The Concentration of Timber Holdings in the British Columbia Forest Industry, 1972

W. T. STANBURY and M. R. McLEOD

The purpose of this note is to summarize the degree of concentration in the holdings, under the various types of tenure, of timber resources in British Columbia. While most studies of industrial concentration deal with the number and relative size of sellers, this study is concerned with concentration in the market for timber as an *input* in a multi-output industry.[1] Concentration in the market for timber has implications for both allocation of resources in the industry and the distribution of the potential rent accruing from the sale of timber. We will begin with some notes on the methodology, followed by a brief discussion of the major types of tenure in the B.C. forest industry. Then we will present a summary of the concentration data and conclude with an examination of the implications of concentration in the timber input market in B.C.

Methodology

A major task in any meaningful measurement of market concentration is to properly define "the market," While the relevant economic theory is couched in terms of the cross price elasticities of supply (in input markets), the absence of empirical estimates closes this avenue of approach. Instead we define the relevant input market as a group of closely substitutable inputs (timber) to a common group of buyers which are distant substitutes for all other inputs.[2] In the case of timber it is necessary to consider at least the following variables in order to define the market(s) :

[1] The primary outputs are lumber, plywood, pulp and paper. One extensive and broadly comparable, study of concentration in input markets is W. J. Mead, *Competition and Oligopsony in the Douglas Fir Lumber Industry* (Berkeley, University of California Press, 1966). See also W. J. Mead and T. E. Hamilton, *Competition for Federal Timber in the Pacific Northwest*, Pacific Northwest Forest and Range Experiment Station, PNW-64, 1968.

[2] This definition proceeds from Joe S. Bain, *Industrial Organization*, New York, Wiley, 1968, "Each industry should be recognizable as a group of products that are close substitutes for all products not included in the industry. This is a 'theoretical industry'." (p. 124).

(i) the geographic location of conversion points (pulp and paper mills, sawmills, plywood plants);

(ii) topography and transportation costs;

(iii) species mix, age and quality of stand of timber.

We began with the five forest districts as defined by the B.C. Department of Lands and Forests made up of the 78 smaller Public Sustained Yield Units (PSYU's).[3]

Using these PSYU's as "building blocks" in conjunction with the location of conversion points and a watchful eye on topography and transportation costs we added and subtracted PSYU's from the districts to form five timber *markets*. While considerable care was exercised in defining these timber markets, if our definition errs it is on the side of overinclusiveness. *Ceteris paribus*, therefore, our concentration measures would *tend to understate* the theoretical market concentration.[4]

Data was then collected on the extent of the timber holdings by firm for each major type of tenure in each timber market.[5] Although the most recent published data were for 1968 (and some were for 1965) the data have been adjusted, to account for mergers and consolidations to bring our figures up to 1972.[6]

Our approach to the definition of timber markets, therefore, was to define each market in geographical terms about an existing conversion point or points. We then view each firm as entering the market, in conjunction with other firms, to acquire timber from the Crown at timber

[3] The location of these districts can be seen on a map in the *British Columbia Forest Service Annual Report*, 1971, Victoria.

[4] See Bain, *op. cit.*, pp. 130-132. "... overinclusiveness of Census industries ... tends generally to result in measures of seller concentration within Census industries which understate the degrees of concentration within component theoretical industries. This understatement is encountered so far as firms included in the Census industry specialize, relatively or absolutely, in only a part of the products or regions which the over-inclusive Census industry contains. It is avoided so far as the firms have a more or less balanced diversification among the products or regions included" (p. 132).

[5] Throughout we refer to timber holdings, yet only one type of tenure (Crown grants) constitutes outright ownership of the timber. We do so for convenience while noting that the various forms of tenure involve leases of varying duration — see Table 1.

[6] The extent of merger and consolidation activity is itself an interesting study. The eight largest firms in the B.C. forest industry in 1969 acquired at least 170 firms between 1945 and 1972. Between 1966 and 1972 the number was 50. MacMillan Bloedel, Crown Zellerbach and B.C. Forest Products acquired (at least) 25, 26 and 44 firms respectively during the period 1945-1972.

   See M. R. McLeod "The Degree of Concentration in the British Columbia Forest Industry" (unpublished BSF Thesis, Faculty of Forestry, University of British Columbia, April, 1971) Chapter III for details on mergers between 1945 and 1970.

