between equality and growth in Germany. The model to establish the impact of equality on growth is weak. Impact of environment on growth could be established, but we could not establish an impact of growth on environment at lag length 3. So, there does not exist a to way causality between environment a growth. Impact of environment on growth positive and impact of growth on equality is found to be negative in Germany.

Table 7: Vector Autoregressive model and Granger Causality for India

VAR & Granger Causality Wald Test Equality & Growth (TWO WAY CAUSALITY)					**VAR & Granger Causality Wald Test Environment & Growth (TWO WAY CAUSALITY)**				
Variable		R-sq	chi-sq	p>chi-sq	**Variable**		R-sq	chi-sq	p>chi-sq
1	Equality	0.81	43.62	0	**1**	Environment	0.93	135.78	0
2	Growth	0.95	235.39	0	**2**	Growth	0.93	149.43	0
Vector Auto Regression					**Vector Auto Regression**				
	(Dep variable) Equality		(Dep variable) Growth			(Dep variable) Environment		(Dep variable) Growth	
Lag3	Equality	Growth	Equality	Growth	**Lag3**	Environment	Growth	Environment	Growth
Coefficient	4.06	-8.4	-.015	0.98	**Coefficient**	-.39	-16.32	-.03	-.5
Granger Causality Wald Test					**Granger Causality Wald Test**				
		Chi sq	df	Prob>Chi-sq			Chi sq	df	Prob>Chi-sq
Equality	GDP	14.31	3	0	**Environment**	GDP	98.1	3	0
GDP	Equality	22.31	3	0	**GDP**	Environment	10.99	3	0.01

- $Equality_t = \beta_0 + 4.06\ Equality_{t-3} - 8.4\ Growth_{t-3} + \mu_t$
- $Growth_t = \beta_0 + .98\ Growth_{t-3} - 0.15\ Equality_{t-3} + \mu_t$
- $Environment_t = \beta_0 - .39\ Environment_{t-3} - 16.32\ Growth_{t-3} + \mu_t$
- $Growth_t = \beta_0 - .5\ Growth_{t-3} - .03\ Environment_{t-3} + \mu_t$

There exists a two-way causality between equality and growth and environment and growth. The model is strong and significant. Moreover, the impact of growth on equality and that of equality on growth is negative. The impact of growth on environment is negative and strong. The impact of environment on growth is also found to be negative.

Model 3

$Development_t = \beta_0 + \beta_1 Development_{t-j} + \beta_2 Growth_{t-j} + \mu_t$

$Growth_t = \beta_0 + \beta_1 Growth_{t-j} + \beta_2 Development_{t-j} + \mu_t$

The values of the models established have been found to have significant r square values. Also the values of coefficients has been expressed in form of separate country equations. The main model 3 equation has been substituted with the country values and expressed below.

USA:

$Development_t = \beta_0 + 1.24\ Development_{t-3} + 10.04\ Growth_{t-3} + \mu_t$

$Growth_t = \beta_0 + 2.63\ Growth_{t-3} - .04\ Development_{t-3} + \mu_t$

China:

$Development_t = \beta_0 + .48\ Development_{t-3} + 11.16\ Growth_{t-3} + \mu_t$

$Growth_t = \beta_0 + .45\ Growth_{t-3} + .07\ Development_{t-3} + \mu_t$

Japan:

$Development_t = \beta_0 + .41\ Development_{t-3} - 5.58\ Growth_{t-3} + \mu_t$

$Growth_t = \beta_0 + .94\ Growth_{t-3} - .73\ Development_{t-3} + \mu_t$

Germany:

$Development_t = \beta_0 + .75\ Development_{t-3} + 17.41\ Growth_{t-3} + \mu_t$

$Growth_t = \beta_0 + .97\ Growth_{t-3} - .07\ Development_{t-3} + \mu_t$

India:

$Development_t = \beta_0 + .87\ Development_{t-3} + 6.67\ Growth_{t-3} + \mu_t$

$Growth_t = \beta_0 + .98\ Growth_{t-3} + .10\ Development_{t-3} + \mu_t$

Table 8: Vector Autoregressive model and Granger causality for 5 countries, Coefficients expressed

USA		China		Japan	
Growth on Dev	11.16	Growth on Dev	10.04	Growth on Dev	-5.58
Dev on Growth	-0.04	Dev on Growth	0.07	Dev on Growth	-.73
R	0.99	R	0.99	R	0.93
	Germany		India		
	Growth on Dev	17.41	Growth on Dev	6.6	
	Dev on Growth	-.07	Dev on Growth	0.1	
	R	0.62	R	0.96	

The strongest coefficient where impact of growth on development is expressed is that of Germany followed by USA, China and India. The coefficient of China is found to be negative, might be because of the case that Japan does not have a strong growth rate , but has significant development in the economy.

Impact of development on growth in developed economies like USA, Japan and Germany are found to be negative, because the countries are already developed and their growth rates are not as high as the developing economies. The impact of development on growth of China and India has been found to be significant and positive.

