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Effects of an Export Tax on Competitiveness: The Case of the Indonesian Palm Oil Industry

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This research analyzes the dynamic effects of an export tax on export performance of the Indonesian palm oil industry using time series analysis. The vector autoregressive model results show exports fell dramatically with the imposition of the tax. This research showed that the imposition of an export tax has long-lasting, negative effects on competitiveness of the Indonesian palm oil industry. The variance decomposition reveals that more than 83% of the variation in the forecast error of the net export shares is explained by its own shock, and 8.6% and 8.4% are explained by export tax and relative export prices, respectively.

I. Introduction

Palm oil has two important characteristics in the Indonesian economy. First, palm oil is an important export commodity that provides export earnings and generates employment opportunities for millions of farm families. Second, palm oil is the primary source for cooking oil, which the government considers "an essential commodity" for Indonesia. The availability of "essential commodities" at affordable prices is key to the Indonesian government's policy of maintaining economic and political stability. Due to this position, it is not surprising that the palm oil industry is subject to heavy government interventions. The government intervenes through investment policies in palm oil production, especially with respect to the small-holder development program, to expand Indonesian exports of palm oil.[1] Concurrently, the government intervenes in domestic markets to guarantee an adequate supply of palm oil at affordable prices. In this regard, the Indonesian government uses a variety of policy measures, such as a domestic allocation price, export restrictions and an export tax.

In June 1991, as a part of its trade liberalization policies, the government lifted all palm oil trade restrictions, including domestic allocation prices and export quantity restrictions. This liberalization policy resulted in a considerable increase in the domestic price of palm cooking oil, along with a significant increase in Indonesian export shares of palm oil in the world market. Concerned with the cooking oil price increase, the Indonesian government issued a new policy imposing export taxes on palm oil products: crude palm oil

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1. In Indonesia, a small-holder is defined as a farmer who grows and operates estate crops under 25 hectares. In practice, most are much smaller, often from 1 to 3 hectares (Winrock International (1996)).

(CPO); refined, bleached, deodorized (RBD) palm oil; crude olein; and RBD olein (palm cooking oil). These new taxes were in effect from 1994 to 1997. At the beginning of 1998, following the economic crisis and political turmoil in Indonesia, the Indonesian government banned exports of CPO and its products.

Given these unique events, the objective of this research is to analyze the dynamic effects of a palm oil export tax on export performance and competitiveness using econometric time series analysis. Specifically, a vector autoregressive model (VAR) is used along with the impulse response function and variance decomposition to investigate the dynamic effects of an export tax. This study adds to the literature by applying econometric time series methods in analyzing the effects of an export tax on industrial competitiveness in both the short and long run. This dynamic perspective differs from previous studies, which use a static model. These results can be used by policy makers to analyze the impact of export tax policies and should be considered when an export tax on perennial crops is considered.

II. Literature Review

Export taxes are predominantly used by developing countries with the objective either to generate government revenues or to protect particular groups for political reasons. The effect of an export tax by a small country under a competitive market structure causes the price in the exporting country to fall below the world price (Reed (2000), McCalla and Josling (1985)). Under this policy, producers in the exporting country will lose because they receive lower prices and exports decline. Consumers in the exporting country gain through lower prices and the government generates revenue. The effect of an export tax is different in the case of a large exporting country (i.e., when a country faces a downward sloping residual demand curve). Having market power on the world market, the export tax causes a reduction in domestic production; thus, exports decline and the world price increases. In this case, consumers, producers and the government in the exporting country can gain from this policy (Reed (2000), McCalla and Josling (1985)).

