Impacts of CPO-Export Tax on Several Aspects of Indonesian CPO Industry

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ABSTRACT

To control domestic supply and price of crude palm oil (CPO) and cooking oil, the government of Indonesia has imposed CPO-export tax since August 1994. As the CPO industry plays an important role in Indonesian economy, the imposition of the tax is expected to have substantial impacts on various aspects of the industry, such as on investment, production, trade, farm income and welfare distribution. The main objective of this study is to assess these impacts using an econometric model of the industry. The results of the study reveal that the export tax policy has inhibited the growth rate of investment, production, export and farm income. On the other hand, this policy has been an effective instrument to control domestic CPO and cooking oil price. Moreover, this policy has caused a substantial welfare transfer from producers to consumers and the government. To compromise these conflicting impacts, an alternative CPO tax formula is also proposed in this paper.

INTRODUCTION

Like rice, crude palm oil (CPO) is considered a strategic commodity in the Indonesian economy. Firstly, as a raw material for the main cooking oil consumed in Indonesia, its price plays an important role in determining the inflation rate of the Indonesian economy (Badan Pusat Statistik, 2001; Arifin and Susila, 1998; Amang, 1995). Secondly, palm oil industries provide employment for more than two million people (Direktorat Jenderal Bina Produksi Perkebunan, 2003). Thirdly, it is a source of foreign exchange earning as its export has exceeded more than USD 1 billion since 1997. While the area of land cultivated with oil palm in 1988 was 862 900 ha, it sharply increased to around 4 million hectares in 2002, implying an 11% per annum growth rate. As a result, the production of CPO increased by around 10% per annum, from 342 700 t in 1988 to 7.97 million tonnes in 2002 (Direktorat Jenderal Bina Produksi Perkebunan, 2003). Similarly, the use of CPO as a raw

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material for cooking oil sharply increased by around 10% per annum.

The CPO industry is expected to play a greater role in the international market for oils and fats. Basiron (2002), Sultoni and Susila (1998) and Pasquali (1993) projected that the growth rate of CPO production would be the fastest among edible oils. CPO has been predicted to over take soyabean oil as the biggest oil traded in the world oil and fat market. The market development of CPO will even be faster because of the success of the Uruguay Round (Susila *et al*., 2002; Barton, 1993).

Considering its importance, Indonesia has launched policies to optimize the development of the industry, such as supply stabilization. The most important policies have been on export tax, first implemented in August 1994 to stabilize and secure the domestic supply and price. The export tax rate when first introduced was linearly related to the CPO price, ranging from 40%-60% of the difference between the CPO price and minimum export price to be taxed. From 4 July 1997 to February 1998, the rate was changed to 5% of the CPO price. Due to a sharp increase in the CPO price and substantial depreciation of the rupiah, the government banned export in the beginning of 1998. Then, this policy was replaced by an export tax of 60% which has since been gradually reduced to 30% in July 1999 and approximately 4% in 2002.

This policy is expected to have a substantial impact on various aspects of the industry, such as investment (area), production, consumption, trade, domestic price, added value, farm income and welfare distribution. On the other hand, the magnitude and distribution of the impacts will colour the future of the industry. Therefore, an estimation of the magnitude and distribution of these impacts is important in an effort to formulate an appropriate export tax rate relatively fair to producers, consumers and the government.

This paper has two main objectives, namely: (1) to assess the impacts of CPO-export tax on Indonesian CPO industry, covering impact on domestic price, investment (area), production, consumption, export, employment, added value, cooking oil price, government revenue, producer surplus and consumer surplus; and (2) to propose an alternative CPO-export tax formula which is relatively fair, either from producer or consumer point of view.

RESEARCH METHOD

Theoretical Model and Model Specification

Simulation approaches on the econometric model of the industry were used to assess the impacts of CPO-export tax on various aspects of the industry. The econometric model developed in this paper is basically a modification of a model previously developed by Susila *et al.* (1995). 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 is 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 inter-dependent (Koutsoyiannis, 1977; Pindyck and Rubinfield, 1987). Due to this advantage, various studies used this approach for commodity market modelling and policy analysis. Dradjat (2003) used this approach to assess the impacts of trade liberalization on Indonesian rubber, cocoa, coffee, and tea industry. Abidin (2000) and Ernawati (1997) used this approach to estimate the impact of trade liberalization on Indonesian sugar industry. Finally, Zulkifli (2000) used this simultaneous equation system to assess the impact of CPO trade liberalization on Indonesian CPO industry.

Theoretical model of CPO market was specified to consist of 10 blocks/subsystems, that are, four blocks of main producing/exporting countries (Malaysia, Indonesia, Nigeria, and Latin America), four blocks of main consuming/importing countries (West Europe, China, Pakistan, and Egypt), one block of the rest of the world, and one block of the world CPO market. The production share of the four producing countries has been around 86% of world production, while the consumption share of the four consuming countries has been around 72%. This implies that the level of aggregation is considered to be relatively justified.

A simplified theoretical model by assuming the model consisting of one block exporting country (Indonesia), one block importing country (West Europe), and the world market block, is illustrated in *Figure 1*. *Figure 1* shows the hypothetical relationships between variables in the model.

