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Does economic growth in Malaysia depend on disaggregate energy?

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ABSTRACT

This study aims to investigate long-run relationship between economic growth and disaggregated energy consumption in Malaysia. Toda-Yamamoto (T-Y), the modified Granger causality test, along with annual disaggregated energy and real GDP growth data from 1971 to 2014 was used in the investigation process. This paper presents several outcomes; firstly, this paper argues that the Malaysian economy is energy dependent and sensitive to energy supply shocks. Secondly, the usage of energy inputs in Malaysian economy is found to be consumed inefficiently meaning that usage of higher energy resources does not contribute the economic growth significantly, rather causes environmental pollution badly. Thirdly, the finding indicates that economic growth and environmental pollution through spreading carbon emissions are responsive to each other. In this circumstance, the Malaysian economy has to find a way to consume the energy inputs efficiently so that economic growth is improved, while negative externality in the environment is reduced. Therefore, the study presents significant policy implications in order to improve the energy efficiency and reduce environmental pollution.

1. Introduction

Continuous carbon dioxide emissions and the resulting global warming in emerging countries such as Malaysia motivated the researchers to investigate the nexus between energy consumption and economic growth in emerging countries, [33]. Because, emerging countries require high energy consumption in order to meet a high economic growth potentiality which is responsible for carbon dioxide emission that increases global warming and negative consequences on biosphere [1]. Although there have been a number of investigations on this subject since the pioneer contribution of Kraft and Kraft [18], findings from those studies do not agree on whether or not economic growth is the cause or the effect of energy consumption. The literature review reveals that most of the earlier studies focus on developed countries with limited emphasis on emerging countries. One of the most important reasons may be the high energy dependency of developed economies against the low energy dependency of developing economy until the next stage of development. The past studies that focused on earlier stage of the nexus between economic growth and energy consumption of emerging economies may not have meaningful results due to the lack of reliable data [28]. But, many emerging countries become energy dependent to support high economic growth in recent decades. The information of energy-growth nexus is must for the policy makers of developing economies to formulate energy policy for ensuring sustainable economic growth with scarce energy resources. Therefore, additional research on the nexus between energy consumption and economic growth is warranted with regard to policy implications. For example, if energy consumption does not Granger cause economic growth, a national development policy that encourages energy consumption could be injurious to the economy. Moreover, if energy consumption Granger causes growth in the economy and at the same time demand growth for the energy consumption is higher than supply growth of primary energy, energy policy should incorporate energy efficiency, energy supply, energy pricing and governance to support economic growth.

Malaysia has emerged as one of the fastest-growing economy in South-East Asia by transforming its concentration from agriculture to production sectors especially industrial and manufacturing sectors. It managed to maintain over 7% annual economic growth rate from 1967 until Asian financial crisis of 1997 [53]. Aftermath of the Asian financial crisis, economic growth of the country began to slow down until 2013 [29]. However, in order to achieve the goal of high income nation by 2020 (the 2020 Vision), Malaysia must plan well in order maintain a consistent economic growth and regain its historical high growth momentum. For this reason, economic policies should be formulated and implemented with much carefully. Accordingly, the

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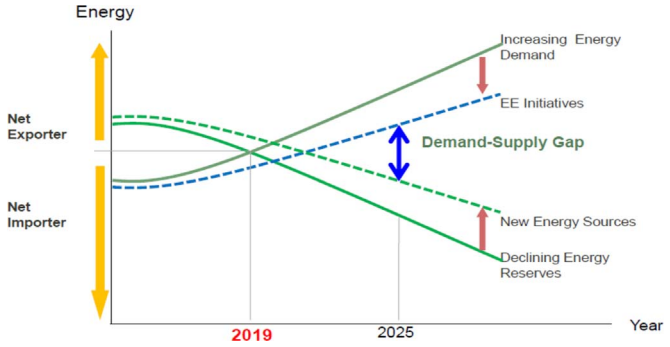

Fig. 1. Malaysian projected energy demand supply balance.
Source: NEB (2012)

policy maker has continuously changed its energy policies in order to ensure continuous supply of energy resources [32]. Besides, many programs have been undertaken in order to achieve the vision 2020. The Economic Transformation Program (ETP) has been initiated in 2010 which is considered as the most comprehensive plan in order to elevate the economy. Various high impact projects have been launched under this program.

With the adoption of the transformation process from agriculture to productive sector, the demand for energy consumption in Malaysia has been progressively increasing over 7.0% per year in last three decades (Ong, Mahlia et al., 2011). NEB, (2012) has projected that if the current pace of energy supply and demand continues Malaysia will become an importer of energy by 2019 (See Fig. 1). Based on the experience of two energy crises in 1973 and 1979, Malaysia successfully implemented four-fuel diversification strategy in 1981 and managed to reduce the dependency on only oil and attain a mix of alternative energy resources such as hydropower, natural gas, and coal [24,32]. This fuel diversification policy helped to alleviate the adverse effect of energy crisis due to high dependency of oil and further extended. Five-fuel diversification strategy adding renewable energy announced in 1999 (Ong, Mahlia et al., 2011) and executed in 2001 [60]. Where, Ong, Mahlia et al. (2011) showed that Malaysian economy still heavily depends on non-renewable energy which gradually exhausting and emitting huge volume of greenhouse gas and will not be able to fully dependent on renewable energy such as wind and mini hydropower, solar, geothermal and biomass. Therefore, from the viewpoint energy security and environmental conservation, it is required to minimize its energy consumption to an efficient level in order to accelerate the economy. The minimisation of production costs requires identifying energy inputs at disaggregated levels to justify which is interdependent with sectoral production and causes high production costs. Once the concerned energy inputs are identified, the production costs can be minimised through efficient allocation of disaggregated energy consumption.

