A Market Share Model of the Malaysian Sawntimber and Plywood Exports

Mohd Shahwahid Haji Othman
Maisom Abdullah
Saroni Judi

ABSTRAK

Objektif kertas ini adalah untuk menganggar suatu model bahagian pasaran ke atas eksport kayu gergaji dan papan lapis Malaysia dengan tujuan mendapatkan anggaran keanjalan bahagian pasaran ke atas harga relatif. Nilai keanjalan bahagian pasaran yang diperolehi melebihi sifar dan adalah signifikan. Ini menunjukkan wujudnya peluang-peluang untuk pengeluar-pengeluar Malaysia meningkatkan bahagian pasaran mereka melalui persaingan harga.

ABSTRACT

The objective of this paper is to estimate market share functions for Malaysian exports of sawntimber and plywood and to obtain estimates of their relative price elasticity of market share. The empirical evidence indicates that the estimates of relative price elasticity of Malaysian market share exceeded zero and are statistically significant, implying that avenues exist for Malaysian producers to increase their shares of the world market through price competition.

INTRODUCTION

Malaysian export contributions to the hardwood sawntimber and plywood international markets have been quite significant. In the sawntimber market Malaysian share was on an increasing trend contributing 19% in 1970 and achieving a maximum share of 28% in 1982. Thereafter Malaysian share decreased and settled to 24% in 1986. Likewise for plywood the share rose, although less distinctly, from 3% in 1970 to a climax of 7% in 1979, after which its shares declined and stagnated at around 5% by 1986. To further increase Malaysia's share of the world markets it is imperative to evaluate

Malaysia's export performance. Increases in share signify improvements in export performance. The objective of this paper is to estimate a Malaysian market share function of the world's import demand for sawntimber and plywood. The market share model popularised by Telser (1962) is applied and estimated following a partial adjustment framework. This model has been applied for traded commodities (Ginsburg 1969; Sirhan Johnson 1971; Capel Rigaux 1974; Castillo Laarman 1984; Mohd Shahwahid 1989a, 1989b).

THEORETICAL MODEL

Consider some import market in which a wood commodity is purchased from a given set of competing exporting countries, one of which is Malaysia. The Malaysian share of that import market is a function of the Malaysian price compared with the average price of all competing foreign exporters in that market:

$$M = f(p_M, p_O) \tag{1}$$

where M represents the Malaysian share in that import market and is defined as (q_m/Q). q_M is import value of a Malaysian wood commodity and Q is the total value of imports for that particular wood commodity from all sources; p_M is the Malaysian import price for that wood commodity and p_O is the average import price of that wood commodity from all other sources. If p_M falls relative to p_O (holding all other factors of supply and demand constant), it is expected that M will increase to the extend that consumers in the importing country can switch from other sources to Malaysia as a source of the wood commodity.

Several assumptions are necessary for the market share model following the specification of equation (1) to provide meaningful results. Each wood commodity purchased by the importing country from a particular source is a good substitute but not a perfect substitute from that purchased from another source. Thus it is required that the wood commodity from different sources are similar enough that the reaction of demand for each to all other economic variables is identical, yet at the same time there are small differences to induce the purchase of both (Leamer and Stern 1970, 60 – 63). This is possible if it is assumed that each commodity from different sources

occurs in varieties (or "brands") at least in the minds of the importers. Such an argument is justifiable since product differentiation by country of origin has been the basis for several theories of international trade (Armington 1969; Johnson, Grennes and Thursby 1979).

For market share of an exporting country to be functionally dependent on the value of P (i.e. p_M/p_O) alone as in the specification of equation (1) requires that the import demand function satisfy the theoretical conditions below:

1.   The algebraic sum of Malaysian and the other competing suppliers' price elasticities of demand for the wood commodity from Malaysia and the whole world be equal.

2.   The income and any other price elasticities of demand for the wood commodity from Malaysia and the whole world must be equal.

The points mentioned above are empirical questions that can be tested for their validity. The above conditions are met in the case of Malaysian share of the United States' imports of dressed meranti sawtimber (Mohd Shahwahid 1989a). Generally, these conditions are not particularly limiting when empirically estimating demand relations of reasonably disaggregated commodities (Richardson 1973). He uses import data for products up to three and four digit levels of the Standard International Trade Classification (SITC). Since hardwood sawtimber and plywood are four digit product levels of the SITC, the conclusion is not unexpected.

