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Trade competitiveness in the global market: An analysis of four palm oil products from Indonesia, Malaysia and Thailand

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Abstract Indonesia, Malaysia, and Thailand's competitiveness positions in the world market trade of four palm oil products, i.e., crude palm oil, refined palm oil, crude palm kernel oil, and refined palm kernel oil were investigated. The results indicated that Indonesia dominated the export of crude palm oil, refined palm oil, crude palm kernel oil, and refined palm kernel oil with the highest comparative advantage, and the country was a net-exporter during the period 2001–2017. Malaysia also had a comparative advantage and was a net- exporter of crude palm oil, refined palm oil, and refined palm kernel oil. Malaysia gained a comparative advantage in crude palm kernel oil export as a net-importer during 2001-2012 and became a net-exporter during 2013-2017. The findings confirmed that Indonesia and Malaysia are leaded the exporters of all four palm oil products that are highly competitive in the world market. Compared to Indonesia and Malaysia, Crude palm kernel oil was found the only product in which Thailand had a comparative advantage from 2001 - 2017. The results showed that Thailand was a net-exporter in all four products. This finding confirmed that Thailand could compete in the export of palm oil and palm kernel in the world market, although it had both comparative advantages and disadvantages. Based on the comparative advantage and trade balance framework, the results in this study suggested a positive relationship between comparative advantages and trade balances. Therefore, RSCA-TBI mapping is suitable for analyzing the export competitiveness at the international level of a country.

Keywords: Export, Palm oil, Product mapping, Revealed symmetric comparative advantage, Trade balance index

Introduction

At present, palm oil is the most widely used vegetable oil in the world. Global palm oil consumption has grown rapidly, rising from 14.6 million tons in 1995 to 68.8 million tons in 2017, and is projected to reach 315.2 million tons in 2030. The increasing trend has been generated by population growth, the increasing demand for food and consumer goods, and the growth in demand for alternative energy sources, especially biodiesel (Rifai *et al.*, 2014;

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Chuasuwan, 2018). Indonesia and Malaysia are currently the two largest producers of palm oil. In 2017/18, approximately 84 percent of the world's total palm oil production was generated by Indonesia (56 percent) and Malaysia (28 percent), with Thailand ranking third with a 3.9 percent share (USDA, 2019b). As the three most significant palm oil producers, Indonesia, Malaysia, and Thailand also have an important role in palm oil export. The main products exported are palm oil and palm kernel oil as they can be processed and blended to produce a wide range of products, including food, non-food, and biofuels. In 2017, around 54 percent of global exports of palm oil and palm kernel oil were generated by Indonesia (US$20,724 million), followed by Malaysia with 28 percent (US$10,506 million), with Thailand's share being much lower at US$347 million, accounting for about 1 percent of the world's exports (International Trade Centre (ITC), 2018).

As the international trade trend has shifted from protectionism to globalization, trade liberalization has resulted in more accessible and fairer competition among countries. Further, trade-related developments, such as the implementation of bilateral and multilateral free trade area (FTA) agreements and trade liberalization policies, have had significant effects on overall international trade as well as on the kinds and amounts of goods countries produce, import and export, and on their trade balances (Jaafar *et al.*, 2002; Yasmin, 2012). Thus, increasing trade liberalization and reducing trade barriers have created competitive pressures in exporting and importing traded commodities (Ferto and Hubbard, 2003; Mirzaei *et al.*, 2012). Trade liberalization under the ASEAN FTA (AFTA) and the World Trade Organization (WTO) has resulted in a significant increase in the value of goods traded among the ASEAN countries and increased competitive pressures on member countries. Moreover, the ASEAN Economic Community (AEC) founding, effective from January 2016, is expected to play an important role in bringing about international competitiveness among Thailand and the other ASEAN member countries. Despite Indonesia, Malaysia, and Thailand being the world's leading palm oil suppliers, their palm oil production and export competitiveness have faced several uncertainties in recent years.

Currently, the extent of areas occupied by oil palm plantations has raised concerns about their environmental impacts and sustainability concerning biodiversity losses, forest fires, carbon dioxide emission, deforestation, and the excessive use of fertilizers and pesticides (Abdullah and Sulaiman, 2013; Wangrakdiskul and Yodpijit, 2015). Moreover, some importing countries have proposed a new certification scheme for sustainable palm oil, which is stricter than the present scheme, and oil palm plantation activities, both in terms of replacing aging trees and expanding planting areas in Malaysia and Indonesia,

have slowed down as a result of international pressures over these concerns. Besides, adverse weather conditions (e.g., prolonged drought or El Nino events) also affect the cultivation of oil palm and palm oil production. However, domestic consumption in both Indonesia and Malaysia is expected to grow, and since these countries need to satisfy their domestic requirements before their exports, this combined with decreasing production levels may indirectly cause a decline in the level of palm oil exports (OECD/FAO, 2018; USDA, 2019a).

