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The Impact of Electricity Tariff towards Cost of Production among Sectors in Malaysia

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Abstract
Purpose: This study discusses on the impact of current electricity tariff, represented by optimized tariff calculation, towards 124 Malaysian sectors' cost of production as stated in the Input-Output (I-O) Table 2015 of Malaysia.
Design/methodology/approach: This study utilized secondary data. The data are gathered from various sources namely a report from a study conducted on tariff simulation framework (Phase 1) by Mohd Saad et. all (2017) published by UNITEN R&D, Malaysian Energy Information Hub (MEIH) website and Input-Output Table Malaysia 2015 (latest version to date) published by the Department of Statistics, Malaysia. The cost of production theory was applied to measure and set the productivity targets of regulated business entities based on identified key cost drivers.
Findings: Overall, the findings show current electricity tariff only lead to 0.55 percent increase in the cost of production. This increment is considered as very small considering the interdependency of each sector when it comes to their cost of production. This imply that the impacts of electricity tariff are not large and could be, in reality, even smaller, as sectors have the option to rearrange their activities in favor of other factors of production including labor and capital**.**
Practical implications: The outcome of this project will provide a practical outcome to the government, utility provider and business sector as well as investors to make a projection on the impact of any decision related to the tariff revision.
Originality/value: The study is relevant and provide a novelty to all stakeholders particularly policymakers and market players to predict the best position in making their planning and investment decisions.

Keywords: Electricity Tariff, Cost of Production, Sector, Malaysia

Introduction

The Malaysian electricity industry is highly regulated. The Energy Commission (EC) has been given the mandate to regulate and set electricity tariff for the nation. This triennial setting is generally based on the costs provided by TNB and the allowable return as part of the regulatory component. TNB is given a base tariff rate in addition to regulations on how to charge the various consumer groups (Mohd Saad et al, 2018a; 2018b; 2018c; 2019a;2019b;2020).

The Ministry of Energy, Green Technology and Water (KeTTHA), Putrajaya on 26 December 2017 released news on electricity tariff review for Peninsular, Sabah and Federal territory of Labuan, which will take an effect from 1st of January 2018. According to the media release, the Ministry's cabinet meeting on 13 December 2017 had decided to maintain current electricity tariff rates for Peninsular Malaysia, effective from 1st January 2018 to 31st December 2020. The current electricity tariff schedule has been implemented since 1st January 2014. The tariff was reviewed for every three years in Malaysia, which means that the last revised tariff was for the period January 2014 until December 2017. This decision to maintain existing tariff schedule clearly demonstrate the concern of the Malaysian government to reduce, at least partially, its' citizens' cost of living. With this latest announcement, the consumers in Peninsular Malaysia will not be experiencing any changes in electricity charges for the gazetted period, if they consume the same amount of electricity as previously (KeTTHA, 2017). Even though it has been decided that there will be no changes in the current electricity tariff and tariff structure, the fluctuation in electricity consumption, market demand and cost of key drivers in tariff regulatory mechanisms, an improved input-output model for energy analysis still need to be revised for future regulatory period.

In Malaysia, the electricity industry is governed and regulated by the government with Tenaga Nasional Berhad (TNB) being the key player. As key player, TNB is required to ensure efficient electricity supply to customers by setting their input and output not only under the first regulatory period (RP) and the second regulatory period (RP2) but also in their future RP model, probably in setting RP3 in year 2021. In ensuring a more efficient tariff setting that consider the impact on local and global economy, the input-output analysis method of national economy could be introduced to analyze electricity demand of various sectors. In this study, the input-output table of electricity demand (IOTED) based on the relevant electricity consumption from different sectors will be established.

This paper is organized as follows. Next section reviews past studies on the electricity tariff structure optimization and its impacts to the customers in each of the sectors followed by a discussion on the research methodology. Then, the paper reports and discusses the results. The last section is on conclusion and policy implications.

