RISK MODELLING OF RUBBER WOOD SAWN VALUE CHAIN AS EXPORT TO CHINA: THAI EXPORTER'S PERSPECTIVE

Phutawan Ho[1], Singha Chiamsiri[2]*, Chatrudee Jongsureyapart[3] and Suthep Nimsai[4]
[1, 2, 3, 4] School of Management, Mae Fah Luang University, Chiang Rai, Thailand

ABSTRACT

This study aims to identify and evaluate risk factors; how it impacts the average production efficiency of Thai rubber wood sawn export to China industry. The theoretical model comprised of five major categories of risk which are systemic risk, market risk, operational risk, credit risk, and liquidity risk, was created using the data from Risk in Value Chain concept and in-depth interview with the Thai rubber wood sawn exporters. Therefore, the data collected from questionnaires distributed are analyzed using Multiple Regression analysis in order to get the evaluation of how risk factors impact the average production efficiency of the industry as it could represent the industry's situation. As a statistically significant result with the confidence intervals of 95%, market, systemic, and operational risk are factors that negatively impact the average production efficiency. Thai government and rubber wood sawn exporter could use the result as a guide to carefully develop strategy or plan for future business.

Keywords: 1) Rubber wood 2) Risk 3) Value chain 4) Multiple regression

1. Introduction

Rough sawn kiln dried rubber wood (hereinafter referred to as RSKD) is one of the industry that currently and importantly contributes to Thailand's agricultural sector with the continuous growth. Nowadays, the entrepreneurs, together with the stakeholders in rubber wood sawn industry's supply chain, pay attention to and look for market opportunity. There was a continuous increasing in both export value and quantity during 2013-2017, with the average rate of change of 16.73% and 26.21%, respectively. The current major markets of Thai RSKD are China, around 49 billion Thai baht or approximately 99% of Thai RSKD 2017 export value following by, Malaysia, India, Vietnam, and Taiwan, respectively (Global Trade Atlas, 2018).

There was a struggle for Thai RSKD export to China as, in 2016, world's unstable economic situation brought China the problem for exporting to United States and European Union which resulted in the deceleration in Thai RSKD export to China. Moreover, Thai RSKD price for export was increasing continuously so that China bought less RSKD from Thailand in a period of time (Thai Hevea Wood Association, personal communication, March 9, 2018). Wood and wood products export in 3rd quarter of 2017 was in an upward trend compare to 2016 as a result from the economic situation in trade partners' countries such as the recovery of China's economic. However, there are still the issues related with the world's unstable economic situations that limit Thailand's export from the expected growth such as China's unstable domestic economic situation due to the debt problem in

[1] E-mail: phutawan.ho13@lamduan.mfu.ac.th

business sector, unstable politics in EU, and the fluctuation of the money market around the world (Office of Industrial Economics, 2017).

Thai Hevea Wood Association (2018) stated that RSKD industry will encounter with more intense competition. Nowadays, there are around 499 RSKD factories including small, medium, and large size (Thai Hevea Wood Association, 2018 and Department of Industrial Works, 2018) which around 80% of the factory are located in southern area and some of them are located in eastern area of Thailand.

Although there is an increasing number both in value and quantity, from the preliminary study, there is more intense competition coming into the only market from new competitors and the expansion of the existing competitors. Together with the deficiency of the information and research regarding the risk in exporting RSKD to China, it is important to identify the risk factors in value chain of RSKD exports to China and how it impacts the production efficiency from Thai exporters' perspective in order to provide the suitable information that can help Thai exporter to plan, create strategy, and develop the RSKD export industry carefully in the future.

2. Literature Review

2.1 Related Research

The researcher has studied about agricultural product but there is only a few researches. So, the researcher will review and develop from existing research. According to Prommontree (2013) from Industrial Management Program, Hatyai Business School, that conducted "the Study of Supply Chain Management for Parawood Manufacturing and FMEA" who studied the logistics management of RSKD industry in Songkhla and the remarks that cause the defects in RSKD products, found that the logistics management of RSKD industry consists of inbound logistics (intermediaries, transportation, grading and raw material reception), operational logistics (sawmills) and outbound logistics (quality checking, product storing, and delivering). Moreover, remarks consist of black spot, long bark, and black pattern.

