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THE 1994 STUMPAGE PRICE INCREASES IN BRITISH COLUMBIA FORESTS: IMPACTS ON THE COASTAL AND INTERIOR REGIONS OF THE PROVINCE

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INTRODUCTION

In the Spring of 1994 the British Columbia (B.C.) government released its Forest Renewal Plan (FNP). The proposal includes provisions for spending $2 billion on forest renewal programs that range from intensive tree farming to promoting more investment in value added manufacture. The FNP is forest industry financed. The annual increase in stumpage and royalty revenues are respectively estimated to total $482 million and $50 million. Clearly stumpage rates, the price of standing timber, are to rise sharply under the plan. The provincial average stumpage rate is forecast to increase from $15.17 to $27.43 per cubic metre, an increase of 80.8%.

The increase in stumpage rates differs between the Coast and Interior regions. The target stumpage rate in the Interior is forecast to increase from $15.17 to $27.47 per cubic metre (81.1%), while on the Coast the target stumpage rate is to rise from $17.20 to $28.03 per cubic metre (63.8%).

The aims of FRP are laudable: address environmental concerns, improve forest sector productivity, and ensure a sustainable timber supply while employing best forestry practices. Yet the means of financing FRP clearly have significant implications for the B.C. economy since the forest industry remains its economic base. Moreover, the differences in stumpage price increases between the Coast and Interior regions will lead to different effects on the regional economies.

This Bulletin reports the estimated impact of these stumpage price increases on three key sets of distributional variables for the province

through the use of a 56 equation general equilibrium model of the B.C. economy. (A detailed description of the model is available from the authors through the Western Centre for Economic Research). First, we examine how stumpage price increases affect aggregate economic variables such as real provincial gross domestic product (GDP), real income and industrial structure. Second, we assess the impact on two income classes in the province: the 'poor' consisting of those with incomes of less than $20,000 annually, and 'average' British Columbians whose income is above $20,000. Finally, we look at the regional impacts by estimating movements of average income in the Coast and Interior regions. Not surprisingly, we find that stumpage price increases of size set out in FRP have distributional consequences in each of these three cases.

The Bulletin first outlines the structural characteristics of the province. The model employed is then outlined and the policy simulation results discussed.

THE FOREST SECTOR IN B.C.: REGIONAL IMPACT

The forest sector remains the dominant element of the B.C. economy. Forest sector shipments presently account for about one-half of total manufacturing shipments for the province. Direct forest sector employment of 86,000 jobs, directly contributed 5.7% of total provincial jobs in 1992. This estimate excludes significant service sector employment in transportation and finance directly dependent on the forest industry. The sector accounted for 59% of all provincial exports, the top two being softwood lumber at 28.3% and commodity grade pulp at 14.7%. The forest sector contributes approximately 11% to overall GDP. These facts are clear evidence that any change in policy affecting the forest sector, either directly or indirectly, will have ramifications for the provincial economy. The descriptive data in Table 1 show the Interior region to be more dependent on the forest sector than the Coast.

Table 1: Selected British Columbia Economic Indicators by Region (values represent shares)

	COAST	INTERIOR
Population	0.765	0.235
Land area	0.255	0.745
Employment	0.745	0.255
Income	0.797	0.203
Revenue from forests	0.450	0.550
Emp. in logging, sawmills	0.455	0.544
Value from logging, sawmills	0.445	0.555

Source: British Columbia Economic and Statistical Review 1992; British Columbia Regional Index 1986; Ministry of Forests, Annual Report 1992/93; Canadian Forestry Statistics 1991.

Table 1 shows the dominance of population, employment and income in the Coastal region. However, forest activity is more heavily concentrated in the Interior region of the province. Table 2, offering a more disaggregated view of employment by sector and region, reveals that in the Interior, employment in the forest and other primary sectors are multiples of their Coast counterparts. The reverse holds true for manufacturing. Both government and services account for a greater share of employment on the Coast.

Table 2: Sectoral Employment in British Columbia by Region (values in shares)

SECTOR	COAST	INTERIOR
Forest	0.069	0.144
Other primary	0.028	0.087
Manufacturing	0.092	0.047
Service	0.736	0.670
Government	0.075	0.052
Total	0.745	0.255

Source: British Columbia Regional Index 1986

Table 3: Income Classes in British Columbia by Region (values in shares)

INCOME CLASS	COAST	INTERIOR
Class A	0.276	0.319
Class B	0.219	0.224
Class C	0.303	0.274
Class D	0.201	0.181

Class A is households with incomes less than $10,000; Class B is households with incomes between $10,000 and $20,000; Class C is households with incomes between $20,000 and $40,000; Class D is households with incomes above $40,000.

