MONITORING BRITISH COLUMBIA'S
TIMBER PRICING PERFORMANCE:

AN EXAMINATION OF INTERREGIONAL STUMPAGE COMPARISONS

by

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Monitoring British Columbia's Timber Pricing Performance: An Examination of Interregional Stumpage Comparisons

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The majority of British Columbia's timber resource is valued by a system of government charges known as stumpage appraisals. This method of timber valuation deducts conversion costs and an allowance for profit and risk from end product values for timber to arrive at a residual value which reflects the rent of the timber resource.

One approach to monitoring the performance of British Columbia's appraisal system has been to conduct comparisons of timber values with the Pacific Northwest where a sizeable fraction of the timber resource is valued by competitive markets. This paper examines these comparisons with a two-fold purpose. The first aim is to determine whether these comparisons are a viable means of monitoring the adequacy of British Columbia timber values. The second aim is, on the basis of the survey, to make a judgement on the accuracy of British Columbia timber charges.

The comparisons revealed that British Columbia timber values are lower in absolute dollar terms than timber values in the Pacific Northwest. It was unclear from earlier studies whether this difference is due to factors such as species and quality differences and the more difficult operating conditions in British Columbia, or due to existence of competitive markets in the Pacific Northwest. Later studies attempted more standardized comparisons where the explanatory factors were accounted for in a quantitative manner. However, these adjustments were plagued by some fundamental differences in
timber appraisal and utilization systems. Furthermore, differences in industry structure and regulation could not be accounted for in the comparison in a quantitative manner, and qualitative evaluation was not always clear.

These differences limit the usefulness of the comparisons. Subject to the limitations of the evidence, the overall assessment is that British Columbia timber charges may be overvaluing the timber resource. Serious doubts about this conclusion are raised, however, from recent evidence on bidding in a new market which now exists for Crown timber in British Columbia.
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INTRODUCTION

The British North America Act established the rights of the provincial and federal governments in 1867. It allocated the ownership and control of natural resources to the provinces. Generally, British Columbia retained Crown ownership of land and resources, and, as a result, 95 percent of timber land in British Columbia is owned by the province.¹

Timber is the basis of British Columbia's most important industry. Of the province's 94.7 million hectares, 54.6 million or 57 percent is classified as forest land. Trees provide the raw material for the forest industry that has consistently accounted for half of the value of shipment from the manufacturing industries in the province. The forest industry also features prominently in the field of export where lumber, pulp, and newsprint account for over half the total as well.² Clearly, then, policy concerning the forest industry is a crucial area for the province's public interest.

Timber pricing is one such aspect of forest policy. Its accurate implementation is necessary both for an efficient use of timber in production and an acceptable distribution of income between the industry and the public. There is, however, more than one way to achieve this result. British Columbia has opted to price its timber primarily by an appraisal method which currently applies to 80 percent of the timber annually harvested. This appraisal method attempts to approximate the price of
standing timber that would exist in the presence of competitive markets. The amount should reflect the full economic value of the resource and should, in principle, go to the Crown. In theory, competitive bids would ensure this result. In the absence of competitive markets for timber, however, the responsibility for protecting the public interest lies with government administrators acting in a cooperative fashion with industry officials.

As with other regulated industries, there is the need to monitor resource valuation when it is done through government administration rather than through markets. In the forest industry, such monitoring concerns the accuracy of British Columbia timber appraisals in assessing timber values and collecting for the Crown the full value of the resource rent.

One method of monitoring British Columbia's timber pricing system has been to compare British Columbia timber values with those of the Pacific North-West. There are strong resource similarities between regions, and both the Pacific North-West and British Columbia share the same output markets for timber. However, in the Pacific North-West, competitive bids usually determine timber values on public lands; hence, an inter-regional comparison should provide a good basis for evaluation of the accuracy of British Columbia's administered appraisals.

The outcome of such comparisons has been of considerable policy interest in recent years. In the Pacific North-West, lumber producers have charged that inadequate Canadian timber
appraisals have resulted in raw material cost advantages for Canadian lumber producers whose products compete in their markets. Under the terms of the Tariff Act of 1930, these producers felt entitled to a countervailing duty as protection against such subsidies. Investigations into these allegations have been made by both the United States International Trade Commission (ITC) and a parallel body, the United States International Trade Administration (ITA).

This paper will examine studies which have compared British Columbia timber values with those of the Pacific North-West. The purpose of this survey is two-fold. One aim is to establish to what extent such comparisons are meaningful. Comparing timber values between regions can be a very complex issue. Every stand of timber is essentially unique with respect to a wide range of characteristics. This fact may imply substantial variation in timber values even within narrow geographic areas. When comparing large areas, it is important to account for all sources of variation which are attributable to these characteristics and to separate this from variation attributable to the timber pricing systems themselves. On top of this, institutional differences and the historical peculiarities of each region must be considered.
The second purpose is to use the results of the survey to make an assessment of the accuracy of British Columbia's appraisals in determining appropriate timber values.

This study has four distinct phases. First, the basic theory of resource pricing is reviewed and a brief description of the Pacific North-West and British Columbia timber pricing systems is given. Second, a description and analysis is made of each region's structural and institutional features. Third, a critical review is made of timber comparisons between British Columbia and the Pacific North-West. Emphasis here is on the Coastal regions of both areas. The review primarily includes evidence relating to the countervailing duty case which was investigated by the United States ITA and ITC. In the final section, the effect of social and political objectives of each region on timber values is assessed. Finally, evidence on bidding in British Columbia's small business timber market is presented and discussed to supplement the evidence on cross-border comparisons.
NOTES

INTRODUCTION


SECTION I

STUMPAGE AND THE THEORY OF RESOURCE RENT

Here the theory of timber pricing is examined from the viewpoint of a simple hypothetical example of a forest industry containing mills with different degrees of cost and locational advantages. Consider a given lumber market served by several mills. Each of the mills could face different cost conditions attributable to the characteristics of the stand from which they draw their timber. For instance, one mill may draw its timber from a rich forest of ideal density. It may also have natural transportation advantages for getting the cut timber to the sawmill. In addition to these advantages, the mill may also be very close to its markets. Other mills may have longer log hauls, be further from markets, and/or draw their timber from sparser stands. Thus, firms in this markets could be facing quite different cost conditions depending on the characteristics of their timber source and its location.

These situations affect the amount firms are willing to pay for standing timber but do not influence their output decisions. Payment for raw timber, like any natural resource, are a result of supply and demand interaction but do not influence supply decisions. The only costs that matter are those which operators must incur in extractive efforts to yield products which after appropriate processing are marketable. If a firm can cover all
of these costs, including the cost of capital and a normal return, it will operate in the long run. The amount the firm would be willing to pay for the timber is, however, dependent on cost conditions associated with its timber source.

To see this, suppose that a price of $200/mbf (thousand board feet) is determined in a competitive market for the forest industry's final output. Only those mills who can operate with costs of $200/mbf or less will consider supplying their output. All other firms who cannot cover their costs will leave the industry in the long run. Now, a mill with the aforementioned locational advantages may have costs as low as $125/mbf. Such a firm would be making an above normal profit of $75/mbf. Firms with successively higher costs would have lower returns. If none of these mills owned their timber, but instead bid on the right to cut it, it is clear that the mill with costs of $125/mbf could bid just marginally less than $75/mbf and be better off with the timber rights than without them. A mill with cost of $175/mbf would only bid at most $25/mbf and a mill with costs of $200/mbf would not bid. Thus, all of these mills would be willing to bid the amount of their surplus over a normal profit. Alfred Marshal defined such a surplus as economic rent or income derived from the gifts of nature. This is because the reason that the firm could bid as high as $75/mbf was the low cost associated with the characteristics of the timber stand. It is also clear that a surplus generated from such a source should accrue to the timber owner.
The amount of this surplus could also be extracted administratively. One would simply work back from the end product market price of $200/mbf and subtract transportation, processing, and logging costs and arrive at the value of the standing timber. Conceptually, both approaches should arrive at the full value of the surplus attributable to the quality, maturity, and locational superiority of the timber stand. Both approaches could also result in errors.

In a bidding system, the full value of the rent may not be collected. There may be few actual or prospective sawmill operators within reasonable hauling distances and subsequently there may not be sufficient competition in the bidding. Alternatively, there may be collusion to suppress competitive bidding among those present at the auction. In the case of administered charges, errors could be made in determining costs or selling prices of end products. Errors in costs may be the result of appraisers yielding to the pressure of industry representatives to understate costs. There could also be very thin and poorly developed markets for end products. British Columbia and the Pacific North-West are practical examples of these two different approaches to rent collection. We now turn to a description of how timber values are determined in these two regions.
CURRENT BRITISH COLUMBIA TIMBER PRICING SYSTEM

In British Columbia there has historically been a long debate over the most appropriate means of collecting the timber resource rents. A variety of royalty rate schedules, taxes, and levies have existed over the years in addition to stumpage payments. Gradually these other charges have been phased out in favor of appraisals. In 1980, 80 percent of the total timber harvest was from land requiring stumpage payments. Timber appraisal in British Columbia is based on a method known as the "Rothery System" developed by an American forester of that name. The logic of this system has already been explained. Basically, an end product selling price is obtained and then milling costs, operating costs, and an allowance for profit and risk are deducted from the selling price to calculate the value of the standing timber. A simplified example is given in Table I. However, an actual computation would be much more complicated.

In British Columbia two separate end products are used as the starting point in the stumpage calculation. On the Coast of British Columbia, log prices, by species and grade, as determined in the Vancouver Log Market are used as the selling price in the appraisal. In the British Columbia Interior, lumber, chips, and pulp logs are the first traded products available after processing, since no log markets exist. Thus, they are used as end products. The cost components of the stumpage calculation are appraised once a year. However, the sales component of the
calculation is changed more frequently. Stumpage in both regions is based on a three month rolling average of end product prices. The three month average is updated once a month. The stumpage rate is adjusted upward or downward based on changes exceeding $5/mbf in the three month selling price of the end product in the interior and $6/mbf in the three month average price of logs on the coast.³ There is a limit on the downward adjustment of the stumpage rate, however. Minimum stumpage rates on the Coast are 6 to 8 percent of the selling prices of logs depending on the region. In the Interior, stumpage rates do not fall below 3 percent of end product prices.⁴

The allowance for profit and risk in both regions is expressed as a percentage of operating cost plus stumpage. The Coast has a basic allowance of 10 percent. There is also a variable risk allowance which may be as high as 13 percent. This allowance includes market risk, defect risk, risk of chance, investment risk, and pioneering risk. These factors relate to specific sales and the actual amounts are set by appraisers. In the Interior, the basic allowance is 12 percent with up to 18 percent being the ceiling for the variable risk factors.⁵
PACIFIC NORTH-WEST TIMBER PRICING SYSTEM

The United States uses a similar appraisal system for its publicly owned timber. An end product selling price is generally calculated from lumber, plywood, or chip prices. The United States Forest Service (U.S.F.S.) uses a profit and risk allowance of 9 to 18 percent, the variable rate being dependent on differing sale conditions, as in British Columbia. Minimum rates of between $1 and $10/mbf are usually enforced when appraisals become too low. U.S.F.S. sales are generally put out for public bid. The appraised price plus estimated road cost is the minimum at which the timber is sold. The bidding usually starts at the advertised price (generally by oral bidding on the West Coast, although sealed bids occur in other parts of the country) and continues until the final price is determined. The purchaser generally has two options. He can build the required roads and receive the assigned road credits against stumpage payments, or he can pass the responsibility on to the U.S.F.S. 6

Stumpage rates are generally not as sensitive to changing market conditions for end products in the Pacific North-West. Until recently (late 1983), there was no adjustment mechanism at all in Western Washington and Western Oregon. Appraisals and bids are made at the time of sale, and payments for timber are made at the time of harvest. The time lag between the time of sale and time of harvest depends on the length of the contract and end product market conditions. If end product prices change
over the interval, the full gain or loss is borne by the operator. Today, as in the Eastern region of the Pacific North-West, an end product price adjustment mechanism does exist. Because of this mechanism, the price paid for timber may not be the same as the bid. Stumpage rates are adjusted up or down by 50 percent of the difference between the base period end product price index and the current price index. For instance, if the index should increase by $2/mbf from the date of sale, the actual price paid for the timber would be increased by $1/mbf. 7

In sum, the key difference between the Pacific North-West and British Columbia is that competitive bids determine the price of timber (except where the appraised floor price prevails) in the former and Forest Service appraisals do the job in the latter. Other institutional differences will be considered in the next section.
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<td>Minus Operating Cost</td>
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<td>Equals Amount Available for Profit and Stumpage Charge</td>
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<tr>
<td>Minus Profit Allowance at 20% of Operating Cost Plus Upset Price, i.e. 20(56.70 + 15.10)</td>
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<tr>
<td>Equals Appraised Upset Price</td>
<td>$15.55</td>
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NOTES

SECTION I

1 This example is taken from F.M. Scherer, Stumpage Charges and Softwood Lumber Imports From Canada; Memorandum to reports submitted by Canadian Softwood Lumber Committee before the United States ITA.


