

What Determines Exports of Coconut Products? The Case of Indonesia

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Abstract

This study aims to investigate what factors determine the exports of coconut and its products. An ordinary least squares method was used to estimate the export value of copra as a proxy for coconut and its products against the explanatory variables, namely the average Gross National Income of eight Indonesia's coconut importing countries, the price of copra, and a dummy variable representing the 1997 economic crisis. Three model specifications were employed. Using the data covering the 1980-2016 period, ordinary least squares estimation results show that the higher the average Gross National Income of coconut importing countries the higher exports. Economic crisis has a significantly negative effect on coconut and its products exports. However, the effect of price is found insignificant. In the light of increasing importance of coconut products in the global market, the government should have a long-term strategy for coconut plantations rejuvenation and expansion. Incentives should also be provided for farmers to increase domestic production of coconuts to support exports.

Keywords: Exports of Coconut, The Price of Copra, Economic Crisis

Introduction

Rapid expansion of oil palm cultivation in Indonesia has been at an alarming rate. In addition to environmental concern, land use change has made the local population the biggest loser (Acosta & Curt, 2019). Environmentally friendly coconut plantations can gradually replace oil palm plantations in tropical countries like Indonesia. Healthy and highly-valued Virgin Coconut Oil (VCO) is especially important for a country like Indonesia where many households farm coconuts on a small scale, and the country can benefit a lot from a widely open international market (Annas, 2015). Coconut (*Cocos nucifera*) is one of important

commodities in most of tropical countries (Li, Martínez-Padilla, Xu, Zisu, & Juliano, 2018) and is usually an important source of income and livelihood for smallholding farmers, especially in coastal areas (FAO, 2001); (Port, 2017). Various products are produced from coconut. Among the products made from coconut are coco chemicals, coco fiber - which is mostly used to make sofas, doormats, brooms, etc., coconut cooking oil, desiccated coconut - grated coconut for making coconut milk), nata de coco jelly, and activated charcoal. There are numerous other products traditionally made from coconut palm, for example, roofing material (from leaves), ropes and strings (coir from husk), beverages (coconut juice, toddy from inflorescences), food (coconut, palm heart), fuel (from husks, nuts and dried leaves), and wood (from the stem). The main produce, however, is coconut oil pressed out of copra, the dried kernel of mature coconut (Mead, 2001; Darwish, 2016). Coconut oil and coconut milk expelled from fresh coconut meat are important edible oils, widely-used ingredients in Asian cooking.

In addition to copra as the intermediate product of coconut, virgin coconut oil (VCO) could also actually be an important export commodity (Annas, 2015). Coconuts historically used to be a prominent traded commodity during colonial times. (Droessler, 2018), for example, argues that one of the ways Samoans responded to colonial capitalism was through their sovereignty over their coconut farming subsistence. Coconut was not just a vital source of food, it also provided an insurance against environmental disasters. It was also a strong foundation for them to protect their political and social self-determination against colonial demands, for example in resisting the colonial German attempt to introduce a large-scale plantation. Recently the branding coconuts as a healthy alternative to other oil fats leads to increasingly greater prospect for this tropical commodity (Lin, Flachsbarth, & Cramon-Taubadel, 2018).

Research interest in coconut is growing rapidly. As (Prades, Salum, & Pioch, 2016) point out, in addition to copra, the main output of the coconut sector, crude coconut oil (CNO), coconut water, virgin coconut oil (VCO), and coconut sugar are becoming increasingly more important on the international market. However, in order for coconut product exporting countries to take full advantage of the coconut product exports and gain a greater share in the world market, a suitable macro policy to increase exports is required.

The research questions for this paper are twofold. First, do foreign income and prices affect the value of coconut product exports. Second, does the economic crisis affect it and is there any difference of the two variables in pre- and post-crisis periods.

Literature

Exports of coconut products by coconut-producing and exporting countries are usually affected by both domestic and international factors. Domestic incentives or disincentives as well as foreign trade shocks may influence the relative returns to coconut production and exports. For example, in early 1990s the Philippines was the world's leading coconut exporter. However, the declining terms of trade in the world market and changes in the domestic income from coconut farming relative to other commodities production, have become disincentives such that exports decline (Boyce, 1992). The country once shipped about 80% of its coconut oil (Anonymous, 2011). However, due to domestic supply shortage, the Philippine coconut oil exports declined by nearly 75% in mid-2011. Exchange rate and export prices directly and indirectly affect the exports of coconut products. In the case of Sri Lanka, the depreciation of domestic currency could raise the income of exporters and the government tax revenue, which in turn increase productivity. Processing of coconut is also

influenced by export prices (Sivarajah, 2010). Domestic copra production may decline due to changes in exogenous factors such as pressures on exports (Pollard, 1985). Similarly, Indonesia's exports of coconut depends internally on domestic production and inflation rates and externally on foreign prices and exchange rates (Risviyaldi, 2017).

