THE AUSTRALIAN JOURNAL OF AGRICULTURAL ECONOMICS

VOL. 17 DECEMBER 1973 NO. 3

FORECASTING THE FUTURE FOR TIMBER*

IAN S. FERGUSON

Australian National University

For each State a simple two-equation model of demand and supply was fitted to post-war data using two-stage least squares. Prior estimates of the housing coefficient were used to break collinearity problems in the demand function. Price elasticity of demand appears to be high and income elasticity moderate but declining with increasing income. The use of these estimates in forecasting is briefly outlined.

Introduction

Forestry in Australia is predominantly under the control of the various State or Territory Forest Services. In 1967-68 some 72 per cent of the Australian sawlog production came from Crown forests and the proportion for other wood products was generally similar [28]. Forest planning within each State therefore tends to be highly centralized under the control of the forest service concerned.

Under the Softwood Forestry Agreements Act of 1967 [5], the Commonwealth allocated about $20 million between 1966 and 1971 to enable the States to expand the rate of establishment of softwood plantations. This plantation programme has recently been the subject of criticism [6, 26]. Parkes [25] and others have drawn attention to weaknesses in the earlier forecasts on which this programme was based. Improved forecasts of the future consumption of wood products are therefore urgently needed.

This paper is a progress report on research relating to forecasts for *sawn timber*, excluding railway sleepers. Some preliminary results will be given but details and final results will be the subject of later publications. Work is also in progress on other wood products but it is too early to report on these.

Prices of sawlogs on the stump are generally between two to four times the prices of pulpwood, while the volume of sawlogs cut annually is some 2·8 times that of pulpwood. Hence sawlog production generally has a dominant influence on the economic returns from growing wood and on the revenues received by the forest services. Furthermore, sawlog production plays a key role in shaping the management regimes in forestry because of the long period of production involved; some 30 to 50 years for softwood plantations and much longer for most native

* The research on which this paper is based has been greatly assisted by a grant from the Australian Research Grants Committee. The assistance of K. Lyall is gratefully acknowledged. E. D. Parkes, J. J. Reilly and Professor J. D. Ovington have also made helpful comments and suggestions.

hardwoods. Thus sawn timber warrants special attention in forecasting, because it is probably the most critical component of the various wood products in terms of determining future policy.

Previous Forecasts

Parkes [25] has summarized the results of most of the earlier forecasts of future wood consumption. The most important are those by Jacobs [17], the NAFTA Joint Consultative Council on Forest Industries [21] and Slinn [27].

Jacobs' estimates appear to have been based on international comparisons of consumption per capita and apparently these or earlier forecasts by Jacobs were the basis for the estimates of future plantation requirements. In common with many of the earlier forecasts, great stress was laid on forecasts of the *aggregate* wood consumption in the future. This emphasis is misleading, however, because it lumps together vastly different products such as sawlogs and pulpwood, which have quite different implications for forest management and industry.

The NAFTA forecasts [21] include two sets of projections called the 'original' and the 'alternative' projections. In the case of sawn timber the original projections were apparently based on an 'international cross-sectional relationship between consumption and per capita income and subjective estimates of Australia's gross national income and population' in the future [24]. The alternative projections, which were substantially lower, were obtained from 'examining trends in per capita consumption' [24], subjectively modified for future prospects. These latter forecasts are generally accepted as the best available to date but are primitive in terms of methodology.

Slinn [27] used what might best be termed an unstructured reduced form method of forecasting. An array of endogenous variables were specified including aggregate wood consumption (roundwood equivalent), sawnwood price and sawlog production. Each was regressed in turn against a large array of exogenous variables, using stepwise regression to eliminate all but five exogenous variables.

There are several reasons for rejecting forecasts based on the equation for aggregate wood consumption. Firstly, as noted earlier, aggregate consumption has little utility. Secondly, there is no formal structure to the demand and supply functions and it is not clear if sensible and consistent linear functions could be formulated. Thirdly, the use of stepwise regression to select the reduced form equations appears inappropriate, especially when collinearity between the exogenous variables is likely to have inflated some of the variances. Finally, an Australia-wide analysis of the market for sawn timber is likely to be misleading for reasons which will be discussed in the next section.