As seen in *Figure 1*, Indonesia block consists of seven equations as follows:

$$INPOA_t = a_0 + a_1 RPORBP + a_2 INE45 + a_3 INI45 + a_4 D_0 + a_5 INPOA_{t-1} + U_1 \quad (1)$$

$$INPOQ_t = b_0 + b_1 INPOP_t + b_2 INPOA_t + b_3 T + U_2 \quad (2)$$

$$INPOC_t = c_0 + c_1 INPOP_t + c_2\ INY_t + c_3\ D_2 + c_4\ D_3 + U_3 \quad (3)$$

$INPOX_t = d_0+d_1(1-INTAX_t)WDPOP_t *INE_t+d_2INPOQ_t+d_3INPOX_{t-1}+U_4$....(4)

$INPOS_t =e_0+e_1(WDPOP_t-WDPOP_{t-1}) +e_2INPOQ_t+e_3INPOC_t+e_4INPOS_{t-1}+ U_5$.....(5)

$INPOM_t = INPOC_t+INPOX_t+INPOS_t-INPOQ_t-INPOS_{t-1}$.....(6)

$INPOP_t = f_0+f_1(1-INTAX_t)\ WDPOP_t *INE_t+f_2INPOQ_t+f_3INPORP_{t-1}+U_7$.....(7)

INPOA = oil palm mature area of Indonesia (1000 ha)

INPOQ = palm oil palm production of Indonesia (1000 t)

INPOC = palm oil consumption of Indonesia (1000 t)

INPOX = palm oil export of Indonesia (1000 t)

INPOM = palm oil import of Indonesia (1000 t)

INPOS = palm oil stock of Indonesia (1000 t)

INPOP = domestic price of palm oil (Rp/kg)

$RPORBP = [(1-INTAX_{t-4})WDPOP_{t-4} +(1-INTAX_{t-5})\ WDPOP_{t-5}]/(INRBP_{t-4} + INRBP_{t-5})$

= price ratio of palm oil and rubber with time lag four and five years

WDPOP = world palm oil price (USD/t)

INTAX = CPO export tax (%)

ING = Indonesia gross domestic product (USD million)

INI = Indonesian interest rate (% per annum)

INN = Indonesian population (million)

INE = Indonesian exchange rate (rupiah/USD)

INY = Indonesian income per capita (USD/capita)

WDRBP = world rubber price (USD/t)

INRBP = domestic rubber price (Rp/kg)

T = vintage of crops which have optimal production or trend of government support

D_0 = dummy variable
D = 0 before1979
D = 1 after 1979 to 2010

D_0 represents the government policy to promote oil palm development (*Perusahaan Inti Rakyat* project and credit subsidy)

D_2 = dummy variable
D_2= 0 before 1980
D_2 = 1 after 1980 to 2010

D_2 represents the government policy to control domestic supply through production allocation policy (domestic allocation policy)

D_3 = dummy variable
D_3 = 0 before 1991
D_3 = 1 after 1991 to 2010

D_3 repersents domestic trade liberalization policy

Note: subscript 45 means sum of variable at time lag 4 and 5
example: $INPOP_{45} = INPOP_{t-4} + INPOP_{t-5}$

