AN ANALYSIS OF THE UNITED STATES DEMAND FOR MALAYSIAN PALM OIL

Juzhar Jusoh

Jika dibandingkan dengan sumber minyak dan lemak utama yang lain, minyak sawit mempunyai potensi yang cerah di Amerika Syarikat (AS) kerana penawarannya yang lebih stabil dan harganya yang selalunya lebih rendah. Anggaran yang dibuat menunjukkan bahawa jumlah minyak sawit yang diimpot oleh AS mempunyai hubungan yang signifikan nisbah harga minyak soya kepada minyak sawit. Implikasi kajian ini adalah pertama, Malaysia harus memberi perhatian khusus kepada polisi-polisi pertanian yang bakal diamalkan oleh Kerajaan AS dan kedua, mengawal dan memastikan harga minyak sawit terus berada di tahap yang "competitive".

PALM OIL IN THE FATS AND OILS MARKETS

The world's palm oil industry has experienced rapid growth during the last two decades and is today an important source of oils and fats. In 1964, the output share of palm oil in the total world output of fats and oils was only 5.4 percent, but by 1984 its share has increased significantly to 11.3 percent (Min. Primary Ind. : 1984:90). In the U.S., its share has increased to 7.0 percent in 1983 from only 1.5 percent in 1970 (Min. Primary Ind. : 1984:93). The significance of palm oil in the world's oils and fats market is further evident from the fact that while during the period of 1964 to 1984 the world's output of 16 major oils and fats grew at a compounded rate of 3.2 percent, palm oil experienced an average compounded growth rate of 7.1 percent (Min. Primary Ind, : 1986:16). This impressive growth pattern of palm oil is expected to continue in the foreseeable future.

Palm oil is imported by the U.S. primarily to supplement the shortage of domestic supply of fats and oils because its prices are lower than that of the soyabean oil (USDA: 1976:5)). From Table 1 it is clear that, even though the U.S. has not been a significant buyer of Malaysian palm oil, there is considerable potential for palm oil to improve its market share in the U.S. fats and oils market. As palm oil is a close substitute of soyabean oil, which is one of the major oils in the U.S any slack in the production of soyabean oil would encourage the import of palm oil.

Table 1: Malaysia's Export Volume of Processed Palm Oil by Destinations (% of total)

	1980	1984	1985
EEC	9.9	8.6	9.1
USSR	2.7	6.3	5.1
U.S.A.	5.8	2.7	3.1
Middle-East	4.2	8.2	7.8
India	19.0	20.7	21.7
Japan	6.8	5.8	5.8
Pakistan	5.4	7.2	4.9
Singapore	31.1	26.9	31.6
Others	15.0	12.7	10.9
	100	100	100

Source: Ministry of Primary Industries, Malaysia

A Brief outline of the Palm Oil Industry in Malaysia

It is well known that the rapid emergence of palm oil in the world's oils and fats scenario is attributable to Malaysia's success in the cultivation of oil palm on a massive scale. The Malaysian government's aggressive pursuit of oil palm cultivation which began in the mid-60s was basically to reduce the country's dependence on rubber and tin, and at the same time to enhance Malaysia's resilience in the face of wide price fluctuations in the world's commodity markets (FMP: 162). Today, Malaysia is the world's largest producer and exporter of palm oil. In 1984 Malaysia exported about 3.7 million tonnes of palm oil, accounting for almost 60 percent of the world palm oil output (FMP: 86).

For Malaysia, the palm oil industry ranks second only to petroluem and gas in terms of foreign exchange earnings. In 1984, export earnings from palm oil and its related products were about US$2.6 billion or 15 percent of the total estimated earnings of Malaysia (FMP: 87). Over half a million are employed in this industry; giving it an important role in eradicating poverty in rural areas.

Consumption Trends in the U.S. Fats and Oils Market

Several researchers have shown that within the past three decades (1951 – 1982) three basic trends within the U.S. fats and oils market are observed. First, there is a dramatic shift from animal fats to increased usage of vegetable

oils. In 1950 the market was nearly evenly divided between the two oils, but in 1973 edible vegetable oils accounted for about 80 percent of the fats and oils market (USDA: 1974:22).

Secondly, there was a shift within the U.S. vegetable oils market itself. In the 1950s, cottonseed was widely used but later lost its dominance to soyabean oil. By 1973, soyabean accounted for over 70 percent of the edible oils market due to its price competitiveness, higher returns to producers, and its worldwide acceptability (USDA: 1974:22).

Palm Oil vis-a-vis Other Oils: Usage and Price

In the U.S., palm oil is basically used in baking and frying fats. Almost all of the imported palm oil is used in the manufacturing of shortening with smaller quatities being used in the production of margarine and cooking oils. From Table 2 it is clear that palm oil competes with soyabean oil, cottonseed oil, lard and tallow – the four other oils sharing the same usage in the U.S. fats and oils market.

