THE UNIVERSITY OF MANITOBA

THE ECONOMIC EFFECTS OF AN ALTERNATIVE TO THE STATUTORY GRAIN FREIGHT RATES

by

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Abstract

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Major Advisor: Dr. E. W. Tyrchniewicz

The statutory grain freight rates have been identified as "the primary source" of many grain transportation problems in Western Canada. The rates which date back to 1897 are responsible for the losses sustained by the railways in the carriage of grain and the resultant lack of railway system renewal and expansion. The statutory rates are so pervasive in the structure, operation and logistics of the grain handling and transportation system that the elimination of them is seen as a possible means of permitting additional growth in Canadian grain exports.

This study analyzed and evaluated one possible alternative to the present preferrential freight rates on Western grain in terms of its potential economic impacts on the Manitoba agricultural economy, and its attractiveness in relation to a broad set of economic and political criteria. The proposed alternative to the present statutory freight rates on grain would provide a constant dollar per ton subsidy payment to the railways to make up their revenue shortfall on statutory grain traffic in a base year with Prairie grain producers being fully responsible thereafter for any future cost increases in railway grain transportation.

The analysis of the proposed alternative to the statutory rates showed how the Manitoba farm economy would "adjust" in response to compensatory freight rates on domestically marketed grain, and a movement towards compensatory rates on export grain based on the annual rate of increase in grain transportation costs. This was facilitated through the use of a linear programming model dimensioned for the Province of Manitoba. The LP model showed the changes in the pattern and aggregate value of agricultural production and changes in net farm income that would result from the rail rate option under a range of inflation/productivity scenarios in Western grain transportation between 1978 and 1985. The upper or pessimistic end of this range employed a 15 percent annual increase in railway grain transport costs while the lower or optimistic end employed a 6 percent annual increase. For analytical purposes, an intermediate scenario that employed an 11 percent annual increase in rail grain transport costs was also examined.

The main conclusions that emerged from this study are as follows:

1. The proposed alternative to the present statutory grain rates would only have minor effects on the aggregate value of output in the provincial farm economy. Effects of this nature ranged from a decrease of $14.9 million (1.3 percent of the base year value) to an increase of $29.5 million (2.5 percent) as the value of statutory grain production fell while the value of livestock production increased.
2. On a net farm income basis, however, the farming sector of the province would suffer some economic dislocation if the grain producer's share of railway grain transport costs increased.

Losses in net farm income for an "average-size" farm in the Province ranged from $270 to $549. The potential to offset these losses in net farm income through further farm diversification into oilseed and livestock enterprises would generally exist only to the extent that favorable market conditions and opportunities exist.

3. Finally, as this study demonstrated, it is virtually impossible for any rate alternative to satisfy the many economic and political considerations involved in contemplating changes to the statutory rates.

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Chapter 1

PROBLEM STATEMENT

Introduction and Historical Perspectives

The statutory freight rates on grain,[1] more commonly known as the Crowsnest Pass grain rates, continue to be one of the most contentious and unresolved issues in Canadian transportation and agricultural policy. These freight rates, which have been described on occasion as the "West's Magna Carta", "Canada's largest freight rate anomaly" and "a mere political policy tool", have been widely debated in political circles, extensively referenced by various royal commissions on transportation and the subject of numerous studies.

The statutory grain rates evolved out of the Crowsnest Pass Agreement of 1897,[2] which was a subsidy and rate control agreement between the Government of Canada and the Canadian Pacific Railway Company.

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[1] Throughout this paper, the term "statutory rate" can be considered synonymous with the "Crowsnest Pass grain rates". The term "statutory rate" refers to the rates on the movement of grain following 1925, when the rates were fixed by Parliament. Prior to 1925, the rates were governed by the Crowsnest Pass Agreement of 1897, and the term "Crowsnest rates" properly applies only in reference to that earlier period.

[2] For an excellent discussion on the historical perspectives of the Crowsnest rates see: (1) Province of Saskatchewan, "An Historical Analysis of the Crow's Nest Pass Agreement and Grain Rates: A Study in National Transportation Policy," A Submission of the Province of Saskatchewan to the Royal Commission on Transportation 1960 (Regina: Queen's Printer, May, 1960); (2) C. D. Nachtigall, G. F. Skinner and E. W. Tyrchniewicz, "Crowsnest Pass Grain Rates: Time for a Change?", Canadian Transportation Research Forum: Proceedings -- Sixteenth Annual Meeting, Vol. XVI, No. 1, 1975; and (3) S. N. Kulshreshtha and D. G. Devine, "Historical Perspectives and Propositions on the Crowsnest Pass

In return for federal and provincial grants of money and land, respectively, to assist in the construction of a railway line to develop southern British Columbia, the railway undertook, among other things, to reduce its freight rates on grain and flour from Prairie points to the Lakehead. As Wilson[3] observed, this undertaking on the part of the railway was regarded as an obligation to maintain such freight rates in perpetuity. In 1925 the reduced freight rates were made statutory by Parliament at the level provided by the 1897 agreement, but the 1925 legislation and subsequent amendments and regulations have greatly widened their scope and application. Thus, despite cost inflation since 1925, the statutory grain rates are still in effect today being part of the Western grain freight rate structure.

The Crowsnest Pass Agreement was passed in 1897 because of prevailing political and economic pressures. Without going into all of the details, it is important to note why the Government of Canada entered the 1897 Agreement and, particularly, why it sought reduced rates on grain and flour.

According to historical accounts, the Federal Government signed the Crowsnest Pass Agreement in order to promote, among other things: (1) the stimulation of agricultural settlement and general economic expansion in the Prairie Provinces by means of the statutory assurance

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[2](continued)

Freight Rate Agreement," Canadian Journal of Agricultural Economics, Vol. 26, No. 2, July, 1978.

[3]C. F. Wilson, Grain Marketing in Canada (Winnipeg: Canadian International Grains Institute, 1979), p. 386.

of lower rates on grain and on the inward movement of capital equipment; and (2) the acceptance by the Canadian Pacific Railway Company of the principle of government rate control in the national interest, without reference to the level of railway earnings.[4] Thus, historical record would suggest that in the late 1800's and early 1900's the Crowsnest Pass grain freight rates, later to become the statutory rates, were used by the Federal Government as part of national policy. The intent of this policy was to stimulate the economic development of the Western Provinces, particularly the emerging grains industry and markets for it, and introduce the principle of government rate regulation in the transportation industry.

During the twentieth century, however, the economic and political rationale regarding the purpose and permanence of the statutory grain rates changed and became in some cases narrowly defined. A look at contemporary arguments, some of which are economic and non-economic in nature, helps one to understand why the rates remain at the 1897 level today, even though the original economic and political objectives associated with the rates appear to have long since been achieved. Consider the following two "popular" arguments tendered for the retention of the rates.

The first one maintains that the statutory rates provide Western grain producers with "the lowest-cost freight rates of any major competing grain exporting country."[5] The Western grain producer, it is

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[4]E. P. Reid, "Statutory Grain Rates," Report of the Royal Commission on Transportation 1961 (Ottawa: Queen's Printer for Canada, 1961), p. 373.

[5]Wilson, op. cit., p. 387.

alleged, cannot absorb higher transportation charges because of his geographical location and the instability in world grain prices and, hence, the resulting instability in his net farm income. In particular, the Canadian grain producer is in a disadvantaged position vis-a-vis foreign grain producers in terms of being land-locked and remote from cheap ocean transport. This essentially makes him a captive shipper of rail transport. This dependency of the grain producer on rail transport in Canada and the world grain market is reinforced given that slightly less than 50 percent of the annual Canadian grain production is exported.[6]

The second reason relates to the importance of the grain and oilseed trade to the Canadian economy, in terms of it being a major earner of foreign exchange (about $2.7 billion a year over the 1975 to 1977 period).[7] This point has been articulated by many people including the recent Grain Handling and Transportation Commission which argued that:

> "...the government must continue to subsidize the transportation of export grain and that the full cost as deemed by the Commission on the Costs of Transporting Grain by Rail, must not be imposed on the producer. The contribution Western grain makes to Canada's balance of payments position demands that a substantial part of any increase be borne by the federal government in the national interest."[8]

In this respect, the fixed rates on grain transport, the statutory rates,

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[6]Canada Grains Council, Canadian Grains Industry Statistical Handbook 79 (Winnipeg: Canada Grains Council, 1979).

[7]Statistics Canada, Exports - Merchandise Trade 1975-1977, Catalogue No. 65-202 Annual (Ottawa: Supply and Services, Canada, August, 1978), pp. 22-24.

[8]The Grain Handling and Transportation Commission, Grain and Rail in Western Canada, Vol. I (Ottawa: Supply and Services, Canada, 1977), p. 336.

are alleged to provide one mechanism for the Canadian Wheat Board, the Prairie grain producer's selling agent, to remain competitive in terms of transportation costs vis-a-vis suppliers closer to markets.[9]

Thus, a synthesized contemporary view regarding why the statutory grain rates have been defended in terms of national policy would seem to indicate the following: the rates represent an "historic" commitment on the part of the Government of Canada to protect the Western grain producer from higher transport charges and maintain his competitive position in export grain markets given the importance of the grain trade to the Canadian economy.

During the last decade, however, it has become quite apparent that the statutory grain rates are not economically viable and they are not necessarily the best means of effecting this historic commitment. The continued existence of the statutory rates has been seriously questioned by the Federal Government and other major participants in the production, handling and transportation of grain in Canada in the recent past given that the rates may have pervasive economic effects on the West's grain handling and transportation system,[10] Prairie agriculture and regional development, and the national economy as a whole.[11] In

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[9]D. A. Dever, "The Effects of the Crowsnest Pass Railway Rates" (Paper presented to the Crowsnest Rates Grain Transportation Seminar, University of Calgary, Calgary, Alberta, August 26, 1974), p. 19.

[10]For the purpose of this study, the grain handling and transportation system is defined as the interrelated process in which Western Canadian grain is called from on-farm storage, collected by the primary elevator system by means of quotas imposed by the Canadian Wheat Board, and forwarded via the Board's grain block shipping system and regional rail network to both domestic points and export terminals at Vancouver, Prince Rupert, Thunder Bay and Churchill.

[11]In fact, just recently at the Western Agriculture Conference in Regina, representatives of the Manitoba Farm Bureau, the Saskatchewan

particular, increasing attention has been focused on the statutory rate issue and its resolution because of a growing concern among the major participants in the grains industry (i.e., the Canadian Wheat Board, producers, grain companies, railways, and the Government of Canada) regarding the ability of the grain transportation system to handle increasing volumes of export grain by the mid-1980's. Indeed, in some circles,[12] the elimination of the statutory rates in favor of compensatory grain rates is seen as a method of permitting additional exports which would not otherwise occur to the same extent by 1985.

The Problem: The Economic Effects of Statutory Rates

The low level and rigid structure of the statutory grain rates are responsible for the operating losses suffered by the major railways in the transportation of statutory grain. According to the report of the Commission on the Costs of Transporting Grain by Rail[13] and the follow-up report by Snavely, King and Associates,[14] the railways

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[11](continued)

Federation of Agriculture and Alberta's Unifarm reached a compromise for a start on negotiations with the Federal Government and the railways aimed at achieving a new statutory rate formula for the movement of Prairie grain. See "Crow Rate Compromise," The Manitoba Co-Operator, Vol. 37, No. 2, August 9, 1979, pp. 1, 18.

[12]See IBI Group, Impact on Transportation Users of Changing Statutory Grain Rates (Report prepared for Alberta Economic Development, August, 1979), p. E-9.

[13]The Commission on the Costs of Transporting Grain by Rail, Report, Vol. I (Ottawa: Supply and Services, Canada, 1976), pp. 205-207.

[14]Snavely, King and Associates, 1977 Costs and Revenues Incurred by the Railways in the Transportation of Grain Under Statutory Rates (Report prepared for the Ministry of Transport, Federal Government of Canada, September, 1978), pp. 75-83.

(Canadian Pacific, Canadian National and Northern Alberta Railways) suffered gross revenue shortfalls of $157.4 million and $239.2 million in 1974 and 1977, respectively. Federal Government branch line subsidy payments ameliorated these losses to some extent but the railways still absorbed 38 percent or $89.3 million and 49.6 percent or $175.5 million in uncompensated losses for the respective years (see Table 1). To put the Commission's and Snavely et al's conclusions another way, the variable cost of rail movement of grain was 2.58 and 3.08 times the statutory rates paid by Prairie grain producers in 1974 and 1977. This gap between the variable costs incurred and revenues earned by the railways in the transportation of grain under statutory rates can be expected to further increase as time progresses given the following:

1. the statutory rates are not remunerative;
2. volumes of export grain can be expected to increase;
3. the railways must by law haul grain and do not have the absolute freedom to abandon low volume branch lines; and
4. continued inflation of the currency will erode railway earnings on grain traffic moving under statutory rates.

The financial losses sustained by the railways in the carriage of statutory grain have serious, negative economic implications for the West's grain handling and transportation system and, consequently, Western Canadian agriculture. As Booz-Allen et al pointed out, the railways no longer have the economic or physical capacity to underwrite "the grain drain" or losses incurred on grain traffic.[15] Consequently, they have

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[15] Booz-Allen & Hamilton, Inc. and IBI Group, Grain Transportation and Handling in Western Canada (Report prepared for the Department of Industry, Trade & Commerce, The Grains Group, Federal Government of Canada, July, 1979), p. X-9.

Table 1. Coverage of the Total Costs Incurred in the 1974 and 1977 Transportation of Statutory Grain by Rail.

Source of Cost Coverage	Amount of Cost Coverage: Total Dollars (Millions)	Dollars per ton	Percentage Distribution of Coverage
1974[a]			
Users of the Service	89.7	4.36	38.9
Federal Government	52.0	2.52	22.4
Railways	89.3	4.34	38.7
TOTAL	231.0	11.22	100.0
1977[b]			
Users of the Service	114.764	4.58	32.4
Federal Government	63.713	2.54	18.0
Railways	175.461	6.99	49.6
TOTAL	353.938	14.11	100.0

[a]The Commission on the Costs of Transporting Grain by Rail, Report, Vol. I (Ottawa: Supply and Services, Canada, October, 1976), p. 207.

[b]Snavely, King and Associates, 1977 Costs and Revenues Incurred by the Railways in the Transportation of Grain Under Statutory Rates (Report prepared for the Ministry of Transport, Federal Government of Canada, September, 1978), p. 79.

not invested in equipment for the transportation of grain and they have deferred substantial maintenance and virtually all capital expenditures on the "grain dependent lines".[16] In fact, since 1972 virtually all major maintenance and capital expenditures for railway plant and equipment used in the transportation of statutory grain has been financed by the Federal Government and, more recently, Prairie provincial governments and the Canadian Wheat Board. The number of government measures taken to counter the massive deterioration in the physical state of the plant and equipment used in grain transportation on the Prairies, and ensure continued operation of the grain transportation system at reasonable capacity levels within the context of continuing statutory rates include:

1. payment of branch line subsidies to the railways;
2. the purchase and lease of grain hopper cars on behalf of the Canadian Wheat Board;
3. a Prairie branch line rehabilitation program;
4. boxcar repair programs; and
5. the provision of tax incentives to the railways.[17]

The statutory grain rates have undoubtedly contributed to the historic pattern of Western Canadian agriculture since they are a subsidy on the rail movement of Prairie grains and oilseeds to export and domestic markets. Under the statutory rates, the grain producer pays all of the charges but not all of the costs of transporting grain by rail. For

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[16] Snavely, King and Associates, op. cit., pp. 80-81.

