The Study of Trade Competitiveness of Thailand's Polyethylene Resin in The Chinese Market: A Comparative Analysis of Thailand, Singapore, Malaysia, And Indonesia

Chanakarn Unsapcharoen and Zhu Zhu

The School of Economics, Shanghai University, Shanghai 200444, China January 2019
Corresponding Author: Chanakarn Unsapcharoen

ABSTRACT: *This paper was aimed to study the competitiveness of exporting polyethylene resin to China among Thailand and the other major trade competitors from ASEAN countries, Singapore, Malaysia, and Indonesia by using the analysis which based on the Revealed Comparative Advantage (RCA), the International Market Share (MS), and the Trade Competitive Index (TC) with the relevant annual time-series data from 2008 to 2017 in order to determine the main factors affecting the export potential of Thailand's polyethylene resin into the Chinese market. The study resulted that (i) Thailand and Singapore are the only two countries that have the comparative advantage of exporting this product, (ii) the biggest market share belonged to Thailand while Malaysia's market share has been annually declined. However, when considering the TC, (iii) Singapore had won the trade competitiveness among all competitors followed by Thailand, Malaysia, and Indonesia in respectively. Furthermore, it could be suggested that price and exchange rate, in THB/RMB, are the significant factors from this study that influenced the phenomenon of that should be concerned in order to enhance the export potential of the polyethylene resin for Thailand in the Chinese market.*

KEYWORDS: *China-Thailand, Trade, Polyethylene, Competitiveness*

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I. INTRODUCTION

The international trade has played an important role in economic and social development and has also been one of the key factors of economic growth especially in developing countries. In recent years, Thailand's exports have rapidly shown the high growth rate particularly in 2017 when the total export value reached 236,634.7 million USD with 9.86% of growth rate compared with the previous year majored by the export products classified by following sector, agriculture (agriculture, livestock, fisheries) by 9.7%, agricultural products by 7.21%, minerals and fuels by 3.66%, and the industrial products - the biggest export share by 79.43% of the total export value.

The polyethylene (PE) resin (sub-product of plastic resin), the property that slightly allowing air and vapor through the surface, seemingly turbid, and heat resistance that mostly used in the plastic product manufacturing industry, for example, water pipes, tanks, bags, bottles, supports, and so on. This is a significant product ranked on the top five of Thailand's overall plastic resins exports at the value of 8673.67 million USD which was 3.67% of the total export value in 2017. As it is one of the key export products of Thailand, so this product has been emphasized and promoted by the Thai government to enhance the potential of trade competitiveness in the global market. Since the Chinese economy has dramatically grown according to the industrial and technological revolution, there has been increasing of demand to import the plastic resin from overseas due to the domestic supply has not been sufficient to the production of final plastic products in China, so China has become the largest market and the destination of exporting the plastic resin beating the United States in 2006, China has also been the biggest importer with the high purchasing power of the plastic resin particularly polyethylene from Thailand at the value of 1225.53 million USD which is 37.07% of the total polyethylene export in 2017, following with other key countries, Japan, Indonesia, Vietnam, Australia, and India as (Table 1). However, the export value of polyethylene has likely fluctuated during 2015 - 2017 due to the fluctuation of crude oil price which is the primary formula of producing the polyethylene (Ministry of Commerce of Thailand, 2017).

Table 1 Thailand's major exporting countries of polyethylene resin (million USD)

	China	Japan	Indonesia	Vietnam	Australia	India	Other	Total
2008	372.15	66.37	101.49	157.69	100.71	84.98	687.32	1570.71
2009	333.94	47.68	59.34	103.24	58.47	83.13	455.04	1140.84
2010	658.08	85.68	109.61	88.33	84.02	138.49	676.91	1841.12
2011	1175.88	253.08	190.48	118.79	163.67	138.93	1145.58	3186.41
2012	1305.85	322.86	246.61	137.54	174.16	180.82	1157.73	3525.57
2013	1414.87	306.67	303.13	153.91	216.56	160.23	1131.32	3686.69
2014	1554.24	435.22	324.07	212.47	174.12	190.94	1309.76	4200.82
2015	1397.93	269.01	262.66	215.45	116.16	178.72	1016.92	3456.85
2016	1142.01	287.91	261.48	205.8	109.69	156.62	872.95	3036.46
2017	1225.53	365.04	293.49	260.78	166.13	164.31	830.84	3306.12

Source: Ministry of Commerce of Thailand (https://www.moc.go.th)

