

FINANCING THE OPERATION AND
REHABILITATION OF
RAIL BRANCH LINES

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Doctor of Philosophy

by
William W. Wilson

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WILLIAM WARREN WILSON

A thesis submitted to the Faculty of Graduate Studies of
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ABSTRACT

Financing the Operation and Rehabilitation of Rail Branch Lines

by William Warren Wilson

Major Advisor: Dr. E.W. Tyrchniewicz

The railway system in Western Canada has an extensive branch line network which is in a deteriorated condition. This problem can be attributed to initial overbuilding by the railways and regulations retarding and/or prohibiting branch line abandonment, despite economic pressures for a rationalized branch line system. The problem is further aggravated by the present grain rate structure which does not differentiate between branch line and nearby main line origins. Consequently, the decision maker (in this case, the grain shipper) is not forced to evaluate the relative rail transport costs associated with his various delivery options.

The general objective of this thesis was to derive a framework for pricing rail branch line services and capital expenditures. The specific objectives were to: (1) specify pricing rules consistent with economic efficiency criteria, for financing branch line service and rehabilitation and upgrading; (2) specify and estimate rail branch line cost functions; (3) estimate the cost of branch line rehabilitation and upgrading; and (4) derive policy implications for financing branch line service.

The conceptual rate structure developed in this thesis differentiates between main line and branch line origins. The rate charged from a specific branch line origin is composed of (1) the rate from that origin to the main line junction (or collection point) and (2) the rate from the latter to the terminal market. The role of price in this rate structure would be to reflect the cost of branch line service to those shippers. It would be effective as an allocator of traffic between modes, and between shipping points, regardless of the level of rates from the main line origin. As well, explicit prices for branch line service would provide a means to finance the service.

Statistical cost functions are specified and estimated for rail branch line service in Western Canada. Total cost, which included operating and capital costs, was the dependent variable, and branch line length and output (measured in car-miles) were the independent variables. Several functional forms were estimated to allow for non linearities. In all cases, marginal costs decreased with increases in output (i.e. the elasticity of cost with respect to output was less than one). The relative importance of various cost components was also determined. Most revealing was the relative unimportance of fuel costs.

Theoretically, a price is efficient if it is equal to marginal cost. However, given that the marginal cost of branch line service decreases, efficient prices would result in a deficit. Three options for financing the deficit was discussed. First, prices equal to unit costs and uniform across users would yield sufficient revenue to cover total costs, but would be inefficient because some demand would be discouraged.

Secondly, prices equated to marginal cost and uniform across users would increase the utilization of the branch line capacity vis-a-vis unit prices. In this case the deficit would be financed from general revenue. The acceptability of this alternative would depend on whether the attendant redistribution of income, from the general taxpayer to the beneficiaries of the branch line service, was tolerable.

An alternative source to finance the deficit from marginal cost pricing would be discriminatory pricing. Despite its anti-social connotation, discriminatory pricing is justifiable when marginal costs are decreasing. In this case, prices should differ across users in inverse proportion to the individual's elasticity of demand for the service. The demand for branch line service varies in a spatial dimension relative to the distance to alternative shipping points, and prices should vary accordingly. For those shippers located geographically equidistant between a branch line and main line origin, their demand would be elastic and prices should not exceed marginal cost. For those situated further from the alternative delivery point, demand would be relatively inelastic and prices should be greater than marginal cost. The deficit would be financed by the latter group.

One option for public policy would be for continuance of the present rate structure where branch line users would not be required to evaluate the relative cost of providing that service. Public evaluation and regulations would continue to be necessary and rehabilitation and upgrading would continue to be demanded as long as costs were borne by the general taxpayer. An alternative policy option would be to charge an explicit rate for branch line service. Grain shippers would have to evaluate the costs and returns

associated with each delivery option and choose delivery points accordingly. In addition, such a rate structure would provide a source for financing the branch line service.

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Finally, I dedicate this thesis to my wife Rhonda, who perceived and reinforced my determination in graduate school, married me while I was experiencing frustrations in the thesis and subsequently completed her own professional training.

