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Natural gas consumption and economic growth: The role of foreign direct investment, capital formation and trade openness in Malaysia

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ABSTRACT

The objective of this paper is to reinvestigate the relationship between natural gas consumption and economic growth by including foreign direct investment, capital and trade openness in Malaysia for the period of 1971–2012. The structural break unit root test is employed to investigate the stationary properties of the series. We have applied combined cointegration test to examine the relationship between the variables in the long run. For robustness sake, the ARDL bounds testing method is also employed to test for a possible long run relationship in the presence of structural breaks. We note the validity of cointegration between the variables. Natural gas consumption, foreign direct investment, capital formation and trade openness have positive influence on economic growth in Malaysia. The results support the presence of feedback hypothesis between natural gas consumption and economic growth, foreign direct investment and economic growth, and natural gas consumption and foreign direct investment. The policy implications of these results are provided.

Contents

1. Introduction

Energy i.e. renewable and non-renewable sources plays a role of driver to stimulate production process in an economy. Renewable energy consists of sunlight, wind, tides, plants and geothermal heat. Non-renewable energy is comprised of coal, crude oil, natural gas and uranium which is mainly made up of carbon. Natural gas plays a role of natural bridge between today's fossil fuels and tomorrow's renewable fuels. Natural gas consumption emits 50% less environment pollution compared to other fossil fuels. Natural gas has become the primary source of electricity generation due to its environment friendly nature. In future, natural gas will become an essential fuel in getting help to control the global warming. Natural gas meets nearly a quarter of the world's energy demand, but recent innovations in exploration

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and production have made it possible to greatly expand gas supplies. Globally, demand for natural gas consumption rose to 113 trillion cubic feet (Tcf) in 2010 from 53 Tcf in 1980 [1]. In North America, gas demand was 29% in 1980 and declined to 25% in 2010. Natural gas consumption was increased more than 10-fold from 1.3 Tcf in 1980 to 13.2 Tcf in 2010 in the Middle East due to rapid economic growth. In Asian region, natural gas demand has increased more than eight-fold from 2.2 Tcf to 19.2 Tcf for the last three decades. Asian natural gas demand approached the level of Europe and the Former Soviet Union in 2010. Cleaner than coal and oil (because it generates 20% less emissions than oil, and almost 50% less than coal), and more efficient and reliable than renewable energy, natural gas is an essential long-term answer to the world's energy and climate challenges [1]. Gas-fired power plants need less construction time than either nuclear facilities or coal-fired plants. This shorter construction time eases the process of investment decisions in many firms [1]. Given the rising importance of natural gas, many characteristics of this valuable resource have not been properly investigated in the economics literature [2]. The causal relationship between consumption of natural gas and economy is one of the areas that have received little attention. Very limited attempts have been made in the literature in this aspect and without a clear consensus among the researchers over the relationship between natural gas consumption and economic growth. Instead, significant part of the causality tests has focused on either aggregate energy consumption or electricity consumption with very vital policy implications [3]. For instance, the unidirectional causality flowing from economic growth to energy consumption suggests that an economy is less energy-reliant and conserving energy use is a vital policy option, as such move will not harm economic development. The causality running from energy consumption (with or without feedback) to economic growth implies that energy consumption has a key role in economic growth. Therefore, any attempt to limit energy consumption may impede economic growth and encouragement of energy use will promote economic growth. The nonexistence of causality between natural gas consumption and gross domestic products (GDP) is an indication that any initiative in energy sector will have no impact on output, in accordance with the neoclassical model. In many respects, natural gas not only differs from electricity but also other forms of energy. It is not as controversial as nuclear power; more environmental-friendly, when compared with either coal or oil; and can be stored, unlike electricity [4]. Therefore, ignoring the different characteristics of energy components may not only hide the differential impact related with different forms of energy consumption, but also leads to wrong policy implications for each component of energy, especially for natural gas, which is characteristically different from other components of energy [5].