Market Structure

Accurate figures on the end uses of timber are not available, but it appears [1] that about 60 per cent of the annual consumption is used in building and construction, some 15 per cent in industrial and mining uses, and the remaining 25 per cent in the manufacture of furniture and cases, and miscellaneous uses. The housing industry consumes about two-thirds of the timber used in building and construction and therefore represents the most important market.

Each State has characteristics peculiar to itself in the marketing of sawn timber. There are differences in the methods of house construction. For example, double brick construction predominates in Western Australia and therefore proportionately less scantling is used than in other States where brick-veneer construction predominates. There are considerable differences between States in the patterns of imports and exports of timber. In 1967-68, Tasmania exported nearly 50 per cent of her annual production [28], mainly to Victoria. New South Wales, on the other hand, imported about 42 per cent of her consumption, mainly from North America, but also exported about 8 per cent to Queensland, mainly native hardwoods from the north coast. Victoria imported about 35 per cent of her consumption mainly from North America, Tasmania and South Australia.

The sawmilling industry in the four eastern States is characterized by a predominance of small sawmills [24], whereas large sawmills account for the bulk of the production in Western and South Australia. The industry in each State has formed a strong trade association. Most of these conduct periodic cost surveys and circulate recommended price lists for the State concerned. The associations also generally undertake an important role in negotiating with the forest services, governments and unions on matters such as royalty levels, transport regulations and wage rates.

The forest resource also varies greatly from State to State in terms of species composition and sawlog characteristics. The supply of sawlogs, as pointed out earlier, is predominantly under the control of the respective forest services and is regulated closely by them.

These differences in resource endowments and regulation, industry structure and operation, imports and export patterns, and construction methods and tastes are such that each State is best treated as a separate market. Separate demand and supply functions for each State should therefore be estimated.

Data

The available data obviously condition the structure of the model used. There were no consumption data available for the individual timber products such as flooring, scantling etc. and it was therefore necessary to treat sawn timber as one commodity even though it has a wide variety of uses. Data for *apparent* consumption by States have been prepared by Wilson [28]. In general, failure to account for changes in stocks in these data was probably not of major consequence. However, this was not true for Tasmania, which was dependent on fluctuating export markets, and it was fortunate industry data were available to correct the apparent consumption figures for changes in stocks in this case.

Weighted average prices were derived variously from Factory Statistics data or from the recommended list prices prepared by the trade associations, dependent on the availability of the latter and the appropriateness of the former. In Tasmania, for example, it would be inappropriate to use prices derived from Factory Statistics because they include export sales. No list prices were available for Queensland or

Victoria but Factory Statistics data appeared to agree with industry experience. There was a very close correlation between the two series in Western Australia but the list prices were used because they better approximate delivered prices to consumers.

Timber prices were deflated relative to the prices of all other goods and services, using the Consumer Price Index for the State concerned for want of a more appropriate series. Personal disposable income [4] was used to develop an income variable, deflated in the same way as price.

Because of the wide array of substitutes for the various timber products, it was not feasible to derive a price series for substitutes.

Annual data were used because the nature of the problem and the proposed application of the results were of a long run nature. However, only data from 1953-54 onwards were used, despite the fact that the income and other series go back to 1948-49. In the immediate post-war period, price control was retained for many commodities and the timber industry was very much affected. There was an excess demand for building materials and rationing was imposed [7]. These controls were progressively lifted and a reasonable approximation to a market in a competitive equilibrium state may have been achieved by 1950 in some States. However, the wool boom of 1951 created another disturbance to the economy which is virtually impossible to incorporate explicitly in the model. Following Fisher [8], 'selective estimation' has therefore been used in restricting the analysis to data from 1953-54 onwards.

Structure of the Model

The primary purpose of the study was to enable long range forecasts of the consumption of timber to be made. Since each data set was limited to 15 to 18 observations, it was necessary to be parsimonious in the number of variables included in the model and to make maximum use of prior information in formulating the model.

An independent model was used for each State even though there were obvious interdependencies between States through trade in timber. For the most part, however, interstate trade was small relative to the consumption and production within each State. Tasmania was the major exception but the period covered by the Tasmanian data did not correspond with that in other States and an integrated model would have reduced the number of observations substantially.

