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# IMPACT OF ECOLOGICAL FOOTPRINTS CONSUMPTION, ENERGY CONSUMPTION AND HUMAN CAPITAL ON ECONOMIC GROWTH OF SELECTED ASIAN ECONOMIES

**Iram Batool [1,*], Qudsia Arshad [2] and Sumra Khalid [3]**

[1] *Director (Treasure Office), PMAS-Arid Agriculture University, Rawalpindi, Pakistan*
[2] *Assistant Professor, Department of Management Sciences, COMSATS University, Islamabad, Pakistan*
[3] *Lecture, Bahria University Islamabad Campus, Islamabad, Pakistan*

## ABSTRACT

The existing research highlights the significant role of ecological footprint consumption along with other control variables in determining economic growth in selected Asian economies. The authors have utilized panel data from 8 Asian nations from the time span of 2006 to 2018. GDP per capita is used as the dependent variable. By using panel data from concerned Asian nations, variables such as ecological footprint consumption, energy consumption, financial development, and secondary school enrollment are used as independent variables in current research. By using the fixed effect method, it is found that ecological footprint consumption along with energy consumption, financial development, and human capital play a significant and positive role in improving the economic growth of economies. The study findings suggest much financial approach and energy consumption for promoting the growth of nations. Moreover, there is a need for more improved quality of free-of-cost higher education for high living standards and growth.

*Keywords: Ecological footprints; Energy consumption; Human capital; Economic growth; Asian economies.*
** Email: dir.treasurer@uaar.edu.pk*

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## INTRODUCTION

Climate change, due to the extensive release of carbon emissions, is a solemn matter that demands to be embarked upon in a proper way. Along with reports from the World Health Organization, this problem has an extensive variety of undesirable inferences on community well-being, with lower life expectancy rates in the world. The major reason for such large carbon deposits, which are quickly heating the earth and producing climatic vicissitudes, is fossil fuel depletion. Predominantly, releases of unsafe gases, like greenhouse gases, particularly CO2, into our atmosphere are importantly amplified because of fossil fuel usage (WHO, 2023). Renewable energy produces less (or no) greenhouse gases, and all at once, nations need to guarantee appropriate economic growth which requires to be realized sustainably, and safeguarding lesser contamination levels is compulsory for climate change contract objectives to be fulfilled. Simultaneously, greater fossil fuel energy charges, amplified price rises, developed standards of living, and enlarged complications confronted by people also defend a robust usage of renewable energy (Bhuiyan et al., 2022).

Apergis and Payne (2010) explain a linkage between renewable energy usage and economic growth. The expedition for greener energy usage arose wide-reaching because of the associated forecasts for fossil fuel depletion, revolving the energy-led economic growth nexus for further research for ensuring a sustainable environment (Wang et al., 2022). Considering the significance of financial development, Demirgüç-Kunt et al. (2013) assumed that financial development means formal financial amenities provision for diverse segments of the community to improve their well-being. Sahay et al. (2015) indicated that financial

development is the approach, practice, and transferring monetary amenities at appropriate prices to the majority of the community. Education is ordinarily regarded as a momentous device for growth and development, nonetheless, still, there is no frequently acknowledged estimation of the use of such a made-up locomotive of growth. There is not even a covenant about the causality system: whether education causes growth or not. A related exertion is whether economic growth responds to human capital stock, as in Romer (1990), or to the increase of human capital, as in Lucas (1988).

The current empirical research work highlights the role of ecological footprint consumption along with energy consumption, financial development, and human capital in strengthening the economic growth of selected economies. A lot of variables such as inflation, information communication technology, education, population growth, etc. seem to affect economic growth has been studied in the literature. However, this research takes into account the key factors affecting the economic growth of nations. Hanushek and Kimko (2000) showed how did level of education affects the growth of Us.by using data on immigrants. The result revealed that immigrant's educational expenditures and human capital seemed to amplify growth in that economy.