2.2 Theoretical Idea

Michael E. Porter (1985), and Srithakaew and Nimsai (2013) defined that value chain is the chain of the processes which create the value to customer. Value chain are made of two main elements which are:

a) Primary activities relate to the production or designing of products and services, marketing, and transport of the goods and services to consumers consist of:

- Inbound logistics related to transport, storing, and distributing raw material from supplier.
- Operations relate to the production of goods and services.
- Outbound logistics relate to storing, consolidating, delivering goods and services to customer.
- Marketing and sales are to convince customer to purchase or use the goods and services.
- After-sales services imply to the services provided during the sale process and after-sale.

b) Support activities, which facilitate primary activities, consists of:

- Procurement of raw materials and other types of input to be used in primary activities.
- Technology development helps increase value of goods and services.
- Human resource management covers the sourcing, measuring, developing the relationship, and training of the labors.
- Firm infrastructure covers the financing system, and firm organizing system.

According to Calatayud and Ketterer (2016) , there are five categories of risk impacting on performance of value chain. Risks are identified by the level that risk occurs and where the outcomes obviously take place as shown in figure 1.

a) Systemic risks have the impacts on the economy in common. Political, macroeconomic, socio-cultural and environmental factors are the example of the potential causes of risks.

b) Market risks have the impacts on a particular economic sector. Customers' needs and technology shift. Price of raw materials and finished goods swings, availability of raw materials and substitutions, criterion of product quality, those are the example of market risks.

c) Operational risks have the impacts on value chain of a particular industry and, sometimes, occurs in one particular operation or between the connection of two operations. The operational risks, for instance, machine problem, inaccurate demand forecasting, and unfulfilled order quantity, impact the material and information flows.

d) Credit and liquidity risks both have the impacts on value chain or one particular operation in terms of monetary steadiness. The errors occur when receiving money from customers, which can impact the financial flow of a company, are credit risks. Moreover, information asymmetries and informality of enterprise can develop credit risk. The errors occur when company attempting to achieve short-period promise can be liquidity risks.

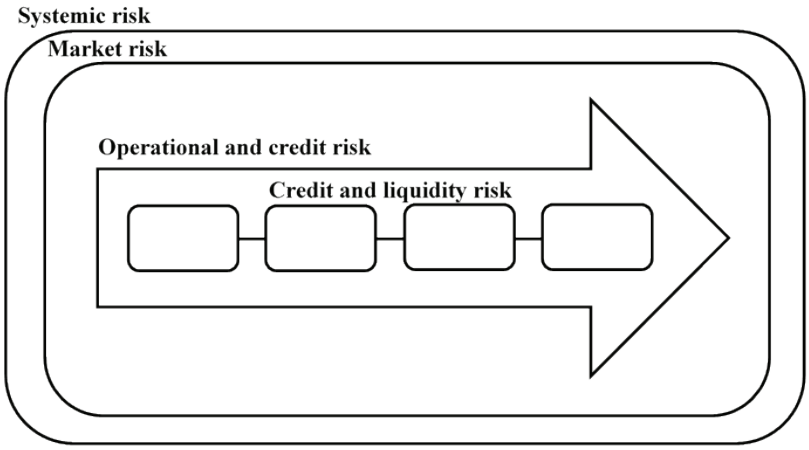

Figure 1: Risk in value chain

The potential risk factors according to the characteristics from this model are reviewed and demonstrated briefly in table 1. However, as the literature about risk in value chain is rare, the literatures listed in table 1 are only potential risk factors that could affect the industry.

Table 1: Summary of potential risk factors reviewed from literatures.

