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The Performance of Energy Sector in Malaysia: Input-Output Analysis: An Extended Study

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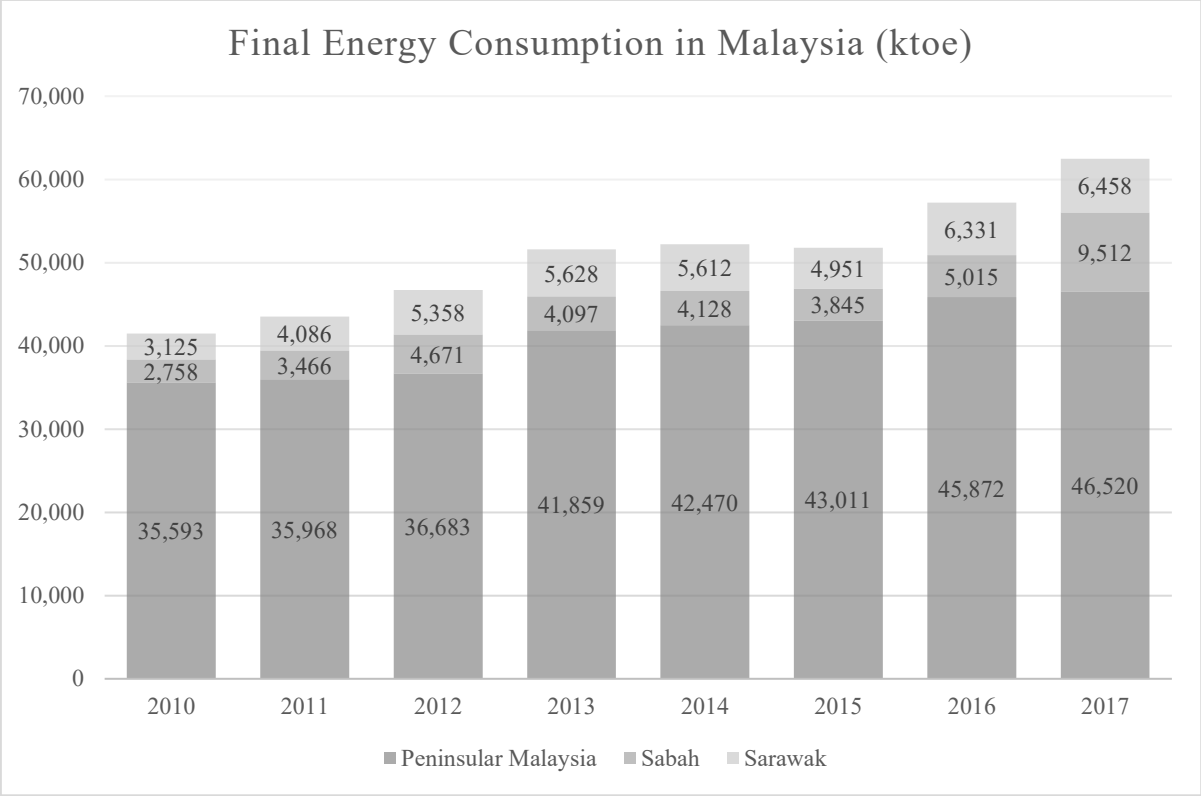
Abstract
Purpose: This study is an extension of previous study made by Abdullah (2013) which has been done to investigate the performance of Malaysian energy sectors from 1991 up to 2005, by adopting 2010 and 2015 input-output price table to explain Malaysian energy condition in recent years.
Design/methodology/approach: The study utilised Input-Output analysis to evaluate the performance of energy related sectors in Malaysian economy. Since the data of input-output table are only available on specific years not annually, the study presented the energy performance for year 1991, 2000 and 2005 while considering 1) 'crude oil and natural gas', 2) 'petroleum refinery' and 3) 'electricity and gas' sectors as three indicators of energy performance in the economy. At present we have additional data of 2010 and 2015 input-output tables published by the Department of Statistics Malaysia (DOSM). Using linkages analysis as its main tool, each sector will then be arranged according to its level of dependencies towards the three energy related sectors, forming a top 10 backward and forward linkages list.
Findings: Since the result from previous study by Abdullah (2013) and this study are compared together, it is found that 'crude oil & natural gas' sector was earlier categorized as 'generally dependent' during 1991 and 2000 and transformed into 'dependent on interindustry demand' since 2005 up until now. Impressively, 'petroleum refinery' remains its position as one of Malaysian key sectors ever since 1991 – except for 2010. As for 'electricity and gas', it maintained as a 'dependent on interindustry demand' since 1991 with its forward linkages remain high but its backward linkages low. However, only in 2005 that it changed its status as a 'generally dependent' sector and become among Malaysian key sectors together with 'petroleum refinery' sector.
Research limitations/implications: This study only focuses on Malaysian energy sectors since the input-output data published by DOSM is only unique to our economy and thus not able to capture level of interdependencies with foreign countries.
Practical implications: Recognition of which sectors perform better among others reflected by level of interdependencies will help policy maker to design any policy or invest in any projects in future.
Originality/value: This paper further evaluates the performance of energy related sectors for the two latest periods, in which both periods are not yet covered in the previous study.