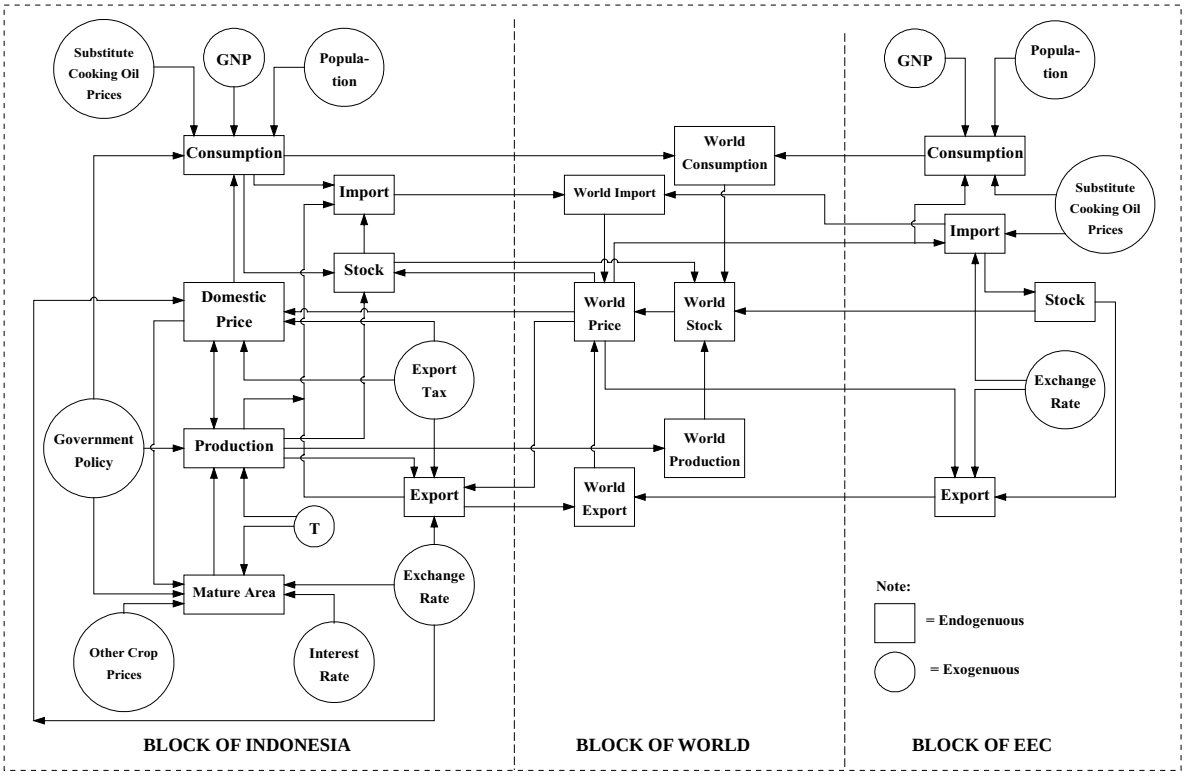

Figure 1. General theoretical model of crude palm oil (CPO).

Equation (1) shows that mature area of oil palm plantation is affected by the price ratio of palm oil and rubber, exchange rate, interest rate, government policy related to palm oil development (D_0), government policy on liberalization of edible oil domestic market, and previous mature area. Moreover, since time lag between investment (planting activities) and mature area is around four to five years, then this time lag is used in Equation (1). 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 exchange rate and mature area is expected to be positive, while that of mature area and interest rate to be negative. The government policies (D_0) to support oil palm development through *Perusahaan Inti Rakyat* (PIR) project , a kind of nucleus estate smallholder project, and credit subsidy to private estates since 1979, are expected to be positively related to development of the oil palm area.

Equation (2) indicates that production 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 production. On the other hand, the tax rate is expected to be negatively related to production, since tax depresses the CPO domestic prices.

Like most consumption equation, consumption of CPO is explained by domestic price, price of its substitute products (coconut oil), gross domestic product (GDP), and population (Equation 3). 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. The government policies to control CPO export by forcing the producers to allocate part of their production to domestic market since 1980 or known as domestic allocation policy (D_2) and domestic trade liberalization policy launched in 1991 (D_3) are expected to have a positive impact on consumption.

Export is expected to be positively related to the CPO world price, production, pervious export, exchange rate, and negatively related to export tax rate (Equation 4). Assuming that stock management is part of speculative activity, the volume of stock is expected to relate positively to price difference between current price and previous period price and production. Moreover, stock is theoretically related to consumption and previous period stock (Equation 5).

In the Indonesian block, import is assumed to be a residual variable as the function of Indonesian import is just to fulfil the deficit in domestic market. To accommodate this phenomenon, the stock equation is represented by residual-identity equation (Equation 6).

Domestic price is basically a market-integrated approach implying that the domestic price is strongly influenced by the world price (Equation 7). 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.

With various adjustments to accommodate specific characteristics of each country/block, all seven equations can be applied to each country. For example, area and production equation will be eliminated in West European block since it is not a producing country. Moreover, West Europe has no export tax, but persistently imposes import tax to protect its sunflower oil industry. Thus, all seven equations could be used as prototype equation in each block, except the world market block. Model specifications and the results of estimation for each block are reported in Susila *et al.* (2002).

Except for price equation, all equations in the world market block are summation of its relevant variables (Equation 8-Equation 13) below. For example, Equation (8) shows that world or total mature area is summation of mature area of all producing countries.

$$WDPOA_t = INPOA_t + MLPOA_t + NIPOA_t + LAPOA_t + CHPOA_t + RWPOA_t \quad (8)$$

$$WDPOQ_t = INPOQ_t + MLPOQ_t + NIPOQ_t + LAPOQ_t + CHPOQ_t + RWPOQ_t \quad (9)$$

$$WDPOC_t = INPOC_t + MLPOC_t + NIPOC_t + LAPOC_t + ECPOC_t + CHPOC_t + PKPOC_t + EGPOC_t + RWPOC_t \quad (10)$$

$$WDPOX_t = INPOX_t + MLPOX_t + LAPOX_t + ECPOX_t + RWPOX_t \quad (11)$$

$$WDPOM_t = INPOM_t + MLPOM_t + NIPOM_t + LAPOM_t + ECPOM_t + CHPOM_t + PKPOM_t + EGPOM_t + RWPOM_t \quad (12)$$

$$WDPOS_t = INPOS_t + MLPOS_t + NIPOS_t + LAPOS_t + ECPOS_t + CHPOS_t + PKPOS_t + EGPOS_t + RWPOS_t \quad (13)$$

$$WDPOP_t = ae_0 + ae_1 WDPOS_{t-1} + ae_2 WDPOM_t + ae_3 WDPOX_t + ae_4 WDPOP_{t-1} \quad (14)$$

where:

1. The first two letters of the label on the dependent variable represent country or world (IN: Indonesia, ML: Malaysia, NI: Nigeria, LA: Latin America, CH: China, EC: European Economic Community, PK: Pakistan, EG: Egypt, RW = rest of the world country, WD: world);
2. The next two letters of the label represent the commodity (PO = palm oil); and

3. The last letter of the labels represents variable (A: mature Area, Q: production, C: consumption, X: export, M: import, S: stock, P: Price) example: WDPOX: world CPO export, MLPOQ: palm oil production of Malaysia.

The CPO world price equation is specified as a behavioural equation, not as a market clearing equation. Following this, the world price is expected to be positively influenced by world import, price of other oils (soybean oil and sunflower oil), moving average effects ($WDPOP_{15}$). Moreover, world export and previous stock are expected to negatively influence world price (Equation 14).