According to Table 1, the large demand of consumption for polyethylene in China market is obviously influent Thailand's export. However, Thailand is not the biggest supplier of the product to China and Thailand must be facing to the other trade competitors especially with the countries in the South East Asia Nations (ASEAN) where the free trade zone was bilaterally established with China (ASEAN +China) and this moment of zero tariffs has brought the potential of trade competition among the ASEAN countries. Singapore and Malaysia are the two major competitors from Southeast Asia for Thailand in the petrochemical industry due to the high potential of crude oil manufacturing. Thus, it should be the advantage to address an issue to study the status of Thailand exporting polyethylene in the Chinese market in order to be used as an information guideline by the trade policymaker as well as relative entrepreneurs to improve the potential of Thailand's competitiveness. According to many academic literatures, the Revealed Competitive Advantage (RCA), International Market Share (MS), and Trade Competitive Index (TC) were extensively used in the analysis of international trade competition basis with the main question that the country whether have the potential of competitiveness for trading a certain product in the market.

II. LITERATURE REVIEWS

The performance of Thailand's trade competition among the competitors from ASEAN in the Chinese market has been studied in various industries and mostly found that Thailand strongly have a competitive advantage and won the big market shares among the competitors such as natural rubber (Zhang, 2013, Pan, 2014, and Li, 2016), and other agriculture products including rice, corn, fruit, and cassava (Chen, 2014, Sae-Chang, 2015, and Lu 2016). Apart from the RCA, Market Share, and TC which are widely used to analyze the international trade competitiveness, the Diamond model was also used in Tunprom (2006) with the main types of plastic resin, LDPE, PC, and POM, exported by Thailand during 2000 - 2005 had a high comparative advantage in the Chinese market for LEPE, Hong Kong for PC, and the United States for POM. The studies were conducted to analyze in many markets due to Thailand is one of the world's suppliers of polyethylene in the global market, however, there also be other countries that received the comparative advantage on the plastic exporting such as Japan revealed a comparative advantage in exporting polypropylene and polyacetal, the United States had a comparative advantage in the export of polyacetal, and Australia had a comparative advantage in polyacetal export (Chumee, 2008).

The export value of polymer resins had skyrocket grown during 2004-2008 according to economic development in China that increased demand to import such plastic resins in the various manufacturing industry. Although Thailand had the comparative advantage of exporting polymer resins, however, the RCA for Thailand was lower than South Korea and Taiwan as claimed in Pheakhoksung (2009) by an intention to study the competitiveness of Thailand's export of polymer resins (Customs Tariff 3902) in comparative with Asian competitors, South Korea, Taiwan and Japan. Nonetheless, the factors that affected the export volume of Thailand's Polymers (Harmonize code 3901-3904) to China was positively correlated with China's gross domestic product (GDP), the exchange rate of the baht over the Chinese yuan (Baht/RMB), as well as the export price of plastic resins from Thailand to China (Rumchit, 2007).

III. METHODOLOGY AND DATA COLLECTING

This study used the annualized time-series international trade data during 2008 - 2017 from the relevant organizations including the Ministry of Commerce of Thailand, Ministry of International Trade of Thailand, Plastics Institute of Thailand, and the United Nations Commodity Trade Database (UNCOMTRADE) in order to

calculate the Revealed Comparative Advantage (RCA), International Market Share (MS), and Trade Competitive Index (TC) to analyze the export competitiveness of Thailand and compared to Singapore, Malaysia and Indonesia. Furthermore, a descriptive analysis method in determination of which the main factors affecting the export of Thai polyethylene was accumulated from the simple regression using annual data from 1992-2017 together with related literature reviews. And the evaluation method for the RCA, MS, and TC can be calculated by the following descriptions:

Revealed Comparative Advantage: RCA

The RCA (Balassa, 1965) which used to calculate the comparative competitiveness of the country's export that refer to the ratio between the export value of a certain commodity over the total value of all exports of the country, and the proportion of exports of such commodities in the world over the total exports of all commodities in the world as described in the following formula:

$$RCA_{ij} = \frac{(X_{ij} / X_{it})}{(X_{wj} / X_{wt})}$$

(1)

Given j is the polyethylene resins, in equation (1), RCA_{ij} is the comparative advantage index of the polyethylene for country i in the Chinese market, while X_{ij} is the total export value of country i exporting polyethylene to China, X_{it} is the total export value of all products of country i to China, X_{wj} is the total of China's imports of polyethylene, and X_{wt} is the total import value of China from the rest of world. The interpretation of RCA>1 indicates that country i has a comparative advantage in exporting polyethylene to China. In the other hand, when RCA<1 indicates that country i is relatively disadvantageous in exporting polyethylene to China.

