# Estimating Demand of India and China for Indonesian Palm Oil Export

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## Abstract

*There has been a shift in the destination of Indonesian palm oil exports from European markets to India and China in recent years. This article aims to estimate the demand of these two countries for Indonesian palm oil exports. This article argues that price supporting policies play an important role behind the increase in the quantity of the demand for Indonesian palm oil exports. This article concludes that it is crucial to disaggregate palm oil data into crude palm oil data and refined palm oil products. This is because it can contribute significantly to improve the results of the price estimation and income elasticity of Indonesian palm oil export for both India and China.*

*Keywords: palm oil exports, price estimation, income elasticity*

## A.    INTRODUCTION

Based on current world market condition, the consumption of palm oil surpasses that of any other vegetable oil today. Moreover, in terms of quantity produced per year, palm oil assumes the number one position if compared with other oils. In its annual report, the United States Departement of Agriculture (USDA) underscores the fact that both world supply of, and demand for, palm oil are projected to increase significantly (October, 2011). The same report notes that world palm oil production today stands at 50,281 thousand metric tons. Meanwhile, palm oil trade is also showing an upward trend. Exports and imports of the commodity registered an increase of 38,009 thousand metric tons and 38,925 thousand metric tons, respectively. Such a substantial increase in production, and international trade in palm oil, makes the commodity to enjoy the largest share of the world's market in vegetable oils. Palm oil production contributes 32 percent of

vegetable oils market, which is followed by soybean oil. Palm oil also contributes the largest percentage to total import and exports of vegetable oils on the world market, carving out a share of 63% and 62%, respectively. This is an indication that palm oil contributes most to the world market vegetable oils market.

Indonesia and Malaysia, are renowned for being the two largest producers and exporters of palm oil in the world market today. Palm oil sector plays an important role in the economies of both Indonesia and Malaysia. Since 2009, Indonesia has become the largest palm oil producer and exporter of palm oil, with Malaysia assuming the number two slot, in both respects. This is attested by an USDA report (October, 2011), which puts the combined contribution of production and export of Indonesia and Malaysia palm oil to the world market at 87% and 90%, respectively. As regards Indonesia, the Government of Indonesia has plans to attain the target of twenty two million tons of palm oil production and palm oil acreage to nine million ha by 2020. Such factors underscore some of the factors that

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underlie the important position Indonesia enjoys in the palm oil World market.

The direction of trade of Indonesian palm oil shown an upward trend over the last five years. Moreover, it is also important to note that the destination of Indonesian palm oil has shown a shift from European countries to India and China , which have become the two largest importing countries for Indonesian palm oil. Restrictions palm oil exports face in Europe, manifested in among other measures, regulation relating to environmental standards, has been one of the factors responsible for that shift in the direction of Indonesian palm oil exports. Based on USDA Report (November 2011) India assumes number one importer of Indonesian palm oil for 2007-2011 period. In November 2011, India imported 7,250 thousand metric tons of palm oil, while China was second in importance, and imported 6,300 thousand metric tons of the commodity during the same period. Moreover, PORAM data show that during 2004 to 2008 period, the share of India's palm oil imports Indonesia increased significantly every year. In 2008, the share of Indonesian palm oil exported to India's constituted about 85 % of India's total palm oil imports. In the case of China, Indonesia palm oil exports contributed 34 percent of that country's imports of the commodity in the same period. In light of that, India and China are the two main destinations of Indonesian palm oil exports. To that end, this study uses monthly data to estimate the demand for Indonesian palm oil in India and China. Data used were for the period between January 1996 and July 2010. The estimation of the demand for palm oil export demand is based on the assumption that export supply of Indonesian palm oil is inelastic.