[17] For a detailed discussion of these measures, see Appendix A of this study.

example, in 1977 the producer (user of the transport service) paid only 32.4 percent of the total variable rail costs incurred in transporting statutory grain.[18] As a result, the preferential freight rates on Western Canadian grain have stimulated grain production, particularly the "wheat economy".[19] And, as Wilson claimed, the rates help to maintain an "excessive amount of resources in agriculture".[20]

At the same time, however, the statutory grain rates tend to discourage livestock production and value added processing activities on the Prairies. Consequently, they may have retarded the economic development of Western Canada. In particular, the statutory rates have removed the natural comparative advantage of livestock producers and agricultural processing activities on the Prairies by making the export of unprocessed grain from the Prairies relatively less expensive than the export of livestock or livestock products which move at higher freight rates.[21] Stickland[22] has estimated that the costs borne by Prairie livestock producers to be about $86 million in 1978 while

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[18] Snavely, King and Associates, op. cit., p. 79.

[19] Reid, op. cit., p. 404.

[20] G. W. Wilson, "Economics of the Crowsnest Pass Rates," Canadian Journal of Agricultural Economics, Vol. 6, No. 1, 1958, pp. 34-43.

[21] On this point, see: (1) Nachtigall, Skinner and Tyrchniewicz, op. cit., pp. 274-275; and (2) W. H. Furtan, J. C. Nagy and G. C. Storey, "The Impact on the Canadian Rapeseed Industry from Changes in Transport and Tariff Rates," American Journal of Agricultural Economics, Vol. 61, No. 2, May, 1979, pp. 238-248.

[22] K. W. Stickland, "Background to the Problems Associated with the Grain Handling and Transportation System and the Crow Rates" (Paper prepared for Alberta Transportation and Alberta Agriculture, June 16, 1977), pp. 9-10.

MacEachern[23] has estimated the total direct loss to Alberta livestock producers alone to be about $59.4 million as of 1978. In addition, Arcus[24] has estimated that the potential increase in gross income for Western livestock producers would be in the order of $100.1 million in 1978 if the statutory rates were removed in favor of compensatory or market freight rates. A similar study by Anderson-Hendriks,[25] which employed rail rates 3.1 and 5.0 times the statutory rates, estimated that the net gains to the livestock sector including meat processing and rapeseed crushing would be $123 million and $241 million in 1977.[26]

Another problem associated with the statutory grain rates is that the Canadian public may not be getting the most value for their tax dollars that are used to subsidize the rail movement of Western grain. As previously mentioned, public funds are used to help finance grain transportation costs through a variety of Federal Government

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[23] G. A. MacEachern, Retention of the Crow Rate and the Alberta Livestock Economy (Ottawa: Agricultural Economics Research Council of Canada, 1978), p. 35.

[24] P. L. Arcus, "The Impact of Changes in the Statutory Freight Rates for Grain," Freight Rates and the Marketing of Canadian Agricultural Products, Occasional Series No. 8, edited by R. M. A. Loyns and E. W. Tyrchniewicz (Winnipeg: Department of Agricultural Economics, University of Manitoba, 1977), pp. 88-93.

[25] Anderson-Hendriks, Study on Implications of Crow Rate for Alberta Agriculture, November 17, 1978, cited by IBI Group, op. cit., pp. VII-4, VII-5 and Appendix A.

[26] These studies are founded on the principle that if rail rates increased, the farm-gate price of feed grains would drop, with the end-users absorbing some of this. It is important to note, however, that this "long-term static effect," as IBI Group referred to it, assumes that there is ample transportation capacity and no marketing constraints within the grain handling and transportation system. Thus, to the extent that transportation capacity, quotas and other marketing policies constrain the access of grain to the export market and thereby insulate Prairie feed grain prices from the world price, the expected gains of the livestock sector will be over-estimated. See ibid., pp. IV-12, IV-13.

programs including the branch line subsidy program, the grain hopper car program, the Prairie branch line rehabilitation program and the box car repair program.[27] The Canadian public, however, may also be subsidizing to some extent those countries that are buying Canadian grain which is shipped under the statutory freight rates. As Reid[28] pointed out, the measure of benefits accruing to Prairie grain producers by shipping their grain at the unremunerative statutory rates is overstated because these benefits are shared by Western Canadian producers with their customers (overseas and domestic). This point was recently corroborated in two University of Saskatchewan studies: one on the economic impacts of changing the statutory rate to a Snavely determined compensatory rate for the transport of Canadian wheat from Prairie points to export position by Nagy, Furtan and Kulshreshtha;[29] and a similar study on rapeseed freight rates by Furtan, Nagy and Storey.[30] In the former analysis, the authors claimed that the Western Canadian wheat producer receives between 76 and 96 percent of the "Crow rate benefits" and the remainder amounts to a subsidy of importers (foreign customers) of Canadian wheat. In the rapeseed study, Furtan, Nagy and Storey concluded that the Western

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[27] Although some of these costs incurred by the public cannot be directly attributed to the low level of the statutory grain rates, it can be said that they all represent charges on the public purse for the provision of grain transportation services which a market rate should take into account.

[28] Reid, op. cit., pp. 400-401.

[29] J. C. Nagy, W. H. Furtan and S. N. Kulshreshtha, The Canadian Wheat Economy: Economic Implications of Changes in the Crowsnest Pass Freight Rates, Technical Bulletin BL: 79-1 (Saskatoon: Department of Agricultural Economics, University of Saskatchewan, January, 1979), pp. 43, 50.

[30] Furtan, Nagy and Storey, loc. cit.

Canadian rapeseed producer receives only 42 percent of the "Crow" benefit and the remaining 58 percent also amounts to a subsidy of the importing nation (i.e., Japan).

As a result, many observers in the Canadian grains industry now suspect[31] that the statutory grain rates may be a "major inhibiting factor in the growth of Canadian grain exports".[32] They also feel that the rates may not be in the public's interest given that the economic costs associated with this transport subsidy may be beginning to outweigh their generally assumed substantial benefits. Thus, the general consensus in the grains industry is that unless the statutory rate issue is resolved, many of the problems in the grain handling and transportation system will not be completely overcome and growth in grain exports will suffer due to the low priority afforded to grain traffic by the railways.

Alternative policy proposals with respect to changes to the statutory freight rates on grain would likely impact on resource allocation and economic activity both within and outside Prairie agriculture. From an agricultural perspective, in particular, changes to the present freight rate structure on grain would probably influence the following:

1. The level and distribution of primary agricultural production, including cereal crop, specialty crop and livestock enterprises, due to changes in the relative profitability of the respective enterprises.
2. Resource use at the farm level due to changes in farm gate product prices and input costs (i.e., farm land prices).

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[31]The term "suspect" is used since the final answer must await "empirical estimation".

[32]For example, see Booz-Allen et al, loc. cit.

3. The level and distribution of income and employment among on-farm and off-farm workers in the agricultural sector.

The removal of the statutory grain rates in favor of a compensatory[33] rate structure represents one possible alternative to the retention of the present freight rates. However, such an alternative would cause significant reductions in the net farm income of Prairie grain producers, particularly those in Saskatchewan, if they were required to bear the full increase in transportation charges. The direct loss in gross farm income of Prairie grain producers resulting from such an option has been estimated to be about $330 million by The Transportation Agency of Saskatchewan[34] and $341 million by Arcus[35] both for the year 1977. In a study prepared for Alberta Economic Development, IBI Group[36] also estimated the gross income loss to Prairie grain producers in 1977 resulting from higher freight rates on grain. Assuming two levels of compensatory rates (i.e., 3.1 times and 5.0 times the statutory rates), IBI estimated that the gross income losses suffered by producers would be $241 million and $459 million, respectively. For Manitoba grain producers delivering grain to primary elevators under 1973-74 conditions, the increase in rail costs resulting from compensatory rail rates that

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[33] According to Section 276 of the Railway Act, a freight rate is deemed compensatory when it exceeds the variable costs on the movement of the traffic concerned as determined by the Canadian Transport Commission. See Parliament of Canada, Revised Statutes of Canada 1970, Vol. VI, Chapters P-1/S-8 (Ottawa: Queen's Printer of Canada, 1970), p. 6451.

[34] The Transportation Agency of Saskatchewan, The Crow Rate and National Transportation Policy (Regina: Queen's Printer, 1977), p. 7.

[35] Arcus, op. cit., p. 86.

[36] IBI Group, op. cit., pp. VII-4, VII-5.

were 2.58 times the statutory rate level was estimated to be $17.7 million or 13 cents per bushel of statutory grain by Tyrchniewicz, Framingham, MacMillan and Craven.[37]

In summary, the statutory grain rates are so pervasive in the overall efficiency and capital renewal of Canadian grain production and transportation that they can no longer be ignored if Canada is to realize its export grain potential. More importantly, the statutory rates have been identified as "the primary source" of many grain transportation problems in Western Canada and, particularly, a "major inhibiting factor" in the growth of Canadian grain exports.

The problems with respect to these grain rates can be summarized as follows: (1) The statutory rates are responsible for the losses sustained by the major railways in the carriage of grain. This "grain drain", which cannot be absorbed indefinitely by the railways under continuing high inflation, has contributed significantly to the lack of renewal and expansion in the railway grain transportation system. Given that the railways' capabilities to continue the level of service now provided for grain are in doubt, grain exports will likely suffer if the statutory rates remain in effect without suitable compensation to the railways. (2) The grain rates tend to perpetuate a misallocation of economic resources not only with respect to the grain transportation and handling system in Western Canada but also with respect to primary agricultural production. Since the rates accrue largely as an input subsidy

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[37] E. W. Tyrchniewicz, C. F. Framingham, J. A. MacMillan and J. W. Craven, "The Abandonment of Uneconomic Branch Lines and Unremunerative Grain Rates: Effects on Agriculture and Regional Development," The Logistics and Transportation Review, Vol. 14, No. 4, 1978, p. 419.

to grain producers, they increase the quantity of grain available for export at any given price. In addition, the preferential freight rates on Western grain may have inhibited the diversification of Prairie agriculture and the economic development of the Prairies by encouraging the shipment of raw agricultural commodities rather than processed agricultural products. (3) The statutory rates have become a major drain on public funds both directly and indirectly. The subsidized export grain freight rates, however, may not be in the Canadian public's best interest given that subsidizing grain transportation services for Prairie grain growers in the current manner does not appear to yield the greatest net benefit to Canadians per subsidy dollar vis-a-vis alternative arrangements.

A wide range of alternatives to the retention of the statutory grain rates including the introduction of compensatory rates are currently being discussed by the various participants in the Canadian grain industry.[38] Changes to the cost structure of the statutory rates, of course, would have important cost/efficiency, equity, socio-economic and public policy implications for the various concerned parties in the grain trade and the national economy as a whole.

Study Objectives

By building upon earlier studies and refining others, this thesis analyses and evaluates from a Manitoba agricultural perspective one particular alternative to the present statutory freight rates on grain.[39]

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[38]See the Canada Grains Council, Proceedings: Ninth Annual Meeting (Winnipeg: Canada Grains Council, April 4, 5, 1978), pp. 65-87.

[39]See Appendix B for a review of related research work regarding possible changes to the statutory grain rates.

This statutory rate alternative, which is similar to one suggested by the Canada Grains Council,[40] involves a constant per ton subsidy payment to the railways based on their revenue shortfall incurred under statutory rates in the base year with the remaining compensation for the costs of grain movement provided through a new rate structure. Essentially, under this alternative the statutory rates would be removed in favor of a cost-based compensatory rate with the grain producer both retaining the present nominal benefit of the statutory rate and absorbing 100 percent of future increases in the cost of transporting grain by rail given the prospect of continuing inflation.

The primary objective of this study, therefore, is to quantify and analyze the economic effects on Manitoba's primary agricultural sector that may result from the above alternative to the retention of the present statutory rates.

A related secondary objective of the study is to develop an analytic framework appropriate for consideration of other statutory grain rate policy alternatives. This is pursued through the presentation and analysis of the previously described statutory rate option.

The empirical analysis of the proposed alternative to the present rail rate structure for statutory grain quantifies the following economic indicators:

1. changes in the level and distribution of primary agricultural production, including cereal crop, specialty crop and livestock enterprises, due to changes in the relative profitability of the

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[40]Canada Grains Council, "Report to the Grain Handling and Transportation Committee" (Winnipeg: Canada Grains Council, June, 1977), pp. 34-35.

respective enterprises; and

2. changes in the level and distribution of net farm income per farm in the Manitoba agricultural sector.

This "narrowly defined" analysis[41] is pursued through the following:

1. (a) Specification of a general criteria for statutory grain rate alternatives that includes both various economic and political considerations.

   (b) A detailed description of the proposed statutory rate alternative and an overview of the potential economic effects that may result from it.

2. A cursory examination of inflationary cost pressures, and offsetting technological progress and productivity increases to provide a conceptual understanding of cost changes in an industrial sector. This, in turn, provides a conceptual and analytical understanding of future anticipated cost increases in railway grain transportation that are a central feature of the proposed statutory rate alternative.

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[41] The author is aware that any possible alternative to the statutory grain freight rates will also have economic implications for the various other sectors of the West's grain handling and transportation system. For example, changes to the statutory rates would likely have important effects on the railways, the primary and terminal elevator industry, the commercial trucking industry, Prairie industrialization and regional economies, and the Canadian public in addition to the immediate effects that they would have on Prairie agricultural producers. To identify and quantify all the potential impacts resulting from a statutory rate option, however, would require a detailed micro and macroeconomic analysis that would not be feasible within the constraints (i.e., model, data and time limitations) faced by the author. Of necessity, therefore, the present analysis is restricted to the economic impacts, as defined, on the primary agricultural sector of Manitoba.

3. A discussion of past and future trends in railway cost changes and productivity developments, particularly with respect to grain transportation operations. This provides the basis for making assumptions about the rate of cost increases that may be experienced in grain transportation in future years in the context of the statutory rate option.
4. A presentation of the overall study framework. This includes:
   (a) An overview of the transport and linear programming models, the two main models used in the analysis.
   (b) A description of the base 1978 situation in the Manitoba farm economy and four possible "adjusted" scenarios in grain handling and transportation. In terms of the proposed rate option, the latter four scenarios are adjusted with respect to the producer's relative share of railway grain transport costs as determined by alternative assumptions regarding future rail cost increases.
5. Comparing the empirical results derived for the base production/grain handling and transportation scenario in the Manitoba farm sector to the four adjusted scenarios. Essentially, these four agricultural production comparisons represent a sensitivity analysis on changes in the producer's share of railway grain transport costs over 1978 to 1985.

The overall analysis is followed by a concluding summary, policy implications, limitations of the study and suggestions for further research in this area.

Chapter II

THE STATUTORY GRAIN RATE ALTERNATIVE: AN OVERVIEW

A General Criteria for Statutory Rate Alternatives

Ideally, any proposed alternative to the statutory rates should promote the economic welfare of those engaged in agriculture on the Prairies as well as other groups in society. In particular, it should satisfy a number of specific economic and political criteria, as suggested by Apedaile,[1] the Canada Grains Council,[2] Palisser Wheat Growers' Association[3] and Wilson.[4] The proposed criteria are as follows:

1. Full Railway Cost Recovery: The railways should receive full remuneration for the costs incurred in the movement of statutory grain and the rate structure should incorporate a return sufficient for the support of an on-going adequate maintained rail plant.

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[1]L. P. Apedaile, "Compensating for the Crow Gap," Meat-Grain Interface Project 1976-77, Vol. 2, edited by D. G. Devine (Saskatoon: Department of Agricultural Economics, University of Saskatchewan, 1977), pp. 13-14.

[2]Canada Grains Council, "Report to the Grain Handling and Transportation Committee" (Winnipeg: Canada Grains Council, June, 1977), pp. 1-2.

[3]Palisser Wheat Growers' Association, "Statement of Principles to Resolve Problems Associated With the Crow Rate" (Regina, February 9, 1979), p. 1, 20.

[4]A. G. Wilson, "The Statutory Grain Rates: The Options" (Paper presented at the University of Manitoba Agricultural Economics Conference at Oak Bluff, Manitoba, March 20, 1979), pp. 9-11.

