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Abstract- Rubber is one of the plantation commodities which have a quite important role in economic activities in Indonesia. Rubber provides the main livelihood for over one million families and more than two thirds of all production comes from smallholders. Rubber is also one of Indonesian export commodities as a foreign exchange earner in the country outside oil and gas. Approximately 86.95 percent of Indonesia's natural rubber production is exported to foreign countries and only a small portion is consumed domestically. This research aims to assess the determinant for rubber export in Indonesia. We use Stata software and estimate the variables by robust regression. Results showed a significant relation between production level, exchange rate and export quantity in the lag time. Indonesia earned substantial foreign exchange from crumb rubber exports. However, major fluctuations in the export earnings have raised concern about the country's future growth potentials and self-sustainability.

Index Terms- Rubber, Determinant, Export, Indonesia

I. INTRODUCTION

Rubber is one of the commodities that serve as the raw materials for the industry. In general, developing countries become producers of natural rubber from plantations belong to smallholders, state and private. While consumers of natural rubber are the advanced industrialized countries. Natural rubber consumption continues to increase along with demand in the industrial sector with rubber raw materials such as rubber balls, yarn, gloves, tires and catheters.

Indonesia is the second largest producer of rubber and represents as one of commodity export which having big enough contribution for state's stock exchange. Rubber is a major export commodity supporting the Indonesian economy. More than 1 million households now depend on rubber as their main source of income. Smallholder rubber constitutes 83 percent of the total Indonesian rubber area (3.5 million ha) and 68 percent of total rubber production. Where smallholder rubber systems often are called jungle rubber (Gouyon et al. 1993; Williams et al. 2001)

The growth of natural rubber production in Indonesia is about 6.3 percent per year. The production estimate is not only because of the growing demand of world market, but also because of growing attention on high yielding clonal rubber and positive externalities brought about by agroforestry system in natural rubber production. For more than a 90 percent share of Indonesian rubber to fulfill the export market, so Indonesia could play a very important role in the international market. Similarly, there are growing concerns among the rubber community to develop domestic markets. In the majority (about 84 percent) of rubber producers in Indonesia is smallholder growers and

concentrated mostly (more than 72 percent) in five production centers: North Sumatra, Jambi, Riau, South Sumatra and West Kalimantan. The rubber-based industrial development is obviously related to many segments of economic policy, including the technological advancement, information system and financial institutions and legal issues and enforcement structures in general. Therefore, the development of domestic rubber industry needs more strategic approach and policy to better support a high quality of economic recovery in the country. (Arifin, 2005)

At present, the competition among rubber exporters is becoming more intense. In order to increase rubber production, the Indonesian government is promoting the expansion of rubber growing area and partnering with strategic alliance in the tire industry to spread best practices in the cultivation of rubber among its smallholders. Consequently, Indonesia will become a more competitive player in the near future. Vietnam, India, and China are also producing a larger share of the world's total rubber output as opportunities for exporting grow with increasing trade liberalization. Free trade agreements (FTAs) will further create opportunities for rubber industry to expand into new markets.

Given this backdrop, the whole objective of this paper is to explore rubber behaviour from the export side, because for the last one year the price of rubber falling down, hence of entering new player producer from Indochina like Vietnam, Laos and Cambodia.

Our study is also related to recent studies using firm level data to examine the effect of exchange rate on exports. For example, Dekle, Jeong, and Ryoo (2008) use panel data of Japanese exporters for the period of 1982-1997 and find the exchange-rate elasticity of export to be statistically significant and have a value of 0.77. Drawing on French firm-level data for the period of 1995-2005, Boman, Martin, and Mayer (2012) uncover the heterogeneous reaction of exporters to real exchange rate changes: high-performance exporters increase more their markup but less their export volume in response to a currency depreciation.

In particular, this study therefore aims to examine the factors that can influence the export of crumb rubber with the following specific objectives:

1. Estimate the factors influencing the crumb rubber export trade.
2. Propose some policy recommendations based on the findings of this investigation.

II. LITERATURE REVIEW

International trade is the exchange of goods and services across national boundaries. It is the most traditional form of

international business activity and has played a major role in shaping world history. It is also the first type of foreign business operation undertaken by most companies because importing or exporting requires the least commitment of, and risk to, the company's resources. For example, a company could produce for export by using its excess production capacity. This is an inexpensive way of testing a product's acceptance in the market before investing in local production facilities. A company could also use intermediaries, who will take on import export functions for a fee, thus eliminating the need to commit additional resources to hire personnel or maintain a department to carry out foreign sales or purchases (Daniels and Radebaugh, 2004).