## B. LITERATURE REVIEWS

Export Demand is the differentiated form of the demand model. Goldstein and Khan (1975) model is the renowned export demand model. The export demand model assumes the following specification:

$$X_i^d = j(Y * e);$$

Where:
quantity demanded for exported good
income of importing countries
price of exported good
price of substitute good in importing countries
exchange rate

In addition to the theoretical framework, a number of studies on the price and income elasticity for Indonesia palm oil both at the aggregate and country levels are available in extant literature. With respect to estimating export demand elasticity of Indonesian palm oil export for India and China, a study by Yulismi and Siregar (2007) found that India has an inelastic price elasticity in the short-run and in the long-run, but showed an elastic income elasticity in long-run. China was found to have an elastic price elasticity and inelastic income elasticity for Indonesian palm oil exports, both in the short- run and in long-run. Yulismi and Siregar (2007) study also conducted an estimation of the price and income elasticity for Malaysian palm oil exports. Their results showed that Malaysian palm oil exports had an elastic price and income elasticity in the cases of India and China, both in short- run and in long-run. On the same note, a study conducted by Shariff et al. (2006) found that Malaysia palm oil exports showed elastic price elasticity for India but inelastic price elasticity for China. Meanwhile, as regards income elasticity, Malaysian palm oil exports were found to have an elastic income elasticity for India and China in long-run, but it is inelastic in the short-run.

Furthermore, Abdullah (2011) using an ECM model examined the price and income elasticity of Indonesian palm oil export to the world market. Results indicated Indonesian palm oil exports have an inelastic price and income elasticity both in the short- run and in the long-run. Rifin (2010a) analyzed the mar-

ket share of palm oil exports from Indonesia and Malaysia to Asia, Europe and Africa using CMSA (Constant Market Share Analysis). Rifin (2010a) found that Indonesian palm oil exports are more competitive in Europe than Malaysian palm oil exports during 1999-2001 and 2005-2007 periods.

More ever, a study by Rifin (2010a) reveals that Indonesia and Malaysia palm oil exports have an inelastic price elasticity both in the short- run and in long-run. However, in terms of income elasticity, Indonesia palm oil exports were shown to be elastic income elasticity both in the short- run and in the long-run, while Malaysia palm oil exports showed inelastic income elasticity in the short- run and in the long-run. Niemi (2004)'s study of Indonesia and Malaysia palm oil exports were found to show elastic price and income elasticity in the European Market. Nonetheless, Malaysia palm oil exports were found to have higher price and income elasticity that Indonesian palm oil exports. To that end, unlike previous studies, this study attempts to estimate price and income elasticity for Indonesian palm oil export to India and China, which are the two largest importing countries. The study uses monthly data for January 1996 to July 2010 period, and the Error Correction Model.

## C. DATA, SOURCE AND METHODOLOGY

### 1. Data and Source

This study uses monthly data for the period between January 1996 and July 2010, to estimate the demand of India and China for Indonesian palm oil exports. Data for the quantity of Indonesian palm oil exports to India and China were taken from IDE JETRO database, at Nagoya Office; the export price of Indonesian palm oil is based on the unit value, which was taken from IDE JETRO at Nagoya Office, and is deflated by world consumer price index; the income data for India and China were taken from International Financial Statistic, IMF. World soybean oil price data were obtained from the International Financial Statistics, IMF, which represents a substitute for palm oil.

### 2. Methodology

The estimation model used in this study is underpinned by an assumption that Indonesian palm oil exports has an infinite elastic export supply. This means that supply can adjust to the rise in demand due to availability of land in Indonesia. To that end, this study uses the export demand approach to estimate the demand of India and China for Indonesian palm oil export during January 1996 -July 2010 period. The export demand model, this study uses is shown below:

$$XI_t = {}_0 + {}_1 PXI_t - {}_2 PSI_t + {}_3 YI_t + ... \quad (1)$$

$$XC_t = {}_0 + {}_1 PXC_t - {}_2 PSC_t + {}_3 YC_t + ... \quad (2)$$

Where:
Indonesian Palm Oil Export Quantity to India and to China respectively (t) and Real Export Price of Indonesian Palm Oil Export to India and to China respectively (USD/t) and Real World Price of Soybean Oil in India and China (USD/t)
Eeal Income of India (USD)
EC = Error Correction Term means all variables are in the form of difference