Since the seminal paper of Kraft and Kraft [18] a number of empirical studies, presented in Table 1, have been undertaken focusing on the nexus between energy consumption and economic growth. Recent literature sources classify the nexus into four views or hypotheses. The first view is the growth hypothesis. Advocates of this hypothesis, such as Yoo and Jung [56] argue that there is a unidirectional causality running from energy consumption to output, that the economy is energy dependent as a consequence, and that the adoption of a conservative energy policy may result in low productivity and high unemployment. Researchers such as the following, Soytas and Sari [41] for Turkey, France, Japan and Germany, Yoo and Jung [56] for Korea, Yoo [55] for Indonesia and Thailand, Ang [3], Chandran, Sharma et al. (2010), and Rahman, Junsheng et al. (2015) for Malaysia, Wang, Wang et al. [51] for China, Yildirim and Aslan [54] for Japan, Dergiades, Martinopoulos et al. (2013) for Greece, Shahbaz, Khan et al. (2013) for China, Tang and Shahbaz [46] for Pakistan and Ghosh and Kanjilal [16] for India found a unidirectional causality running from energy consumption to economic growth.

The second hypothesis is known as the conservation hypothesis opposite to the growth hypothesis. Supporters of this hypothesis, Kraft & Kraft [18] takes the view of a unidirectional causality running from output to energy consumption. Here, energy policy does not affect economic growth but that changes in growth bring about changes in energy consumption. Based on the findings of Soytas and Sari [41] for Italy and Korea, Gross [17] for USA,Saboori and Sulaiman [36] for ASEAN, Salahuddin and Gow [38] for Gulf Council Countries, Bastola and Sapkota [5] for Nepal and Rahman, Banna et al. (2015) for Malaysia.

Follower of the third hypothesis which is commonly known as feedback hypothesis, Masih and Masih [23], takes the view that there is bidirectional causality between economic growth and energy consumption which means that energy consumption and output cause each other. Soytas and Sari [41] presents a bidirectional causality for Argentina, Ghali and El-Sakka [15] also finds similar evidence for Canada. A number of studies also find similar evidence for different countries such as Yoo [55] for Malaysia and Singapore, Soytas and Sari [42] for Turkey, Rafiq [31] for Thailand, Tang [45] for Malaysia, Chang [11] for China, Belke, Dobnik et al. (2011) for OECD countries, Wesseh and Zoumara [52] for Liberia, Dagher and Yacoubian [12] for Lebanon, Tang and Tan [47] for Malaysia, Bashiri Behmiri and Pires Manso [4] for Sub-Saharan Africa, Omri [25] for MENA, Zhang and Yang [59] for China, Bildirici and Bakirtas [8] for Brazil, China, India, Russian, South Africa and Turkey, Esseghir and Haouaoui Khouni [14] for Mediterranean countries, Salahuddin and Gow [38] for GCC, Ladu and Meleddu [19] for Italy, Park and Yoo [27] for Malaysia, Al-Mulali and Ozturk [2] for MENA, Tang and Tan [48] for Vietnam.

The fourth hypothesis, the neutral hypothesis, argues that there is no causality between energy consumption and output. The studies that found the existence of a neutrality hypothesis include Masih and Masih [22] for Thailand, Rafiq [31] for Malaysia, Indonesia and Philippines, Ozturk and Acaravci [26] for Turkey, Shaari, Hussain et al. (2012) for Malaysia and Behmiri and Pires Manso [6] for Latin America. The first three hypotheses suggest that bringing the nexus of energy consumption and output into consideration is necessary in carefully forming energy policy.

The investigations on the nexus between energy consumption and economic growth for Malaysia are found scarce as well as inconsistent. For instant, Masih and Masih [22] finds energy consumption does not Granger cause to real income. However, initially Yoo [55] and later Tang [45] reports a bi-directional causality between electricity consumption and economic output. In an another study, Chandran, Sharma et al. (2010) reveals a unidirectional causality running from electricity consumption to economic growth indicating Malaysia as heavy energy dependent country. Shaari, Hussain et al. (2012) investigate energy-growth nexus at a disaggregated setting including energy consumption of gas, oil, electricity and coal and finds no Granger causality is running from coal and oil consumption to economic growth. But, the study finds a unidirectional causality running from gas consumption to economic growth and economic growth to electricity consumption. Most recently, Tang and Shahbaz [46] finds a bidirectional causality between economic growth and electricity consumption and Park and Yoo [27] also finds a bidirectional causality between oil consumption and economic growth. In addition, Banna, Rahman, et al. [34] finds a unidirectional causality running for industrial productivity to total energy consumption and coal, a bidirectional causality between industrial productivity and fossil fuel, mineral, natural gas and electricity and no Granger causality between industrial productivity and industrial waste. In another study Rahman, Junsheng et al. (2015) investigates the nexus between sectoral productivity decomposed with industrial productivity, manufacturing productivity and GDP growth with aggregated and disaggregated energy consumption consisting electricity, fossil, mineral, coal