2. Guarantee Producers the "Crow Benefit": If grain producers are to continue to enjoy the monetary benefits presently conferred upon them by the statutory rates,[5] the funds to be distributed either to the grain producer and/or the railways should equate over time to the sum required to compensate the railways on a current basis for the difference between compensatory rates on the movement of grain and their receipts under the present statutory rates. Essentially, the compensation funds must be related to actual financial losses due to compensatory freight rates on grain.
3. Resource Allocation and Comparative Advantage: Resource allocation and comparative advantage[6] should not be distorted by an

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[5]Whether or not Prairie grain producers should be compensated in some manner for any income losses resulting from changes to the statutory freight rates on grain is, to say the least, a controversial and politically sensitive question. To gain a conceptual understanding of this issue and why compensation in some acceptable form to the producer could be justified the interested reader should examine the following: First, welfare economics and the theory of compensation which, in conjunction with efficiency considerations (i.e., first-best pricing rules) provide the pure-economic positivistic dimension of this sensitive policy question. See J. G. Head, Public Goods and Public Welfare (Durham, North Carolina: Duke University Press, 1974), pp. 3-49. And, second, Rawls' theory of distributive justice and its economic implications, which fill the equity or normative void in this issue left by welfare compensation criteria. See J. Rawls, A Theory of Justice (Cambridge, Massachusetts: Harvard University Press, 1971); and S. T. Phillips, "Some Economic Implications of John Rawls' Theory of Justice," Public Finance Quarterly, Vol. 3, No. 1, January, 1975, pp. 70-75.

[6]In terms of utilization of resources and the development of exchange and trade, the Law of Comparative Advantage generally states that a producer (individual, region, or nation) will tend to specialize in the production of the commodities in which it has the highest comparative advantage or the least comparative disadvantage and to obtain by trade the commodities in which it has the least comparative advantage or greatest comparative disadvantage. Essentially, the comparative advantage idea suggests that instead of looking at the absolute level of costs of individual products, we should consider the "opportunity" costs when analyzing trade flow patterns. This concept, which underlies the model used

alternative within the Prairie agricultural sector where the present statutory rate applies. In other words, an alternative to statutory rates should minimize freight rate discrimination to encourage value adding in the livestock, rapeseed, alfalfa and other agricultural processing sectors on the Prairies. Additionally, to maximize resource allocative efficiency within Prairie agriculture, it should be independent from the marketing and pricing of grains and other agricultural products.

4. Efficient Use and Rationalization of the System: An alternative should encourage the optimal use of available plant and "rationalization" of the grain handling and transportation system. In other words, there should be incentives providing for a more efficient system with the patronage of the various transport modes and elevator delivery points on the Prairies being in relation to their real economic costs. However, as Wilson warns, institutional constraints may prove to be a greater deterrent to the attainment of this objective rather than the alternative under consideration itself.

5. Guaranteed Service Levels: At the same time, an alternative to the statutory rates should guarantee that grain producers (or shippers would receive acceptable levels of rail grain transport

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[6](continued)

in this study, is discussed in detail in the following: (1) R. C. Bressler, Jr. and R. A. King, Markets, Prices and Interregional Trade (New York: John Wiley & Sons, Inc., 1970), p. 345; and (2) J. P. Houck and P. K. Pollak, "Basic Concepts of Trade," Speaking of Trade: Its Effect on Agriculture, Special Report No. 72 (St. Paul, Minnesota: University of Minnesota, Agricultural Extension Service, November, 1978), pp. 22-25.

service.

6. Period of Adjustment: A time horizon should be specified to reduce the trauma of adjustment at the farm level in the short run, and to avoid uncertainty regarding a statutory rate alternative. For example, in the case of annuity type compensation payments to grain producers, the time horizon or period of adjustment for the producer should be of some specified duration. This time period would depend on how severe the perceived impacts are from compensatory rates. Ideally, a time horizon should allow smooth production adjustments on the part of producers and, at the same time, it should not be unduly prolonged so as to impose an excessive burden on taxpayers.
7. Equity to Producers: An alternative should be equitable to all producers who lose the benefits of statutory grain rates. Accordingly, grain farmers who sell their production to local domestic markets and realize higher selling prices than they would in the absence of statutory rates, benefit from the rates and hence should also be compensated.
8. Political Acceptability: It is not possible to say whether or not an alternative to the statutory rates would be politically acceptable. However, an alternative to the present freight rates on grain should impart some degree of political acceptability particularly with respect to the following considerations:
   (a) If the producer suffers financial losses due to a change, he should receive adequate compensation according to the theoretical considerations of welfare economics and compensatory justice.

(b) Simplicity and practicability should be key-notes of any alternative with a view to minimize administrative and other costs.

(c) It should be feasible recognizing that there are limits to the financial resources of all levels of government.

(d) It should be immune to misuse and gerrymandering by producers, governments and other concerned parties, and seen to be secure from political interference and pressures.

(e) The alternative should have a relatively high degree of public acceptability.

As Wilson noted, this list of criteria, which is by no means exhaustive, "severly restricts" the number of grain transportation policy options that are worthy of consideration as possible alternatives to the statutory grain rates.[7] In fact, it is almost assured that no alternative to the present rail tariffs on grain and oilseeds would satisfy all the criteria and, at the same time, be acceptable to each of the concerned parties in the Canadian grain trade. This merely demonstrates the complex economic and political problems associated with the statutory rates and why the final resolution of the "Crow" debate is so difficult.

Nevertheless, the above economic and political criteria are essential to an analysis of any alternative to the preferential freight rates on Western grain since they provide a benchmark as to the relative economic and political merits of an alternative.

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[7] Wilson, op. cit., p. 11.

The Statutory Grain Rate Alternative

This study assumes that the statutory grain rates would be replaced by a "Snavely determined" cost-based freight rate[8] largely because of resource-allocative efficiency considerations and, in particular, to improve the capacity and throughput of the grain transportation system "in the face of a growing world market for Canadian export grain and oilseeds".[9] This study also assumes that there would be: A constant per ton subsidy payment to the railways based on the revenue shortfall incurred under the statutory rates in the base year with the remaining compensation for the costs of grain movement provided through the new rate structure.[10]

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[8]The level of compensatory rates used in this analysis is set at 3.4 times the statutory rates in 1978. This estimate is based on the 3.08 variable cost to user revenue ratio (as determined by Snavely, King and Associates for 1977) and a cost increase of 10 percent between 1977 and 1978. It is important to stress, however, that the cost estimates of the updated Snavely report do not include any allowance for contribution to the constant or fixed costs burden of the railways. See Snavely, King and Associates, 1977 Costs and Revenues Incurred by the Railways in the Transportation of Grain Under Statutory Rates (Report prepared for the Ministry of Transport, Federal Government of Canada, September, 1978), p. 79; and The Commission on the Costs of Transporting Grain by Rail, Report, Vol. I (Ottawa: Supply and Services, Canada, October, 1976), pp. 60-67.

[9]Booz-Allen & Hamilton, Inc. and IBI Group, Grain Transportation and Handling in Western Canada (Report prepared for the Department of Industry, Trade and Commerce, The Grains Group, Federal Government of Canada, July, 1979), p. I-6.

[10]As previously stated, the resolution of the sensitive policy issue of whether or not the grain producer should be compensated for any loss of income resulting from an alternative to the statutory rates is an interesting exercise in applying the theoretical concepts of welfare economics and Rawls' theory of distributive justice. However, given that this is beyond the scope of the present analysis, the explicit assumption is made that full compensation to the producer is justified based on the premises that: (1) We accept the present pre-policy situation with respect to grain transportation in Western Canada as the status quo

Under this constant per-ton subsidy alternative, the railways would receive an annual compensation payment from the Federal Government that would be based on both their revenue shortfall[11] and the volume of statutory grain traffic[12] in the base year, 1978. Thereafter, under conditions of continuing inflation in railway costs, the railways would be allowed to obtain the remainder of the costs of transporting grain by rail through annual increases in the rates on this traffic. The annual adjustments in rail tariffs for grain would be based upon the 12-month increase in railway costs as determined annually by, say, the Canadian Transport Commission's Railway Transport Committee. The result of this "compensation scheme" is that both current and new grain producers would absorb all future increases in the costs of transporting grain by rail. In other words, the Prairie grain producer shipping "statutory" grain destined for export markets would, in effect, be the recipient of a constant per-ton transport subsidy that applied to changing export levels of grain and declined in real value over time. Essentially, this

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[10](continued)

distribution of economic welfare; and (2) We assume that protecting the grain producer to a certain extent from higher grain freight rates is one of the society's guiding principles of social distributive justice in Canada.

[11]For the year 1978, the revenue shortfall incurred by the railways in transporting statutory grain is derived from the cost estimates provided by Snavely, King and Associates, op. cit., pp. 75-83, for the year 1977. See footnote 8.

[12]The statutory rates presently apply to grain and grain products, flour, flaxseed and rapeseed transported by rail from points in the four Western Provinces to Thunder Bay, Ontario for both domestic and export uses and to Vancouver and Prince Rupert, B.C. and Churchill, Manitoba, for export only. For purposes of this analysis, however, the proposed constant per-ton subsidy was restricted to grains and oilseeds exported abroad.

statutory grain rate alternative may be a gradual movement to a user-pay situation with respect to rail movement of grain on the Prairies depending on future cost increases in rail transport of grain.

To illustrate how future increases in the cost of transporting grain by rail would be reflected back to grain producers in the context of this alternative, consider Table 2. As can be seen from this table, the distribution of railway grain transport costs between the grain producers and the Federal Government changes over the 1978-85 period. With an assumed 10 percent annual increase in total grain transport costs, the producer's (or user's) share of these costs, whether measured on a nominal or real dollar basis, increases relative to the government's share, as represented by the subsidy payment. In fact, over the seven year period, the real 1978 value of the government subsidy payment declines from $10.46 per ton or 70.5 percent of the total cost to $5.37 per ton or 36.2 percent. In contrast, the grain producer's share of the real cost of rail transport services increases from $4.38 per ton or 29.5 percent of the total real cost to $9.47 per ton or 63.8 percent. From a different perspective, the real value of grain transport costs borne by the producer rise 116 percent over the 1978-85 period while the real value of costs absorbed by the Federal Government decline 49 percent.

In terms of the analysis of the potential impacts of increases in grain transportation costs on primary agricultural producers, the important consideration would be how fast grain transport costs inflate over the 1978-85 period and, consequently, how fast the real value of the Federal Government per-ton subsidy payment declines in real value

Table 2. The Changing Distribution of Railway Grain Transportation Costs Over the 1978-85 Period with an Assumed Annual Cost Increase of 10 Percent.

Year	Total Variable Rail Costs[a]	Federal Government Subsidy Payment[b]		User's Share of Total Costs	
	nominal dollars per ton (%)				
1978	14.84	10.46	(70.5)	4.38	(29.5)
1979	16.32	10.46	(64.1)	5.86	(35.9)
1980	17.96	10.46	(58.3)	7.50	(41.7)
1981	19.75	10.46	(52.9)	9.29	(47.1)
1982	21.73	10.46	(48.1)	11.27	(51.9)
1983	23.90	10.46	(43.8)	13.44	(56.2)
1984	26.29	10.46	(39.8)	15.83	(60.2)
1985	28.92	10.46	(36.2)	18.46	(63.8)
	1978 dollars per ton (%)[c]				
1978	14.84	10.46	(70.5)	4.38	(29.5)
1979	14.84	9.51	(64.1)	5.33	(35.9)
1980	14.84	8.65	(58.3)	6.19	(41.7)
1981	14.84	7.85	(52.9)	6.99	(47.1)
1982	14.84	7.14	(48.1)	7.70	(51.9)
1983	14.84	6.50	(43.8)	8.34	(56.2)
1984	14.84	5.91	(39.8)	8.93	(60.2)
1985	14.84	5.37	(36.2)	9.47	(63.8)

[a]The weighted average variable cost per ton for the base year, 1978, was derived using the per ton cost estimates and the shares of statutory grain traffic for the two major railways. For CN and CP in 1977, the average variable cost per ton estimates were $13.77 and $13.29 while their respective shares of total statutory grain movements were 41.4 percent and 58.6 percent. The weighted average cost per ton was then indexed up by 10 percent to give an approximation of the 1978 variable cost of transporting grain by rail. Similarly, thereafter this 1978 figure was indexed up by 10 percent on an annual basis.

[b]The initial Federal Government subsidy payment of $10.46 per ton in 1977 was based on the ratio, total variable cost to user revenue, which was estimated to be 3.39 in 1978. Dividing the total cost of transport through by this ratio yielded the producer's share of the total cost (i.e., 14.84 ÷ 3.39 = 4.38). The government portion was then simply the difference between the total cost and the producer's share (i.e., 14.84 - 4.38 = 10.46). In nominal dollars, the federal payment remained at the 1978 level of $10.46 per ton while the producer's share increased to make up the 10 percent annual cost increase.

Table 2. (continued)

[c]"Real" or 1978 dollars are used in order to net out the real change in transport costs borne by the producer and to show how the real value of the government subsidy declines over time with cost increases of 10 percent per annum.

Source: Snavely, King and Associates, 1977 Costs and Revenues Incurred by the Railways in the Transportation of Grain Under Statutory Rates (Report prepared for the Ministry of Transport, Federal Government of Canada, September, 1978).

over the same period.[13] Conversely, this can be viewed as how fast the grain producer's relative share of the total real cost of transporting grain by rail increases over the relevant study period.

To predict the extent of any real transport cost increases borne by producers under the proposed statutory rate alternative requires that one make certain assumptions regarding future increases in the cost of transporting grain by rail. However, the actual extent of cost increases that a particular sector of any economy may experience will, as Chapter III bears out, largely depend upon the mix of inflationary cost pressures and offsetting productivity growth experienced by that sector. Thus, to predict the annual increase in railway grain transportation costs in this study also requires that one consider the prime determinants of future cost increases in this sector. In other words, one must also make assumptions regarding the mix of possible inflationary cost pressures and productivity increases that may be experienced in rail transportation of Western grain between 1978 and 1985.

The Potential Economic Effects

In terms of the potential economic effects, the proposed statutory grain rate alternative would probably have economic effects including distributional impacts on primary agricultural producers, Prairie industrialization and rural economies, the railways, elevator companies, governments and society. All of the above potential implications are extremely important from a public policy perspective and within a general equilibrium analysis, due consideration would be given to them for the most part.

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[13]The specifics of the actual freight rate increase methodology employed in the analysis are presented in detail in Appendix C.

However, it would be extremely difficult and infeasible to model and analyze all of these expected economic effects and distributional impacts resulting from this particular statutory rate alternative, given the available modeling techniques and time and resource constraints. Of necessity, therefore, the present study only attempts to model the economic effects on primary agricultural producers in Manitoba. This is primarily in terms of changes in the level and distribution of primary agricultural production and changes in net income in the Province's agricultural sector as estimated by the overall study framework.

In terms of the potential economic implications of this constant per-ton subsidy on the agricultural economy of Manitoba, the grain producer should not experience any significant adverse income and employment effects in the short run, "ceteris paribus". But in the long run with a declining level of "Crow" benefits and the grain producer absorbing higher nominal freight charges for export grains and oilseeds, we should expect to see some production adjustments on his part and the resultant income and employment effects. However, as the Canada Grains Council[14] points out, any production adjustments should be relatively smooth, being spread out over a lengthy period and therefore be relatively acceptable to them.

Thus, this alternative may be relatively acceptable to the grain farming community given that the benefits under this transport subsidy would be enjoyed by all grain producers (present and new) who ship their eligible grain products by rail to export positions.

The benefits conferred upon grain growers by this statutory rate

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[14]Canada Grains Council, op. cit., p. 33.

alternative, however, would likely remain capitalized in current crop land values. But this capitalization, which represents an additional cost to new producers and present producers wishing to expand their operations, would likely decline in real value over time just as the real value of the transport subsidy would also decline under anticipated inflationary conditions.[15]

In addition, the present privileged position of grain producers on the Prairies relative to livestock producers would be eroded over time as the freight rates on grain increase. In other words, the so-called disparity between meat and grain freight rates would diminish gradually. Consequently, comparative advantage with respect to primary agricultural production and value-added processing activities should eventually prevail on the Prairies as feed grain prices fall in a long term static sense (ignoring the economic effects of other agricultural policies and programs such as Feed Freight Assistance).