William W. Wilson

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Chapter I

INTRODUCTION

A fundamental problem in the Western Canadian grain gathering system is its extensive branch line network which is in a deteriorated condition. There are also pressures from several economic forces for a transition to a more rationalized system. However, this transition has been politically unpopular and consequently has not been explicitly encouraged. A further contributing factor is that the transportation rate structure does not encourage the transition to a more efficient system configuration in that no differentiation is made between main line and branch line originating traffic. The general objective of this thesis was to develop a conceptual rate structure for financing branch line rail service and capital expenditures. Cost functions for branch line operation in Western Canada were specified and estimated in this study, from which the essential parameters for pricing the service could be derived.

THE PROBLEM

Several factors have contributed to the excess capacity in the branch line system. These include initial overexpansion, reluctance to adapt to changing technology, and the political process of branch line abandonment. During the railroad building era the railways initially constructed an extensive branch line network across the prairies. The incentives for doing so were generally the quest for future increases in traffic, competitive pressures, and government encouragement. These

reasons for the initial overexpansion were suggested by Tyrchniewicz:

With the benefit of 20/20 hindsight it is fairly obvious that there was considerable over-building of facilities by the railways and the grain companies in the early 1900's. This over-building is generally attributed to competitive forces, overly optimistic assessment of grain production potentials, and government encouragement.¹

The necessity for an extensive rail branch line network has diminished because of several technological advances which have evolved since the early 1900's. As a general rule, elevators were built within six to ten miles of each other to accommodate grain delivery by horses and wagon and service centers became established at these points. Grain delivery by horses and wagon has since been eliminated as motor carriage made more distant deliveries economically possible. Secondly, economies of size in the modern elevator industry provide an impetus for larger plants so long as corresponding increases in throughput accrue.² However, the statutory grain rate structure does not differentiate between main line and branch line shipping points and consequently, there is no freight rate incentive to deliver grain beyond the nearest elevator.

Contraction of the branch line system has been restrained by the political process despite these economic incentives for rationalization. Since the MacPherson Royal Commission on Transportation reported in 1961, the prairie rail line network has constantly been subject to freezes and/or public evaluations and re-evaluations. Branch line abandonment

¹E. W. Tyrchniewicz, "Transportation Problems in Canadian Agriculture with Special Reference to Grains;" Canadian Journal of Agricultural Economics, CAES Annual Meeting Proceedings (July 1976), p.20.

²Report of the Grain Handling and Transportation Commission, Grain and Rail in Western Canada, Vol. I (Ottawa: Government of Canada, 1977), pp. 133-143.

has been, and still is, politically unpopular. It meant greater trucking costs for producers which, inevitably, exceeded the freight costs of utilizing branch line service. On the other hand, it has been politically popular to advocate retention, government subsidies for operation and rehabilitation of branch lines, and public evaluation in the abandonment/retention decision.

A related branch line problem is the deteriorated state of its infrastructure. It was recognized during the recent rail cost inquiry that large capital injections, from whatever source, would be required if branch line operations were to continue for more than a short period.³ There are several interrelated causes which have contributed to the deterioration of the branch line system. Foremost is that the statutory rates on grain and grain products are sufficiently low, relative to costs, that proper branch line maintenance has been discouraged. The Snavely Commission on the Cost of Transporting Grain by Rail confirmed the contention that rail rates were unremunerative.⁴ Many capital investment alternatives are available to the railways and the priority of each is measured by its net present value. As long as the returns from grain traffic are less than the net present value of alternative investments, maintenance programs and capital improvements on branch lines, beyond the minimum required to fulfill their common

³Report of The Commission on the Cost of Transporting Grain by Rail, Vol. I (Ottawa: Government of Canada, October 1976), p.128.

⁴The results of this study are covered more completely in Chapter II. Specifically, it was found that rail costs for moving grain was 2.58 times the revenue in 1974 and 3.08 times the revenue in 1977. See Report of the Commission on The Costs of Transporting Grain by Rail, op. cit., pp. 204-214; also Snavely, King and Associates, 1977 Costs and Revenues Incurred by the Railways in The Transportation of Grain Under the Statutory Rates, prepared for the Grain Transportation Branch (Ottawa: Transport Canada, September, 1978).

carriage obligations, will be discouraged. In fact, maintenance deferral by the railways may be an effort to terminate their common carrier obligations.