Besides, palm oil faces competition from other vegetable oils, particularly soybean oil, as it is the closest substitute commodity (Zakaria *et al.*, 2017). Furthermore, the European Union (EU), the second biggest importer of palm oil, is projected to reduce palm oil usage for biofuel production to zero by 2030. Meanwhile, American soybean oil was recognized as a sustainable product by the EU in January 2019 and can be used for biofuel production in the EU (USDA, 2019a). Therefore, it is imperative to reconsider the competitiveness of palm oil exports. The study aimed to analyze the competitive position of selected palm oil commodities as exports from the three largest palm oil suppliers Indonesia, Malaysia, and Thailand, in the global marketplace.

Materials and methods

In international trade, the Harmonized System (HS) was classified as both export and import commodities. The used system was a common basis for customs tariffs and collecting statistical data on international trade (United Nations, 2017; ITC, 2018). The 2-digit and 4-digit levels identify the commodities classified and grouping based on HS code within that chapter. The HS 6-digit level is more specific and allowed clear classification at the international level. The patterns of competitiveness were considered at different levels in terms of the aggregation or disaggregation of data. The disaggregated classifications are reflected in more detail of an area with a comparative advantage and were used to assess the situation in one particular country according to the methods of Acharya (2008) and Gupta and Kumar (2017).

The classification of palm oil commodities used in the study is based on HS code at the 6-digit level categorized in the HS 2012 covering the years 2001 to 2017. The export and import data of total products and four product groups, including crude palm oil (HS 151110), refined palm oil (HS 151190), crude palm kernel oil (HS 151321), and refined palm kernel oil (HS 151329) obtained from the United Nations Commodity Trade Statistics Database (UN Comtrade) and the ITC. All export and import data for Indonesia, Malaysia, and Thailand are recorded in U.S. Dollars.

Comparative advantage

The international competitiveness of a country was measured for revealed comparative advantage (RCA) which followed the comparative advantage theory. A country's comparative advantage was estimated by pre-trade relative prices. The limitation on availability and unobservable pre-trade data were recorded as the relative prices or costs. Many researchers adopt indirect measures such as the RCA to analyzed the comparative advantage (Bender and Li, 2002; Ferto and Hubbard, 2003; Acharya, 2008; Kuldilok *et al.*, 2013). The RCA method, developed by Balassa (1965), is based on observed trade patterns and concerns relative export performance. The RCA was used to get the post-trade data and analyzed the comparative advantage. The RCA data were compared a country's export share of a particular commodity relative to the export share of that commodity in a set of countries or the world level.

The RCA index is the ratio of country *i*'s export value of product *j* against the country's total export value relative to the world export value for product *j* to the total world export value. The RCA index can be expressed as: RCA_{ij} =

$(X_{ij} / X_{it}) / (X_{wj} / X_{wt})$ ---------- (1)

Where:

i = the exporting countries (Indonesia, Malaysia or Thailand),

j = the selected product (HS 151110 = crude palm oil, HS 151190 = refined palm oil, HS 151321 = crude palm kernel oil, HS 151329 = refined palm kernel oil),

t = the total export value,

w = the world market,

X = the export value,

X_{ij} = the export value in product j of the country *i*,

X_{it} = the total export value of the country *i*,

X_{wj} = the world's total export value of product *j*,

X_{wt} = the world's total export value of all products, and

RCA_{ij} = the revealed comparative advantage index of product *j* of the country *i* in the world market.

If RCA_{ij} is greater than one ($RCA_{ij} > 1$) or less than one ($RCA_{ij} < 1$), it indicates that country *i* has a comparative advantage or disadvantage in the export of the selected palm oil product *j*. Higher or lower RCA_{ij} represents the strength or weakness of export competitiveness of country *i* for product *j* compared with global exports.

Revealed symmetric comparative advantage (RSCA)

The revealed symmetric comparative advantage (RSCA) index was used by following the method of Dalum *et al.* (1998) and Laursen (1998). The index is symmetric which its value ranges between (-1) and (+1), to avoid the problem of asymmetry or skewness which followed Widodo (2009), Etuk and Ohen (2017), and Jayadi and Aziz (2017). The RSCA index of country *i* for exporting a product *j* can be expressed as:

$RSCA_{ij} = (RCA_{ij} - 1) / (RCA_{ij} + 1)$ ---------- (2)

Where:

$RSCA_{ij}$ is the revealed symmetric comparative advantage index of the selected product *j* of country *i* in the world market.

If the $RSCA_{ij}$ value is positive that indicates a country has a comparative advantage for exporting the product, and competing the international market. If it is negative that indicates the country has a comparative disadvantage and can not competing the international market. The RSCA value is neutral at the zero points, which followed the methods of Dalum *et al.* (1998) and Oelgemoller (2012). The higher or, the closer the RSCA is +1, while values are approaching -1 is the lower RCA, according to Hassanpour and Ismail (2010) and Etuk and Ohen (2017).

Trade balance index (TBI)

Trade balance index (TBI) was used to examine whether a country is a net-exporter or a net-importer of commodity. The TBI index is calculated by comparing the net exports of a selected product *j* in country *i* with total trade values as follows:

$TBI_{ij} = (X_{ijt} - M_{ijt}) / (X_{ijt} + M_{ijt})$ ---------- (3)

Where:

X_{ijt} = the total *t* export value in product *j* of country *i*,

M_{ijt} = the total *t* import value in the product *j* of country *i*, and

TBI_{ij} = the trade balance index in the product *j* of country *i* in the world market.