Potential risk factors	Authors
Natural Disaster	Benson and Clay (2003)
	Oh and Reuveny (2010)
	Meyer, Brinckerhoff, Rowan, Snow and Choate (2013)
Political events	Ferreira, Li, Guisinger and Serra (2009)
	Vuorela (2015)
Tax policy	Umeora (as cited in Ibrahim and Muritala, 2015)
	Bryan (2013)

Potential risk factors	Authors
Exchange rate	Chartered Institute of Procurement and Supply (2018)
	Hou (2013)
	Yanbin, Baodong, Chang and Tingting (2014)
Raw material price fluctuation	Moheb-Alizadeh and Handfield (2018)
	Yanbin, Baodong, Chang and Tingting (2014)
Supply scarcity	Clancy and Jeyasingham (2012)
	Alonso, Field, Gregory and Kirchain (2007)
	Yanbin, Baodong, Chang and Tingting (2014)
Threat of substitute products	Hautamäki, Mutanen and Viitanen (2012)
	Grege (n.d.)
	Clancy and Jeyasingham (2012)
Forecasting Accuracy	Kalchschmidt (2008)
	Huff and Sultan (2014)
	Wacker and Sprague (2007)
Machine downtime	Tabikh (2014)
	Tanwari, Memon and Arrab (2011).
	Ozkok (2013)
	Fox, Brammall and Yarlagadda (2008)
Skill labor shortage	Briggs (2010)
	Oke, Aigbavboa and Khangale (2018)
	Makhene and Thwala (2009)
Information asymmetries	Gudelyte (2015)
	Minarelli et al. (2016)
Inability to access credit	Mills and McCarthy (2014)
	Muguchu (2013)
	Mayabi (2013)
	Etemesi (2017)
Credit terms	Horen (2007)
	Cunat and Appendini (2012)
	Fabbri and Klapper (2016)

Source: Own construction from literature review

3. Research Methodology

This research is mixed between qualitative and quantitative methods to complete the objective. The researcher interviews Thai RSKD exporters in order to identify potential risk factors that they are facing and construct risk model. Risk model is analyzed using multiple regression analysis to explore the relationship and evaluate the impact of potential risk factor on average production efficiency.

Data used in this research comes from both primary and secondary sources. Primary data is collected by visiting and interviewing the exporters and sawmills' owners, and using questionnaire consists of two parts namely the background information of the business, e.g. the number of employees and the income per year, and risk management section that consists of the questions related to potential risk factors, that could impact the Thai RSKD export industry, identified base on five categories of risk in value chain; systemic, market,

operational, credit, and liquidity risks (Calatayud and Ketterer, 2016) which are all rating questions. Likert scale (5 scales) was implemented so that the respondents are able to rate the factors where 5 = Strongly agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly disagree.

Moreover, self-administered questionnaire (done by respondents while visiting them at their places) is used since the RSKD producers and exporters might give some feedbacks regarding to the questionnaire so that the researcher can adapt and edit before sending to the rest of the population. As there is the limitation that there are no data indicate the number of Thai RSKD exporters, the questionnaires were sent to the whole population of 499 of RSKD producer in order to identify the number of Thai RSKD exporters samples. Data was analyzed using multiple regression analysis to evaluate how potential risk factors impact production efficiency as it could represent the situation of the industry. The primary theoretical model from literature review and in-depth interview is demonstrated in figure 2.