The reasonableness and relatively simplistic nature of this constant per-ton subsidy scheme may be questioned by some since it does not allow for changing grain prices or changing farm input costs. More importantly perhaps, some may object to this apparent open-ended federally

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[15]One estimate of this capitalization of "Crow Gap" benefits into land values, which may be high, has been provided by G. A. MacEachern, Retention of the Crow Rate and the Alberta Livestock Economy (Ottawa: Agricultural Economics Research Council of Canada, 1978), p. 31. He estimated that the capitalized benefits have inflated the values of improved Alberta crop land approximately $142 per acre between 1972 and 1978. However, this estimate appears to be unrealistically high; a study currently underway in the Department of Agricultural Economics at the University of Manitoba suggests a capitalized benefit of about $33 per improved acre of Manitoba farmland in 1978. See V. J. Fields, "The Impact of Statutory Freight Rates on Land Values in the Prairie Provinces" (M.Sc. thesis in progress, University of Manitoba, May, 1980).

funded compensation scheme on feasibility grounds since the attendant financial benefits are not restricted to current grain producers and the volume of export grain eligible for the subsidy is not limited to the 1978 base year volume.

However, an export-based indirect transport subsidy of this nature, administered through the auspicies of, say, the Canadian Wheat Board or the Canadian Transport Commission, may be worthy of consideration as a realistic and appealing alternative to the statutory grain rates given the current economic and political conditions in the Western grains industry and the Canadian economy as a whole. As A. C. Wilson,[16] Research Director, Canada Grains Council, attests, a fixed subsidy of this nature would be relatively easy to administer, the necessity for regulation minimized and the government financial commitment would become relatively less onerous over time to taxpayers as transportation costs progressively increased given the anticipated continuance of inflation. From the standpoint of efficient resource allocation both within Western agriculture and between transportation options, a fixed per-ton subsidy mechanism should approach a relatively neutral position over time, again "ceteris paribus". Consequently, the present distortions between grain and livestock production would gradually be reduced and there would be a shift toward agricultural production in accord with comparative advantage with attendant benefits to society. From the standpoint of the Western grain producer, this proposed freight rate policy would have the effect of reducing the trauma of adjustment at the farm level in the short run while, at the same time, guaranteeing the grain producer the nominal-1978

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[16]Wilson, op. cit., pp. 17-18.

benefit of the statutory rate.

The Study Period

The study period, 1978 to 1985, was chosen for the empirical analysis for following general reasons:

1. The 1977/78 crop year was a relatively normal year for the Western grain economy based on the past five year averages for the volume of production of principal crops in the Western Provinces and payments to producers.[17]
2. Timeliness, data availability and relevance also warranted the use of the latest year, 1978, as the appropriate base year for the study.
3. The relatively short time horizon, 1978 to 1985, was judged appropriate in modeling the proposed statutory rate alternative. The author believes that extending the study period beyond 1985 would do little to enhance the reasonableness, accuracy and relevance of the results from a policy perspective.
4. The selection of the study period was also reinforced by the current general mood in the Canadian grains industry which appears to have set 1985 as the upper limit of the current short term planning horizon. For example, 1985 has been set as a

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[17] See the Canadian Wheat Board, The Canadian Wheat Board Annual Report 1977/78 (Winnipeg: Canadian Wheat Board, 1979); and the Canada Grains Council, Canadian Grains Industry Statistical Handbook 1979 (Winnipeg: Canada Grains Council, 1979). At this point, it is important to note, however, that in the analysis actual 1978 yields for the six principal grain and oilseed crops were not used. Instead, regressed yields based on Manitoba Crop Insurance Commission data for the 1960-1976 period were used. This was to remove possible production biases from the analysis and ensure that the 1978 base year approximated more closely a normal year in terms of the volume of crop production.

target date for carrying anticipated increases in Canadian grain exports of more than 50 percent, and brining on stream new capital equipment and facilities and improvements in the Western grain handling and transportation system.[18]

To facilitate the modeling of the economic effects on Manitoba agricultural producers resulting from this grain transportation policy option requires that one make certain assumptions. As previously mentioned, these assumptions relate to the possible rates of cost increases and, hence, the mix of inflationary cost pressures and productivity growth that may be experienced in rail transportation of grain over the 1978 to 1985 study period. Non-inflationary pressures such as a price level adjustment to a random shock of some nature may also impact in future grain transport costs. However, the discussion in this study will be confined to those cost increases and resultant changes in relative product prices received by grain producers that are brought about by inflationary pressures in the economy.[19]

However, before the exact model assumptions and scenarios associated with the statutory grain rate alternative under consideration can

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[18]For example, see O. Lang, "Can Canada _really_ export 1¼ billion bushels of grain a year by 1985? Let's make sure!" Insert advertisement supplement to _Grainews_, March, 1979; and Booz-Allen & Hamilton, Inc. and IBI Group, _loc. cit._

[19]This leads into the difficult question what is a cost increase resulting from pure market adjustment (or the interplay of the so-called "natural" economic forces of supply and demand) and what is an inflationary cost increase? As described in the following chapter, the difference between these two sources of price variation is largely conceptual in nature, lying in the distinction between changes in relative prices and changes in the average level of prices. In actual practice, however, the distinction between true price variation and inflationary price increases will not be as distinct as suggested in this paper.

be specified, it is first necessary to discuss the prime determinants of cost changes in an industrial sector; namely, inflationary cost pressures, technological change and productivity increases. Once these interrelated phenomena are put in a Western Canadian grain transportation context, they provide a conceptual and analytical understanding of the proposed alternative to the statutory grain rates and they provide a basis as to the reasonableness of the assumptions that it employs.

Chapter III

COST CHANGES IN AN INDUSTRIAL SECTOR: A THEORETICAL FRAMEWORK

Inflationary cost pressures and productivity growth are two important determinants of the level and quality of economic performance in an industrial sector. Inflationary cost pressures tend to put upward pressures on prices in a sector while productivity increases contribute to real economic growth that a sector may experience. Perhaps more importantly, these two macroeconomic phenomena interact: increases in productivity act as a constraint on rising costs while under certain economic conditions inflation dampens productivity growth. In addition, a decline in the rate of productivity can represent a significant source of inflation, particularly in the short run.

Inflationary cost pressures and productivity growth and its sources represent the theoretical framework for the proposed statutory rate alternative. Future growth in Canadian railway productivity either through technological change or its other sources can be expected to dampen anticipated inflationary cost pressures in the railway sector, thereby reducing the size of price increases needed to ensure the economic viability of the railways. Given the divisional structure of the major Canadian railways, one could expect improved productivity performance of the railways to spillover into their grain related operations. This would presumably reduce the size of price increases needed to sustain financial viability of the railway grain transportation system while

maintaining an acceptable quality of service. From the standpoint of Prairie grain producers, the mix of inflationary cost pressures and productivity growth in railway grain transportation is especially important since producers are expected to absorb 100 percent of future cost increases for grain transport services. Thus, in the context of the proposed statutory rate alternative, inflationary cost pressures and productivity growth in railway grain transportation are the major determinants of the changing distribution of grain transport costs over the 1978-85 period.

Given the above, this chapter provides a brief overview of inflationary cost pressures, technological change and productivity growth. The intent here is not to provide a penetrating analysis of these complex macroeconomic phenomena. Rather, the objective is to provide a basic understanding of their interaction in an industrial sector and, hence, put them into perspective in terms of the proposed statutory rate option.

Inflation

In an economic sense, the term inflation[1] is probably best defined as a persistent and appreciable rise in the general price level or average level of prices with the percentage changes not quite uniform

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[1]For a comprehensive explanation of the inflationary process, its effects and its policy implications, the reader is advised to see the following: (1) W. H. Branson and J. M. Litvack, Macroeconomics (New York: Harper & Row, Publishers, 1976); (2) J. A. Trevithick and C. Mulvey, The Economics of Inflation (London: Martin Robertson & Co., Ltd., 1975); and (3) a collection of articles and speeches under title, Federal Reserve Readings on Inflation, edited by the Federal Reserve Bank of New York (New York: Federal Reserve Bank of New York, 1979).

and with no compensating advances in output quality.[2] Trevithick and Mulvey[3] claim that this definition is sufficiently elastic to embrace phenomena such as "hyper-inflation", "stagflation" and "creeping inflation", conceptual and measurement problems notwithstanding. Alternatively, inflation can be defined as a decline in the purchasing power of money. As Bond and Shearer[4] point out, inflation involves a decline in the real value of anything (subsidy payments included) whose nominal value in terms of the unit of account is fixed.

Inflationary vs Relative Price Changes

Being able to differentiate between changes in relative prices and an increase in the general level of prices (i.e., inflation) is fundamental to any economic analysis of price changes. This distinction, as mentioned previously, introduces the largely conceptual questions: What is a price change resulting from the interaction of the so-called "natural" economic forces of supply and demand for an individual good and is there such a thing as an inflationary price increase for an individual good or service?

According to the economic literature, changes in relative prices -- for example, the price of wheat going up, while the price of barley goes down -- occur in response to shifts in the supply and demand for individual goods. Here there is a presumption that a desirable economic

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[2] F. M. Scherer, Industrial Market Structure and Economic Performance (Chicago: Rand McNally College Publishing Company, 1970), p. 288.

[3] Trevithick and Mulvey, op. cit., p. 1.

[4] D. E. Bond and R. A. Shearer, The Economics of the Canadian Financial System: Theory, Policy and Institutions (Scarborough: Prentice-Hall of Canada, Ltd., 1972), p. 86.

function is performed; that is, a relative price change allocates resources and encourages the production of goods and services in accordance with consumer demand.[5]

On the other hand, inflation refers to an increase in the general price level[6] in an economy. Inflation, however, is likely in fact to be associated with changes in relative prices since under inflationary conditions, particularly rapid and variable ones, it is highly improbable that all prices would change an identical amount. In terms of the economic significance of inflations, there is a presumption that it tends to make the economic system less efficient by causing a distorted flow of resources towards those segments most able to adjust to the inflationary process.[7] Therefore, a change in relative prices can be categorized as a microeconomic phenomenon while inflation tends to be a macroeconomic phenomenon.

Given that inflation applies to a myriad of individual prices which constitute a general level of prices, it would be incorrect, at least conceptually, to label increases in the cost of one particular good or service as inflationary when this price change is viewed in isolation. In this context, it would be equally incorrect to label increases in the costs of grain transport services as inflationary when

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[5]See P. Wonnacott, Macroeconomics (Homewood, Illinois: Richard D. Irwin, Inc., 1974), pp. 294-295.

[6]The general price level, simply defined, is a statistical averare of prices that is used to monitor the direction and rate of change of many prices at some point in time relative to a base year or period of years. See R. J. Ball, Inflation and the Theory of Money (Chicago: Aldine Publishing Co., 1964), p. 17.

[7]Wonnacott, loc. cit.

viewed in isolation from other farm input costs; they are simply cost increases which are a contributing factor in the rate of inflation in farm input costs. Thus, future cost increases for shipping grain by rail could be termed inflationary when considered in the aggregate with other farm input cost pressures experienced by grain growers as reflected in the Farm Input Price Index.

One of the objectives of the forthcoming analysis, therefore, is to isolate the projected inflationary increases in grain transport costs from any real relative changes in these costs that grain shippers might bear over the 1978-85 period. Typically, sorting out relative price changes from inflationary price changes stems from the distinction between "nominal" or "current" economic variables and "real" or "deflated" economic variables. Nominal economic variables (i.e., wages, prices and output) are expressed in dollars current in each year. On the other hand, real or deflated economic variables have been divided by an "appropriate" price index to net out the effects of price changes over time and, hence, facilitate more meaningful comparisons of economic variables.

Equally important to the discussion of the inflationary dimension of the proposed statutory grain rate alternative is the identification of some of the forces that may give rise to inflationary cost pressures. In this context, the following section briefly examines those theories of inflation which may be particularly relevant to inflationary cost pressures in railway grain transportation in Western Canada.

Relevant Theories of Inflation

Typically, economists have advanced two principle theories of inflation to explain inflations in advanced economies. These include:

(1) demand-pull inflation which, in very simple terms, frequently results from excessive demand pressures placed on an economy at existing prices; and (2) cost-push inflation which has its impetus on the supply side of the economy. Demand-pull inflation may be relevant to a discussion of future cost increases that may be experienced in transporting grain by rail. However, it is extremely difficult if not impossible to relate this source of inflation to the discussion given that continued government regulation of grain freight rates can be expected even under the proposed statutory rate option. Accordingly, the following discussion centres on cost-push inflationary forces.

However, as the reader proceeds through this cursory overview of popular cost-push inflation theories, it is important to bear in mind that simple unambiguous classification of actual inflationary situations is often difficult and impossible since elements of both the demand-pull and cost-push models may co-exist and interact.

Cost-Push Inflation. At the risk of being over simplistic, a pure cost-push inflation is illustrated in Figure 1. It arises when there is an exogenous upward shift in the economy's aggregate supply curve with the economy at its full-employment level of output (Y_0), with no change in demand and with no change in the money income level. The upward shift of the curve creates excess demand at the initial price level (P_0) raising prices but bringing a reduction in equilibrium output.

According to Shapiro,[8] there are two principle causes of inflationary shifts in the aggregate supply function, both of which represent

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[8] E. Shapiro, Macroeconomic Analysis, 2nd edition (New York: Harcourt, Brace & World, Inc., 1970), pp. 519-523.

the exercise of market power by specific groups in the economy. One is higher money wages secured by labor unions, and the other is higher prices secured by business firms in monopolistic or oligopolistic industries. For purposes of classification, these two principle causes of inflation on the supply side are referred to as wage-push and profit-push, respectively.

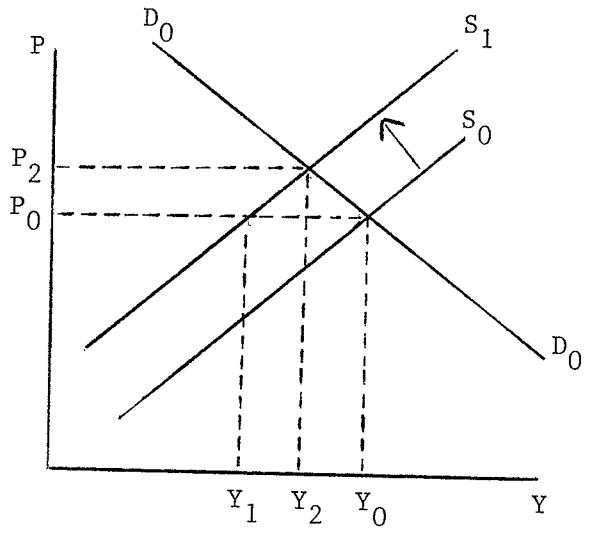

Figure 1. Cost-Push Inflation

Source: W. H. Branson and J. M. Litvack, Macroeconomics (New York: Harper & Row, Publishers, 1976), pp. 321, 323.

Wage-Push Inflation. With wage-push inflation, wage rate increases outpace productivity increases and there is the consequential upward shift in the aggregate supply function. The concept of wage-push inflation is limited to increases in labor costs that are the cause and not the result of higher prices. Wage-push inflation can follow only from aggressive organized labor with sufficient strength to push up wage rates in the absence of any excess demand for labor. Given that Canada's two major railways, Canadian National and Canadian Pacific, are highly unionized in terms of labor organization, the wage-push inflation theory

may be relevant to any discussion regarding future rail cost increases in Canada.