The TBI_{ij} value is ranged between (-1) and (+1). TBI_{ij} index equal to -1 or +1 implies that the country *i* only import or export. A country *i* represent a net-importer in the selected palm oil product *j* if the value of the TBI_{ij} is negative. It is a net-exporter if the value of TBI_{ij} is positive. Further, if country *i* is neither exports nor imports the selected palm oil product *j*, the TBI_{ij} index is undefined according to Widodo (2009).

RSCA-TBI product mapping

To distinguish the international competitive position of country *i* in each product *j*, product mapping is constructed from both the domestic and international perspectives. From the domestic perspective, an export product with a higher share of the country's total exports can be regarded as a top product and capable of earning an enormous amount of foreign exchange for an economy. From the international competition perspective, an export that accounts for a dominant share of the total world exports in that product can be considered a leading product and have a high comparative advantage in the international market. Hence, exported products are considered competitive products, even though they may not contribute significantly to foreign exchange-earners (Widodo, 2009; Ishchukova and Smutka, 2013).

An international competitive position for the three countries in product exporting was analyzed for RSCA-TBI mapping. RSCA-TBI index is a symmetrical combination that ranged from -1 to +1 to determine export competitiveness. The RSCA-TBI values in each selected palm oil product were plotted in the product mapping and classified into four groups, A, B, C, and D (Figure 1).

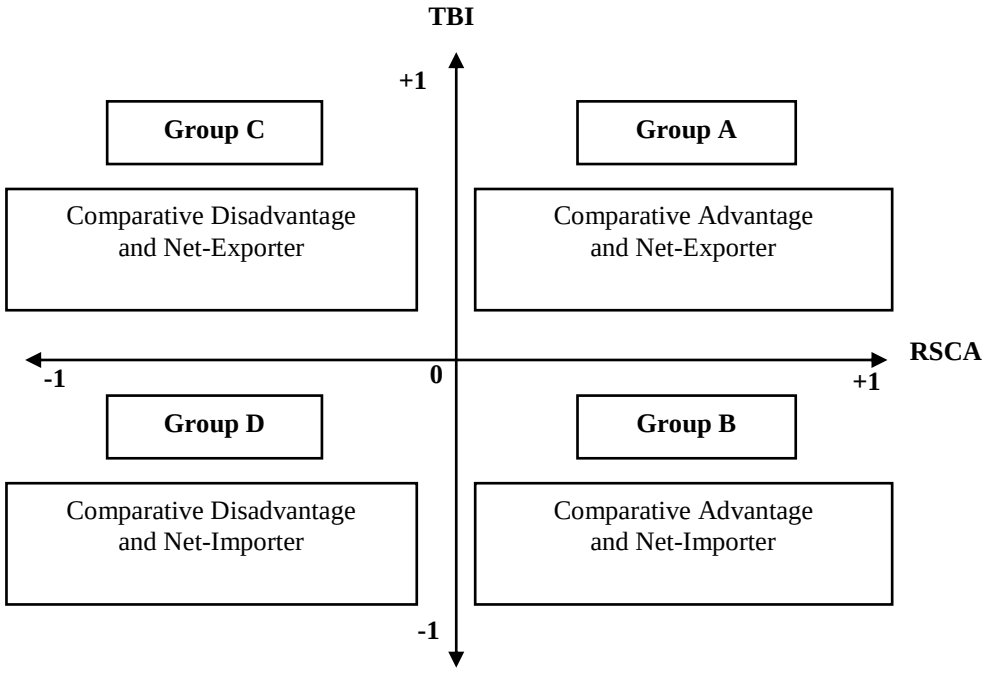

Figure 1. Position of a product in relation to the RSCA-TBI mapping
Sources: Modified from Widodo (2009) and Oelgemoller (2012)

Group A indicated those selected palm oil products *j* with comparative advantage and export specialization. Group B indicated those selected palm oil products *j* with comparative advantage but no export specialization. Group C indicated those selected palm oil products *j* with export specialization without comparative advantage. Group D indicated those selected palm oil products j which was neither comparative advantage nor export specialization. Those selected palm oil products *j* in groups A and C are referred to net exports, while those in groups B and D are considered net imports according to Widodo (2009) and Oelgemoller (2012).

Results

The analysis of comparative advantage and trade balance

The RCA, RSCA and TBI values of crude palm oil (product HS 151110), refined palm oil (product HS 151190), crude palm kernel oil (product HS 151321), and refined palm kernel oil (product HS 151329) from Indonesia, Malaysia and Thailand during 2001-2017 are shown in Table 1-4. In the export of crude palm oil, Indonesia had a relatively high comparative advantage over Malaysia and Thailand (Table 1).

