

Global Energy Consumption and Inclusive Wealth

ヨギ, スギアワン

<https://hdl.handle.net/2324/2236215>

出版情報 : Kyushu University, 2018, 博士 (工学), 課程博士
バージョン :
権利関係 :

氏 名 : ヨギ スギアワン

論 文 名 : Global Energy Consumption and Inclusive Wealth
(世界的なエネルギー消費と包括的富)

区 分 : 甲

論 文 内 容 の 要 旨

Gross domestic product (GDP) and well-being are two different terminologies that cannot be used interchangeably. However, GDP has been inappropriately used as the main indicator for gauging well-being for a long time. As a result, development policies aiming only on sustaining GDP growth tend to deviate from the sustainable development path and eventually fail to maintain the well-being over time. Inclusive wealth (*IW*) offers a new approach to assess the progress toward well-being of a nation by comprehensively measuring the productive base of the economy that involves three types of capital assets of nations (produced, human and natural capital), and aggregates them into a single measure of wealth. The notion of sustainability in the *IW* framework follows the weak perspective. Therefore, a sustainable development path is characterized by a non-declining value of well-being over time while allowing a limited substitutability between each type of capital asset.

However, efforts for pursuing well-being does not necessarily follow a sustainable development path. In most cases, economic development is followed by rapid depletion of natural resources and increasing level of anthropogenic pollution, such as carbon dioxide (CO₂) emissions, which is generally attributed to the increasing level of energy consumption. The strong interrelationship between economic development, energy consumption and CO₂ emissions has led to an ongoing discussion about the sustainability of energy consumption within the policymakers. This paper aims to contribute to the literature by investigating whether the current pattern of energy consumption is associated with the improvement or deterioration of well-being by using the *IW* index as a proxy.

The discussion about the sustainability of energy consumption in this paper is divided into two main parts. The first part contains three chapters and will discuss about global energy and sustainability issues. The analysis of sustainability cannot be done without having a comprehensive measure of well-being. Therefore, the analysis of sustainability in **Chapter 2** is started by proposing a novel method for estimating the abundance of global marine fisheries stock. The topic of this chapter is very intriguing and provide a valuable contribution for the calculation of the natural capital component of the *IW*. Additionally, this chapter aims to empirically analyzes the relationship between the state of global marine fisheries and economic factors. This chapter applies the pooled mean group estimator method to examine 70 fishing countries for the period of 1961-2010 and uses both the catch data and the estimated size of stock as proxies for marine ecosystems. The results from this chapter confirm that economic growth initially leads to the deterioration of marine ecosystems. However, for a per capita income level of approximately 3,827 USD for the catch model and of 6,066 USD for the biomass model, this chapter found beneficial impacts of economic growth on the sustainability of marine fisheries.

Chapter 3 proposes an alternative to the literature on the conventional energy – growth nexus that widely uses GDP as a proxy of the growth. The main objectives of Chapter 2 are to investigate the impact of energy

consumption on wealth in the *IW* framework and forecast the growth of *IW* over the next three decades. For this purpose, this chapter uses both parametric and non-parametric analyses on 104 countries for 1993-2014. The main findings of Chapter 2 shows that there is a negative and significant impact of energy consumption on *IW* growth, suggesting an unsustainable pattern of world energy consumption. Using a machine learning technique, this chapter forecasted that increasing the efficiency of energy consumption leads to a higher growth in average per capita *IW*.

A comprehensive analysis of energy and environmental conservation policies issues is provided in **Chapter 4**. This chapter will assess the impact of CO₂ emission mitigation scenarios on sustainable well-being in the framework of *IW* and provide a projection of CO₂ emission level and wealth for the next 20 years. In the light of CO₂ emission mitigation scenarios, better outcome measure is not the economic development itself as previous studies are based, but it is better gauged by considering harmful effects of CO₂ emissions as loss of future well-being. Chapter 3 uses three different energy pathways to forecast the level of CO₂ emissions in the next two decades and foresee their impacts on sustainable well-being in the *IW* framework. This chapter identifies different patterns of *IW* growth from each scenario which varies across time frame, income groups and types of capital. While efficiency scenario leads to the lowest growth in CO₂ emissions, its beneficial impacts on wealth gain are perceptible only on high income group and diminishing in the long run.

Shifting from global analysis, the second part of this paper will focus on a country specific analysis by taking Indonesia as a case study. In **Chapter 5**, this paper aims to test the existence of the EKC hypothesis in Indonesia and analyze the impact of renewable energy consumption on shaping the EKC curve by using the autoregressive distributed lag (ARDL) approach to cointegration as the estimation method. The results from this chapter show that there is an inverted U-shaped EKC relationship between economic growth and CO₂ emissions in the long run. The estimated turning point was found to be 7,729 USD per capita, which lies outside of our sample period. This chapter also confirms the beneficial impacts of renewable energy on CO₂ emission reduction both in the short run and in the long run.

Furthermore, the discussion about sustainability of energy should also consider the social sustainability of the energy technology. Public acceptance is a very crucial aspect that will determine the successful implementation of new energy technologies and its social sustainability. Therefore, **Chapter 6** attempts to investigate the role of the multilevel managing authorities in shaping public attitudes to nuclear power plants (NPPs) in Indonesia. NPPs were chosen because it is a type of energy technology that always attracts a lot of public controversy. Problems with public acceptance have made NPP projects in Indonesia experience a number of considerable setbacks. Trust in the managing authorities is one of the key factors that is expected to enhance the acceptance of nuclear energy. However, in a country with a multilevel governance system, such as Indonesia, the concept of trust needs to be specified further. By employing both multinomial logit and path models, this chapter shows that nuclear energy authorities and local governments are the key players that positively influence the acceptance of NPPs. Meanwhile, the role of the central government in promoting the acceptance of NPPs is barely perceptible.

Finally, the discussion about the sustainability of energy consumption will be concluded in **Chapter 7**. This paper reveals important implications both for the formulation of energy- and environment-related policies and for encouraging a paradigm shift in assessing the progress of economic development.