TABLE 2. Summary of Timber concentration in British Columbia, by Timber Markets and Public Sustained Yield adjusted to 1972:[1]

Timber Market and Weights (Percent of 1971 Total Harvest)	VANCOUVER 50.3							NELSON 9.3		KAMLOOPS 14.6			PRINCE GEORGE 20.4			PRINCE RUPERT 5.4		
Tenure Form and Weights (Percent of 1971 Total Harvest)	Timber Sale and TSHL 25.7	Tree Farm Licence 20.8	Timber Licence 19.2	Timber Lease 1.8	Pulp Lease 3.5	Pulp Licence 1.1	All Other 27.9 [2] (20.9)[2]	Timber Sale and TSHL 63.0	Timber Licence .8 [2] (20.6)[2]	Timber Sale and TSHL 76.0	Tree Farm Licence 8.2	All Other 15.8 [2] (7.6)[2]	Timber Sale and TSHL 82.8	Tree Farm Licence 4.3	All Other 12.9 [2] (2.9)[2]	Timber Sale and TSHL 56.1	Tree Farm Licence 35.1	All Other 8.8 [2] (7.5)[2]
Unit of Measure	annual allowable cut	Acres	Acres	Acres	Acres	Acres		annual allowable cut	A	annual allowable cut	Acres		annual allowable cut	Acres		annual allowable cut	Acres	
Concentration Ratio																		
Percent of total held by largest four firms	36.4	76.1	57.6	92.6	100.0[3]	100.0[3]		49.5	1	36.5	97.2		40.0	100.0[6]		78.0	100.0[7]	
Identity[8]	1,8, 11,7	5,3, 6,14	5,4 16,1	5,1, 2,7	4,6,5	6,5,4		9,20, 21,22	1 9	10,1, 8,4	4,33,10, 1		2,1, 34,35	1,8		1,3, 41,42	3	
Percent of total held by largest eight firms	54.8	95.2	79.4	98.0[5]	100.0	100.0	DATA NOT AVAILABLE	73.1	1	61.6	100.0[4]	DATA NOT AVAILABLE	62.7	100.0	DATA NOT AVAILABLE	88.8	100.0	DATA NOT AVAILABLE
Identity[8]	3,2, 4,5	1,8, 7,2	6,17, 7,8	8,6, 19	–	–		23,10, 50,25		28,29, 22,31	31		37,36, 8,38	–		14,43, 44,45	–	
Percent of total held by largest ten firms	59.9	100.0	83.0	99.2[5]	100.0	100.0		79.8	1	68.7	100.0		69.8	100.0		92.5	100.0	
Identity[8]	12,13	4,52	3,18	–	–	–		49,26		30,32	–		39,51	–		46,47	–	

NOTES:

1. The values presented in this table reflect timber rights consolidations resulting from the recent mer British Columbia Forest Products Ltd. and Cattermole Trethewey Ltd., merger between Northwood Mills Ltd. and Bulkley Valley F tries Ltd. and consideration of effective control given to Northwood Mills Ltd. of British Columbia Forest Products Ltd. through i ry Northwood Pulp Ltd. (see Financial Post Cards, "Noranda Mines Ltd.")

2. Percent accounted for by Crown-granted lands

3. Three firms only

4. Five firms only

5. Data given for seven largest only, estimate for other(s)

6. Two firms only

7. One firm only

8. Identity of firms in descending order of size, largest four, next largest four, and next largest two. or identity of firms:

1. Northwood Mills Limited
2. Canadian Forest Products Limited
3. Columbia Cellulose Limited
4. Crown Zellerbach Canada Limited
5. MacMillan Bloedel Limited
6. Rayonier Canada Limited
7. Tahsis Company Limited
8. Weldwood of Canada Limited
9. Crestbrook Forest Industries
10. Kamloops Pulp and Paper Co. Ltd.
11. Bay Forest Products Limited
12. Mayo Lumber Company Limited
13. Pretty's Limited
14. Euocan Pulp and Paper Co. Ltd.
15. Bendickson Logging Limited
16. Royal Trust Company
17. Canada Trust Company
18. R.D. and M.N. Gates
19. Port Douglas Timber Company
20. Kootenay Forest Products Limited
21. Crows Nest Industries Limited
22. Evans Forest Products Limited
23. K-V Timber Company
24. Pacific Logging Limited
25. Grand Forks Sawmills Limited
26. Boundary Sawmills Limited
27. Galloway Lumber Company Limited
28. Merrill Wagner Limited
29. Balco Forest Products Limited
30. Fadear Enterprises
31. Federated Co
32. Lignum Limit
33. Clearwater I cts Ltd.
34. Takla Develc ed
35. The Pas Lumb Limited
36. Swanson Lumb
37. West Fraser
38. Fergunon Lak Ltd.
39. Interior Spr Limited
40. Brownmiller er Co. Ltd.
41. Skeena Fores Limited
42. Western Spru imited
43. Little Haugl rr Ltd.
44. Skoglund Log ny Limited
45. Beavers Logg y Limited
46. MacGinnis & Gibbs Ltd.
47. Bell Pole Co. Ltd.
48. Alice Creek Timber
49. Riverside Forest Products Limited
50. Triangle Pacific Co. Ltd.
51. Bowron Lake Timber Ltd.
52. Corp. of District of Mission

Source: Developed from Tables in McLeod op.cit. and unpublished British Columbia Forest Service Annual Feach Forest District.

tion of 1969, proportion of Timber Sales awarded at the upset stumpage price has not been less than 95%.[7]

Subject to contract conditions set by the government and "successful bidding" at Timber Sales the firm has its quota virtually in perpetuity.

(b) Timber Sale Harvesting Licence (TSHL)

TSHL's are created by aggregating a number of separate tracts bought in Timber Sales, so as to consolidate a firm's holdings and make logging operations more efficient. TSHL's run for 10 years and are automatically renewable upon application if the firm has complied with the terms. The price of timber is the "going" upset stumpage price set by the province. However, the TSHL holder must agree to harvest the timber on "close utilization" standards and have the proper conversion facilities or a long term contract with a pulp mill for converting the smallwood obtained from the operation.[8]

(c) Tree Farm Licence (TFL)

While no new licences have been awarded after 1965-66, TFL's account for a substantial proportion of the annual harvest. (see the top of Table 2.) TFL's run for 21 years and are renewable subject to negotiations of the terms of the contract.

However in this form of tenure the firm must manage its large tract on a sustained-yield basis with a plan approved by the government.

(d) Timber Licence, Timber Lease, Pulp Licence, Pulp Lease

No new grants have been made of these types of tenure since about 1912, but existing ones continue. The length of tenure varies. (see Table 1.) Under these tenures there is no requirement to cut the timber as only the timber is privately owned whereas the land is held by the Crown. Once the timber is removed the land and future timber revert to the Crown.

(e) Crown Grants

This is the only type of tenure in which the firm owns the land on

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[7] The imposition of the 5% non-refundable bidding fee in 1965 increased the proportion of sales at the upset prices from an average of 90% in the period 1954-1964 to an average of 95% in 1965 through 1969. See *British Columbia Forest Service Annual Report*, 1969.

[8] In the Interior under the close utilization standard trees down to 7.1" dbh (diameter breast height) and to a 4" top (with 12" stump) have to be logged. An allowance is given for decay only, not for waste and breakage. On the Coast, the standard goes down to a 9.1" dbh tree and a 6" top.

which the timber stands. There have been no Crown grants since 1941 but in terms of annual harvest they constitute about one-fifth of the total. (see Table 2.) The price of the timber here depends upon the combination of royalty and/or original capital cost and of course, time and opportunity cost.

Concentration of Timber Holdings in B.C.

In Table 2 we summarize our findings by type of tenure in each of the five timber markets.

It is not possible to simply calculate a weighted average concentration ratio in each market because of the impossibility of adding stocks and flows and because of the absence of reliable data for the holdings of Crown-grant timber. The concentration ratios for Timber Sale and TSHL are based on annual allowable cut (flow data), while those of all the other tenure forms are based on acreage or on mature volume in thousands of cubic feet (stock data).

In the Vancouver timber market, (which stretches up the coast to just above Prince Rupert and includes Vancouver Island) the largest four holders of Timber Sales and TSHL's jointly account for 36% of the annual allowable cut. The largest eight firms account for 55%. Concentration in the other forms of tenure in the Vancouver market is much higher, with the largest eight firms accounting for at least 80% of the holdings. Table 2 also indicates the identity of the largest ten firms by type of tenure in each market.