Model Identification, Estimation, and Simulation

Model identification used in this study was order condition. With 52 endogenous variables (equations), 73 pre-determined variables, and around 3-10 explanatory variables in each equation and using order condition, we know that the model is definitely over-identified. 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 was not applied in this study.

Given that the model was over-identified, 2SLS method of estimation was 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 analysed in this study, namely:

- ⇑ Scenario I is the basic scenario, that is a scenario in which the government would not have imposed the CPO export;
- ⇑ Scenario II is conducted to evaluate the impacts of export tax on various aspects of Indonesian CPO industry since its implementation (1994-1999). This scenario, therefore, is based on the imposition of actual tax rate as the government had decided in the 1994-1999 periods. The differences between the results of Scenarios I and II are the impacts of the export tax imposition on the industry in the 1994-1999 periods; and
- ⇑ Scenarios III, IV, and V is used to predict the impacts of export tax on various aspects of Indonesian CPO industry using time horizon of the year 1999-2010. Scenario III is based on an assumption that the export tax rate in that time horizon would be 40%. Using similar approach, Scenarios III and IV represent 40% and 60% tax rate, respectively. The differences between the results of these scenarios and Scenario I are the impacts of the export tax imposition on the industry in the year 1999-2010 periods, respectively.

On the basis of the magnitude and distribution of the impacts, the effectiveness of the export tax policy was 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.

Data Sources and Descriptions

In general, there are two groups of data used in this study, namely, palm oil and macro-economic related data. The first group of data consists of oil palm mature area, production, consumption, export, import, stock, and edible oil prices. Data sources for these are *Oil World* (1987-2002), *Direktorat Jenderal Bina Produksi Perkebunan, Statistik Kelapa Sawit* (1991-2003) and *Badan Pusat Statistik* (2001). Macro-economic related data consist of various data such as population, income per capita, gross domestic product, exchange rate, and interest rate. The main source of these data is International Monetary Fund (1986-2002).

For future values of explanatory variables used in the scenario, two approaches were applied. If the future values (predicted values) are available, such as for population and gross domestic product that are provided by FAO or IMF, then these data were used in the scenario. Otherwise, some time series approaches, such as moving average or autoregressive models were applied to estimate the predicted value of the explanatory variable.

RESULTS AND DISCUSSIONS

Results of Model Estimates

The results of estimates are generally in accordance with theories/hypotheses. This can be seen from the sign and magnitude of estimates, which are generally as expected. Moreover, the model estimates are also fairly robust,

indicated by 25 equations out of 39 estimated equations (13 identity equations do not need to be estimated) have coefficient of determination larger than 90%. Only nine equations have coefficient of determination lower than 75%. Moreover, with a criterion of root mean square percentage error to validate the model, it can be concluded that the model is adequate for simulation modelling. A more comprehensive discussion on model validation can be found in Susila *et al.* (2002).

Equation (15) shows that there are four explanatory variables that significantly influenced investment (mature area). They are price ratio of CPO and rubber, D2, D3, and T. These four variables can explain around 92.65% of mature area variation. The domestic allocation policy (D2) had a negative impact on area development while liberalization of CPO trade in Indonesia (D3) had supported the development of oil palm plantation. Moreover, variable T that also represents the trend of government support policy has a significant and positive impact on palm oil plantation in Indonesia.

$$INPOA_t = \underset{(0.044)}{-761.05} + \underset{(0.286)}{345.33}\ RPORBP - \underset{(0.070)}{226.77}\ D2 + \underset{(0.068)}{321.73}\ D3 + \underset{(0.001)}{62.85}\ T \quad .....(15)$$

$$R^2 = 92.65\%$$

The price ratio of CPO to rubber, which is significant in Equation (15) indicates that there has been a competition in resource (land) use between oil palm and rubber. The competition has occurred mainly in Sumatera and Kalimantan, which are traditionally known as rubber and oil palm plantation centres. The positive sign of the price ratio coefficient indicates that the increase of CPO price or a decrease in rubber price will increase oil palm plantation with four to five year time lag.

Production behaviour can simply be explained by mature area and time trend (T). These two variables can explain around 98% of production variation. CPO price has an insignificant effect on production, a common characteristic of production response of estate crops. In other words, price changes had not responded to production changes, but by investment decision (area expansion). T in Equation (16) mostly represents an increase in yield due to plantation composition based on plantation age (vintage). The expansion of oil palm since 1970 has caused a continuous increase of vintages which are in maximum yield (Susila, 1997).

$$INPOQ_t = \underset{(0.003)}{-521.49} + \underset{(0.000)}{1.96}\ INPOA + \underset{(0.000)}{77.77}\ T \quad .....(16)$$

$$R^2 = 98.41\%$$

As expected, consumption of CPO has been positively related to income per capita as most domestic use of palm oil is for cooking oil (Equation 17). Moreover, government domestic allocation policies (D2) and trade liberalization policy (D3) also had a significant impact on the increase of CPO domestic consumption. By using domestic allocation policy, the CPO producers were forced to allocate part of their production to domestic market. Therefore, government has a control to domestic supply and price that had a positive impact on domestic consumption. Trade liberalization policy was aimed at improving domestic market efficiency by reducing the role of the state trading company (BULOG) and to promote participation of private companies. This policy has a positive impact on domestic consumption. Moreover, the consumption of CPO has not been significantly affected by its price as cooking oil is considered as a basic need.

