4.1 Revealed Comparative Advantage

4.1.1 Measuring Revealed Comparative Advantages

There mainly exist two prominent theories of trade based on comparative advantage: the Ricardian theory and the Heckscher-Ohlin (H-O) theory. The Ricardian theory assumes that comparative advantage arises from differences in technology across countries while the H-O theory suggests that technologies are the same across countries. Instead, the H-O theory attributes comparative advantage to cost differences resulting from differences in factor prices across countries. In brief, the predictions of orthodox (classical) trade theories are based on the principle of comparative advantage which derives from relative price determination, i.e. differences in pre-trade relative prices across countries, underlined by supply and demand factors (Utku, et al., 2004)

According to the H-O theory, a country’s comparative advantage is determined by its relative factor scarcity (i.e. its factor endowment ratios, relative to the rest of the world or a set of countries). However, it is well known that measuring comparative advantage and testing the Heckscher-Ohlin (H-O) theory have some difficulties (Balassa, 1989) since relative prices under autarky are not observable. Given this fact, Balassa (1965) proposes that it may not be necessary to include all constituents effecting country’s comparative advantage. Instead, he suggests that comparative advantage is “revealed” by observed trade patterns, and in line with the theory, one needs pre-trade relative prices which are not observable. Thus, inferring comparative advantage from observed data is named “revealed” comparative advantage (RCA). In practice, this is a commonly
accepted method to analyzing trade data. Balassa (1965) derives an index that measures a country’s comparative advantage. The Balassa index tries to identify whether a country has a “revealed” comparative advantage rather than to determine the underlying sources of comparative advantage. However, since first suggested by Balassa (1965), the definition of RCA has been revised and modified such that an excessive number of measures now exist. Some studies measures RCA at the global level, others at a sub-global / regional level, and while some others evaluates the measurement as bilateral trade between two countries or trading partners.

4.1.2 Merits and Limitations of Revealed Comparative Advantage

The proper application of RCA can provide useful information for both business and policy decision-making. While unavailability of data is a major constraint to empirical application of other methods of measurement, the RCA approach is less demanding of data. The spirit of the RCA approach is to infer comparative advantage patterns through systematically comparing specialization patterns; i.e., a country’s relatively high specialization (compared to other countries) in one species reveals its comparative advantage in that species.

However, a well-recognized limitation of the RCA approach is that high specialization may not reveal true comparative advantage but result from policy or other distortions (Balassa, 1965). One way to mitigate this problem is to examine specialization patterns in time series rather than merely at a point in time.

Another limitation of the RCA approach is that it does not have straightforward policy implications. A country’s high RCA index in one species indicates that it has comparative advantage in this species and hence has devoted
relatively more of its resources to it. However, it is unclear whether the observed high specialization level is already optimal, still not high enough, or already excessive. Conversely, a low RCA index may not indicate comparative disadvantage but could reflect comparative advantage being unexploited. Therefore, once again, it is important to examine RCA indices over time rather than at a point in time. Notwithstanding these limitations, the RCA approach can still be very useful since it provides a systematic framework for comparing specialization patterns across countries.

4.2 Empirical Method

4.2.1 Changing Export Structure and Dynamics of World Demand

One of the tools that that was applied to measure the export specialization of CPO is the Revealed Comparative Advantage Index (RCAI), which manifest both post-trade relative prices and prevailing factors as well as product market distortions. Developed by Balassa (1989), the RCAI is defined as a ratio of the share of particular industry (or product) in a country's total exports to the share of the industry’s exports in world's total exports. For instance, the RCAI of country $i$ in product $a$ is the ratio of the share of $a$ in $i$’s total exports to the share of $a$ in the world’s total manufactured exports. Defined as such, the $(RCAI^i)_{a}$ can be presented as:

$$RCAI^i_{a} = \left( \frac{X^i_a / X^i_i}{X^w_a / X^w_i} \right)$$

Where

$X^i_a = \text{value of exports of commodity } a \text{ by country } i$
\[ \begin{align*}
X_i^t &= \text{value of total exports by country } i \\
X_w^a &= \text{value of world exports of commodity } a \\
X_w^t &= \text{value of total world exports}
\end{align*} \]

A rearrangement of the above equation gives the following expression:

\[ \frac{\left( \frac{X_i^a}{X_w^a} \right)}{\left( \frac{X_i^t}{X_w^t} \right)} = \frac{X_i^t}{X_w^t} \]

Equation above is the ratio of the country \( i \)'s export share in the world’s exports of \( a \) to the export share held by \( i \) in the world’s total export. Defined as such, the industry \( i \) exhibit revealed comparative advantage or has a greater specialization in the export of product \( a \) than the world as whole. In other words, a country has a revealed comparative advantage only in those products for which its market share of world exports is above its average share of world exports, i.e., if \( RCA^i_a \) is greater than one.