A careful macro policy to boost exports and income of the coconut farmers may not be an easy choice. Export taxes may result in distributional effects domestically and coconut farmers may be the worst affected. (Warr, 2002) shows that because of the fact that coconut producers are unskilled and among the poorest in the Philippines, an export tax will depress them while at the same time raise skilled wages throughout the economy. In other words, the unskilled labor-intensive coconut farming suffers most from the regressive distributional effects of export tax.

(Lin et al., 2018) suggest that foreign institutions significantly affect the trade performance of 26 coconut exporting countries to the top three coconut importing countries. Whereas the quality of domestic institutions has no effect on the coconut trade flow. A study on Indonesia exports of crude coconut oil (CCO) shows that export price, importing country's population and GDP real per capita, rupiah real exchange rate and the Philippine's CCO export price significantly affect Indonesia's CCO exports (Djoni, Darusman, Atmaja, & Fauzi, 2013).

Copra, from which various products are made, represents the major coconut product in the world market. Copra is a 4 digit HS92 product (Anonymous, 2019a) and is the 1149th most traded product and the 1108th most complex product according to the Product Complexity Index (PCI). Indonesia is the second top exporter of copra next to Papua New Guinea (The Observatory of Economic Complexity, 2019). With a share of 20% of USD146 millions of exports value, Indonesia ranks the fourth largest exporter of copra (Anonymous, 2019a). Other big exporters include the Solomon Islands, Vanuatu, and Malaysia. Meanwhile, the five big importers of copra are the Philippines, Bangladesh, Pakistan, Malaysia, and Fiji. Due to the lack of local supply of copra, the Philippines, the largest coconut oil exporter in the world, experienced a sharp decline in exports of coconut oil in early 2010s (Anonymous, 2011). This creates an opportunity for Indonesia to boost exports of copra to the Philippines. However, Indonesia lacks copra supply for exports. There is a shortage of copra because of several factors, namely on average land ownership by farmers is small and coconut plantations are usually remote from villages and therefore farmers tend to sell raw coconuts instead of processed copra (Baskara & Supriono, 2018).

Price and quantity of copra production significantly determine on-farm income at the village level (Diman, Rauf, & Kalaba, 2018). Coconut farming is usually commercially-oriented in most places and a large portion of production is intended for further processing. In an Indian district, for example, over 90 percent of harvested coconut is for copra processing (Sivanesan & Prabin, 2013). In the Philippines, approximately 80% of coconuts are processed into copra. Coconut crude oil and animal feeds sell very well in the world market.

The Data and Method

Data

The data set was constructed from various sources, namely Indonesian Ministry of Agriculture, Ministry of Trade and Industry and the World Bank. Table 1 lists and describes the variables used in the model and a brief summary of statistics is shown in Table 2.

Table 1

A brief summary of variables

Variable	Definition	Source
EX	Indonesia's exports of copra in US dollars	Directorate General of Plantations the Ministry of Agriculture
FI	Average of gross national income of Indonesia's major copra export destination countries, in current U.S. dollars, Annual from 1980 to 2016	World Bank (for the 1980-2014 period) and Indonesian Ministry of Trade and Industry (for the 2015-2016 period).
FP	Price of copra in foreign markets, in US dollars per metric ton	World Bank

Table 2

Descriptive statistics

Variable	Mean	S.D.	Min.	Max.
EX	32789.51	12650.15	10078.00	61449.00
FI	320824902190.78	248254018967.01	74120519405.00	806635821616.00
FP	484.43	223.23	197.00	1157.00

Copra is used as a proxy for coconut products. The data on gross national income of eight countries that import Indonesia's copra are used to calculate the average foreign income (FI).

$$AFI_t = \frac{\sum_i^8 GNI_{it}}{8} \quad (1)$$

where AFI_t is the average foreign income of eight countries in year t . GNI_{it} is the gross national income of country i in year t . The eight countries are the Philippines, Bangladesh, South Korea, India, Pakistan, Malaysia, Iran, and Australia. Foreign prices (FP) are the prices of copra per metric ton published by the World Bank and the Indonesian Ministry of Trade and Industry.

