

# ***CAN ASEAN COUNTRIES PROMOTE THEIR ECONOMIC GROWTH BY ENERGY INVESTMENT? - LESSONS LEARNT FROM CHINA***

Dr. Xiyang Liu, Research Fellow, Energy studies Institute, National University of Singapore, email: [esilx@nus.edu.sg](mailto:esilx@nus.edu.sg)

## **Overview**

A large amount of investment in the energy sector has substantially improved China's energy production capacity, which in turn has strongly supported its fast-growing economy. For developing countries in ASEAN, China's experience could be relevant as they face the energy investment challenges ahead. Expecting fast growing energy demand driven by industrialization, urbanization and rapid economic growth, ASEAN's inadequate investment in the energy sector has become a major barrier for their further development. In order to tackle the issue of energy shortage, ASEAN countries will need to expand energy investment in the coming years, not only within their domestic markets, but also in regional energy market for further connection and integration.

This study analyzes the impacts of energy investment on economic growth based on China's experience. The relationship between energy input and economic growth has been widely explored by using energy consumption as an indicator [1], however it is energy investment with which policy makers from developing countries are concerned the most. This study carries out a panel data analysis on both national and regional impacts of China's energy sector investment on its economic growth. It allows us to examine and compare the variable impacts across different regions. Similarly, as with different regions in China, ASEAN countries are located in a closely-connected area, with diversified resource endowment and different stage of economic development, and they play various roles in the region as energy producer, consumer and investor. Although each of the ASEAN member states makes its energy investment decisions independently, currently they are also exploring more opportunities for closer cooperation to support fair and sustainable economic development across the region. Learning from China's experience can provide some insightful answers to questions that need to be addressed by ASEAN policy makers, not only within each country's domestic energy sector, but also the interaction in regional energy market.

## **Methods**

In this study, we conduct a panel data analysis on 31 provinces and municipalities in China from 2000 to 2012. Chongqing, Xinjiang and Tibet are commonly not discussed due to data limitations in the previous research. However we include them in this analysis in order to study their important roles after China's Western Development Strategy that was implemented in 2000. Cobb-Douglas Production Function is adopted to estimate the output elasticity of capital and labor inputs. The general expression of the function is:  $Y = f(A, K, L, \dots)$ , where  $Y$  represents output,  $A$ ,  $K$ , and  $L$  represent technology, capital and labor input respectively. Further, in order to calculate the impact of energy investment on economic growth, we divide the total capital input  $K$  into capital stock in energy sector and non-energy sector. The selected function form is shown in Equation (1), where  $Y$  is output represented by real provincial domestic production at constant prices of 2000,  $i$  represents province,  $t$  represents time,  $Y_{i,t}$  is the total output of province  $i$  in year  $t$ .  $A_i$  is the measurement of generalized technology developmental level of province  $i$ ,  $K_{ei,t}$  and  $K_{nonei,t}$  represents the capital stock in energy sector and non-energy sector respectively of province  $i$  in year  $t$ ,  $L_{i,t}$  is the labor input of province  $i$  in year  $t$  indicated by the employment, while  $\alpha$ ,  $\beta$ , and  $\gamma$  are output elasticity of capital stock in energy sector, capital stock in non-energy sector and labor input, respectively.

$$Y_{i,t} = A_i K_{ei,t}^\alpha K_{nonei,t}^\beta L_{i,t}^\gamma \quad (1)$$

Then, Equation (1) is transformed into linear form by taking logarithm of its both side:

$$\ln Y_{i,t} = \ln A_i + \alpha \ln K_{ei,t} + \beta \ln K_{nonei,t} + \gamma \ln L_{i,t} \quad (2)$$

The data on China's economic growth, employment energy investment, and investment in other sectors all come from various national statistics yearbooks, including China Statistical Yearbook 2000-2013, China Energy Statistical Yearbook 1997-2013, Statistical Yearbook of the Chinese Investment in Fixed Assets 1999-2013 and others, and provincial capital stock is derived from [2].