Empirical studies on the effect of export taxes have been conducted by Akiyama (1992); Bruce and Perez-Garcia (1992); Warr (1997); and Marks, Larson, and Pomeroy (1998). Akiyama (1992) examined the effect of an optimal tax on perennial crops (cocoa) in a large country case. In particular, his research focused on an optimal export tax and its implications on producer surplus and government reserves. His results showed that an export tax significantly affected the distribution of national welfare between farmers and the government, and also significantly affected the long-run production of cocoa. Bruce and Perez-Garcia (1992) examined the economic impact of a U.S. export tax on forest products using a competitive global trade model. Their results showed a loss of consumer welfare in the U.S. and a large transfer of wealth from timber growers to processors. Warr (1997) conducted a similar study on Thailand's rice export tax and calculated economic gains and losses.

Finally, Marks, Larson, and Pomeroy (1998) analyzed the effect of an export tax for palm oil on the distribution of income in Indonesia using a static model. They found that an export tax reduced the price of palm oil products, ceteris paribus, thus, benefiting consumers.

In addition, they found that the tax lowered profits earned by palm oil producers, and that processors lost slightly as well. The government gained revenue from the export tax, but lost more revenue in the government's role as owners of palm estates. Thus, the net result was that the government lost with an export tax on palm oil. Our research extends their work by using a dynamic, time series model that assesses the short and long term consequences of the Indonesian palm oil export tax on competitiveness.

Most of the above literature focused on the distributional effects of the export trade policy, namely, identifying who gains and who loses. In addition, most studies used general equilibrium trade models to identify and estimate policy impacts. Implicit in a general equilibrium trade model is the assumption that all sectors are in equilibrium and sectors would return to equilibrium after the exogenous policy shock. In these models, complete demand-supply systems are estimated and the effects of particular trade policies are assessed using those estimated demand-supply parameters. One limitation of this approach is that it cannot capture the dynamic effects of particular trade policies on variables in the model.

In this study, econometric time series analysis is used to analyze the dynamic behavior of an export tax on export performance. A vector autoregressive (VAR) model is specified and the resulting impulse response function and the variance decomposition are analyzed. The impulse response function reveals how export performance responds to "shocks" from other variables, such as an export tax. The variance decomposition indicates the amount of variation in the forecast-error corresponding to export performance due to shocks from other variables. This approach has limitations since it cannot trace the spillover effects of a particular trade policy to other sectors and it does not take into account the complete demand-supply system for the sector. Despite these limitations, the vector autoregressive model provides a useful and unique perspective on the dynamics of trade policies.

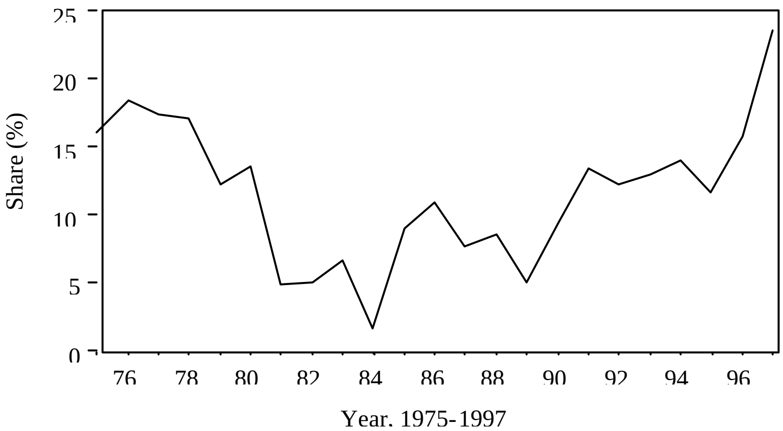
III. An Overview of the Indonesian Palm Oil Industry

The production of most Indonesian plantation trees comes from three sources: small-holders, the Indonesian government and private estates. Small-holders provide 24% of total production, while the government and private estates contribute 33% and 43%, respectively (Directorate General of Estates, Ministry of Agriculture (1997)).