## D. FINDINGS AND DISCUSSION

Since the data used are in time series, conducting test for stationarity of variables, using ADF Test was deemed necessary. To that end, the unit root test using ADF Test was conducted both on data for India and China using none, constant included and constant and trend included specifications. The results are categorized into two: the case for India and China, as depicted hereunder:

*- India*

**Table 1**
ADF Result of India

| Variable | ADF Test | ADF Test | ADF Test |
|---|---|---|---|
| | **None** | **Constant Included** | **Constant and Trend Included** |
| **Level** | | | |
| Export Quantity | 0.269995 | -4.210068*** | -8.199696*** |
| Price of Indonesian Palm Oil Export to India | -0.297506 | -9.298507*** | -9.302071*** |
| World Soybean Oil Price | -0.235838 | -2.10656 | -2.222536 |
| India Income | 2.565265 | -0.182407 | -3.218683* |
| | | | |
| **First Difference** | | | |
| Export Quantity | -10.36797*** | -10.35869*** | -10.32959*** |
| Price of Indonesian Palm Oil Export to India | 10.64212*** | -10.61048*** | 10.60296*** |
| World Soybean Oil Price | -9.498520*** | 9.472537*** | -9.490315*** |
| India Income | -23.55879*** | -24.08320*** | 24.03197*** |

Source: Author's Calculation

Note: ***Significant at 1% probability level.

As depicted in table above, ADF test results show that all variables were stationary at 1% probability level in three categories. In light of that, taking the next step involving conducting co-integration test on residual, becomes admissible. The results of that process are presented in Table 2.

The result from the co-integration test shows that residual is stationary, an indication that there was co-integration between all variables. To that end, the last step involving conducting the error correction model (ECM) analysis for India case was done.

The result of the ECM model estimation show that the price and income elasticity of Indonesian palm oil export for India are elastic both in the short-run and in the long-run (with negative sign, which is an expected result). In the short-run, price elasticity is shown to be 1.31, which means that an increase of 1 percent in the price of Indonesian palm oil exports to India, induces a decrease of 1.31 in the quantity of Indonesian palm oil exports to India. In long-run, the price elasticity is larger than in short-run (It has value 1.49). World price of soybean oil, while not significant in the short-run, is shown to be significant in the long-run. This shows that in the short-run consumers in India do not find it easy to switch from consuming Indonesian palm oil to soybean oil in the event of an increase in prices of Indonesian palm oil exports. It is also notable that the

**Table 2**
Co-Integration Result of India

| Variable | ADF Test | ADF Test | ADF Test |
|---|---|---|---|
| | None | Constant Included | Constant and Trend Included |
| **Level** | | | |
| Residual (u) | -13.86086*** | -13.82052*** | -13.77892*** |

Source: Author's Calculation

Note: *** Significant at 1% probability value

**Table 3**
Short-Run and Long-Run Estimates of India Export Demand

| Period | Constant | Export Price | Soybean Oil Price | Income | Error Correction | Result |
|---|---|---|---|---|---|---|
| Short-run (ECM) | 0.01 | 1.31 | -0.12 | 1.27 | -0.49 | R2 = 0.75 |
| | (0.35) | (20.33)*** | (-0.17) | (3.10)** | (-8.04)*** | DW = 2.1 |
| Long-run | 3.55 | 1.49 | -3.26 | 1.69 | | |
| | (6.06)*** | (13.98)*** | (-14.13)*** | (19.03)*** | | |

Source: Author's Calculation

Note: *** = significant at 1% probability levels

coefficient of the income elasticity in the long-run is larger than in the short-run. In the short-run, income elasticity is 1.27 , while in the long-run it is 1.69. This means that in the long-run, an increase of 1 percent of incomes of Indian consumers , induces a decrease of 1.69 in the quantity demanded of Indonesian palm oil exports.

### - *China*

The same procedure and steps are applied to the case of Chin. The unit root test was conducted to test the stationarity of all variables. The ADF test result appear in the Table 4.

As shown in the table above, all the variables were found to be stationary in the first difference based on none, constant included, and constant and trend specifications. To that end, the second step of conducting a co-integration test using ADF test on the residual then followed. The result are presented in the Table 5.

