

Renewable Energy and Energy Security – The Case of Taiwan

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Submission of abstract

For the past several decades, Taiwan has relied heavily on imported energy to sustain a remarkable level of economic growth. Owing to this, constantly assessing its energy supply security and finding alternative ways of fueling the economy have become an extremely important task of the Taiwanese government. For energy security assessment, traditional energy security indicators either take only the supply side into account or consider only part of the demand-side effect, the important interactions among players of the whole economy have largely been neglected. Consequently, the assessment results using traditional indicators could reflect only part of the true energy security situation of the economy, and might thus mislead the formulation of combating policies to an incorrect direction. To remedy the shortfalls conventional energy security indicators might have in assessing the energy security status of an economy, Lin and Feng (2010) make use of a typical static computable general equilibrium (CGE) model for Taiwan to evaluate the energy security of the economy at several different time points. For each type of energy, they distinguish sources of import in the model and assigning necessary substitution elasticity values for the parameters associated with the specified functions. Using the model, their simulations have been focusing on shocks in energy prices and quantity of energy

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supply, and their results show that when a region or a specific oil-exporting country raises oil price, GDP will be affected negatively. In the case of oil supply disruption, reducing the oil supply from Saudi Arabia has the greatest effect on Taiwan's economy. Basically, their results show that the higher the import energy dependency is, the greater the impact Taiwan has to endure for a rising energy price or energy supply disruption.

This paper intends to assess the potential (or ex ante) energy security status of Taiwan under some specified renewable portfolio targets. It differs from Lin and Feng's work in several ways. First, in order to stretch to the distant future, instead of using a static model we constructed a dynamic model to fulfill our purposes. Second, to be able to simulate renewable energy policy and related incentive mechanisms, we modified the model to include major renewable sectors and specify necessary transmitting mechanism for renewable policy measures. Third and last, to capture the learning effect associated with the technological advancement of renewable energy technologies, we specified in the model the improvement in productivity resulting from the accumulation of research and development stock and output for these technologies. With the constructed model, we simulate changes of energy security situation for Taiwan when encountering energy price and supply shocks under some formulated renewable policies. The results of our analysis could shed some light on how renewables could contribute to the improvement of energy security status for Taiwan.

Keywords: Renewable energy, computable general equilibrium, energy security

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