In recognition that some of the "protected" branch lines may be unprofitable a subsidy program was established in 1971 to reimburse the railways for their losses.⁵ The following table indicates that since 1971 claims for subsidies on branch lines and subsidy payments have been continually increasing:⁶

Table 1.1. Claims and Payments Under the Branch Line Subsidy Program^a

Year	Miles of Track	Claimed Loss (Million)	Subsidy Payments (Million)
1971	8,031	\$ 35.2	\$33.8
1972	10,332	44.2	26.9
1973	11,071	57.9	42.0
1974	10,985	93.2	71.7
1975	11,594	115.7	79.2
1976	11,284	115.5	83.4

^aWestern Branch Lines Submission Under Sections 256 and 258 of the Railway Act, Railway Transport Committee, Canadian Transport Commission (Ottawa, 1971-1979).

⁵Actually, the MacPherson Commission recommended in 1961 that a subsidy fund be established to recompense the railways for their losses. The subsidy was not to exceed \$13 million so that the railways would have an incentive to abandon unprofitable lines. However, these recommendations were not adhered to. See Report of the Royal Commission on Transportation (Ottawa: Queen's Printer, 1961).

⁶The disparity between claims and losses has been criticized but is not important here. See Report of the Grain Handling and Transportation Commission, op. cit., p. 182.

The subsidy program has not been a cause of the deteriorated infrastructure, but it hasn't contributed toward improved maintenance. The problem is that these subsidy payments to the railways have not been earmarked for branch line maintenance and operation and, therefore, have been treated as a general subsidy to grain traffic.⁷ The result has been continued deferred maintenance as indicated by reduced operating speeds, partial year operation of many lines, and the inability to utilize covered hopper cars to capacity because of load restriction.

RECOMMENDATIONS FROM RECENT INQUIRIES

The grain handling and transportation system has recurrently been the subject of public inquiries since the early 1900's. With the exception of the Snavely Commission, recent investigations dealt specifically with branch line problems. In 1974 the Minister of Transportation announced the composition of the prairie rail network: Class A lines consisting of 12,413 miles would be protected from abandonment until 2000; Class B branch lines consisting of 6,294 miles which were protected for at least a year to allow for evaluation by the inquiring process; and Class C branch lines consisting of 525 miles which were no longer in use and left unprotected. The Hall Commission on Grain Handling and Transportation was established to recommend upon the disposition of the Class B lines. The Hall Commission reported in 1977 and in its recommendations the branch lines were categorized

⁷It was recognized by the railways and Provinces that branch line subsidy funds have not been invested in that traffic but merely defer over-all losses from grain movements. See Report of the Commission on the Costs of Transporting Grain by Rail, op. cit., p. 128.

further: 1,813 miles were to be incorporated into the permanent prairie rail network; 2,344 miles were to be retained on the basis of need and were to be evaluated by a Prairie Rail Authority; and 2,165 miles were to be abandoned by 1981. Again, the future of the 2,344 miles of branch lines was left uncertain.

As indicated, the function of the Prairie Rail Authority would be to re-evaluate the 2,344 miles of branch lines. As well, it would be responsible for administration of branch line subsidies, rehabilitation and maintenance programs and to determine when and if each of the branch lines should be abandoned. Instead of forming the Prairie Rail Authority the Minister of Transportation appointed the Prairie Rail Action Committee (PRAC) in July 1977 to "advise the government of Canada and the railways" on the "priorities for rail upgrading" and the feasibility of the PRA concept.⁸ PRAC reviewed submissions to the Hall Commission, solicited additional comments, visited each of the lines and subsequently recommended that all but 40 percent of the branch lines they evaluated be abandoned.⁹ Since then the Neil Inquiry was appointed to investigate the questionable lines. In January 1980 they recommended that 645 miles of rail line become part of the Prairie Rail network.

REHABILITATION AND THE FINANCE PROBLEM

As a result of branch line abandonment restrictions, unremunerative grain rates and an ineffective subsidy program, the branch line system is

⁸Honourable Otto Lang, "Lang Announces Prairie Rail Action Committee Members," News Release (Saskatoon: Minister of Transport, July 11, 1977).