Source: Revenue Canada, Taxation Statistics 1993

Table 3, derived from household taxable income data, provides a breakdown of income distribution by region for four categories of income. In the Interior, 53.4% of households have an income below $20,000 compared with 49.5% on the Coast.

Table 4 providing a more detailed breakdown for specific communities within the two regions for 'wage and salary income' and income from 'other sources' does indicate that a greater share of income in the Interior relative to the Coast comes from the former. The result is that employment income overall is more dependent on the forest sector in the Interior than on the Coast.

Table 4: Sources of Household Income for Selected Localities in British Columbia (values in shares)

REGION	WAGES/SALARIES	OTHER SOURCES
Coast		
Victoria	0.587	0.413
Vancouver	0.600	0.400
Interior		
Prince George	0.785	0.215
East Kootenay	0.736	0.264

Source: Revenue Canada, Taxation Statistics 1993

DESCRIPTION OF THE ESTIMATING MODEL

ECONOMIC SECTORS

The model used in the analysis divides the B.C. economy into 9 sectors. These are:

1. Coast logging
2. Interior logging
3. Coast wood products
4. Interior wood products
5. Pulp and paper products
6. Other primary products
7. Manufacturing
8. Services
9. Government

The first four sectors regionally separate Coastal and Interior forest sector activity because of differences in the resource base, derived demands for timber, production technology, and stumpage rates. Sector 1 pri-marily produces logs fabricated in sector 3, and sector 2 produces logs utilized by sector 4. Only a small portion of the output of 1 and 2 are exported. Sectors 3 and 4, tightly coupled to sectors 1 and 2 respectively, produce mainly sawmill products such as construction grade lumber.

Pulp and paper sector 5 produces mainly for export markets and is not regionally differentiated. Sector 6 contains all renewable and non-renewable resource industries (mining) and is heavily export oriented. Sector 7 consists of manufacturing industries excluding wood and paper. The output of sectors 8 and 9 is consumed entirely within B.C.

INPUTS USED IN THE SECTORS

The primary factors of production consist of labour used in all of the sectors, mobile between sectors, but with a quantity assumed to be fixed for the province. Wages are assumed to be rigid, an assumption that reflects the highly unionized character of the labour force. Capital is specific to each sector and fixed in quantity (so that there is no net investment). Land is used in sectors 1, 2, 6 and 8.

Neither interprovincial migration, nor adjustments to the capital stock in response to stumpage price increases, are permitted. While there will, of course, be these longer run changes in population and in investment there incorporation into the model obscures the immediate impact of the policy shock on the economic well-being and income distribution of those currently residing in the province.

PRICES

Prices in sectors (1), (2), (3), (4), (5), (8) and (9) are determined within the framework of the model. Prices facing the logging sectors are determined by the level of demand from the regional wood products and pulp and paper sectors. The production of these latter sectors is assumed to be large enough in international export markets to influence world prices. This means that B.C. has the potential to exercise market power, but the degree of power that is possesses will depend on the demand elasticities that prevail in these export markets. the simulation results that re presented below will be sensitive to the magnitude of these elasticities.

Production in sector (6) is assumed to be small in world markets and producers are treated as price takers. Sector (7) represents import competing manufacturing and the province is considered a small importer in the world market, again with no influence over price.

HOW THE MODEL'S VARIABLES ARE SPECIFIED.

The model is linear with variables specified in rate of change form. The advantage of this format is that it requires relatively little data, produces results easily interpreted in terms of elasticities, uses as simple solution algorithm, and lends itself to the analysis of a wide range of policy shocks. Models of this structure have been used extensively to assess policy scenarios. The results indicate the particular impact of the policy in question with all other variables such as productivity growth and rest of the world price changes taken as constant.

OTHER CONDITIONS

The model is open ended in the sense that neither the change in exports equals the change in imports, nor does the change in savings equal the change in imports. A fixed exchange rate is assumed, and the balance of payments passively adapts to any change in the trade balance. The modelling exercise also ignores any adjustments in macroeconomic variables such as interest rates in response to changes in the forest sector trade balance.

SIMULATION RESULTS

(1) STRUCTURAL RESPONSE OF THE COAST AND INTERIOR REGIONS TO A 1% INCREASE IN STUMPAGE PRICES

The results in Table 5 indicate the structural responsiveness of the B.C. economy, and the two regional economies to a 1% increase in stumpage rates. They can be interpreted as the percentage change of the variable in question to a 1% increase in stumpage rates under alternative scenarios of the price responsiveness (ED) of export demand for wood products. Note that the smaller the value of ED the more market power B.C. is assumed to possess in international markets.