Nunes (2003) also focused on how education may influence growth. The study result pointed out that educational expenditures led to enhanced economic growth in Portugal. Yousefi-Sahzabi et al. (2011) focused on the association of CO2 emission and economic growth in an Iranian study. It was found that CO2 emission enhanced economic growth of the economy. Alsaleh and Abdul-Rahin (2021) focused on how renewable energy consumption from biomass would make an appositive contribution to European Union nations' growth. Moreover, the study also confirmed the stability of this link of both variables. Balsalobre-Lorente and Leitão (2020) emphasized the role of trade openness and renewable energy in economic growth by using dynamic and modified ordinary least squares technique in EU 28 countries. Findings revealed that CO2 emissions and renewable energy consumption led to improved growth.

Chen et al. (2020) worked on an association of consumption and economic growth in 103 nations from 1995 to 2015. Findings indicated the positive link between consumption and economic growth. The study also found an inverse association of consumption and economic growth in the near the beginning stages of renewable energies can be rewarded in the long term when concerned nations strengthen renewable energy consumption levels. Silva et al. (2012) analyzed the rising contribution of renewable energy sources on electricity generation affected gross domestic product and CO2 by using data from 1960 to 2004 in the USA and other countries. It was found that renewable energy sources had economic costs regarding GDP per capita in other countries except the USA. Azam et al., (2016) investigated how CO2 emissions per capita, energy use, trade, and human capital affected economic growth in, the USA, India, and Japan. They used data from 2000 to 2013. Findings indicated that CO2 emissions and energy use decreased growth. However, trade and human capital increased economic growth.

Considering the significance of Information communication technology Khan et al., (2019) worked on the link of ICT, economic growth, and the human development index on the basis of data collected from 1990 to 2014. Results showed that information communication technology and economic growth had increased the human development index. Ali et al. (2022) used data from 1984 to 2014 and found how foreign capital affected the human development of sixty-five developing countries. The GMM results highlighted that foreign direct investment and FPI decreased per capita income and secondary school enrolment. Madaleno and Nogueira (2023) analyzed the impact of CO2 (carbon dioxide) emissions and renewable energy consumption on economic growth in EU nations from 1994 to 2019. GMM results indicated that gross fixed capital, human development, and trade made a positive contribution to increasing economic growth.

Hasnawati et al. (2024) also emphasized life expectancy and growth relationships by using data from 1950 to 2020 in Indonesia. The result showed a bidirectional association between life expectancy at birth and population growth. Partially, economic growth seemed to influence life expectancy and CO2.

**Significance of the Study**

Considerable variables have been observed as affecting the growth of nations, however, this research considered the major role of ecological footprint consumption along with energy consumption, financial development, and human capital on the growth potential of Asian economies.

**Research Hypothesis**

The hypotheses are described as:

1. H1: The human capital and economic growth are positively linked.
2. H 2: The higher the ecological footprint consumption, the higher the growth.
3. H 3: There is a positive link between financial development and growth.
4. H 4: Higher energy consumption leads to high economic growth of nations.

## METHODOLOGY

Current research work has emphasized the condition of growth and welfare of Asian nations. Keeping in view this aim, the data for the analysis have been taken from 2006 to 2018 of selected Asian emerging nations. An endeavor has been made to point out the key role of how financial development, ecological footprint consumption, energy consumption, and human capital augmented growth in concerned regions. The existing study selected data from the economies of Bangladesh, India, Indonesia, Iran, Jordan, Malaysia, Pakistan, and the Philippines. The data were taken from World Development Indicators. Here economic growth was taken as the dependent variable and independent factors were used as financial development, ecological footprints consumption per capita as a proxy of environment degradation, energy consumption, and human capital influencing economic growth.

The econometric model which is utilized is assumed as:

$$LGDPPC = \beta 0 + \beta 1 LEFPCNit + \beta 2\ NCBBit + \beta 3\ LENUSPCit + \beta 4 SSENR\ it + uit \quad (1)$$

LGDPPC= Log GDP per capita

NCBB= Numer of commercial bank branches

LENUSPC= Log energy use per capita

LEFPCN= Log ecological footprints consumption per capita

SSENR= Secondary school enrolment ratio

it = (time trend)

uit= (error term)

## RESULTS AND EMPIRICAL ANALYSIS

Table 1 reveals that on average, log GDP per capita is 0.42 percent. However, the number of commercial bank branches is 13.1509 and its standard deviation is lower than its mean. Data also points out that log ecological footprint consumption per capita is 0.1876 percent. Moreover, energy use per capita is 2.90 percent on average. Finally, secondary school enrolment seems 75.40 percent and the sample ranges from 30.86 to 88.91 percent in Asian economies. The value of standard deviation is less than the mean value of all variables which suggests the normality of data being used in the analysis.