Keywords: Energy, input-output, linkages, key sector, Malaysia

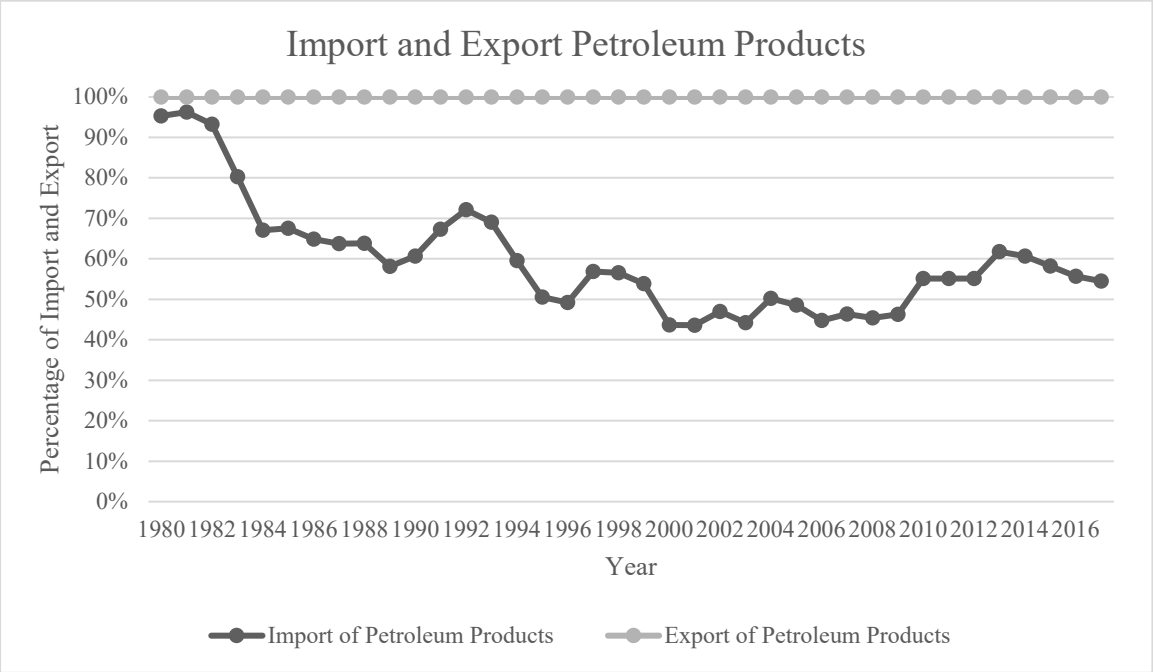
Introduction

Energy plays a significant role in sustaining and further boost the development process of an economy. In Malaysian case, total energy consumption keeps increasing from year to year since 2010 – with exceptional drop faced in 2015. While energy consumption for the remaining years keep growing, it is expected that the demand for energy in Malaysia will continue to expand further in many years coming. According to Suruhanjaya Tenaga (2019), the growth rate of energy consumption for Malaysia since year 2010 up to 2017 is at 50.7% in just an eight-year period.