Table 2: Fats and Oils Used in Food Products in the U.S.A. 1981/82 (Million pounds).

Item	Salad and Cooking oil	Baking and Frying Fats	Margarine
Soyabean	4368	2991	1723
Cottonseed	402	167	22
Corn	357	–	217
Palm	–	193	–
Lard	–	693	28
Tallow	–	282	8
Others	311	157	9

Source: Fats and Oils Situation, U.S.D.A., June '86

It should, however, be noted that palm oil is not strongly favored among manufacturers of fat food products in the U.S. Instead, soyabean oil, corn

oil, and cottonseed oil are more strongly favored over palm oil in such usage, as these oils contain lower levels of saturated fatty acids and are not in solid state at room temperature.

From Figure 1 it is evident that palm oil prices are usually lower than the price of soyabean oil and always higher than the price of tallow. This would mean that palm oil would be more price competitive than soyabean oil and less price competitive when compared to tallow. However, due to the diet-consciousness of U.S. consumers, palm oil has been able to maintain its advantage over tallow.

One distinct advantage of palm oil over other oils and fats is the reliability of its supply in the world market. Oil palm is a perennial crop which enjoys a long productive life of about 30 years and its yield per acre is very high when compared to other oils and fats.

LITERATURE REVIEW

One of the econometric models to deal with the U.S. demand for palm oil was constructed by Cohen (1978). The objective of Cohen's study was to determine the effects of increased palm oil imports on soyabean oil prices.

Cohen constructed a three-equation model in order to project the supply of palm oil and to see how the projected supply affects soyabean prices. She pointed out that palm oil is used mainly in the U.S. in food manufacturing, and not at the individual household level. Therefore, in her equation, she used U.S. net national income per capita to represent the income variable. Cohen also indicated that palm oil imports are determined by, first, the total world production of palm oil, and second, the combined U.S production of soyabean oil and cottonseed oil.

Another study was undertaken by Wayne Boutwell et al (1976). Their objective was to analyze the outlook of the U.S. domestic fats and oils industry in the context of the world supply and demand. Boutwell et al. concluded that the production of soyabeans affects it prices which in turn affects the soyabean oil price. They also concluded that the U.S. would import other oils, or soyabean oil substitutes such as palm oil, if the price of soyabean oil were too high. Boutwell et al. also calculated various elasticities for fats and oils in the U.S. and found that an income elasticity of 0.25, population elasticity of 1.00, and price elasticity of 0.10.

Armore (1983) did a similiar study for cottonseed oil. He showed that the production of U.S. cottonseed oil affects its price and he concluded that the price of cottonseed has an effect on the percentage of cottonseed oil being sold.

Other researchers, such as Griffifth and Meilke (1979), have studied the relationships among U.S. fats and oils, and their findings have shown that substitution does occur between the various fats and oils depending on their relative prices.

Griffifth and Mielke observed that palm oil price is highly correlated with soyabean oil price but moderately correlated to other fats and oils prices.

THE MODEL

The model is built by defining U.S. import of Malaysian's palm oil (QtyIm) as the surplus between U.S. domestic demand and supply for all oil and fats.

It is assumed that the U.S. import of palm oil is given by the following:

QtyIm = f(PoilP, Incm., Popu., OtherSs, Time)

where

QtyIm	=	U.S. Import of Malaysia's palm oil
PoilP	=	palm oil price
Incm.	=	Income
Popu.	=	Population
OtherSs	=	supply of U.S. domestic competing oils and fats (palm oil substitutes)
Time	=	trend variable

In specifying the above model, the following two alternatives models are regressed linearly.

Model I

QtyIm = f(SBOss, COTTss, LRD & TLOW, NPP/cap, PoilP, Time)

Model II

QtyIm = f(SBOss, COTTss, LRD & TLOW, NNP/cap, POP: SBP%, Time)

where:

QtyIm = quantity of Malaysian palm oil being imported by the U.S. (million lbs.)

SBOss = U.S. soyabean oil supply figures (millions lbs.)

COTTss = U.S. lard & tallow supply figures (million lbs.)

LRD & TLOW = U.S. lard & tallow supply figures (million lbs.)

NNP/cap = U.S. net national product per capita (in thousand U.S. dollars)

PoilP = av. palm oil price in U.S. ($/lb)

POP : SBP% = ratio of palm oil price to soyabean oil price in percentage form.

Time = trend factor (1 to 19)

Data were collected from 1966 to 1984 as record showed that no palm oil was imported by the U.S. from Malaysia prior to 1966.

There is only one variable which makes the two models different. The first model has the palm oil price variable, whereas the second model does not; instead, a price ratio of the two major competing oils is substituted. This ratio is introduced in the second model to minimize possible multicollinearity problems between the two prices.

RESULTS AND ANALYSIS

As the major purpose of this paper is to determine those variables which affect and generate shifts in the level of U.S. palm oil imports from Malaysia, it is important for the equations to yield significant coefficients and as much explanatory power as possible.