$$INPOC_t = \underset{(0.828)}{16.47} - \underset{(0.892)}{0.000024}\ INXP + \underset{(0.000)}{0.66}\ INY + \underset{(0.001)}{359.15}\ D2 + \underset{(0.105)}{253.25}\ D3 \quad .....(17)$$

$$R^2 = 96.62\%$$

Equation (18) shows the behaviour of Indonesian CPO export that is mainly influenced by CPO export price and production. A 1% increase of export price causes a 0.253% increase in export, implying that export is inelastic to price. Since export tax is negatively related to export price, increases in export tax decreases volume of export. The role of production in export equation indicates that international market has been the main destination of Indonesian CPO production. On the other hand, Indonesian stock has been relatively small, due to high risk and cost of holding stock, compared to its potential profit gain.

$$INPOX_t = \underset{(0.233)}{24.78} + \underset{(0.033)}{0.00044}\ INPOPXT + \underset{(0.011)}{0.42}\ INPOQ - \underset{(0.414)}{0.23}\ INPOX_{t-1} + \underset{(0.437)}{191.53}\ D3 \quad .....(18)$$

$$R^2 = 96.62\%$$

The estimates of stock and import are not as robust as the previous equations. As an example, signs of the estimates of stock equation are consistent with hypotheses, but are not significantly explained through the variation of stock. Yet, import equation can only explain by its moving average term implying that there is no variable that can explain the behaviour of import, except for some previous values of imports. This can be justified because the import volume has been relatively small (Indonesia is

one of the main CPO exporters) so that import is just a residual variable.

$$INPOM_t = 35.52 + 0.63\ INPOME \quad ..(19)$$
$$(0.235) \quad (0.030)$$
$$R^2 = 96.62\%$$

$$INPOS_t = 24.78 + 0.00044\ INPOPXT$$
$$(0.235) \quad (0.033)$$
$$+ 0.42\ INPOQ - 0.23\ INPOX_{t-1}$$
$$(0.011) \quad (0.414)$$
$$+ 191.53\ D3 \quad .....(20)$$
$$(0.437)$$
$$R^2 = 96.62\%$$

The world CPO price can well be explained by world current and previous stock, import, export, and moving average effect (Equation 21). All these four variables explain around 90% of world price fluctuation. As expected, world stock and export are negatively related to price while import is positively related to price.

$$WDPOP_t = -422.82 - 0.11SWDPOS$$
$$(0.000) \quad (0.002)$$
$$+ 0.37WDPOM$$
$$(0.001)$$
$$- 0.30WDPOX$$
$$(0.003)$$
$$+ 0.76WDPOP15$$
$$(0.000)$$
$$+ 0.45WDSBSFP \quad .....(21)$$
$$(0.000)$$
$$R^2 = 90.52\%$$

The magnitudes of price flexibility which are relatively high are as expected. Price flexibility of import and export are 18.08 and 18.37, respectively. This implies that a 1% import/export increase will cause more than 18% increase/decrease in price. This is consistent with the fact that the CPO price has been highly volatile with coefficient of variation of around 34%. As an example, while the average CPO price in 1998 was USD 550/t, it sharply decreased to USD 220/t in 1999. This sharp price decrease was triggered by an increase in soyabean oil production in main CPO importing country (the USA), causing a decrease in CPO import

Evaluation and Projection of the Impacts of CPO-Export Tax

Since the policy implementation in August 1994, this export tax policy has had significant impact on the industry. Within the time horizon 1994-1999 when the effective tax rate was around 13.33%, the mature area of oil palm plantation had been reduced by 2.56% per annum or around 37 000 ha per annum (*Table 1*). This indicates that this policy had a substantial negative effect on investment in the industry. As a result of this negative investment effect, CPO production had also been depressed by the policy. It is estimated that the policy had caused a loss of around 0.81% of the total production or around 36 000 t CPO per annum.

The most devastating impact of the policy had been on the export and farm income. During that time horizon, this policy had caused export to be 6.02% lower compared to the no export tax scenario. This implies that Indonesia had sacrificed her export of about 147 000 t annually. Similarly, the policy had caused the farm income to be lower by around 11.35% or around Rp 400 000/ha/yr; a substantial loss for farmers.

On the other hand, this policy had been proven to be effective in controlling domestic cooking oil price. With this policy, the government had been successful to keep the cooking oil price down when the world CPO price increased or when rupiah was substantially depreciated. Using this policy, the government had kept the cooking oil price to be 7.77% or Rp 184/kg lower than it should be. Moreover, from the government point of view, a significant tax revenue, estimated around Rp 5241 billion, was also considered to be a positive result of the policy.