Why do some countries export or import more than others? Several studies have been conducted to establish major factors that influence exports. The trade and exchange rate regime (import tariffs, quotas, and exchange rates), presence of an entrepreneurial class, efficiency enhancing government policy, and secure access to transport (and transport costs) and marketing services are considered to be important influential factors of export behavior (Kaynak and Kothavi, 1984; Fugazza, 2004). A study on the nature, composition, and determinants of Singapore's technology exports suggests that the country's open trade and investment regime and development-oriented economic policy have been the key factors in enhancing the country's exports. Singapore's economy has shown continued and remarkable growth in exports for over thirty years with only two brief and mild recessions in the mid-1970s and mid-1980s. Its total trade as a proportion of GDP remains one of the highest in the world, over 300 percent of GDP in 2003 (Fong and Hill, 1991; WTO, 2004b). A recent study on the determinants of export performance underlines the importance of foreign direct investment (FDI) and the general quality of the institutional framework. Foreign direct investment contributes to capital formation and helps promote the development and export of knowledge-based industries (Fugazza, 2004).

Related research for this study like Tang and Zhang (2012) find significant effect of exchange rate on the exit and entry of Chinese exporters as well as product churning. Li, Xu, and Xiong (2012) use detailed Chinese firm-level data to examine the effect of exchange rate on firms exporting behaviors, such as export volume, export price, the probability of exporting, and product scope. The main difference between our work and this literature lies in the identification strategy: while besides other variable we also explore the currency exchange monthly from 2005 until 2012 as an exogenous variable.

Yussof & Baharumshah (1999) examined the effects of the Malaysian dollar (ringgit) real exchange rate on the export demand for Malaysian primary commodities under alternative specification and estimation procedures. The results showed that the price and exchange rates were found to be inelastic meaning an increase in demand for exports due to depreciation in the ringgit may not be big enough to improve the balance of trade. Oskooee & Bourdon (2005) assessed the impact of the RMB-dollar exchange rate and volatility on U.S. agricultural exports to and imports from China using a moving standard deviation of the real RMB-dollar rate and the GARCH-based measure which yields more significant results. The results concluded that the exchange rate volatility has a significantly positive long-run effect only on export earnings of the non-agricultural sector

while depreciation of the dollar has an expected long-run effect on the import value of the non-agricultural sector and on export earnings of the agricultural sector. This is in line with the study conducted by (Erdal, et al., 2012).

Empirically, apart from Klaassen (2011) who established that exchange rate has insignificant effect on exports, several studies have found significant impact of exchange rate on export (see, Oskooee and Bourdon 2005, Erdal et al. 2012, Dincer and Kandil 2011 and Granskog and Wisdom 2003). These impact findings are however very mixed with some establishing positive while others getting negative impacts (see Hsu and Chiang, 2011).

Dincer & Kandil (2011) explored the asymmetric effects of random exchange rate fluctuations on exchange rate movements on export sectors in Turkey using data from spanning 1996 to 2002 and 2003 to 2008 from 21 exporting sectors. The results support the significance of exchange rate policy to export growth in Turkey in the period 1996–2002. Caglayan et al. (2013) investigated the effects of real exchange rate uncertainty on manufacturers' exports from 28 emerging economies. Adopting a two-step system GMM dynamic panel data estimator for the study, they established findings which supported the claims that exchange rate uncertainties affect trade flows emanating from emerging economies negatively. They also found out more importantly that trade effects of exchange rate uncertainties may very well depend on the direction of trade.

Erdal et al. (2012) conducted an empirical study of the effect of Real Effective Exchange Rate Volatility (REERV) on Agricultural Export (AGX) and Agricultural Import (AGM) in Turkey. The study period covered 1995 to 2007. The GARCH model was used. Long-term relationship between series was also determined using Johansen co-integration test. The direction of this relationship, on the other hand, was determined using pairwise Granger causality. The empirical results indicated that there was a positive long-term relationship between REERV and AGX series, while there was a negative long-term relationship between REERV and AGM. This is a position supported by (Oskooee & Bourdon, 2005)

III. DATA AND METHOD

The data for this study were obtained from secondary sources using time series data. They include the following; Central Bureau of Statistics (BPS), reputable journals, Indonesian Rubber Council (DEKARINDO), International Rubber Study Group (IRSG), and association of the rubber processing sector, GAPKINDO

Robust regression method was used to determine variables affecting export of crumb rubber by using STATA 12.0 software. The function is stated as: $XCr_t = f(PCr_t, PrCr_t, EXR_t, XCrMt, XCrTt, XCr_{t-1})$. Where as:

- i). XCr_t = Crumb rubber export quantity (000 tonnes) monthly between 2005 and 2012
- ii). $PrCr_t$ = Crumb rubber export price in SICOM market (USD/ton),
- iii). PCr_t = Quantity of Crumb rubber output (000 tonnes) monthly between 2005 and 2012
- iv). EXR_t = Exchange rate (USD) monthly between 2005 until 2012,

v). $XCrMt$ = Crumb rubber export quantity in Malaysia (000tonnes) monthly between 2005 and 2012,

vi). $XCrTt$ = Crumb rubber export quantity in Thailand (000tonnes) monthly between 2005 and 2012, and

vii). XCr_{t-1} = Crumb rubber export quantity in lag time (000 tonnes) monthly between 2005 and 2012.