### 4.2.2 Export Competitiveness of the Indonesian Crude Palm Oil

It is important to note that changes in \( RCA^i_a \) over time will reflect trends in a country’s export specialization and that variation in an activity’s absolute level of \( RCA^i_a \) indicates its relative position in the country’s overall export structure. The absolute value of an activity’s \( RCA^i_a \), however, does not reflect its competitiveness in world markets. Alternatively, gauging export competitiveness through the export growth rate of an individual product or industry is also flawed as this measure fails to incorporate the world growth trends exhibited by a particular product category. For instance, if world markets for product \( a \) are growing faster than a country’s growth rate in the export of \( a \) then the country loses its export competitiveness in product \( a \).
This study used the export competitiveness index (XCI) to gauge the success (or failure) of Indonesia in contesting high growth markets. By incorporating changes in a country’s world market share, XCI provides a better indicator of export performance of a product or a set of products. A rise in the value of XCI over time reflects a product’s success in contesting high growth world markets. Export competitiveness of country \( i \) in export of product \( a \) (\( XCI^i_a \)) is expressed as a ratio of world market share of county \( i \) in export of \( a \) in period \( t \) (the period under review) to its world market share in the previous period.

\[
XCI^i_a(t) = \frac{X^i_a / X^w_a(t)}{X^i_a / X^w_a(t-1)}
\]

If XCI of a product takes a value of greater than one, this points towards rising export competitiveness. Similarly, a value of less than one implies declining market share in world markets. This index can also be seen as a ratio of the growth rate of country \( i \)’s export in \( a \) to the growth rate of \( a \) in world markets.

### 4.2.3 Indonesia’s Revealed Comparative Advantage in the Crude Palm Oil World Market

In the present climate of trade liberalization, both internal as well as external to Indonesian economies, an important question is the extent of competition or complementarity in world export markets between Indonesia and other world economies. The degree and nature of export specialization association between Indonesia and other CPO exporting member countries was evaluated by estimating the Spearman’s Rank Correlation (SRC) Coefficients of revealed comparative advantage indices between other economies and Indonesia in the world markets of crude palm oil.
The SRC coefficient compared the ranking of the two sets of RCAI by taking the differences of ranks, squaring these differences and then adding, and finally manipulating the measure so that its value will be +1 whenever there is a perfect positive association between two series of RCAI. A higher (positive) value of the coefficient indicates intense competition for export market between the two countries. Likewise, the SRC coefficient would be equal to -1 if the two series of RCAI are in perfect disagreement and zero if there is no relationship. Further a higher negative SRC coefficient points to complementarity in export specialisation of the two countries.

The Spearman’s Rank Correlation Coefficient is given by:

\[ r_s = 1 - \frac{6}{n(n^2 - 1)} \sum_{i=1}^{n} D^2_{RCAI_i} \]

Where \( D_{RCAI_i} \) is the difference between any pair of RCAI ranks.

\( n \) -is the no of items or countries

4.3 Factors Contributing to Competitiveness of Crude Palm Oil

The factors that contribute to the competitiveness were analyzed quantitatively through the use of a regression model. In this situation, a single equation model was used to estimate the factors that contribute to the competitiveness of Indonesian CPO in the world market. The theoretical model used for this analysis is represented in the Figure 5 below. From the model, a single endogenous variable i.e. export competitiveness index was used in the analysis. At the same time, six exogenous variables were used and they included exchange rate, export tax, productivity, population that was used as proxy for CPO demand, domestic price of CPO and world CPO price.
The equation used was as follows

\[ XCI_t = a_0 + a_1 \text{INTAX}_t + a_2 \text{WDN}_t + a_3 \text{WDPOP}_t + a_4 \text{INE}_t + a_5 \text{INPOC}_t + a_6 \text{INPOY}_t \]

\[ a_0, a_1, a_5 < 0; \quad a_2, a_3, a_4, a_6 > 0 \]