Indonesia's RCA value increased from 46.9 in 2001 to a high of 74.9 in 2008 before decreased to 54.8 in 2017. Malaysia had a comparative advantage throughout the study period. Malaysia's RCA values were relatively stable ranged from 14.8 to 28.6. Thailand found to be the lowest comparative advantage in the export of crude palm oil. RCA showed varying values, ranged from 0.00 to 3.63, indicating Thailand's crude palm oil exports had experienced fluctuating levels of export competitiveness in different periods, with a comparative advantage in 2001-2003, 2006-2008, 2011-2014 and 2017 and found a comparative disadvantage in 2004-2005, 2009-2010 and 2015-2016. The RSCA index confirmed the results obtained from RCA for all three countries. The positive RSCA values of Indonesia and Malaysia, respectively, ranged from 0.96 to 0.97 and 0.87 to 0.93. The RSCA values of Thailand showed both positive and negative, ranged from -1.00 to 0.57. The TBI index results revealed that all three countries had a trade surplus in the export of crude palm oil in the world market during 2001-2017. Indonesia's TBI values were constant, from 0.99 to 1.00, indicating that Indonesia was a net-exporter of crude palm oil. Malaysia also was a net-exporter with positive TBI values ranged from 0.21 to 0.90. Thailand's TBI values were positive over the sample period except in 2005 and 2015, indicating that Thailand was a net-exporter for crude palm oil export during 2001-2004, 2006-2014, and 2016-2017.

Table 1. RCA, RSCA and TBI values of crude palm oil (HS 151110) of Indonesia, Malaysia and Thailand in the world market (2001- 2017)

Year	Indonesia			Malaysia			Thailand		
	RCA	**RSCA**	**TBI**	**RCA**	**RSCA**	**TBI**	**RCA**	**RSCA**	**TBI**
2001	46.92	0.96	1.00	21.09	0.91	0.77	3.63	0.57	1.00
2002	65.54	0.97	1.00	17.63	0.89	0.45	1.11	0.05	1.00
2003	67.52	0.97	1.00	18.93	0.90	0.55	1.37	0.15	1.00
2004	74.77	0.97	1.00	15.79	0.88	0.21	0.05	-0.91	1.00
2005	72.91	0.97	1.00	15.68	0.88	0.58	*0.00	-1.00	*0.00
2006	67.71	0.97	1.00	19.70	0.90	0.60	1.69	0.26	1.00
2007	74.74	0.97	1.00	16.33	0.88	0.72	2.16	0.37	1.00
2008	74.91	0.97	1.00	14.80	0.87	0.58	2.34	0.40	0.78
2009	71.84	0.97	1.00	15.65	0.88	0.42	0.42	-0.41	1.00
2010	66.21	0.97	1.00	15.89	0.88	0.39	0.38	-0.45	1.00
2011	52.87	0.96	0.99	20.50	0.91	0.40	1.77	0.28	0.62
2012	49.08	0.96	1.00	27.44	0.93	0.70	1.30	0.13	1.00
2013	51.19	0.96	1.00	24.55	0.92	0.84	2.96	0.49	1.00
2014	46.78	0.96	1.00	28.67	0.93	0.88	1.17	0.08	1.00
2015	52.80	0.96	1.00	27.80	0.93	0.75	0.00	-1.00	-0.98
2016	49.11	0.96	1.00	26.47	0.93	0.90	0.00	-1.00	1.00
2017	54.89	0.96	1.00	17.03	0.89	0.80	1.31	0.13	1.00
Average	61.16	0.97	1.00	20.23	0.90	0.62	1.35	-0.11	0.79

Source: Computation based on data from the ITC (2018), * No export and/or import.

RCA and RSCA's results in the export of refined palm oil indicated that Indonesia and Malaysia had a comparative advantage, while Thailand had a comparative disadvantage for this product over 2001-2017 (Table 2). Indonesia's RCA value increased from 22.6 in 2001 to a peak of 59.4 in 2015 and was slightly decline to 57.0 in 2017. Malaysia's RCA values were stable during 2001-2011 ranged from 37.4 to 45.4. Malaysia experienced a decline in RCA values from 41.6 in 2011 to 26.0 in 2015 before increased to 44.0 in 2017. On the contrary, Thailand's RCA values were lower than one, indicating a comparative disadvantage in refined palm oil export in the world market. The results of the RSCA were in line with the results of RCA. From 2001-2017, the RSCA values of Indonesia and Malaysia were relatively stable over the sample period, ranged from 0.92 to 0.97. This stability contrast with Thailand, which had a comparative disadvantage and more volatile negative values that ranged from (-0.74) to (-0.03). The TBI results showed that Indonesia, Malaysia, and Thailand recorded positive values during 2001-2017 except for Thailand in 2015, with a value of (-0.02), indicating all three countries were a net-exporter

of refined palm oil export in the world market. TBI values of Indonesia and Malaysia were constant and relatively high ranged from 0.99 to 1.00. and 0.85 to 1.00, respectively. Thailand's TBI showed varying values in different years of the sample period ranged from (-0.02) to 1.00.