Methodology

The use of time series data for the variable of interest have several advantages. By choosing only two explanatory variables on the right-hand side reducing the risk of having multicollinearity. The average gross national income of copra importing countries and prices of copra are less likely correlated and therefore the degree of multicollinearity can be reduced by regressing exports of copra (EX) on only the two variables. In addition, it is also simple and justifiable for the fact that the use of time series data allows only time-variant relationships rather than a more complicated cross-sectional model.

As outlined in Section 2, the potential confounding variables that may affect exports of copra are numerous. However, the choice of the two independent variables suggests that the price of copra substitutes, export taxes, domestic production and prices of coconut and copra, and changes in domestic income are controlled variables in this study. Thus, following (Sivarajah, 2010) and (Risviyaldi, 2017), the explanatory variables are limited to the two external factors only. Therefore, the basic model is written as follows:

$$EX_t = \beta_0 + \beta_1 AFI_t + \beta_2 FP_t + \mu_t \quad (2)$$

where EX_t is the US dollar value of Indonesia's exports of copra in year t . AFI_t is the simple average of gross national income of eight countries that import copra from Indonesia in year t . FP_t is the price of copra in foreign markets, in US dollars per metric ton. μ_t is a stochastic disturbance term.

Exports may also be affected by economic crises because of the fluctuations in the exchange rates. Hence, to account for this effect, the 1997 economic crisis dummy (D) is used. Therefore, the model is written as follows:

$$EX_t = \beta_0 + \beta_1 AFI_t + \beta_2 FP_t + \beta_3 D_t + \mu_t \quad (3)$$

Ordinary least squares estimation was conducted for three specifications. The first specification was estimated for the whole 1980-2016 period with a crisis dummy being included. The second specification was estimated for the period before the economic crises (1980-1997) and the third specification was performed to cover the period after the crisis only (1998-2016). Data stationarity tests were conducted in order to avoid spurious regression results. Then Johansen System Cointegration Test was also carried out to find out whether there exist relationships as specified in the model and an OLS estimation can be applied even to nonstationary series.

Descriptive Statistics on Production and Exports of Coconut

Indonesia has become the most important coconut products producer and exporter. Commercial coconut oil contributes nearly 80 percent, the greatest share, to Indonesian coconut-based exports in 2000. Copra meals and copra ranks the second at 11% (Henderson, Henry, & MacAulay, 2006). With 18.98 million tons of coconut production, Indonesia is the largest producer of coconut in the world and shares around 30 percent of world production (Anonymous, 2019b). Although the domestic consumption of coconut and coconut products is huge in Indonesia, the country is a major player in exports of those commodities (Port, 2017). It has become the second largest exporter of coconut products in the world, after the Philippines. Together with other three coconut exporting countries, i.e. Sri Lanka, Vietnam and India, the five countries shared over 70 percent of the world coconut exports in 2016 (Central Statistics Agency, 2016).

As an archipelagic country, Indonesia has the advantages for coconut growing because coconut can be naturally grown all over the archipelago with minimum care. Coconut and its products can replace palm oil which is increasingly controversial in the global context. Coconut has a good prospect for Indonesia amid the growing world demand for coconut products. However, between 2014 and 2016 the value of Indonesia's copra exports drastically declined and accordingly coconut production also dropped. With the shortage of world supply of coconut and coconut products, it is a great challenge for Indonesia to grasp the growing market opportunities for the commodities. With the decline in the value of oil and natural gas exports, the country has made a lot of effort to accelerate non-oil and gas exports. Coconut has become one important source of household income as well as a source of foreign exchange (Direktorat Jenderal Perkebunan - Kementerian Pertanian RI, 2016).