For the time horizon of 2000-2010, impacts of three export tax rates, namely 20% (4.78% effective), 40% (9.55% effective), and 60% (14.33% effective) were forecasted. The impacts of these tax rates are summarized in *Table 2*. In term of mature area, an increase of 1% effective tax rate decreases mature area by around 0.15%, which is equivalent to a

TABLE 1. EVALUATION OF THE IMPACTS OF CPO-EXPORT TAX (1994-1999)

Explanations	Unit	Mean	Impacts of export tax implementation (%)	Impacts of 1% increasing of EET (%)
Mature area	'000 ha	1 444.86	-2.56	- 0.19
Production	'000 t	4 483.95	-0.81	- 0.06
Export	'000 t	2 371.03	-6.20	- 0.47
CPO price	Rp/kg	1 524.54	-8.58	- 0.64
Cooking oil price	Rp/kg	2 366.85	-7.77	- 0.58
FFB price	Rp/kg	342	-8.58	- 0.64
Gross margin	Rp/ha/yr	3 512 116	-11.35	- 0.85

Note:
EET: effective export tax.

decrease of 3145 ha. For example, if the tax rate imposed in year 1999-2010 is 4.75% effective tax rate, then the mature area will be lower by around 0.76% or around 16 000 ha per annum. This implies that the imposition of the export tax has significantly depressed the development of oil palm plantation in Indonesia.

In addition to its negative impact on mature area, the export tax has also depressed production, although at a relatively lower rate. In general, a 1% increase of effective tax rate is projected to decrease production by 0.09% per annum or around 5700 t per annum. As seen in *Table 2*, if the government imposed a 14.33% effective rate, production decreases by around 84 000 t per annum.

The negative impact of this policy is more substantial in term of export volume. A 1% increase of the tax rate decreases Indonesian export by around 0.41% or around 14 000 t per annum. If for example, the government imposes a 9.55% effective tax rate, then the export loss will be around 133 000 t per annum. This indicates that this policy could be an effective policy instrument to control supply in domestic market.

On the other hand, this policy has provided substantial benefit to consumers. *Table 3* shows that the implementation of this policy has caused domestic CPO and cooking oil price to be lower than they should be. For example, an increase of a 1% effective tax rate decreases CPO price by 1.13% or Rp 26.89/kg. If the government imposes an effective export tax of 14.33%, then the domestic price will be about Rp 360/kg lower compared to that without export tax.

As a consequence of CPO domestic price being depressed by the tax, the price of cooking oil has also decreased. An increase of a 1% effective tax rate will cause a decrease of 1.03% or Rp 37.35/kg price of cooking oil. This shows that this policy has been effective to control the price of cooking oil. Thus, if the government intends to protect cooking oil consumers from price increase and possibly fluctuation in the world market, then this policy could be an effective alternative.

Producers, mainly smallholders, have suffered a great deal due to the policy. As the domestic price of CPO is depressed by this policy, the farm gate price of the farmers' product (fresh fruit bunch or FFB), declines substantially. If the government imposes a 4.78% effective tax rate, then FFB price will be lower by around 6.61% or Rp 35.23/kg (*Table 3*). In general, a 1% increase in tax will reduce FFB price by 1.13% (Rp 6/kg).

As the FFB price declines due to the tax, farm income, measured in terms of gross margin, also significantly decreases (*Table 3*). A 1% increase in the tax rate will reduce farm income by around 1.53% or around Rp 90 000/ha/annum. When export tax is 14.33% effective rate, such as that imposed in 1999, and assuming each farmer has 2 ha of oil palm plantation, then this policy will cause each farmer to suffer a loss of Rp 2.4 million per annum, a substantial loss for a smallholder.

The export tax policy has also an impact on social welfare distribution (*Table 3*). This policy has caused welfare distribution from producer to consumer and government. If the government increases the export tax rate by 1%, the producer surplus will decrease by 1.26%. On the other hand, this tax rate increase will increase consumer surplus by 0.86%. Moreover, this policy will also increase the government revenue. For example, the average revenue gained from this policy if the effective tax rate is 9.55%, is around USD 174.5 million or Rp 1 221. 544 billion per annum.

TABLE 2. PROJECTION OF THE IMPACTS OF CPO-EXPORT TAX (2000-2010)

Explanations	Unit	Means	Impacts of tax policy (%)			Impacts of 1% increasing of EET (%)
			Tax 20%	Tax 40%	Tax 60%	
			Ef. 4.78%	Ef. 9.55%	Ef. 14.33%	
Mature area	'000 ha	2 096.75	-0.76	-1.39	-2.05	-0.15
Production	'000 t	6 345.89	-0.49	-0.90	-1.32	-0.09
Export	'000 t	3 457.51	-2.28	-3.86	-5.51	-0.41
CPO price	Rp/kg	2 379.24	-6.61	-10.69	-15.12	-1.13
Cooking oil price	Rp/kg	3 626.61	-6.05	-9.78	-13.80	-1.03
Consumption	'000 t	2 728.54	0.01	-0.03	-0.06	0.00
Import	'000 t	94.19	0.00	0.00	0.00	0.00
Stock	'000 t	708.08	0.10	0.05	-0.01	0.00

Notes:
Ef. = equivalent with effective export tax.
EET = effective export tax.