3. CONCLUSION:

The first section deals with determining how growth affects two sustainability characteristics, such as the environment and equality. We do not test for heteroscedasticity since multivariate regression analysis is utilised to detect the impact with a robust standard error. Growth has a beneficial and large influence on equality, but in the case of China, it has little effect on the environment. Growth in Japan has a favourable effect on the environment and equality. Germany will not be significantly affected. Growth in India has a negligible effect on equality but a substantial detrimental impact on the environment.

After determining the appropriate lag length, vector auto regression is utilized in the second section to assess the effects of the sustainability factors—such as equality and the environment—on growth and growth's influence on the sustainability variables. Granger Causality Wald Test is performed after vector auto regression to determine whether there is two-way causality between the variables.

There is a two-way causal relationship in the USA between growth and environment and equality. Furthermore, equality has a beneficial influence on growth and growth has a negative impact on equality. Growth has a beneficial influence on the environment, and the environment has a positive influence on growth. The model has excellent r-squared rates and is robust as well. Both the environment and growth and equality and growth are causally related in the case of China. There is a negative correlation between equality and growth as well as a negative relationship between equality and growth. Nonetheless, there is a large coefficient of negative growth-environment interaction as well as a negative environment-growth interaction. A lag of three years is ideal. Furthermore, the model has a solid foundation. Both the environment and growth and equality and growth are causally related in the case of Japan. In Japan, growth has a notable, robust, and beneficial effect on equality; conversely, equality has a good impact on growth. The impact of growth on environment is positive, but the impact of environment on growth is positive. The optimum lag length is 3 years. Model is strongly established as well.

Growth has a considerable influence on equality, but the opposite is not always true. Therefore, we were unable to demonstrate a two-way causal relationship between growth and equality in Germany with a three-year lag. The model used to determine how equality affects growth is inadequate. It was possible to demonstrate how the environment affected growth, but at lag length three, we were unable to demonstrate how growth affected the environment. Therefore, there is no direct causal relationship between development and environment. In Germany, it is discovered that expansion has a detrimental influence on equality and a favorable impact on the environment.

Both the environment and growth and equality and growth are causally related in both directions. The model is substantial and powerful. Furthermore, there is a negative relationship between equality and growth as well as growth and equality. Growth has a significant and detrimental influence on the environment. It is also discovered that the environment has a detrimental effect on development. After determining the appropriate lag duration, vector auto regression was employed in the third section to assess the effects of growth and development on each other. Granger Causality Wald Test is performed after vector auto regression to determine whether there is two-way causality between the variables.

Germany has the highest coefficient when expressing the influence of growth on development, followed by the United States, China, and India. China's coefficient is discovered to be negative, which may be related to the fact that Japan's economy is developing significantly while not having a large growth rate. Because mature economies like the United States, Japan, and Germany are already developed and have slower growth rates than emerging economies, the impact of development on growth in these economies is shown to be negative. It has been determined that development has a major and favourable

effect on the expansion of China and India.

REFERENCES

[1] Ahenkan & Osei-Kojo Reference: Ahenkan, A., & Osei-Kojo, A. (n.d.). Achieving sustainable development in Africa: Progress, challenges, and prospects. International Journal of Development and Sustainability, 5(3), 345-367.

[2] Alam, S. (2010). Globalization, poverty, and environmental degradation: Sustainable development in Pakistan. Journal of Sustainable Development, 3(3), 103–114.

[3] Allen, Reid, Thwaites, Glover, & Kestin Reference: Allen, C., Reid, M., Thwaites, J., Glover, R., & Kestin, T. (n.d.). Assessing national progress and priorities for the Sustainable Development Goals (SDGs): Experience from Australia. Sustainability Science, 18(2), 255–270.

[4] Armeanu, Vintilă, & Gherghina Reference: Armeanu, D., Vintilă, G., & Gherghina, S. C. (n.d.). Empirical study towards the drivers of sustainable economic growth in EU-27 countries. Sustainability, 9(3), 45. https://doi.org/10.3390/su9030045

[5] Asongu & Odhiambo Reference: Asongu, S. A., & Odhiambo, N. M. (n.d.). How enhancing information and communication technology has affected inequality in Africa for sustainable development: An empirical investigation. Sustainable Development, 18(2), 123–136.

[6] Bauer & Scholz Reference: Bauer, S., & Scholz, I. (n.d.). Adaptation to climate change in Southern Africa: New boundaries for sustainable development? Climate and Development, 8(6), 534–545.

[7] Fauzi, A., & Oxtavianus, A. (2014). The measurement of sustainable development in Indonesia. Jurnal Ekonomi Pembangunan, 15(1), June.

[8] Boston Consulting Group (BCG). (2016). An interactive view of sustainable economic development. Retrievedfrom https://www.bcgperspectives.com/content/interactive/public_sector_globalization_interactive_map_sustainable_economic_development/

[9] Bhattari, K. (2016). Economic growth and development in India and SAARC countries.

[10] Bloomberg Markets. (2016, July 21). Rich countries often fail to bolster well-being, Boston Consulting says. Bloomberg Markets. Retrieved from https://www.bloomberg.com/news/articles/2016-07-20/rich-countries-often-fail-to-bolster-well-being-boston-consulting-says.