Profit-Push Inflation. Profit-push inflation, another variant of the cost-push variety, is the result of oligopolists and monopolists who, in their drive toward greater profits, raise prices more than enough to offset any cost increases. The existence of imperfectly competitive markets in the sale of goods and services is a prerequisite to profit-push inflation. Where competitive forces are lacking, sellers may be able to "administer" prices for their goods. In an economy where so-called administered prices abound, there is the possibility that these prices may be administered upward faster than costs in an attempt to earn greater profits with the resultant profit-push inflation.

Profit-push inflation resulting from both market power on the seller's side and a reduction in the supply of inputs used in a productive process may also be particularly relevant to this study in terms of future rail cost developments. For example, severe cost-push inflation like that experienced by many of the industrialized economies since 1973-74 because of the Organization of Petroleum Exporting Countries' (OPEC) administered oil price increases seems almost certain to continue in the near future. Crude oil price increases, in turn, work themselves through the various sectors of the economy with the transportation sector naturally being one of the most susceptible to these cost increases.

Technological Progress and Productivity Increases

As elaborated earlier, productivity performance is especially relevant to the theoretical framework of the proposed statutory rate alternative since increased railway productive efficiency would tend to

offset cost-push inflationary pressures that might be experienced by the railway sector. The following discussion investigates the concept of productivity and the principal factors that contribute to it in an industrialized economy.[9]

Increased productivity generally refers to the residual from the growth of output when we remove the effects of increases in the quantities of all factor inputs. As Dhruvarajan and Harris[10] point out, this residual increase in economic output not explained by increased inputs is often interpreted as the result of "technological change".

Technological change, a somewhat abstract concept, is usually defined as a change that results in a shift in the production function upwards through time.[11] The production function in its simplest form is the relationship between physical quantities of inputs -- in the form of land, labor and capital -- and physical quantities of output. An economically meaningful technological change is one that permits either the production of a given output with less inputs or the production of more output with unchanged inputs. Regardless of how technological change is viewed, the marginal product of labor and/or capital is assumed to have increased relative to another productive process or previous time period.

Capital-embodied technological progress assumes that new machines or productive processes are more efficient than old ones while labor-

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[9]For an interesting productivity analysis, but in a commercial airline context, see P. S. Dhruvarajan and R. F. Harris, A Productivity Study of the Canadian Airline Industry, Report No. 10-78-93 (Ottawa: Research Branch, Canadian Transport Commission, March, 1978).

[10]Ibid., p. 64.

[11]Shapiro, op. cit., p. 230.

embodied technological progress assumes that changes in the quality of the labor force either through education, increased experience or a change in age-sex composition will increase labor productivity. In the neutral, disembodied technological progress model introduced by Solow neither capital or labor is as important as the fact of technological change and less can be expected of economic growth policies that alter the growth rate of labor or capital.[12] What the Solow model is perhaps alluding to is the fact that productivity increases are not restricted to changes in the capital and/or labor stock; they are also organizational in nature. Indeed, significant technological change stems from organizational and administrative changes which, in terms of productivity increases, manifest themselves in not just increased capital or labor productivity, but also increased managerial efficiency. In addition, increased productivity may result from changes in the production environment (i.e., public policy and regulations).

Despite the controversy among economists as to what is the most important source of technical change -- growth in the capital stock assuming that technical change has its impact through new capital stock, improvements in the quality of labor, organizational and administrative changes or technical change itself -- it appears that "technological change has in the long run reduced the capital-output ratio and the labor-output ratio."[13] In other words, technological change, generally regarded as the most important source of real economic growth in highly developed economies, has been both capital saving and labor saving. Therefore,

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[12]See Branson and Litvack, op. cit., p. 390.

[13]Shapiro, op. cit., p. 234.

technological progress and resultant productivity increases may be expected to result in a reduction in costs and expansion of industrial output.

Another important emerging dimension to the inflation/productivity relationship is the impact of inflation on productivity and the impact of lagging productivity on inflation. It is now generally recognized in the economics profession that inflation impairs productivity. In particular, as Ruttan[14] recently pointed out, inflation erodes the capacity of public sector institutions to provide the services needed to enhance productivity in the private sector. Ruttan also argued that a decline in the rate of growth in productivity can represent a significant source of inflation, particularly in the short run when an economy is characterized by substantial structural rigidities. Thus, in addition to the basic tenet that productivity growth offsets inflation, it can also be stated that under certain economic and political conditions, inflation dampens productivity growth and slower productivity growth contributes to inflation.

Wages, Prices and Productivity

An appropriate way of capsulizing the interaction between inflation and productivity growth would be to review the basic wage-price-productivity relationship. In a very simplistic manner, it provides the analytic basis for understanding inflationary and non-inflationary wage and price increases. In its briefest forms, the basic rule for non-inflationary wage increases is that annual percentage increases in nominal wage

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[14] V. W. Ruttan, "Inflation and Productivity," American Journal of Agricultural Economics, Vol. 61, No. 5, Proceedings Issue, December, 1979, pp. 896-902.

rates should not exceed the rate of labor productivity increases otherwise a cost-push inflation may be generated. The general price rule is that in industries or firms where productivity rose faster than the national average, prices should fall by an amount to reflect this difference, and in industries where productivity lags, prices should rise, maintaining approximate price stability. This wage-price-productivity relationship, which formed the basis of the U.S. Council of Economic Advisors' wage-price guideposts of 1962,[15] would, if adhered to in an idealized setting, provide overall price stability in an economy, maintain a constant average unit labor cost and diminish the distributional effects of inflation (political and economic difficulties notwithstanding).

To put the interrelated phenomena of inflationary cost pressures and productivity changes in perspective in terms of this study, the following economic generalizations should be noted:

1. Inflation, which is usually defined as an appreciable rise in the general level of prices, involves a decline in the real value of anything (subsidy or bond payments) whose nominal value in terms of the unit of account is fixed over time.
2. Inflationary cost pressures differ in the various sectors of an economy due to a variety of factors including the exercise of market power by specific groups in an economy (i.e., labor unions and oligopolistic sellers).
3. Productivity gains stem from technological advances embodied in changes in the stock of capital and labor inputs, and

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[15] See Branson and Litvack, op. cit., pp. 331-333.

organizational and administrative changes. Due to the diverse nature, structure and environments of an industrialized economy, productivity gains vary widely by firm and industry.

4. Productivity increases tend to offset inflationary pressures in an economy and hence contribute to price level stability. Furthermore, under certain conditions, inflation dampens productivity growth, and lagging or slower productivity growth can represent a significant source of inflation.
5. Thus, the actual extent of cost increases experienced by a particular sector of an economy will, of course, largely depend upon the mix of inflationary cost pressures and productivity growth experienced by that sector.

As the next chapter bears out, these economic generalizations are equally applicable to the grain handling and transportation industry in Western Canada.

Chapter IV

COST INCREASES AND PRODUCTIVITY IN CANADIAN RAILROADING: PAST AND FUTURE TRENDS

This chapter reviews past cost increases and productivity growth experienced by major Canadian railways and, in particular, their Western grain transportation divisions. It also discusses future anticipated rail cost and productivity developments to 1985. An overview of both past and future anticipated rail cost and productivity developments is a prerequisite for anyone making assumptions regarding the rate of cost inflation and productivity increases that may be experienced in Canadian grain handling and transportation to 1985.[1] In this context, the underlying objective of this chapter is to help frame a range of possible future cost increases in Western railway grain transportation between 1978 and 1985 that are used in the analysis.

Past Cost Increases and Productivity

Past Cost Increases in Canadian Rail Operations

Since the early 1970's, rail transport costs in Canada have been rising at an appreciable rate in response to "inflationary cost pressures in the economy of which fuel prices have been the most spectacular".[2]

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[1] It should be made clear here that when one is talking about potential productivity increases in the grain transportation system, the grain producer and the primary and terminal elevator sub-system cannot be overlooked since they form integral parts of the overall system.

[2] Canadian Transport Commission, Transport Review: Trends and Selected Issues (Ottawa: Supply and Services, Canada, March, 1979), p. 17.

For 1973-1977, railway traffic and operating statistics show that for Canada's six major Class I and Class II railways, which represent 95 percent of the industry, railway expenses on a per unit of output basis increased at an average annual rate of 13.2 percent (see Table 3).[3] The comparative estimate for all 33 common carrier railways operating in Canada (i.e., Class I, Class II, Class III and Class IV) shows that cost per unit of output increased at an average annual rate of 13.4 percent during the same period (see Table 4).[4]

To derive an estimate of the cost increases experienced by the grain transportation divisions of Canada's two major railways, Canadian National and Canadian Pacific, the cost estimates of the "Snavely" Commission on the Costs of Transporting Grain by Rail[5] and the updated report by Snavely, King and Associates[6] were used. These two technical studies made a determination of the variable costs incurred and revenues received by the railways for the transportation of statutory grain in the calendar years 1974 and 1977, respectively.

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[3]Statistics Canada, Railway Operating Statistics, Catalogue 52-003 Monthly (Ottawa: Supply and Services, Canada, December, 1973-1978).

[4]From these estimates of rail cost changes, it is difficult to determine what the mix of inflationary cost pressures and offsetting productivity increases were during the 1973-77 period. Furthermore, without a detailed analysis, it is difficult to distinguish the "inflationary" and "market adjustment" components of these rail cost changes.

[5]The Commission on the Costs of Transporting Grain by Rail, Report, Vol. I (Ottawa: Supply and Services, Canada, October, 1976).

[6]Snavely, King and Associates, 1977 Costs and Revenues Incurred by the Railways in the Transportation of Grain Under Statutory Rates (Report prepared for the Ministry of Transport, Federal Government of Canada, September, 1978), pp. 76-77.

Table 3. Estimated Average Change in Operating Expenses for Canada's Six Major Class I and Class II Railways[a] Between 1973 to 1977.

Year	Freight and Passenger Car-Miles[b] (Total Rail Service)	Total Operating Expenses[c] (Dollars)	Cost per Car-Mile[d] (Dollars)	Percentage Change
1973	4,606,076,272	1,895,612,456	0.4116	-----
1974	4,855,410,502	2,356,582,695	0.4833	17.42
1975	4,676,543,133	2,636,255,848	0.5637	16.64
1976	4,601,903,899	2,873,899,127	0.6245	10.79
1977	4,641,467,441	3,126,056,070	0.6734	7.85
1973-77 Average Percentage Change				13.18

[a]The six major Class I and Class II railways operating in Canada between 1973 and 1977 include: Canadian National, Canadian Pacific, the Ontario Northland, the British Columbia Railway, the Quebec North Shore and Labrador Railway, and the Chesapeake and Ohio. These lines, in terms of operating revenues and other performance indicators represent about 95 percent of the rail industry.

[b]Freight car-miles included loaded, empty and caboose while passenger car miles included passenger carrying cars, head-end in baggage service and head-end in mail and express service.

[c]Total railway operating expenses included: road maintenance, equipment maintenance, traffic, transportation, railway line, miscellaneous operations and general expenses.

[d]To calculate annual cost per car-mile, total operating expenses were simply divided by total rail service.

Source: Statistics Canada, Railway Operating Statistics, Catalogues 52-003 Monthly, December 1973-1978 (Ottawa: Supply and Services, Canada).

Table 4. Estimated Average Change in Operating Expenses for 33 Common Carrier Railways in Canada Between 1973 to 1977 Using Three Measures of Railway Output.

Year	Freight and Passenger Car-Miles	Total Operating Expenses (Dollars)	Cost per Car-Mile (Dollars)	Percentage Change
1973	4,653,874,846	2,032,983,640	0.4368	-----
1974	4,875,667,472	2,512,922,201	0.5154	18.00
1975	4,683,362,502	2,801,966,600	0.5983	16.09
1976	4,652,207,291	3,075,927,965	0.6612	10.51
1977	4,696,303,174	3,349,043,625	0.7131	7.85
1973-77 Average Percentage Change				13.11

Year	Train-Miles	Total Operating Expenses (Dollars)	Cost per Train-Mile (Dollars)	Percentage Change
1973	88,743,464	2,032,983,640	2.2909	-----
1974	96,953,785	2,512,922,201	2.5919	13.14
1975	88,696,349	2,801,966,600	3.1591	21.88
1976	87,259,305	3,075,927,965	3.5250	11.58
1977	86,894,288	3,349,043,625	3.8542	9.34
1973-77 Average Percentage Change				13.99

Year	Locomotive Unit-Miles	Total Operating Expenses (Dollars)	Cost per Unit-Mile (Dollars)	Percentage Change
1973	246,752,159	2,032,983,640	8.2390	-----
1974	263,213,616	2,512,922,201	9.5471	15.88

Table 4. (Continued)

Year	Locomotive Unit-Miles	Total Operating Expenses (Dollars)	Cost per Unit-Mile (Dollars)	Percentage Change
1975	248,149,497	2,801,966,600	11.2915	18.27
1976	242,539,635	3,075,927,965	12.6822	12.32
1977	249,103,723	3,349,043,625	13.4444	6.01
1973-77 Average Percentage Change				13.12

Overall 1973-77 Average Percentage Change:

$$\frac{13.11 + 13.99 + 13.12}{3} = 13.41$$

[a]Common carrier railways in Canada, which come within the legislative authority of the Canadian Transport Commission, hold themselves out to transport passengers and/or goods for compensation and have been declared to be for the general advantage of Canada. These railways include Class I (CN and CP Rail), Class II (other carriers having average gross revenues of $500,000 or more annually), Class III (carriers having average cross revenues less than $500,000 annually) and Class IV (other companies which report under the Railway Act, such as terminal, bridge and tunnel companies).

Source: Statistics Canada, Railway Transport: Part I Comparative Summary Statistics 1973-1977, Catalogue 52-207 Annual (Ottawa: Supply and Services, Canada), pp. 18-19.

According to the report by Snavely et al, the average variable cost per ton incurred by CN in the transportation of statutory grain increased by only 11.1 percent over the 1974-1977 period. In 1974 CN's average variable cost per ton was $12.39 compared to $13.77 in 1977. CP Rail's average variable cost per ton increased from $11.44 in 1974 to $13.29 in 1977, an increase of only 16.2 percent over the three year period. Using the "present discounted value approach to investment decisions",[7] a rough estimate of the "cost factor" that reflected the mix of inflationary cost pressures and productivity growth in Western rail grain transportation between 1974 and 1977 was derived. According to Snavely's cost estimates and the present value methodology, CN experienced an annual cost increase of 3.6 percent in its grain transportation operations over the three year period while CP experienced an annual cost increase of 5.1 percent (see Table 5).

These estimated annual cost increases experienced in railway grain transportation between 1974 and 1977 can be put into better perspective by considering the cost increases associated with other farm inputs used in Western grain production. The Farm Input Price Index (FIPI) provides an indication of the production cost increases that Western grain growers have experienced in recent years.[8] Referring to Table 6, the FIPI shows that over the 1973-77 period Western Canadian agricultural producers experienced an average annual increase of 9.4

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[7]See D. E. Bond and R. A. Shearer, The Economics of the Canadian Financial System: Theory, Policy and Institutions (Scarborough: Prentice-Hall of Canada, Otd., 1972), pp. 100-102.

[8]See Statistics Canada, Farm Input Price Index, Catalogue 62-004 Quarterly (Ottawa: Supply and Services, Canada, 1973-1977).

Table 5. The "Cost Factor" in Snavely's Estimates of the Cost of Transporting Grain by Rail Over the 1974-1977 Period.

	Canadian National's Average Cost Per Ton	Canadian Pacific's Average Cost Per Ton
1974	$12.39	$11.44
1977	$13.77	$13.29
Percentage Change Over 1974-1977	11.14	16.17

Using the "Present Discounted Value" formula: $PDV = \frac{C_n}{(1+i)^n}$

where:
PDV = the present (1974) cost of transporting grain by rail;
C_n = the cost of transporting grain by rail n periods from 1974; and
i = the prevailing annual rate of change in railway grain transport costs.[a]

The "Cost Factors" (i) are as follows:

For CN: $PDV = \frac{C}{(1+i)^3}$; $12.39 = \frac{13.77}{(1+i)^3}$; i = 3.58 percent

For CP: $PDV = \frac{C}{(1+i)^3}$; $11.44 = \frac{13.29}{(1+i)^3}$; i = 5.10 percent

[a]The assumption of a constant rate of change in grain transport costs is obviously unrealistic. Since the problems introduced by considering a rate that varies from period to period greatly complicates the notation without adding a commensurate degree of conceptual knowledge, such an analysis is not undertaken here.