EMPIRICAL MODEL

The market share demand model is characterized below. All variables are in logarithms.

$$M_t^* = a + b\,P_t \tag{2}$$

$$M_t - M_{t-1} = c(M_t^* - M_{t-1}) + u_t, \quad 0 < c \leq 1 \tag{3}$$

The desired long run equilibrium market share of the current period, M_t^* is the share that would be achieved if a particular price relation between Malaysian commodity and that of its competitors in the import market (P_t) is to prevail indefinitely. But M_t^* will never be observed because P_t changes constantly. Furthermore import

purchases adjustment towards attaining M_t^* is not instantaneous. It is assumed that M_t^* is influenced by P_t, the ratio of Malaysian import price and the price of the most direct, though imperfect substitute.

Equation (2) depicts that only a fraction of the desired adjustment in market share can be achieved within a specified period when P_t changes. $M_t - M_{t-1}$ is the empirically observed market share adjustment, $M_t^* - M_{t-1}$ is the potential market share adjustment to achieve desired long run equilibrium, and c is the speed of adjustment which specifies the fraction of the potential adjustment attained within the specified time interval. c is between zero and one for the underlying absence of instantaneous adjustment or is one when total adjustment is attained. u_t is the error term which is assumed normally, identically and independently distributed. Equation (3) is usually regarded as the proper place to introduce the error term since the actual market share M_t is stochastic and the desired long run share M_t^* is deterministic. This partial adjustment process is illustrated in[5] (Johnston 1972: 303; Kmenta 1986: 529).

There are many reasons for the occurence of partial adjustment. Any variation of the importers' pattern of consumption is influenced by their perception of the price change, whether it is permanent or temporary. When a price change is perceived to remain steady over a considerable period of time, adjustment would be more rapid since the risk factor is low and the chance of monetary loss or gain is minimal. A high c value is implied under this circumstance. But the fulfillment of contractual obligations and other institutional arrangements will delay any alteration to the importers' purchasing pattern. In addition, persistence of habit is another explanation why adjustment is not always immediate (Nerlove 1958; Griliches 1967).

Combining equations (2) and (3) yields

$$M_t = ac + bc\,P_t + (1 - c)M_{t-1} + u_t \qquad (4)$$

Since data from several countries were used for this analysis equation (4) is first altered as the following:

$$M_t = ac + bc\,P_t + (1 - c)M_{t-1}$$

$$+ \sum_{i=2}^{m} r_i R_{it} + zZ_t + u_t \qquad (5)$$

R_{it} is a dummy variable taking the value one if an observation relates to country i (i is equal to two for the second country, three for the third and so on), and zero otherwise. m is the number of countries pooled. The dummy variables have been introduced to account for any systematic country variation in market shares not captured by the explanatory variables. To avoid perfect multicollinearity, only $m - 1$ dummies were used. The advantage of using cross country time series data is the increase in the number of sample size. However, by pooling it is assumed that pooled importing countries have a common coefficient for the relative price variable. This approach has been adopted by Castillo Laarman (1984). This assumption of common coefficient for the relative price variable is validated by testing for a common slope vector across the pooled cross-sectional time-series data following Johnston (1984: 221 – 225).

Another dummy variable (Z) has been included to take into account changes in Malaysian market share over time as a result of recent imposition of stricter export restrictions on logs, the main raw material in both sawntimber and plywood manufacturing, by Malaysia's main competitor, Indonesia. The Indonesian government doubled the export tax on logs from 10% to 20% in 1978 with the intention of encouraging greater development of domestic timber processing facilities particularly in sawmilling and plywood. Later in 1981, in a bid to hasten the rate of expansion of processed timber exports, the Indonesian government further implemented stricter log export policies using two major instruments. First a gradual phase-out of log exports was imposed resulting in log exports decline from 17.8 million cubic metres in 1979, 6.2 million cubic metres in 1981 to essentially zero in 1985. Second, export taxes on logs were increased and export quotas for the 1981-85 were assigned only to logging concessionaires who had processing facilities in operation or plans for construction. The result, plywood exports grew from 0.1 million cubic metres in 1979, 0.8 million cubic metres in 1981 to 4.6 million cubic metres in 1986. It is interesting to see how the above policies affected Malaysian shares in the sawntimber and plywood international trade. Z takes the value one if an observation relates to the period after 1978, and zero before.

Since the variables are in logarithms, the coefficients of the variables of equation (4) are the short run market share elasticities with respect to relative price. In the long run, market shares will progressively reach an equilibrium level such that $M_t = M_{t-1} = M_t^*$, for

all t. Assuming that relative price remains constant for a sufficient period of time, we will also have $P_{t-1} = P_t$, for all t. The relationship between equilibrium market share and relative price can be obtained by replacing all variables in equation (4) by their equilibrium values. This yields back equation (2) in which case the long run market share elasticity can be computed by dividing the short run elasticity by c.