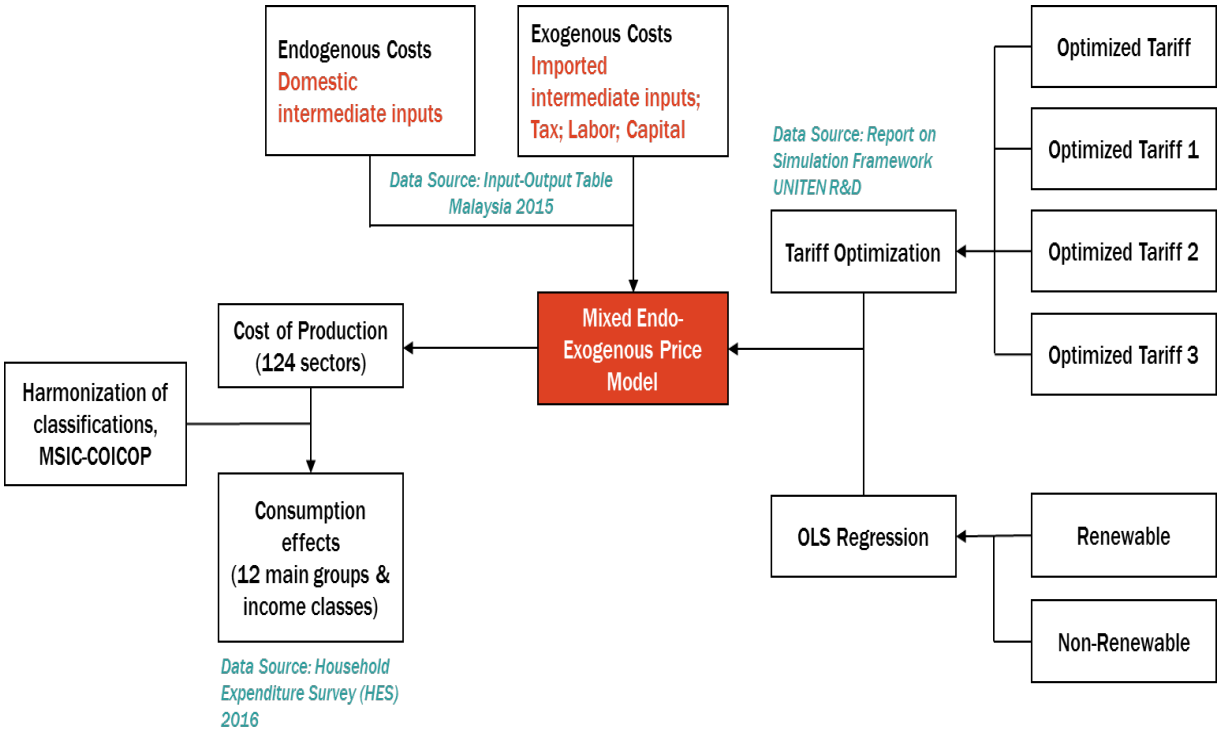
Literature Review

Electricity plays a very important role in the economy, both as an intermediate input and as final consumption. Thus, any changes in its price are expected to have significant impacts on the economy (Vandudzai & Lumengo 2018). The impacts of increasing electricity tariff are on prices of consumer goods and services and the likely distribution impacts by household income quintiles using a static Input-Output approach (Nguyen, 2012). Not only that, the importance of electricity can be seen as an essential input to production and to economic activity in general (Cameron & Rossouw, 2012). In their finding, they concluded that increased tariffs will therefore weigh heavily on various energy intensive industries whereby these industries could struggle to maintain profitability levels required by shareholders. Notably however, this present study did not focus on increasing the electricity tariff but instead on its changes and the impact on consumers and non-consumer participation by considering the government's sentiment