Table 2 shows findings using the fixed effect technique. As Chi2 value is 2591.09 and the probability value is 0.0000 which is in favour of fixed effect result validity. It highlights that CO2 emission with other factors may enhance economic growth in selected Asian countries.

Table 1. Summary statistics of important variables.

| Variables | Observations | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| LGDPPC | 104 | 3.4217 | 0.35300 | 2.8129 | 4.0831 |
| LEFPC | 88 | 0.1876 | 0.2528 | -0.2042 | 0.6510 |
| LENUSPC | 72 | 2.8968 | 0.3736 | 2.2388 | 3.4858 |
| NCBB | 104 | 13.2445 | 6.9747 | 5.7171 | 32.3072 |
| SSENR | 104 | 70.4075 | 16.7202 | 30.8604 | 88.9102 |

Table 2. Fixed effect results (dependent variable is economic growth).

| Variables | Coefficients, Standard Errors and Z-values |
|---|---|
| LCO2 | 0.3322** |
| | 0.1263 |
| | (2.63) |
| LENUSPC | 0.7129* |
| | 0.1642 |
| | (4.34) |
| NCBB | 0.0039** |
| | 0.0018 |
| | (2.19) |
| SSENR | 0.0033*** |
| | 0.0012 |
| | (2.82) |
| Con | 1.1142 |
| | 0.4193 |
| | (2.66) |
| R2 Within | 0.74 |
| R2 Between | 0.90 |
| R2 Overall | 0.89 |

Note: t-values are in parentheses; ** p<0.05, * p<0.1 and*** p< 0.01.

Ecological footprint consumption which is being used as the proxy of environmental degradation may affect economic growth and development in Asian economies. Much of the working-age population seems to be involved in production activities to increase production and growth at the cost of environmental degradation. So, more consumption of ecological footprints per capital leads to increased economic growth of economies. The study result shows that one percent increased ecological footprint consumption results in economic growth of 0.3322 percent. The result is supported by Chen et al. (2022).

The role of energy consumption cannot be ignored. A lot of the population resides in urban areas and is involved in factories and industries to earn bread. More indulgence in industries results in more usage of energy level which also increases economic growth. All this is in favor of economies. As more usage of energy provides more employment and earning chances. It is found that a one percent increase in energy use leads to increased economic growth by 0.7129 percent. The result is consistent with Madaleno & Nogueira (2023).

Financial development also plays a significant role in determining the economic growth of the selected Asian economies. An increased number of commercial bank branches provides loaning facilities along with other facilities. This provision results in much of investments and increased business and employment chances. All this process leads to increased economic growth of nations. It is revealed that a one percent increased number of commercial bank branches will result in increased economic growth by 0.0039 percent.

Education plays a key role in determining and enhancing the growth of emerging economies. Secondary school enrolment results in an educated and efficient working force which will cause efficient production

share and high earning chances. The result highlighted that one unit increased secondary school enrolment leads to an increase in economic growth by 0.0033 percent. The finding is supported by Azam et al. (2016).

## CONCLUSIONS

Our research reveals the major determinants of economic growth by including the major role of ecological footprint consumption in some selected Asian economies. We have used the fixed effect technique. It is pointed out how ecological footprint consumption improved the economic growth of concerned economies. However, energy consumption per capita also seems to be increasing the economic growth of the economies. Moreover, better and improved financial development such as a number of commercial bank branches also enhances the economic growth of nations more and improved. Finally, the study concludes that secondary school enrolment results in increased growth of Asian nations. On the basis of significant findings, it is suggested that there is a dire need for more usage of energy consumption and better financial access to enhance high investments and economic growth in these economies. Finally, focus should be placed on skill development, high production, employment, and economic growth in Asian nations.

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