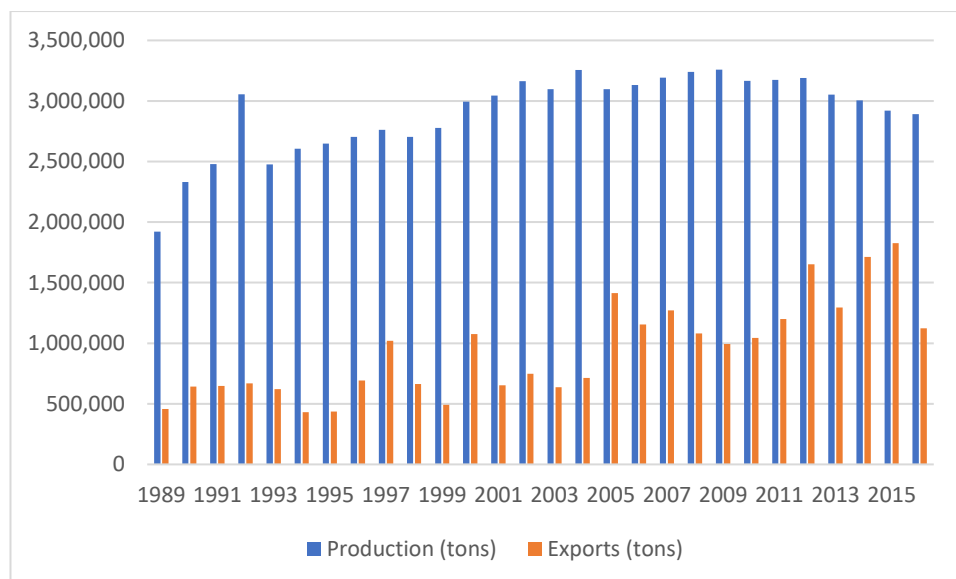


Figure 1. Coconut production and exports (tons)

Source: Directorate General of Estate Crops, Ministry of Agriculture of Indonesia (<http://ditjenbun.pertanian.go.id>), Tree Crop Estate Statistics of Indonesia 2015 - 2017: Coconut

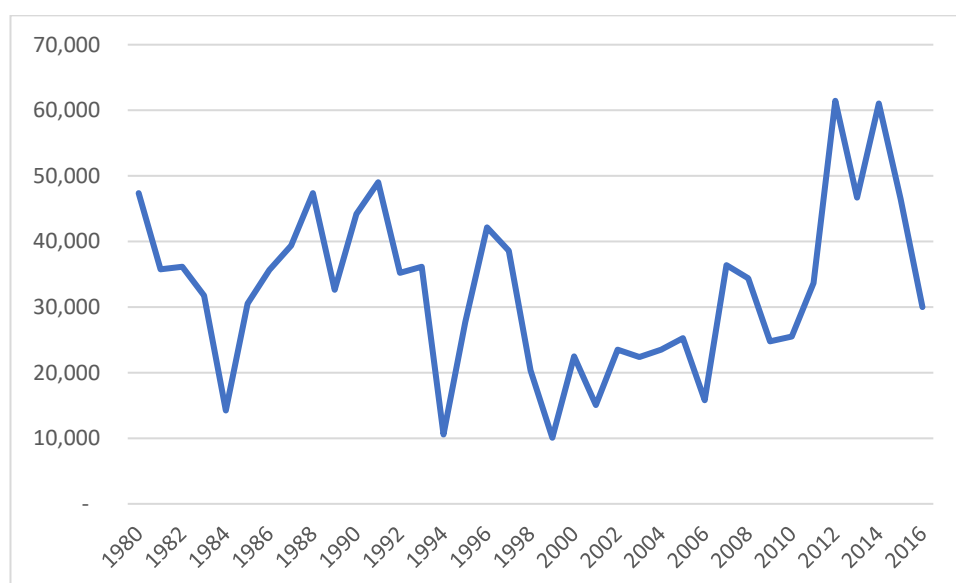


Figure 2. Value of copra exports (US thousand dollars)

Source: Directorate General of Estate Crops, Ministry of Agriculture of Indonesia (<http://ditjenbun.pertanian.go.id>), Tree Crop Estate Statistics of Indonesia 2015 - 2017: Coconut