using I-O approach. This represent a big gap with Cameron and Rossouw (2012) study as the current study will be applying a three scenarios analysis for each of the electricity tariff.
In a study conducted on Turkey's electricity market that have undergone extensive reform since 2001 through market liberalization, unbundling, privatization, and establishment of organized power markets, retail market opening, and the establishment of an independent energy regulatory authority, major findings suggest reform has for a major part been beneficial to the economy (Erisa and Ali Akkemik, 2016). However, Malaysian's electricity market, specifically in the Peninsular is yet to undergone market liberalization, thus government's sentiments need to be considered and embedded in the model since the main energy player still belong to the government as regulatory authority. It is expected that market liberalization and market with no liberalization (market restriction) will establish different practices and regulations. Therefore, a robust or hybrid model should cap with certain element especially in determining the revenue requirement under electricity tariff.
According to Marriott (2007), the electricity system and products, economic and environmental results match well with external verification sources, but for analyses of the future, there is significant uncertainty. There is, however, a clear gap between this study and present study whereby this present study builds up the scenario based on the electricity tariff changes optimization. Thus, future model would come from the effects of the most optimize option which meet both the consumer and governments' sentiment and not derived from life-cycle assessment as applied in Marriott (2007) study.
By using petroleum price as an energy price, Saari and Abdul Rashid (2007) employs the input-output model as its basic framework where=the study takes into account the inter-industry relationships in calculating the sectoral costs of production. Their findings reported that without the government interventions, fishing, forestry and logging products, electricity and gas, cement, lime and plaster, and transport will mostly be affected by the increase in the petroleum price.
Boniface & Edokobi (2014) highlighted the negative impact of the increased tariff to consumers and statistically analyzes the electric tariff in general. They mentioned that the electricity tariff was increased in the process in order to make the sector more attractive to the intended investors prior to the privatization and set a platform of realizing every investment made by assuring constant power supply. As highlighted before, the findings show the increased tariff has negative impact on the end-users since there is no significant increase in amount of power supply as promised to compliment the situation. Rather the existing capacity dropped drastically by more than half of what it used to be and resulted to frequent nationwide load shedding.

Theoretical Framework and Hypothesis Development

This study utilized secondary data. The data are gathered from various sources namely report from study conducted on simulation framework (Phase 1) by Mohd Saad et. all (2017) published by UNITEN R&D, Malaysia Energy Information Hub (MEIH) website, and Input-Output Table Malaysia 2015 published by the Department of Statistics of Malaysia. Here, the cost of production theory was applied to measure and set the productivity targets of regulated business entities based on identified key cost drivers. All these data and output are then embedded in the study framework as illustrated in the Figure 1 as follow:



Notes:

1) The model operation relies on mixed endo-exogenous input-output price model.
2) I-O sectors are classified according to Malaysia Standard Industrial Classification (MSIC), while consumption of goods and services are according to Classification of Individual Consumption According to Purpose (COICOP).

Figure 1: Mix Endo-Exogenous Input-Output Price Modeling Framework

From the figure, this study only discusses on the impact of current electricity tariff that represented by optimized tariff towards cost of production based on 124 sectors as stated in the I-O table for year 2015. The rest of the factor variables will be discussed in the next paper. Therefore, the main objective of the study is to investigate the impact of the current electricity tariff towards cost of production among all sectors in Malaysia. Here with, this study develops the following null and alternate hypothesis to fit the proposed model:

Ho: There is no impact between current electricity price towards cost of production among all sectors in Malaysia.
Ha: There is an impact between current electricity price towards cost of production among all sectors in Malaysia.

Methodology

The I–O model describes the interdependence of all sectors in the production and consumption of products. It shows the input requirement for a sector and at the same time specifies how one particular sector distributes its production output to other sectors. In this regard, the I–O model will be able to analyze the relationships among sectors, evaluate the impacts from one sector to other sectors, and can thus be used to quantify the effects of electricity sector on other sectors (Nguyen, (2012).