Sources: D. E. Bond and R. A. Shearer, The Economics of the Canadian Financial System: Theory, Policy and Institutions (Scarborough: Prentice-Hall of Canada, ltd., 1972), pp. 100-102.

Snavely, King and Associates, 1977 Costs and Revenues Incurred by the Railways in the Transportation of Grain Under Statutory Rates (Report prepared for the Ministry of Transport, Federal Government of Canada, September, 1978), pp. 76-77.

Table 6. Estimated Rate of Production Cost Increases Experienced by Western Agricultural Producers for Farm Inputs Over the 1973-1977 Period as Reflected by the Farm Input Price Index for Western Canada.

Quarter	Farm Input Price Index[a] (1961 = 100)	Percentage Change Over the Previous Year	Average Annual Percentage Change
1st 1973	150.2	7.7	
2nd 1973	153.7	9.0	
3rd 1973	160.1	12.7	
4th 1973	-----	----	9.80
1st 1974	179.6	16.6	
2nd 1974	184.8	16.2	
3rd 1974	190.0	14.7	
4th 1974	196.3	14.8	15.58
1st 1975	204.4	11.6	
2nd 1975	206.5	10.2	
3rd 1975	213.0	10.7	
4th 1975	218.8	10.5	10.75
1st 1976	224.5	7.1	
2nd 1976	229.6	7.4	
3rd 1976	230.0	5.0	
4th 1976	232.9	3.5	5.75
1st 1977	236.3	4.6	
2nd 1977	250.7	5.3	
3rd 1977	252.6	5.8	
4th 1977	255.6	5.6	5.33
1973-1977 Average Percentage Change			9.44

[a]Components of the Farm Input Price Index include: building and fencing, machinery and motor vehicles, crop production, animal production, supplies and services, hired farm labor, property taxes, interest and farm rent.

Source: Statistics Canada, Farm Input Price Index, Catalogue 62-004 Quarterly (Ottawa: Supply and Services, Canada, 1973-1977).

percent.[9]

Past Productivity Trends in Canadian Rail Operations

At this point, it would be useful to review productivity changes in Canadian railroads and recent developments in grain transportation productivity. An overview of past rail productivity provides an indication of savings which occurred due to improvements in technology and managerial efficiency and possible future trends in technological change in Canadian railroad operations. This is important in terms of the present analysis since future productivity growth in railway grain transportation would presumably offset inflationary cost pressures in this industrial sector and hence have a moderating effect on the cost of transporting grain by rail.

A study of the productivity performance of Canadian National and Canadian Pacific Railways, as well as the two railways combined during the 1956-1975 period, has been carried out by Caves and Christensen.[10] In addition to providing estimates of productivity changes for Canada's two principal railroads, this study also examined changes in railway input utilization over the 1956-1975 period. With respect to future anticipated cost and productivity developments in Canadian railroad

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[9] It is important to bear in mind that the estimates of cost increases experienced by certain divisions of an industry and different sectors in an economy are not strictly comparable because of, among other things, the different methodologies used to determine cost figures and respective indices. In the case of rail transport of grain versus overall rail transport, other factors such as the respective traffic and operating characteristics associated with various commodities, geographical differences, and the respective operating, maintenance and capital investment policies of the railways make cost comparisons difficult.

[10] D. W. Caves and L. R. Christensen, Productivity in Canadian Railroads, 1956-1975, Report No. 10-78-16 (Ottawa: Research Branch, Canadian Transport Commission, August, 1978).

operations and, particularly, in the transportation of statutory grain, the important findings of this study are paraphrased as follows. Over the years 1956-75, Canada's two principal railways (CN and CP) were increasing output (measured in terms of ton-miles and passenger miles) but reducing utilization of inputs (labor, way and structures, equipment, fuel and materials). In the case of CN, aggregate output increased by 2.3 percent per annum, aggregate input fell by 0.8 percent per annum and productivity increased by 3.1 percent per annum. For CP, the annual increase in output was 0.8 percent, but aggregate input fell by 1.8 percent and productivity increased by 2.7 percent per annum (see Tables 7 and 8). The combined rate of productivity increase for the two railroad companies, which was essentially the net difference between average annual percentage changes in output and input utilization, was approximately 3 percent per year. In contrast, U.S. railroad productivity grew about half as fast for a comparable period[11] and, over the 1960-76 period, the Canadian economy as a whole experienced a real average annual growth rate of 5.1 percent in Gross National Expenditure.[12]

Although this study did not measure the relative contribution of specific railway inputs to the increased productivity that was realized by CN and CP between 1956 and 1975, it did attribute the productivity

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[11] As Caves and Christensen warn, the productivity level comparisons for the two railways and their U.S. counterparts should be interpreted only as productivity comparisons and not as comparisons of economic efficiency. Productivity estimates may reflect the influence of other factors including differences in the environment which the railways operate in. Ibid., p. 59.

[12] P. S. Dhruvarajan and R. F. Harris, A Productivity Study of the Canadian Airline Industry, Report No. 10-78-93 (Ottawa: Research Branch, Canadian Transport Commission, March, 1978), p. 36.

Table 7. Average Annual Changes in Output CN and CP: 1956-75.

	CN (%)	CP (%)	CN and CP Combined (%)
Ton-miles	3.0	2.7	2.9
Passenger-miles	-0.2	-7.8	-2.9
Weighted Aggregate Output	2.3	0.8	1.6

Source: Canadian Transport Commission, Transport Review: Trends and Selected Issues (Ottawa: Supply and Services, Canada, March, 1979), p. 93.

Table 8. Average Annual Changes in Inputs CN and CP: 1956-75.

	CN (%)	CP (%)	CN and CP Combined (%)
Labor	-2.6	-4.0	-3.1
Way and Structure	2.7	----	1.2
Equipment	3.2	0.7	2.0
Fuel	-5.3	-5.2	-5.2
Material	1.9	1.5	1.7
Weighted Aggregate Inputs	-0.8	-1.8	-1.2

Source: Canadian Transport Commission, Transport Review: Trends and Selected Issues (Ottawa: Supply and Services, Canada, March, 1979), p. 93.

gains to the following: capital using and labor saving technological progress, and improvements in both managerial efficiency and the quality of factor inputs.

Unlike overall Canadian railway operations, no specific study on rail productivity in grain transportation is currently available. Consequently, the following general discussion of productivity developments in transporting grain by rail is largely restricted to the 1972-1979 period which was highlighted by Federal Government involvements in Western grain handling and transportation. The discussion includes mainly observations and comments from such federally-appointed studies as The Commission on the Costs of Transporting Grain by Rail (CCTGR), the follow-up study by Snavely, King & Associates, and the Booz-Allen et al study.

If one were to start discussing grain related productivity increases that have been achieved by the major railways over the past decade or so and understand why government involvement in grain transportation has been necessary, one must first reconsider the "Crowsnest" statutory grain rates and investigate the effect they have had in this context.

It is now generally conceded among major participants in the production, handling and transportation of grain in Canada that the unremunerative statutory freight rates on grain are the primary source of many grain transportation problems. In terms of grain transportation productivity, the important point is that the statutory and non-variable nature of the present rates does not provide the railways with an economic incentive to haul grain. Instead, as Booz-Allen et al claim, "the railways strive to minimize their losses while meeting their obligations

to move grain".[13] Perhaps of even greater significance is the fact that over recent years the railways have not invested in equipment for the transportation of statutory grain and they have deferred substantial maintenance and virtually all capital expenditures on the "grain dependent lines".[14] In fact, since 1972 virtually all major maintenance and capital expenditures for railway plant and equipment used in the transportation of statutory grain have been financed by the Federal Government and, more recently, the Canadian Wheat Board and Prairie provincial governments. The number of government measures taken to counter railway disinvestment in grain cars, locomotives, and branch line maintenance, and ensure continued operation of the grain transportation system at reasonable capacity levels within the context of continuing statutory rates include the following:

1. payment of branch line subsidies to the railways;
2. the purchase and lease of grain hopper cars on behalf of the Canadian Wheat Board;
3. a Prairie branch line rehabilitation program;
4. boxcar repair programs; and
5. the provision of tax incentives to the railways.[15]

Given the previously developed theoretical framework of capital embodied technological progress, it therefore seems safe to assume that

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[13] Booz-Allen & Hamilton, Inc. and IBI Group, Grain Transportation and Handling in Western Canada (Report prepared for the Department of Industry, Trade & Commerce, The Grains Group, Federal Government of Canada, July, 1979), p. II-1.

[14] Snavely, King and Associates, op. cit., pp. 80-81.

[15] A detailed discussion of these measures is presented in Appendix A of this study.

the bulk of major capital embodied technological gains and productivity increases achieved in transporting Prairie grain by rail over the past decade have stemmed from Federal Government capital investments in grain-related railway plant and equipment. It also seems safe to assume that the railway disinvestment in grain-related rail facilities and rolling stock over the last several years has caused grain transportation productivity to lag behind the productivity growth achieved in the other operations of the railways.

As mentioned previously, however, productivity growth is not just attributable to improvements in the quality of capital and labor factor inputs; it is also organizational in nature. For example, as Smellie[16] pointed out, the introduction of the Block Shipping System and the pooling of Board grains at terminal elevators in the early 1970's both enhanced the efficiency of the railway part of Canada's grain handling and transportation system. These changes were essentially improvements in industry-railway managerial efficiency with respect to coordinating railway grain transportation; they were organizational in origin and not the result of Federal Government or railway capital investments.

Inflation offsetting productivity gains that the railways were directly responsible for in grain movements in recent years would appear to be mainly those improvements in Canadian railroad operations which have spilled-over into the grain transportation dimension of their overall operations. These improvements include the following: improvements in managerial and overall operations efficiency; improvements in the

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[16] G. Smellie, "The Railway and Grain: Moving Grain" (A series of articles dealing with the Grain Transportation System in Canada, reprinted from CP Rail News, 1975), pp. 13-14.

quality of factor inputs; capital using and labor saving technological progress; and other advances in Canadian railroad operations that grain traffic gets a "free ride" on.[17]

In summary, it is apparent that the productivity increases that were experienced in the rail movement of Western grain over the past decade or more were largely the result of: (1) Federal Government efforts to sustain the capacity of a deteriorating grain handling and transportation system; (2) organizational changes in the grain handling and transportation system that were industry-railway generated; and (3) improvements in the operation of the Canadian railway industry which have spilled-over into railway grain transportation.

Future Cost Increases and Productivity in Grain Transportation

This section provides an overview of technological changes in general railway operations and, particularly, in grain handling and transportation that may be implemented over the 1979 to 1985 period. It also considers possible inflationary situations that may prevail in the economy during the same period. The possible trends in cost inflation and productivity in rail movements of Western grain are largely based on recent published research reports, personal interviews with various people knowledgeable in the Canadian grains industry, and current related information. Concluding this section is a brief discussion of other considerations which are important in making assumptions about productivity and inflationary trends in grain transportation.

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[17] Booz-Allen & Hamilton, Inc. and IBI Group, op. cit., p. X-7.

Rail Technological Developments to 1985

In an extensive study, R. S. Wallace and Associates Ltd.[18] identified those areas of Canadian railroad operations where future technological progress may occur between 1978 and 1990. According to Wallace et al, the past emphasis on pure technological performance in the rail industry is shifting towards concern for greater energy efficiency, environmental quality, dependability, economy of operation and safety. Of particular importance to the present study is that overall technological change in the rail industry to 1990 will be less than in the period from 1945 to 1978 unless electrification of main lines of both major railways occurs by 1990. This, they claim, will bring with it a wave of new rail technology and haulage efficiencies as well as the savings in fossil energy. And, as the CCTGR noted: "any economies of operation resulting from electrification would be experienced by grain traffic as well as other commodities being transported on the electrified lines".[19] However, this study concluded that the general outlook for electrification of the main lines of CN and CP Rail is not favorable in spite of the advantages of electrification (i.e., reduced operating and maintenance costs) because of the high initial capital investment (about $1.8 billion).

Besides electrification, Wallace et al claimed that future productivity growth in the rail industry between 1978 and 1990 would be

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[18] R. S. Wallace and Associates, Ltd., Truck and Rail Technological Developments to 1990, Report No. 10-78-19, prepared for the Research Branch of the Canadian Transport Commission (Ottawa: Supply and Services, Canada, 1978), pp. 117-123.

[19] The Commission on the Costs of Transporting Grain by Rail, Report, Vol. II (Ottawa: Supply and Services, Canada, 1977), p. 139.

restricted to the following general areas: traction motors in diesel-electric locomotives; radio controlled locomotive power; continuous-welded rail; new freight truck design; increasing piggyback and container service; traffic control systems; wheels and bearings; and gas turbine electric locomotives.

Thus, unless the far reaching development of rail electrification occurs by 1990, overall technological change in the Canadian rail industry and, therefore quite possibly, rail productivity to 1990 will be less than in the period from 1945 to 1978. In terms of grain transportation between now and 1985, this projection of overall technical change in the rail industry to 1990 appears reasonable when we consider Snavely et al's comments. Speaking on the effects of inflation and productivity on the revenue shortfalls experienced by the railways between 1974 and 1977, Snavely et al[20] predicted that productivity gains in rail transportation of grain would lag relative to those gains achieved between 1974 and 1977. This in turn may lead to a faster rate of increase in the cost of grain transport service under continued inflationary conditions.

In addition to overall rail technological changes, numerous operating, institutional and capital improvements specific to grain handling and transportation in Western Canada to 1985 have been identified by the recent Booz-Allen & Hamilton, Inc. and IBI Group study.[21] This technical study was appointed by the Federal Government to make recommendations to improve the throughput of export grain so that the potential export grain sale projections developed by the Canadian Wheat Board for

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[20]Snavely, King and Associates, op. cit., p. 81.

[21]Booz-Allen & Hamilton, Inc. and IBI Group, op. cit.

the 1985/86 crop year can be met. The most significant recommendations of this study which would likely enhance productivity in grain transportation and hence diminish cost-push inflationary pressures experienced by the railways centered on the following:

(1) Improved information, planning and control systems with respect to the CWB's Block Shipping System;

(2) operational and institutional improvements relative to grain producers, primary elevators and the railways;

(3) major capital expenditures for hopper cars, locomotives, Prince Rupert Terminal Elevator capacity expansion, grain branch line rehabilitation, and CN and CP main line capacity improvements;

(4) a grain transportation improvement task force;

(5) relocation of the CWB transportation staff; and

(6) compensatory rail rates for grain.

The above recommendations are discussed in greater detail in Appendix A, but it is important to stress here their recommendation regarding compensatory grain rates. Essentially, the Booz-Allen study felt that the introduction of compensatory grain rates was "most important" to enhance the likelihood of achieving many of the identified potential operational improvements and major capital investments in Western grain handling and transportation by 1985.[22]

In terms of the present analysis, it was previously stated that the assumption is made that the low statutory rates are replaced by Snavely determined compensatory grain rates. Given this scenario, it therefore seems reasonable to assume that many of these potential

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[22] Ibid., p. 5.

operational improvements and major capital investments in grain handling and transportation may be achieved between now and 1985. On an optimistic note, future anticipated inflationary cost pressures in railway grain transportation may therefore be held down due to the possible resultant efficiency gains in grain related rail operations (assuming that the Booz-Allen recommendations in fact improve grain transportation).

Anticipated Cost Increases in Grain Transportation

Predicting future anticipated inflationary cost pressures likely to be experienced by the grain transportation divisions of Canada's two major railways with a high degree of accuracy is a difficult, if not impossible, task. Nevertheless, in this context it would be useful to consider railway inputs and the respective costs. This may provide an insight into the susceptibility of grain transport costs to cost-push inflationary pressures and hence allow one to predict possible cost settings in railway grain transportation in the near future.