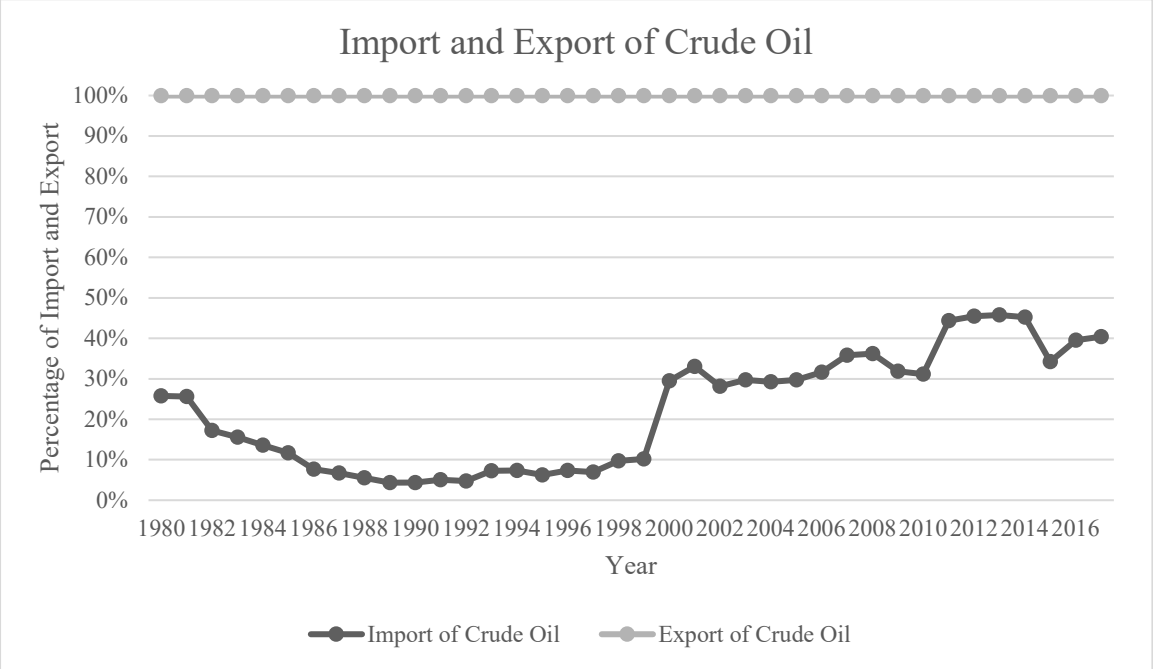


Source: Malaysia Energy Statistics Handbook 2019, Authors' illustration

Malaysia is fortunate to have bounty and diverse energy sources which then mixed to maintain the level of energy supply for local demand – on top of its import and export activities. It is interesting to mention that Malaysia maintain high percentage of coal and coke imported and crude oil exported since 1980. With that amount, Malaysia still manage to meet the growing energy demand for many years up until today.



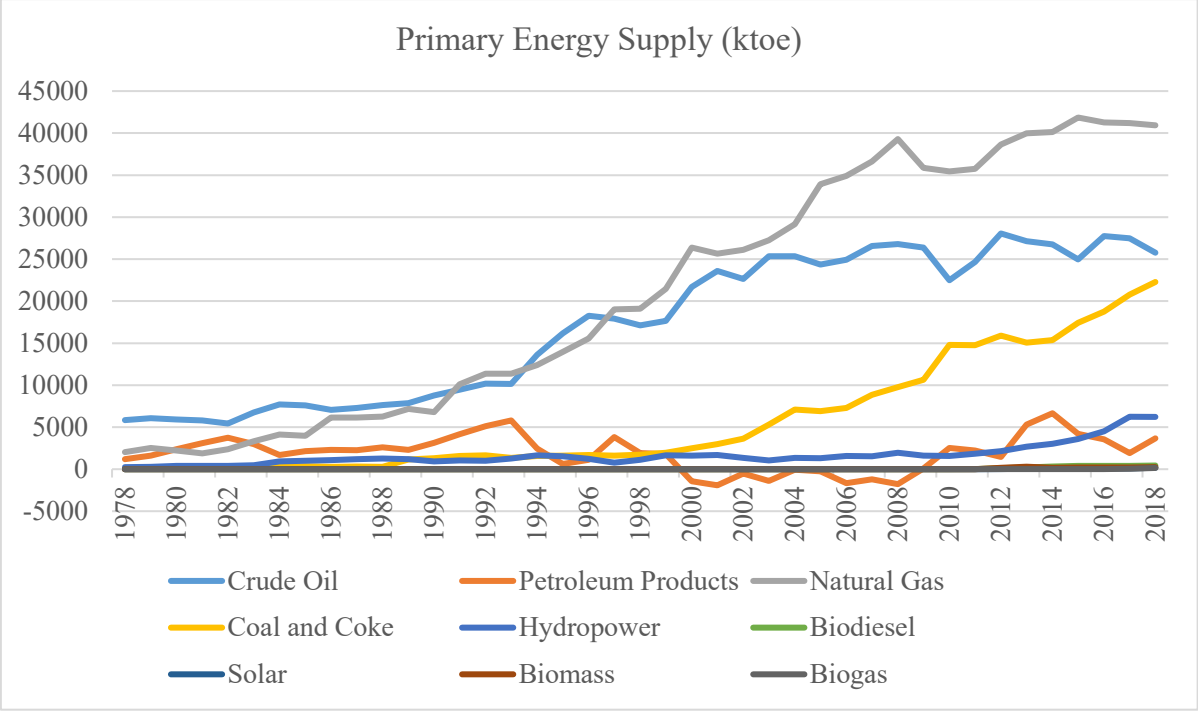
Source: Malaysia Energy Statistics Handbook 2019, Authors' illustration



Source: Malaysia Energy Statistics Handbook 2019, Authors' illustration

Without denying the importance of green energy for cleaner environment in response to the arising climate change concern, it is beyond doubt that fossil fuels are supreme and highly important to supplicate enough and fulfil the energy demand at least for the time being. Although the discussion of energy transition is controversial and emerging these days due to the call for environmental action, the fact that the large portion of energy we enjoyed today are mainly contributed by the fossil fuels says that they are still our main energy source. This could be proved by the high amount of fossil fuel in Malaysian energy mix sources complemented

by the fact that the percentage of renewable energy (or particularly, solar) is currently very little. Again, according to Suruhanjaya Tenaga (2019), the amount of energy generated according to fuel type shows that renewable energy are just about to emerge and thus are not yet capable to contribute even 10% from overall supply. With the facts mentioned above, this study considers that the three sectors representing energy performance highlighted by previous study which are 1) 'crude oil and natural gas', 2) 'petroleum refinery' and 3) 'electricity and gas' are sufficient and relevant to reflect our current energy performance.