4 ITC Hearing, Testimony of Mr. Ainscough and Mr. Pinette.


6 ITC Report, p. 47.

In this section, structural and institutional aspects of the timber markets in British Columbia and the Pacific North-West will be examined. British Columbia has gone through extensive changes in its complicated tenure system as a result of the 1978 Provincial Forest Act. Hence, the material on British Columbia is presented from an historical perspective in order to aid in the understanding of the present system.

INSTITUTIONAL ASPECTS OF BRITISH COLUMBIA'S FOREST INDUSTRY

Access to the province's timber is granted to private firms by the provincial government under a complicated set of terms known as forest tenures. The system of timber pricing in British Columbia has historically been linked to the terms of tenure agreement. In turn, these terms have been linked to the evolving objectives of the forest policy.

Today, British Columbia firms acquire or have acquired timber from the Crown under several major forms of tenure agreement. There are Crown grant lands, Old Temporary Tenures (OTT's), Tree Farm Licences (TFL's), and quotas in Timber Supply Areas (TSA's).

Crown-grant timber lands originated in the earliest stages of the Province's timber history when the primary objective was to stimulate general economic development. The grant entitled...
the land owner to exclusive possession and use of the land in perpetuity. These holdings today are the most desirable from the viewpoint of accessibility and location, and because of their permanency and wide scope of rights they convey, are undoubtedly the most secure form of access to the timber resource. In 1983 these Crown-grants accounted for approximately 6 percent of the total harvest.¹

The principle of granting rights to harvest timber without alienating the land originated in a Land Ordinance proclaimed by the Governor of Vancouver Island in 1865. This Ordinance gave colonial administrators the authority to grant rights to cut Crown timber in the form of Timber Leases to individuals or companies engaged in lumbering. Three other forms of provincial tenure followed shortly after this. They included Timber Licences, Pulp Licences, and Pulp Leases. Collectively, they are part of what are today known as the OTT's.

Originally, these tenures accounted for about 10 million acres of forest land. Most of them have since expired, and by the mid 1970's, the total acreage outstanding had dwindled to 1.7 million acres.²

As a result of the Forest Act of 1978, many of these old tenure forms have since been merged into a new form of Timber Licence. In 1983, all of the OTT's accounted for 9 percent of the total harvest. The new timber licences accounted for 6.5 percent of the total harvest. The older tenure forms accounted for 2.5 percent of the total.³
Like the Crown-grant lands, the OTT's represent some of the best timber in terms of location and species that exist in British Columbia. More than 70 percent lies in the Vancouver Forest District. The various forms of OTT's are heterogeneous with respect to term (varying from 1 to 21 years), but in practice renewal has been perfunctory, and, as a result, the OTT's only expire upon exhaustion of timber supply. Thus, like the Crown-grants, they are a secure form of tenure.

In the 1940's, long term forest management became the central objective of forest policy. In order to ensure this, TFL's and Public Sustained Yield Units (PSYU's) were established. The distinction between them was that TFL's referred to private forest land management units and the PSYU's to public ones. The TFL's were designed to encourage firms to bring old tenured forest lands under sustained yield management. Since this meant a reduction in annual harvest from old tenured lands, licensees willing to bring their total supply under sustained yield management obtained additional rights to harvest timber. The Crown-granted lands and old OTT's contributed by the licensees are known as "Schedule A" lands and the licensee is bound by the terms and statutory provisions relating to these tenures. Hence, the old royalty rates apply to the timber harvested there. The new Crown lands granted to the licensee are known as "Schedule B" lands and here stumpage appraisals apply. By 1982, timber from Schedule B lands accounted for 82 percent of the total Annual Allowable Cut (AAC) for all TFL's with Schedule A lands.
contributing the remainder.\textsuperscript{5}

The first TFL's were established in perpetuity. Since then, a number of changes have taken place regarding the terms of this form of tenure. Today, they have renewable terms of 25 years. The TFL's are concentrated heavily in the coastal region of the province and in 1983 accounted for 28 percent of the AAC for all of B.C.\textsuperscript{6}

The PSYU's were public owned land management units. They consisted of fixed geographic areas with established AAC's which were divided into quota volumes given to established operators based on historical cut positions. Initially, the form of tenure agreement was the Timber Sale Licence (TSL). They were allocated by competitive auction and only accounted for a small portion of the total harvest. By the 1960's, Timber Sale Harvesting Licences had become more common.

The Forest Act of 1978 incorporated many of the recommendations made by the Pearse Commission regarding tenure reform. As a result of the new legislation, the former 85 PSYU's were to be converted into 33 TSA's. By 1983, AAC's had been determined for 32 of the 33 TSA's. There was little room for change in the apportionment of the TSA cut. The Forest Act had entrenched security of supply to holders of Crown timber who had obtained their rights under previous legislation. All quota harvesting rights under TSHL's and TSL's were rolled over into new licences. The dominant form of agreement is the new Forest Licences, which accounts for 85.8 percent of the total TSA cut.
with Revised TSL's accounting for 1.8 percent. The remainder of the cut is known as "third-band" or non_quota timber. Initially, the existing allocation of this wood was used as the starting point in the apportionment process. However, when determining how this wood was to be replaced, priority was given to companies without existing or secure wood supplies. The Small Business Enterprise Program was established with this priority in mind. The initial target for the program was that these companies should account for 15 percent of the AAC in each TSA. As of March 31, 1983, the Small Business Program accounted for 10.1 percent of the total TSA cut. In order to achieve the target, reductions in the existing licensee's volumes were necessary and will likely become more significant as the long term target for the Small Business Program is 25 percent of the AAC within the TSA's.

Until recently, competitive bidding for Crown timber was a possibility which was rarely realized. Although TSL's were allocated by competitive auction since 1912, they were only for small parcels of timber on the fringes of royalty bearing lands. After 1945, TSL's became more common, and although still granted on a short term basis, there was rarely competitive bidding at sales. This was due to certain features of the "licensee priority" system which implied that whenever one of the established operator's licences expired, the Forest Service would make another available for an equal volume of timber. The ongoing annual volumes which they were authorized to cut became
known as their quota position. These tended to be maintained and protected even though neither their contracts nor the Forest Act gave them the right to renewal. The reason is that a combination of administrative discretion and Statutory privileges evolved which protected established operators when available timber on PSYU's was heavily committed. These procedures gave the existing quota holder special status in the bidding procedures for licence renewal. He had the option of sealed vs. an oral bid, which implied that he simply matched any bid higher than his own. Furthermore, anyone else who tendered a bid was required to pay to the Crown a non-refundable bidding fee which was fixed at 50 cents per unit of total volume sold for the duration of the licence. This involved a substantial sum if the cut was large. Thus, given the likelihood of the existing quota holders bid being matched by the existing operator (who did not have to pay such a fee), other bidders were at such a disadvantage that, in practice, existing operators maintained their licences and usually paid the stumpage appraised by the Forest Service.9

Today, competitive bids do not exist at all for quota timber. However, substantial bidding has taken place since 1980 on the Small Business Enterprise Program sales. Bidding begins at the appraised price and ends when the highest bid has been established. Both sealed and oral bidding procedures are used.

In sum, for the majority of Crown timber, the present tenure system in B.C. emphasizes security of tenure and long term forest management. However, for a small but growing segment of the
resource, a new competitive market has emerged and is likely to be significant in the future.

STRUCTURE OF BRITISH COLUMBIA TIMBER MARKET

The structure of the British Columbia timber industry is difficult to analyze. Richard Schwindt, in his study of MacMillan Bloedel Ltd., made the point that the British Columbia timber market should be segmented according to tenure type, because the difference in degree of security and accessibility results in firms viewing them as essentially different inputs. Furthermore, because the interior forest differs considerably from coastal forests according to species type, market segmentation should occur geographically as well. ¹⁰

The Pearse Commission, conducted in the early 1970's, documented a high degree of market concentration in the forest industry. Eight companies controlled 90 percent of the log supply, and held all the TFL's and 45 percent of the quotas in PSYU's. In the Coastal region, there were only 30 controlling companies with significant timber holdings. Of these, the 10 largest held rights to 85.7 percent of the committed allowable cut on the coast, and their production represented 76.3 percent of the total coastal harvest. In the Interior, there were 59 controlling companies which held significant timber rights. The largest 10 controlled 52.7 percent of the committed allowable cut and produced 44.9 percent of the total 1974 harvest. ¹¹ All this
was quite surprising when the significant growth in the forest industry in the twenty years before the Pearse Commission is considered.

Since the Pearse Commission, the situation has changed little. Although 17 different companies held TFL's in British Columbia in 1981. MacMillan Bloedel alone made up 35.1 percent of the AAC for TFL's. The four largest controlling companies accounted for 75.8 percent of the AAC for TFL's.¹²

For TSA's, the four and eight largest controlling companies held 18.5 and 32.6 percent respectively of the AAC.¹³ However, when only TSA quota timber is considered, the five and ten largest controlling companies controlled 37.8 and 52.6 percent respectively of the AAC for Forest Licences and TSL's.¹⁴

In short, there is a high degree of market concentration in British Columbia timber markets both geographically and according to tenure type.

INSTITUTIONAL AND STRUCTURAL ASPECTS OF THE U.S. PACIFIC NORTH-WEST TIMBER MARKETS

Whereas 95 percent of forest land in British Columbia is owned by the Crown, the supply situation in the United States is quite different. In the Pacific North-West, 58 percent of all forest lands is publicly owned. Fifty one percent is Federal; 6 percent State; and 1 percent county or municipal.¹⁵ The remaining 42 percent of timber in the Pacific North-West is
privately owned and this represents the best timber land.

Although studies have documented low market concentration ratios for timber relative to other sections of the American economy, the figures are difficult to interpret for two reasons. One is the variety of public and private timber ownership among regions. For instance, in the United States as a whole 72 percent of commercial timber lands are managed and owned principally by private industry. However, in the Western United States, only 32 percent of commercial timberland is so owned. The second reason is that timber markets are likely to be strongly oligopsonistic if not monopsonistic. The value of logs is very low relative to their weight; hence, transportation charges cause stumpages to go to 0. The geographical market for timber, then, is likely to be a very narrow one. Records in the United States indicate that 92 percent of national forest log production goes to primary processors within 70 miles of the timber sale. Consequently, in any competitive timber sale, buyers may be few in number despite a large number of potential bidders within any given lumber producing area.

An alternative to investigating the structure of United States timber markets was conducted by Walter Mead. Using multiple regression analysis, he examined the factors responsible for the degree of competition in timber sales from public lands. His measure of competition was the bid/appraisal ratio. Since appraisals establish the floor price for public timber this ratio always has a minimum value of 1. The ratio of the weighted
average bid price for timber to the weighted average appraisal for the same timber defined the bid/appraisal ratio. Sales in which there was only one bidder, or when no serious bidding took place (bid/appraisal ratio of 1.01 or less), were classed immediately as non-competitive sales. For all other sales, there was a strong positive correlation between the number of qualified bidders at each sale and the bid/appraisal ratio. Bids exceeded appraisals by an average premium of 63 percent for Western Washington and Oregon U.S.F.S. sales.18

Although it was not known how many potential bidders were present at each sale, the results indicated that the number of qualified (those who presented sealed bids equal to the appraisal) bidders did not have to be too large in order for bids to significantly exceed appraisals. In the case of Western Washington U.S.F.S. sales, the average number of qualified bidders at competitive sales was 5.28 compared to 3.06 for non-competitive sales. In Eastern regions of the Pacific North-West, the comparable figures were 3.56 for competitive sales and 2.46 for non-competitive.19

One possible explanation for the positive correlation between the bid/appraisal ratio and the number of qualified bidders is that timber appraisals may be inaccurate in their assessment of timber values and that competitive bids may correct for these errors. There are other explanations, however. For instance, inflationary expectations about end product prices may induce speculative bidding on timber intended for future cutting.
This factor, among others, will be discussed in more detail later.