In the column marked "All Other" we have indicated that data was not available to permit us to construct concentration ratios. However, Crown-grant (privately-owned) timber accounts for about two-thirds of these other forms of tenure. While no comprehensive public information exists on privately-owned timber there are scattered bits of information which suggest that the largest eight owners account for at least 75% of Crown-grant timber.[9] Consequently, holdings in this form of tenure would not reduce the impact of the concentration ratios indicated in Table 2.

Concentration in the other markets by type of tenure ranges from moderate (Timber Sale and TSHL in Nelson, Kamloops, and Prince George markets) to very high (TFL's in all other markets). In fact in the Kamloops market five firms hold *all* the TFL's, in the Prince George market two firms account for 100% of TFL's, and in the Nelson market

[9] In general, the first ten firms identified in Table 2 hold virtually all of the privately-owned timber.

four companies account for 100% of TFL's. In the Prince Rupert market *one* firm holds 100% of the TFL acreage.

Earlier we suggested that timber markets as we have defined them may be over inclusive and hence tend to understate concentration in theoretical markets. Therefore, we have calculated the concentration ratios in 73 of the 78 PSYU's in B.C. which jointly account for about 44% of the annual harvest in B.C.[10] PSYU's constitute a much narrower definition of the timber input market and would tend to err on the side of under-inclusiveness and tend, therefore, to overstate theoretical concentration.[11]

TABLE 3

Degree of Concentration of Timber Sale and Timber Sale Harvesting Licence Annual Quota Within Individual PSYU's, Adjusted to 1972

Concentration Rato	No. of PSYU's	% of Total Quota	Concentration Rato	No. of PSYU's	% of Total Quota
⩾90/4*	56	55.8	⩾90/8	68	78.0
75-89/4	8	17.9	75-89/8	3	11.6
55-74/4	7	15.9	55-74/8	2	10.4
35-54/4	2	10.4	35-54/8	0	0.0
1-34/4	0	0.0	1-34/8	0	0.0
	73	100.0		73	100.0

*indicates that the four largest firms account for 90% or more of the annual quota.

As Table 3 indicates some 90% of the total quota in PSYU's comes from units in which the largest eight tenure holders account for 78% or more of the total harvesting quota. In 56 PSYU's, accounting for 56% of the total quota in all PSYU's, the four largest firms hold 90% or more of the quota. These data suggest that the major proportions of timber sales in PSYU's take place in highly concentrated oligopsonistic markets. The 5% non-refundable bidding fee required at Timber Sales may constitute an important barrier to entry to smaller firms and hence limit competition at such sales. These two facts would help to account for the fact that 95% of Timber Sales were made at the upset stumpage price.

Some Implications of Oligopsonistic Timber Markets

While it is not obvious that the province has sought to realize the full economic rent from its forest resources its ability to do so depends upon at least two other important factors:

[10] M. R. McLeod, *op. cit.*, Table 3-2 p. 81.
[11] Bain, *op. cit.*, pp. 128-130.

(i) The use of log prices established in the Vancouver log market as the "market value" of harvested timber from which an allowance for logging costs, profit and risk are deducted to determine the stumpage price of timber (the economic rent accruing to the Crown).[12]

(ii) The possibility that the allowances for logging and transportation costs, profit and risk include an element of "X-inefficiency".[13]

Our principal concern here is the effect that the oligopsonistic timber market has on the distribution of the economic rent from the timber resource. In the short term the total supply of timber in B.C. is fixed. In the long run the supply curve is still inelastic.[14] If the final market for forest products is perfectly competitive and the Crown maximizes its economic rent the result will be an efficient allocation of resources in the industry. Even if the Crown fails to capture the entire economic rent where the output market is competitive and the elasticity of supply of timber is zero no misallocation will result. The issue then is the distribution of the economic rent between the Crown and the producers.

For the Vancouver timber market (the Coast Region), the Vancouver log market is deemed to be the first competitive market for timber. For the other four timber markets (the Interior Region) stumpage calculations begin with the price of *lumber,* which to casual observation appears to be an almost atomistic market.[15] As Table 2 shows in all but one tenure form the Vancouver timber market is highly concentrated. In addition, if

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[12] For details on the stumpage calculation see M. R. McLeod, *op. cit.,* pp. 100-103.