Source: Malaysian Energy Information Hub

Literature Review

Input-Output Analysis

Input-Output or Leontief model could be considered as a magnum opus of Professor Wassily Leontief, an economist who later received the Nobel Prize in Economics in 1973 because of his great work he made. An input-output table which consist of many rows and columns that he introduced is not just merely a table. It tells us the interlinkages of sectors in the whole economy and simply answer the questions of "where sector *j* receives its inputs from" and "to whom does sector *j* supply its output". Input-output is considered as more straightforward if compared to many economic tools since it 1) uses fixed production structure and 2) there is no economies of scale (Bekhet & Yasmin, 2014).

The horizontal row represents the amount of output whilst the vertical column represents the amount of input. Thus, reading across its row will tell "how much and to whom the output of sector *j* goes", whereas reading down its column tells "how much and from whom sector *j* gains its input". However, despite known with its comprehensiveness and usefulness to predict the multiplier effect or impact of changes happened to any sector in the economy, input-output table (or to be specific and relevant – Malaysian input-output table) still has its own limitations we have to acknowledge prior to utilizing it. TABLE I below summarize five limitations of input-output table as discussed by Khazanah Research Institute (2018).

Table 1: Limitations of input-output model

No.	Limitations
1.	Frequencies of data being published. - Reliance on the latest data published made input-output analysis somehow is limited and thus relevant more towards specific timeframe only. - In Malaysia, the data of input-output table will be made publicly available only once for every five years. - So far, the Department of Statistics Malaysia (DOSM) has published eight Malaysian Input-Output tables (i.e. 1978, 1983, 1987, 1991, 2000, 2005, 2010 and 2015).
2.	Assumption of a perfectly elastic supply curve. - Inability to capture changes in price level/ inflation or irregular rising and falling of the currency. - Input-output response towards any exogenous demand shock is as if the price is always sticky and that, no valuation adjustment occurred. - This approach is more reflective of the short-run and less relevant for the long-run.
3.	Fixed production structure. - This approach is again more relevant to the short run since it does not consider increased scale in factor of production (i.e. labor, capital), specialization or technological advancements in which happened in the long run.
4.	Largely heterogeneous. - Since input-output table is arranged by sectors, it is noteworthy that each sector is made up of large number of individuals with various-sized businesses. - It is not that simple for policy makers to implement any policies since a sector does not necessarily reflect everyone's achievement under that sector. Some may be dominated by single large sectors only. - Policy makers should zoom in further and consider SMEs in each sector.
5.	Interdependencies between countries. - Input-output compromises of many subsectors and each country have their own business activities or niche. - Some sectors might be disregarded, and some might be added in other countries due to the law and legality. - Although input-output table is very comprehensive to show level of interdependencies within an economy, it is still not able to capture interdependency level with foreign countries.

In Malaysia, this input-output tables are not published annually but on specific years. So far, DOSM had published this table in 1978, 1983, 1987, 1991, 2000, 2005, 2010 and 2015. However, since the structure of the economy changes over time, the number of sectors is also changed in tandem. In 1978, it was only 58 subsectors whereas in 2005, it was increased to 120 and further expanded up to 124 subsectors in 2010 and 2015 as prevailed in the input-output report. Thus, in order to harmonize and make them comparable, one must aggregate the table into identical number of sectors at first before reevaluating the contribution of each sector (Khazanah Research Institute, 2018).

The study of energy using input-output approach in Malaysia has been conducted by several number of researchers. For instance, Saari & Rashid (2007) claimed that an increase in petroleum product prices had significantly affected several sectors in the economy. Aggregated into 43 sectors, the study analyzed the impact by identifying three costs of production; 1) domestic materials, 2) imported input, and 3) labor. Furthermore, another study on

interlinkages between agriculture and energy sectors has also been done using input-output data from 1991 to 2000 (Bekhet & Abdullah, 2010). In addition to that, Bekhet & Yasmin (2014) use 2005 input-output table with the objective to investigate the impact of global financial crisis on Malaysian sectors. The reason why they use 2005 data is because it is the nearest one to the year of global crisis which had also affected Malaysia. Different study also been conducted to study the performance of energy sector in Malaysia using input-output table from 1991 to 2005 (Abdullah, 2013).

Method

A. Linkages Analysis Using Input-Output Models

This study applies both backward and forward linkages analyses based on Leontief's input-output model to investigate the strength of interconnectedness between sectors. Theoretically, every production made by any sector will give impacts to the economy in two ways (Miller and Blair, 2009). First is changes in demand on sectors whose goods are bought as an input to its production, while second is changes in supplies from that sector to those sectors using its products as an input. An appropriate term to describe the interconnection of the former is 'backward linkage' whilst the latter is known as 'forward linkage'. An increase in the production of sector *j* will eventually lead to the increase in demand of inputs for production in *j*. Likewise, that particular scenario will also lead to the increase in supplies to sectors using good *j* as their input of production. The value of forward and backward linkages indicates level of interdependencies between sectors. In a simpler word, we could see which sectors will give impact or impacted the most or more to any sector (in this case – energy-related sectors).