Table 2. RCA, RSCA and TBI values of refined palm oil (HS 151190) of Indonesia, Malaysia and Thailand in the world market (2001- 2017)

Year	Indonesia			Malaysia			Thailand		
	RCA	**RSCA**	**TBI**	**RCA**	**RSCA**	**TBI**	**RCA**	**RSCA**	**TBI**
2001	22.63	0.92	1.00	44.01	0.96	1.00	0.19	-0.68	0.99
2002	27.62	0.93	1.00	43.03	0.95	0.99	0.25	-0.60	0.83
2003	26.40	0.93	1.00	45.42	0.96	1.00	0.47	-0.36	0.73
2004	34.09	0.94	1.00	40.71	0.95	1.00	0.94	-0.03	0.31
2005	37.48	0.95	1.00	39.07	0.95	1.00	0.61	-0.24	0.67
2006	39.42	0.95	1.00	37.47	0.95	0.98	0.24	-0.61	0.92
2007	37.67	0.95	1.00	41.33	0.95	0.98	0.36	-0.47	0.96
2008	33.80	0.94	1.00	43.55	0.96	0.97	0.40	-0.42	0.97
2009	33.21	0.94	0.99	40.03	0.95	0.99	0.25	-0.60	0.96
2010	29.56	0.93	0.99	40.69	0.95	0.98	0.25	-0.60	0.96
2011	28.89	0.93	1.00	41.67	0.95	0.96	0.21	-0.65	0.81
2012	41.75	0.95	1.00	34.94	0.94	0.85	0.29	-0.54	0.36
2013	47.87	0.96	0.99	32.78	0.94	0.94	0.26	-0.59	1.00
2014	56.75	0.97	1.00	27.57	0.93	0.96	0.22	-0.64	0.52
2015	59.42	0.97	1.00	26.07	0.93	0.92	0.19	-0.69	-0.02
2016	59.03	0.97	1.00	27.40	0.93	0.94	0.15	-0.74	0.38
2017	57.00	0.97	1.00	44.01	0.96	1.00	0.18	-0.70	0.67
Average	39.56	0.95	1.00	38.22	0.95	0.97	0.32	-0.54	0.71

Source: Computation based on data from the ITC (2018)

The RCA and RSCA values in the export of crude palm kernel oil showed that all three countries had a comparative advantage during 2001-2017 except for Thailand in 2009 and 2010 (Table 3). Indonesia's RCA value was 74.1 in 2001 and increased to a high of 90.7 in 2006 before decreased to 31.9 in 2017. Malaysia experienced considerable growth with RCA values, which increased from 7.1 in 2001 to 24.3 in 2017. Thailand's competitiveness in the export of crude palm kernel oil fluctuated with varying RCA values ranged from (-0.001) to 0.81. Based on the RSCA results, Indonesia, Malaysia, and Thailand had positive values, which revealed RCA's same results. Indonesia showed relatively high and stable RSCA ranged from 0.94 to 0.98. This stability contrast with Malaysia and Thailand, which had more volatile values of RSCA.

The RSCA values of Malaysia and Thailand ranged from 0.71 to 0.93 and (-0.001) to 0.81, respectively. The TBI index results revealed that Indonesia and Thailand had a trade surplus in the export of crude palm kernel oil. TBI values of both countries were equal to 1.00, indicating that Indonesia and Thailand were net-exporter of crude palm kernel oil in the world market during 2001-2017. Meanwhile, Malaysia was a net-importer during 2001 – 2012 and a net-exporter since 2013, confirmed by the negative and positive TBI values.

Table 3. RCA, RSCA and TBI values of crude palm kernel oil (HS 151321) of Indonesia, Malaysia and Thailand in the world market (2001- 2017)

Year	Indonesia			Malaysia			Thailand		
	RCA	**RSCA**	**TBI**	**RCA**	**RSCA**	**TBI**	**RCA**	**RSCA**	**TBI**
2001	74.18	0.97	1.00	7.19	0.76	-0.13	9.73	0.81	1.00
2002	85.68	0.98	1.00	5.57	0.70	-0.72	6.26	0.72	1.00
2003	86.88	0.98	1.00	10.08	0.82	-0.08	5.25	0.68	1.00
2004	86.34	0.98	1.00	10.05	0.82	-0.20	5.40	0.69	1.00
2005	84.69	0.98	1.00	7.89	0.77	-0.03	4.67	0.65	1.00
2006	90.77	0.98	1.00	5.93	0.71	-0.41	4.46	0.63	1.00
2007	88.30	0.98	1.00	9.84	0.82	-0.26	2.84	0.48	1.00
2008	85.56	0.98	1.00	8.48	0.79	-0.34	3.13	0.52	1.00
2009	83.24	0.98	1.00	7.97	0.78	-0.39	0.75	-0.14	1.00
2010	75.79	0.97	1.00	7.81	0.77	-0.51	1.00	*-0.001	1.00
2011	64.05	0.97	1.00	12.12	0.85	-0.36	1.14	0.06	1.00
2012	54.10	0.96	1.00	15.83	0.88	-0.11	1.44	0.18	1.00
2013	44.30	0.96	1.00	20.74	0.91	0.34	2.25	0.39	1.00
2014	41.78	0.95	1.00	24.51	0.92	0.34	4.55	0.64	1.00
2015	51.51	0.96	1.00	18.51	0.90	0.06	2.46	0.42	1.00
2016	33.66	0.94	1.00	28.71	0.93	0.33	4.66	0.65	1.00
2017	31.95	0.94	1.00	24.36	0.92	0.26	6.18	0.72	1.00
Average	68.40	0.97	1.00	13.27	0.83	-0.13	3.89	0.48	1.00