Where

- **XCI** = Export Competitiveness Index for Indonesian CPO
- **INTAX** = CPO Export Tax (%)  
- **WDN** = Population of world market (million)  
- **INE** = Indonesian exchange rate on average market rate (rupiah/USD)  
- **WDPOP** = World crude palm oil price (USD/t)  
- **INPOC** = Crude Palm oil consumption of Indonesia (1000 t)  
- **INPOY** = Palm oil yield of Indonesia (Ton/ha)
The equation shows that Export competitiveness Index of Indonesian CPO in the world market is negatively related to CPO export tax and the domestic consumption of CPO in Indonesia. This is due the fact that the above factors will reduce the export capacity to the world market. However, the export competitiveness index is expected to have a positive relationship with the world population, Indonesian exchange rate, productivity and world CPO price. Since it was only a single equation, the analysis was performed using the Ordinary Least Square Method (OLS).

4.4  Effect of Export Tax on Crude Palm Oil Performance

4.4.1 Theoretical Model and Model Specification

Simulation approaches on the econometric model of the industry was used to assess the impacts of CPO-export tax on various aspects of the Indonesian CPO industry. The econometric model developed in this paper is basically a modification of a model previously developed by Susila et al., (2004). The main model modifications are a re-specification of the model, level of aggregation and the use of a simultaneous equation system approach for all equations (the previous model used single equation for each country and simultaneous equation system for the world market).

The use of a simultaneous equation system approach was expected to yield better estimates because this approach is considered more appropriate in dealing with a system of commodity market in which some variables are simultaneously related or interdependent (Koutsoyiannis, 1977). A simplified theoretical model illustrated in Figure 6 shows the hypothetical relationships between variables in the model.
Figure 6. General Empirical Model of Indonesian Crude Palm Oil
As seen in Figure 6, Indonesia block consisted of seven equations as follows:

Identity equations

\[
\text{INPOQ}_t = \text{INPOY}_t \times \text{INPOA}_t
\]
\[
\text{INPOS}_t = \text{INPOQ}_t - \text{INPOC}_t + \text{INPOS}_{t-1} + \text{INPOM}_t - \text{INPOX}_t
\]

Structural equations

\[
\text{INPOA}_t = a_0 + a_1 (\text{INPOP} / \text{INRBP})_t + a_2 \text{TREND} + U_1 \quad \text{.................. (1)}
\]
Hypothesis: \(a_0, a_1>0; a_2<0\)

\[
\text{INPOY}_t = b_0 + b_1 \text{INPOA}_t + b_2 \text{INPOY}_{t-1} + U_2 \quad \text{.................. (2)}
\]
Hypothesis: \(b_0, b_2>0; b_1<0\)

\[
\text{INPOC}_t = c_0 + c_1 \text{INPOP}_t + c_2 \text{INY}_t + c_3 \text{INN} + U_3 \quad \text{.................. (3)}
\]
Hypothesis: \(c_0, c_1<0; c_2, c_3>0\)

\[
\text{INPOX}_t = d_0 + d_1 \text{INPOQ}_t + d_2 \text{INTAX}_t + d_3 \text{WDPOP}_t + d_4 \text{INE}_t +
\]
\[
d_5 \text{INPOC}_t + U_4 \quad \text{.................. (4)}
\]
Hypothesis: \(d_0, d_2, d_5<0; d_1, d_3, d_4>0\)

\[
\text{INPOP}_t = f_0 + f_1 \text{WDPOP}_t + f_2 \text{INPOS}_t + f_3 \text{INPOP}_{t-1} + U_5 \quad \text{.................. (5)}
\]
Hypothesis: \(f_0, f_2<0; f_1, f_3>0\)