However, given that Mead's analysis raises some doubts as to whether appraisals can capture the full value of the resource rent and given that the majority of Crown timber in British Columbia is valued by such appraisals, there are two interesting questions that arise. The first question concerns the accuracy of British Columbia appraisals in assessing full timber values and thus capturing for the Crown the full value of the resource rent. The second question concerns possible outcomes regarding timber values if an open market existed for Crown timber in B.C.

The analysis just carried out here suggests a high degree of market concentration for B.C. timber. The number of potential and qualified bidders is likely to be small at auctions, and hence there is a strong possibility of collusion to suppress active bidding.

The answer to this second question is highly speculative. However, a good deal of effort has gone into providing answers to the first question. The remainder of the paper is concerned with critically examining one approach to the problem of assessing the accuracy of B.C. timber appraisals and thus we turn our attention to inter-regional stumpage comparisons.
NOTES

SECTION II

1 B.C. Ministry of Forests, Annual Report, Victoria, 1982-83, Table B5. Total Volume of all Products Billed in 1982-83, by Forest Region.


3 B.C. Ministry of Forests, Annual Report, Victoria, 1982-83, Table B5. Total Volume of all Products Billed in 1982-83, by Forest Region.

4 Schwindt, p. 38.


8 Ibid.


10 Schwindt, p. 39.

11 Ibid., p. 45.


14 B.C. Ministry of Forests, Annual Report, Victoria, 1982-83, Table III: Concentration of Control over Timber Harvesting Rights in Timber Supply Areas as at March 31, 1983. (Forest Licences and Designated Timber Sale Licences only).

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16 ITC report, p. 40.


SECTION III

INTER-REGIONAL STUMPAGE COMPARISONS

INTRODUCTION

British Columbia timber values are determined by formula based appraisals which attempt to estimate all conversion costs and an acceptable level of profit and risk that would be incurred by an "average efficient operation". When these estimates are deducted from an end product selling price, the result is a residual value which reflects the value of the standing timber. This amount should be identical with the price bid at an auction where there is active competition among efficient enterprises. At such an auction, inefficient operations would encounter a price which would reflect a level of performance beyond their capabilities and would be forced to withdraw from the market. Similarly, a uniquely efficient operator would expect a market price below the level he could afford to pay and thus would expect an above normal return until others could duplicate his efforts. The price that would be expected would be the one affordable to the operator with a reasonable level of efficiency. Thus, the Forest Service uses cost estimates which reflect the average efficient operator.

Admittedly, the average efficient operator concept is highly hypothetical, and the translation of such an idea into accounting
terms is a problem for appraisals. The actual costs used in the stumpage calculation come primarily from an appraisal manual compiled by the B.C. Forest Service and are supplemented with site specific information obtained from the timber cruise. The cost information in the manual comes from annual cost surveys performed by the Forest Service. In negotiations with the Council of Forest Industries, the Forest Service has reached agreement on what operations would be representative. Presently, this sample includes 22 operations throughout the province. For Coastal appraisals, cost information is submitted by the COFI representatives on all phases of the logging operation. This includes bucking and felling, yarding, loading, dumping, hauling, booming, sorting, towing, barging, road construction, and maintenance, engineering, and camp activities. The identity and actual costs of these operations are confidential. These surveys are audited by Forest Service accountants and independent surveys are occasionally carried out on other operations outside the sample. If the Forest Service is satisfied with the authenticity of this information, it is used as the basis for appraisal estimates for most of the phases of the logging operation.

The "Tree-to-Truck" phase of the operation is highly capital intensive. Cost estimates here are based not only on cost survey data but also on productivity estimates carried out by Forest Service personnel on the machinery used in the tree-to-truck phase. Estimates of cubic metre per hour are obtained through time studies and are combined with machine and labour
dollar-per-hour costs submitted by COFI to obtain dollar per cubic meter figures.

In general, the appraisal is indifferent to the actual method used by a given operator. The estimates used in the appraisal are based on state of the art equipment and techniques. Experimental techniques which may yield lower costs are not considered.

Actual costs, however, can vary considerably with terrain and climatic conditions, which dictate what types of equipment and method are used as well as costs of harvesting and hauling. The Forest Service has general guidelines for determining cost allowances concerning slope steepness, soil type, etc. Site specific information comes from the timber cruise. This is carried out by the licencsee subject to the performance guidelines of a Forest Service check cruise. However, the extent to which detailed information regarding soil conditions and terrain is used to supplement the Forest Service's guidelines for cost allowances on these factors could not be determined.

Because of the Forest Service's policy of secrecy, little can be said by way of judgement on the Forest Service construction of the cost estimate of an "average efficient operation", i.e., that operation which would secure the winning bid in a competitive market. Price Waterhouse has made wood industry cost surveys and found that appraisal allowances are lower than its estimates of industry costs. This could mean either that appraisals are unrealistically low or that the Forest
Service's cost estimates are correct, since presumably an efficient operation will have lower costs than some industry average. Any definitive explanation would be highly speculative, however, since the identities and actual costs of the appraisal sample are confidential. However, most of the timber resource is valued by the appraisal method, and hence some independent means of evaluating this method is needed.

There is suspicion that British Columbia timber appraisals have failed to approximate timber values. This suspicion stems from two sources. The first source is that small parcels of non quota timber, when sold competitively, have gone for prices well above the appraised value. The second source is based upon comparisons with the Pacific North-West where, as mentioned previously, successful bids for public timber exceeded appraised values by an average of 63 percent, and where it was felt true competitive bidding was taking place. Given the considerable experience of the U.S.F.S. in making appraisals, there is, on the basis of this evidence, reason to believe that a system of competitive bids will out-perform a system of timber appraisals in practice. Furthermore, British Columbia uses a similar method of appraising timber values. Since there is no reason to believe that the British Columbia Forest Service is any more competent than the U.S.F.S. in making appraisals, there is a need to monitor the accuracy of British Columbia timber appraisals.

As mentioned, for most of the Crown resource in British Columbia, the sole means of determining correct timber values
lies with the appraisal system, and therefore there is no way of comparing appraisals with bids for a given timber sale. However, an alternative means to monitor British Columbia appraisals is to compare bids for Pacific North-West timber with British Columbia timber appraisals. Inter-regional comparisons between the timber industries of the Pacific North-West and British Columbia have been made periodically over the past twenty years. Such comparisons are thought to be viable because there are strong similarities in the resource in both regions and both industries compete in the same output markets. Such studies are, then, of considerable policy interest. The major drawback of inter-regional comparisons is that every stand of timber is unique with respect to species mix, timber quality, and operating conditions. Differences in these factors may account for considerable variation in stumpage values, even within fairly narrow geographic areas. Therefore, the problem with inter-regional comparisons, as opposed to comparing bid vs. appraised values on a sale basis, is to ensure all such sources of variation are accounted for and appropriate adjustments made in the comparison. Despite the many comparisons that have been made in past decades such problems have usually been disregarded. Studies have been made in which a particularly high rate of stumpage in one region, which arose because of special circumstances, is compared with the average rate for another region. Rates have been quoted in different currencies, units of measure, and sometimes even for different species. Evidence
from recent comparisons which do not suffer these obvious flaws is analysed below.

PRICE WATERHOUSE REPORT

The Price Waterhouse report provided a comprehensive examination of stumpage and the factors which determine its value in both British Columbia and the Pacific North-West. The conclusions of this study were that Pacific North-West timber was more valuable for a number of reasons. Due to the more remote and difficult terrain, conversion costs are generally higher in British Columbia than the Pacific North-West. In addition, the more northerly latitude of British Columbia forests results in a less attractive species mix and lower quality grades within each species. Given the effects of higher conversion costs and lower end-product revenues on the stumpage calculation, British Columbia timber values should be lower than those of the Pacific North-West, ceteris paribus. In addition, the study identified several other reasons why public timber should be more valuable in the Pacific North-West. These included superior marketing opportunities, particularly log and chip exports to Japan, which result in higher end product sales realizations and hence higher stumpages, as well as more favourable tax treatment for U.S. operators. These issues will be considered in more detail later. An important implication of these studies, however, is that in a stumpage comparison between regions it is important to
standardize for both species and grade.

HALEY

David Haley, a U.B.C. forest economist, considered making direct stumpage comparisons between the Pacific North-West and British Columbia. He first made his comparison in a very general manner. He compared average real stumpage prices in Washington and Oregon with those in British Columbia for the 1963-78 period, and found an upward trend of 11 percent per annum in the United States and a slight downward trend in British Columbia. Haley found this surprising because of the increasing demands on the forest resource during that period, particularly in the Vancouver forest region.

To determine the source of this difference, he next made a very specific comparison between two areas very similar in forest density and operating conditions.

Stumpage payments from Quadra P.S.Y.U. of the Vancouver Forest Region in 1977 were compared with those of the Mount Baker-Snoqualmie National Forest Region in the Pacific North-West. Only the Douglas Fir species was considered. After deducting logging costs and an allowance for profit and risk from log prices, Haley determined that stumpage for the Quadra P.S.Y.U. was $0.17/m³. For the Mount Baker-Snoqualmie National Forest, where a similar system of stumpage appraisal is used, the comparable charge was $18.96/m³. Subsequent analysis could not
explain why the Quadra P.S.Y.U. appraisal was so much lower than the comparable United States region. Logging and transportation costs were 11 percent higher in the Mount Baker-Snoqualmie Forest Region and the allowance for profit and risk was virtually identical in both regions. He reasoned that the one possible explanation was the lower timber quality of the Vancouver region. An adjustment was made for grade by assuming that the log grade distribution of the Quadra P.S.Y.U. region was identical to that of the Mount Baker Region and then determining its value in the Vancouver Log Market. The adjustment was somewhat arbitrary because the log grade specifications of the two regions were quite different. After adjustment for quality, however, the Quadra P.S.Y.U. appraisal was still only 38 percent of the Mount Baker-Snoqualmie appraisal.

In addition, the bid price more than doubled the appraised value of the stumpage in the Pacific North-West Region. Thus, although recognizing imperfections in the Vancouver log market and superior marketing opportunities in the United States, Haley still felt that British Columbia timber appraisals undervalued the resource.

There were weaknesses with both phases of Haley's analysis. In failing to consider some peculiarities of the U.S. sale process, he missed the possibility that the bid price and paid price of timber, though related, were often quite different. In some cases, the bid price may have no relationship at all to the price that is actually paid for timber. In fact, there are
several difficulties with comparing the bid and appraisal timber price.

The bid price does not represent the current value of timber. When a United States operator bids on public timber, he enters into a contract to harvest within a certain period of time. The average length of these contracts is 3.5 years, but may range anywhere from 1 to 8 years. The timber must be harvested before the contract expires, and no stumpage is paid until the timber is harvested. Furthermore, as mentioned in Section I, in Western regions of the Pacific North-West, there was no adjustment in stumpage rates in response to changes in end product market conditions at the time of Haley's analysis. This means that operators must accurately assess end product values at the time at which they intend to harvest the timber. Hence, bidding on timber on public lands has elements of a futures market. Harry Smith, a U.B.C. forest economist and a colleague of Haley's, addressed this point in a rebuttal to Haley. In Haley's analysis of the Douglas Fir species, the bid of $59.43/m³ more than doubled the advertised stumpage of $27.43/m³ (appraised value of $18.96 + $8.47 for road credits). Smith noticed that the difference between the bid and advertised rate exceeded the expected profit and risk by $12.80/m³ and concluded that only expectations of very high end product prices in the future could justify such a bid.9

Furthermore, this speculative bidding has a very low risk of losses associated with it. If end product prices are higher than
anticipated, the operator experiences the full gain. If end product prices are lower than anticipated, of course, the reverse is true. However, unlike British Columbia operators, Pacific North-West operators do not face quota and cut control regulations. This allows greater flexibility in reacting to changes in market conditions. In many cases, bad market conditions can be waited out within the limits of the contract, and the timber can be harvested when market conditions improve. Thus, although the bid price eventually is paid, this may happen with a considerable lag, and thus it is not correct to compare bid prices, which are for timber intended for future cutting, with appraisals, which assess the current value of timber. Moreover, it is possible that the average Pacific North-West bid price might actually never be paid.