Source: Computation based on data from the ITC (2018)

* No export and/or import

In the export of refined palm kernel oil, results found that Indonesia and Malaysia had a comparative advantage from 2001-2017 (Table 4). The RCA values of Indonesia increased continuously from 20.8 in 2001 to a high of 75.1 in 2017. On the contrary, Malaysia's RCA values experienced a decline from 2001 to 2017 with a value of 48.6 to 15.2. The RCA values lower than one, indicating Thailand had a comparative disadvantage in 2001-2006 and 2015-2017. However, Thailand found a comparative advantage during 2007-2014,

which was shown by the RCA value ranged from 1.1 to 4.5. The RSCA values confirmed the results of RCA. Both Indonesia and Malaysia revealed a positive RSCA value in refined palm kernel oil export with relatively high values ranged from 0.88 to 0.97. Thailand recorded the negative values of RSCA from 2001 to 2006 ranged from (-0.22) to (-0.88). Thailand's RSCA increased substantially from (-0.85) in 2006 to 0.39 in 2014 before it decreased to (-0.10) in 2017. The TBI results showed that Indonesia and Malaysia were a net-exporter in refined palm kernel oil export globally. Both countries had relatively high values of TBI from 2001-2017. Indonesia experienced steady growth with the value from 0.87 to 1.00, while Malaysia revealed a continual decline in the TBI values from 1.00 to 0.64. Thailand was a net-exporter in the export of refined palm kernel oil, confirmed by TBI values ranged from 0.03 to 1.00 during 2001-2013. Thailand's TBI values tended to decline to (-0.36) in 2016 before increasing to 0.17 in 2017.

Table 4. RCA, RSCA and TBI values of refined palm kernel oil (HS 151329) of Indonesia, Malaysia and Thailand in the world market (2001- 2017)

Year	Indonesia			Malaysia			Thailand		
	RCA	RSCA	TBI	RCA	RSCA	TBI	RCA	RSCA	TBI
2001	20.81	0.91	0.87	48.66	0.96	1.00	0.11	-0.80	0.99
2002	24.94	0.92	0.95	47.26	0.96	1.00	0.64	-0.22	1.00
2003	22.32	0.91	0.96	53.77	0.96	1.00	0.28	-0.56	0.20
2004	36.27	0.95	0.95	46.17	0.96	1.00	0.38	-0.45	0.16
2005	37.85	0.95	0.96	44.20	0.96	1.00	0.06	-0.88	1.00
2006	34.56	0.94	0.94	45.80	0.96	0.99	0.08	-0.85	1.00
2007	36.72	0.95	0.96	44.26	0.96	0.94	4.52	0.64	1.00
2008	30.21	0.94	0.97	47.40	0.96	0.91	4.18	0.61	1.00
2009	28.89	0.93	0.98	45.00	0.96	0.97	1.17	0.08	0.28
2010	24.14	0.92	0.98	46.82	0.96	0.96	2.57	0.44	0.74
2011	24.60	0.92	0.99	43.42	0.95	0.76	3.26	0.53	0.69
2012	49.23	0.96	1.00	27.81	0.93	0.46	2.71	0.46	0.15
2013	55.11	0.96	1.00	23.48	0.92	0.71	2.81	0.48	0.03
2014	67.28	0.97	1.00	22.24	0.91	0.60	2.27	0.39	-0.03
2015	71.49	0.97	1.00	21.35	0.91	0.58	0.75	-0.14	-0.22
2016	78.67	0.97	1.00	17.71	0.89	0.68	0.72	-0.17	-0.36
2017	75.11	0.97	1.00	15.21	0.88	0.64	0.81	-0.10	0.17
Average	42.25	0.94	0.97	37.68	0.94	0.84	1.61	-0.03	0.46

Source: Computation based on data from the ITC (2018)

The analysis of product mapping (RSCA-TBI mapping)

The RSCA-TBI mapping of Indonesia, Malaysia, and Thailand for each of the selected palm oil products (crude palm oil, refined palm oil, crude palm kernel oil, and refined palm kernel oil) in each period over the 17 years from 2001-2017 is presented in Figure 2.