[13] The concept of "X — inefficiency was originally developed in H. Leibenstein "Allocative Efficiency vs. X — Efficiency" *American Economic Review,* June 1966.
    In W. S. Commanor and H. Leibenstein, "Allocative Efficiency, X-Efficiency and the Measurement of Welfare Losses", *Economica,* Volume 36, 1969, the welfare implications of X — inefficiency are explored. The concept of X — inefficiency may be closely allied with the idea of "managerial slack" — see R. M. Cyert and J. G. March, *A Behavioural Theory of the Firm,* Englewood Cliffs, Prentice-Hall, 1963.

[14] These statements should be explained briefly. In the short run the total stock of timber is fixed. In the long run the total (gross) stock of timber increases with the natural rate of growth. However, in the short run the *flow* of timber available to firms may be increased if the province increases the annual allowable cut. If the province is practicing a sustained yield policy and total annual quota is at the maximum sustainable level then in the short run the flow of timber can be increased this year only by reducing it next year. In the long run the flow of timber available to firms will be constant once the maximum sustainable level of cut is attained.

[15] This particular issue is worthy of a careful study. With the growth of joint selling agencies and the fact that the market for each of the various products is not "the world", but a number of regions defined by demand, transportation costs, tariffs and comparative advantage, the final markets for forest products may not be as highly competitive as is alleged.

one examines the *identity* of the largest firms one notes that a handful of firms dominate the market. One other fact must be kept in mind. The dominant firms are all vertically integrated and tend to harvest their own logs for use in lumber, plywood, pulp and paper production.

These circumstances provide both the incentive and the opportunity for divergences from competitive behaviour in the Vancouver log market. It should be clear that, *ceteris paribus*, collusion to reduce the price at which logs are traded increases the return to the firms and reduces the economic rent accruing to the Crown.[16] This problem was apparently recognized when the Minister of Lands, Forest and Water Resources stated:

> ... this (Vancouver log) market is becoming more restricted year by year because an increasing volume of the annual cut is controlled by a reducing number of centrally located plants and I doubt whether the present system of (stumpage) appraisal can be maintained much longer. (Williston, *The Truck Logger*, Feb. 1967).

It is interesting to note that it is the Council of Forest Industries[17] and not the Forest Service, which compiles the data submitted voluntarily by individual companies on transactions in the Vancouver log market. These data are not published.[18]

Oligopsony in the market for timber may have another effect. Even with perfect competition in the output market for forest products firms may be able to operate with costs above the minimum attainable level of costs which would be forced upon them if their input markets was highly competitive. The positive difference between actual and minimum attainable costs may be described as X-inefficiency. In oligopsony it is possible for firms to collude (implicitly or explicitly) on their production functions. Because of the different degrees of specialization and the difficulty of both specifying and enforcing such agreements the practical significance of this potential power may be limited. To determine the stumpage price in the Vancouver timber market the Forest Service deducts from

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[16] It is important to note that the "increased return to the firm" may not take the form of observed excess profits, but simply provides a margin for actual costs to exceed minimum attainable costs, or *if* the firm *sell* in imperfectly competitive markets this return may be sacrificed to expand sales in line with the constrained sales-maximization model.

[17] An association of the major B.C. forest companies which functions as a research, advisory and promotion organization for its member firms.

[18] Without such data and very careful estimates of both conversion costs and logging and transportation costs it is impossible to make an economic test of the hypothesis that oligopsony/oligopoly in the Vancouver log market has resulted in artificially low log prices and hence stumpage prices.

the price of *logs*, determined by the Vancouver log market, allowances for logging costs, transportation, risk and profit. The Forest Service computes logging and transportation costs from actual average costs of a number of firms in each appraisal zone in the province.[19] If actual costs exceed minimum attainable costs due to oligopsony power then the stumpage price and the Crown's share of the economic rent will be reduced.

'What we have indicated in this section of the paper is that the structure of the industry's input market and the institutional arrangements embodied in provincial forest policy combine to provide the possibility that the Crown will be constrained in its ability to capture the entire economic rent accruing to the public resource.

[19] See W. J. Mead, *op. cit.*, regarding the U.S. Forest Service's apparently consistent overestimation of logging and transportation costs.