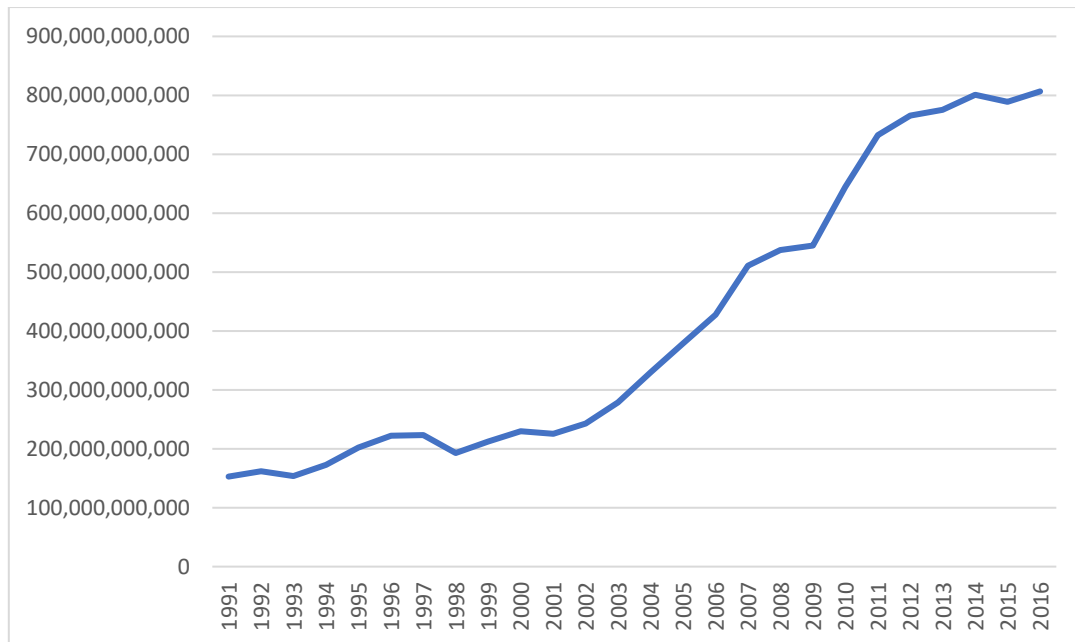


Figure 3. Average Gross National Income of 8 coconut importing countries (US dollars)
Source: World Bank (for the 1980-2014 period) and Indonesian Ministry of Trade and Industry (for the 2015-2016 period).

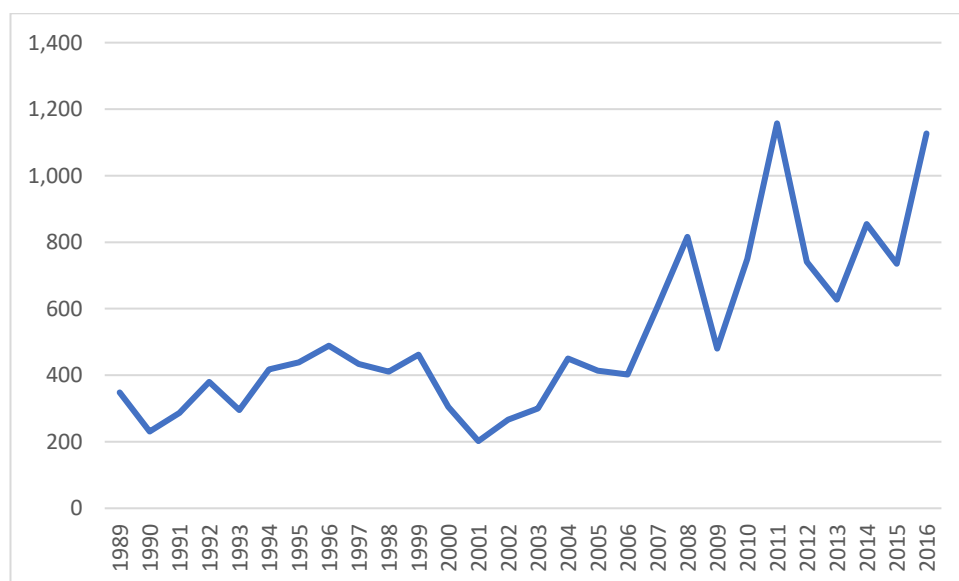


Figure 4. Price of copra per ton (US dollars)
Source: World Bank

Figure 1 displays Indonesia's exports of coconut. Over the period from 1989 to 2004 production increased from year to year with the highest production occurring in 1992. From 2005 to 2009, the country produces a rather stable level of output of around 3 million tons of coconuts per year, although there is a slight decline during the period from 2010 onward. Exports fluctuate and so is domestic use. On average, the amount of exported coconut represents less than half of production, except for 2012, 2014, and 2015. Exports of coconuts depend on the relative incentive factors such as foreign income, prices and exchange rates. The Asian economic crisis caused Indonesian rupiah depreciated against the US dollar and resulted in increased exports from 1999 and onward. The export value fluctuates even more

erratically (see Figure 2). Although the average Gross National Income sharply increases from 2001 onward (Figure 3) and copra prices from 2008 (Figure 4), coconut exports do not seem to be much affected. Nevertheless, over the long period the two external factors seem to be important determinants of Indonesia's coconut exports.

Results and Discussions

Stationarity test results

Table 3 shows the results of Phillips-Perron Test for data stationarity. None of the explanatory variables are stationary at level in the three specifications. This overall no stationarity results provides a justification to use ordinary least squares (OLS) estimation and so spurious regression can be ruled out as a possibility. In order to further justify the use of OLS estimation, cointegration tests are also carried out and the results are shown in Table 4.