⁹Report of the Prairie Rail Action Committee (Ottawa: Government of Canada, December 1978).

deteriorated and requires capital investment. In the Hall Commission hearings it became apparent that the branch line system was in poor condition. Conclusions of the report were as follows:

Some lines have reached the point where continuation of train service beyond a period of from two to five years could only be considered practical by the injection of capital in the form of a major program to replace defective ties, reballast and repair sub-grade and structures.¹⁰

It was accepted within the industry that rehabilitation and upgrading are prerequisites for continued use of many of the lines. Estimates range from \$25,000 to \$250,000 per mile depending on the initial and desired condition and carrying capacity of the line.¹¹ The Hall Commission estimated that \$445 million (1974) would be required to restructure the system according to their recommendations.¹² More recent estimates have been upwards of \$900 million.

An obvious question yet to be answered was how to finance the costs of rehabilitation and upgrading. The railways insisted that they would not expend the required funds "unless there is a substantial increase in the revenues received from statutory grain."¹³ Similarly, the Provinces contended that the funds "ultimately will be paid by someone other than the railways."¹⁴

¹⁰ Report of the Grain Handling and Transportation Commission, op. cit., p. 316.

¹¹ Tyrchniewicz, op. cit., p. 22

¹² Report of the Grain Handling and Transportation Commission, op. cit., p. 327.

¹³ Report of the Commission on the Costs of Transporting Grain by Rail, op. cit., p. 125.

¹⁴ Ibid., p. 124.

During this period momentum toward the recently popular "user pay" concept was building. One implication of this was the rehabilitation costs could possibly be recovered by assessing charges on users according to demand. Potentially, the total costs of branch line service -- including operating, maintenance, capital and rehabilitation and upgrading costs -- could be recouped from those users who benefit from branch line service. Two economic consequences of the user pay concept are that it provides a source of cost recovery for financing the service and simultaneously acts as an allocator of traffic between modes and delivery points.

Shortly after the inception of this thesis the Minister for Transport stated that \$100 million in Federal funds would be made available for rehabilitating Prairie branch lines.¹⁶ He also stressed that "this infusion of money is in addition to the more than \$100 million that the federal government anticipates paying in 1977 under the branch line subsidy program."¹⁷ Indications were also made that additional federal funds would be forthcoming.

¹⁵For background discussion of the user pay concept see E. W. Tyrchniewicz, "Recent Freight Rate Policy Developments," Freight Rates and the Marketing of Canadian Agricultural Products, ed. R.M.A. Loyns and E.W. Tyrchniewicz, Occasional Series No. 8 (Department of Agricultural Economics, University of Manitoba, August 1977), pp. 15-25.

¹⁶Honourable Otta Lang, "Prairie Rail Branch Line Rehabilitation Program," News Release (Calgary: Minister of Transport, July 18, 1977).

¹⁷Ibid.

Recent empirical studies on branch line problems have been oriented to determine whether or not a line should be retained and consequently cost-benefit analysis has been used. Baumol et. al. specifically calculated costs and benefits of branch line retention in Iowa.¹⁸ The recent PRAC study, although not an explicit quantitative cost-benefit study, compared the relative costs of truck and branch line rail operations.¹⁹ The nature of the cost information calculated in these studies indicated whether a line should be abandoned but did not provide the necessary functional relationships for pricing the service.

OBJECTIVES AND SCOPE OF THIS STUDY

The general objective of this study was to derive a framework for pricing rail branch line service and capital expenditures. The specific objectives were to: (1) specify pricing rules, consistent with economic efficiency criteria, for financing branch line service and rehabilitation and upgrading; (2) specify and estimate branch line cost functions; (3) estimate the cost of branch line rehabilitation and upgrading; and (4) derive policy implications for financing branch line service.

An underlying assumption in this study was that the decision of whether or not a branch line should be retained has already been made by

¹⁸C.P. Baumol, J.J. Miller and T.P. Drinka, "The Economics of Upgrading Seventy-one Branch Rail Lines in Iowa, "American Journal of Agricultural Economics, Vol, 50, No. 1 (February 1977,) pp. 61-70.

¹⁹Report of the Prairie Rail Action Committee, op. cit.