In Eastern Regions of the Pacific North-West, there is an end product price adjustment for stumpage. This was explained in Section I. Although it does tend to reduce speculative bidding, since the operator does not experience the full gain of a favourable end product price change, it also implies that the paid price for timber will be different from the bid price. There is also the possibility that a particularly high bid price will never be paid. The bids for each sale are determined by multiplying the dollar value bid for each species by its volume and summing over all species to arrive at the total bid for the stand. The highest total bid wins the sale. If the bidder is aware of cruise errors concerning these species
volumes, he may capitalize on them in the following way. The bidder may have superior knowledge concerning the actual volume of timber by species in a given stand. For appraisal purposes, however, a prediction of this volume is based on sample plots obtained in the timber cruise. If these predictions significantly overestimate the volume, the bidder may use his superior knowledge to overbid this species in order to win the sale. He also knows that most of his bid will never be paid simply because the timber does not exist. Price Waterhouse documented such an example in Western Washington in 1971, where the bid/appraisal ratio was 32. In this case, as in most, these spectacular bid appraisal ratios result from bidding on a species which is a very small proportion of the total sale; thus, the bids effect on the actual stumpage paid is very small.

There are other difficulties with comparing bid prices with appraisals, and these will be discussed in Section IV. To summarize this discussion of Haley's work, it appears that it would have been more appropriate to compare trends on the prices that were actually paid for timber in the two regions over the 1963-78 period. Table II gives some indication of the difference such an adjustment might make. Table II compares bid prices, advertised prices (stumpage appraisal and road costs), and actual payments for timber cut in each year over the 1977-81 period. The data show that there is a much closer relationship between the advertised price in each year and the actual payments for timber. Both of these are, in all cases, well below the level of
the bid price. Thus, if Haley had considered payments made for timber, he would have discovered a much lower and less steep trend than he encountered for bids.

This data also gives some indication of the effects of cruise errors. The average contract length is 3.5 years which implies that the 1981 payments for timber should be very close to 1977 bids for timber. Table II indicates that the 1977 average bid of $181.76/mbf was still significantly greater than the 1981 average payment of $126.02/mbf. One explanation is that the bids were based on cruise volumes and the actual payments were based on scaled volumes of timber and hence the difference could have been due to the existence of cruise errors which were discussed earlier.

The second problem with Haley's analysis is his use of a single species, Douglas Fir, for his comparison. This species typically accounts for only 10 percent or less of the total Vancouver Region annual cut. Hemlock is the most commonly harvested species of both regions and would have been a better choice. However, regardless of the species chosen, a one species comparison does not provide an adequate basis for generalization.

Impact of Haley's Study

Haley's study proved to have profound impact on the industry. After his article appeared, the U.S. industry became concerned that low Canadian timber appraisals were placing United
### TABLE II

**COMPARISON OF BID PRICES, ADVERTISED PRICES AND ACTUAL PAYMENTS FOR CUT TIMBER FOR THE PACIFIC NORTH-WEST**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>U.S. BID PRICE</th>
<th>U.S. ADVERTISED PRICE</th>
<th>ACTUAL PAYMENTS MADE FOR TIMBER FOR CURRENT YEAR (U.S.F.S. CUT &amp; SOLD REPORTS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>181.76/MBF</td>
<td>112.78</td>
<td>106.36</td>
</tr>
<tr>
<td>1978</td>
<td>214.95</td>
<td>120.13</td>
<td>124.53</td>
</tr>
<tr>
<td>1979</td>
<td>335.00</td>
<td>131.24</td>
<td>135.53</td>
</tr>
<tr>
<td>1980</td>
<td>350.46</td>
<td>99.42</td>
<td>125.36</td>
</tr>
<tr>
<td>1981</td>
<td>275.14</td>
<td>97.50</td>
<td>126.02</td>
</tr>
</tbody>
</table>

States timber producers at a competitive disadvantage vis-à-vis Canadian producers. This concern generally was due to the very severe slump that hit the North American lumber industry early in 1981, due in large measure to the very high interest rates of that period. This slump had different effects on British Columbia and Pacific North-West regions. First, with regard to stumpage charges, British Columbia producers were insulated from the down-turn to some extent because stumpage charges in B.C. change in response to changes in end product values until minimum stumpage rates apply. As noted previously, this did not happen in Western Washington and Oregon at the time. The very poor end product markets of 1981 had not been anticipated at the time bids were made. In many cases, it was not rational to harvest the timber given the high price that had to be paid for the timber as a result of earlier bids. Those who could not sit out the slump, either because they had no source of private timber or because their contract was due to expire, faced defaults which meant heavy penalties.

A second difference is that British Columbia operators face minimum cut requirements. These requirements reflect a deliberate policy of the British Columbia government to minimize employment fluctuations caused by the volatile nature of the industry. In short, the B.C. operator is compelled to operate during periods of weak demand. This fact, combined with a falling Canadian dollar, contributed to increased Canadian exports to the U.S. Although the reasons for the increases were
disputed, the fact was that many Western Washington and Oregon operators were in the position of having to pay very high rates of stumpage while all British Columbia operators were paying minimum rates of appraisal. This led many to blame the increased exports on low Canadian timber appraisals, and strong public pressure mounted in the U.S. for countervailing tariffs. In many cases, petitioners wanted the amount of the countervailing duty to equal the difference between U.S. bid price and Canadian appraisals, which in some cases was 12 to 1. Consequently, on December 2, 1981, the Committee on Finance of the United States Senate requested the United States ITC to conduct a study pursuant to Section 332 of the Tariff Act of 1930 on conditions relating to the importation of Canadian softwood lumber and to compare the competitive status of both industries.

We now turn to a critical examination of the ITC report on timber pricing systems.

ITC STUMPAGE COMPARISONS

The ITC compared average stumpage payments of the Pacific North-West (Washington and Oregon) with those of British Columbia for the 1977-81 period. They also conducted comparisons between the Coastal region of British Columbia and Western Washington and Oregon and between the Interior of British Columbia and Eastern Washington and Oregon. They found British Columbia stumpage payments to be consistently lower over the entire period.
British Columbia stumpage charges were as low as 1/6 of comparable Pacific North-West charges in bad market years where minimum stumpage payments prevailed. In good market years, British Columbia stumpages were still only 1/2 United States charges. 13

Methodology and Problems

Whereas Haley compared trends in the Pacific North-West bid values with British Columbia appraised values, the ITC attempted to compare annual payments for timber from each region. The objective of such a comparison should be to determine differences in stumpage values and see whether this difference is due to factors such as conversion costs, discernible value differences in the timber resource, or different political or social priorities of the regions. If the difference is not due to any such factors, then the timber pricing systems may be failing to properly assess timber values. In order to reach such a conclusion, however, all such factors must be accounted for in the comparison. The ITC study did not do this.

When comparing such large regions as the Pacific North-West and British Columbia, it is unreasonable to assume that they are identical in all factors which impact on the stumpage calculation. These factors are species mix, timber quality, and operating conditions.
Species and Quality

Previous studies concerning species comparison of these two regions have shown that the Pacific North-West has a more valuable species mix than does British Columbia. This is due mainly to a much higher proportion of Douglas-fir, which is a relatively valuable species. Douglas-fir accounts for 49 percent of total softwood lumber in the Pacific North-West compared with 8 percent for British Columbia. To account for this difference, the ITC took the percent of each species harvested in Washington and Oregon and multiplied this percentage by the price paid for the same species in British Columbia to arrive at an adjusted comparable price. The actual adjustment varied from year to year according to the share of each species harvested and the price paid for each species, but the ITC results confirmed the results of earlier studies, which indicated that the Pacific North-West has the more valuable species mix. To put B.C. stumpage values on a comparable basis, a 77 percent upward adjustment would be necessary for the 1980 harvest and a 105 percent upward adjustment would be necessary for the 1981 harvest.

However, when a similar adjustment factor was applied to a comparison between the Coastal British Columbia harvest and the Western Region of the Pacific North-West, it was found that no adjustment was necessary, as the species mix was virtually identical.
Like species mix, timber quality is an inherent value difference in the resource of the two areas, and should be accounted for in any stumpage comparison. Previous studies by COFI and U.S.F.S. have argued that generally the quality of timber within each species is lower in British Columbia than adjacent Pacific North-West stands. This argument was based on comparisons of the log grade mix of each region. The Pacific North-West log grade distribution appeared in all cases to have a higher proportion of top grade logs for each species. The results are flawed, however, by the fact that the log grade specification, measurement, and scaling systems are completely different in the two regions. The Pacific North-West uses the Scribner scaling system, which employs a board foot measure. It is essentially a net recovery system, which attempts to estimate the expected recovery of one inch boards. Since it is closely related to lumber recovery at the mill, it allows for many more deductions than the British Columbia Firmwood Scale, which uses a volume measure and gives the highest net volumes of any scale. The only allowable deductions are for rot and decay. It is not related at all to the outturn of any manufactured product from the log. The grading rules from these two systems are therefore completely independent and any comparison of grade distribution is inherently arbitrary. At best, a thorough study of the two grading rules allows one to set up arbitrary categories concerning the correspondence of Scribner Scale and Firmwood Scale logs. To avoid such an arbitrary solution, what is needed
is a dual scale analysis of a representative sample of logs. The sample would be scaled independently by both systems and the results subjected to analysis in order to work out the proper conversion factor between measurement systems and relationship between the grades.

The ITC did not make an adjustment for timber quality. They felt that a proper adjustment of the kind just described would require too much time and money and that any other attempt would be arbitrary in light of many conflicting opinions that existed concerning timber quality. For example, United States producers have pointed out that trees in British Columbia have a better growth ring count due to slower growth. This would give British Columbia better strength characteristics. British Columbia producers, on the other hand, claim that United States producers have a higher percentage of knot free wood. Even though differences such as these are extremely difficult to evaluate and quantify, the ITC's omission of a quality adjustment represents a serious problem with their results. Haley's adjustment for timber quality, even though based on arbitrary log grade correlations, showed that timber quality can account for a significant difference in stumpage values.

Even though the relationship between the grading systems was not calculated, it is necessary for the purposes of comparison to present both stumpage rates in a common volume unit. Thus, an appropriate conversion factor between board feet and cubic meters must be determined. This factor could range, theoretically, from
9.9 cubic meters being equal to 1000 board feet for a 4" top diameter 40 foot log to 3.7 cubic meters being equal to 1000 board feet for a 40" top diameter 40 foot log. The true factor varies with the deductions scaled from logs, the log scaler, and, in general, all other variables associated with scaling. Thus, again, the appropriate conversion factor should come from a dual scale analysis of a representative sample of logs.

Price Waterhouse has conducted such studies, although only for a limited number of species for the Coastal region of the Pacific North-West and British Columbia. On the basis of 62 samples of Hemlock and Douglas-fir logs, they found the average conversion factors could range from 5.38 cubic meters per thousand board feet to 5.95 cubic meters per thousand board feet. Given that a price comparison between regions would be sensitive to this measure, and given the range of average conversion factors, a dual scaling analysis is usually appropriate. If it is not done, then arbitrary assumptions must be made. The ITC made such assumptions. They assumed an average log diameter of 15", which yielded an average conversion factor of 5.66 cubic meters per thousand board feet.

**Bid vs. Appraised Values**

Some problems with making annual comparisons between bid prices in the United States and British Columbia stumpage appraisals have already been discussed. Basically, timber bids
in a given year are on timber intended for future cutting. For the purposes of year-by-year comparisons, payments for timber actually cut in a given year are more appropriate. Thus, the data used by the ITC were only for the timber actually cut year by year over the 1977-81 period. These data were obtained from U.S.F.S. cut and sold timber reports and were generally representative of past bidding. The data, however, were not necessarily representative of the operator's true stumpage cost.

The Pacific North-West has a timber utilization system which attempts to encourage utilization of low grade material. All such material below minimum utilization standards is appraised separately and is sold on a lump-sum per acre basis rather than on a scaled basis. Furthermore, this material may be disregarded without penalty if the operator feels he cannot profit from its removal. An operator can significantly lower his overall unit stumpage cost by recovering a high volume of this material, for which he pays a lump sum. However, since this material is not scaled or recorded, its impact is not reflected in cut timber data.