Table 2: Classification of backward and forward linkage results

		Total Forward Linkage	
		Low (<1)	**High (>1)**
Total Backward Linkage	**Low (<1)**	Generally independent	Dependent on interindustry demand
	High (>1)	Dependent on interindustry supply	Generally dependent

Miller and Blair (2009) suggested that sectors are often categorized into four based on their level of interlinkages. For any sector which is not strongly connected to other sectors (both forward and backward linkages are less than 1), it must be categorized under 'generally independent'. If that sector has high backward linkage but low forward linkage, it is known as 'dependent on interindustry supply'. If it is vice versa, it falls under the category of 'dependent on interindustry demand'. Finally, if both linkages are strong (forward and backward linkages are more than 1), then it is called 'generally dependent' (also known as key sector). The categorization is as illustrated in TABLE II above.

B. Data Source

As to continue with the same effort done by Abdullah (2013), this study also use secondary data from Malaysia's input-output tables published by the Department of Statistics Malaysia (DOSM). To fill in the gaps, we use the two most recent table available i.e. 2010 and 2015 in which both are not yet covered by previous study. In addition to that, this study will also aggregate the commodity-by-commodity table into 38 sectors (refer to appendix) for consistency purpose. Three energy-related sectors which are 1) 'crude oil & natural

gas', 2) 'petroleum refinery', and 3) 'electricity & gas' will be given special focus in this paper to investigate recent energy performance of Malaysia.

Findings

It is worth to mention again that this study is trying to fill in the gap of previous study made in analyzing the performance of energy sector in Malaysia by conducting backward and forward linkage analyses specifically for year 1991, 2000 and 2005 (Abdullah, 2013). Thus, to ensure consistency and comparability, this paper remain most of the standards so that the trend shown by both studies are relevant and comparable. The input-output data published by DOSM is aggregated into the same number of 38-sectors and only three energy-related sectors' performance are focused namely, 1) crude oil and natural gas, 2) petroleum refinery and 3) electricity and gas.

Prior to discussing each of the three sectors into further, this study will begin by briefly discussing the evolution of economic 'connectedness' by comparing results from previous study (i.e. year 1991, 2000 and 2005) and current study (i.e. year 2010 and 2015). This in accordance to Miller and Blair (2009), whom suggested that having more than one period data will allow us to see the evolution of interconnectedness between sectors in an economy. Thus, this study will grab the opportunity to highlight trends of evolution of those energy-related sectors from 1991 up to 2015.

Table 3: Classification of backward and forward linkages of energy-related sectors 2010-2015

		Total Forward Linkage			
		Low (<1)		**High (>1)**	
		2010	**2015**	**2010**	**2015**
Total Backward Linkage	**Low (<1)**	x	x	- Crude oil & natural gas - Petroleum refinery - Electricity & gas	- Crude oil & natural gas - Electricity & gas
	High (>1)	x	x	x	- Petroleum refinery

TABLE II above is the result of interlinkages for 2010 and 2015. To make it concise, it is found that 'crude oil & natural gas' sector which previously fall under 'generally dependent' in 1991 and 2000 had changed its status since 2005 and become 'dependent on interindustry demand'. Furthermore, 'petroleum refinery' remains as one of Malaysian key sectors since 1991 – except for 2010 which was assumed to be among the global financial crisis impacts which hit Malaysian export activities during fourth quarter of 2008, until its total export experienced a significance slowdown by 16.7%. Although many of its input suppliers were affected during that time, the drop was still not relatively big (Bekhet & Yasmin, 2014). As for 'electricity and gas', it maintained being 'dependent on interindustry demand' with its forward linkages remain high and backward linkages low. However, only in 2005 that it changed its status as a 'generally dependent' sector and become among Malaysian key sectors together with 'petroleum refinery' sector.

A. Crude Oil and Natural Gas

TABLE III below is the top 10 ranking for 'crude oil and natural gas' linkages. In relation to backward linkages, 7 sectors are found to be the main inputs for 'crude oil and natural gas' sector in 2010 namely 1) 'crude oil & natural gas', 2) 'petroleum refinery', 3) 'fishing', 4) 'financial services', 5) 'industrial chemical', 6) 'cement' and 7) 'forestry & logging'. In 2015, it turns out that there are only 6 sectors in which this sector highly depends on. Those sectors are 1) 'crude oil & natural gas', 2) 'petroleum refinery', 3) 'industrial chemical', 4) 'communication', 5) 'electricity & gas' and 6) 'transport'. Interestingly, when it comes to forward linkages, only one sector is found to be highly dependent on it for both years. That sector is 'crude oil and gas' itself.