TABLE 3. PROJECTION OF THE IMPACTS OF CPO-EXPORT TAX ON WELFARE (2000-2010)

Explanation	Unit	Means	Impacts of tax policy (%)			Impacts of 1% increasing of EET (%)
			Tax 20%	Tax 40%	Tax 60%	
			Ef. 4.78%	Ef. 9.55%	Ef. 14.33%	
FFB price	RP/Kg	533	-6.61	-10.69	-15.12	-1.13
Gross margin	Rp/ha/t	5 888 299	-8.79	-14.38	-20.56	-1.53
Producer surplus	Billion Rp	4 348.26	-7.14	-11.76	-17.30	-1.26
Consumer surplus	Billion Rp	25 140.12	5.11	8.14	11.27	0.86
Total surplus	Billion Rp	29 488.38	3.39	5.45	7.53	0.57
Value-added	Billion Rp	13 150.26	-7.03	-11.56	-16.44	-1.221
Labour	Million	1.90	-0.49	-0.90	-1.32	-0.09
CPO tax	Thousand USD	-	85 583	174 506	266 587	175 559
CPO tax	Billion Rp	-	599 084	1 221 544	1 866 108	1 228 912

Notes:
Ef. = equivalent with effective export tax.
EET = effective export tax.

In addition, total government revenue from this policy in 1994-1999 was estimated to be around Rp 5241 billion.

The two other negative impacts of this policy are a loss in terms of added value of the industry and employment. If the government imposes a 9.55% effective tax rate, the loss in terms of added value was predicted to be around 11.56% of added value of the industry. Moreover, this export tax rate is also expected to reduce the job opportunity in the industry for around 1730 workers.

AN ALTERNATIVE FORMULATION OF EXPORT TAX RATE

The results of analysis indicate that the implementation of the CPO-export tax has advantages and disadvantages to the industry. Moreover, this policy also has a redistribution impact to the agents involved in the industries and government revenue. This policy has caused consumers and the government to be better off. On the contrary, producers have become worse off, indicated by the decline in area, production, export, farm income and employment.

Considering the benefits and costs of the policy, the government is likely to maintain this policy in the future. As this policy has substantial impacts on the industry, this policy needs to be reformulated in such a way that consumers are fairly protected from a sharp fluctuation of the international market, while producers still gain a normal profit or incentive to develop their plantations. Following this, the magnitude/rate of CPO tax should consider the following facts:

- ⇑ investment in palm oil plantation is a long-term investment and therefore, price fluctuation cannot be avoided by the investors/ producers. Within a certain period of time, CPO price may well be above production cost and *vice versa*. Production cost in this case includes variable cost and capital accumulation for re-investment or rehabilitation (sustainable development approach);
- ⇑ using this approach, production cost (assuming that the exchange rate is Rp 7000/USD) is around USD 362/t or Rp 2555/kg. The government also indicates that the minimum CPO price to be taxed since July 1999 has been USD 365/t (SK Menkeu No. 181/ KMK.017/1999). The assumption about exchange rate is on the basis of the real exchange rate since current exchange that is around Rp 8400/USD, is considered under-valued;
- ⇑ profits/losses strongly depend on the world price (HE) and exchange rate (ER). Therefore, these two factors should be explicitly considered to determine the rate of the tax. In the other words, the export tax rate has to be calculated on the bases of the fluctuation of these variables. Thus, profit (P) = (HE*ER-2555);
- ⇑ when the price of CPO is below the production cost, the producers/smallholders suffer from a loss. Using world CPO price in the last two decades, it was found

that around 27% of the times CPO price were below the production cost or probability (P) to get profit is around 0.7 (P = 0.7). This means that if the producers/smallholders have to transfer part of their profit to consumers and government, it is only around 0.7 of the time can that be transferred. This coefficient acts as the first weight in distributing welfare (Equation 22);

⇑ on the basis of the secondary right theory which states that profit gain of an industry is not merely enjoyed by the people involved in the industry, but also by people, who because of some obstacles cannot participate in the industry. This theory is relevant because profit gain by producers due to either world price increase or currency depreciation will cause a decrease in consumer welfare. In line with this argument, it is assumed that 75% of the profit belongs to producers as primary right, while the rest (25%) will belong to consumers as secondary right (SR). The main rationale behind this assumption is that social cost of the estate crop industry in so-called *reformation era* is around 20%-30%. For example, the government asked private estates to release around 20% of their land for local people. For NES Schemes, the government stipulated that total local people involved in the project is at least 30% of total participants;

⇑ the magnitude of the tax should also consider the number of producers and consumers, as a proxy of political power/pressure group. In this study, the number of consumer (NC) and producers together with family members (NP) are 210 million and 10 million, respectively; and

⇑ the magnitude of the tax should also consider the income share of oil palm plantation to total farmers' income (IS), and share of cooking oil expenditure to total household expenditure (ES). Within this study, the former is estimated to be around 80% and the latter to be 4% (Badan Pusat Statistik, 2001).

Following all these arguments then, the formulation of an alternative export tax is as follows:

$$PE = \Pi * P * SR * (NC/NP) * (CS/IS)$$
$$= (HE*ER-2\,555)*0.7*0.25*(210/10)*(4/80) \quad (22)$$
$$= (HE*ER-2\,555)*0.1838$$
$$= (HE*ER-2\,555)*18.38\% \quad (23)$$

where:
PE = Export tax rate (Rp/kg)
HE = Export price (USD/t)
ER = Exchange rate (Rp/USD)

This export tax formulation has some fairer justifications. Firstly, the tax will be effective if the producers gain profit, at least enough to rehabilitate their plantation. This represents sustainable development argument. Secondly, the benefits gained due to price increase or currency depreciation are distributed among producers, consumers and the government after considering secondary right (equity argument), the number of producers and consumer that could be a proxy of political power or pressure group (political argument) and the importance of CPO in producer and consumer perspective (economic or welfare argument).

