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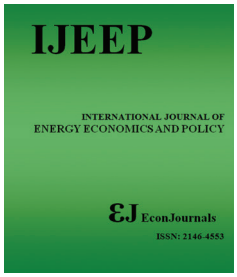

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Energy Tax and the Downstream Palm Oil Trade Competitiveness Nexus in Malaysia: An Application of GMM Approach

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ABSTRACT

This paper analyses the impact of energy tax imposed in European Union countries on Malaysia's downstream palm oil trade competitiveness. The competitiveness factors consist four major attributes adopted from porter diamond model (PDM) framework introduced by Porter (1990) that determine the national competitiveness and analyses using the dynamic generalized method of moments (GMM) proposed by Arellano and Bond (1991). The study utilizes yearly data spanning from 2009 until 2016. The results indicate that energy taxes have positive and significant influence on Malaysia's trade competitiveness of palm oil downstream products (oleochemicals, biodiesel and palm-based finished products) and the result also suggests that all the main factors of PDM (i.e., factor condition; demand condition; firm strategy and rivalry; and related supporting industry) significantly influence the competitiveness of the industry. The policy recommendation remains that, in order for Malaysia to improve the competitiveness of palm oil downstream industries, producers need to ensure that the country's palm oil production is sustainable, which is stipulated by international agreements, especially in EU countries, where environmental sustainability is their main concern.

Keywords: Competitiveness, Palm Oil Downstream, Energy tax, Porter Hypothesis, DGMM
JEL Classifications: A11, Q02, R11

1. INTRODUCTION

Environmental and sustainability issues in palm oil have been widely debated. Among all the countries in the global market, European countries appear to have the most stringent requirement on certified palm oil. Energy tax is a tax levied on energy production and consumption due to environmental reasons. It is a market-based tools aimed at mitigating climate change in European countries (Liobikiene et al., 2017). The main purpose of these taxes is to change market prices to internalize the harm to the environment (Bhandaria et al., 2017). Rising prices of goods and services have prompted consumers to change their purchasing behavior, thereby reducing the demand for polluters' products and services. Zhang and Li (2011) pointed out that these taxes may be an ideal economic tool to cope with post-Kyoto pressure and an effective measure to build a low-carbon economy.

In Europe, palm oil is the most imported vegetable oil, which is used for both food industry as well as non-food sectors, including the biofuel industry. Palm oil is not only the lowest in terms of price, but also could replace various ingredients in all of these industries (Qiu, 2014 and Santeramo, 2017). However, the consumption of edible palm oil has been decreasing in the last few

years due to increase in environmental issues among producing countries plus various negative campaign against palm oil.

2. OVERVIEW OF MALAYSIA'S PALM OIL DOWNSTREAM INDUSTRY

Malaysia's palm oil industry has been one of the key economic drivers and contributors to the national economy. It is designed to increase total contributions to national income and help Malaysia reach high income status (Othman et al., 2020). Despite the long history of the industry, the overall development of the oil palm industry in Malaysia has been below expectation. Currently, palm oil related exports were still highly biased toward the upstream segments, with total contribution to the overall industry of 83%, while downstream contribution was only 17%. Malaysia could easily be affected and experience a slowdown in economy if there is a fall in commodity prices since exports are a major component of its GDP. The risk of fluctuations in crude palm oil (CPO) global prices can be reduced if the industry relies more on downstream activities. It could absorb excess supply of palm oil upstream products in the market and stabilize the prices.

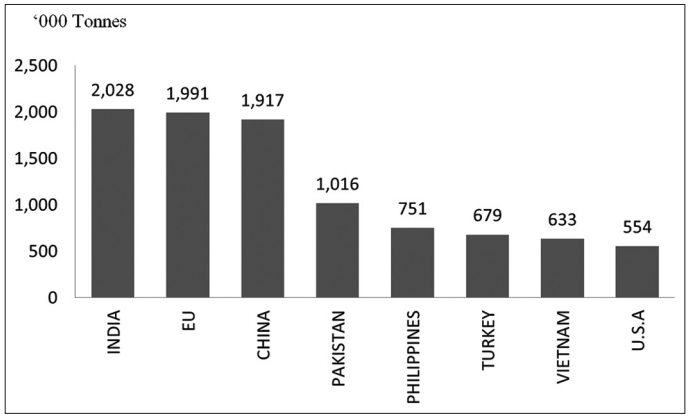
Current trends of exports indicate that Malaysia is losing out to competitors especially from Indonesia. One of the reasons of this weak export performance due to lack of competitiveness. In view of its current domestic production, it is expected that Malaysia's palm oil downstream palm oil products export in future will be further decline. In order to curb this problem, an effort to enhance and continue promoting palm oil downstream competitiveness by the government to other countries are crucial to recover and sustain its strong position against other key players (Yusoff et al, 2013).