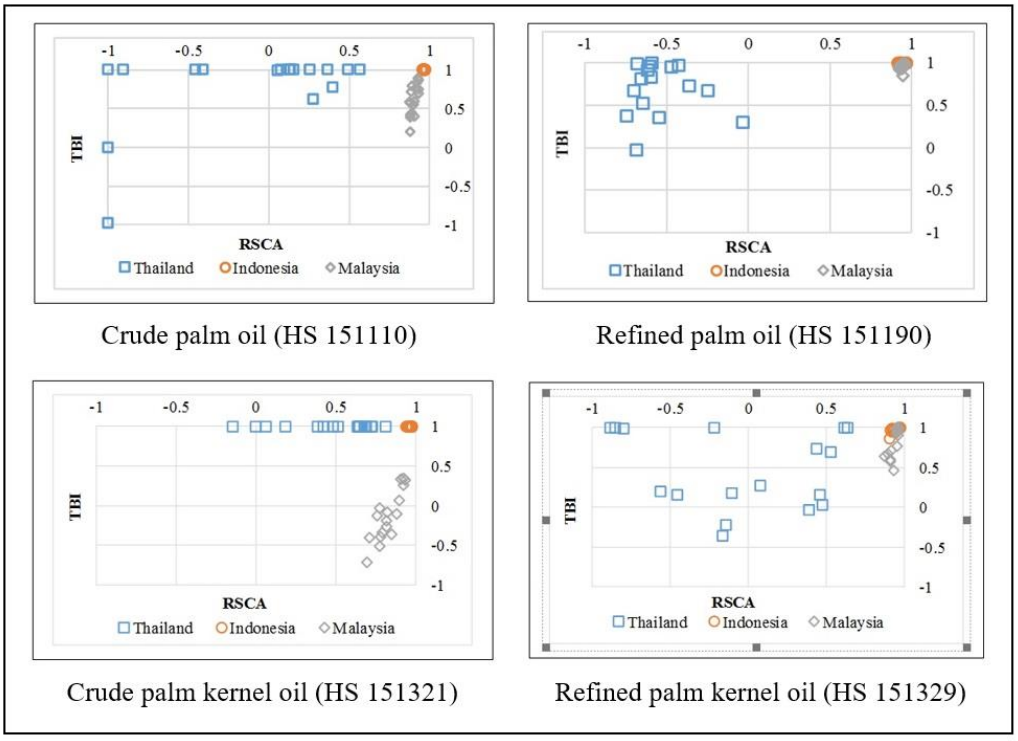

Figure 2. RSCA-TBI mapping of crude palm oil, refined palm oil, grude palm kernel oil and refined palm kernel oil for Indonesia, Malaysia and Thailand in the world market (2001-2017)

Indonesia had the highest position regarding all four products lying in Group A. The results confirmed that Indonesia had a comparative advantage more significant than both countries and was a net-exporter in the world market during 2001-2017. Malaysia had relatively similar positions in the export of crude palm oil, refined palm oil, and palm kernel oil, which were in the position of having comparative advantage and trade balance in Group A. Findings indicated that Malaysia revealed comparative advantage and was a net-exporter of these three products. However, the position for Malaysia's crude palm kernel

oil export was plotted in Group A and B, indicating a comparative advantage with a positive or negative trade balance. These results confirmed that Malaysia gained a comparative advantage as a net-importer during 2001-2012 and became a net-exporter during 2013-2017.

Compared with Indonesia and Malaysia, Thailand's export competitiveness position varied in a different RSCA-TBI mapping group. Results showed that Thailand's positions in the export of crude palm oil were plotted in Group A and C, indicating Thailand was a net-exporter and had both comparative advantage and disadvantage during 2001-2017. Refined palm oil was considered Thailand's fewer competitive products, confirmed by having a comparative disadvantage in Group C throughout the study period. However, Thailand was a net-exporter in the export of this product. With the competitiveness position in Group A, Thailand was a net-exporter and had a comparative advantage in the crude palm kernel oil export. Results of RSCA-TBI mapping revealed that the refined palm kernel oil export of Thailand was plotted in Group A, C, and D. Thailand was a net-exporter with a comparative disadvantage (2001-2006) and comparative advantage (2007-2013). The country also had a comparative disadvantage and was a net-importer from 2014, confirmed by Group D's position.

Discussion

This study identified the export competitiveness positions of Indonesia, Malaysia and Thailnd for palm oil products within a comparative advantage and trade balance frameworks for 2001- 2017. The positions of export competitiveness for these four palm oil products of Indonesia, Malaysia and Thailand were different during the study period. One reason is the policy implications on export-import duty and economic development plan. The international competitiveness can possible be distorted by the government interventions such as tariffs, quotas, subsidies, import policies of importing countries or the liberalization policy as well as the implementation of FTAs (Bender and Li, 2002; Ferto and Hubbard, 2003; Yasmin, 2012; Kuldilok *et al.*, 2013). The products that obtain their comparative advantages could become more competitive if the market is more open to trade, less intervention, and remove distortive policies (Ferto and Hubbard, 2003; Kuldilok *et al.*, 2013).

Indonesia dominated the export of crude palm oil, refined palm oil, crude palm kernel oil, and refined palm kernel oil with the highest competitiveness position. The findings showed that Indonesia experienced downward trends in its export of crude palm oil and crude palm kernel oil and its upward trends in the export of refined palm oil and refined palm kernel oil. According to Rifai *et*

al. (2014) and Abdulla *et al.* (2014), Indonesia's implemented a new export duty structure to encourage more downstream investment and production of refined palm oil products that have a higher value than crude oil form since 2011. The export tax policy decreased the export competitiveness for crude palm oil and encouraged the local producers to sell the product domestically to the palm oil refineries (Rifin, 2010). Indonesia increased its focus on refined palm oil and refined palm kernel oil. Indonesia maintained its competitiveness position in crude palm oil and crude palm kernel oil and improved its competitiveness position in refined palm oil and refined palm kernel oil. The findings indicated that Indonesia had more competitiveness in crude palm oil and crude palm kernel oil than Malaysia from 2001-2017 and more competitiveness in refined palm oil and refined palm kernel oil than Malaysia since 2012. These results were consistent with Salleh *et al.* (2016) conducted in Malaysia and Indonesia's competitiveness of crude palm oil and processed palm oil exports during 1999-2014.