International Market Share: MS

The international market share, also known as the export market share, refers to the proportion of a country's exports of a certain product in the world which represents the country's commodity share in the global market. This indicator can reflect the status of international competition or changes in the international competitiveness of a country, and can also be considered as a direct indicator of international competitiveness that can be calculated by the following equation:

$$MS_{ij} = \frac{A_{ij}}{A_{wj}} \times 100\%$$

(2)

According to equation (2), MS_{ij} is the international market share of country i exporting polyethylene resin to China, A_{ij} is the total value polyethylene exports of the country i to the Chinese market, and A_{wj} is the total export value of polyethylene from all countries in the rest of the world to China. The higher MS indicates that polyethylene from country i has a higher global market share of polyethylene in China which referred to a high international competitiveness.

Trade Competitive Index (TC)

The trade competitive index, also known as the trade specialization coefficient, is the relative proportion of the import and export of a certain product of a country, it is indicating that a certain type of product of the country whether has net import or net export. The index was accounted on both import and export value with the calculation formula as:

$$TC_{ij} = \frac{X_{ij} - M_{ij}}{X_{ij} + M_{ij}}$$

(3)

From equation (3) TC_{ij} is the trade competitive index for polyethylene products of country i, X_{ij} is the total value of polyethylene that country i export to China, and M_{ij} is the total value of polyethylene that country i import from China. The value of TC>0, will indicate that country i has net exports and have a strong international competitiveness, while TC<0 indicates the net imports and have a weak international competitiveness on the polyethylene resin trading.

An Empirical Analysis of Factors of Thailand's Polyethylene Export

In this study, the multiple linear regression model with the ordinary least square (OLS) method with the annual time-series data from 1992 – 2017, in order to estimate how the selected factors in the dimension of (i) price factor, (ii) demand factor, and (iii) supply factor, would impact the export of Thai polyethylene in the Chinese market which can be expressed as:

$$lnXP_t = \alpha - \alpha_{PT}lnPT_t + \alpha_{GC}lnGC_t + \alpha_{CX}lnCX_t + \alpha_{PW}lnPW_t + \alpha_{ER}lnER_t + \varepsilon_t \quad (4)$$

where, XP is Thailand's export of polyethylene exports to China, PT is Thai price of polyethylene, GC is China's gross domestic product, CX is China's total export of product in the plastic manufacturing industry,
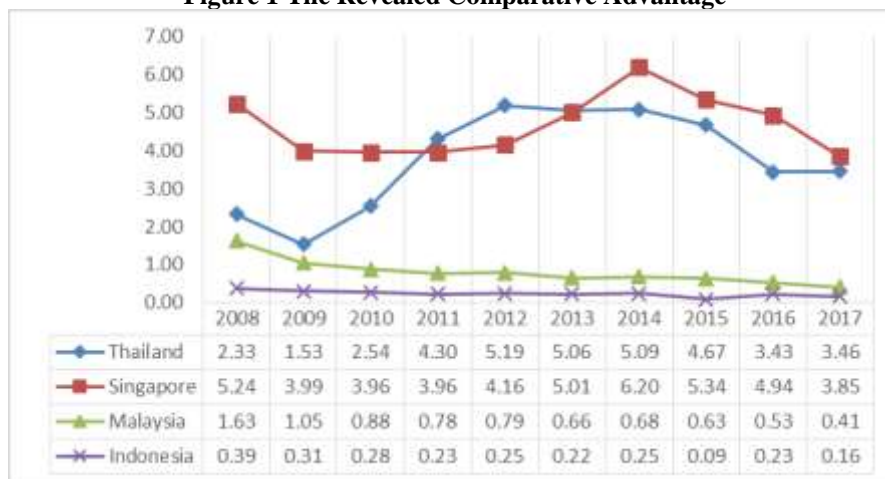
PW is the world price of polyethylene, and *ER* is the exchange rate of THB/RMB. According to Thai price (*PT*) of polyethylene, this variable is considered as the Chinese demand of polyethylene from Thailand subjected to the world price, so this factor must cause the negative effect on Thailand's export in the designed model (equation 4).