Other Adjustments

Adjustments were also necessary for road credits and currency. Given the exchange differential, it was necessary to express all cost figures in terms of a common currency, and the U.S. dollar was used. On United States public lands, the operator has the option of building his own roads or having the
service provided by the U.S.F.S. If the second option is chosen, the road building costs are added to the appraised value of the stumpage to yield the advertised rate, i.e., the minimum price at which the timber will sell. In British Columbia, all road building is done by the operator. Thus, in a stumpage comparison between regions, these road credits would have to be deducted from United States stumpage payments to yield a comparable charge.

In sum, the adjustments made by the ITC in their stumpage comparison were for species, road, credits, currency, and bid vs. current payments for timber.

**Operating Costs**

Analysis of operating costs, i.e., the costs of harvesting and transporting the timber from the stump to the market, were not considered in the ITC stumpage analysis. This was probably because detailed data on logging operations are difficult to obtain, particularly in British Columbia, due to the Forest Service's policy of secrecy. To indirectly gauge the importance of operating costs the ITC conducted log price comparisons. Clearly if log prices were similar, but stumpage differed, the explanation had to lie in differing costs.

**Log Price Comparisons**

The ITC conducted log price comparisons between sales reported on the Vancouver Log Market (as compiled by COFI) and
domestic log sales from the Pacific North-West (as reported by the Industrial Forestry Association {IFA}). After adjustment for species differences, the ITC found that the average Vancouver log prices were 15 to 25 percent below those reported by the IFA over the 1977-81 period.\textsuperscript{22}

The ITC concluded, on the basis of their stumpage and log price comparison results, that a substantial portion of the large stumpage differential that they found could be explained by the costs of harvesting and transporting the timber from the stump to the market and that Canadian claims of higher logging costs appeared justified.

Although log market comparisons circumvent the difficult problem of comparing bids with appraisals, all of the other problems with stumpage comparisons also apply to log price comparisons. Appropriate consolidation of the two different scaling and measurement practices are as essential to a log price comparison as to a stumpage comparison. This was not done by the ITC and therefore, their log price comparison was only adjusted for species. This leaves open the possibility that the log price differential may be completely accounted for by the higher timber quality of the Pacific North-West region. Hence, the large stumpage differential that was uncovered by the ITC could be completely explained by lower timber quality of the B.C. resource and its higher harvesting and to-market hauling costs. Thus, until all adjustments in a timber a log price comparison are made, it is not clear that differences in timber values between
regions are due to errors in the timber pricing system of one region or the other or are due to explainable factors such as resource quality or operating costs.

Finally, there is a fundamental weakness in the log market comparisons conducted by the ITC, which involves the validity of prices from both markets. For many years, it has been argued that the Vancouver log market is neither competitive nor representative of the total Coastal cut. The price data are submitted to the industry association (COFI) on a voluntary basis and are supposed to represent "arms-length" transactions. These data, however, usually represent only 15 percent of the total Coastal cut, with the remainder being accounted for by intracompany transfers among firms. In 1981, Cedars including Cypress were the primary species sold on the Vancouver Log Market, accounting for 47 percent of sales. Other major sales were hemlock, which accounted for 26 percent of sales, and Douglas-fir, which accounted for 12 percent of sales. In contrast, these three species accounted for 37 percent, 41 percent, and 9 percent respectively of the total Coastal harvest. It appears then that doubts concerning the validity of the Vancouver Log Market prices are justified. Furthermore, it is difficult to say to what extent firms collude to suppress log prices, given the high degree of market concentration among holders of timber rights in the Coastal B.C. region.

Similar problems exist with the Pacific North-West market. Data are submitted to the industry association (IFA), also on a
voluntary basis, and these data only represent 5 percent of the saw timber harvest in Western Washington and Oregon. Thus, although IFA statistics are believed to be the best available for market log prices in the Pacific North-West, there is some doubt as to how accurately they represent log values.

**Summary and Conclusions**

The examination of the studies which have attempted direct comparison of stumpages between the Pacific North-West and British Columbia have not shown clearly that British Columbia's public timber charges are inadequate. There have been difficulties in netting out the component of the bid price which reflects the current value of the timber, but this is clearly necessary if comparisons are on an annual basis. Log price comparisons can avoid this problem and, when used together with stumpage comparisons, can give a rough idea of the importance of differences in logging costs. However, the lack of adjustment for grade omits an important explanatory factor in stumpage value, and there is doubt as to how reliable log market data are as a basis for generalization.

**Impact of the ITC Report**

The ITC was not concerned with settling the various issues at the countervailing duty hearings. They sought to establish whether there was in fact "substantial injury" to the U.S. producers from increased imports. On the basis of their
evidence, which indicated that Canadian raw material costs were lower than comparable U.S. costs, further hearings were scheduled.

The allegations of the U.S. producers concerning Canadian stumpage appraisals were not subsequently upheld by the ITA, who ruled that in order for a countervailing duty to be imposed, there would have to be proof that Canadian stumpage appraisals alter general economic conditions for the benefit of specific producers or a specific sector of the economy, and this clearly does not happen. The ITA also stated that the issue of cross-border comparisons was too complex to make meaningful comparisons. However, they felt that where attempts were made to quantify and account for as many factors as possible, the results indicated that Canadian stumpage appraisals did not appear to be underpricing timber.

We now turn to critical examination of these results with the shortcomings of previous studies in mind.

JOINT REPORT

The Canadian Softwood Lumber Committee commissioned a study which was presented at the countervailing duty hearings that were conducted by the ITA. The study was prepared by a team of both United States and Canadian consultants; consequently, the study came to be known as the Joint Report. The aim of the study was to show that when all factors which influence a stumpage
comparison are accounted for and appropriate adjustments made, Canadian lumber producers did not have a raw material advantage over United States producers. The phase of the Joint Report that concerned inter-regional stumpage comparisons was presented in two parts. The first was presented in February 1983 and was based on the 1980 harvest, a year when end product markets were for the most part buoyant. The second was presented in April 1983 and based on the 1982 harvest, when end product markets were depressed. The reason for both presentations was to give a balanced view of the comparisons in both good and bad market years, as the ITC had done. The study was very broad in scope and provided cross-border comparisons for all major regions of the U.S. and Canada. In evaluating the evidence, we are concerned with their comparison of the Mount Baker-Snoqualmie National Forest vs. Vancouver Forest Region. This comparison represented the largest share of the total resources devoted to the study, since Haley's paper made a similar comparison and most of the petitioners seeking a countervailing tariff were from the Coastal Pacific North-West region.

The basis of the comparison was delivered log cost. After various adjustments to correct for inter-regional appraisal differences, appraised logging costs for each region were added to actual cash stumpage payments for each region to obtain a total cost of delivered logs. In effect, this approach is similar to a log price comparison. However, given the absence of reliable log price data, the Joint Report's approach would appear
to be an alternative means of explicitly accounting for the costs of harvesting and hauling of the timber in the stumpage comparison.

The results of the 1980 comparison are presented in summarized form in Table III, and the 1982 comparison results are presented in the same manner in Table IV. In short, they show that when cash stumpage payments are put on a comparable basis for each region, British Columbia's stumpage payments are approximately 75 percent of the Pacific North-West payments in a good year, and in the bad market year of 1982 the comparable figure was 30 percent. Both results are considerably higher than the figures the ITC reported. Moreover, this appear to be almost completely explained by higher logging costs in the Canadian region. This result was also indicated by ITC log price comparisons. We now examine the categories of Table III and IV more closely.

**Cash Stumpage Payments**

The authors of the Joint Report, like the ITC, only considered payments made for timber cut in 1980. For the Mount Baker region, the 1980 harvest was the result of 95 contracts awarded between 1973 and 1980. The majority (67) were awarded over the 1978-80 period. The actual payments for the 1980 harvest, then, reflected bids on these contracts. The payments on the actual raw timber harvest were found to average $108/mbf. The authors of the Joint Report made an additional
### TABLE III

SUMMARY OF CROSS-BORDER COMPARISON BETWEEN
THE MT. BAKER-SNOQUALMIE NATIONAL FOREST AND
THE VANCOUVER FOREST REGION - 1980

<table>
<thead>
<tr>
<th>COST ITEMS</th>
<th>MT. BAKER</th>
<th>VANCOUVER REGION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$(U.S.)</td>
<td>$(Cdn.)</td>
</tr>
<tr>
<td></td>
<td>/mbf LS</td>
<td>/m³</td>
</tr>
<tr>
<td>Annual Rentals</td>
<td>$ 0.35</td>
<td>$ 1.84</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Stumpage Payments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- in cash</td>
<td>$ 88.26</td>
<td>$13.73</td>
</tr>
<tr>
<td>- in permanent road</td>
<td></td>
<td></td>
</tr>
<tr>
<td>building</td>
<td>17.77</td>
<td>3.90</td>
</tr>
<tr>
<td>- in species and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>quality differences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Stumpage Cost</td>
<td>$106.03</td>
<td>$18.29</td>
</tr>
<tr>
<td>Operating Cost</td>
<td>125.02</td>
<td>30.08</td>
</tr>
<tr>
<td>Delivered Log Cost</td>
<td>$231.05</td>
<td>$254.58</td>
</tr>
<tr>
<td>Log Scale</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delivered Log Cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lumber Tally</td>
<td>$177.73</td>
<td>$195.83</td>
</tr>
</tbody>
</table>

Source: Joint Report, Volume II, p. 20
<table>
<thead>
<tr>
<th>COST ITEMS</th>
<th>MT. BAKER</th>
<th>VANCOUVER REGION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$(U.S.)</td>
<td>$(Cdn.)</td>
</tr>
<tr>
<td>/mbf LS</td>
<td>/m³</td>
<td>/mbf LS</td>
</tr>
<tr>
<td>Annual Rentals</td>
<td>$ 0.35</td>
<td>$ 1.84</td>
</tr>
<tr>
<td>Current Stumpage Payments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- in cash</td>
<td>$ 50.92</td>
<td>$ 3.52</td>
</tr>
<tr>
<td>- in permanent road building</td>
<td>20.85</td>
<td>4.52</td>
</tr>
<tr>
<td>- in species and quality differences</td>
<td>0.29</td>
<td>1.53</td>
</tr>
<tr>
<td>Total Stumpage Cost</td>
<td>$ 71.83</td>
<td>$ 8.68</td>
</tr>
<tr>
<td>Operating Cost</td>
<td>135.84</td>
<td>41.46</td>
</tr>
<tr>
<td>Delivered Log Cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log Scale</td>
<td>$207.67</td>
<td>$263.90</td>
</tr>
<tr>
<td>Delivered Log Cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lumber Tally</td>
<td>$159.75</td>
<td>$203.00</td>
</tr>
</tbody>
</table>

Source: Supplementary Joint Report, p. 6
adjustment that was not made by the ITC. In the discussion in the ITC report, it was mentioned that material below minimum utilization standards was sold on a per acre basis, but usually was not scaled or recorded by the Forest Service and thus the data on payments for the cut timber would not reflect it. The authors of the Joint Report identified this material and arrived at the $88.26/mbf figure shown in Table III. This result confirms the earlier discussion of ITC results: an operator can have his unit cost reduced significantly by the lump sum manner of payment for such material.