The period of this study covers from 1970 to 1986. Annual data on quantity and value of imports of hardwood sawntimber and plywood were collected from the United Nation's Commodity Trade Statistics. The countries involved in the importing of hardwood sawntimber were Belgium, Canada, France, West Germany, Italy, Japan, Netherland, United Kingdom and United States of America while for plywood they were Belgium, France, Japan, Netherland, United Kingdom and United States of America. The choice of importing countries was limited by the availability of continuous time series information. The Malaysian market share in a particular importing country is calculated as a ratio of the import value of Malaysian wood commodity to total value of import for that particular wood commodity from all sources. The per unit values of imports were used as proxies for imported prices. Relative price is defined as the ratio of imported price of a Malaysian wood commodity to the average price of that particular commodity from all other sources.

Equation (5) was first estimated by ordinary least squares but due to autocorrelation problem in the estimation of the plywood equation, reestimation using maximum likelihood method following Beach and McKinnon (1978) was attempted.

RESULTS AND DISCUSSION

The values of the estimated regression coefficients are given in Table 1. The coefficient of the lagged market share variable was 0.37 for sawntimber but was not statistically different from zero for plywood. The latter indicates that the speed of adjustment was one in the plywood equation and that the short run and long run market share elasticities were similar. The estimates of the short run market share elasticities were -0.66 for hardwood sawntimber and -0.73 for plywood. The long run market share elasticity for sawntimber can be obtained by dividing the estimated short run elasticity by its speed of adjustment. The estimates of these long run elasticities were -1.05 for hardwood sawntimber and -0.73 for plywood.

TABLE 1. Regression Estimates of the Malaysian Market Share Functions for Hardwood Sawntimber and Plywood

Estimated coefficients			Regression Diagnostics				Market share elasticities		
@P_t [bc]	M_{t-1} [1 − c]	Z z	R^2	F	DW {h}	ρ	df	SRE	LRE
Hardwood sawntimber									
−0.66	0.37	−0.19	0.82	62.59**	2.02	n.e.	140	−0.66	−1.05
(−2.47)**	(5.85)**	(−2.37)**			{0.20}				
Plywood									
−0.73	−0.02	−0.18	0.88	85.33**	1.66	0.74**	91	−0.73	−0.73
(−2.91)**	(−0.27)	(−1.01)			{2.34}				

Note: @Tests for a common slope vector among the pooled cross country time series data indicate that there are no evidence of a significant difference in the coefficients of relative price among the cross country time series data at 5% and 1% levels of significance. The calculated F statistics for sawntimber and plywood are 0.01 in both cases.
Figures in brackets ( ) are the t statistics.
** reflects statistical significance at the 1% level of significance.
R^2 is the adjusted coefficient of determination.
F is the F statistics.
ρ is the first order autocorrelation coefficient.
df is the degree of freedom.
n.e. implies that the regression is estimated using ordinary least squares since it is serially not correlated.
{h} is the Durbin h statistic.

Speed of adjustment estimate between zero and one as in sawntimber suggests that only a fraction of the intended adjustment in market share is achieved within a year when price changes. The fulfillment of contractual arrangements will delay any alteration to the importers' purchasing pattern. In addition, persistence of habit, together with possible technological rigidities and cost of change are other explanations why adjustment is not always immediate. However, a speed of adjustment estimate of one in plywood implies that market share adjusts completely to relative price changes in this case. It is implied that importers' purchases during the duration of the current period are according to what are planned for the current

requirements. For instance, importers may perceive that any relative price changes would be rather permanent. However, generally there is little *a priori* reason to believe that the speed of adjustment coefficient could be one even if annual data are used. It is felt that further attempts at estimating this market share function may be needed by experimenting with various possible specifications of the underlying process governing the behaviour of the autocorrelation structure of the error term.

The long run elasticity estimate for hardwood sawntimber was lower (in absolute value) than the estimates for Malaysian meranti sawntimber in the United States market which ranged from 2.42 to 8.00 (Mohd Shahwahid 1989b). The higher estimates for meranti sawntimber can be attributed to the fact that meranti sawntimber faces stiff competition from the Lauan and Philippine Mahogany species in the United States market. These estimates were not reflective of sawntimber exports from other species to other countries. Our elasticity estimate was an average for all Malaysian sawntimber species exported to several countries. Nevertheless our long run elasticity estimate obtained for sawntimber still lies in the elastic region.