Where

\[
\text{INPOA} = \text{oil palm mature area of Indonesia (1000 ha)}
\]
\[
\text{INPOQ} = \text{oil palm oil production of Indonesia (1000 t)}
\]
\[
\text{INPOC} = \text{oil palm oil consumption of Indonesia (1000 t)}
\]
\[
\text{INPOX} = \text{oil palm oil export of Indonesia (1000 t)}
\]
\[
\text{INPOS} = \text{oil palm oil stock of Indonesia (1000 t)}
\]
\[
\text{INPOP} = \text{domestic price of palm oil (Rp/kg)}
\]
\[
\text{INPOM} = \text{oil palm import of Indonesia (1000 t)}
\]
\[
\text{INPOY} = \text{oil palm oil yield of Indonesia (Ton/ha)}
\]
\[
\text{RPORBP} = \text{INPOP}_t / \text{INRBP}_t
\]
\[
= \text{Price ratio of palm oil and rubber}
\]
\[
\text{WDPOP} = \text{world palm oil price (USD/t)}
\]
\[
\text{INTAX} = \text{CPO export tax (%)}
\]
Equation one shows that mature area of oil palm plantation is affected by the price ratio of palm oil and rubber, production and trend. The role of the CPO-export tax will be captured in the model as the producer price is defined as the world price minus tax. The relationship between the exchange rate and mature area is expected to be positive, while that of mature area and the interest rate to be negative. Equation two indicates that yield is determined by the current mature area, CPO price, government policies, and export tax rate. The CPO price, mature area, and government policies are expected to be positively related to the productivity (yield). On the other hand, the tax rate is expected to be negatively related to productivity, since tax depresses the CPO domestic prices.

Like most consumption equation, consumption of CPO is explained by domestic price, gross domestic product (GDP), and population as represented by equation three. The higher the GDP, number of population, and substituting product prices, the higher will be the CPO domestic consumption. On the other hand, the higher the CPO domestic prices, the lower will be the CPO domestic consumption.

Export is expected to be positively related to the CPO world price, production, previous export, exchange rate, and negatively related to export tax
rate as indicated by equation four. Domestic price is basically a market-integrated approach implying that the domestic price is strongly influenced by the world price as in equation 5. As seen in the equation, the domestic price is negatively related to the tax rate and production and positively related to exchange rate and previous period price.

The production equation is an identity equation that shows that production is a product of crop yield or productivity and mature area under oil palm. Assuming that stock management is part of speculative activity, the volume of stock is expected to relate positively to previous production, import and stock. However, the stock is negatively related to previous consumption and previous period export. The stock equation has also been used as an identity equation.

4.4.2 Model Identification, Estimation and Simulation

Model identification to be used in this study was found to be of order condition. With endogenous variables (equations), pre-determined variables, and explanatory variables in each equation and using order condition, the model qualifies as definitely over-identified, unidentified or exactly identified.

The model was identified based on its order condition as follows:

\[(K-M) \geq (G-1)\]

Where:
- \(K\) = total variables in the model (endogen and exogen variables)
- \(M\) = total endogen and exogen variables in the a given equation
- \(G\) = Total equations that exist in the model excluding identity equations

If \((K-M)\) is greater than \((G-1)\), the problem is over-identified; if \((K-M)\) is equal to \((G-1)\), then it is exactly identified; while if \((K-M)\) is less than \((G-1)\), then the condition is unidentified. Based on the above definitions, the equations on the Indonesian block can be identified as follows.
Table 6. Model Identification

<table>
<thead>
<tr>
<th>No.</th>
<th>Equation</th>
<th>K</th>
<th>K-M</th>
<th>G-1</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mature area</td>
<td>15</td>
<td>12</td>
<td>6</td>
<td>Over identified</td>
</tr>
<tr>
<td>2</td>
<td>Productivity</td>
<td>15</td>
<td>13</td>
<td>6</td>
<td>Over identified</td>
</tr>
<tr>
<td>3</td>
<td>Crude Palm Oil consumption</td>
<td>15</td>
<td>12</td>
<td>6</td>
<td>Over identified</td>
</tr>
<tr>
<td>4</td>
<td>Crude Palm Oil export</td>
<td>15</td>
<td>10</td>
<td>6</td>
<td>Over identified</td>
</tr>
<tr>
<td>5</td>
<td>Crude Palm Oil Production</td>
<td>15</td>
<td>13</td>
<td>6</td>
<td>Over identified</td>
</tr>
<tr>
<td>6</td>
<td>Domestic price of palm oil</td>
<td>15</td>
<td>12</td>
<td>6</td>
<td>Over identified</td>
</tr>
<tr>
<td>7</td>
<td>Crude Palm Oil Stock</td>
<td>15</td>
<td>10</td>
<td>6</td>
<td>Over identified</td>
</tr>
</tbody>
</table>