Model I

$$\underset{}{\text{QtyIm}} = 1424.4 - \underset{(0.13)}{.0025\ \text{SBOss}} - \underset{(2.17)}{.181\ \text{COTTss}} - \underset{10.32)}{.497\ \text{LRD \& TLOW}}$$

$$+ \underset{(3.68)}{60.57\ \text{Time}} + \underset{(1.04)}{.01\ \text{NNP/cap}} + \underset{(0.82)}{3.25\ \text{PoilP}}$$

$R^2 = 0.899$

Se = 68.52

F = 27.7

The variables are as defined before, R^2 is the coefficient of multiple determination and the figures in parentheses are the t-ratios. Except for the palm oil [illegible] signs and magnitudes of the coefficients are consistent with economic theory. The Beta coefficient of the palm oil price variable

is ranked fifth, indicating that it does not have a strong individual impact on the dependent variable. The model, which yielded a relatively high R^2 value, has one significant weakness, namely, that the palm oil price variable fails to correspond with 'a priori' expectations.

Model II

$$\begin{aligned} \text{QtyIm} = 1647.7 &- .006\ \text{SBOss} - .141\ \text{COTss} - .563\ \text{LRD \& TLOW} \\ &\quad (0.41) \qquad (1.79) \qquad (12.17) \\ &+ 64.22\ \text{Time} + .021\ \text{NNP/cap} - 1.083\ \text{POP: SBP\%} \\ &\quad (4.63) \qquad (2.43) \qquad 2.48) \end{aligned}$$

$R^2 = .93$

$Se = 57.27$

$F = 40.6$

The inclusion of the price ratio in this models greatly improved the results, and the coefficients of the variables confirmed the hypothesized economic relationships. The respective t-values are also significant at the 95 percent level of confidence, except for the soyabean oil supply and the cottonseed oil supply variables. To say that these two variables with the low t-values have no significant impact on the dependent variable could lead to a wrong conclusion, however, as the two variables are highly correlated, (0.87), and these oils are the major oils in the U.S. market. Model II also yield a higher R^2 value and a smaller standard error.

The following conclusions may be drawn from the study:

a) Malaysia's palm oil exports to the U.S. will rise by 0.2 percent and 0.6 percent respectively as a result of a 1 percent drop in the U.S. production of soyabean oil and cottonseed oil, respectively.
b) The U.S. income elasticity for palm oil is 0.6.
c) A 1 percent increase in the ratio of palm oil to soyabean oil prices will lead to a 1.1 percent reduction in the amount of palm oil exported by Malaysia to the U.S.

SUMMARY AND CONCLUSIONS

The study analyzed the factors influencing the U.S. demand for Malaysian palm oil based on from 1966 to 1984. The demand equation

Qtylm = f(SBOss, COTTss, LRD & TLOW, Time, NNPpop, PoilP or SBP:POP%)

describes the functional form of the model used in the econometric analysis. U.S. production figures for soyabean oil, cottonseed oil, lard and edible tallow (which are very close subsitutes for palm oil) were used instead of the respective prices in order to avoid the multicollinearity problem. The time variable was introduced in order to take care of any specific trend which might occur over time, and was found to be significant. Among the substitutes considered, only the lard and edible tallow variables were significant. Because of their importance in the U.S. facts and oils sector, the soyabean oil and cottonseed oil variables were maintained in the regression equation even though they were found to be insignificant. Omitting these variables would lead to the misspecification of the model. All three substitutes displayed the hypothesized relationships; a decline in the U.S. production of any of the three substitutes would lead to larger imports of palm oil from Malaysia. The U.S. net national income per capita has a positive impact on demand for Malaysian palm oil which indicates that palm oil is not an inferior good. The ratio of palm oil to soyabean oil prices was used in the final regression instead of the palm oil price alone, as the latter failed to display the hypothesized relationship. This price ratio was selected as soyabean oil price is very highly correlated to palm oil price and was found to produce the correct hypothesized relationship.

The study provides the following implications for Malaysian policy makers interested in the promotion of Malaysia's palm oil exports to the U.S.:

1) The quantity of palm oil imported by the U.S. from Malaysia is influenced by the amount of U.S. – produced oils and fats, especially those used in the shortening industry. Policy changes by the U.S. government, aimed at curtailing the production of domestic oils, would increase the demand for palm oil.
2) Malaysia's palm oil faces a normal demand reaction to any changes in the factors affecting the demand for oils and fats. Thus it is not an inferior good. However, it must be remembered that the tastes and preferences of the U.S. consumer could play a significant role in determining the future of Malaysian palm oil in the U.S. fats and oils market.
3) The price of Malaysian palm oil relative to other oils and fats prices is a significant variable in determining the amounts of palm oil likely to be imported by the U.S. both now and in the future.

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