Table 4: Crude oil and natural gas linkages

Top 10	**Backward Linkage**		**Forward Linkage**	
	2010	**2015**	**2010**	**2015**
1	**Crude oil & natural gas**	**Crude oil & natural gas**	**Crude oil & natural gas**	**Crude oil & natural gas**
2	**Petroleum refinery**	**Petroleum refinery**	Petroleum refinery	Wholesale & retail trade
3	**Fishing**	**Industrial chemical**	Financial services	Transport
4	**Financial services**	**Communication**	Wholesale & retail trade	Business services
5	**Industrial chemical**	**Electricity & gas**	Business services	Petroleum refinery
6	**Cement**	**Transport**	Transport	Machinery industries
7	**Forestry & logging**	Other mining	Industrial chemical	Financial services
8	Real estate & dwellings	Glass & other non-metallic products	Construction	Transport & transport equipment
9	Other chemical	Other chemical	Basic metals	Other metals
10	Glass & other non-metallic products	Cement	Other metals	Tourism

B. ***Petroleum Refinery***

TABLE IV shows top 10 ranking for another energy related sector namely 'petroleum refinery'. For 2010 and 2015, 'petroleum refinery' sector is observed to depend a lot on many sectors to produce its output. 1) 'Petroleum refinery', 2) 'transport', 3) 'cement', 4) 'communication', 5) 'other chemical', 6) 'glass & other non-metallic products', 7) 'electricity and gas' and 8) 'industrial chemical' sectors remain in top 10 ranking while discussing on its backward linkages. 1) 'Fishing' and 2) 'forestry & logging' are only important to petroleum refinery sector during 2010 whereas in 2015, 1) 'other mining' and 2) 'construction' come into the picture. Although it depends on many sectors to produce its output, most of 'petroleum refinery products' are only enjoyed by few sectors in huge manner – indicated by its high forward linkage value. 1) 'Petroleum refinery' and 2) 'crude oil and natural gas' are the two sectors which highly depend on this sector for both years. In 2015, 'wholesale & retail trade' also recorded a high forward linkage value.

Table 5: Petroleum refinery linkages

Top 10	**Backward Linkage**		**Forward Linkage**	
	2010	**2015**	**2010**	**2015**
1	**Petroleum refinery**	**Petroleum refinery**	**Petroleum refinery**	**Petroleum refinery**
2	**Fishing**	**Industrial chemical**	**Crude oil & natural gas**	**Crude oil & natural gas**
3	**Transport**	**Communication**	Wholesale & retail trade	**Wholesale & retail trade**
4	**Cement**	**Electricity & gas**	Financial services	Industrial chemical
5	**Forestry & logging**	**Transport**	Transport	Transport
6	**Communication**	**Other mining**	Business services	Business services
7	**Other chemical**	**Glass & other non-metallic products**	Industrial chemical	Financial services
8	**Glass & other non-metallic products**	**Other chemical**	Other chemical	Machinery industries
9	**Electricity & gas**	**Cement**	Construction	Transport & transport equipment
10	Industrial chemical	**Construction**	Food	Electricity & gas

C. ***Electricity & Gas***

TABLE IV remarks several sectors which are important to and highly depend to 'electricity & gas' sector. Indicated by high value of backward linkages, 1) 'electricity & gas', 2) 'cement' and 3) 'waterworks' are sectors which remain to contribute a lot to the production of 'electricity & gas' in 2010 and 2015. In terms of forward linkages, only three sectors are highly dependent to this sector in 2010. Those sectors are 1) 'electricity and gas', 2) 'business services' and 3) 'petroleum and refinery'. In 2015, five sectors are

recognized to have high forward linkages value, namely 1) 'electricity & gas', 2) 'petroleum refinery', 3) 'construction', 4) 'wholesale & retail trade' and 5) 'crude oil & natural gas'.

Table 6: Electricity & gas linkages

Top 10	Backward Linkage		Forward Linkage	
	2010	2015	2010	2015
1	**Electricity & gas**	**Electricity & gas**	**Electricity & gas**	**Electricity & gas**
2	**Cement**	**Cement**	**Business services**	**Petroleum refinery**
3	**Waterworks**	**Basic metals**	**Petroleum refinery**	**Construction**
4	**Tourism**	**Waterworks**	Crude oil & natural gas	**Wholesale & retail trade**
5	Glass & other non-metallic products	Food	Wholesale & retail trade	**Crude oil & natural gas**
6	Textiles, wearing apparels & leather	Textiles, wearing apparels & leather	Financial services	Business services
7	Plastics products	Healthcare	Other mining	Machinery industries
8	Basic metals	Education	Transport	Financial services
9	Financial services	Other metals	Basic metals	Transport
10	Wood-based industry	Glass & other non-metallic products	Machinery industries	Glass & other non-metallic products

Discussion and Conclusion

As the study of energy is never being insignificant and continuously demanding, complemented by the fact that the input-output table will continuously be published by DOSM, the need to extend the study of this kind must be an advantageous to innumerable number of bodies. Policy makers, industrial players, and investors will be able to evaluate and understand the condition of energy-related sectors in our economy prior to taking any action or implementing any policy. A key sector plays important role to the economy. In Malaysian energy industry, 'petroleum refinery' is considered as one, based on the result table shown earlier and thus have major role in Malaysian economy. Either its growth or downturn, both will give significant impact to many of its input suppliers together with its output consumers. Thus, policy makers should be fully aware that any policy which related to the key sectors must be done in extra carefulness since small action might hugely impact sectors which are strongly connected to it.

