Najia, Noura; Taher, Hanadi; Elkader, Ghassan Abed

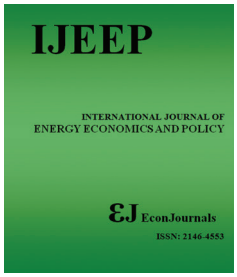
Article

The impact of socio-cultural and environmental deterioration factors on economic sustainability in G7 countries

International Journal of Energy Economics and Policy

Provided in Cooperation with:
International Journal of Energy Economics and Policy (IJEEP)

Reference: Najia, Noura/Taher, Hanadi et. al. (2024). The impact of socio-cultural and environmental deterioration factors on economic sustainability in G7 countries. In: International Journal of Energy Economics and Policy 14 (5), S. 141 - 148. https://www.econjournals.com/index.php/ijeep/article/download/16646/8130/38801. doi:10.32479/ijeep.16646.



International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2024, 14(5), 141-148.

The Impact of Socio-cultural and Environmental Deterioration Factors on Economic Sustainability in G7 Countries

Noura Najia[1]*, Hanadi Taher[2], Ghassan Abed Elkader[2]

[1]PhD Candidate in Economics, Beirut Arab University, Lebanon, [2]Beirut Arab University, Lebanon. *Email: noura.najia@hotmail.com

Received: 23 April 2024 **Accepted:** 17 July 2024 **DOI:** https://doi.org/10.32479/ijeep.16646

ABSTRACT

The paper provides the examination of economic sustainability based on the impact of socio-cultural factors and the environmental deterioration factors. This empirical analysis focuses particularly on G7 countries, and panel time series during the period 2000-2022 are used to test this relationship. It applies several variables to determine these impacts that are tested with a principal component analysis and generalized least square estimation. According to Hofstede (1980) which is explained the culture dimensions (masculinity, power distance, uncertainty avoidance, and indulgence); and U-shaped in Environmental Kuznets curve (EKC) which showed the relationship between environmental deterioration and income level. Socio-cultural variables are divided into three groups: "socio-development," "Hofstede dimensions," and "economic development." Environmental deterioration variables are divided into two groups: "air pollution," and "water pollution." The paper indicates the hypothesis that socio-cultural variables significantly impact economic sustainability; and the significant impact of environmental deterioration variables on economic sustainability. The findings shows that socio-cultural negatively impacts economic sustainability, and environmental deterioration positively affects economic sustainability. Different tests apply to determine these effects, Hausman test to determine either Fixed effect or Random effect, Heteroscedasticity test (Durbin Watson test), Persan's CD to test the serial correlation and Jarque-Berra test to confirm the normality distribution.

Keywords: Generalized Least Square Estimation, Gross Domestic Product Per Capita, Socio-Cultural, Environmental Deterioration, G7 Countries
JEL Classifications: A130, C180, Q530

1. INTRODUCTION

The variation in culture values over time is a problem to discuss for researcher as it is produced for controlling social life, political and economic. The culture of persons depends on actions, behavior of people, and essentially economic recommendations (Throsby, 2001). In fact, economic development and economic growth have significantly affect by the generation characteristics that are passed over the years (Spolaore and Wacziarg, 2013). It is an action of development in culture where a group of actions takes place, and the culture is transferred among people/countries and between generations, covering components of communication and psychology (Boyd and Richerson, 2005).

The cultural variables are more significant and obvious than before during theories growth and evolution studies. Nevertheless, few studies test the direct relationship between culture variables and economic growth. Dieckmann (1996) applied cross-sectional growth model to examine the impact of culture on economic growth; another study didn't use any control variables to determine the relationship between culture and economic growth (Papamarcos and Watson, 2006); other researchers showed that the relationship between culture and economic development could improve countries economy and others have a recession (Acemoglu, 2008; Casson and Godley, 2000).

In addition, the environmental pollution and carbon neutrality is strongly impacted by the economic growth and economic

development. Environmental Kuznets curve (EKC) hypothesis that have inverted U-Shaped explained the linkage among economic growth and environmental pollution in the next phase. In the lately economic growth phases, in order to raise the economy production, the environmental deterioration problems are increased because of natural resource depletion. Different countries are significantly eliminated the environmental quality to attend uppermost economic growth in this phase (Mughal et al., 2022).

The perspective, strategies, and achievements of G7 countries have great capacity possessing about 50% of GDP Worldwide lowering CO_2 are very essential. In the early twentieth century, the achievements of G7 countries to a decrease in carbon dioxide emissions is commendable as its exploit to greenhouse gas emission was 70% which decreased to 24% in 2012. Between G7 countries, Canada has the high uses per-capita greenhouse gas emission and energy resources. The achievement of Canada in climate regulation is classified as a medium as it persists to subsidize the production and uses of fossil fuels. The achievements of Germany, Italy, and UK have high rank in the group of greenhouse gas emission and energy consumption while it's ranked low in USA and Japan (Hao et al., 2021).