Railway inputs may be classified as follows: labor, structures, equipment (including rolling stock), fuel and meterials. In terms of the cost shares for railway inputs, Caves and Christensen[23] report that for Canadian railroads (i.e., CN and CP combined) during the 1973-1975 period, labor accounted for 51 percent of total railway costs, structures 13 percent, equipment 13 percent, fuel 5 percent and materials 18 percent.

Given that Canadian railways are highly unionized in terms of labor organization and relatively capital intensive (structures and

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[23]Caves and Christensen, op. cit., p. 22.

equipment) the following hypotheses can be made:

1. Market power possessed by railway labor via their highly organized unions (i.e., the Canadian Railway Labour Association and The Canadian Brotherhood of Railway, Transport and General Workers) may lead to wage-push inflationary pressures in railway costs between now and 1985. That is to say, the railway unions through collective bargaining and cost-of-living increases may win wage increases in excess of productivity gains despite the persistence of some aggregate unemployment in the Canadian economy. Here the railways are presumed to then pass along their higher labor costs by raising end product prices in an attempt to defend their profit share. The possibility of future wage-push inflation in Canadian rail operations including grain transportation may be reasonable given that the industry is highly unionized and very oligopolistic with CN and CP accounting for 90 percent of total railway revenues earned in Canada. It should be noted, however, that in terms of this study, the wage-push inflation theory as described would only be relevant to transporting grain by rail under a compensatory rate structure to the extent that the railways are allowed by a rate-making body sufficient latitude to adjust rates annually according to such cost-push pressures.
2. Given the capital intensity of railroads, Canadian rail operations may experience relatively high rates of cost increases over the near future due to the so-called administered price

inflation phenomenon.[24] In particular, over the 1978-85 study period, the Canadian rail industry may experience rapid cost increases which are largely the result of administered pricing in the steel industry and other oligopolistic sectors that supply raw materials and intermediate products that enter into the railway production function. In addition, the Canadian rail sector and, hence, railway grain transportation may be particularly susceptible to administered crude oil price increases (triggered by OPEC) since oil (like steel) is a basic input in the rail productive process.

To add another dimension to the foregoing discussion of possible trends in railway cost inflation and productivity growth, the remarks and comments of several people knowledgeable in the West's grain handling and transportation system are presented here. Their remarks and comments, which are obtained through interviews and direct correspondence, are essentially informed judgments on rail cost and productivity developments in railway grain transportation to 1985. Their informed judgments in turn helped to frame the range of possible cost inflation and productivity growth scenarios in Western railway grain transportation that are used in the analysis. Presented below then are the comments of those individuals in the industry considered to be optimistic with respect to future cost inflation and productivity in grain transportation, followed by the comments and observations of those persons more on the pessimistic side in this respect.

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[24] Administered prices are usually defined as "prices set by administrative action and held constant for a period of time, whereas market prices are said to be made in the market as the result of the

Rick Wansbutter, Research Economist, Manitoba Transportation Economics Council,[25] and A. G. Wilson, Research Director, Canada Grains Council,[26] both feel that there is a great potential for productivity increases in railway grain transportation in Western Canada over the next few years. Their optimism is attributable to the following grain handling and transportation developments and factors:

1. an expected increased number of the more efficient, large, 90 ton and 100 ton capacity hopper cars in the grain fleet to displace the older and smaller boxcars which are not particularly well-suited to, or economically feasible for, the carriage of grain;
2. the on-going branch line rehabilitation and upgrading program of the Federal Government which should improve rail transport of grain through a better utilization of rolling stock (i.e., heavier loads and faster running speeds);
3. expanded grain terminal capacity at Vancouver and Prince Rupert;
4. improved turnaround time and grain car utilization, greater mechanization in terms of larger diesel locomotives, use of computers in grain transportation activities, and other potential operational improvements as identified by the Booz-Allen study;

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[24](continued)

interaction of buyers and sellers." See F. M. Scherer, Industrial Market Structure and Economic Performance (Chicago: Rand McNally College Publishing Company, 1970), p. 285.

[25]R. Wansbutter, personal interview, Winnipeg, Manitoba, July 9, 1979.

[26]A. G. Wilson, personal interview, Winnipeg, Manitoba, July 9, 1979.

5. more rail branch line abandonments and consolidation of the Prairie rail branch line network which should reduce to some extent the variable cost of rail movement of grain;
6. country elevator operations becoming more efficient through modernization and rationalization; and
7. improved planning and coordination among all participants in the grain handling and transportation system (i.e., improvements in the ordering procedure of the Transportation Division of the CWB).

On the other hand, Kent Magarrell, Coordinator of Planning Grain Transportation for CP Rail,[27] agrees with Snavely, King and Associates' prediction that inflation-offsetting productivity increases in transporting grain by rail in the near future will be less than the productivity gains experienced by the railways between 1974 and 1977. Magarrell believes that this would be the case even with a Snavely determined cost-based rate on grain which is quite a bit different from a full compensatory rate (a rate that according to the Canadian Railway Act exceeds the variable costs of the movement of the traffic concerned). The basis of his prediction is as follows:

1. Almost all productivity increases in CP's rail operations come out of capital and not labor since very restrictive labor agreements impede productivity.
2. Canadian railways are almost forced to buy more expensive Canadian-made rolling stock that is protected by tariffs (i.e.,

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[27]H. K. Magarrell, personal interview, Winnipeg, Manitoba, August 3, 1979.

a Canadian-made hopper car costs CP about $45,000 while an American-made hopper car lists at about $30,000 in the U.S.).

3. As a result of the high cost of new capital equipment, Canadian railways require a very high rate of return to justify the infusion of new equipment in their operations.

As far as incentives go for transporting grain under a cost-based rate, Magarrell says it is doubtful that the railways would have the economic incentive to significantly improve their performance by implementing cost-saving measures and innovations, discounts, etc. His concern is shared by George Smellie, Public Relations and Advertising Regional Manager for CP Rail,[28] who elaborated: Compensation to the level of variable costs, which of course falls short of covering "total rail costs", would only eliminate the "economic negativeness" for the railways that the current statutory rates create. This would put them in a position of "economic indifference" whereas a higher level of compensation would tend to create a situation of positiveness with respect to the economic incentive. Therefore, a Snavely cost-based freight rate on grain would eliminate the "economic negativeness" and leave only the other factors (i.e., political, social and statutory obligations) which motivate railway performance in grain transportation.

Finally, Magarrell claims that the peak or threshold for railway productivity in grain transportation appears to have been reached; the quantum leaps represented by Block Shipping and pooling are past. Unless significant structural change occurs, the future holds only steady

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[28] G. Smellie, Canadian Pacific internal correspondence, Winnipeg, Manitoba, November 2, 1979, p. 3.

incremental gains confined largely to car control, turnaround time and increased numbers of hopper cars in the grain fleet. Given the above, Magarrell feels that under the present operating environment, but with a cost-based freight rate on grain, it is reasonable to assume that productivity growth in railway grain transportation will not keep pace with other areas of railroading.

Other Considerations

In addition to anticipated inflation and productivity per se in Canadian railroad operations and, particularly, the various identified potential improvements and changes in the grain handling and transportation system, other considerations may have a significant impact on the cost of transporting grain by rail over the 1978-85 study period. As alluded to earlier, the overriding consideration in future rail cost inflation and productivity scenarios is to what extent the proposed new rate level and rate structure for grain provides economic incentives to the railways to make grain-related capital expenditures and haul grain effectively and efficiently. Perhaps equally important would be the extent that the Snavely cost-based freight rate provides incentives to the other participants in the grain transportation system to make the most efficient use of available railway plant and equipment.

Closely related to the above is the impact of government transportation regulatory policy in general on the performance of the rail grain transportation system. In particular, future decisions by the Canadian Transport Commission such as those regarding branch line abandonment will impact on the operating environment of Canadian railways and hence influence productivity growth in their grain transportation

divisions.

Finally, the overall future economic and political setting in both the Western grains industry and Canadian economy as a whole will play an important part in the context of future cost and productivity developments in grain transportation and their impact on primary agricultural production decisions. Future grain prices and demand for export grain, CWB marketing efforts and policies, operating and service decisions by the railways, and the Federal Government's continued involvement in grain transportation and commitment to escalate domestic oil prices to the world level are among the plethora of economic and political factors in this regard.

A Range of Possible Grain Transportation Scenarios

From this review of past and future trends in cost inflation and productivity in Canadian rail operations, it becomes apparent that many scenarios in rail cost and productivity developments to 1985 are seemingly possible.

On an optimistic note, one could assume that significant productivity increases might be achieved in the overall grain handling and transportation system coupled with "creeping" inflation in railway input costs over the 1978-85 period. The combined effect of these two interacting developments would be say a 6 percent annual increase in railway grain transportation costs. This is substantially lower than past rates of increases in railway costs and other farm input prices. Such an optimistic scenario in grain transportation might prevail because of the following factors:

1. Relatively low inflationary cost pressures are experienced in

the railway sector as fuel, labor and other input price increases moderate or level off.

2. The many potential productivity developments in railroading (excluding rail electrification) come on stream by 1985 and spill-over into the grain transportation divisions of the railways.
3. The many potential operating, institutional and major capital improvements in Western grain handling and transportation also come on stream enhancing the efficiency and productivity of rail transportation of grain.
4. Prairie rail branch line rehabilitation continues with its inherent increased efficiencies in the utilization of grain related rolling stock and overall movement of Prairie grain.
5. The on-going rationalization of the rail system and consolidation of elevator delivery points yields rail cost savings and other potential operating efficiencies in the handling and transportation of Western grain.
6. The new rate structure for export grain provides the economic incentives needed to promote the efficient use of railway resources in the transportation of Western grain.

On a pessimistic note, however, one could predict that minimal productivity gains might be experienced in the transportation of Western grain by rail in conjunction with "hyper-inflation" in railway input costs. Given the interaction of inflationary cost pressures and productivity growth, this would lead to, say, a 15 percent annual increase in railway grain transport costs over the 1978-85 study period. Relative to past cost increases experienced in the railway sector and farm sector,

a 15 percent annual increase in rail costs is somewhat high and may be regarded as the upper limit of projected rail cost increases. Such a scenario in Western railway grain transportation might prevail over the relevant time frame if the following events and developments were to occur:

1. Relatively strong cost-push inflationary pressures stemming from aggressive railway labor unions, significant domestic oil price hikes and other relatively high input cost increases are experienced by Canada's major railways.
2. Many of the potential operating, institutional and major capital improvements in Western grain handling and transportation fail to come on stream largely because of the prevailing economic and political environment; consequently, productivity growth specific to grain transportation also tends to lag.
3. And, in particular, the new compensatory rail rates on grain remove the negative economic aspect of hauling grain for the railways, but they fail to make grain an "attractive proposition", which would tend to encourage cost saving measures and grain related capital investments.

Thus, by reviewing past and possible future trends in railway costs and productivity we have set forth a range of 6 percent to 15 percent annual cost increases that might be experienced in Western railway grain transportation between 1978 and 1985. In terms of the analysis of the proposed statutory rate alternative, these assumed minimum and maximum annual increases in grain transport costs help to sketch three model scenarios used in the analysis; namely, an optimistic situation with respect to future grain transport cost increases, an intermediate

situation and a pessimistic situation. As the next chapter illustrates, these scenarios are important in the context of the proposed rate alternative since they in turn determine the extent of future grain transport cost increases borne by grain producers.

Chapter V

MODEL SPECIFICATION AND MODEL SCENARIOS

Model Specification

In order to model and analyze the economic effects of a transport subsidy on primary agricultural producers over the 1978 to 1985 study period, a number of prior studies and related assumptions were utilized in this study.[1] Specifically, the overall model employed in this study was composed of two main models: a "transport" model and a linear programming (LP) model. Together, they were used to analyze the economic implications of changing the statutory grain rates in the described fashion. That is, they were used to estimate the changes in the level and distribution of agricultural production and on-farm income in the Manitoba agricultural economy arising from the removal of statutory rates in favor of a constant per ton subsidy payment to the railways coupled with user fees for grain transport services.

The Transport Model

Rail branch line abandonment and the closure of elevators at existing delivery points has resulted in changed grain delivery patterns by primary agricultural producers for an area. Diverting grain producer

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[1] For a discussion of the numerous prior studies that were also employed in the framework and methodology of this study, see E. W. Tyrchniewicz, C. F. Framingham, J. A. MacMillan and J. W. Craven, "The Abandonment of Uneconomic Branch Lines and Unremunerative Grain Rates: Effects on Agriculture and Regional Development," The Logistics and Transportation Review, Vol. 14, No. 4, 1978, pp. 412-413.

deliveries from closed delivery points to other points remaining open has had implications for the cost to farmers of trucking grain, the costs of operating primary elevators, and loadings on highways.

The extra hauling distances and resultant increased trucking costs that grain producers incur due to rationalization of the grain handling and transportation system were relevant to this study only to the extent that the analysis incorporated rail branch line abandonments and elevator closures as of December 31, 1978 as recommended by the Grain Handling and Transportation Commission.[2]

To simultaneously measure the economic impacts on Manitoba's agricultural producers that may result from rail branch line and elevator rationalization as of December 31, 1978 a "transport" model was used. Essentially, this model was general; it brought the various components of the analysis of alternative rail route options together into a common framework. These components included: the Canadian Transport Commission's PHAER (Producers' Handling and Elevator Receipts) model, which provided an analysis of the redistribution of farmer delivery patterns to primary elevators due to rail route changes; the calculation of the costs of trucking grain from farm to elevator; and the calculation of primary elevator operating costs.

It is important to bear in mind, however, that rail branch line abandonment and elevator consolidation were only very peripheral dimensions to the analysis; they facilitated a more accurate representation of the rail configuration in the base year. The thrust or focus of this

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[2]The Grain Handling and Transportation Commission, Grain and Rail in Western Canada, Vol. I (Ottawa: Supply and Services, Canada, 1977).

study was, of course, the impact on producers of raising the level of rail freight rates on grain. This, plus the fact that rationalization impacts on producers (as reflected in changes in farm-gate prices) were of minor importance relative to the impacts of higher grain freight rates,[3] warranted the exclusion of rationalization impacts from the analysis.

The Linear Programming (LP) Model

Real increases in the cost of transporting statutory grain by rail also represented a direct reduction in net farm income to grain producers assuming that they bore these cost increases. Also, like rail branch line and elevator rationalization, increased grain freight rates may have affected the levels and distribution of agricultural production by changing the relative profitability of various farm enterprises. For example, an increase in grain transport costs may have made it more profitable for a farm operator to stop producing cereal grains for export and enter or expand livestock production enterprises.

In this context, the analysis of changing costs to farmers due to the previously described statutory rate alternative was extended through the application of an LP model for the Province of Manitoba.

Linear programming, one of the best understood and most widely used models in operations research, was employed by Framingham, Baker and

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[3] As concluded by Tyrchniewicz, Framingham, MacMillan and Craven, op. cit., pp. 418-429.

Craddock,[4] and by Tyrchniewicz, Framingham, MacMillan and Craven.[5] This normative modeling technique,[6] with its underlying marginal productive theory of distribution,[7] was used in the present analysis to model the impact of changing farm gate prices and levels of agricultural production and distribution over 1978 to 1985 due to the statutory rate option. This application of the LP model was essentially a sensitivity analysis on grain freight rates borne by the producer (or on net returns received by the producer for statutory grain). It yielded the pattern of agricultural production resulting from changes in cost of production to producers that, if adopted, would maximize net returns to producers.

Generally, the LP model has three main components: (1) an objective function; (2) a set of constraints; and (3) a set of alternate activities. Figure 2 is a schematic illustration of these components couched in terms of the dimensions of the present study.[8]

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[4]C. F. Framingham, L. B. B. Baker and W. J. Craddock, Farm Income, Employment and Manitoba Agriculture: A Linear Programming Approach to Consideration of Policy Alternatives, Vol. 1.1, Research Bulletin No. 78-1 (Winnipeg: Department of Agricultural Economics, University of Manitoba, 1978).