The EU has aimed to increase its use of renewable energy from biofuels with one of the potential feedstocks being palm oil. Unfortunately, palm oil has been portrayed negatively by some groups of people claiming that production of palm oil would cause higher global emissions than those from the conventional fossil fuels due to conversion of forests and peatlands (Butler, 2014; Ramdani and Hino, 2013). This led to growing concerns on the environmental sustainability of oil palm farming may affect the import demand of palm oil and hence the economy of the exporting countries.

The European Union is second biggest buyer after India market for Malaysia's total palm oil exports (Figure 1) and about 46% of total palm oil imports into the 28-nation economic bloc are used for biofuels. Palm oil exports to the EU continue declining on a gradual basis, even though its Renewable Energy Directive proposed total ban of palm oil usage in the biofuel mix will only be realised in 2030 (deferred from earlier date of 2021). Palm oil exports to the EU had already decreased by 3.3% to two million tonnes in 2017 from the year before (Malaysian Oil Palm Statistics, 2017). This will definitely put pressure on Malaysia's palm oil export earnings.

Although EU countries have offered incentives to promote uses of biodiesel, palm-based biodiesel will only be eligible for the incentives if the default value of greenhouse gas emission savings for palm oil specified in the instructions is below the threshold.

Figure 1: Malaysia's export of palm oil to major destination in 2017



Source: Malaysian Oil Palm Statistics, 2017

However, this can only be realized if palm oil biodiesel met right conditions, such as avoiding methane emissions. Malaysia sees this underlying sustainability criteria as a trade barrier and a form of "crop apartheid" (Sundram, 2018) since it requires the production of the palm oil product to submit additional proof to validate compliance, or have to change the production patterns (for biofuel derived from palm oil, the auditor shall verify that (i) the palm oil mill effluent (POME) is treated in a gas-tight digester system equipped with methane capture, and (ii) the methane is either used for energy generation purposes or flared). Despite these circumstances, the potential of palm oil as source of biodiesel raises question since both EU and US countries do not support palm oil as sustainable produced fuels as it is not able to reach required threshold values for emission savings.

Most studies emphasize the impact of energy taxes on greenhouse gas emissions (Liobikienė et al., 2017, Barker et al., 2011, Freedman et al., 2012, Huan, 2012). Liobikiene et al. (2019) emphasized that in the process of seeking to mitigate climate change, taxation policies should be reformed and matched with the emissions trading system. Gonseth et al. (2015) estimates the effect of energy tax changes on total factor productivity (TFP) and net trade at the industry level using the generalized method of moments (GMM). In this paper, we consider energy taxes imposed in all EU countries contribute to the trade competitiveness of Malaysia's palm oil downstream products, which to the best of our knowledge has not been analyzed yet. Thus, the main objective of this study is to investigate the effect of energy taxes imposed in EU towards Malaysia's competitiveness of palm oil downstream products.

3. METHODOLOGY

3.1. Revealed Trade Advantage (RTA)

Despite several critical caveats in Ballasa index, or B index (Balassa, 1989), such as the asymmetric value problem and logarithmic transformation (De Benedictis and Tamberi, 2004), the index remains a popular tool in trade analysis. Scott and Vollrath (1992) extended the B index (Balassa, 1989) and constructed the revealed trade advantage (RTA) index which considers both export and import activities by taking the

difference of the relative export advantage index (RXA) and the relative import penetration index (RMP). RTA index gained more popularity over B index due to the special feature of RTA which avoids double counting issue that can lead to biased index values (Vollrath, 1991).