Therefore, this study uses the generalized least squared (GLS) to determine the impact of socio- cultural, environmental deterioration, and foreign direct investment on economic sustainability. This model was developed by applying socio-cultural index and environmental deterioration index to determine the degree of socio-cultural, and environmental deterioration on economic sustainability in the context of G7 groups.

2. LITERATURE REVIEW

2.1. Impact of Socio-cultural on Economic Sustainability

Schwartz's (1992; 1994) and Hofstede theories endeavor to create a detailed set of moral measurements of culture, starting with person scale then at the cultural scale. Schwartz (1994, p. 88) specifies human behavior as "desirable goals, differing in importance, that provide as a conductor standard in people's lives." By choosing fifty-six particular human behaviors, first Schwartz presented ten motivationally types individual behaviors such as power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, tradition, conformity and security which were arranged on two bi-polar measurements, where each measurement is against two or more of the mentioned types.

Autonomy-Conservatism measurements Hofstede's Individualism-Collectivism presents the single or group distinction more strongly by concentrating on the importance of the person in a specific country more than on the contradiction of single objectives against group objectives that comprised the factors choose to test Hofstede's measurement (Hofstede, 1980). Hofstede's Masculinity measurement indicates the behaviors "social power," "wealth," and "authority," and contains the authority of social regulations and resource distribution; it varies from Conservatism in that it is presented with the power usable to encourage individual against group interests (Hofstede, 1980). In Hofstede's collectivist societies, which are based on close consistent connections, Conservatism and Hierarchy are essential behavior; individual work to encourage the interest of the in-group and they conduct towards others in composed methods to maintain social harmony. Harmony with Nature, contains "protecting the environment" and "unity with nature," so Harmony with Nature can be considered as the contrast of Mastery. Both, Egalitarian Commitment and Harmony with Nature consider the self-transcendence of person and in-group objectives in favor of encouraging the interest of others (Hofstede, 1980).

Several studies tested the relationship between culture and economic growth, they found a negative impact of trust on economic growth in emerging countries (Butzer et al., 2013) and a negative relationship between individualism and economic growth for developing and developed countries (Tsegaye et al., 2019); also, when cultural background taken as traditional materialistic value (Work ethic, trust, religion and competition) while its negative impact on economic growth in post-materialistic value such as generalized trust, respect and independence (Kafka and Kostis, 2021). Other studies showed positive relationship between cultural value of individualism and economic growth (Gorodnichenko and Roland, 2011). The found no relationship between power distance, innovation and economic growth (Tsegaye et al., 2019).

In addition, some studies showed a significant effect of education level and life expecting at birth on economic growth (Korkmaz and Kulunk, 2016). Also, education impacts economic growth indirectly through income distribution (Ranis, 2004). Also, it exists positive impact of life expectancy and expected years of schooling (social factors) on economic growth (Popa, 2012). A study tested the influence of carbon dioxide emissions on health indicators in Turkey from 1971 to 2016. Observations present the existence of long-term co-integration linkage among CO2 emissions and health indicators. where it was discovered that elevated levels of carbon dioxide led to a decrease in expectation of life at birth and a rise in newborn death rate (Erdogan et al., 2019).

Varsakelis (2001) studied the relationship between openness of the economy, national culture and patent protection framework on Research and Development (R&D) investment by utilizing cross-country analysis for fifty nations including these countries G7 countries. The data was taken from different resources and different years because it is based to Hofstede (1984) such as R&D intensity was taken as index for R&D; the patents right protection index; the openness of the economy was measured by the black-market exchange rate premium; and the national culture was measured by the power distance index. The results showed that there exists a strong positive association among patent protection and R&D intensity. Nevertheless, the essential policy goal of the patents protection framework is the establishing of new technology by promoting domestic and foreign scientific research and significance (OECD, 1997). The findings of Varsakelis study prove the point of view that's related to the capability in establish a monopolistic characteristic is a significant variable in the decision for R&D investment. In addition, the results showed a negative relationship between power distance index and innovation activity.

According to (Butzer et al., 2013; and Tsegaye et al., 2019) the hypothesis mentions as follow

H1: It exists a negative relationship between socio-cultural and economic sustainability.

2.2. Impact of Environmental Deterioration on Economic Growth

Previous studies showed that economic growth have an essential role in the environment. Whereas, Environmental Kuznets curve (EKC) have shown that economic growth can increase. U-shaped in EKC theory showed the relationship among environmental deterioration and income level, this means economic growth will decrease the negative impact on the environment (Yu et al., 2022).

A current perspective in the social sciences according climate change is based on neoclassical economics. This viewpoint identifies the primary social issue concerning climate change as an externality rather than a matter of sovereignty. The fundamental issue which is the emission of greenhouse gases, along with other activities that participate to climate change, like desertification, is considered rational and beneficial for greedy, maximization the utility of reasonable actors, as long as they are permitted to do so at no cost and receive a revenue from it. This view point confirms the need to address the economic incentives that drive the behavior of individuals and organizations responsible for greenhouse gas emissions in order to effectively conflict climate change (Agrawala and Fankhauser, 2008; Lorenzoni et al., 2007).