A simple two equation model was adopted for use in each State. The major problem in formulating the demand function was to recognize factors relating to the nature of the *derived* demand for timber without introducing many additional variables. The proportion of flats constructed had increased markedly over the period under examination. Flats require far less timber than houses and this change in the housing market had a substantial effect on the derived demand for timber. The demand for flats has probably increased as a result of relative price trends in housing [23], although changes in the age and family structure may also have had an effect. Equally, however, there have been changes in the supply of flats which reflect quite different factors such as private investment opportunities, changes in building codes and zoning regulations. The demand for timber is affected both by changes in the demand for housing and by changes in the supply of other factors used in or affecting the supply of housing.

Probably the most effective way of accounting for all these factors would be to include the ratio of the price of housing to that of flats since this would approximate their marginal rate of substitution. However, no such data are available [23]. The proportion of houses to dwellings commenced was therefore introduced as an exogenous 'housing variable' in the demand function. This variable is obviously not truly exogenous but timber prices probably have little effect on the price of housing relative to that of flats. Moreover it is a variable which lends itself to forecasting without the necessity to examine explicitly the demand functions for houses and flats.

The demand function was therefore formulated as follows:—

(1) $q^d = b_{11} + b_{12}p + b_{13} \log y + b_{14}h + u$

where q^d denotes quantity demanded per capita (s ft/capita)
p denotes price (1969/70 \$/100 s ft)
$\log y$ denotes the logarithm (base 10) of personal disposable income per capita (1969/70 \$/capita)
h denotes the proportion of houses to dwellings commenced (%)
u denotes a random error term.

The logarithm of income was used to ensure diminishing income elasticity with increasing quantity demanded, in accord with expectations and the limited evidence available [29].

The supply function took the form:—

(2) $q^s = b_{21} + b_{22}p + b_{23}t + v$

where q^s denotes the quantity supplied per capita (s ft/capita)
t denotes the year
v denotes a random error term.

Quantity supplied *per capita* is not really appropriate, since it is difficult to rationalize supply expressed relative to population, but a more satisfactory simple model could not be found, However, it had the advantage of reducing collinearity problems and the number of parameters to be estimated in the demand function.

The market clearing identity that quantity demanded must equal that supplied is obviously implicit to the system.

A variant of equation (1), which included the quantity variable lagged one year as a predetermined variable, was tested to examine possible institutional or other rigidities in demand [22]. In the case of Tasmania, exports of timber per capita were also included as an exogenous variable in the supply function (eqation 2). Finally, the dynamic model of demand developed by Houthakker and Taylor [16] was also tested for most of the States, based on the same variables as in equation (1).

Methods of Estimation

It was necessary to estimate the structural equations in the model because reduced form equations would be unsuitable for forecasting beyond 1990. The past plantation programme will radically change the supply function for sawn timber during the next forty years. Earlier estimates [13] suggest that production of sawn timber could be doubled by the year 2000 as large areas of plantations reach rotation age. Sawmilling of pine will result in a somewhat different and more capital-intensive technology to that used for hardwoods and will therefore result in substantial changes in cost structure and future price trends. Thus estimation of the existing demand function is the critical initial problem: the existing supply function may have little relevance for the future.

The sawmilling industry is an oligopoly in Western Australia [7]. Recommended prices are prepared from periodic cost surveys and there is very little deviation from them. Equation (2) is therefore not applicable, price being predetermined and supply perfectly elastic. Thus ordinary least squares can be used to estimate the parameters of the demand function since the identification problem [9] does not arise.

In the other States, prices cannot be regarded as being predetermined even though similar practices are followed in preparing price lists. Because there are independent timber merchants and importers [24], recommended prices are less rigidly adhered to and may be changed frequently to try to prevent overt price cutting during periods of severe competition. While the sawmilling industry in Australia generally prefers to adjust to changes in demand through changes in production, rather than in price, discounting and similar practices representing effective changes in price do take place during downswings.

For States other than Western Australia, the demand function was just-identified and the supply function over-identified in the basic model described by equations (1) and (2). Similarly, the variants of these equations described earlier were either just-identified or over-identified. Two stage least squares was therefore used to estimate the coefficients of these equations.

The limited number of observations gave rise to major problems with respect to collinearity since it was not uncommon to find correlation coefficients exceeding 0·90 between two or three variables. Where three or more variables were so affected in the demand function, the estimated coefficients tended to be erratic in signs, in addition to having large variances. Where this occurred, prior estimates of the coefficient for the housing variable were prepared to overcome the problem.