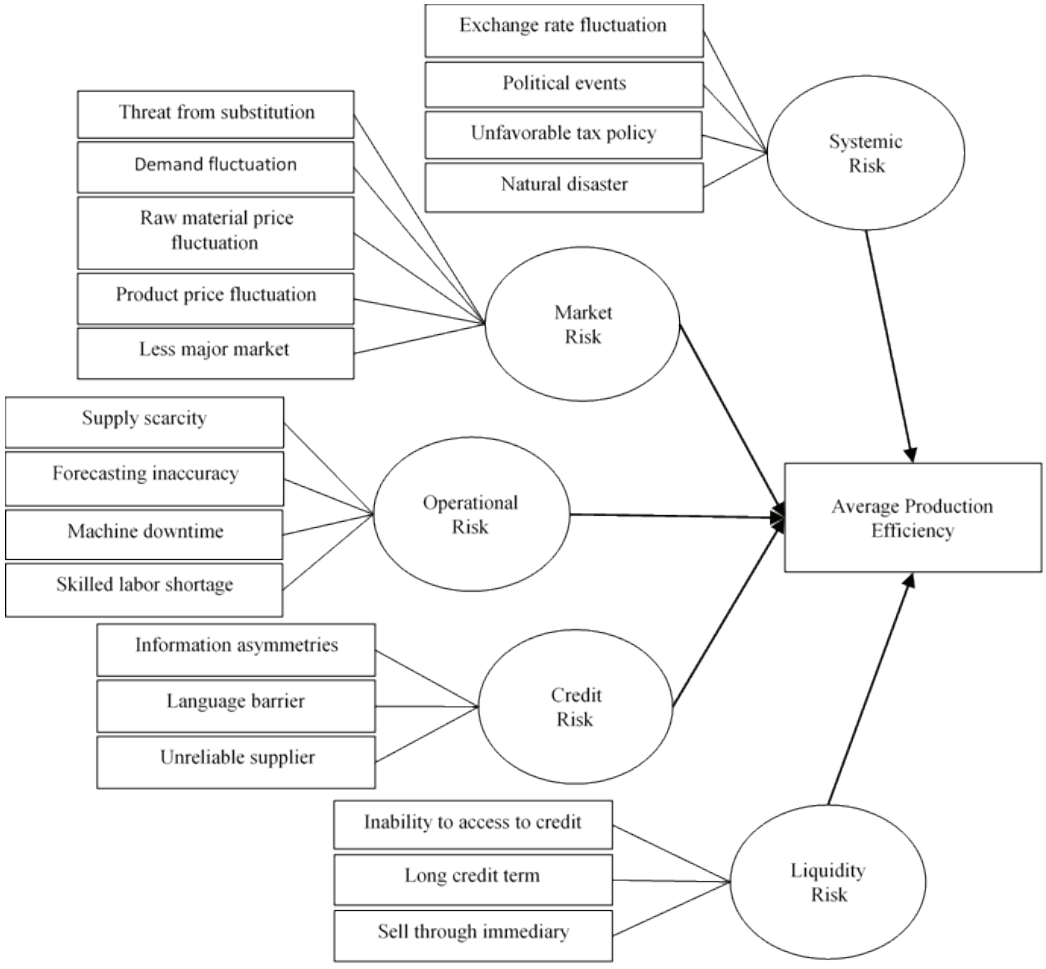

Figure 2: Primary theoretical model

From the primary literature review and in-depth interview with Thai RSKD exporters, the researcher stated the hypothesis as follows

$H_0$1: There is no significant prediction of average production efficiency by systemic, market, operational, credit, and liquidity risk.

H_a1: There is a significant prediction of average production efficiency by systemic, market, operational, credit, and liquidity risk.

$H_0$2a: In the presence of the others, there is no significant prediction of average production efficiency by systemic risk.

H_a2a: In the presence of the others, there is a significant prediction of average production efficiency by systemic risk.

$H_0$2b: In the presence of the others, there is no significant prediction of average production efficiency by market risk.

H_a2b: In the presence of the others, there is a significant prediction of average production efficiency by market risk.

$H_0$2c: In the presence of the others, there is no significant prediction of average production efficiency by operational risk.

H_a2c: In the presence of the others, there is a significant prediction of average production efficiency by operational risk.

$H_0$2d: In the presence of the others, there is no significant prediction of average production efficiency by credit risk.

H_a2d: In the presence of the others, there is a significant prediction of average production efficiency by credit risk.

$H_0$2e: In the presence of the others, there is no significant prediction of average production efficiency by liquidity risk.

H_a2e: In the presence of the others, there is a significant prediction of average production efficiency by liquidity risk.