A study present that the consumption of clean energy can enhance environmental development, while dense population, urbanization, and GDP have a harmful impact on the environment. Also, it reveals a unidirectional relationship of carbon release with clean energy, GDP, and urbanization (Rahman and Alam, 2021). In addition, a study considers the components of FDI inflows in Pakistan from 1980 to 2014. Findings showed that an increase in economic growth tends to higher pollution release. The scale impact demonstrated that the funds of capital and labor has a positive impact on Pakistan's economic growth, but pollution harms develop. In terms of the capital collection effect, GDP and FDI had a positive and strong effect on the fund of capital (Bakhsh et al., 2017).

According to energy growth, different studies have tested the relationship between economic growth and environmental deterioration based on the EKC hypothesis (Al-Mulali et al., 2015; Boluk and Mert, 2015; Pata, 2019; Sharif et al., 2020; Ike et al., 2020; Iorember et al., 2020). Their results proved that renewable energy consumption led to encourage in environmental quality. Meanwhile, several studies showed that renewable energy consumption led to a reduction in environmental degradation (Dogan and Seker, 2016; Dogan and Ozturk, 2017; Zoundi, 2017; Sinha et al., 2018; Alvarez-Herranz et al., 2017; Balsalobre-Lorente et al., 2018; Allard et al., 2018; Wang and Dong, 2019; Zafar et al., 2019; Usman et al., 2020).

Shahbaz et al. (2017) tests the relationship between CO_2 and economic growth (GDP per capita) in G7 countries and conclude that economic growth and CO_2 are cointegrated in France, Canada, US, Italy, Germany and UK. Ozturk and Suluk (2020) found a bidirectional relationship between economic growth and CO_2 emission in G7 countries.

According to Shabaz et al. (2017), Ozturk and Suluk (2020), and (Bakhsh et al., 2017) the hypothesis mentions as follow.

H2: It exists a positive relationship between environmental deterioration and economic sustainability.

3. METHODOLOGY

The Panel data contains Group of Seven countries that are developed countries. Based on WDI (world development indicators), World Bank classification, the Group of Seven countries are as follows: Canada, France, United States, United Kingdom, Germany, Italy, and Japan. The sample includes data from the World Bank, World Value Surveys (WVS), European Value Surveys (EVS), and BP statistical review of world energy during the period 2000-2022. This study determines the impact of socio-cultural and environmental deterioration for the period 2000-2022.

The explanatory variable of socio-cultural index based on Hofsted's culture dimensions (Hofstede, 1980), such as power distance index (PDI), individualism (IDV), masculinity (MAS), and uncertainty avoidance (UAI). Power distance presents the extent to which member of institutions and organizations (family) expect that power is not classified equally between individuals who hold fluctuations degrees of impacts and authority. Second dimension, individualism represents a society identified by low relations among members. In certain society, the norm is for each individual to take care of themselves and their family, with less assurance on broader social responsibilities. Third dimension, masculinity presents a societal framework where different gender roles are upheld, Men are expected to be assertive and oriented toward attaining material success, therefore, women are expected to combine modesty, tenderness, and focus on encouraging the life quality. Then, uncertainty avoidance defines the propensity of individual to agree or reject a sudden action.

In addition, the socio-cultural index contains socio development factors such as thrift represents the percentage in every society attain economic growth and a preference for saving money (Onesimo, 2009); and trust represents the percentage of answers that most individual can be trusted (Williamson and Mathers, 2011). Also, economic development such as education level identifies by school enrollment in tertiary education (Arachchi and Managi, 2022), and life expectancy at birth presents the living years of newborn infant (Borges et al., 2021).

The environmental deterioration index contains air pollution identifies by carbon neutrality (CO_2 emissions) contains production of carbon dioxide along consumption of liquid, solid and gas fuels and flaring (Mughal et al., 2022); and land pollution indicates by agriculture, forestry, and fishing, value added (% of GDP) identifies to ISIC divisions 1-3 and contains hunting, forestry, and fishing, also the production of crops and livestock production.

Value added is equal to the net output of a sector that means sum of all outputs and deduct intermediate inputs without subtracting for depreciation of fabricated assets or depletion and degradation of natural resources (Kouassi et al., 2021).

The factors take value between −3 and +3. This study applied the methodology of Petrakis and Kostis (2013) to calculate the socio-cultural index and environmental deterioration index for G7 countries. According to this methodology, this study built socio-cultural index and environmental deterioration index using a principal component analysis (PCA). PCA permits us to reduce the number of variables including cultural background, while finding the structure in the association among these variables. Smith (2002) supposed that PCA is a method of measuring patterns in data. In addition, PCA is a factor extraction method used to constitute uncorrelated linear combinations of the observed variables, which are then used to obtain the initial factor solution when a correlation matrix is singular.