In the early years of palm oil development, most Indonesian palm oil production was exported. During this period, domestic needs for cooking oil came from copra (from which most crude coconut oil is made). In 1971, 93% of total expenditures on crude vegetable oil were devoted to coconut oil. However, coconut oil production only increased at a modest rate of 1.2% during the 1979-1994 period. Concurrently, production of palm oil grew rapidly from only 0.6 million metric tons in 1979 to 4.1 million metric tons in 1994 (Winrock International (1996)). Thus, palm oil has become an important source of Indonesian cooking oil and fatty acid since the late 1970s. Since 1984, the market share of manufactured cooking oil made from palm oil has exceeded the share of coconut oil and made palm oil the most prominent edible oil consumed in Indonesia. Along with this change, the share of palm oil exports declined significantly.

Exports of palm oil fluctuated during this period due to government policies. Before 1978, the Indonesian government did not impose trade restrictions (tariff and non-tariff barriers) on palm oil exports. During this period, palm oil exports were extremely large, ranging from 73% to 94% of production (Directorate General of Estate, Ministry of Agriculture, various issues). This situation changed in 1978, after the government imposed trade restrictions on palm oil in the form of an export tax and domestic allocation prices for palm oil in order to guarantee the availability of cooking oil at affordable prices. As a result, palm oil exports dropped significantly in one year from 84% of production in 1978 to 55% in 1979.

Throughout the 1970s, Indonesia's exports of palm oil were about 17% of total world exports. In the 1980s, Indonesian palm oil exports as a percentage of total world exports dropped to less than 10%. In particular, export shares declined dramatically from 18% in 1976 to only 1.6% in 1984. Indonesia's export share started to recover in the early 1990s - from a low of 1.6% in 1984 to 13% in 1991 (Indonesian Central Bureau of Statistics (1997)). Indonesia's share of total world palm oil exports continued to increase in subsequent years until 1997, when Indonesian export shares reached their peak at 23% of global exports. Figure 1 shows Indonesian export shares of palm oil in the world from 1975-1997.



Sources: Oil World, various issues and the Indonesian Central Bureau of Statistics, various issues.

Figure 1 Indonesian Net Export Share of Palm Oil in World Market

The market structure of the Indonesian palm oil industry has changed in the last 20 years. The concentration ratio of the four largest firms decreased significantly. A decline in the four-firm concentration ratio has been accompanied by an increase in the number of firms in the industry - from only 24 palm oil firms in 1975 to 194 firms in 1997. In terms of value added per worker and per plant, substantial changes have also occurred in the structure of the Indonesian palm oil industry. Real value added per worker increased significantly from US $3,518 in 1975 to US $5,359 in 1985. In 1997, the real value added per worker became US $7,201, a more than two-fold increase from 1975. Meanwhile, real value added per plant also showed a significant increase from US $430,116 in 1975 to US $1,687,555 in 1997 (Indonesian Central Bureau of Statistics, various issues).

Indonesia continues to be one of the most efficient producers of palm oil in the world. It is estimated that production costs average about US $200/metric ton, considerably lower than costs of other producing countries as shown in Table 1.

Table 1 Comparisons of Palm Oil Production Costs in 1997 (in US$ per metric ton)

	Columbia	Cote d' Ivoire	Indonesia	Malaysia	Nigeria	World Average
Establishment	71.2	69.5	64.3	60.7	224.5	72.1
Cultivation	91.2	136.1	72.5	75.7	113.7	79.3
Harvesting/ Transporting	78.9	33.8	40.5	45.1	90.7	47.3
Milling Costs	106.1	105.3	82.6	98.3	130.7	96.6
Kernel Milling Costs	6.9	7.7	7.2	7.6	8.2	7.5
Kernel Oil and Meal Credits	(58.2)	(54.0)	(60.0)	(61.9)	(65.6)	(61.5)
Total Costs	296.1	298.4	206.2	225.5	502.2	241.6

Source: P.T. Purimas Sasmita in Casson (1999).

Meanwhile, current palm oil prices are well above US $400/metric ton and projected to remain high for the foreseeable future (Larson (1996)). In addition, palm oil continues to be one of the most profitable tree crops for Indonesia. The financial internal rate of return (FIRR) for palm oil is the second highest (22%), after cashews (26%), among tree crops in Indonesia (Winrock International (1996)).