The RXA index is defined as the ratio of a country's export of a certain product in the world market to the same country's share in world export of all other commodities whereas the RMP index is defined as the ratio of a country's import of a certain product in the world market to the same country's share in world import of all other commodities. The formula of RXA and RMP are presented in equation 1 and 2 respectively.

$$RXA_{ij} = \frac{\left(X_{ij} \Big/ \sum_{n,n\neq i} X_{nj} \right)}{\left(\sum_{t,t\neq j} X_{it} \Big/ \sum_{n,n\neq i} \sum_{t,t\neq j} X_{nt} \right)} \quad (1)$$

In equation 1, X represents the value of exports, subscripts i and n denote country and all countries of the world respectively while subscripts j and t denote the palm oil downstream product and a set of product group respectively. Value of world export of a product group, $X_{nj,}$ is used as benchmark. To explain the special feature of RTA index, the double counting issue is avoided because the export of product group by ith country, X_{it}, and world palm oil downstream product export, X_{nj}, are excluded from the calculation of the $X_{nt.}$ Furthermore, the country of interest is excluded from the calculation of product group exports of the world (X_{ij} is excluded from X_{it}). Therefore, in equation 1, $n \neq i$ and $t \neq j$. If RXA is >1, it indicates a relative revealed comparative export advantage in palm oil downstream product in the world market.

The RMP index is shown in equation 2.

$$RMP_{ij} = \frac{\left(M_{ij} \Big/ \sum_{n,n\neq i} M_{nj} \right)}{\left(\sum_{t,t\neq j} M_{it} \Big/ \sum_{n,n\neq i} \sum_{t,t\neq j} M_{nt} \right)} \quad (2)$$

In equation 2, M represents the value of imports, subscripts i and n denote country and all countries of the world respectively while subscripts j and t denote the palm oil downstream product and a set of product group respectively. The value of total imports of product group in the world is represented by M_{nj} and is used as benchmark. To avoid double counting issue, the ith country is excluded from the sum imports of product group, i.e. M_{ij} is deducted from M_{nj}. The ith country's imports of product group (M_{it}) and the difference between M_{ij} and M_{nj} are excluded from world imports of product group (M_{nt}). Therefore, in equation 2 as well, $n \neq i$ and $t \neq j$. If RMP indices value is lower than one, it indicates a relative comparative import penetration advantage in palm oil downstream product and vice versa if RMP is >1.

Vollrath (1991) explained the RTA index as shown in equation 3. It takes into account exports and imports simultaneously and is calculated as the difference between RXA and RMP indices.

$$RTA_{ij} = RXA_{ij} - RMP_{ij} \quad (3)$$

If RTA is >0, it indicates a relative revealed trade advantage in palm oil downstream product and vice versa if RTA is <0.

3.2. Porter Diamond Model Framework

To analyse the impact of energy tax towards trade competitiveness of Malaysian palm oil downstream, this study adopts porter diamond model (PDM) framework introduced by Porter (1990) and analyzes using the dynamic generalized method of moments (GMM) proposed by Arellano and Bond (1991). In PDM, there are four major attributes that determine the national competitiveness in palm oil downstream industries. These attributes are factor condition (FC), demand condition (DC), related and supporting industries (RSI) and strategy, structure, and rivalry (SSR). PDM treats the "role of government" and "chance" as external or among the supporting factors which affect the strength and weaknesses for each of the main attributes. This study, however, omits the role of government and chance attributes and includes an additional determinant namely energy tax as the fifth determinant of competitiveness. The sample of countries selected is limited to European Union-27 due to their energy policy and data availability.

Proxy used to assess the factor conditions in this study is land productivity. Palm oil and palm kernel oil output per hectares are considered as basic factors. Land productivity is vital because of growing pressure for sustainable palm oil production that has resulted in many companies throughout the oil palm value chain to take on significant sustainability commitments (Wijnands et al., 2015). It has become critical to increase productivity throughout the oil palm value chain in order to reduce pressure for expanding into new forest areas to meet economic and production targets. Given that smallholder farmers hold a significant portion of oil palm plantations, increasing their productivity and ensuring their plantations are located on environmentally suitable lands to optimize land use would be of immense importance to them.