If we expressed the equation of Crumb rubber export is to be expected influenced by quantity of crumbrubber output, price of crumb rubber in the SICOM marketprice, exchange rate, export of crumb rubber in Malaysia and Thailand and export of crumb rubber in the previous period as shown below.

$$XCr_t = a_0 + a_1 PCr_t + a_2 PrCr_t + a_3 EXR_t + a_4 XCrM + a_5 XCrT + a_6 XCr_{t-1} + g_1 \quad (1)$$

$$0 < a_6 < 1; a_1, a_2, a_3, a_4, a_5 > 0$$

IV. RESULTS AND DISCUSSION

The result of the robust regression method is presented in table 1. We prefer natural logs (that is, logarithms base e) because, coefficients on the natural-log scale are directly interpretable as approximate proportional differences. The coefficient of determination R^2 was 0.5009; Implying that the independent variables explain 50.09% of the total variation in the rubber export. The value was significant at 1% for rubber production ($b = 0.3523097$) and , exchange rate ($b = -0.7399705$), was significant at 5%. The F value (12.59); $P < 0.05$ is significant at 1%, implying that the model was significant.

The appropriate sign on crumb rubber production is positive; it implies that an increase in production will stimulate an increase in export. The crumb rubber price has a positive sign. This is in agreement with Okoruwa et al. (2003), who reported that an increase in producer's price of rubber will lead to an increase in export of rubber. The implication is that an increase in the crumb rubber price to match world price will encourage maintenance of rubber farms and increased output. Likewise for the production level of crumb rubber has a positive sign. While the magnitude of 1% output of crumb rubber will increase the export quantity as much as 0.3523%.

Table 1. Determinant of Crumb Rubber Export

Variable	Coefficient	T	Sig (p< α)
Constant	9.302866	2.98	0.0004
lnPCR	0.3523097	3.04	0.003*
lnPrCR	0.0042997	0.10	0.923
lnEXC	-0.7399705	-2.43	0.017**
lnXCRM	0.0294005	1.01	0.316
Ln XCRT	-0.0624168	-0.66	0.510
lnXCR _{t-1}	0.1898669	1.70	0.092***

Source. Computed from data using STATA 12.0

F = 12.59 ; $R^2 = 0.5009$; * = significant at 1% ; ** significant at 5% ;
*** Significant at 10%

We find a negative and statistically significant effect of a currency appreciation on quantity of exports. In terms of economic magnitude, a 1 % currency appreciation is found to

cause total exports to fall by 0.7399%...a significant number that may justify the concerns by government officials and exporters. This finding is in agreement with Mesike (2005) who also reported a negative relationship between rubber export and exchange rate.

Wang and Barrett (2007) found monthly exchange rate volatility affects agricultural trade flows, but not trade in other sectors in Taiwan. Kayode (2003) revealed that the low elasticity suggests potentially limited volume of agricultural export earning in response to the devaluation of the local currency. This finding also support by Sang, Sriboonchitta, Huang, and Wiboonpongse (2013) observed that the exchange rate return of the Thai Baht can affect the rubber price return, indicated the trade volume was an important factor in international product pricing.

As we know exchange rate is subject to various endogenous and exogenous factors which are outside the control of the exporter; which has to bear the risk. However, fluctuation in exchange rates is not of significance to the export flows of the selected agricultural products. The focus of trade diversification should not solely be on traditional large export markets, as this is not necessary were the growth can be achieved.

V. CONCLUSION

As the intermediary products in international trade, crumb rubber exports showed a significant relation between production level, exchange rate and export quantity in the lag time. Indonesia earned substantial foreign exchange from crumb rubber exports. However, major fluctuations in the export earnings have raised concern about the country's future growth potentials and self-sustainability.

VI. IMPLICATION POLICY

Indonesian crumb rubber exports, which were earlier dominated by resource products must be shifting in. No longer enjoys the luxury of exporting such products rather are exporting standardized manufactured products that compete with other countries in the Asia especially compare with Thailand. Given such structural change in the export trade and international trade environment, Indonesia needs to devise a longterm strategy to raise the quality of its exportables through adaptation of better technology and encouragement of foreign investment in moderately high-tech industries. The focus should be to move towards human-capital based products and remain less dependent on resource-based and or standardized manufactured products which face tremendous competition from relatively low cost countries such as Cambodia, India and Vietnam.

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