Subsequently, the last step involving conducting an error correction analysis using the export demand model for China, was done. The results of the estimates of price and income elasticity for China are presented in the following table:

The ECM analysis result for the case of China, show that Indonesian Palm oil exports exhibit an elastic income elasticity in long-run and elastic price elasticity of soybean oil as substitute good in the long- run. The price of Indonesian palm oil exports, is not significant both in the short- run and in the long- run. Moreover, income elasticity is found to insignificant in the short-run but shown to be significantly elastic in the long-run. This means that imports of Indonesian palm oil in China is not sensitive to both price and incomes in the short- run but does so in the long-run. In the

**Table 4**

ADF Result of China

| Variable | ADF Test | ADF Test | ADF Test |
|---|---|---|---|
| | **None** | **Constant Included** | **Constant and Trend Included** |
| **Level** | | | |
| Quantity of Indonesian Palm Oil Export to China | -1.784878* | 3.311791** | -4.151112*** |
| Price of Indonesian Palm Oil Export to China | 0.033058 | -4.299932*** | -4.348252*** |
| World Price of Soybean Oil | -0.235838 | -2.10656 | -2.222536 |
| China Income | 2.843392 | -0.92408 | -1.883095 |
| | | | |
| **First Difference** | | | |
| Quantity of Indonesian Palm Oil Export to China | -16.18447*** | -16.13866*** | -16.10244*** |
| Price of Indonesian Palm Oil Export to China | -17.47315*** | -17.42718*** | -17.36744*** |
| World Price of Soybean Oil | -9.498520*** | -9.472537*** | -9.490315*** |
| China Income | -1.727431* | -3.428147** | -3.474196** |

Source: Author's Calculation

Note: ***Significant at 1% probability level

**Table 5**

Co-Integration Result of China

| Variable | ADF Test | ADF Test | ADF Test |
|---|---|---|---|
| | **None** | **Constant Included** | **Constant and Trend Included** |
| **Level** | | | |
| Residual (u) | -4.573977*** | -4.558986*** | -4.519721*** |
| | | | |

Source: Author's Calculation

Note: ****Significant at 1% probability level

**Table 6**
Short-Run and Long-Run Estimates of China Export Demand

| Period | Constant | Export Price | Soybean Oil Price | Income | Error Correction | Result |
|---|---|---|---|---|---|---|
| Short-run (ECM) | 0.01 | 0.03 | 5.20 | 1.65 | -0.68 | R2 = 0.33 |
| | (0.07) | (0.12) | (1.14) | (1.02) | (-9.12)*** | DW = 2.08 |
| Long-run | -22.85 | 0.05 | 3.43 | 3.39 | - | |
| | (-7.02)*** | (0.14) | (3.29)*** | (8.19)*** | | |

Source: Author's Calculation

Note: *** = significant at 1% probability levels

long-run, an increase of 1 percent in the income of oil palm consumers in China, induces an increase of more than 1 percent (3.39) in the quantity of Indonesian palm oil demanded. However, the price of soybean oil is shown to be elastic in the long-run, which means that if the price of soybean oil falls by 1%, it induces a decrease of 3.34 in the quantity demanded for Indonesian palm oil. This finding supports the notion that the demand for Indonesian palm oil in China is sensitive to incomes of palm oil consumers in China.

Findings of this study, with respect to elasticity of demand for Indonesian palm oil in India and China, which is found to be elastic, are different from those found by Yulismi and Siregar (2007). While the Yulismi and Siregar (2007) study established that price elasticity of Indonesian palm oil exports for India was inelastic while for China was elastic, in both the short-run and the long-run., this study, which used monthly data for January 1996 to July 2010 period, found that price elasticity of Indonesian palm oil exports to India us was elastic both in the short-run and in the long-run. Findings of this study are also different for China as well. This study found that the price elasticity of Indonesian palm oil export for China is insignificant in both the short-run and in the long-run. Price elasticity of demand shows the effects of change in price of palm oil exports can be divided into income