Demand conditions in this study take into account the international demand for Malaysian palm oil downstream industry. The attributes of real effective exchange rate (REER) considered significant as a demand condition factor which impacts the competitiveness of palm oil industries. The role of the REER is important because Malaysia is one of the export-oriented countries whose economic growth is largely dependent on international trade and any change in the exchange rate affects exports (Stone and Ranchhod, 2006; Hunegnaw, 2017). This study calculates the REER between Malaysia and European Union. The data uses 2010 as the base year (2010 = 100). An increase in REER indicates that Ringgit Malaysia appreciates. To obtain REER, the index for the nominal bilateral exchange rate (NBER) needs to be obtained as shown in equation 4.

$$NBER_{EUt} = 100 \times \left(\frac{ER_{EUt}}{ER_{EU0}} \right) \quad (4)$$

In equation 4, ER_{EUt} is the nominal exchange rate for Euro to RM for time period t and ER_{EU0} is the nominal exchange rate for base year of 2010. Next, the $REER_{EUt}$ is obtained using the equation 5.

$$REER_{EUt} = NBER_{EUt} \times (\frac{CPI_{EUt}}{CPI_{myt}}) \quad (5)$$

In equation 5, CPI_{EU} and CPI_{my} is the change of consumer price index for the European Union and Malaysia for time period t. Appreciation of the REER reduces the competitiveness for export-inclined companies in the palm oil sector (Hunegnaw, 2017).

Related and supporting industries are those industries in which firms can share activities and strength in innovation within and across sectors in the value chain e.g., technology development, suppliers, distribution channels and marketing and quick information flow enhanced downstream industries competitiveness (Filippini and Molini, 2003; Archibugi and Coco, 2005; Chobanyan and Leigh, 2006; Setyawan, 2011, Kharub and Sharma, 2016). The diamond model focuses on the role of financial intermediaries in facilitating large-scale, high-return projects and shows that economies with developed financial sectors have a comparative advantage in manufacturing industries (Beck, 2002). The importance of financial sector development is underlined because of its positive impact on exports (Moon and Lee, 2004; Kiendrebeogo and Minea, 2012). Indicators chosen to represent financial development in this study are stock market capitalization which is defined as the stock market value of listed companies as a percentage of GDP.

Firm strategy, structure and rivalry describe the conditions of a country determining how firms are organized and how they run. This determinant also reflects the way companies compete, such as on price/costs and how much competition they face. Positive coefficient on this indicator indicates that the sector performance benefits from domestic competition (Wijnands et al., 2015). New business formation means new competitors in the industry which brings new technology and managerial skills and helps in gaining competitive advantage. To estimate the ease with which new entrants can appear in the market, that improves competitive environment, the index of ease of doing business in a country is considered. The main factors addressed in this index are the following: (i) number of all procedures required to register a firm, (ii) the average time spent during each procedure, (iii) the official cost of each procedure, and (iv) the minimum capital required as a percentage of income per capita. For the purpose of this study, the fourth factor in the index is taken into account. The lower the capital requirement is, the higher is the chance for new firms to enter the market and exploit its comparative advantage.

3.3. Model Estimation

As explained earlier, this study also intends to investigate the impact of energy tax towards trade competitiveness of Malaysian palm oil downstream industry. The energy tax is employed as fifth determinant of competitiveness. The hypothesis for this study is energy from the importing countries may foster Malaysia's competitiveness in producing sustainable palm oil products since compliance with environmental commitment may be achieved by adopting sustainable and environmentally friendly in the production process. The dynamic GMM model for competitiveness analysis as shown in equation 6.

$$TCP_{ijt} = \beta_0 + \beta_1 Prod_{it} + \beta_2 REER_{ijt} + \beta_3 lmc_{it} + \beta_4 bd_{i_t} + \beta_5 lener\_tax_{it} + \mu_{ijt} \quad (6)$$

In equation 6, TCP_{ijt} represents the RTA index for trade competitiveness of palm oil downstream products as dependent variable. The independent variables are defined as follows: *Prod* is land productivity represents factor condition; *REER* is real effective exchange rate between Malaysia and EU as proxy for demand condition; is log of market capitalization of listed domestic companies in Malaysia (% of GDP) represents related supporting industry; is new business density (new registrations per 1,000 people ages 15-64) as proxy for strategy, structure and rivalry; *lener_tax* = energy tax. Subscripts i indicate exporting country which is Malaysia, j is importing countries from 27 European Union and t is time.