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Appendix: Sectors Aggregation Based on 2010 And 2015 Input-Output Tables

	Aggregation (38 sectors)	2010	2015
1	Other agriculture	1. Paddy 2. Food Crops 3. Vegetables 4. Fruits 7. Flower Plants 8. Other Agriculture	1. Paddy 2. Food Crops 3. Vegetables 4. Fruits 7. Flower Plants 8. Other Agriculture
2	Rubber plantation	5. Rubber	5. Rubber
3	Oil palm plantation	6. Oil Palm	6. Oil Palm
4	Livestock	9. Poultry Farming 10. Other Livestock	9. Poultry Farming 10. Other Livestock
5	Forestry & logging	11. Forestry and Logging	11. Forestry and Logging
6	Fishing	12. Fishing	12. Fishing and Aquaculture
7	Crude oil & natural gas	13. Crude Oil and Natural Gas	13. Crude Oil and Natural Gas
8	Other mining	14. Metal Ore Mining 15. Stone Clay and Sand Quarrying 16. Other Mining and Quarrying	14. Mining of Metal Ores 15. Quarrying of Stone, Sand and Clay 16. Other Mining and Quarrying
9	Food	17. Meat and Meat Production 18. Preservation of Seafood 19. Preservation of Fruits and Vegetables 20. Dairy Production 21. Oils and Fats 22. Grain Mills 23. Bakery Products 24. Confectionery 25. Other Food Processing 26. Animal Feeds	17. Processing and Preserving of Meat 18. Processing and Preserving of Seafood 19. Processing and Preserving of Fruits & Vegetables 20. Dairy Products 21. Vegetable & Animal Oils and Fats 22. Grain Mill Products, Starches and Starch Products 23. Bakery Products 24. Confectionery 25. Other Food Processing 26. Prepared Animal Feeds
10	Beverages & tobacco	27. Wine and Spirit 28. Soft Drink 29. Tobacco Products	27. Spirits, Wines and Liquors 28. Soft Drinks, Mineral Waters and Other Bottled Waters 29. Tobacco Products
11	Textiles, wearing apparels & leather	30. Yarn and Cloth 31. Finishing of Textiles 32. Other Textiles	30. Preparation, Spinning and Weaving of Textiles 31. Finishing of Textiles

	Aggregation (38 sectors)	2010	2015
		33. Wearing Apparel 34. Leather Industries 35. Footwear	32. Other Textiles 33. Wearing Apparel 34. Leather Products 35. Footwear
12	Wood-based industry	36. Sawmilling and Planning of Wood 37. Veneer Sheets, Plywood, Laminated & Particle Board 38. Builders' Carpentry and Joinery 39. Wooden and Cane Containers 40. Other Wood Products 41. Paper and Paper Products and Furniture	36. Sawmilling and Planning of Wood 37. Veneer Sheets and Wood-based Panels 38. Builders' Carpentry and Joinery 39. Wooden Containers and Other Wood Products 40. Paper and Paper Products 41. Furniture
13	Printing & publishing	42. Publishing 43. Printing	42. Reproduction of Recorded Media 43. Printing
14	Industrial chemical	45. Basic Chemicals 46. Fertilizers	45. Basic Chemicals 46. Fertilizers and Nitrogen Compounds
15	Other chemical	47. Paints and Varnishes 48. Pharmaceuticals, Chemicals & Botanical Product 49. Soap, Detergents, Perfumes, Cleaning & Toilet Preparations 50. Other Chemicals Product	47. Paints and Varnishes 48. Pharmaceuticals, Medicinal Chemical and Botanical Products 49. Soaps & Detergents, Cleaning & Polishing, Perfumes and Toilet Preparations 50. Other Chemicals Products
16	Petroleum refinery	44. Petroleum Refinery	44. Coke and Refined Petroleum Products
17	Rubber products	51. Tyres 52. Rubber Processing 53. Rubber Gloves 54. Rubber Products	51. Rubber Tyres and Tubes 52. Rubber Processing 53. Rubber Gloves 54. Other Rubber Products
18	Plastics products	55. Plastics Products	55. Plastic Products
19	Cement	58. Cement, Lime and Plaster	58. Cement, Lime and Plaster
20	Glass & other non-metallic products	56. Sheet Glass and Glass Products 57. Clay and Ceramic 59. Concrete & Other Non-Metallic Mineral	56. Glass and Glass Products 57. Refractory, Clay, Porcelain and Ceramic Products