IV. Analytical Framework

The concept of competitiveness is an illusive one. Most definitions, however, focus on market share in international markets. For this study, we use net export market share as our measure of competitiveness (Indonesia's net exports of palm oil as a percentage of world exports). Assume a representative competitive exporter maximizes profit when subjected to an export tax[2] From this profit maximization framework, exports (export shares) are influenced by relative export prices and the export tax. Using a vector autoregressive model (VAR), this relationship can be presented as follows:

2. In this study, we assume that Indonesia is a small country in the world market for crude palm oil. We tested this hypothesis with the Granger causality test. We hypothesized that relative export prices cause variation in net export shares and not vice versa. With an F-statistic of 2.99, we are able to reject the null hypothesis that relative export prices cause net export shares at the 10% level of statistical significance. On the contrary, we fail to reject the null hypothesis that net export shares do not Granger cause relative export prices with a F-statistic of 1.63 at the 10% level. The result that relative export prices cause net export shares and not vice versa means that Indonesia is a small country on the world market for palm oil. These results confirm Marks, Larson, and Pomeroy's (1998) small country assumption. Even though Indonesia currently accounts for 23% of world palm oil exports, they account for only 5% of world vegetable oil exports. Given the great substitutability among vegetable oils, it is not surprising that Indonesia is a small country for palm oil exports.

$$Z_{1t} = a_{10} + \sum_{i=1}^{m} a_{1i} Z_{1t-i} + \sum_{j=1}^{m} b_{1j} Z_{2t-j} + \sum_{k=1}^{m} c_{1k} Z_{3t-k} + e_{1t}\,, \tag{1}$$

$$Z_{2t} = a_{20} + \sum_{i=1}^{m} a_{2i} Z_{1t-i} + \sum_{j=1}^{m} b_{2j} Z_{2t-j} + \sum_{k=1}^{m} c_{2k} Z_{3t-k} + e_{2t}\,, \tag{2}$$

$$Z_{3t} = a_{30} + \sum_{i=1}^{m} a_{3i} Z_{1t-i} + \sum_{j=1}^{m} b_{3j} Z_{2t-j} + \sum_{k=1}^{m} c_{3k} Z_{3t-k} + e_{3t}\,. \tag{3}$$

where Z_{1t}, Z_{2t}, and Z_{3t} are net export shares, the export tax, and relative export prices of Indonesian palm oil, respectively; *a*, *b*, and *c* are parameters to be estimated; and the e_s are the errors or innovations.

V. Data

As described below, data for these variables are readily available from secondary sources on a monthly basis making them an excellent choice for time series analysis. Thus, the three data series included in this analysis are

(1) $Z_{t,1}$ = Net Export Shares: Indonesian net export shares of world palm oil exports (NXS) are calculated as Indonesian' s net exports divided by the world' s total exports. Data for these series come from *Exports and Imports* published by the Indonesian Central Bureau of Statistics and the *Oil World Statistical Update* published by Oil World.

(2) $Z_{t,2}$ = Export Tax: It is expected that an export tax will increase the supply of palm oil in the Indonesian domestic market relative to the export market. Data for this series come from *Palm Oil Data* published by the Indonesian State Marketing Board *and Tax Decrees on Palm Oil and Its Products* published by Ministry of Finance.

(3) $Z_{t,3}$ = Relative export prices: This variable is constructed by dividing the world price of palm oil (CIF Rotterdam) by Indonesian export prices (FOB). If the world price increases relative to the export price, exports will increase and Indonesia' s net export share will be larger. Data for this series come from the *Oil World Statistical Update* published by Oil World and *Palm Oil Data* published by the Indonesian State Marketing Board.

All of the above data are on a monthly basis for the period of 1994-1997.