IV. RESULTS

   Considering the revealed comparative advantage among Thailand, Singapore, Malaysia, and Indonesia in Figure 1, Thailand and Singapore are the only two countries in ASEAN that have the comparative advantage on exporting polyethylene to in the Chinese market as the calculated RCA value for both countries are greater than one in all sample periods. It could be seen that Thailand's RCA was far behind Singapore during 2008 – 2010 approximately around 100%, however, Thailand's RCA had significantly climbed up to the near level as Singapore's, even higher in during 2011-2012, where the highest RCA for Thailand reached at the value of 5.19. Meanwhile, at the bottom of Figure 1, Malaysia used to have the comparative advantage on polyethylene export only with the value of RCA at 1.63 and 1.05 respectively in 2008 and 2009 and has never had it since 2010 as well as Indonesia where the RCA are all lower than one.
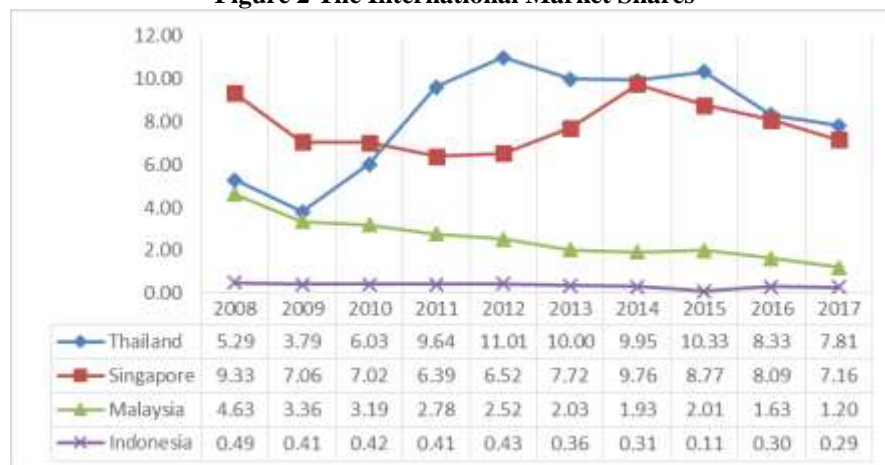
   Although Singapore likely have the highest comparative advantage over all ASEAN countries, the downtrend of Singapore's RCA (as well as Thailand's RCA) has occurred since 2014 and barely different from Thailand in 2017 when Thailand's RCA value was 3.46 and Singapore's RCA value was 3.85. Nevertheless, in comparing the RCA for Thailand in 2017and 2008, Thailand has increased the comparative advantage on exporting polyethylene resin by 49% over the past ten years.

Figure 1 The Revealed Comparative Advantage

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Thailand	2.33	1.53	2.54	4.30	5.19	5.06	5.09	4.67	3.43	3.46
Singapore	5.24	3.99	3.96	3.96	4.16	5.01	6.20	5.34	4.94	3.85
Malaysia	1.63	1.05	0.88	0.78	0.79	0.66	0.68	0.63	0.53	0.41
Indonesia	0.39	0.31	0.28	0.23	0.25	0.22	0.25	0.09	0.23	0.16

Source: From the calculation.

Figure 2 The International Market Shares

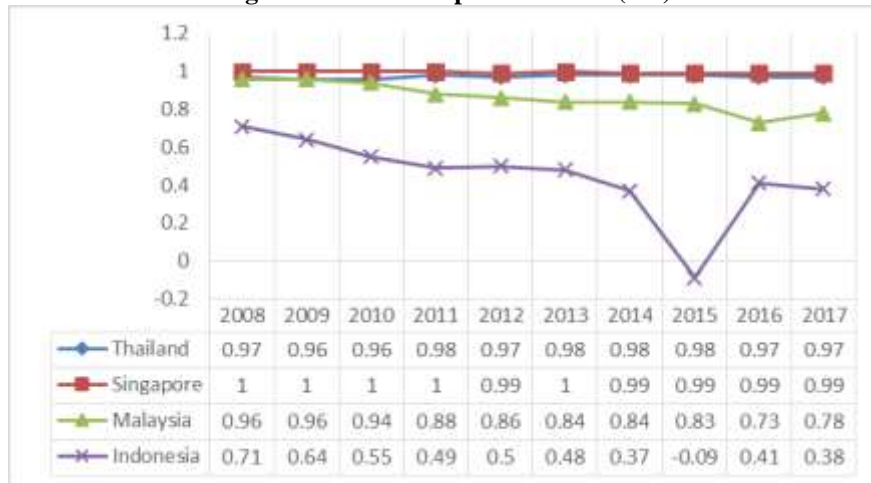|	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Thailand	5.29	3.79	6.03	9.64	11.01	10.00	9.95	10.33	8.33	7.81
Singapore	9.33	7.06	7.02	6.39	6.52	7.72	9.76	8.77	8.09	7.16
Malaysia	4.63	3.36	3.19	2.78	2.52	2.03	1.93	2.01	1.63	1.20
Indonesia	0.49	0.41	0.42	0.41	0.43	0.36	0.31	0.11	0.30	0.29

Source: From the calculation.