With the exception of Saboori and Sulaiman [6], we are not aware of any study that has undertaken the task of exploring the relationship between natural gas and economic growth in Malaysia. The focus has either been on energy consumption or electricity consumption [7–9]. The purpose of this study is to reinvestigate the causal relationship between natural gas consumption and economic growth for the period spanning 1971–2012. Malaysia is a good case study because as one of the success stories in Asia, the oil and gas sector is thought to play increasing roles in the transformation of the country. Within the 10 years that preceded the Asian financial crisis of 1997–1998, the Malaysian economy grew at an average of 7.3% per year. Subsequent to the financial crisis, the country has been almost consistent in generating positive growth rates, averaging 5.5% per year [10]. The oil and gas sector has been the sole biggest provider of revenues to the Malaysian government in the form of dividends and taxes [11]. Investments in the infrastructural facilities of the oil and gas industry are anticipated to benefit the gross domestic product (GDP) in the country [12]. As a result, there were efforts on the part of the government to promote natural gas development in the country. New investment and tax incentives launched in 2010 were aimed at promoting natural gas exploration and development [11]. Therefore, it is timely and important to examine the causal relationship between natural gas and the economy of Malaysia.

Our paper extends the existing literature on natural gas consumption in Malaysia in three different ways. We conduct our research within a multivariate framework, by including three additional variables to the nexus. The inclusion of a single independent series (in bivariate case) is premised on the supposition that such series-natural gas is the only major factor of the total level of output. In the trivariate case (such as the case of Saboori and Sulaiman [6]), an additional regressor is introduced into the equation. However, in the practical economic sense, several variables determine the level of domestic output. The causality and cointegration tests would produce spurious and biased outputs results in the event that relevant variable(s) are ignored [13,14]. In addition, non-inclusion of relevant variables may cause wrong conclusion of no causality [15]. Secondly, beyond the use of capital formation and international trade [16,17], we introduce foreign direct investment into the natural gas and economic growth equation. Foreign direct investment not only accelerates current growth rate by promoting employment and production, but also contributes to the potential growth in the future through the accompanying superior technological know-how practices into the country. In several countries, foreign direct investment takes central stage in the process of enhancing natural gas sub-sector. It supplements the insufficient resources to fund both capital formation and ownership change in the home country. For Malaysian case, the foreign direct investment plays a vital function in the economy and not surprisingly there are several incentives to attract foreign direct investment into several sectors including the oil and gas industry. The majority of the natural gas production is derived from production-sharing schemes managed by foreign companies in association with the state-owned petroleum company-Petronas [11]. The country offers foreign investors a wide range of business opportunities and attractive incentives designed to help them get the most out of Malaysia's dynamic economy. The authorities introduced the Global Incentives For Trading (GIFT) Programme (which include 0% tax rate for Liquidified Natural Gas or LNG trading companies for the first 3 years of operation, 3% flat corporate tax rate and 50% exemption on personal income tax for foreign professionals) to boost oil and gas industry [18]. In 2012, Petronas signed 13 production sharing contracts (PSC), which is the highest ever-recorded for any calendar year. A foreign company-Shell is the biggest producer of gas in the country [11]. In 2013, the total foreign investments was RM66.3 billion or 44.6% of the total investment with almost RM6.1 billion going to the energy sector [19].[2] Malaysia achieved its highest-ever foreign direct investment in 2013 at RM38.8 billion, surging 3.9% past its previous record of RM37.3 billion in 2011 with oil and gas (and allied sector) accounting for 28.7% [12]. Malaysia has to date attracted thousands of foreign companies from several countries to establish their operations in different kinds of businesses including oil and gas business. There are over 3500 oil and gas businesses in Malaysia comprising international oil companies, services and manufacturing companies. Thirdly, we use assortments of econometric procedures including the Bayer and Hanck [20] cointegration approach, which is a relatively recent time series method and able to uncover relationships that might otherwise be missed by

[2] RM is Malaysian ringgit and the average exchange rate is RM3 to a dollar.