VI. Econometric Procedures and Preliminary Tests

An Augmented Dickey-Fuller test, the first stage in any time series analysis, is used to determine the order of integration for each univariate series. This test involves running a regression using the first difference of a series against the series lagged once (Z_{t-1}), lag difference terms (ΔZ_{t-1}, ΔZ_{t-2}, ... ΔZ_{t-n}) and a constant (b_0):

$$\Delta Z_t = b_0 + b_1 Z_{t-1} + b_2 \Delta Z_{t-1} + \ldots + b_{n+1} \Delta Z_{t-n} + e_t . \tag{4}$$

The unit-root test is performed using ordinary least squares (OLS) and presented in Table 2.

Table 2 Augmented-Dickey Fuller (ADF) Test Results

Statistic/Diagnostic	Test Results for Variables in Original Series		
	Net Export Shares	Export Tax	Relative Export Prices
ADF Test[a]	0.18	1.11	0.51
F-test	8.13***	3.19**	2.99**
R-squared	0.32	0.17	0.22
Schwarz Criterion	6.67	8.11	−2.37
AIC (Akaike Information Criterion)	6.54	7.98	−2.54
Durbin Watson	1.87	1.89	1.87
	Test Results for Variables after First-Differencing		
	Net Export Shares	Export Tax	Relative Export Prices
ADF Test[a]	4.47***	5.42***	3.65***
R-squared	0.74	0.65	0.65
F-Test	47.07***	31.76***	19.36***
Schwarz Criterion	6.69	7.93	−2.53
AIC (Akaike Information Criterion)	6.56	7.79	−2.71
Durbin Watson	1.81	1.91	1.97

Note: *** 1% significance level, ** 5% significance level, * 10% significance level.

[a] In absolute value and compared to MacKinnon critical value.

As shown in the upper portion of Table 2, all of the t-statistics are smaller (in absolute value) than the reported critical value. In each case, we failed to reject the null hypothesis of first-order autocorrelation, meaning that the series are non-stationary. Based on these results, the series were transformed to make them stationary. The lower portion of Table 2 gives the results of the Augmented Dickey Fuller test for the first difference transformation of the series. As shown, all the *t*-statistics are larger (in absolute value) than the reported MacKinnon critical value. We are able to reject the null hypothesis and conclude that each of the series becomes stationary after a first difference transformation. Thus, each of the series is an integrated process of order 1 or I(1) (Ali (1996), Enders (1995)).

Because the data series is I(1), the potential for co-integration exists. Results of Johansen's co-integration test determine whether a vector autoregressive (VAR) model is appropriate (Enders (1995), Ali (1996)). This test uses the likelihood ratio (LR) to determine whether the data series are co-integrated and to determine the co-integrating rank, (r), and the number of co-integrating vectors in the system (Holder and Perman (1994), Vickner and Davis (1999)).

Table 3 shows the results of co-integration tests under various sets of assumptions regarding the deterministic trend of the series. It indicates that at the 1% critical value we are unable to reject the null hypothesis of no co-integration under every set of assumptions regarding the deterministic trend of the series. This is true for the co-integrating rank, r = 0 to r = 2. Thus, we conclude the series are not co-integrated. These results indicate that a vector autoregressive (VAR) model is appropriate for this study.

Table 3 Johansen Cointegration Test Results

Null Hypothesis	Likelihood Ratio Statistic	1% Critical Value	Eigenvalue
No deterministic trend in the series or intercept in the co-integrating equations			
$r^a = 0$	35.95	41.07	0.543
$r \leq 1$	6.90	24.60	0.129
$r \leq 2$	1.76	12.97	0.046
Deterministic trend in the series and intercept and linear trend in the co-integrating equations			
$r^a = 0$	39.43	40.49	0.538
$r \leq 1$	10.84	23.46	0.202
$r \leq 2$	2.46	6.40	0.064

Note: a is the co-integrating rank.

VII. Results

Following Enders (1995) and Holder and Perman (1994), over-specified models were initially used according to the standard multivariate time series diagnostics, such as the Akaike Information Criteria (AIC), and the Schwarz Criteria. Based on these considerations, the specification of the VAR model includes one lag without an intercept. The t-statistics for coefficients beyond the one period lag are not statistically significant in this specification. Table 4 provides a summary of estimation results for the VAR model with the associated standard errors and relevant specification diagnostics.