	Aggregation (38 sectors)	2010	2015
		Products	59. Non-Metallic Mineral Products
21	Basic metals	60. Iron and Steel Products 61. Basic Precious and Non-Ferrous Metals 62. Casting of Metals 63. Structural Metal Products	60. Basic Iron and Steel 61. Basic Precious and Other Non-Ferrous Metals 62. Casting of Metals 63. Structural Metal Products, Tanks, Reservoirs and Steam Generators
22	Other metals	64. Other Fabricated Metal Products	64. Other Fabricated Metal Products
23	Machinery industries	65. Industrial Machinery 66. General Purpose Machinery 67. Special Purpose Machinery 68. Domestic Appliances 69. Office, Accounting and Computing Machinery 70. Electrical Machinery and Apparatus 71. Other Electrical Machinery 72. Insulated Wires and Cables 73. Electric Lamps and Lighting Equipment 74. Semi-Conductor Devices, Tubes and Circuit Boards 75. TV, Radio Receivers & Transmitters & Asso. Goods	65. Engines & Turbines, Fluid Power Equipment, Other Pumps, Compressors, Taps and Valves 66. Other General Purpose Machinery 67. Weapons, Ammunition and Special Purpose Machinery 68. Domestic Appliances 69.Computers, Peripheral, Office Equipment and Machinery 70. Electric Motors, Generators and Transformers 71. Electricity Distribution & Control Apparatus, Batteries and Accumulators 72. Fibre Optic Cables, Electronic and Other Electric 73. Wiring Devices, Electric Lighting Equipment and Other Electrical 74. Electronic Components and Boards 75. Communication Equipment and Consumer Electronics
24	Transport & transport equipment	80. Motor Vehicles 81. Motorcycles	80. Motor Vehicles, Trailers and Semi-Trailers

	Aggregation (38 sectors)	2010	2015
		82. Building & Repairing of Ships & Boats, Manufacture of Bicycle 83. Other Transport Equipment	81. Motorcycles 82. Ships, Boats, Bicycles and Invalid Carriages 83. Other Transport Equipment
25	Other manufacturing	76. Medical, Surgical and Orthopaedic Appliances 77. Measuring, Checking & Industrial Process Equipment 78. Optical Instruments and Photographic Equipment 79. Watches and Clocks 84. Other Manufacturing 85. Repair & Maintenance	76. Irradiation Equipment, Electro Medical and Electrotherapeutic 77. Measuring Equipment, Testing, Navigating and Control 78. Optical Instruments, Photographic Equipment, Magnetic and Optical Media 79. Watches and Clocks 84. Other Manufacturing 85. Repair & Installation of Machinery and Equipment
26	Electricity & gas	86. Electricity and Gas	86. Electricity and Gas
27	Waterworks	87. Waterworks 88. Sewerage, Waste Collection & Remediation Activities	87. Water 88. Sewerage, Waste Management and Remediation Activities
28	Construction	89. Residential 90. Non Residential 91. Civil Engineering 92. Special Trade Works	89. Residential Buildings 90. Non-Residential Buildings 91. Civil Engineering 92. Specialised Construction Activities
29	Wholesale & retail trade	93. Wholesale & Retail Trade and Motor Vehicle	93. Wholesale & Retail Trade, Repair of Motor Vehicles and Motorcycles
30	Tourism	94. Accommodation 95. Restaurants 123. Amusement and Recreational Services	94. Accommodation 95. Food and Beverage 123. Arts, Entertainment and Recreation
31	Transport	96. Land Transport 97. Water Transport 98. Air Transport 99. Other Transport Services 100. Port and Airport Operation Services 101. Highway, Bridge and Tunnel Operation Services	96. Land Transport 97. Water Transport 98. Air Transport 99. Warehousing and Support Activities for Transportation 100. Services Incidental to Water and Air Transportation

	Aggregation (38 sectors)	2010	2015
			101. Highway Operation Services, Bridge and Tunnel
32	Communication	102. Communications	102. Postal and Courier Activities
33	Financial services	107. Banks 108. Financial Institution 109. Insurance 110. Other Financial Institution	107. Monetary Intermediation 108. Other Financial Service 109. Insurance/ Takaful and Pension Funding 110. Activities Auxiliary to Financial Service and Insurance/ Takaful
34	Real estate & dwellings	111. Real Estate 112. Ownership of Dwellings	111. Real Estate 112. Ownership of Dwellings
35	Business services	103. Publishing Activity 104. Telecommunications 105. Cinema, Video and Television Activity 106. ICT & Computer Services 113. Rental and Leasing 114. Research and Development 115. Professional 116. Business Services	103. Publishing Activities 104. Telecommunications 105. Motion Picture, Programming and Broadcasting Activities 106. Computer and Information Services 113. Rental and Leasing 114. Scientific Research and Development 115. Professional 116. Business Services
36	Education	118. Education	118. Education
37	Healthcare	119. Health	119. Health
38	Other services	117. Public Administration 120. Defence and Public Order 121. Other Public Administration 122. Private Non-Profit Institution 124. Other Private Services	117. Public Administration 120. Public Order and Safety 121. Other Public Administration 122. Non-Profit Institutions Serving Households 124. Other Private Services