Based on Jayaprakash and Pillai (2022), who tested the relationship between innovation capacity technology, national culture and economic growth:

$$GDP_{it} = \beta_0 + \beta_1 ICT_{it} + \beta_2 PDi + \beta_3 IDV_i + \beta_4 MAS_i + \beta_5 UAI_i + \beta_6 LTO_i + \beta_7 IDN_i + \beta_8 ICTPD_i + \beta_9 ICTIDV_{it} + \beta_{10} ICTMAS_{it} + \beta_{11} ICTUA_{it} + \beta_{12} ICTLTO_{it} + \beta_{13} ICTIND_{it} + \beta_{14} HDI_{it} + \beta_{15} EPI_{it} + \beta_{16} Region_i + \beta_{17} Goveff_{it} + \eta_t + \alpha_i + \varepsilon_{it} \quad (1)$$

Adding to the above, an econometric model of the impact of socio-cultural and environmental deterioration on economic sustainability will be estimated for a panel of G7 countries and during the period 2000-2021. The below indicators of socio-cultural (SC), environmental deterioration (ED) relevant from the common indicators of different previous studies of the culture and economic factors.

Therefore, the model is specified in Equation 2, GDP per capita, socio-cultural, environmental deterioration, and foreign direct investment. GDP per capita is transformed into logarithm form for simple calculation.

$$LnGDP = f\,(SC, ED) \quad (2)$$

Panel unit root tests have been developed by Levin and Lin (1992), Im, Pesaran and Shin (1997).

In addition, Bhargava et al. (1982), Boumahdi and Thomas (1991), and Breitung and Wolfgang (1994) have suggested a new test for fixed effect models.

According to Panel data tests, first, the study applies pooled least square model (OLS) in equation (3)

$$LnGDP_{it} = \beta_0 + \beta_1 SC_{it} + \beta_2 ED_{it} + \beta_3 FDI_{it} + \varepsilon_{it} \quad (3)$$

Then, fixed effect model applies in equation (4) and a test validate to compare results between pooled least square model or fixed effect model.

$$LnGDP_{it} = \beta_0 + \beta_1 SC_{it} + \beta_2 ED_{it} + \beta_3 FDI_{it} + \varepsilon_{it} \quad (4)$$

After that, a random effect model applies in equation (5). A Hausman Test uses in order to choose the best model between fixed effect and random effect.

$$LnGDP_{it} = \beta_0 + \beta_1 SC_{it} + \beta_2 ED_{it} + \beta_3 FDI_{it} + \varepsilon_{it} \quad (5)$$

Persan (2004) tested the cross-section dependence (CD) to determine if it exists any correlation between the cross sections. Therefore, Persan (2015) tested the low cross-sectional dependence by supposing that the errors are weakly cross-sectional dependent as null hypothesis. Breusch Pagan (1979) test developed in order to examine the existence of heteroskedasticity.

Due to the presence of heteroskedasticity and serial correlation, this study applies generalized least square (GLS) model that is effective and homoscedastic. In the results of heteroskedasticity, the variables are divided by the standard deviation (δ_i) and mentioned in the equation (6) as follows:

$$\frac{LnGDPit}{\delta i} = \frac{\beta 0}{\delta i} + \frac{\beta 1 + SCit}{\delta i} + \frac{\beta 2 + EDit}{\delta i} + \frac{\beta 3 + FDIit}{\delta i} + \frac{\varepsilon it}{\delta i} \quad (6)$$

Therefore, equation (7) presents GLS model with a simple form that is effective and homoscedasticity, it is used in this study for the econometric analysis.

$$LnGDP_{it}^* = \beta_0^* + \beta_1 SC_{it}^* + \beta_2 ED_{it}^* + FDI_i t^* + \mu_{it}^* \quad (7)$$

Where GDP is taken as logarithm of GDP per capita, SC presents socio-cultural index, ED indicates environmental deterioration index and FDI presents foreign direct investment. The term i indicates the countries, t presents the years; β refers to the coefficient and μ is the error.

Moreover, the residual diagnostic tests applied to this study are normality test developed by Jarque-Bera (1980) and Persan CD (2004) test the serial correlation in order to validate the use of Panel GLS model.

4. RESULTS AND DISCUSSION

This section presents the results obtain from several tests, first descriptive statistics to identify the variables, then correlation analysis by apply Pearson correlation coefficient to evaluate how the variables are affecting each other; and VIF test to check the multicollinearity between variables. Therefore, panel estimations apply and due to the existence of serial-correlation and heteroskedasticity, GLS estimation is conducted.