Previous study in the area of porter diamond competitiveness has frequently been survey-based (Dogl et al., 2012; Papanastassiou and Pearce, 1999). Even though survey-based may have certain advantages, but they are sometimes characterized by subjectivity, self-reporting bias and small sample sizes. In order to avoid these types of disadvantages, this analysis will be based on secondary data. The dynamic panel GMM estimator (Arellano and Bond, 1991) is employed to estimate the model for panel data with small T and large Arellano and Bond (1991) pointed out that the problems with static panel data models (e.g., pooled OLS fixed-effects [FE] and random-effects [RE]) arise because in these estimators, it did not take into account if heteroscedasticity, serial correlation and endogeneity of some explanatory variables occurred. Beck et al. (2000) argued that the GMM is an appropriate estimator in exploiting the time series variation in the data, where it taking into account for unobserved individual specific effects, and allowed the lagged dependent variables to be included as regressors. Consequently, it ensures much better control for endogeneity of all the explanatory variables.

The consistency of the GMM estimator depends on two specification tests as proposed by Arellano and Bond (1991). First one is the Sargan test of over-identifying tests for joint validity of the instruments. The null hypothesis is that the instruments are not correlated with the residuals. Second one is to test for first order and second order serial correlation. The null hypothesis of the absence of first order serial correlation should be rejected and the absence of second order serial correlation should not be rejected (Law and Azman-Saini, 2012).

D-GMM is also a relevant estimator which basically takes first differences of the variables in the model to get rid of country specific effects or any time invariant country specific variable. This also eliminates endogeneity that may be due to the correlation of these country specific effects and the independent variables (Baltagi et al., 2008). There are several recent papers that have illustrated that this type of modelling strategy may lead to incorrect inferences

Table 1: Selected palm Oil downstream products under the hs-6 digit code

Palm oil downstream product categories	Product Code (HS 6 digit)
Oleochemical	290516; 290517; 290519; 290539; 290545; 290559; 291539; 291570; 291590; 291615; 291732; 291734; 291739; 382311; 382312; 382319; 382370; 382490
Palm-based Finished Products	151710; 151790; 151800; 152000; 152200; 340111; 340120; 340213; 340219; 340490; 293621; 293628
Biodiesel	382600; 271020

Table 2: Summary of all causal and proxy variables

Factor	Variables	Data sources
Trade Competitiveness	Relative trade advantage (RTA) of Malaysia's palm oil downstream	Comtrade database by United Nations Statistic Division
Factor condition	Malaysia palm oil output per hectares	MPOB Database
Demand condition	Real Effective Exchange Rate	Index mundi database
Related and supporting industries	Market capitalization of listed domestic companies in Malaysia (% of GDP)	WDI
Strategy, structure and rivalry	New business density (new registrations per 1,000 people ages 15-64)	WDI
Energy taxes	Energy taxes revenues (percentage of gross domestic product (GDP))	EUROSTAT

if the explanatory variables are persistent (Arellano and Bover, 1995). However, this is particularly not relevant for this study as the competitiveness indices of RTA have a weak tendency to persist.

3.4. Data Sources

The data of export (on fob price) and import (on cif price) for palm oil downstream products are based on HS six digit codes retrieved from UN Comtrade database spanning annually for 8 years from 2009 to 2016. The detail of selected palm oil downstream products based on HS six-digit codes are obtained from Malaysia Revision of customs tariff codes for oil palm products published by MPOB (2013). All 32 products listed under HS six-digit codes includes oleochemicals products, finished products and biodiesel (Table 1).

The summary of the determinants is presented in Table 2 which indicates the lists of all proxy variables used as determinant of trade competitiveness of Malaysian palm oil downstream industry in EU market. The countries selected was limited to European Union-27[1] due to their energy policy and also due to data availability.

Four main factors from PDM framework were applied along with an additional factor of energy taxes as relevant determinants

1 List of European Union-27 Countries includes Austria; Belgium; Bulgaria; Croatia; Cyprus; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Malta; Netherlands; Poland; Portugal; Romania; Slovak Republic; Slovenia; Spain; Sweden; United Kingdom.