4. Results

The questionnaires were sent to the population of 499 of RSKD producer and only 45 questionnaires were finished (response rate of 9 percent). There are only 39 RSKD exporters from the total responses. 48.7% of the exporters have been operating from more than 15 years following by 5-10 years and 10-15 years with the percentage of 17.9 for both, and less than 5 years with the percentage of 15.4. Most of the RSKD exporters, approximately 76.9%, are small size businesses who have the revenue less than 500 million baht per year following by medium and large size business with the percentage of 15.4 and 7.7, respectively.

For the average production efficiency measured by dividing average production capacity (container) by max production (container), most of the exporters, approximately 33.33%, have 91-100 percent of average production efficiency following by 81-90%, 71-80%, less than 60%, and 61-70% with the percentage of 25.64, 17.95, 12.82, and 10.26, respectively.

Figure 3 demonstrated the average production efficiency that was affected from risk factors. After passing through the analyzing procedure; data screening, reliability test, and multiple regression analysis, the overall results indicated that the primary theoretical model is statistically significant with p-value of 0.000 ($p<0.05$) and adjusted r^2 of 0.661 which rejects $H_0$1 and accepts H_a1 that there is a significant prediction of average production efficiency by systemic, market, operational, credit, and liquidity risk.

However, the statistical results do not allow to reject all H_0. The researcher rejects $H_0$2a and accepts H_a2a that in the presence of the others, there is a significant prediction of average production efficiency by systemic risk, with the p-value of 0.041 ($p<0.05$). For hypothesis testing H2b, the researcher rejects $H_0$2b and accepts H_a2b that in the presence

of the others, there is a significant prediction of average production efficiency by market risk, with the p-value of 0.003 ($p<0.05$). For hypothesis testing H2c, the researcher rejects $H_0$2c and accepts H_a2c that in the presence of the others, there is a significant prediction of average production efficiency by operational risk, with the p-value of 0.082 ($p<0.1$). For hypothesis testing H2d, the researcher accepts $H_0$2d that in the presence of the others, there is no significant prediction of average production efficiency by credit risk, with the p-value of 0.144 ($p>0.1$). For hypothesis testing H2e, the researcher accepts $H_0$2e that in the presence of the others, there is no significant prediction of average production efficiency by liquidity risk, with the p-value of 0.313 ($p>0.1$).