Table 4 Vector Autoregression Model Parameter and Diagnostic

Variables	NXS	ETAX	REP
NXS (−1)	0.422***	−0.121	−0.0001
(Net Export Shares)	(0.173)	(0.341)	(0.002)
ETAX (−1)	−0.075*	0.776***	−0.001**
(Export Tax)	(0.045)	(0.107)	(0.0001)
REP (−1)	11.643***	11.442*	1.041***
(Relative export prices)	(4.467)	(8.818)	(0.049)
R-squared	0.27	0.71	0.09
AIC (Akaike Information Criterion)	3.79	5.15	−5.23
Schwarz Criteria	3.92	5.28	−5.10

Note: Standard errors are in parentheses.

*** 1% significance level, ** 5% significance level, * 10% significance level.

This study focuses on the effects of competitiveness of Indonesian palm oil export shares as influenced by relative export prices and a palm oil export tax. The estimation of these effects is shown in the first column of Table 4. As shown, the parameter estimates for the one-period lag of net export shares (NXS) is positive and statistically significant at the 1% level. The coefficient on the palm oil export tax (ETAX), as expected, is negative and statistically significant at the 10% level. Finally, the coefficient for relative export prices (REP) has the expected sign and is significant at the 1% level. A more meaningful way to interpret the results of a VAR model is to look at the impulse response functions and variance decompositions.

1. Impulse Response Function

An impulse response function traces the effect on current and future values of the endogenous variable of a one standard deviation shock to one of the innovations. If the innovations, e_{1t} to e_{3t} in Equation (1) to (3), are not correlated with each other, interpretation of the impulse response function is straightforward. The impulse response function of e_{3t} can be interpreted as the effect of a one standard deviation change in the current relative export prices on the current and future Indonesian net export shares and export tax on palm oil. However, since the innovations are correlated throughout the system of equations, the effect of a shock permeates the system and cannot be assigned to any specific variable. Thus, all variables need to be analyzed. The impulse response function is based on the assumption that the variables are arranged in order via a Choleski decomposition (Ali (1996)). Thus, in our example, the impulse response function quantifies the response of a one standard deviation shock in the recursive innovations created via the Choleski decomposition on relative export prices of Indonesian palm oil, the export tax on palm oil, and net export shares.

This study focuses on the effect of changes to the export tax and relative export prices on net export shares of Indonesian palm oil. Figures 2 and 3 summarize the impulse response function for these impacts. The impulse response function indicates that

1. If the export tax on Indonesian palm oil increases by 1%, there is no instantaneous change in the net export shares of Indonesian palm oil. However, net export shares will decrease by 0.8% in the second period, by 1.1% in the third period, and so on.

2. If the relative export prices for Indonesian palm oil increase by 1%, there is no change in the net export shares in the first period. However, net export shares of Indonesian palm oil increase by 0.75% in the second period, by 1.04% in the third period, and so on.

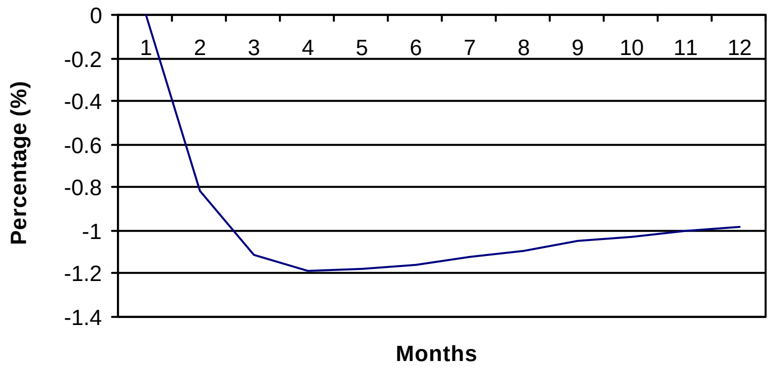


Figure 2 Impulse Response Function of the Effect of Changes to the Export Tax on the Net Export Shares of Indonesian Palm Oil