The figures shown in Table III for Mount Baker cash stumpage payments ($88.26) and British Columbia cash payments ($61.78) are still not directly comparable, however. Although the stumpage appraisal systems in both B.C. and the Pacific North-West are based on the same general approach, they are not identical. There is a difference between regions concerning physical standards by which timber is recovered. In British Columbia rigid uniform utilization standards exist which in effect require that all low grade wood above a minimum size and minimum solid wood content be removed, even if it yields a negative return; otherwise, penalties are imposed for waste. Such wood is subject to the same rate of stumpage as all other logs of the same species in the stand, and this rate cannot be less than the Statutory Minimum stumpage rate. The Pacific North-West, as does British Columbia, has utilization standards which encourage the removal of low grade wood. As described, this results in this
wood being appraised separately and sold on a lump sum basis. This encourages the operator to recover every piece of wood that is worth as much as, or more than, the incremental cost of recovering it. Furthermore, the operator has the option of disregarding this material without penalty if he feels he cannot profit from its removal. No such option is available to the British Columbia operator. The net effect of this difference is not entirely clear. In British Columbia's utilization system, the effects of this incremental wood tends to be disguised by the averaging of costs and revenues in the stumpage appraisal. However, it is likely that Crown stumpage revenue would be higher if a physical utilization standard similar to that used in the United States existed in British Columbia. The costs of removing such submarginal material are very high and the revenues received very low, if not zero. Therefore, the average costs of timber harvesting are increased and its average value decreased. In addition to this, the British Columbia utilization system probably interferes with the incentive of operators to remove timber to the true economic margin. 28

A second difference between the two regions lies in the appraisal system. The U.S. uses stand-as-a-whole appraisals whereas British Columbia appraises timber by species and each species is subject to a minimum applicable charge. 29 When all species in a stand are appraised above minimum rates, there is no difference in the two methods. However, under certain market conditions the appraisal will indicate negative stumpages, i.e.,
the total allowance for profit and risk and conversion costs exceed the total selling price. If a stand of timber contains some species which are appraised above minimum and some below, then the two appraisal systems will yield different results. The stand-as-a-whole method involves balancing negative stumpages against positive stumpages. This results in lower overall stumpages in mixed stands. Minimum stumpage rates apply, but only against the average value of the stand. In British Columbia, on the other hand, species that are appraised below minimum rates are charged minimum rates and all other species are charged the full rate. The net effect of this difference is that substantially lower stumpage payments would result in B.C. if the stand-as-a-whole appraisal system were used.

The effect of this difference was probably minimal during the 1980 harvest, as markets were buoyant. However, much of the 1982 harvest had appraisals which indicated negative stumpages, and hence minimum rates prevailed. Thus, it is likely that the figure for cash stumpage payments for B.C. in Table IV overstates the value of the harvest.

Finally it was likely that the harvest from the Mount Baker Region was not representative of a normal year in 1982. U.S. operators do not face minimum cut requirements and many operators did not cut in 1982. Those that did not have time remaining on their contracts were awarded extensions. Hence, the timber cut in 1982 in the Pacific North-West was probably the lowest price stumpage available. The total Mount Baker 1982 harvest was, in
fact, 35 percent lower than the 1980 total. For the Vancouver region, the comparable figure was 20 percent and as mentioned, minimum stumpage rates prevailed. Thus, relative to a normal year, stumpage payments in the Vancouver region were unusually high in relation to U.S. Payments.

**Annual Rentals**

Annual rentals were also added to British Columbia stumpage payments. These represent charges in addition to stumpage that are paid as a result of tenure agreement. Because U.S. producers do not bear such charges, it was felt in the interest of fairness, that all charges against the timber resource of the regions should be taken into account. The inclusion of annual rentals is debatable, however. There is no offset of these charges against stumpage, as they are not viewed by the Crown as part of the resource rent. Rather, they are viewed as a charge against the security provided by the tenure form, i.e., in return for secure timber supply, the Crown is extracting a price. The more secure the tenure agreement, the higher the annual rental, and hence the highest rental is paid by holders of TFL's. Therefore, since U.S. public timber holders do not have such guarantees of a secure timber supply, the tenure charges should be excluded in order that payments for timber are put on a comparable basis.
Road Costs

As mentioned before, United States operators have the option of building their own logging roads or having the Forest Service do this for them and then having the road costs added to their stumpage payments. To put road costs on a comparable basis, the following adjustments were made. All road building costs were deducted from Vancouver Region's operating cost for 1980. For the Mount Baker region, the procedure was somewhat more complicated. U.S.F.S. appraisals are made at the time of sale, not at the time of harvest. Therefore, U.S.F.S. road building appraisals were for a series of contracts dating back to 1973. To put the U.S. figure on a comparable basis with B.C. road building costs, the appraised road building costs were updated to 1980 dollars using the Producer Price Index. Each appraisal (in unit costs) was then weighted by the total harvest from each contract, and all appraisal values were summed and then divided by the total harvest to give an average figure for the total harvest. This yielded an average comparable measure to the Vancouver Region figure. For the Mount Baker Region 1980 harvest, the average road costs were $22.29/mbf. Of this, $4.52/mbf represented roads built by the U.S.F.S. and was recovered by the Forest Service in the stumpage payments. The remaining $17.77/mbf is the figure shown in Table III, and this represents roads built by the operator.

Tables III and IV show average road costs incurred by the operators of both regions. However, it seems that the data would
have been on a more comparable basis if total road cost were shown for both regions. Thus, the $4.52/mbf of road credits should have been deducted from the $88.26/mbf of each stumpage payment to yield $83.74 for that figure and added in with the operator's road costs of $17.77 to yield overall average road costs of $22.29/mbf for the Mount Baker Region.

For the same reasons, the Table IV results are also misleading. The $20.85/mbf for the Mount Baker region road costs are the costs incurred by the operator. An additional $8.85/mbf of road building was carried out by the U.S.F.S. and recovered in stumpage payments. Thus, total road building costs for the Mount Baker region were $29.70/mbf\(^{33}\) for the 1982 harvest (which was considerably higher than the Vancouver Region figure of $19.27), and the comparable stumpage figure net of road credits to the Vancouver Region was $42.13/mbf, not the $50.98/mbf that is shown in Table IV.

**Species and Quality Differences**

The discussion on species and quality adjustment concerning the ITC report revealed that adjustments for timber quality are difficult because of differences in scaling and log grading standards between regions and what was needed was a dual scaling analysis of a representative sample of logs. The authors of the Joint Report noted how tedious a task this was.
A dual scaling study involving over 13,000 individual logs was commissioned. Each log was scaled and graded separately by Scalers from both Puget Sound Log Scaling and Grading Bureau and from the British Columbia Ministry of Forests in their respective log scale and grade. A comparative analysis developed the relationship between the respective log grades and calculated the appropriate conversion factors between the two scaling systems, quantifying the price differences attributable to differences in species and log grade. The actual 1980 harvest by species and log grade from the two areas compared was priced at the average sales prices by species log grade realized in the Vancouver Log Market in 1980.34

Their adjustment for species and grade was actually more complicated than what was noted above, and the results are summarized in Table V. To begin with, each species in the Mount Baker harvest was scaled using a board foot measure and Scribner log grading specifications. This scaling practice is completely different from the British Columbia Firmwood system based on volume measure. Briefly, each species of the Mount Baker harvest first had to be converted from U.S. log grades in board feet to U.S. log grades in cubic meters and then converted to B.C. log grades in cubic meters. The appropriate conversion factors and the relationship between the grades were developed by the above mentioned computer analysis. Next, the twice-converted Mount Baker harvest was valued at Vancouver log market prices. This was done by multiplying the volume of each grade by its price, summing over all grades, and then dividing this total value of the harvest by its volume to obtain its average value. The value of the Vancouver Region harvest for the same species, already in
B.C. log grades and cubic meters, of course, was determined in the same manner. The exercise was performed for all of the species shown in Table V. The figures shown under Ave. Price/m³ represent the exercise just described. They are the average values of the harvests from both regions expressed in terms of B.C. log grades and valued at Vancouver Log Market prices.

The next step in the analysis was to multiply the volume of each species in the total harvest of each region by its average value, sum over all species, and then divide by the total harvest. The results in Table V show that the average selling price of the timber harvested from the Vancouver forest region based on Vancouver Log Market prices was $49.70/m³. The average selling price of the Mount Baker harvest, when converted to B.C. log grades in cubic meters and based on the same log prices, would be $50.06/m³. The difference between these two figures is .36/m³ and is shown as the Weighted Average Log Price Differential. This figure shows, in effect, that if the Vancouver Region had the same distribution as the Mount Baker region in terms of species and quality, then on average the timber would sell for 36 cents more per cubic meter. To determine the stumpage payable on this increased value, the weighted average log price differential is divided by the average profit and risk allowance for the Vancouver Forest Region to obtain a figure of .31/m³. This is also shown in Table III, in terms of U.S. currency and board feet, as $1.39/mbf.
TABLE V

LOG PRICE DIFFERENTIAL ATTRIBUTABLE TO DIFFERENCES IN LOG QUALITY AND SPECIES MIX

<table>
<thead>
<tr>
<th></th>
<th>VANCOUVER FOREST REGION</th>
<th>MT. BAKER FOREST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m³</td>
<td>%</td>
</tr>
<tr>
<td>Hemlock</td>
<td>4,954,350</td>
<td>40.09</td>
</tr>
<tr>
<td>Balsam</td>
<td>2,816,888</td>
<td>22.79</td>
</tr>
<tr>
<td>Cedar</td>
<td>2,822,067</td>
<td>22.83</td>
</tr>
<tr>
<td>Douglas-fir</td>
<td>1,337,338</td>
<td>10.82</td>
</tr>
<tr>
<td>Cypress</td>
<td>428,722</td>
<td>3.47</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>12,359,365</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Weighted Average Log Price Differential = $ 50.06

\[
\frac{49.70}{0.36/m^3}
\]

Stumpage Payable on Increased Log Price = \[
\frac{0.36}{1.18} = 0.31/m^3
\]

Direct verification of this result by duplicating such an experiment would be very time consuming and costly. Therefore, indirect means were sought. First, an attempt was made to analyze end product lumber grades from both regions. The hypothesis was that if the proportion of lumber grades from a given volume of timber of the same species were the same for both regions, then the assertion of higher timber quality from either region could be disputed. The advantage of this approach is that lumber grades are identical in both regions. However, no data are presently recorded by lumber grades, only by species and region.

Next, an attempt was made to see how sensitive the Joint Report's results were to alternative, but equally probable assumptions of timber quality. Although in general the species mix is more valuable in the Pacific North-West, this is not necessarily true for when comparing areas in close proximity between British Columbia and the Pacific North-West. The ITC found that the Coastal British Columbia harvest was virtually identical to the Coastal Washington harvest with respect to species mix. Furthermore, when comparing COFI log prices with IFA log prices, the ITC found that an 8 to 14 percent downward adjustment on COFI prices was necessary to put them on a comparable basis. This was primarily due to the higher valued Spruce and Cypress that were sold in higher proportion in the Vancouver Log Market.
For the Mount Baker and Vancouver regions, then, adjustment for species can be made by multiplying the percent of each species harvested in the Mount Baker region by the average price prevailing in the Vancouver Log Market. This exercise is summarized in Table VI. It shows that a 3.7 percent downward adjustment on Vancouver stumpages would be necessary to put them on a comparable basis with Mount Baker. Thus, if timber quality was identical in both regions, then Vancouver timber is more valuable, not less, as is usually assumed, than the adjacent U.S. timber.

Previous studies, using arbitrary assumptions concerning the relationship between the log grades of the two regions have indicated that British Columbia has indisputably lower quality wood. An adjustment for quality using previous assumptions concerning log grade correlations was made. This result will be compared with the result obtained in the Joint Report.

In this comparison the Joint Report's Balsam species data for 1980 are considered. The top Vancouver Region grades, D and C, correspond roughly to #1 and #2 peeler and #2 sawlog grades in the Scribner system. Vancouver grade H corresponds to #3 peeler, #2 sawlog, and special peeler. This is an intermediate category. Finally, low grade B.C. logs are grades I, S, X, Y, and they correspond to #3 sawlog and poorer in the U.S. system. These categories are shown in Table VII. To adjust for quality, we assume that the Vancouver region has the same percentage distribution of high, intermediate, and low grade logs as the
Mount Baker Region. If this were so, then the average value of
the harvest would increase to $58.06/m³ from $47.21/m³, a change
of 23 percent. By contrast, in the Joint Report, where the
relationship between the grades was worked out by a dual scale
analysis, the average value increased by only 2.5 percent.36
Haley, who used a similar system of correspondence between U.S.
and B.C. log grades for the Douglas-fir species, found that the
B.C. species increased in value by 38 percent when adjustments
were made for quality.

In sum, it appears that when such adjustments are based on
loose assumptions concerning the relationship between the two log
grading systems, adjustments for timber quality appear to be
overstated in comparison to the results produced by a dual scale
analysis.

In short, the Joint Report data shows that while the
Vancouver Forest Region has a slightly more valuable species mix,
the Mount Baker Region compensates by having higher quality
timber, with the net effect resulting in the Mount Baker resource
being slightly more valuable.