The statistically significant coefficient of the dummy variable accounting for the time series data after 1978 for sawntimber, whereby Indonesia imposed stricter export restrictions on logs implies that Malaysian market share was affected by the increase in Indonesian participations in the world trade. But this was not the case for plywood. Indonesia increased its market shares in both products export trade from 8% in 1979 to 19% in 1986 for sawntimber and from 1% to 39% during the same period for plywood. Malaysian share in hardwood sawntimber trade was affected when shares which were initially rising up to 28% in 1982 begun to decline to 24% by 1986. But in plywood Malaysian share remained quite stable at around 6% during the eighties. The emergence of Indonesia as an important international plywood supplier was at the expense of other countries such as South Korea and Taiwan which are not well-endowed with forest resources.

Demand for any commodity exhibiting nonzero relative price elasticity of market share is price responsive. This in turn shows that a reduction in the relative price (following price reductions of Malaysian wood products with prices from the rest of the world remaining unchanged) will lead to an increase in the Malaysian market

share. Since market share in this study is the ratio of import values, this increase in share following a reduction in relative price could be accounted by two things. It could be either due to a high rate of import quantity increase from Malaysia following the price reduction or that total import values from the rest of the world has declined. In either case, an ability of Malaysian exporters to reduce their cost structure, assuming that the average price of competitors does not change, would enable them to increase their share of the world market for these wood commodities.

However, the government policy of imposing an export levy and possibly a quota on twenty two species of sawntimber from West Malaysia could make our sawntimber exports more expensive. Such a levy coupled with increasing labour wages not commensurating with productivity would erode any attempt at reducing price on the part of manufacturers and potentially makes Malaysian sawntimber price uncompetitive. But in reality the situation may not be so grim as other producing countries have also imposed some kinds of export restriction, including Indonesia, Philippines and Thailand. But the emergence of new exporting countries with vast forest resources like Papua New Guinea is of concern. The export levy is also imposed on veneers from West Malaysia to encourage greater availability of domestic veneers for further processing into plywood. With this protection and the finding of substantial price responsiveness in plywood export share, makes reducing production costs more rewarding in plywood manufacturing. Nevertheless, Malaysian producers of sawntimber and plywood need to focus on non-price competition as well, in order to further penetrate the world market.

CONCLUSION AND POLICY IMPLICATIONS

International competitiveness relates growth in market share to two sets of factors: the ability to compete in prices and non-price factors. The empirical evidence for sawntimber and plywood manufactures in Malaysia, is that estimates of relative price elasticity of Malaysian market share are statistically significant. Avenues exist for Malaysian producers to increase their shares of the world market through price competition. However in order to penetrate further the world market for sawntimber and plywood, producers should also focus their attention to other non-price factors as well. Studies have also shown

that non-price factors can significantly contribute to the comparative advantage of an exporting country. Seven factors that may influence competitive strength include; (1) differential rates of productivity growth in different countries, (2) changes in exchange rates, (3) changes in export taxation or subsidisation, (4) differential rates of increase of national price levels, (5) differential rates of improvement in the efficiency with which exports are marketed, (6) differential rates of improvement in the quality of exports and differential rates of development of new products for exports and (7) differential changes in the extent to which export orders can be met promptly (Fleming and Tsiang 1958). Among the factors above, only factors one to four determine changes in the price competitiveness of the exports of different countries. Factors five to seven constitute changes in the non-price competitiveness of different countries.

With Malaysian prices bound to rise especially due to rising wage rates, Malaysian hardwood sawntimber and plywood will be used more selectively by foreign buyers. This is especially so with the emergence of new exporting countries in the timber trade. This change in purchasing habit should pave the way for further processed components. Sawntimber can be dimensioned, kiln-dried and preservative treated if needed, to meet end-use specifications. Quality decorative and constructional plywood, plain or overlaid can be exported at varying thicknesses. Malaysian producers should now be competing on the basis of product quality and prompt delivery. The Malaysian sawmilling and plywood industry must be restructured. For instance in sawmilling, the replacement of low quality and worn-out machinery and the introduction of setting devices and proper feeding equipments in resawing would improve sawing accuracy. Implementation of quality control throughout all stages of production becomes necessary. With respect to delivery, Malaysian producers have established themselves as reliable suppliers owing to their long experiences in the export trade, technical skills, service to customers and supporting trade infrastructure. This competitive edge should be maintained if Malaysian market share is to expand. Emphasis is needed on improving the efficiency in marketing (the ability to compete in delivery) and improving the quality and types of products (the ability to compete in technology).

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Fakulti Ekonomi dan Pengurusan
Universiti Pertanian Malaysia
43400 Serdang
Selangor D.E., Malaysia