Prior estimates of the coefficient for the housing variable were used for all States except Queensland. Inclusion of this variable in linear form amounts to the adjustment of consumption per capita to reflect the level which would have pertained if all dwellings had been houses. It assumed that the marginal propensity to consume timber is the same for the demand derived from the construction of flats as that derived from houses and similarly with the effect of price on quantity demanded. Finally, it also assumes that the composition of flats and houses respectively remains the same in terms of size, mode of construction etc. as the housing variable changes. Despite the fact that none of these assumptions are likely to hold exactly, this simple formulation proved highly effective.

The prior estimates were based on Victorian data concerning the relative quantities of timber used in flats and houses in 1971 [15]. Some adjustment of these figures was made for Western Australia where house construction was predominantly double brick rather than brick veneer. Further investigations are under way to check and improve the prior estimates.

The estimated values of the coefficients in equation (1) are shown in Table 1 together with their estimated standard errors. The elasticities in Table 1 are point elasticities of demand calculated at the centroid of the sample data.

Multiple coefficients of determination (R^2) are also shown in Table 1. Note that these latter values are not corrected for the number of independent variables but simply represent the proportion of 'explained' to 'total' variation.

TABLE 1

Results of Analyses of the Demand Function for Sawn Timber

	Price	Variable Income	Housing	R^2
New South Wales				
Coefficient	–48·3	60·	·48	·64
Standard error	18·6	44·	P	
Elasticity	– 6·1	·19	·28	
Victoria				
Coefficient	–72·2	274·	·42	·84
Standard error	18·8	160·	P	
Elasticity	– 6·5	·73	·21	
Queensland				
Coefficient	–40·1	387·	1·20	·85
Standard error	9·6	226·	·66	
Elasticity	– 2·4	·96	·62	
Western Australia				
Coefficient	–40·9	424·	·31	·84
Standard error	5·9	115·	P	
Elasticity	– 3·8	1·13	·17	
Tasmania				
Coefficient	–26·6	518·	·39	·51
Standard error	15.6	478·	P	
Elasticity	– 1·7	·90	·14	

P denotes a prior estimate of the coefficient was used.

In all cases the signs of the coefficients were sensible and the standard errors less than the value of the corresponding coefficients. Sensitivity testing suggests that the elasticities with respect to price and income are not likely to change greatly as a result of any future changes in the prior estimates of the coefficient of the housing variable.

The results for New South Wales differ from the other States with respect to income elasticity. However, the price data for this State were most unsatisfactory because they were based on a single timber product. Attempts are being made to obtain additional data.

Other than this, the estimates appear to be consistent between States and the trend in the magnitude of price elacticities is roughly in accord with a subjective assessment of the supply of substitutes. With due allowance for the number of observations (15 to 18) and State characteristics, the values of the multiple coefficient of determination are satisfactory. The Durbin-Watson statistic was also estimated for each State but the values provided no evidence for the existence of serial correlation.

The high price elasticities run contrary to Mead's views [20], which were based on a deductive analysis using Marshall's propositions concerning the likely elasticity of a derived demand. Gregory [11], however, has questioned the arguments used to support this analysis, particularly regarding the availability of substitutes. Since substitutes are readily available in Australia for virtually every use of timber, including framing, Mead appears to be on weak ground. Furthermore, *in situ*, timber makes up about 22 per cent of house construction costs [18], which is a fairly substantial proportion of the cost of the product. Finally, McKillop's [19] econometric study of the wood products market also yielded a high price elasticity of demand for sawn timber, although McKillop is equivocal in his conclusions.

The income elasticities are of similar order of magnitude to those found by Zaremba [29] in cross-section surveys in the United States. Gregory's [10] work suggested that income elasticities may soon become negative as income increases. His analysis was based on an international cross-section model without recognition of differences in prices or availability of substitutes between countries and with a very arbitrary and questionable variable representing resource endowment. The evidence from this model must therefore be viewed with considerable scepticism. Graphical analyses of the residuals from the demand functions provided no evidence to support the hypothesis of a trend towards negative income elasticities.

The inclusion of quantity demanded lagged one year as an independent variable in equation (2) was unsuccessful. It exacerbated collinearity problems, yielded incorrect signs and gave evidence of significant serial correlation. In the case of Tasmania, the inclusion of exports per capita in the supply function, and thus in the reduced form equations, had no significant effect and it was excluded in obtaining the results in Table 1.