The process flow of future electricity tariff regulatory model development started with data segregation from the I-O table 2015, then the economic wide data among sectors was aggregated and run for the impact for each of the 124 sector as presented in the finding section. Overall, the methodology of the proposed project comprises 4 main stages as shown in Figure 2 as follows:

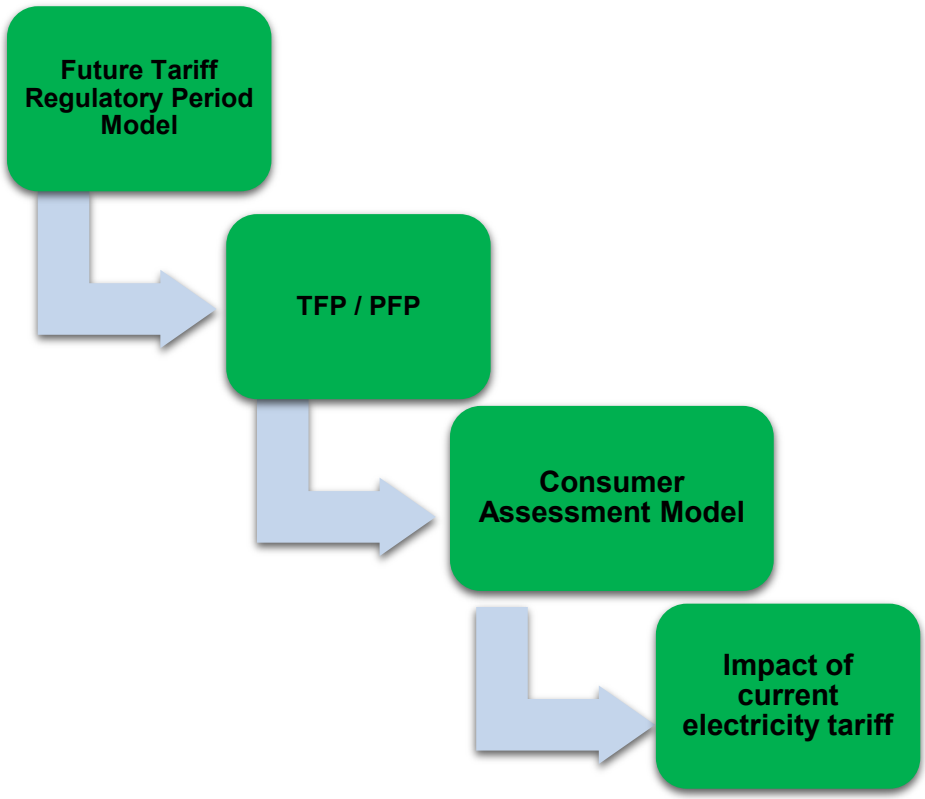


Figure 2: Research Methodology Phases for Analyzing the Impact of Electricity Tariff in Malaysia

Findings

Figure 3 illustrate about the impact of electricity tariff towards cost of production according to 124 sectors in Malaysia. Overall, current electricity tariff basically only lead to an overall increase in the cost of production for about 0.55 percent, which is considered very small since most of the sectors' cost of production are interdependence with each other. For instance, the ratio for the electricity and gas sectors indicates a value of 1.1345. The ratio is much smaller for other sector such as processing and preserving of fruits and vegetables sector with only 1.00029 ratio. This implies that the impacts are not large and could be, in reality, even smaller as sectors could cut the benefit or rearrange their activities in favor of other factors of production including labor and capital.