In socializing the export tax rate, the government should not apply this formula because this tends to be misunderstood. For example, when the government announces that the export tax rate was 30%, then many producers perceive that the magnitude of the tax was 30% of the price, not 30% of the difference between world price and the minimum price taxed. To avoid this misunderstanding, then the rate to be utilized should be the effective tax rate. Following this, the export tax rate on the basis of various CPO prices and exchange rates are presented in *Table 4*.

As seen in *Table 4*, if CPO price is USD 480/t and the exchange rate is Rp 7200/USD, then the effective export tax rate will be 4.74% of price or around USD 22.7/t. If the price goes up to USD 620/t and the exchange rate is Rp 9000/USD, then the effective tax rate will be 9.79% of export price or around USD 60.14/t.

Since the export tax rate has an effect on the cooking oil contribution to inflation rate, it is considered important to estimate the relationship between the contribution of cooking oil to the inflation rate with world CPO price and exchange rate under the assumption that the effective tax rates are as presented in *Table 4* (Equation 24).

$$KONIFL = 0.00349DWDPOP + 0.000224DINER \quad (24)$$

where:
KONIFL: contribution of cooking oil to Indonesian inflation rate (percent);
DWDPOP: change in the world CPO price (USD/t)
DINER: change in exchange rate (Rp/USD)

Since 2002, the contribution of cooking oil to the inflation rate has been around 0.2266%. For example, if the world CPO price increased by USD 100/t, and the effective tax rate is as presented in *Table 4*, then contribution of cooking oil to the inflation increase will be 0.349%. Similarly, a 1% increase in the exchange rate will cause a 0.356 increase in the contribution.

CONCLUSION AND POLICY IMPLICATIONS

The implementation of the CPO-export tax has had various substantial effects on both efficiency/growth and welfare distribution. This study finds that an increase of a 1% export tax rate causes a 0.19% decrease in mature area/investment and 0.81% drop in production. More over, this policy also leads to a 0.41% cent drop in export. At the farm level, an increase of 1% export tax rate leads to a decrease of 1.53% of farm income. In addition, this also causes a 1.22% decrease in added value in industry and 0.09% decrease in employment. However, this policy has been proven as an effective means to control domestic CPO price and cooking oil price. A 1% increase in the export tax rate reduces the CPO domestic price and cooking oil price by 1.13% and 1.03%, respectively. Following these, producer surplus declines by 1.26%, while consumer surplus increases by 0.86% for 1% increase of the tax rate. Total export revenue gained by the government in 1994-1999 was around Rp 5 241 billion.

Considering several factors related to the industries, the export tax rate prior to 2001 which is 30%, is too high. The results of this study show that the export tax rate should be around 18% of the difference between the world CPO price and the minimum price taxed (USD 362/t). Under this tax rate formula, the effective tax rates will vary from 0.19%-10.98% of the world price, depending on the CPO world price and exchange rate. Moreover, the socialized tax rate should be the effective tax rates, not the nominal tax rates.

TABLE 4. EXPORT TAX EFFECTIVE VALUE BASED ON EXPORT TAX FORMULATION 18.38%

Price (USD/t)	Exchange rate (Rp/USD)	Effective tax (%)	Value (USD/t)	Exchange rate (Rp/USD)	Effective rate (%)
366-400	6 000-6 500	0.00	550-600	6 000-6 500	5.31
366-400	6 500-7 000	0.19	550-600	6 500-7 000	6.28
366-400	7 000-7 500	1.45	550-600	7 000-7 500	7.12
366-400	7 500-8 000	2.54	550-600	7 500-8 000	7.84
366-400	8 000-8 500	3.50	550-600	8 000-8 500	8.48
366-400	8 500-9 000	4.35	550-600	8 500-9 000	9.05
400-450	6 000-6 500	0.70	600-650	6 000-6 500	6.36
400-450	6 500-7 000	2.01	600-650	6 500-7 000	7.25
400-450	7 000-7 500	3.14	600-650	7 000-7 500	8.02
400-450	7 500-8 000	4.12	600-650	7 500-8 000	8.68
400-450	8 000-8 500	4.99	600-650	8 000-8 500	9.27
400-450	8 500-9 000	5.75	600-650	8 500-9 000	9.79
450-500	6 000-6 500	2.56	650-700	6 000-6 500	7.25
450-500	6 500-7 000	3.73	650-700	6 500-7 000	8.07
450-500	7 000-7 500	4.74	650-700	7 000-7 500	8.78
450-500	7 500-8 000	5.62	650-700	7 500-8 000	9.40
450-500	8 000-8 500	6.40	650-700	8 000-8 500	9.95
450-500	8 500-9 000	7.08	650-700	8 500-9 000	10.43
500-550	6 000-6 500	4.07	700-750	6 000-6 500	8.02
500-550	6 500-7 000	5.13	700-750	6 500-7 000	8.78
500-550	7 000-7 500	6.04	700-750	7 000-7 500	9.45
500-550	7 500-8 000	6.84	700-750	7 500-8 000	10.02
500-550	8 000-8 500	7.54	700-750	8 000-8 500	10.53
500-550	8 500-9 000	8.16	700-750	8 500-9 000	10.98

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