effect and substitution effects. The income effect refers to the effect on consumer demand when price changes but keeping other factors constant. If there is price change, the purchasing power parity of consumer also changes. If the price elasticity of demand is elastic, then an increase of 1% of the price of Indonesian palm oil exports to India, induces an increase of more than 1 percent in the quantity demanded for Indonesian palm oil export by Indian consumers. This is because the purchasing power parity of Indian consumer will decrease. The elastic price elasticity of demand for Indonesian palm oil exports by India consumers implies that the expenditure on Indonesian palm oil exports constitutes a large proportion of the total budget of Indian consumers. The other effect induced by price change is the substitution effect. Change in the price, implies a substitution effect of other goods. The elastic price elasticity of Indonesian palm oil exports to India, implies that the substitution effect for other goods is large. In addition, the price elasticity of Indonesian palm oil export for India, is larger in the long-run than in the short-run. This is mainly because in the event of an increase in the price of Indonesian palm oil exports, in the short-run Indian consumers face difficulties in switching from consuming Indonesian palm oil for alternatives such as soybean oil.

Income elasticity of Indonesian palm oil

exports to India was found to be elastic in both the short-run and in the long-run, while the case of China produces insignificant estimates in the short-run but was found to elastic in the long-run. Income elasticity of demand implies the change in income induces a change in quantity demanded for Indonesian palm oil exports. The elastic income elasticity of Indonesian palm oil exports to India shows that as incomes of Indian consumers increase by 1%, the quantity of demanded for Indonesian palm oil exports increases by more than 1%. This implies that Indonesian palm oil exports is an important good for Indian consumers. However, in the case of China, income elasticity for Indonesian palm oil exports is insignificant but is elastic in the long-run. Meanwhile, results also show significant and elastic price of soybean oil in the long-run.

The price and income elasticity of Indonesian palm oil exports for India and China, which this study show, also confirm the reality based on data that India and China are two major importing countries for Indonesian palm oil. The growth of income and population in India and China are two major important factors that are attributable for the large contribution the two countries make to vegetable oil consumption. China and India are the second largest consumers of vegetable oils in the world. Since 2007 to the present, Vegetable oil consumption in India and China has been increasing every year. In October 2011, based on USDA Report (October 2011), China consumed 20% of total world consumption of vegetable oil, while India was in the third position, consuming 11% of total world vegetable oil consumption. Moreover, on closer observation, it comes to light that in October 2011, India and China, imported 36% of total world palm oil. Additionally, from 2007 to October 2011, India and China have been the two largest consumers of palm oil in the World. This implies that the pattern of vegetable oil consumption in India and China has changed. During early 1970s, India consumed peanut oil and rapeseed oil as the major vegetable oils, but since

1999 to the present, India consumes palm oil and soybean oil as the two major vegetable oils instead of peanut oil and rapeseed oil. The trend and pattern of vegetable oil in China also shows a similar pattern to that in India. The pattern of vegetable oil consumption in China also changed. Currently, palm oil consumption contributes 70% to total vegetable oils consumption. Many researchers believe that the consumption of palm oil in India and China will significantly increase in future.

## E. CONCLUSION

The growth of incomes and population, as well as changes in policies and pattern of vegetable oils consumption in India and China, are key factors that underlie increase in consumption of vegetable oils. The elastic price and income elasticity of Indonesian palm oil exports for India and China in the short-run and in the long-run, have some implications for trade policies which should the Indonesian government should implement. Based on current condition, India and China are the two rapidly growing economies in the world. This means that Indians and Chinese are today enjoying ever rising incomes, which have led them to demand larger quantities of Indonesian palm oil exports. This should serve as a good opportunity for the Indonesian government to increase palm oil exports to India and China. Price supporting policies play an important role in supporting the increase in quantity demanded for Indonesian palm oil exports. Implementation of price supporting policies can be done by among other measures, reducing various barriers that that affect cost of production, effective and efficient marketing strategies and promoting innovation toward enhancing the quality of Indonesian palm oil products. Based on this study findings, the author recommends disaggregating palm oil data into crude palm oil data and refined palm oil products. This is because doing so should contribute significantly to improving results of estimation of price and income elasticity of Indo-

nesian palm oil export for both India and China.

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