Table 5: Structural Response of Coast and Interior Regions to a 1% Increase in Stumpage Prices (values in % changes)

VARIABLE	LOW ED (-0.75)	MEDIUM ED (-1.25)	HIGH ED (-2.00)
Employed labour force Coast	-0.0078	-0.0129	0.0199
Employed labour force Interior	-0.0118	-0.0192	-0.0293
Return on capital in Coast logging	-0.0906	-0.1427	-0.2136
Return on capital in Interior logging	-0.0976	-0.1545	-0.2324
Return on capital in Coast wood prod.	-0.0596	-0.0943	-0.1414
Return on capital in Interior wood prod.	-0.0691	-0.1097	-0.1654
Logging area in Coast region	-0.0453	-0.0713	-0.1067
Logging area in Interior region	-0.0487	-0.0772	-0.1161
Real income of Coast region	-0.0119	-0.0152	-0.0197
Real income of Interior region	-0.0145	-0.0192	-0.0258
real provincial GDP	-0.0125	-0.0162	-0.0213
Exports of Coast region lumber	-0.0644	-0.1032	-0.1559
Exports of Interior region lumber	-0.0698	-0.1121	-0.1700
real income of 'average' households	-0.0012	-0.0008	-0.0004
real income of 'poor' households	-0.0007	-0.0001	0.0007

Results show that employment, real GDP, and real income in B.C. fall in response to a 1% increase in stumpage. The results also indicate that in all scenarios the Interior region is the more sensitive to the stumpage increase. For example with the medium ED employed labour force in the Interior is expected to fall by 0.019% while the expected fall on the Coast is 0.013%. In the same ED scenario, real income in the Interior is expected to fall by 0.019% in contrast to a 0.015% decline on the Coast. These results reflect the fact that in the Interior the share of the forest sector in employment and income is higher. In the Interior the return to capital in logging and wood products, the use of the forest land base, and export markets for wood products all fall more than on the Coast. Generally, the lower is ED the smaller is the effect on real income and employment as a result of a stumpage increase.

The effect of a 1% increase on the real incomes of average and poor households is also shown in Table 5. The income of poor households falls less, a result which may be largely the result of a difference in the share of government transfers in their respective incomes. In fact, the income of poor households actually rises with the high ED scenario.

(2) EFFECT OF THE MAY 1994 STUMPAGE CHANGES

As previously indicated the feature of the May 1994 increase in stumpage rates was the higher rate of increase in the Interior region. We already know from Table 5 that for comparable stumpage price increases the impacts will be greater in the Interior than on the Coast. Table 6 shows the results of simulating the actual increases in stumpage of 63.8% and 81.8% respectively in the Coast and Interior regions. Results are reported for high, medium and low scenarios of ED for B.C. solid wood products. In all scenarios real GDP and household disposable income fall with the greatest impact under the high ED scenario. With high ED, B.C. has less market power in passing along the burden of the policy shock to buyers in export markets. In all scenarios sectors (1) through (5) absorb much of the burden. A large fall in the use of the forest base, in returns to capital, and in output occurs in these sectors with the decline largest for the high ED scenario. A corresponding fall in exports is observed in the wood products sectors–(3) and (4)-- with the decline again highest for the high ED scenario.

One interesting result is that the decline in real income for both average and poor households is smaller than the fall in real GDP. For both groups nominal income falls, with the decline larger with the high ED scenario. However, in the latter case the fall in the CPI is also greater. Also, the fall in the CPI of poor households is higher than that for average income households. Therefore, in the short run, both income groups are relatively better off in the high ED scenario. Poor households in the high ED scenario experience an increase in real income since a large proportion of their consumption is from the service sector. The latter is a large component of the CPI which drops significantly in this case. However, the high ED scenario is also accompanied by a larger decline in employment so that it is only poor households who hold on to their jobs who will be better off.

(3) REGIONAL EFFECTS OF THE POLICY CHANGE

For all ED scenarios employment in the Interior falls more than in the Coastal region with the decline largest for the high ED scenario. For example, in the Interior employment fall by 0.94% in the low ED scenario and 2.37% in the high. For all ED scenarios, the real income in both regions falls with that of the Interior region showing the largest decline. The results also indicate that there is a substantial difference in the returns to capital in the logging and wood products sectors between the two regions. In the medium ED scenario, for example, the return on capital in Interior wood products (sector 4) fall by about 9% while the decline in the profitability in the Coast wood products industry is 6%. Similar differences occur in logging area reduction and wood products exports as between the two regions. However, the real wage for employed workers rises as a result of the stumpage change and rises more in the high ED scenario.

Finally, the results indicate that the policy change affecting the forest sectors brings about diversification in the provincial economy. The significant contraction in the forest sectors, the resulting slight fall in nominal wages and the large fall in prices in the service sectors combine to promote the expansion of the domestic manufacturing (sector 7) and the other primary products (sector 6) sectors. This result supports arguments [Constantino and Percy 1988] that "a contracting sector, especially one that forms the economic base of a region, induces expansion of peripheral sectors, particularly those facing highly elastic demands in output markets". In the high ED scenario, the model predicts a 3.74% decline in imports of manufactured goods with a 1.24% increase in manufacturing output.