4.1. Descriptive Analysis

Descriptive analysis summarizes and organize characteristics of data set. Table 1 identifies the summary of descriptive statistics for all the variables of this study. GDP per capita has a mean value of 40754 with a maximum value of 76330 and a minimum value of 20138. The mean value of socio-cultural index is 0 with

Table 1: Descriptive statistics

Var	Mean	Median	Std.dev.	Maximum	Minimum	Observations
GDP	40754	40871	9309.7591	76330	20138	161
SC	0	0.07648	1.5213	3.20182	−4.0162	161
ED	0	0.2551	1.12	2.3101	−2.0835	161
FDI	2.1545	1.6891	2.1981	12.7315	−1.642	161

GDP: Gross domestic product, SC: Socio-cultural, ED: Environmental deterioration

a maximum value of 3.2018 and a minimum value of −4.0162. The mean value of environmental deterioration index is 0 with a maximum value of 2.3101 and a minimum value of −2.0835. Then, the mean value of FDI 2.1545 with a maximum value of 12.7315 and a minimum value of −1.642.

4.2. Correlation Analysis

The relationship among socio-cultural and environmental deterioration (independent variables) and the economic sustainability (independent variable) was proved by correlation analysis. In addition, the collinearity statistics tolerance was tested by applying variance inflation factors (VIF) in order to test the multicollinearity between variables.

Table 2 presents the correlation analysis. The results display that FDI and environmental deterioration, are negatively correlated with socio-cultural and FDI are positively correlated with environmental deterioration. In addition, this study checked the multicollinearity of variables by variance inflation factors (VIF) and it results that all values <5 which means that it doesn't exists multicollinearity in this study.

4.3. Panel LS Estimation

This study applies Panel least square estimation in order to test the impact of socio-cultural and environmental deterioration on economic sustainability. First, pooled least square estimation was conducted and showed a negative relationship between socio-cultural and economic sustainability; positive impact of environmental deterioration on economic sustainability and negative relationship between FDI and economic sustainability. Therefore, fixed effect used in order to examine these relationships and found that it exists negative impact of socio-cultural factors on economic sustainability, positive effect of environmental deterioration factors on economic sustainability, and negative relationship between FDI and economic sustainability. A such test use to choose between OLS estimation and fixed effect estimation, it indicates to choose fixed effect estimation. Then, random effect estimation found no effect of socio-cultural factors on economic sustainability, positive effect of environmental deterioration and economic sustainability, and negative relationship between FDI and economic sustainability; a Hausman test have a P-value 2.81e-07 which indicates that fixed effect should be applied. Therefore, Persan CD test and Durbin Watson test showed the existence of serial correlation and heteroscedasticity which lead to use GLS estimation to solve these problems.

Table 3 presents the outcomes of Panel least square estimations. The results of panel pooled LS based on equation (2) is no applicable. Therefore, this study conducts the panel fixed effects based on equation (3) and panel random effect based on equation

Table 2: Correlation statistics

Var	GDP	SC	ED	FDI
GDP	1.000			
SC	−0.170	1.000		
ED	0.560	−0.054***	1.000	
FDI	−0.665	−0.070**	0.016***	1.000

Source: Own calculation. Note, ***, **,* indicate the significance level at 1%, 5%, and 10% respectively. GDP: Gross domestic product, SC: Socio-cultural, ED: Environmental deterioration

Table 3: Panel LS outcomes

Pooled least squares (OLS) outcomes			
Var	**Coef.**	**t-stat**	**P-value**
SC	−0.0199	−1.957	0.0521*
ED	0.115	8.349	3.38e−14***
FDI	−0.0117	−1.674	0.0960*
C	10.6139	492.023	<2e−16***
Panel fixed effects (FE) outcomes			
Var	**Coef.**	**t-stat**	**P-value**
SC	−0.0179	−1.9069	0.0584*
ED	0.4859	8.1055	1.66e−13***
FDI	−0.02	−2.8977	0.004318**
FE test outcomes	statistic	d.f.	P-value
	11.519	6	1.36E−10
Panel random effects (RE) outcomes			
Var	**Coef.**	**t-stat**	**P-value**
SC	−0.0161	−1.5948	0.1107
ED	0.1853	6.0508	1.441e−09***
FDI	−0.0195	−2.6589	0.00784**
C	10.6307	258.3283	<2.2e−16***
Hausman test	**Statistic**	**d.f.**	**P-value**
Hausman test	33.283	3	2.81e−07
Heteroskedasticity test	**Value**	**d.f.**	**P-value**
Likelihood ratio	13.187	3	0.00425

***P<0.01, **P<0.05,*P<0.1. SC: Socio-cultural, ED: Environmental deterioration

(4). Hausman test determined that FE estimation is applicable in this study. Moreover, the results showed the existence of heteroscedasticity and serial correlation.

For that, panel GLS estimation based on equation (6) was applied. The results are presented in the Table 4. In addition, based on Persan CD(Persan, 2004) and Jarque Bera test, it exists homoscedasticity and the model is normally distributed.