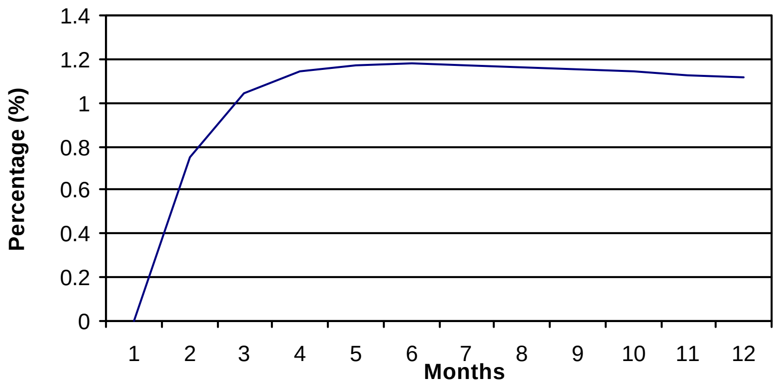


Figure 3 Impulse Response Function of the Effect of Changes to the Relative Domestic Prices on the Net Export Shares of Indonesian Palm Oil

The impulse response functions also show that these effects do not disappear even after 12 months. Changes in the export tax and relative export prices have similar effects, but in opposite directions. The initial response of the net export shares with respect to a shock in relative export prices are relatively moderate and increase significantly after the first two months. It reached a peak in the fifth month then fell monotonically to an equilibrium path. Meanwhile, the response of the net export shares of Indonesian palm oil to a shock in an export tax on palm oil does not appear until the second month and increases moderately until it reaches a peak in the fourth month. It starts to decline after the fourth month toward an equilibrium path.

These results indicate that Indonesian palm oil net export shares fell by 44.5% in October 1994 after the implementation of the export tax in September 1994. The effect of the export tax on Indonesian palm oil reached a peak in December 1994, when it reduced net export shares by 64.4%. The export tax was quite variable during the September 1994 through December 1997 period, but model results make it clear that the export tax had tremendous impacts on palm oil exports from Indonesia.

Clearly, the export tax policy reduces not only competitiveness of the Indonesian palm oil industry but also hurts producers of CPO, some of them are small-holder farmers, due to the lower price of CPO relative to the world market price. On the other hand, refiners that process CPO into various products - such as cooking oil, margarine, shortening - gain from this policy since they get CPO at lower prices. Finally, consumers may or may not gain from this policy since there is no guarantee that the processors will pass on the lower price of cooking oil. Considering that the concentration ratio (CR4) in this industry is large, which indicates a potential oligopolistic market structure, it is not likely that the consumers fully benefit from the lower price of cooking oil.

The export tax policy also hinders the development of the cooking oil industry in Indonesia as a whole and does not encourage diversification in cooking oils. As mentioned earlier, the major sources of cooking oil in Indonesia are coconut oil, which is made from CCO (crude coconut oil), and RBD (refined, bleached, deodorized) olein, which is made from CPO. These two products are close substitutes so that policies imposed on one commodity will have tremendous effects on the other commodity. The imposition of an export tax diverts CPO from the export market to the domestic market, lowering all cooking oil prices. This causes more competition with the domestic coconut oil industry, which otherwise would provide the supply more of the raw material for domestic cooking oil. Considering that significant amounts of copra, the raw material of coconut oil, are made from coconuts that come from small-holder farmers, the export tax policy on CPO could further lower price of coconuts and pressure farm incomes.