Insights learned from previous studies suggest that the use of rank condition will end up with the same conclusion as that of order condition. Therefore, rank condition may not be applied in this study. Given that the model was over identified, the 2SLS method of estimation will be applied. Koutsoyiannis (1977) stated that under the circumstance of the existence of model misspecification, missing of relevant variables, multicolinearity and autocorrelation error, 2SLS tends to yield more robust estimates. Moreover, 2SLS method is arguably the simplest method among methods suited to over-identified model. Based on previous export tax rates, four scenarios associated with the tax rates were analyzed in this study, namely:

1. Scenario I was used as the basic scenario that is a scenario in which the values of the parameters were estimated and predicted means used as the true values for the model.

2. Scenario II was conducted to evaluate the impacts of export tax on various aspects of Indonesian CPO industry since its implementation for the entire period covered. This scenario, therefore, was based on the imposition of average export tax that was estimated as 2.31 percent. The differences
between the results of Scenarios I and II were considered as the impacts of the export tax imposition on the industry during the specified period; and

3. Scenarios III, IV, and V were further used to predict the impacts of export tax on various aspects of Indonesian CPO industry using time horizon of the year after 2007. Arbitrary values of export tax were used in scenario III, IV and V based on an assumption that the export tax rate in that time horizon increased with time. Scenario III was taken as 7.5 percent scenario IV as 15 percent and scenario V as 20 percent. These values were converted into effective export tax that makes the export tax to be based on the profit got not on the price of CPO.

The differences between the results of these scenarios and Scenario 1 were the impacts of the export tax imposition on the industry in the period under study. On the basis of the magnitude and distribution of the impacts, the effectiveness of the export tax policy and exchange rate were evaluated. Based on this evaluation and various factors related to the consumer and producer, such as the number of farmers/consumers consumption/ income share, and theory of secondary right, an alternative export tax rate was formulated.

In the baseline projection, all the exogenous variables were assumed to be constant, whereas scenario projections were run by changing exogenous variables of interest (export tax and exchange rate) in the model. In both projections, simulation was done until the values of endogenous variables do not change any more. The policy effects are measured by comparing the differences between the scenario and the baseline projections.
4.4.3 Model Validation

Model validation was undertaken by using the standard t-tests, F-tests, and $R^2$ procedures where applicable in this analysis. Mean Squared Error (MSE) and Theil’s inequality coefficient techniques were applied to assess the overall reliability of each model. MSE depends upon the units in which the variable is expressed. The magnitude of the error does not give any indication of how large the error is, therefore, this error can be assessed only by comparing it with the average size of the variable in question. However, the main advantage of MSE is that it can be decomposed into various components, which show the deviation between the simulated and actual values. Theil’s method of decomposition was applied.

4.5 Formulation of Alternative Strategies for Indonesian Crude Palm Oil

In order to improve the competitiveness of Indonesian CPO in the world market, the researcher was to propose the alternative strategies for the CPO industry. In this situation, the method used was through interviews with personalities who have been working with Indonesian CPO sector. In this case, the qualitative method was used to come up with strategies that would increase the benefits of CPO to the Indonesian community as a whole. The interviews were carried out after which results were evaluated. Those interviewed included the lecturers, students and staff of PT Unilever Indonesia Tbk in Jakarta. The Unilever staff were chosen as their organization is the leading consumers of Indonesian CPO locally. The analysis involved the usage of SWOT analysis method in which the strengths, weaknesses, opportunities and threats of the sector were critically analyzed.
4.6 Data Sources and Descriptions

In general, two groups of data were used in this study, namely, palm oil and macro-economic related data. The former data consisted of oil palm mature area, production, consumption, export, import, stock, and edible oil prices. The data sources included Indonesia palm oil statistics 2004-2006 and oil world 2007. Macro-economic related data consisted of data such as population, income per capita, GDP, exchange rate, and interest rate. The main source of these data is Bank of Indonesia and BPS. Data for econometric analysis were used on quarterly basis while those for competitive analysis were on yearly based.