The estimated findings showed that the coefficient of SC is negatively significant at the 5% level, denoting that socio-cultural index negatively affect GDP per capita. Any decrease in socio-cultural is likely to improve the economic performance of the countries. Ciommi et al. (2021) found that social capital had negative impact on economic growth taken into consideration the variables included in the index (life expectancy, population and persons with tertiary level in education). In such countries, the

Table 4: Panel GLS estimation results

Variable	Coef.	t-stat	P-value
SC	−0.0199	−1.951	0.0521*
ED	0.115	8.3488	3.38e−14***
FDI	−0.0117	−1.6745	0.0960*
C	10.6139	492.023	<2e−16***
Residual diagnostic check	**Value**		**P-value**
Pesaran CD	2.1515		0.3335
Jarque-Bera	2.3573		0.3077

***P<0.01, **P<0.05, *P<0.1. GLS: Generalized least squared, SC: Socio-cultural, ED: Environmental deterioration, CD: Cross-section dependence

disadvantages of culture values may exceed their advantages, for that it has a negative impact on economic growth (Liu et al., 2020).

Therefore, the coefficient of ED is positively significant at 1% level, indicating that environmental deterioration index positively affects GDP per capita. Any increase in environmental deterioration will encourage the economic growth. An increase in the country's economy will help the pollution to develop (Bakhsh et al., 2017).

In addition, the coefficient of FDI is negatively significant at 10% level, noting that foreign direct investment negatively affects GDP per capita. Any decrease in foreign direct investment will improve the economic growth. In such cases, FDI can be affect economic growth positively or negatively (Fan and Hao, 2020).

Based on Hofstede dimensions, Butzer et al. (2013), and Tsegaye et al. (2019), this study confirm the negative effect of socio-cultural index on economic sustainability. According to Rahman and Alam (2021), Shahbaz et al. (2017) found that environmental deterioration enhances the economic growth which accept the hypothesis, environmental deterioration index has a positive impact on economic sustainability.

5. CONCLUSION

The study examined the impact of socio-cultural and environmental deterioration on economic sustainability using panel data from the Group of Seven (G7) countries over the period from 2000 to 2022. Initially, Pesaran's Cross-sectional Dependence (CD) test was applied to detect serial correlation within the panel data series. The CD test statistics showed that it exists a correlation between the cross-sectional variables.

The Panel generalized least square estimation showed that socio-cultural index negatively affected economic sustainability. Thrift and some variables of Hofstede dimensions which contained in the socio-cultural index led to a decrease in economic sustainability. While, the environmental deterioration index indicated a positive relationship with economic sustainability. In developed countries, it suggests that high economic sustainability is related to the high environmental pollution. In G7 countries, economic sustainability is more significantly impacted by environmental deterioration than by socio-cultural.

According to the findings, G7 economies need to improve socio-cultural factors and reduce environmental deterioration to encourage economic sustainability. A comparative study between developed countries and developing countries could be conducted by merging additional cultural factors related to politics; also adding water pollution factor in the environmental deterioration index.

REFERENCES

Acemoglu, D. (2008), Introduction to Modern Economic Growth. Princeton: Princeton University Press.

Agrawala, S., Fankhauser, S. (2008), Putting Climate Change Adaptation in an Economic Context. France: OECD.

Allard, A., Takman, J., Uddin, G. S., & Ahmed, A. (2018). The N-shaped environmental Kuznets curve: an empirical evaluation using a panel quantile regression approach. Environmental Science and Pollution Research, 25, 5848-5861.

Alvarez-Herranz, A., Balsalobre-Lorente, D., Shahbaz, M., & Cantos, J. M. (2017). Energy innovation and renewable energy consumption in the correction of air pollution levels. Energy policy, 105, 386-397.

Al-Mulali, U., Weng-Wai, C., Sheau-Ting, L., & Mohammed, A. H. (2015). Investigating the environmental Kuznets curve (EKC) hypothesis by utilizing the ecological footprint as an indicator of environmental degradation. Ecological indicators, 48, 315-323.

Arachchi, J.I., Managi, S. (2022), Social capital, household income and carbon dioxide emissions: A multicountry analysis. Environmental Impact Assessment Review, 96, 106838.

Bakhsh, K., Rose, S., Ali, M.F., Ahmad, N., Shahbaz, M. (2017), Economic growth, CO_2 emissions, renewable waste and FDI relation in Pakistan: New evidences from 3SLS. Journal of Environmental Management, 196, 627-632.

Balsalobre-Lorente, D., Shahbaz, M., Roubaud, D., & Farhani, S. (2018). How economic growth, renewable electricity and natural resources contribute to CO2 emissions?. Energy policy, 113, 356-367.

Bhargava, A., Franzini, L. and Narendranathan, W.: 1982, Serial correlation and the fixed effects model, Review of Economic Studies 49(4), 533–49. 1, 2, 3, 5, 10

Bölük, G., & Mert, M. (2015). The renewable energy, growth and environmental Kuznets curve in Turkey: an ARDL approach. Renewable and Sustainable Energy Reviews, 52, 587-595.

Boumahdi, R., & Thomas, A. (1991). Testing for unit roots using panel data: Application to the French stock market efficiency. Economics Letters, 37(1), 77-79.