Table 3: Summary of statistics

Variable	Mean	Std. Dev.	Min	Max
Palm oil output per hectares	4.36	0.37	3.73	4.72
REER	100.01	5.59	84.77	110.46
Market capitalization	140.68	12.47	121.33	160.25
New business density	2.29	0.04	2.23	2.37
Energy taxes	219.95	84.47	97.86	500.95

Table 4: Results of different GMM estimations for trade competitiveness in EU-27: Dependent variable: RTA

Variables	COMP: RTA
Constant	−0.0200* (0.0115)
$COMPOD_{ijt}$	0.220*** (0.00133)
$Prod_{it}$	0.0165*** (0.000315)
$REER_{ijt}$	−0.00472*** (3.19e-05)
lmc_{jt}	0.0612*** (0.00105)
bd_{jt}	0.0359*** (0.00278)
$lener\_tax_{jt}$	0.0130*** (0.00261)
Sargan Test	26.4864 (0.1503)
AR(1)	−1.1984 (0.2307)
AR(2)	−0.9955 (0.3195)
Observations	162
Number of code	27

All models are estimated using the two-step Arellano and Bond dynamic panel GMM estimations (Stata xtabond twostep command). Figures in the parentheses are P-value. *** and ** indicate significance at the 1% and 5% levels, respectively

of competitiveness. An extensive set of official international sources have been taken into account. The sources of secondary data for PDM are also consistent with existing empirical research (Vestergaard et al., 2004; Sledge, 2005; Stone and Ranchhod, 2006 and Nair et al., 2007).

4. RESULTS

The country dataset is composed of one exporting country which is Malaysia and j importing countries which consist of 27 European Union nations for the time period of 8 years from 2009 to 2016. The full sample, therefore, has 162 observations. The dependent variable is alternatively expressed by RTA index. The products exported comprise of 32 downstream products. Table 3 Summarize the statistics data set for Malaysia's competitiveness in EU countries. It can be seen that all the variables display considerable variation and justify the use of panel estimation technique.

Table 4 presents the empirical results using the two-step GMM estimator in the energy policy indicator measured by energy tax and the RTA index were used as competitiveness indicators or the dependent variables. The findings indicate that energy tax have a positive impact on Malaysian palm oil downstream competitiveness. This indicates that green policies help in increasing the entrepreneurial efforts towards the invention of green technology which raises competitive edge of the nation. In line with porter hypothesis (PH), when policies are price-based (such as energy taxes), their pervasiveness ensures their efficacy and stimulates overall economic competitiveness.

The dynamic specifications used for the dependent variable of RTA.

The empirical outcome also states that factor of related supporting industry which is proxied by market capitalization seems to carry more weight (0.0612) than the other factors in determining Malaysian palm oil downstream competitive advantages in EU-27. This result is in line with the argument of Beck (2002) who stated the role of financial intermediaries in facilitating large-scale, high-return projects and shows that economies with developed financial sectors have a comparative advantage in manufacturing industries.

The result also shows that the coefficient of real effective exchange rate (REER) is the lowest (−0.0047) negative and statistically significant. This supports the finding of Hunegnaw, 2017 who claimed Appreciation of the REER reduces the competitiveness for export-inclined companies in the palm oil sector.

The lagged dependent variable in the model is statistically significant, which implies that the dynamic GMM is an appropriate estimator and the empirical results can be relied upon for statistical inference. It can therefore be concluded that impact of environmental protection which is proxied by energy taxes have positive impact on palm oil based exports opposing the traditional view that such policies raises the costs and reduces the competitiveness of the local firms engaged in exports. The Sargan over-identifying restrictions are accepted. There is presence of serial correlation of order 1 (AR1) and absence of serial correlation of order 2 (AR2) at the 5 % level of significance.

As the finding shows a positive impact of EU energy tax on Malaysia's palm oil downstream product competitiveness, the proxy uses as energy policy is limited to energy tax. The other perspective of energy issues can also be looked into the energy consumption toward Malaysia's competitiveness in palm oil downstream industry.

5. CONCLUSION

This study intends to investigate the effect of energy tax implemented in EU towards Malaysia's competitiveness of palm oil downstream products. The results indicate that based on Porter Diamond framework shows that all the main factors (i.e., factor condition; demand condition; firm strategy and rivalry; and related supporting industry) significantly influence the competitiveness of the industry. Interestingly, the result also suggests that energy tax in EU has some positive impact on palm oil industry competitiveness, which is technically consistent with porter hypothesis.

To enhance the competitiveness of palm oil downstream industry, the producer needs to ensure the production of palm oil in the country are sustainable, as ruled by the international agreement especially EU countries where the environment sustainability is their main concern. Accreditation is one of the crucial elements in the palm oil industry to prove that the production practice was in a sustainable way along the whole supply chain.

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