Further, China's experience is adapted to analyzing the impacts of energy investment on economic growth across ASEAN countries. The results of energy investment and the interactive relations among energy development, energy

integration and economic growth are studied based on a scenario analysis. The assumed scenarios in the study are: 1) business as usual (BAU) with no further energy integration in ASEAN, 2) ASEAN Power Grid (APG) connection, and 3) Greater Mekong Sub-region (GMS) grid (see detailed assumptions in [3]). The data on ASEAN's energy sector are from EIA, ERIA and AEMI Group, data on economic and social development come from the World Bank.

## Results

The key results from this analysis are as follows: 1) The driving effect of energy investment to economic growth in China has been confirmed at both national and regional level (see Table 1), and the output elasticity in the relatively more developed eastern region is higher than in the western and central regions, but only with limited differences; 2) The regional energy system in ASEAN could be formed in various ways, and member states could benefit from the closer energy connection within the region; and 3) China's Western Development Strategy aimed to balance the regional disparity by largely increasing investment in the western region, especially in the energy sector. ASEAN countries could learn from China's experience and optimize their energy policies by making decisions in a regional context. Building up a regional grouping could support the formation of regional energy strategy, as well as develop the energy infrastructure and utilize them more efficiently.

**Table 1** Output coefficients at the national and the regional levels in China, 2000 - 2012

	Nation <sup>fe</sup>	East <sup>fe</sup>	West <sup>re</sup>	Central <sup>re</sup>
LnL	0.580** (11.76)	0.448** (10.96)	0.413** (8.19)	0.316** (4.25)
LnK <sub>ei</sub>	0.153** (13.59)	0.197** (14.6)	0.137** (7.61)	0.161** (6.2)
LnK <sub>nonei</sub>	0.463** (26.9)	0.473** (17.06)	0.496** (9.25)	0.462** (11.13)
LnA	10.249** (59.22)	10.262** (46.59)	10.185** (19.81)	10.955** (30.03)
	F-statistic: 2741.12 Prob(F-statistic): 0.000	F-statistic: 2788.76 Prob(F-statistic): 0.000	$\chi^2$ -statistic: 1391.43 Prob( $\chi^2$ -statistic): 0.000	$\chi^2$ -statistic: 1343.91 Prob( $\chi^2$ -statistic): 0.000

Note: \*\* means that it passes the significance test on the confidence level of 5%.

## Conclusions

China's experience in energy investment and economic growth could be very useful for the developing ASEAN economies. Expanding energy investment has substantially improved China's energy production capacity and supported its economic growth. When ASEAN countries are making energy investment policies, they need to think beyond their own borders. Within a closely-connected region, energy investment policies made by one country can influence both domestic and regional markets. Therefore, possible consequences caused by changes in both markets should be thoroughly analyzed and taken into consideration while energy policy is being made in the domestic market. China's experience shows that collective efforts at the regional level can lead to balanced energy and economic development. In the case of ASEAN, a regional grouping designed to facilitate communication and cooperation, could be formed to support energy infrastructure development and energy integration in a more efficient way. In addition, energy strategy made in a regional context could be supportive for fair and sustainable economic development across the ASEAN countries.

## References

- [1] Usama Al-mulali and Che Normee Binti Che Sab. (2012). The impact of energy consumption and CO<sub>2</sub> emission on the economic and financial development in 19 selected countries. *Renewable and Sustainable Energy Reviews*, 16: 4365–4369.
- [2] Zhang Jun, Wu Guiying, Zhang Jipeng. (2004). The Estimation of China's provincial capital stock: 1952-2000. *Economics Research Journal*, 10: 35-44. [In Chinese]
- [3] Ichiro Kutani and Yanfei Li. (2014). Investing in power grid interconnection in East Asia," Economic Research Institute for ASEAN and East Asia (ERIA) Research Project Report 2013-23. Available online: [http://www.eria.org/publications/research\\_project\\_reports/FY2013/No.23.html](http://www.eria.org/publications/research_project_reports/FY2013/No.23.html)