   As demonstrated in Figure 2, Indonesia's international market share for polyethylene resin is in a very low position among the referenced countries while Malaysia's market share was slightly lower than Thailand in 2008 and 2009 and had continuously decreased. In all over the study period from 2008 to 2017, the international

market share on Singapore's polyethylene had taken the high position in comparative with Malaysia and Indonesia which were between 6.39 and 9.76. An interesting of changes in the international market share of Thailand is that to climbed up beating Singapore in 2010 and stayed higher on the top of the graph even if Singapore had the higher comparative of this product at the same time.

However, from 2014, the international market shares on both Thailand and Singapore has been diminishing to appear downward trend of the share of Thai polyethylene resins in the Chinese market at 10.33%, 8.33%, and 7.81% respectively in 2015, 2016, and 2017.

Figure 3 Trade Competitive Index (TC)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Thailand	0.97	0.96	0.96	0.98	0.97	0.98	0.98	0.98	0.97	0.97
Singapore	1	1	1	1	0.99	1	0.99	0.99	0.99	0.99
Malaysia	0.96	0.96	0.94	0.88	0.86	0.84	0.84	0.83	0.73	0.78
Indonesia	0.71	0.64	0.55	0.49	0.5	0.48	0.37	-0.09	0.41	0.38

Source: From the calculation according to the UN COMTRADE database.

Figure 3 demonstrates the estimation result of trade competitiveness index of Thailand, Singapore, Malaysia, and Indonesia from 2008 to 2017. As the expected value of TC>0 in the methodology indicates net export gained implying the ability of trade competitiveness, from the calculation, it resulted that all the countries in the study had gained net export of polyethylene resin in the China market during 2008 to 2017, except for Indonesia that net export was negative at -0.09 of the TC index value in 2015. Furthermore, it could also be seen that the trade competitiveness of the polyethylene for Malaysia has slightly descended since 2010 around 19% at the value of 0.78 the TC index in 2017.

The trade competitiveness of Thailand and Singapore are slightly different. However, Singapore has had better trade competitiveness with the index value between 0.99 and 1.00 while Thailand has had the index between 0.96 and 0.98 for the whole period.

An Empirical result of Thailand's polyethylene export factors

Regarding the estimation model in equation (4) in order to analyze the impact of selected factors on Thailand's polyethylene export, after the unit-root test by Augmented Dicky-Fuller (ADF) to receive that the data set used in the estimation is stationary at the level (0) so that the estimated coefficients of the five independent variables; Thailand's export volume of polyethylene exports to China (XP), Thai price of polyethylene (PT), China's gross domestic product (GC), China's total export of product in the plastic manufacturing industry (CX), the world price of polyethylene (PW), and the exchange rate of THB/RMB (ER), are resulted in the below table:

Table 2 Factor Regression Coefficients on Thai's Polyethylene Export (XP)

Variables	Model 1	Model 2	Model 3	Model 4
$logPT$	-1.79***	-1.31***	-2.16***	-1.78***
$logER$	0.55	0.71*		0.56
$logGC$	0.21			
$logPW$	0.64		0.89	0.63
$logCX$	1.76***	1.60***	1.64***	1.57***
α	-9.62***	-11.51***	-10.87***	-11.00***
R-Square	0.9814	0.9801	0.9796	0.981
Adjusted R-Square	0.9767	0.9774	0.9769	0.9774
D-W Statistics	2.14	1.95	2.28	2.09