Borges, C.M., Pollock, J.C., Crowley, M., Purandare, R., Sparano, J., Spike, K. (2021), Social capital or vulnerability: Which has the stronger connection with selected U.S. Health outcomes? SSM-Population Health, 15, 100812.

Boyd, R., Richerson, P.J. (2005), The Origin and Evolution of Cultures. Oxford: Oxford University Press.

Breitung, Jorg and Wolfgang Meyer (1994): Testing for unit roots in panel data: are wages on different bargaining levels cointegrated?, Applied Economics, 26, 353- 361.

Breusch, T. & Pagan, A. (1979), 'A simple test of heteroskedasticity and random coefficient variation', Econometrica 47, 1287–1294.

Bützer, S., Jordan, C., & Stracca, L. (2013). Macroeconomic imbalances: A question of trust?.

Casson, M., Godley, A. (2000), Cultural Factors in Economic Growth. Berlin, Heidelberg: Springer-Verlag.

Ciommi, M., Mariani, F., Recchioni, M.C., Zallocco, R. (2021), The role of social capital in economic performance across European regions. Rivista Italiana di Economia Demografia e Statistica, 75(4), 78-79.

Dieckmann, O. (1996), Cultural determinants of economic growth: Theory and evidence. Journal of Cultural Economics, 20(4), 297-320.

Dogan, E., & Seker, F. (2016). An investigation on the determinants of carbon emissions for OECD countries: empirical evidence from panel models robust to heterogeneity and cross-sectional dependence. Environmental Science and Pollution Research, 23, 14646-14655.

Dogan, E., & Ozturk, I. (2017). The influence of renewable and non-renewable energy consumption and real income on CO 2 emissions in the USA: evidence from structural break tests. Environmental Science and Pollution Research, 24, 10846-10854.

Erdogan, S., Kirca, M., Gedikli, A. (2020), Is there a relationship between CO_2 emissions and health expenditures? Evidence from BRICS-T countries. Business and Economics Research Journal, 11(2), 293-305.

Gorodnichenko, Y., & Roland, G. (2011). Individualism, innovation, and long-run growth. Proceedings of the National Academy of Sciences, 108(supplement_4), 21316-21319.

Fan, W., Hao, Y. (2020), Empirical research on the relationship amongst renewable energy consumption, economic growth and foreign direct investment in China. Renewable Energy, 146, 598-609.

Hao, L.N., Umar, M., Khan, Z., Ali, W. (2021), Green growth and low carbon emission in G7 countries: How critical the network of environmental taxes, renewable energy and human capital is? Science of the Total Environment, 752, 141853.

Hofstede, G. (1980), Values and Culture. Culture's Consequences: International differences in Work-Related Values. United Kingdom: SAGE.

Hofstede, G. (1984). Cultural dimensions in management and planning. Asia Pacific Journal of Management, 1(2), 81-99.

Ike, G. N., Usman, O., & Sarkodie, S. A. (2020). Testing the role of oil production in the environmental Kuznets curve of oil producing countries: New insights from Method of Moments Quantile Regression. Science of the Total Environment, 711, 135208.

Im, K.S., Pesaran, M.H., and Shin, Y. (1997), ìTesting for Unit Roots in Heterogenous Panelsî, DAE, Working Paper 9526, University of Cambridge.

Jarque, C., Bera, A., 1980. Efficient tests for normality homoscedasticity and serial independence of regression residuals. Econometric Letters 6, 255–259.

Kafka, K. I., & Kostis, P. C. (2021). Post-materialism and economic growth: Cultural backlash, 1981–2019. Journal of Comparative Economics, 49(4), 901-917.

Iorember, P. T., Goshit, G. G., & Dabwor, D. T. (2020). Testing the nexus between renewable energy consumption and environmental quality in Nigeria: The role of broad-based financial development. African Development Review, 32(2), 163-175.

Jayaprakash, P., & Pillai, R. (2022). The role of ICT and effect of national culture on economic growth. Information Technology for Development, 28(2), 420-442.

Korkmaz, S., & Kulunk, I. (2016). Granger causality between life expectancy, education and economic growth in OECD countries. Economic Research Guardian, 6(1), 2.

Kouassi, J.L., Gyau, A., Diby, L., Bene, Y., Kouamé, C. (2021), Assessing land use and land cover change and farmers' perceptions of deforestation and land degradation in South-West Côte d'Ivoire, West Africa. Land, 10(4), 429.

Liu, K., Yang, J., Zou, H. (2020), Cultural heterogeneity, social policy, and economic growth in China. China Economic Review, 62, 101501.

Levin, A., Lin, C.-F., 1992. Unit root tests in panel data: Asymptotic and Önitesample properties. U.C. San Diego Discussion Paper 92-23.

Lorenzoni, I., Nicholson-Cole, S., Whitmarsh, L. (2007), Barriers perceived to engaging with climate change among the UK public and their policy implications. Global Environmental Change, 17(3-4), 445-459.