Malaysia maintained its export competitiveness position in all four palm oil products from 2001-2017. In order to encourage the utilization of crude oil to produce downstream palm oil products domestically, which had more profitable to export, Malaysia imposed the tariff duty on the export of crude oil (both palm oil and palm kernel oil) and entirely exempted the export tax on export of refined or processed palm oil (Amiruddin, 2003; Rifin, 2010). However, Malaysia changed the export duty structure to compete with Indonesia in the world market in 2013 (Abdulla *et al.*, 2014). The findings found that Malaysia had lower competitiveness than Indonesia in crude palm oil and crude palm kernel oil export from 2001-2017. Furthermore, Malaysia's competitiveness in refined palm oil and refined palm kernel oil was higher than Indonesia's position until 2011. Malaysia lost its competitiveness position in these two products to Indonesia in 2012 and after. The results described in the present study were supported by previous studies (Arip *et al.*, 2013; Salleh *et al.*, 2016). The results indicated that Malaysia showed an increasing trend in its export competitiveness position for crude palm oil and crude palm kernel oil and revealed a decreasing trend in the export competitiveness position for refined palm oil and refined palm kernel oil.

Thailand had different export competitiveness levels in crude palm oil, refined palm oil, crude palm kernel oil, and refined palm kernel oil. Thailand's export of crude palm kernel oil showed an increasing trend in the world market, but the other three products showed decreasing trends. Palm oil is primarily produced in Thailand to satisfy domestic demand. The volume of palm oil exported depends on the level of excess production (Chuasuwan, 2018). Therefore, the Thai government launched several measures to encourage

domestic production (e.g., expanding plantation areas, improving production efficiency), domestic consumption for food use, consumer products, biodiesel, and feed ingredients (Wangrakdiskul and Yodpijit, 2015; USDA, 2019b). In oil palm production, Thailand experiences difficulties because of adverse weather conditions, especially drought and prolonged dry weather (USDA, 2015). Further, Thailand has placed oil palm on Tariff Rate Quota Products List and the High Sensitive Products List under the WTO and AFTA agreements to protect its domestic palm oil producers and consumers. The Thai government allows the government-controlled Public Warehouse Organization (PWO) to manage all crude palm oil imports and sales to domestic palm oil refineries (PWO, 2015; OAE, 2016; Petchseechoung, 2016). The decrease in oil palm production was causing the palm oil volume to decrease, which directly influenced declining exports. As a result, Thailand revealed a comparative disadvantage in palm oil export, especially in adverse weather conditions. The results found that Thailand was a net-exporter in all four products. This finding indicated that Thailand could compete in the export of palm oil and palm kernel in the world market, although it had both comparative advantages and disadvantages.

The findings in the pattern of comparative advantage based on the RCA and RSCA approaches confirmed that the RCA and RSCA provided the same results and similar trends as suggested by many previous studies (Hassanpour and Ismail, 2010; Startiene and Remeikiene, 2014; Etuk and Ohen, 2017). A high or low RCA may result from the differences between the RCA formula's numerator and denominator. This result corresponded to Acharya (2008) and Chien (2010), who indicated that the share of a particular commodity in one country's total export is much larger (or smaller) than the share of a particular commodity in the world's total export leads to a high (or low) RCA value. Therefore, a higher export value or export share for a commodity does not necessarily lead to a higher RCA value (Arip *et al.*, 2013). Based on the comparative advantage and trade balance framework, the results in this study suggested a positive relationship between comparative advantages and trade balances. In this case, the RSCA and TBI index tended to be consistently related. The finding was consistent with the empirical works of Widodo (2009) and Oelgemoller (2012). However, when a country has a low level of exports and imports of a particular commodity simultaneously, the RSCA and TBI indices reflect opposite results. Low exports lead to a low RSCA value, whereas low imports lead to a high TBI value. Additionally, a high proportion of imports to exports may lead to a low TBI value. This study pointed out that a country may export a product considered to be a foreign exchange earner without the country being competitive in that product. This type of export

pattern can be found at the global level while a country's comparative advantages can be achieved, especially in bilateral trade (Ishchukova and Smutka, 2013; Sachithra *et al.*, 2014).

Some recommendations for further study are as follows: 1) several studies have shown a positive relationship between comparative advantage and trade balance. The higher the comparative advantage of a specific commodity likelihood that a country has of being a net-exporter. Therefore, RSCA-TBI mapping is suitable for analyzing the export competitiveness at the international level of a country; 2) the number of commodities in this study is limited to four main palm oil products as categorized in the HS-Code 6-digit level in the world market. It can be interesting to study major palm oil importing countries such as the EU, India, and China. Furthermore, empirical studies into related palm oil products and other high-value products that used palm oil as raw materials in the midstream and downstream industry would provide helpful information for more elaborated policy implications.

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