In Table 2, the multiple regressions of the factors affected on Thailand's polyethylene export using reference variables was estimated in four different models. In order to model selection via goodness of fit, the R-square and Durbin-Watson statistics will be used to consider the best model among the four regression. From the

estimation, Model 2 with the R-square value at 0.9801 together with D-W statistics at 1.95, appears to be the best model with the best statistics among the others so that the equation in general form for the Model 2 can be expressed as:

$$lnXP = -11.51 - 1.31lnPT + 0.71lnER + 1.60lnCX \qquad (5)$$

Regarding to the Table 2 and equation (5), the estimated coefficients in Model 2 are obviously significant at the 99% confidence. The polyethylene resin price sold by Thailand coefficient is -1.31, which is consistent to the law of demand for polyethylene from China that negatively impact on Thailand's polyethylene export by 1.31%. Following with the exchange rate between Thai Baht and Chinese Yuan (THB/RMB), this factor affects increasing in the value of Thailand's export by 0.71%. The last variable is China's total export of plastic products, this factor produces positive impact on Thailand's polyethylene export to China as if China's export the plastic products changes by 1% then Thailand's export of polyethylene to China will be changed by 1.6%.

V. CONCLUSION

According to the economic and industrial development in China has rapidly grown and brought the largest demand for plastic resins from overseas in the variety manufacturing industry, so the study of trade competitiveness of polyethylene resins in the Chinese market in this paper by using main analysis benchmarks such as the revealed comparative advantage (RCA), the international market share (MS), and the trade competitive index (TC), comparing among the potential suppliers from Southeast Asian countries, Thailand, Singapore, Malaysia, and Indonesia, in order to emphasize the analysis of the potential of Thailand's polyethylene export with the trade competitors in the same region. It was found that Thailand has a high comparative advantage alternately with Singapore and take the biggest market share of exporting polyethylene among other countries in the sample. However, we found the downward trend has occurred for the RCA and MS since 2014 that can be assumed the causes regarding China's economic slowdown. Finally, Thailand, Singapore, and Malaysia are the three countries that have gained net export of polyethylene resins with the high ratio to reveal trade competitiveness on this commodity. However, the TC index for Malaysia seems to be diminishing while Indonesia's trade competitiveness index has been very low and lost net export for polyethylene sometimes.

Furthermore, the multivariate regression was also used in the study to analyze the key factors that affect Thailand's polyethylene export in the Chinese market. Based on the model selection with the goodness of fit, Thailand's export price of polyethylene resins, the exchange rate between Thai Baht and Chinese Yuan (RMB), and China's total export of plastic products are the three variables that were considered to use in the model estimation due to their significant impact on Thailand's export. The estimated coefficients showed that the total of China's export of plastic products is the most significantly affect to Thailand's polyethylene export to China by 1.60%, while Thailand's export price of polyethylene resins would decrease the export by 1.31%, and the exchange rate of THB/RMB would produce the effect by 0.71% according to its coefficient.

Thus, the conclusion of this study could be confirmed that Thailand still has the potential of competitiveness of exporting the polyethylene resins in the Chinese market. However, the occurring of downtrend should be carefully concerned and focused in order to maintain the exportability of this product by the relevant organizations especially the Thai government and department of trade promotion in order to improve the enhancement of Thai polyethylene resins in the global market.

Policy recommendation

According to the research results, Thailand has a competitive advantage in exporting polyethylene to the Chinese market, and the amount of polyethylene exported to the Chinese market is also increasing every year. In order to maintain this advantage and continue the growth, Thai entrepreneurs should strengthen their strategies, making understanding to the rules and requirements of the Chinese polyethylene market, and develop their products to push Thailand's trade to be on the top list of the potential suppliers. In addition, entrepreneurs and governments should also consider the following key recommendations:

First, the polyethylene is the primary raw material for the production of the other plastic products, therefore, it is a high-competitive industry in the world. According to this study is only focused on the Southeast Asian suppliers, however, Thai entrepreneurs should also pay attention to other trade competitors from outside of the region such as the competitors from the Middle Eastern countries who have the advantage on the production cost due to oil and gas production, and become the major suppliers of plastic resins with a high volume of exports to China in every year. Nonetheless, although China is Thailand's largest polyethylene export market, Thai entrepreneurs should not ignore other markets, which will help to hedge the risk of fluctuations in the Chinese polyethylene market.

Second, since the production of polyethylene is using and relying on natural resources such as crude oil and gas and nowadays the over plastic waste problem has been spreading in the global environment, so the producers should concern and develop their production technology, for example, using more bio-chemical

substance instead the crude oil raw material as well as design the recycling technology in order to take the plastic re-using that help decreasing of plastic waste which is more friendly to the environment.

Finally, due to the currency exchange is a key factor, so the financial policy should be well regulated in order to maintain the international trade environment stability that could bring the confidence of the importer in Thai export products.

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