Mughal, N., Arif, A., Jain, V., Chupradit, S., Shabbir, M.S., Ramos-Meza, C.S., Zhanbayev, R. (2022), The role of technological innovation in environmental pollution, energy consumption and sustainable economic growth: Evidence from South Asian economies. Energy Strategy Reviews, 39, 100745.

OECD, 1997. Patents and innovation in the international context. Paris, mimeo.

Öztürk, S., & Suluk, S. (2020). The relationship between CO2 emission, energy and economic growth: an empirical analysis for the G7 countries. IPASJ Int J Manag, 8(11), 16-24.

Papamarcos, S. D. – Watson, G. W. (2006): Culture's Consequences for economic Development: An Empirical Examination of Culture, Freedom, and National Market Performance. Journal of Global Business and Technology, 2(1): 48–57.

Pata, U. K. (2019). Environmental Kuznets curve and trade openness in Turkey: bootstrap ARDL approach with a structural break. Environmental Science and Pollution Research, 26(20), 20264-20276.

Pesaran, M. H. (2004). General Diagnostic Tests for Cross Section Dependence in Panels. IZA Discussion Paper No. 1240 .

Pesaran, M. H. (2015). Testing Weak Cross-Sectional Dependence in Large Panels. Econometric Reviews 34 (6-10), 1089ñ1117.

Petrakis, P., & Kostis, P. (2013). Economic growth and cultural change. The Journal of Socio-Economics, 47, 147-157.

Popa, A. M. (2012). The impact of social factors on economic growth: Empirical evidence for Romania and European Union countries. Romanian Journal of Fiscal Policy (RJFP), 3(2), 1-16.

Rahman, M. M., & Alam, K. (2021). Clean energy, population density, urbanization and environmental pollution nexus: Evidence from Bangladesh. Renewable Energy, 172, 1063-1072.

Ranis, G. (2004). Human development and economic growth. Available at SSRN 551662.

Schwartz, S. H. (1992). Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. In Advances in experimental social psychology (Vol. 25, pp. 1-65). Academic Press.

Schwartz, S. H. (1994). Beyond individualism/collectivism: New cultural dimensions of values.

Shahbaz, M., Shafiullah, M., Papavassiliou, V. G., & Hammoudeh, S. (2017). The CO2–growth nexus revisited: A nonparametric analysis for the G7 economies over nearly two centuries. Energy Economics, 65, 183-193.

Sharif, A., Godil, D. I., Xu, B., Sinha, A., Khan, S. A. R., & Jermsittiparsert, K. (2020). Revisiting the role of tourism and globalization in environmental degradation in China: Fresh insights from the quantile ARDL approach. Journal of Cleaner Production, 272, 122906.

Sinha, A., Shahbaz, M., & Sengupta, T. (2018). Renewable energy policies and contradictions in causality: a case of Next 11 countries. Journal of cleaner production, 197, 73-84.

Smith, L. I. (2002). A tutorial on principal components analysis.

Spolaore, E., Wacziarg, R., 2013. How deep are the roots of economic development? J Econ Lit 51 (2), 325–369.

Throsby, D., 2001. Economics and Culture. Cambridge University Press, Cambridge.

Tsegaye, W., Su, Q., & Malik, M. (2019). The Antecedent Impact of Culture and Economic Growth on NationsCreativity and Innovation Capability. Creativity Research Journal, 31(2), 215-222.

Usman, O., Alola, A. A., & Sarkodie, S. A. (2020). Assessment of the role of renewable energy consumption and trade policy on environmental degradation using innovation accounting: Evidence from the US. Renewable Energy, 150, 266-277.

Uy, A. O. (2009). Can culture explain economic growth? A note on issues regarding culture-growth studies. Journal of Economics and Economic Education Research, 10(3), 85-105.

Varsakelis, N. C. (2001). The impact of patent protection, economy openness and national culture on R&D investment: a cross-country empirical investigation. Research policy, 30(7), 1059-1068.

Wang, J., & Dong, K. (2019). What drives environmental degradation?

Evidence from 14 Sub-Saharan African countries. Science of the Total Environment, 656, 165-173.

Williamson, C. R., & Mathers, R. L. (2011). Economic freedom, culture, and growth. Public choice, 148, 313-335.

Yu, Y., Radulescu, M., Ifelunini, A. I., Ogwu, S. O., Onwe, J. C., & Jahanger, A. (2022). Achieving carbon neutrality pledge through clean energy transition: Linking the role of green innovation and environmental policy in E7 countries. Energies, 15(17), 6456.

Zafar, M. W., Mirza, F. M., Zaidi, S. A. H., & Hou, F. (2019). The nexus of renewable and nonrenewable energy consumption, trade openness, and CO 2 emissions in the framework of EKC: evidence from emerging economies. Environmental Science and Pollution Research, 26, 15162-15173.

Zoundi, Z. (2017). CO2 emissions, renewable energy and the Environmental Kuznets Curve, a panel cointegration approach. Renewable and Sustainable Energy Reviews, 72, 1067-1075.