Although verification through duplication of effort was not
possible, the result does not seem out of line with common sense,
given that the two regions are essentially adjacent border areas,
with almost the same species mix.
TABLE VI

SPECIES ADJUSTMENT FOR TIMBER HARVESTED FROM MOUNT BAKER-SNOQUALMIE NATIONAL FOREST AND VANCOUVER FOREST REGION

<table>
<thead>
<tr>
<th>Mount Baker Harvest</th>
<th>Average Price of Vancouver Region Harvest</th>
<th>Adjusted Average Price of Mount Baker Region Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species</td>
<td>Ratio to Total Volume</td>
<td>Ratio to Total Volume</td>
</tr>
<tr>
<td>Hemlock</td>
<td>.5218</td>
<td>.4009</td>
</tr>
<tr>
<td>Balsam</td>
<td>.1974</td>
<td>.2279</td>
</tr>
<tr>
<td>Cedar</td>
<td>.1643</td>
<td>.2283</td>
</tr>
<tr>
<td>D.-Fir</td>
<td>.1102</td>
<td>.1082</td>
</tr>
<tr>
<td>Cypress</td>
<td>.0063</td>
<td>.0347</td>
</tr>
</tbody>
</table>

| Total | 1.0 | 1.0 | 49.66 | 1.0 | 47.88 |

Adjustment for Species: \[
\frac{47.88 - 49.66}{47.88} = -3.76 \text{ percent adjustment}
\]
TABLE VII

COMPARISON OF BALSAM TIMBER QUALITY BETWEEN THE MOUNT BAKER-SNOQUALMIE NATIONAL FOREST REGION AND VANCOUVER FOREST REGION

<table>
<thead>
<tr>
<th>Region</th>
<th>Top Grades</th>
<th>Intermediate Grades</th>
<th>Low Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vancouver Forest Region</td>
<td>12.38</td>
<td>17.23</td>
<td>70.39</td>
</tr>
<tr>
<td>Mount Baker-Snoqualmie Region</td>
<td>37.63</td>
<td>47.78</td>
<td>15.09</td>
</tr>
</tbody>
</table>
Operating Costs

The operating costs shown in Tables III and IV are appraised logging costs from both regions, net of road construction. Like road cost, the Mount Baker logging cost appraisals are made at the time of sale, and thus all costs were updated in the same manner, as road costs, to 1980 dollars in Table III, and 1982 dollars for Table IV. The results indicate in both cases that logging costs were higher in the Vancouver region. However, the 1980 difference of 8 percent was extremely slight when one considers that logging costs can be extremely variable within a given region because of variations of topographical and climatic conditions. Logging costs appraisals within the Mount Baker region itself ranged from $103.89/mbf to $155.23/mbf in constant dollars between 1973 and 1982.37

However, average 1982 appraisals for the Vancouver Forest Regions of $176/mbf (shown in Table IV) were outside this range and 30 percent higher than Mount Baker costs.

Generally, it is believed that British Columbia has higher road building and logging costs than the Pacific North-West. However, the Joint Report data show that appraised road building costs are higher in the Mount Baker Region. The reason for higher logging costs is difficult to pinpoint, again, because of the lack of detailed data. Past studies (operating of course, within this constraint) have revealed that generally B.C. has slightly higher wage rates, but slightly lower fringe benefits, and virtually identical logging productivity estimates for
labour. There has been a general move toward parity in both areas over the past 10 years.

In both regions, environmental regulation such as stream bank protection and slash disposal increase logging costs. These costs have always been thought to be significantly greater in the U.S. than in B.C. However, the differential has probably diminished as more constraints have been placed on B.C. operators in recent years. In fact, the B.C. government came to view them as sufficiently high to erode the operators' margin for profit and risk when minimum stumpage rates apply. As a result, these costs today are charged against the stumpage payable rather than selling price in order to prevent this possibility.

In general, harvesting modes and equipment are the same for both regions as are stump to roadside transportation methods. The Mount Baker region has some level ground which enables skidders to be used from stump to roadside. From roadside to mill, the Vancouver Region uses predominantly water transportation whereas the Mount Baker Region uses truck. Over-all, these costs, particularly for yarding and loading, vary considerably with terrain, and here the Vancouver Forest Region has a distinct disadvantage. Although conditions may be similar in adjacent border areas, it should be remembered that the Vancouver Forest Region is 400 miles from North to South and stretches to the Alaska Panhandle. The entire area encompasses approximately 31 million acres. The Mount Baker Region, by contrast, is only 60 miles in length and contains approximately
943 thousand acres. Thus, on average, given the remoteness of
the northern region of the Vancouver Forest Region, one would
expect higher costs in the B.C. region for a number of reasons.
The terrain is considerably more difficult; as a result, bucking
and falling is manual, and yarding often requires an expensive
high leads system with towers and skylines. Camp costs are
incurred because of the remoteness, and these are estimated to be
the highest in North America. By contrast, in the Mount Baker
Region, a high proportion of operations are located in non-remote
areas, and hence camp costs are not generally incurred.

Finally, it also seems that the water transportation that
predominates in the Vancouver Region is more expensive than the
truck transportation that predominates in the Mount Baker Region.
There is a problem associated with sinking logs that requires the
use of high cost dry land sorting works for the intensive sorting
necessary for coastal wood. Comparisons of Coastal water
transportation costs with truck transportation in the Interior
indicates water transportation is $15/cunit (100 cubic feet)
higher. 40

Because of these factors, it appears that if identical
operations existed in each region, the Vancouver Region operation
would incur higher costs.

Conversion Systems

The final two lines of Tables III and IV give the total
delivered log costs of both regions using two different
conversion scales. These two scales are shown as Log Scale and Lumber Tally in the tables. The Log Scale conversion system was developed by the aforementioned dual scale analysis. The factors used to convert Scribner boardfeet to Firmwood cubic meters was determined by the dual scale analysis.

The lumber tally conversion is somewhat different. In addition to what is considered in Log-to-Log conversions, lumber recoveries at the mill are also considered. Because of scale overruns, where the amount of lumber recovered is greater than the quantity of timber purchased, the unit costs for the lumber tally system are less than under the Log-to-Log system. However, because it considers mill efficiencies within the manufacturing process, it is less useful for stumpage comparisons. For example, if two mills sawed two logs of identical dimensions, one mill might produce twice as much lumber, but it may be of lower quality. Hence variables other than absolute wood costs are considered in the conversion.

Evaluation of the Joint Report

The analyses indicated little that would change the numerical outcome of the Joint Report. The only change was the exclusion of annual rentals from the Vancouver Region cash stumpage payments. The effects of differences in appraisal systems and cut control regulations were also considered. It was felt that these differences implied overvalued Vancouver Region timber in bad market years relative to the Pacific North-West.
Finally, since cash stumpage payments from the Mount Baker region included payments for road building, it was necessary to deduct these payment in order to put cash stumpage payments from both regions on a comparable basis.

With all of these factors considered, actual cash stumpage payments from the Vancouver Region were unambiguously lower than those of the Mount Baker Region. Factors such as road costs, species and quality differences could not explain the stumpage differential. For instance, in 1980, the stumpage differential of 28 percent narrows to 23 percent after these factors are considered. After consideration of operating costs, the cost differential between regions narrows to 6 percent.

The absolute difference between regions is of more significance however. Consider that if operating costs were identical between regions in 1980 the cost differential would narrow from 25 percent for stumpage to 10 percent. However, there would be no explanation for the stumpage difference of $26.48/mbf. Thus, given that operating costs were only $10.16/mbf higher in the Vancouver Region in 1980, only 38 percent of the stumpage differential is explained by this factor. A $14/mbf differential remains to be accounted for at the delivered log cost stage, i.e. 53 percent of the original stumpage differential.

It must be recognized that the Joint Report's conclusions rest exclusively upon the differences in logging cost between regions. A fundamental weakness of the Joint Report is that the
data on logging costs come from the government appraisals of both regions and are not market determined. Clearly, appraisal data based on arbitrary formulae can have substantial errors. There are several reasons why these data would not be representative of actual costs incurred in both regions. For example, in the Mount Baker Region, much logging is carried out by contractors whose techniques may differ substantially from those considered in the appraisal. Little recorded data exist on the costs of these contractors. In addition, the appraisals in the Mount Baker region are made at the time of sale, which in some cases can precede the harvest by 8 years. This clearly assumes that over that period the harvester does not change his input mix. This is highly unlikely if the relative prices of the inputs change.

Additional doubts are raised when considering that the Joint Report analysis indicates that appraised operating cost in the Vancouver Region rose by 35 percent between 1980 and 1982, whereas in the Mount Baker Region, the comparable figure was 8 percent. No explanation was given for this fact despite its obvious importance for the results. It was also generally known in the industry that the Forest Service gave operators much leeway concerning their annual cuts because of prevailing market conditions. Generally, only the most accessible timber was removed. The implication is that such flexibility would tend to lower, not raise operating costs. Given that the stumpage differential in 1982 was approximately 70 percent, it is likely that a substantial subsidy for B.C. operators was in effect
Finally, there appear to be inconsistencies in the figures used in the Joint Report analysis. For instance, if the average operating cost and average stumpage payments are deducted from average log prices the resulting figure should be the average profit and risk allowance. This figure is typically 18 percent of operating cost and stumpage. This calculation can be performed for the Vancouver Region for 1980 by utilizing figures from Tables III and V. When average operating costs of $33.98/m$^3$ and average stumpage payments of $13.73/m$^3$ are deducted from the average log price of $49.70 the resulting figure is $1.99 which yields a profit and risk allowance of approximately 4 percent. In order to obtain the correct profit and risk allowance of 18 percent, the same calculation would have to yield $8.59/m^3$, which would imply that $27.38/m^3$ would be the appropriate figure for average operating cost. This figure is $6.6/m^3$ lower than the figure used in the Joint Report, and after conversion, would mean that delivered log cost would be approximately $135/mbf lower than the figure in Table III.

One possible explanation for the inconsistency revealed by the above calculation is that the different weights used in constructing the averages may have distorted the result. The average log price was constructed using the proportion of the total harvest accounted for by each species as weights. For average operating cost, data are submitted on a cutting permit by cutting permit basis and hence, the proportion of the total.
harvest accounted for by each timber block is the weight used. However, given the magnitude of the inconsistency, this explanation is not very promising.

Thus, the Joint Report cannot conclude on the basis of its evidence that delivered log costs were equal between these two regions in 1980 and 1982. Furthermore, given the imperfections in the B.C. timber market, there is no reason to believe they should be. Given the above analysis, nothing at all is known about actual delivered log costs. Hence, given the changes that our analysis makes for road credits and annual rentals, all that is known for certain from Table III and IV is that stumpage payments in the Mount Baker Region were 28 percent higher in 1980 and 67 percent higher in 1982 and that species and quality differences cannot explain the stumpage differential. There is no evidence to suggest that competitive bidding in B.C. would not eliminate this difference. In fact, the opposite is implied. The Joint Report analysis reveals, in effect, that in a comparison of stumpage payments between the two regions with virtually identical resource characteristics, the region in which timber was valued by competitive bidding rather than public charges produced significantly higher stumpages.

Summary and Conclusions

The survey of inter-regional stumpage comparisons has revealed that British Columbia stumpages are lower than those of the Pacific North-West. The Price Waterhouse study examined the
factors which influence stumpage values on a separate basis for both regions. The conclusion of this study was that the Pacific North-West had advantages in every case and thus stumpage values should be higher. Haley concluded that such factors only offered a partial explanation and that the chief reason for higher Pacific North-West stumpages was the presence of competitive markets. The ITC and Joint Report tried to resolve this problem by annual dollar comparisons in which the factors influencing stumpage values were accounted for in a quantitative manner. These studies indicated that the inherent resource characteristics were very similar between adjacent border areas and thus are a minor explanatory factor. The apparent explanation from both studies was that British Columbia has higher costs of harvesting and hauling the timber to market. However, this conclusion in both cases was based upon data which may have been a poor indication of actual costs. Therefore, the explanation for lower B.C. stumpage remains elusive.

Certain factors could not be worked into the comparisons in a quantitative manner. However, these factors influence bids in the Pacific North-West and hence timber values. Such factors are relevant to the outcome of an inter-regional comparison. The next section briefly examines such factors.
NOTES

SECTION III


7 This comparison was between the stumpages indicated by the Rothery appraisal systems of both regions. The rate actually paid in the Vancouver Quadra region was $2.72/m³ which was the statutory minimum rate. In the Mount Baker region, road costs would be added to the $18.96/m³ figure to yield the advertised rate and this would be the minimum at which the timber would be sold.