Table 6: Impacts of 63.8% and 80.8% Increases in Stumpage Prices respectively in the Coast and Interior Regions (values are expressed as % changes)

VARIABLE	ED=-0.75	ED=-1.25	ED=-2.00
Producer price in Coast logging	11.201	10.907	10.508
Producer price in Interior logging	18.254	17.979	17.602
Producer price in Coast wood products	5.556	5.330	5.023
Producer price in Interior wood products	7.741	7.462	7.079
Producer price in pulp and paper products	1.381	1.298	1.186
Producer price in other primary products	0.014	0.013	0.011
Producer price in manufactures	0.012	0.023	0.037
Producer price in services	-0.277	-0.471	-0.737
Producer price in government	-0.108	-0.192	-0.306
Employed labour force in Coast region	-0.576	-0.950	-1.462
Employed labour force in Interior region	-0.942	-1.531	-2.337
Wages	-0.013	-0.022	-0.034
Return on capital in Coast logging	-5.813	-9.121	-13.606
Return on capital in Interior logging	-7.954	-12.614	-19.006
Return on capital in Coast wood products	-3.820	-6.020	-9.005
Return on capital in Interior wood products	-5.633	-8.964	-13.534
Return on capital in pulp and paper	-0.957	-0.877	-0.768
Return on capital in other primary	0.194	0.299	0.442
Return on capital in manufacturing	0.816	1.405	2.210
Return on capital in services	-0.745	-1.266	-1.980
Return to government	-0.263	-0.561	-0.967
Logging area in the Coast region	-2.903	-4.554	-6.793
Logging area in the Interior region	-3.974	-6.301	-9.494
Land rent in other primary products	0.194	0.299	0.442
Land rent in services	-0.745	-1.266	-1.980
Output in Coast logging	-2.580	-4.047	-6.037
Output in Interior logging	-3.661	-5.805	-8.746
Output in Coast wood products	-2.951	-4.650	-6.954
Output in Interior wood products	-4.156	-6.613	-9.983
Output in pulp and paper	-0.517	-0.469	-0.402
Output in other primary products	0.049	0.076	0.113
Output in manufacturing	0.459	0.790	1.242
Output in services	-0.335	-0.570	-0.892
Output of government	-0.111	-0.239	-0.414
Income in the Coast region	-0.402	-0.785	-1.309
Income in the Interior region	-0.597	-1.126	-1.850
Real provincial GDP	-0.438	-0.862	-1.440
GDP deflator	0.484	0.339	0.141

Household real disposable income	-0.438	-0.862	-1.440
CPI for the average household	-0.016	-0.115	-0.251
CPI for the poor household	-0.046	-0.152	-0.297
Nominal income of average household	-0.096	-0.170	-0.271
Nominal income of poor household	-0.091	-0.148	-0.228
Market price of Coast logging good	10.865	10.580	10.193
Market price of Interior logging good	17.707	17.440	17.074
Market price of Coast wood product	5.467	5.245	4.943
Market price of Interior wood product	7.617	7.342	6.965
Market price of pulp and paper	1.350	1.270	1.160
Exports of other primary products	-1.138	-1.016	-0.849
Exports of manufactures	-1.219	-2.286	-3.746
Market price of services	-0.264	-0.449	-0.701
Exports of Coast region wood products	-4.100	-6.556	-9.886
Exports of Interior region wood products	-5.713	-9.178	-13.931
Exports of pulp and paper	-0.675	-0.635	-0.580
Real income of 'average' household	-0.080	-0.055	-0.020
Real income of 'poor' household	-0.044	0.004	0.070

CONCLUSION

The results from application of a CGE model to measure the effects of an increase in B.C. stumpage prices show a decline in both provincial employment and in real GDP. The results also demonstrate that the negative impacts of the May 1994 stumpage policy are greater in the Interior than on the Coast.

The decline in real income for British Columbians as measured by consumption is smaller than the fall in real GDP. For households when nominal wages are rigid (due to contracts or strong union activity) the change in prices of goods that make up the major portion of what they consume matter the most. Because forest products occupy only a small share in household consumption, large increases in their prices do not have much effect on the CPI. However, in the longer terms when the assumption of rigid nominal wages is relaxed, the fall in nominal wages may be equal to or even higher than the decline in the CPI.

Finally, some of the limitations of the study should be noted. The results are sensitive to the parameters used in the model, particularly to degree of international market power that can be exercised by the B.C. forest products industry. Further, the model does not incorporate the non-market benefits associated with the decrease in harvest levels. If these are significant, the conclusions reported must be modified.

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