In light of the current economic crisis, the export tax policies also discourage the country's recovery effort. Under current exchange rates, there is an opportunity to increase Indonesia's industrial export competitiveness to achieve economic recovery. Improved competitiveness will benefit not only economic growth but also overcome the bias against the rural and agricultural sectors which was associated with previous growth spurts. Thus, agricultural exports should be encouraged at all costs. The implications are that taxes and non-tax barriers to export should be removed if the potential gains from export are to be realized. By imposing an export tax on CPO, the government creates an impediment to increasing agricultural exports and competitiveness of the export-oriented industry.

Figure 2 shows that the effects of an export tax are long-lasting. From the policy perspective, this means that it is difficult for the industry to regain its lost competitiveness in the long run. Consequently, it becomes difficult for the policy makers to overcome the bias against the agricultural sector from the tax, especially with a perennial crop like palm oil.

2. Variance Decomposition

The variance decomposition of a vector autoregressive model gives information about the relative importance of the random innovations. It gives information on the percentage of variation in the forecast error of a variable explained by its own innovation and the proportion explained by innovations in other variables. Table 5 summarizes the results of the variance decomposition on the effects of export taxes, and relative export prices on the net export shares for Indonesian palm oil.

Table 5 Variance Decomposition on the Effects of An Export Tax and Relative Export Prices on the Net Export Shares

Period	Net Export Shares	Export Taxes	Relative export prices
1	100.000	0.000	0.000
2	97.514	1.359	1.126
3	93.643	3.420	2.937
4	89.640	5.487	4.873
5	85.990	7.311	6.699
6	82.791	8.855	8.354
7	80.007	10.154	9.839
8	77.574	11.250	11.176
9	75.429	12.187	12.384
10	73.520	12.996	13.484
11	71.807	13.703	14.490
12	70.254	14.326	15.430

Table 5 shows that on average 83.2% of the variation in the forecast error for net export shares can be explained by its own innovation (or other factors outside this model). Around 8.6% of the forecast error variance for net export shares is explained by the export tax. The rest of the variation in the forecast error of net export shares is explained by relative export prices. This evidence shows that the effect of export tax and relative export prices are small, but important in explaining the performance of net export shares. The variance decomposition results illustrate that current performance of net export shares depends largely upon their past performance. This may be caused by the limitation of the explanatory variables in the model, but we were only focusing on the effects of an export tax. The percentage of the variation in the forecast error of net export shares that can be explained by the export tax and relative export prices increases over time, while the percentages of the variation in the forecast error of net export shares explained by its own innovation declines.

VIII. Conclusions and Policy Implications

The objective of this research was to analyze the short and long run dynamic effects of an export tax on the export performance of the Indonesian palm oil industry using econometric time series methods. A vector autoregressive (VAR) model was specified and the impulse response function as well as the variance decomposition of this model was analyzed.

The VAR model results show that net export shares are positively related to net export shares lagged by one period. As expected, an export tax has a negative and significant relationship with net export shares, while relative export prices have a positive and statistically significant influence on net export shares of Indonesian palm oil. Further, we interpret the result of the VAR model using an impulse response function and variance decomposition. The impulse response function shows that there is a one-period lagged response of net export shares to changes in export taxes and relative export prices. The impulse response function also implies that the response of net export shares to changes in other variables is permanent rather than temporary. This is consistent with our preliminary finding that no series were stationary in their original form. Variance decomposition reveals that more than 83% of the variation in the forecast error of the net export shares is explained by its own shock, while 8.6% and 8.4% are explained by export taxes and relative export prices, respectively.

This research showed that the imposition of an export tax has long-lasting, negative effects on competitiveness of the Indonesian palm oil industry. In fact, the effect of an export tax was not immediate; it appears in the second month and reaches a peak in the fourth month after the export tax of Indonesian palm oil is imposed; yet the effects remain long after that time. Results of this study further our understanding on how an export tax affects competitiveness and export performance as well as the important dynamic implications that can be relevant when policies are applied to perennial crops. The effects are large, complex, and long lasting. Governments should be careful when considering implementation or changes in export taxes and other policies for export crops. This is particularly true if the country needs foreign exchange for funding investments and other development projects.

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