9 The figures here were those which appeared in Smith's article. However, the actual figures used in Haley's analysis for profit and risk in the Mount Baker Region
was $12.94/m³. This would mean that the difference between the bid and the advertised rate would exceed the expected profit and risk by $18.85/m³.

10 Price Waterhouse, p. 61.

11 Joint Report, Vol. II, p. 27


14 Price Waterhouse, Appendix B, p. 29.

15 ITC Report, p. 50.


18 ITC Report, p. 52.

19 Ibid, p. 108.

20 Ibid.

21 ITC Hearings, Statements of Mr. Pinette.

22 ITC Report, pp. 53-55.

23 Ibid, p. 49.

24 Ibid., p. 50

25 Ibid, p. 45


27 Ibid, Appendix 3.4.

29 Ministry of Forests, White Paper, p. 27.


32 Ibid, Appendices, 3.2, 3.2(a).

33 Supplementary Joint Report, Appendices, 3.2, 3.2(a).


In the analysis of the previous section, differences in timber utilization and stumpage appraisal systems were seen to cloud the outcome of a dollar comparison between regions. There are other factors such as political and social goals, as well as fundamental structural differences in the industries of both regions, that influence timber values. Because these factors are difficult to work quantitatively into cross-border stumpage comparisons, they too limit the usefulness of such comparisons. In this section, these factors are examined.

The Price Waterhouse study indicated that U.S. Pacific North-West producers faced transportation and marketing advantages which tended to yield higher sales realizations and hence higher stumpage values than in British Columbia. These claims were disputed by Haley, who felt that advantages in these areas could also be found for British Columbia producers and that the net effect was not clear. For instance, British Columbia producers enjoy a cost advantage when using waterborne transport to the United States as they are not bound by the Jones Act to use higher cost merchant ships of United States Registry as are U.S. producers.

The ITC reached conclusions similar to Haley's. They examined all aspects of costs facing U.S. and Canadian producers, including transportation and marketing. Except for raw material costs, they did not find that the net effect of cost differences...
in these other factors yielded an advantage to either region. ¹
The uncertainty of the exact impact of these factors on stumpage comparisons, however undermines the value of inter-regional stumpage comparisons.

There appear to be factors mainly associated with government policy and regulation that have a predictable impact on timber values and which imply that, other things being equal, stumpage values in the Pacific North-West would be higher than in B.C. We now examine these factors.

TAXATION

Tax laws in the United States may result in bids which exceed the timber's true value. In the United States, income earned in the timber harvesting sector is treated as capital gains and is taxed at an effective rate of 28 percent. This is considerably lower than income earned in the manufacturing sector, which is taxed at the same rate as normal corporate income, 53 percent. The portion of a United States timber company's profits taxed at the capital gains rate is determined by the difference between the book value of private timber and the rate paid for public timber in the near vicinity. Therefore, it is argued that integrated firms with private timber holdings have a vested interest in bidding public timber above its true value in order to increase the proportion of their total income which is treated as a capital gain.
It has been estimated that British Columbia forest product companies face an average nominal tax rate of 44 percent compared to 35 percent for their United States counterparts operating in the Pacific North-West. The Joint Report has estimated that such tax provisions could effectively reduce the cost of delivered logs for the Mount Baker Region by as much as $4.40/mbf.\textsuperscript{3} Despite quantitative estimates of the taxation factor, it would be difficult to accurately account for it in a stumpage comparison. The importance of this factor is likely to be highly variable among operators according to their income position and specific financial situation. Furthermore, Haley observed that many successful bidders were firms without private timber holdings. The safest conclusion is that, other things being equal between regions, United States stumpage values from public lands may tend to be higher than the comparable Canadian stumpage.

**TIMBER SUPPLY AND DEMAND**

It has been shown in Section II that the United States supply situation is somewhat different than British Columbia's. Stumpage from public lands accounts for a much smaller proportion of the total harvest. This fact, combined with the different regulatory policies for public and private timber, results in a situation which tends to cloud the results of cross-border stumpage comparison.
In both British Columbia and the Pacific North-West, exports of public timber are very strictly regulated. In British Columbia, logs and chips may only be exported if it is demonstrated that they are surplus to domestic needs. As a result, log exports typically account for only about 1 percent of the total harvest. In the Pacific North-West, log exports from public lands have virtually been non-existent since the early 1970's. However, no such restrictions exist for private firms. Given that export markets are more lucrative than domestic, very high grade logs have found their way to these markets. The result has been that exports account typically for about 20 percent of total log production in the Pacific North-West and the volume of private timber directed to the domestic market has been declining over time.4 This has meant increased competition for supplies of non-exportable timber, and has tended to force up the value of stumpage from public lands, despite the fact that the regulations exist to discourage the substitution of public for private timber. In addition, this situation also means that export demand has a greater influence on timber from United States lands than on timber from British Columbia lands.

DIFFERENCES IN OVERALL OBJECTIVES OF THE FOREST INDUSTRY

Given the importance of the forest industry to British Columbia's economy, forest policy is designed with overall economic objectives in mind. Full collection of the resource
rent is but one of these. Another important objective is employment stability. At times there may be trade-offs between these goals. Policies such as strict log exports regulations tend to further the employment objective, but clearly result in lower timber values. A fair assessment of this trade-off, and British Columbia's timber pricing system generally, should be made in the context of evaluating overall objectives. The different consequences of a bidding system vs. an appraisal system on long term forest management objectives is outside the range of this study.

The factors examined in this section reflect fundamental differences in industry structure and government policy between regions. The implication of this analysis is that annual payments for timber between British Columbia and the Pacific North-West are not strictly comparable. For this to be so, one would have to net out of any bid the effects of speculation, exports and tax advantage and this cannot be done. A second implication is that factors such as taxation and export opportunities imply higher timber values in the Pacific North-West, ceteris paribus. Since it is difficult to account for the importance of these factors quantitatively, the feasibility of using inter-regional stumpage comparisons is further undermined.
Thus far what has been shown is that inter-regional comparisons show very little promise as a monitor of British Columbia timber charges. Obviously, a far more effective means to mitigate this problem is to introduce competitive forces into British Columbia timber markets and compare the timber value outcomes with appraisals.

Recently, an opportunity to perform such a comparison has materialized. As a result of the 1978 Forest Act, as described in Section II, a portion of Crown timber is now set aside for non-integrated operators. Allocation of this wood fibre is as near a form of perfect competition as exists and the results have been quite remarkable. Table VIII gives the results of bidding over the past three years. The overwhelming majority of timber allocated by tenure other than the small business program was sold at the upset price — i.e. the appraisal stumpage rate. In stark contrast, the stumpage paid for the competitively allocated fibre ranged from 286 percent to 368 percent of the upset rate. These results are even more surprising since many appraisals, which supposedly indicate the fair market value of timber, have indicated negative values over the period. In interviews, industry representatives have claimed that the existence of minimum stumpage rates result (in the presence of negative appraisals) in a reduced margin for profit and risk when the average over the full market cycle is considered. Furthermore,
it was felt by industry officials that the results of the small business auctions reflect bidding errors and as a result contract defaults will be likely. However, Forest Service personnel revealed that this timber is presently being logged and that companies are not experiencing financial difficulties as a result.

One possible reason for this could be that the small business operators who were winning these sales were more efficient than what was assumed in the appraisal manual. This may have resulted from the fact that much logging in the Interior was carried out by independent loggers prior to the establishment of the small business timber market and the fierce competition among these small operators to obtain these contracts may have produced such efficiency.

Explanations for the high bid/appraisal ratios other than appraisal errors are elusive. One possible explanation lies with the fact that most of these companies do not incur road building costs as timber sales are usually made where roads already exist. Since upset stumpage rates were set at statutory minimum rates it may have been possible that the Rothery appraisal for these small business timber tracts exceeded the statutory minimum. If it is assumed that the Rothery appraisal with road costs yielded the minimum rate, a large portion of bid/appraisal differential would still be unaccounted for because average appraised road costs in 1982 were approximately equal to the minimum stumpage rate. However, it is likely that actual road costs for these small
business operators would be much less than the appraisals for large tracts of quota timber. Furthermore, most 1982 Rothery appraisals which included road costs indicated negative stumpages.

At present, there is limited information on the market. An attempt was made to discover the extent of competition in this market by an approach similar to that of Mead's analysis discussed in Section II. However, no information is presently recorded concerning the number of bidders at each sale, or whether there was oral vs. sealed bidding. Less promising explanations for the bidding that occurred in the small business market may be found in possible bidding motives. The speculative motive was probably not too much of a factor as most of the contracts were very short term. They ranged in length from six months to 2 years, with possible one year extensions. Given that the market conditions in which the bids were made were very poor and expected to continue for sometime, it is unlikely that bidders were hoping that much higher future end product prices would compensate them for excessive bids.

"Incremental" bidding sometimes occurs where an operator must obtain a given timber sale to fill out a fraction of his total needs. This is alleged to occur in the U.S., where an operator has substantial holdings of private timber with which he can meet most of his needs. To balance the operation, the operator may pay excessive stumpages for the increment and average the excess over the total timber supply. Again, this
bidding motive is unlikely to be operating, since most of the participants do not have any timber supply at all and are bidding to acquire it.

If some of the bidders have processing equipment, high bids may be explained by a motive known as defensive bidding. Faced with no timber supply, an operator may be willing to bid to a very high level in order to defend his existing investment. In a series of short term contracts, and over a relatively large number of operators, this motive may occur more or less continually among different participants. It may also generate spite bidding over the longer term. However, if appraisals were essentially accurate in assessment of market value of timber, it would be irrational for the producer to incur both capital losses and the short-run operating loss as well. The appropriate response would have been for most operators simply not to bid, let alone harvest, until market conditions improved, if it became evident that such bidding motives were operating.

At the present time, it is not completely certain whether these over-bids are the result of appraisal errors or bidding motives. The market and its participants are new and it is too early for clear trends to emerge. However, eventually this market will account for a fairly sizeable fraction of the timber harvest in British Columbia. Thus, the comparison of bids from this market with appraisals from this market, as well as with quota timber, promises to be a better means of monitoring the accuracy of appraisals than inter-regional comparisons with the
Pacific North-West. All of the institutional and structural differences between regions concerning the timber resource, appraisal systems, and the industries themselves will not complicate the comparison nor cloud the outcome.
TABLE VIII

COMPARISON OF AVERAGE BID PRICE WITH AVERAGE APPRAISED PRICE FOR BRITISH COLUMBIA SMALL BUSINESS ENTERPRISE SCALES

<table>
<thead>
<tr>
<th>Year</th>
<th>1980-81</th>
<th>1981-82</th>
<th>1982-83</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stumpage received as a percent of Stumpage Appraised&lt;sup&gt;1&lt;/sup&gt;</td>
<td>286</td>
<td>368</td>
<td>305</td>
</tr>
</tbody>
</table>


<sup>1</sup> Appraised Stumpage was set as prescribed minimum rates for the period June 1, 1980 through November 1982.
NOTES

SECTION IV


FINAL SUMMARY

The purpose of this examination of inter-regional stumpage comparisons was to determine whether they are a viable means of monitoring the British Columbia appraisal system, and, on the basis of the survey, to make a judgement concerning the accuracy of British Columbia timber charges.

These comparisons indicated that while British Columbia stumpages are unambiguously lower than in the Pacific North-West, a viable explanation could not be found. In general, inter-regional comparisons are a poor means of assessing the accuracy of B.C. timber appraisals in collecting the full value of the resource rent for the Crown. Certain factors which influence bids in the Pacific North-West and which do not exist in British Columbia could not be accounted for quantitatively in comparisons. Furthermore, there appear to be no viable means of accounting for operating costs in such comparisons.

By way of contrast the bid/appraisal comparisons in the B.C. small business timber market are a far superior means of comparing timber valuation in competitive markets with valuation by public charges. These comparisons provided strong evidence that British Columbia appraisals fail to capture the full resource rent. Moreover, inter-regional institutional and political differences are not present to cloud the interpretation of results. Furthermore, the comparison of bids with appraisals for a given sale should be less complicated than a similar
Pacific North-West comparison. There is not the variety of timber ownership, nor taxation factors which distort U.S. bids. Contracts are on a short-term basis and hence speculative bidding should be less of a problem.

Thus, while the case for comparing bids with appraisals as a means of monitoring public charges for timber is still a strong one, it appears that inter-regional comparisons are a severely limited means for such a purpose.
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