Dynamic models of demand following the work of Houthakker and Taylor [16] yielded equally good values for the multiple coefficient of determination but the signs and magnitudes of the regression coefficients were erratic. This model ignores the identification problem and is therefore inappropriate where the data often exhibit relative changes in price over the limited time span in excess of the relative changes in income. Although one can eliminate variables until only two or three remain with sensible signs and values, it does not appear to provide a useful forecasting model because there was no consistency between States in the behaviour of the model and significant serial correlation was common.

Supply

Results for the supply function were unsatisfactory for all States other than Western Australia, where the supply price was predetermined. Negative price coefficients were obtained, values for the multiple coefficient of determination were generally small, and all regression coefficients had very high variances attached to them. These results partly reflect the high collinearity between price and the trend variable. It was not possible to make prior estimates of either coefficient to eliminate this problem.

However, there were also numerous exogenous shocks affecting supply which could not be explicitly incorporated in the supply model. Matters such as import quotas, currency restrictions, changes in shipping freight rates, wharf strikes and bad (or good) logging conditions during winter all had a considerable impact on supply but could not be explicitly incorporated in the model. Finally, as mentioned earlier, it is difficult to rationalize a model of supply which used *per capita* consumption as a dependent variable. In view of all these problems, it is not surprising that it is difficult to estimate the coefficients successfully.

Because of the tendency of the sawmilling industry to adjust to changes in demand through quantity and production sold rather than price, it seems likely that the supply functions would be relatively price elastic. One would expect the trend coefficient to be negative because of the progressive reduction in sawlog supplies from private property, which have not generally been offset by increases in the supply from Crown forests. However, it would be difficult even to guess at the magnitude of the trend coefficient.

Forecasts for the Future

Estimates of the demand surface at future points in time can readily be made once forecasts of the exogenous variables are available for all States. Haig [12] has already developed suitable forecasts for population and personal disposable income by States, which only leaves forecasts of the housing variable to consider, and research is proceeding on this.

However, forecasts of the demand surface in the future are not in themselves the complete answer. They provide valuable insights but are not sufficient to guide policy on future supply, which is the critical issue.

A number of avenues are available to examine future supply. The choice will depend on the time, assistance and data available. The simplest approach would be to estimate future trends in supply price, assuming a perfectly elastic supply function, and thus future levels of consumption.

The study of future trends in price is itself a major task because so little is known about the cost structure of the sawmilling industry. Productivity per man employed in the Australian timber industry has increased at a rate of only 2·8 per cent per annum, compared to 4·0 per cent for manufacturing industry as a whole over the period concerned [3]. Amalgamation of hardwood operations to achieve economies of scale in production has been widely advocated [24] but is proceeding very slowly. On the other hand, however, the large increase in softwood supplies from 1990 onwards [13] will open the way for substantial improvements in productivity in this sector of the industry. Hence there are many conflicting influences on supply price.

Nevertheless, given data on future price levels, it would then be possible to formulate a transportation model to allocate production levels and trade so as to minimize transport costs. Earlier estimates of potential production are already available [13] by states and it is hoped that more detailed estimates by regions will become available in the near future. Overseas trade, of course, will need to be incorporated in the model perhaps using various assumptions about tariff levels.

Examples of the application of such a model to timber supplies are available on a static basis [2, 14] but there appears to be no reason why these models should not be extended to a recursive basis for successive time periods. A recursive model would obviously represent a major simplification because the interdependence between supply from one period to the next which characterizes forest production problems is quite complex [7]. Nevertheless such a model would be a useful first approximation.

At the other end of the spectrum of complexity are welfare models based on the maximization of net social benefit (consumers' plus producers' surplus). My own experience with such a model for Western Australia [7] suggests that an Australia-wide model will require more time and data than are likely to be available. However, some intermediate form of development may be possible and fruitful.

References

[1] A.N.Z. Bank Ltd., *The Australian Timber Industry*, Report prepared for the Timber Development Association (NSW) Ltd., Economics and Statistical Dept., ANZ Bank, Melbourne, 1961, pp. 155.

[2] Bruce, R. W., *Intraregional Competition in Lumber Markets of the Eleven Western States*. Washington Agric. Exp. Sta., Bull. 711, August 1969, pp. 31.