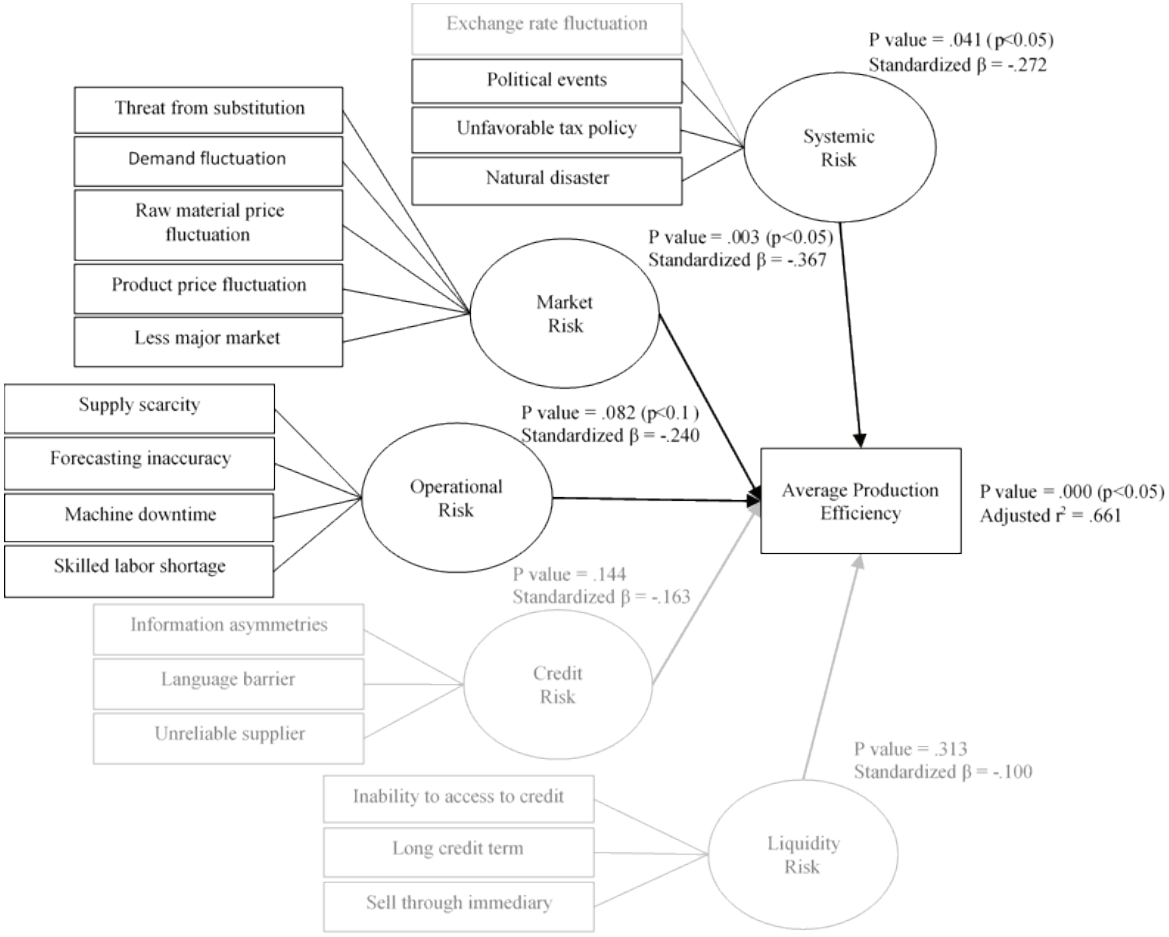

Figure 3: Average production efficiency and impacts from risk factors

The analysis also shows the levels of the impact from risk factors by considering standardized coefficient beta. Market risk has highest negative impact on average production efficiency among the significant risk factors. If market risk increases by 1 standard deviation, average production efficiency will decrease by 36.7%. Systemic risk has the next high negative impact on average production efficiency. If systemic risk increases by 1 standard deviation, average production efficiency will decrease by 27.2%. Operational risk ranks the 3rd among the significant risk factors that has negative impact on average production efficiency. If operational risk increase by 1 standard deviation, average production efficiency will decrease by 24%.

5. Conclusions

This study presents the important risk factors that have negative impact on average production efficiency which, somehow, could represent the situation of Thai RSKD export industry. From five risk factors mentioned in model, market risk has impact the most among other risk factors because they are external factors that the exporters cannot control and it seem to happen randomly and can be many times in a year such as demand and product price fluctuation. Moreover, the industry reacts directly to the market and even more immediate for Thai RSKD export industry that has only one major market and it will suffer from risks influenced by China market.

For systemic risk, it rarely happens in case of unfavorable tax policy; once in 2 or 3 years, for example, and they still be able to produce or delay the production if the demand from market is coming. Natural disaster, only flood that impacts the industry, is predictable somehow because it happens almost every year and the exporters have found the way to deal with it.

Operational risk is an internal factor which the entrepreneurs can manage to overcome the situation in a quick period of time, for example, company always has spare parts for machine or even has another machine to change in order to smooth the production. However, company without good practice still be affected from this risk.

Credit and liquidity risk do not cause severe problem to the industry as they are easy to be avoid or mitigated. However, the lost can happen with the small company that has bad management practice, for example, if they give to long credit term to customer, they will not have cash to buy raw material to fill the production or even not have cash to pay the labor.

Thai RSKD exporters and government should work together in order to come up with the development strategy and plan which will reduce the level of impacts from those risks. Exploring new potential market should be one of the things to be considered.

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