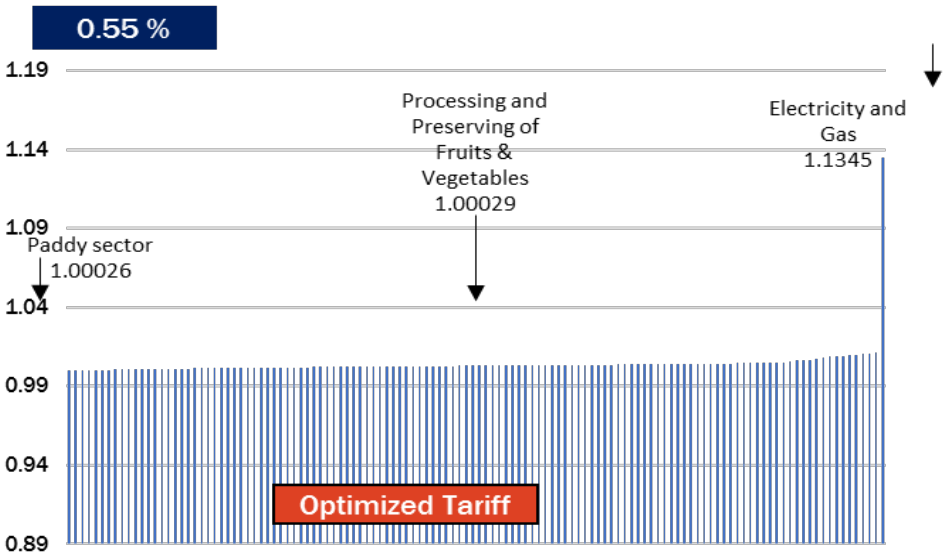


Figure 3: The Graph of the Electricity Tariff Impact on Cost of Production according to 124 sectors in Malaysia

With respect to Figure 4, the graph shows the impact of current electricity tariff towards cost of production according to 4 broad sectors. Out of 124 sectors, the classifications into 12 main groups based on the consumption effects have shown Manufacturing as the most affected sectors followed by services, construction and agriculture sector.

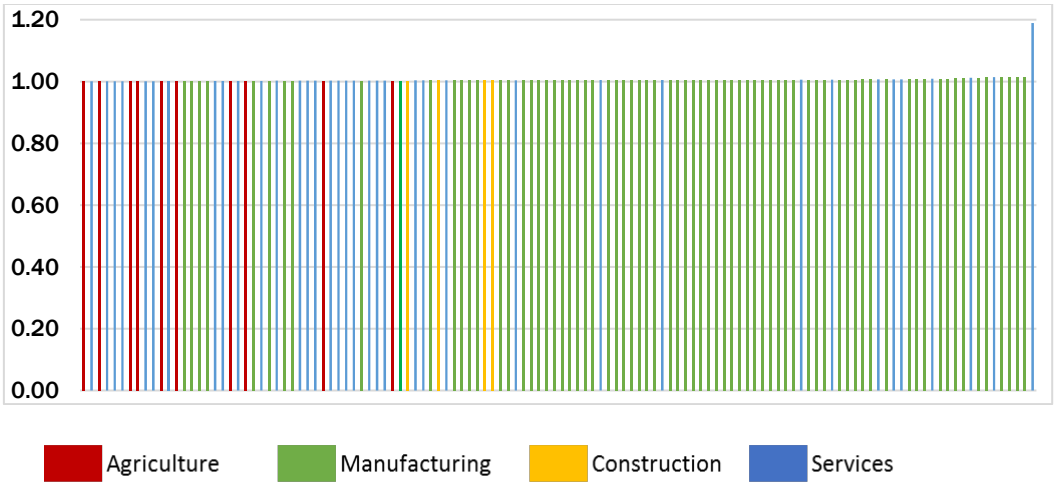


Figure 4: The Impacts of Current Electricity Tariff towards Mainly 4 Broad Sectors' Cost of Production

Discussion and Conclusion

The findings confirmed that the alternative hypothesis was supported since there is evidence of current electricity tariff in Malaysia affected the 124 Malaysian sector's cost of production. However, the impact is relatively small since most of the 124 sectors in Malaysia are interdependence. Even the most affected sectors namely manufacturing and services sectors were showing very small changes under the three scenarios analysis. Overall, it can be concluded that Malaysian current electricity tariff may have led to the increase in the cost of production but the impact is still at small percentage with overall value of 0.55 percent. It is

notable that the value could be less than that after taking into consideration the possibility of sectors substituting to other factors of production. The outcome of this study will provide a practical outcome to the government, utility provider and business sector as well as investors to make a projection related to any revision of regulatory planning.

Acknowledgements
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