[3] Commonwealth Bureau of Census and Statistics, *Indexes of Factory Production 1949-50 to 1966-67*, Cwlth. Govt. Printer, Canberra, 1969.

[4] Commonwealth Bureau of Census and Statistics, *Australian National Accounts, National Income and Expenditure, 1970-71*, Cwlth. Govt. Printer, Canberra, 1972, pp. 116.

[5] Commonwealth of Australia, *Softwood Forestry Agreements Act 1967*, Cwlth. Govt. Printer, Canberra, 1967.

[6] Commonwealth of Australia, 'Softwood Forestry Agreements Bill—Second Reading', *Parliamentary Debates, Senate*, 16 August, 1972, pp. 68-100.

[7] Ferguson, I. S., *Production and Price Goals in Western Australia*, D. For. thesis, Yale Univ., University Microfilms Order No. 698118, pp. 226.

[8] Fisher, F. M. *A Priori Information and Time Series Analysis*, Contributions to Economic Analysis XXVI, North-Holland, Amsterdam, 1962, pp. 168.

[9] Goldberger, A. G., *Econometric Theory*, Wiley, N.Y. 1964, pp. 394.

[10] Gregory, G. R. 'Estimating Wood Consumption with particular reference to the effects of income and wood availability', *For. Sci.* 12 (1): 104-117, 1965.

[11] Gregory, G. R., *Forest Resource Economics*, Ronald Press, N.Y. 1972, pp. 548.

[12] Haig, B. D. *The Australian Economy to the Year 2000*, Unpubl. report, Canberra, 1971, pp. 139.

[13] Hanson, A. G., 'Estimates of Future Production of Sawn Timber', *Timber Supply Review*, 19 (1): 36-37, 1969.

[14] Holland, I. I. and Judge, G. G., 'Estimating Interregional Flows of Hardwood and Softwood Lumber', *J. For.* 61 (7): 488-497, 1963.

[15] Housing Industry Association, *Materials Usage in the Housing Industry in Victoria*, HIA, Melbourne, May 1972, pp. 74.

[16] Houthakker, H. S. and Taylor, L. D., *Consumer Demand in the United States, 1929-70*, Harvard Univ. Press, Cambridge, 1966, pp. 214.

[17] Jacobs, M. R., 'Forecasts for the Future', *Aus. Timb. J.* May 1966: 35-43.

[18] Kennedy, W. G., 'Markets, Innovation and Panelization', *Building Economist* 9 (1): 12-19, 21, 1970.

[19] McKillop, W. L. M., 'Supply and Demand for Forest Products—An Econometric Study', *Hilgardia* 38 (1), pp. 132, 1967.

[20] Mead, W. J., *Competition and Oligopsony in the Douglas Fir Lumber Industry*, Univ. of Calif. Press, Berkeley, 1966, pp. 276.

[21] NAFTA Joint Consultative Council on Forest Industries, *Report on Australian and New Zealand Forest Resources, Consumption, Production, Imports and Exports up to the Year 2010*, Dept. of Trade and Industry, Canberra, 1970, pp. 60.

[22] Nerlove, M., *Distributed Lags and Demand Analysis for Agricultural and Other Commodities*, U.S. Dept. of Agric., Agric. Handbook No. 141, Washington, D.C., 1958, pp. 121.

[23] Neutze, M. 'The Cost of Housing', *Eco. Rec.* 48: 357-373, 1972.

[24] Office of Secondary Industry, *Report of the Economic Study Group on the Australian Timber Industry*, Aust. Govt. Publishing Service, Canberra, 1971, pp. 119.
[25] Parkes, E. D., 'International Comparisons of Trade in Forest Products and Some Implications for Australian Forest Policy', *Aust. For.* 35 (3): 167-181, 1972.
[26] Samuel, P., 'Why Should We Waste Money on Growing Pines?' *The Bulletin*, September 3, 1972, p. 57.
[27] Slinn, R. J., *Public and Private Forestry Enterprises in Relation to National Forestry Production Goals,* Ph.D. thesis, Duke Univ., University Microfilm Order No. 70-18099, Ann Arbor, 1969, pp. 166.
[28] Wilson, D., *Compendium of Australian Forest Products Statistics*, Forestry & Timber Bureau, Canberra, 1969, pp. 160.
[29] Zaremba, J., *Economics of the American Lumber Industry*, R. Speller and Sons, N.Y., 1963, pp. 232.