Table 3

Phillips-Perron Test for Data Stationarity

Explanatory Variable	Specification 1	Specification 2	Specification 3
EX	NS	NS	NS
AFI	NS	NS	NS
FP	NS	NS	NS

NS - Nonstationary

Table 4

Cointegration Test Results

Unrestricted Cointegration Rank Test (Trace)				
Specification	Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.**
1	None *	50.93910	47.85613	0.0249
2	None *	39.53864	29.79707	0.0028
3	None *	32.47019	29.79707	0.0240

Table 4 shows that the Johansen System Cointegration Test has the value of Trace statistics greater than the critical value at a 5% significance level. This implies that in the short term each variable in the study will balance each other so that in the long term there is a balance. In other words, the specified model is cointegrated. Thus, the OLS estimation method for the nonstationary time series can be used.

Estimation Results

Table 5 provides the results of estimation of the three specifications. Foreign income has a significantly positive effect on coconut exports only for specifications 1 and 3. Under specification 1 the effect of foreign income on exports is positive, while foreign price is not significant in both specifications. Exports drop as a result of economic crisis. A million dollar increase in the average Gross National Income of coconut importing countries raises 6.78 US dollars in the value of Indonesia's coconut exports regardless of whether the period considered is before or after the economic crisis. Meanwhile, its effect is smaller during the period after the economic crisis. Under specification 2, both foreign income and price have no significant effects. In other words, for the period before the economic crisis the two

variables do not affect exports of coconuts. The positive effects of foreign income are consistent with the findings of (Tokuo & Hayato, 2014).

Table 5

Results of OLS Estimation of Exports (EX)

Variables	Specification 1	Specification 2	Specification 3
C	34773.03*	51938.04*	7844.745
AFI	0.0000000678*	-0.00000000149	0.0000000644*
FP	-22.58665	-42.63167	-16.21027
D	-24910.55*	-	-
R-Squared	0.483150	0.232285	0.653429
Adjusted R-Squared	0.436164	0.129923	0.610108
S.E. Of Regression	9498.876	9575.645	9021.835
S.D. Dependent Var	12650.15	10265.72	14448.50
F-Statistic	10.28278	2.269254	15.08332
Prob(F-Statistic)	0.000063	0.137721	0.000208
Sample	1980-2016	1980-1997	1998-2016

*Significant at 5 percent

Foreign price of copra is not significant for the fact that income is the sole determinant of coconut exports. This is partly because the share of coconut products in total consumption is so small that the effect of price changes is negligible. The US, one of the largest key coconut consumer countries, consumed only 1.4 kg coconut per person, while Indonesia consumed only 1.1 kg (Anonymous, 2018a).

Prices of coconut and coconut products seem be increasing for several reasons. The world demand for coconuts as healthy food is expected to rise, whereas the shortage of coconuts would persist for a long period. The higher the per capita income the higher demand for healthy coconut products would be. In addition, coconut palm trees can only be cultivated in certain tropical countries and land become increasingly scarce. Often a large area of land for coconut plantations is infected by disease Anonymous (2018b), and if it happens the supply of coconuts will be affected. Coconut exports would then be very much dependent on the growth of foreign income and domestic supply.

Conclusions

Coconuts and coconut products are increasingly important export commodities for tropical countries like Indonesia. However, significant external factors that affect exports of coconut products are foreign income. Price of coconuts is not a significant factor determining exports. The effect of economic crisis is significantly negative. An increase in the average Gross National Income of coconut importing countries raises the value of Indonesia's coconut exports, especially in the period after the 1997 economic crisis. The insignificance of price implies that consumption of coconut and its products may be only a small share of consumers' total expenditures, and hence income effects are dominant. A microeconomic study to investigate income effects and price effects on the demand for coconut and its products should be an agenda for further research. Foreign demand for coconut products may increase in the light of the fact that consumers become more aware of the importance of coconuts as a healthy food. Furthermore, because the shortage of domestic supply of coconuts could

hamper exports, the government should have a long-term strategy to rejuvenate old coconut palm tree plantations and provide incentives to farmers to open new plantations. The government should also support research and development in coconuts as the commodities become increasingly important in the global market.

Furthermore, suggestions for future study include the need for more thorough studies on the factors that determine export demand for coconut and its products, using cross-country data and micro-level data. It is also suggested that coconut-producing countries develop and diversify products from coconuts and intensify campaign for increased use of healthy coconut products.

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