[11] Brocchi Reference: Brocchi, D. (n.d.). The cultural dimension of un/sustainability. In S. Bergmann & D. Gerten (Eds.), Religion and dangerous environmental change: Transdisciplinary perspectives on the ethics of climate and sustainability (pp. 125–136).

[12] Brundtland Commission. (1987). Our common future: Report of the World Commission on Environment and Development. Oxford University Press.

[13] Byrne, Fiess, & MacDonald Reference: Byrne, J. P., Fiess, N., & MacDonald, R. (n.d.). The global dimension to fiscal sustainability. Journal of Macroeconomics, 44, 220–234.

[14] Cadman et al. Reference: Cadman, T., Eastwood, L., Michaelis, F. L. C., Maraseni, T. N., Pittock, J., & Sarker, T. (n.d.). The political economy of sustainable development: Policy instruments and market mechanisms.

[15] Casado-Asensio & Steurer Reference: Casado-Asensio, J., & Steurer, R. (n.d.). Integrated strategies on sustainable development, climate change mitigation and adaptation in Western Europe: Communication rather than coordination. Journal of Public Policy, 30(2), 157–173.

[16] Christopoulos, D. K., & Tsionas, E. G. (2004). Financial development and economic growth: Evidence from panel unit root and cointegration tests. Journal of Development Economics, 73(1), 55–74. https://doi.org/10.1016/j.jdeveco.2003.03.002.

[17] Dincer, I. (2000). Renewable energy and sustainable development: A crucial review. Renewable and Sustainable Energy Reviews, 4(2), 157–175.

[18] Dincer, I., & Rosen, M. A. (1998). A worldwide perspective on energy, environment, and sustainable development. Renewable and Sustainable Energy Reviews, 2(4), 1305–1321.

[19] Jung, W. S. (1986). Financial development and economic growth: International evidence. Economic Development and Cultural Change, 34(2), 333–346.

[20] Kamstra, J., et al. (2016). Constraining is enabling? Exploring the influence of national context on civil society strength. Voluntas, 27, 1023–1044.

[21] Garg, S., & Sharma, V. (2017). Green marketing: An emerging approach to sustainable development. Journal of Environmental Management, 12(2), 177–184.

[22] Geissdoerfer, M., Savaget, P., Bocken, N., & Hultink, E. (2017). The circular economy – A new sustainability paradigm? Journal of Cleaner Production, 143, 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048

[23] Gorica, K., Kripa, D., & Zenelaj, E. (n.d.). Tourism and sustainable development: The role of local government in sustainable development. Literature Review, 8(2), 139–155.

[24] Klarin, T. (2018). The concept of sustainable development: From its beginning to contemporary issues. Sustainability, 21(1), 67–94.

[25] Klauer, B. (1999). Defining and achieving sustainable development. International Journal of Sustainable Development & World Ecology, 6(2), 114–121.

[26] Kumar, N., & Arora, J. (2020). COVID-19 and the importance of environmental sustainability. Environmental Sustainability, 3(2), 117–119.

[27] Mukherjee, P., & Ahuja, K. (2018). A comparative assessment of sustainable economic development among the G20 countries. Proceedings of the 7th International RAIS Conference, 005. Research Association for Interdisciplinary Studies.

[28] Mukherjee, P., et al. (2020). Connecting growth with development and income with sustainability, education, and employment of global powerhouses: A SEDA perspective. Shanlax International Journal of Economics, 9(1), 18–27.

[29] Robinson, J. (2016). Rich countries often fail to bolster well-being, Boston Consulting says. Bloomberg Markets. Retrieved from https://www.bloomberg.com/news/articles/2016-07-20/rich-countries-often-fail-to-bolster-well-being-boston-consulting-says

[30] Miller, D. C., et al. (2009). Comparative indicators of education in the United States and other G-8 countries: 2009. U.S. Department of Education and National Center for Education Statistics.

[31] Sullivan, A., & Sheffrin, M. S. (2003). Economics: Principles in action. Upper Saddle River, NJ: Pearson Prentice Hall.

[32] Sutamihardja, S. (2004). Perubahan lingkungan global: Program studi pengelolaan sumber daya alam dan lingkungan. Bogor: Sekolah Pascasarjana, IPB.

[33] Shotter, J., & Majos, A. (2019). Poland election: The unfinished counter-revolution. Financial Times.

[34] Nakamura, T. (n.d.). A declining technocratic regime. Democracy, Governance and Human Rights. (PDF)

[35] Satyanarayana, M. D., & Amresh, S. (2014). Assessing financial development in India and its relation with economic growth: An empirical analysis. Journal of Economic and Financial Modelling, 2(1), 1–12.

[36] Schumpeter, J. A. (1911). The theory of economic development. Cambridge, MA: Harvard University Press.

[37] Schumpeter, J. A. (1934). The theory of economic development (R. Opie, Trans.). Cambridge, MA: Harvard University Press. (Original work published 1912).

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