[5]Tyrchniewicz, Framingham, MacMillan and Craven, op. cit.

[6]For a basic reference on linear programming techniques and applications, including sensitivity analysis in a linear programming problem, see R. V. Hartley, Operations Research: A Managerial Emphasis (Pacific Palisades, California: Goodyear Publishing Company, Inc., 1976).

[7]For a basic reference on the theory of production and, in particular, linear programming analysis of the firm, see P. R. G. Layard and A. A. Walters, Microeconomic Theory (New York: McGraw-Hill Book Company, 1978).

[8]The following discussion of the components of an LP type model has been drawn from Framingham, Baker and Craddock, op. cit., pp. 6-8.

Part A

Objective Function or Factor to be Maximized or Minimized

Constraints Within which the Objective Function Factor Must be Maximized or Minimized

Alternative Activities that Contribute to the Factor to be Maximized or Minimized, Use Constraining Resources, and Contribute to Satisfaction of Specified Product and Other Objective Constraints

Part B

Objective Functions: Net Farm Income (Net Activity Receipts Less Transportation Costs)

Activity Constraints

Available Land
Livestock Feed
Intermediate Inputs:
Stocker Calves
Feeders
Replacements to Basic Herd

Enterprise Expansion Limitations

Commodity Demand:
Fed Beef
Wheat for Export
Eggs
Policy Objectives:
Income
Employment

Alternative Activities:
(Each with a Set of Production Coefficients)

- Wheat for Export Sale
- Wheat for Feed
- Veal Calves
- Fed Beef
- Market Hogs
- Fluid Milk
- Broilers
- Eggs
- Transportation of Intermediate Products

Duplicated for Farm Size and Producing Regions (Crop Districts)

Figure 2. Overview of the Major Components of a Linear Programming Model

Sources: C. F. Framingham, L. B. B. Baker and W. J. Craddock, Farm Income, Employment and Manitoba Agriculture: A Linear Programming Approach to Consideration of Policy Alternatives, Vol. 1.1, Research Bulletin No. 78-1 (Winnipeg: Department of Agricultural Economics, University of Manitoba, 1978, p. 7.

The objective function is so named in an LP application because it is, by definition, the factor to be maximized or minimized. When linear programming is applied in an agricultural policy analysis, the variable maximized or minimized in the objective function is usually one public policy objective (e.g., maximizing net farm income or agricultural production).

LP model constraints, as the term suggests, constrain or restrict the extent to which the objective function may be maximized or minimized. The three general mathematical forms of constraints include: the less-than-or-equal-to variety; the greater-than-or-equal-to variety; and the equal-to type. These constraints might represent resource constraints (such as material, labor, or land), minimum and/or maximum production levels of a product, or simply objective constraints.

Alternative activities or decision variables in an LP model are alternative ways of increasing or decreasing the objective function that, using constraining resources, produces products to satisfy specified production constraints and contributes towards satisfying objective constraints.

Thus, solving an LP problem involves the selection of alternative activities that maximize (minimize) the objective function within the constraints imposed. The set of activities that maximizes (minimizes) the objective function within the constraints imposed is normally referred to as the optimal solution.

For the present study, the objective function was simply the maximization of net farm income (net activity receipts less farm transportation costs) accruing from various crop and livestock production activities. This objective function was subject to a number of

constraints, including: available land (i.e., physical acres on a crop district basis); the size and number of farm enterprises; specified intermediate demand by the livestock sector for feed grains (i.e., technical relationships and technical consistency constraints); and enterprise expansion limits and commodity demand (i.e., regional and provincial market limitations).[9] The set of alternate crop and livestock production activities in the LP model represented a means of increasing or decreasing the objective function. For example, wheat production, which yielded net income, used land, produced wheat for export and domestic use, and provided employment.

In summary, the LP model dimensioned for the 12 crop districts of the Manitoba Department of Agriculture and aggregated for the five Agricultural Administrative Regions of the province, was used to determine the impact of changing farm gate prices and levels of agricultural production and distribution that resulted from the statutory grain rate alternative.

Model Scenarios

Having discussed the conceptual and analytical dimensions of the

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[9]It is important to emphasize that the application of the LP model in this study was to determine which commodities would do most to improve farm income if produced. Therefore, it was necessary to set commodity output constraints adequate to show which commodities to produce given market demand rather than to analyze how much of each could be produced. To accomplish this, equations limiting the feasible range of variability in the level and mix of agricultural commodities were specified. These provincial and regional farm size specific minimum and maximum production constraints were set at 80 and 120 percent of the base year levels for 1978 and generally relaxed to 80 and 140 percent by 1985.

proposed statutory grain rate alternative and the overall study model, we are now in a position to describe the specific model scenarios that were used in the analysis of the economic effects of this "constant per ton subsidy" alternative.

The analysis of the economic impacts resulting from the proposed grain freight rate option as determined by the overall study model essentially involved five model scenarios: a "current" 1978 situation in terms of grain freight rates with four alternative scenarios in terms of the proposed rate option (see Table 9).

Scenarios I and II were both representative of the base year of the analysis. In a linear-programming-optimizing context, they facilitated a comparative analysis of the economic impacts on the Manitoba agricultural economy resulting from changing the statutory grain rates in the described fashion in the base year 1978. The impacts resulting from the rail rate alternative and quantified by the study model were largely in terms of increased costs of production and changes in farm enterprise mixes.

Scenarios III, IV and V on the other hand, indicated the pattern of agricultural production that would result at the end of the 1978-85 period given the statutory rate alternative and certain assumptions regarding the mix of cost-inflation and productivity growth in Western railway grain transportation over the same period. Modeling these three scenarios in grain transportation in Western Canada was essentially a sensitivity analysis of changing the producer's share of the real cost of transporting export grain by rail over the 1978-85 period.

A more detailed discussion of each of the five scenarios in terms of market conditions, production technologies, costs, prices, crop

Table 9. Description of Model Scenarios Analyzed

	Market Conditions	Rail Rates	Rail Routes	Farm-Gate Prices	L.P. Model
Scenario I 1978 Situation with Crow Rates	1978 Production Levels 1971 Technology 1978 Costs Indexed from 1971 1978 Labor Wages	Present Crow Rates	Present Configuration as of December 31, 1978	1978 Prices	1978 Production Patterns with ±20% Production Flexibility
Scenario II 1978 Situation with No Crow Rates/ Export Subsidy	Same as I	3.4 x Crow for Domestic Shipments and Present Crow Rates for Export Shipments	Same as I	1978 Prices Adjusted for No Crow (3.4 x Crow) on Domestic Shipments	I Adjusted for No Crow Rates (3.4 x Crow)
Scenario III 1985 Situation with No Crow Rates/Export Subsidy and 6% Annual Increase in Rail Costs	Same as I	3.4 x Crow for Domestic Shipments and Subsidy on Export Shipments Subject to a 6% Annual Cost Increase	Same as I	1978 Prices Adjusted for No Crow on Domestic Shipments and Declining Subsidy on Export Shipments	I Adjusted for No Crow (3.4 x) and Declining Export Subsidy (due to 6% Annual Cost Increase) with Expansion of Production Flexibility to -20% to +40%
Scenario IV 1985 Situation with No Crow Rates/Export Subsidy and 11% Annual Increase in Rail Costs	Same as I	3.4 x Crow for Domestic Shipments and Subsidy on Export Shipments Subject to an 11% Annual Cost Increase	Same as I	1978 Prices Adjusted for No Crow on Domestic Shipments and Declining Subsidy on Export Shipments	Same as III Except Export Subsidy Declines in Real Value due to an 11% Annual Cost Increase
Scenario V 1985 Situation with No Crow Rates/Export Subsidy and 15% Annual Increase in Rail Costs	Same as I	3.4 x Crow for Domestic Shipments and Subsidy on Export Shipments Subject to a 15% Annual Cost Increase	Same as I	1978 Prices Adjusted for No Crow on Domestic Shipments and Declining Subsidy on Export Shipments	Same as III Except Export Subsidy Declines in Real Value due to a 15% Annual Cost Increase

and livestock yields, rail branch line configurations, and grain freight rates follows.

Scenario I

Scenario I, the benchmark for the analysis, represented the "current" 1978 situation in the Manitoba agricultural sector. Specifically, this scenario reflected the 1978 market conditions (i.e., the supply and demand situation that prevailed and generated the price levels for each commodity in 1978). 1971 production techniques for the various crop and livestock enterprises were utilized in this scenario and throughout the others. Consequently, the production costs associated with the various crop and livestock enterprises were based on 1971 figures indexed up to 1978 levels. Livestock production was based on actual 1978 figures, while crop yields for 1978 were estimated using the econometric technique of regression analysis on 1960-1976 yield data of the Manitoba Crop Insurance Commission. As noted previously, estimated rather than actual crop yield data were used in order to present 1978 as a "normal" year in terms crop production and, hence, minimize the possibility of a distorted analysis.

The rail freight rates on grain used in Scenario I were the present "Crowsnest" statutory rates, while the farm-gate prices for the six principal crops produced in Western Canada were based on 1978 average figures. These prices directly reflect the cost of rail transport of grain by the producer. Accordingly, only the farm-gate prices received for wheat, oats, barley, flax, rapeseed, and rye were affected by the statutory grain rate alternative under consideration.

In terms of the rail branch line configuration for Scenario I,

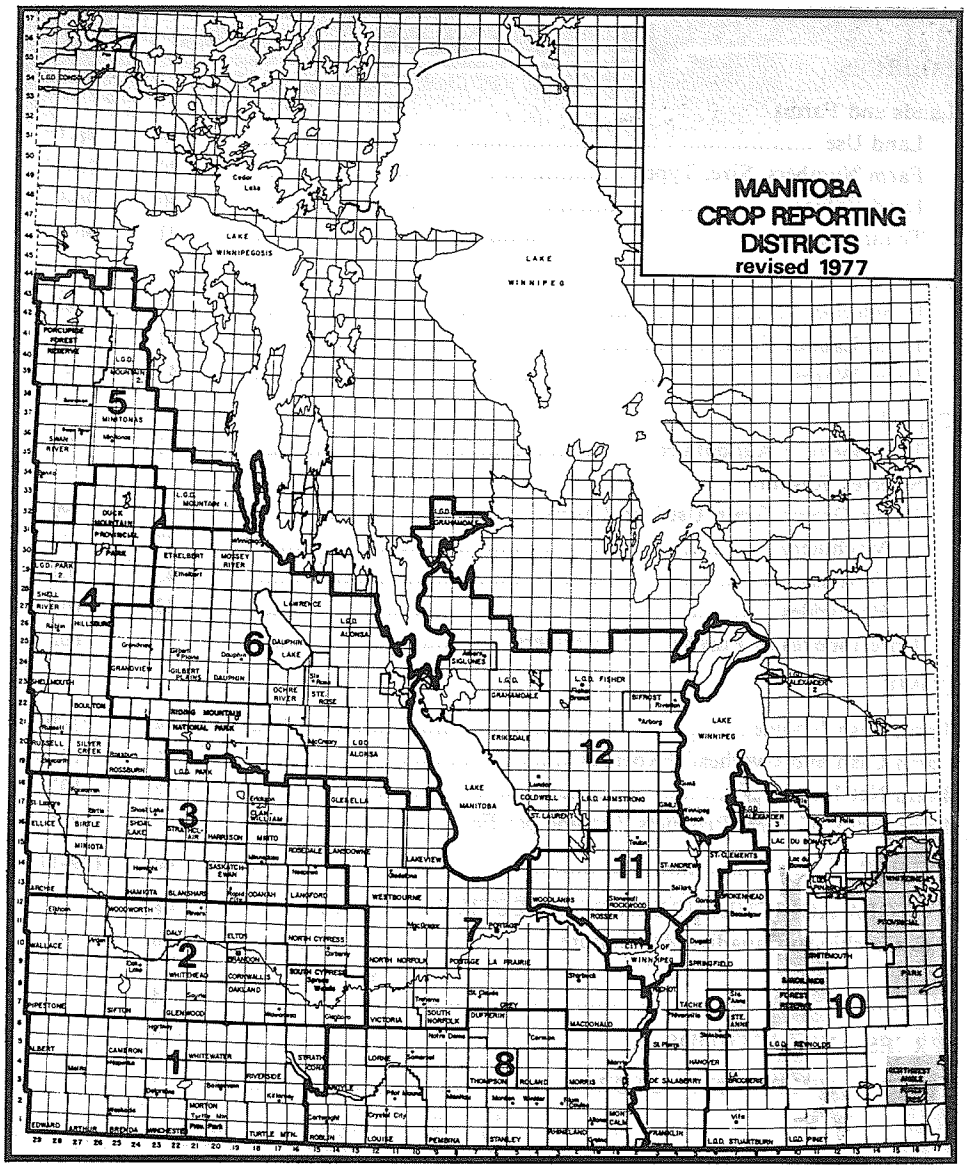

Figure 3. Provincial Crop Districts Used in the Analysis

Crop Districts 1, 2, 3 - South West Region
Crop Districts 4, 5, 6 - North West Region
Crop Districts 7, 8 - Central Region
Crop Districts 9, 10 - Eastern Region
Crop Districts 11, 12 - Interlake Region

Source: Manitoba Department of Agriculture, 1978 Yearbook: Manitoba Agriculture (Winnipeg: Queen's Printer, 1979), p. 4.

The primary purpose of applying the LP model was to determine which commodities would do the most to improve farm income if produced to a specified level of market demand rather than to analyze how much of each commodity could physically be produced. Therefore, it was necessary to specify production constraints in the model that limited the feasible range of variability in the level and mix of agricultural production. For Scenario I, production adjustments were limited to within a $\pm$ 20 percent range of the actual livestock and regressed crop production levels in 1978. In other words, within this scenario, production on each farm size within every crop district was allowed to shift up or down by a maximum margin of 20 percent from its original 1978 production level (i.e., production constraints were set at 80 and 120 percent of the 1978 levels). As in a similar study recently completed for the Province of Manitoba, it was thought that these minimum and maximum production constraints reflected "a reasonable production flexibility" that allowed producers to alter their present pattern of agricultural production in response to changes in cost of production in order to maximize net farm income.[11]

Scenario II

Scenario II represented the base year in terms of implementing the proposed statutory grain rate alternative over the 1978-85 study period. That is, it represented the shift from the "current" 1978 situation (Scenario I) to one where:

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[11] K. Olsen, E. W. Tyrchniewicz and C. F. Framingham, "Impact of Changes in Statutory Grain Rates and Rail Branch Line Configurations on Manitoba's Agricultural Economy" (Special report prepared under contract for the Government of Manitoba by the Department of Agricultural Economics, University of Manitoba, March, 1980), p. 5.

1. The statutory grain rates were removed in favor of "Snavely determined" cost-based freight rates. These rates were assumed to be 3.4 times the current rail rates in 1978 using an inflationary increase of 10 percent in the 1977 Snavely determined costs.
2. A federally-financed constant per ton transport subsidy was applied to export grain and oilseeds that formerly moved under statutory rates. This nominally valued per ton subsidy was based on the revenue shortfall incurred by the railways in the transport of statutory grain and the volume of statutory grain traffic in 1977, and indexed up by 10 percent to a 1978 base year level.

Therefore, Scenario II was essentially the same as Scenario I, except that non-export grains and oilseeds moved under higher compensatory rail rates while those grains and oilseeds destined for export markets moved under subsidized freight rates.

In terms of the analysis, it is important to note that the introduction of the statutory rate alternative and the consequent rate increase on the six principal crops destined for domestic markets beyond the Prairie region resulted in a direct decrease in the farm-gate prices and relative profitability of these respective farm enterprises. As far as export grains and oilseeds were concerned, their absolute farm-gate prices were not affected by the rate option in the base year. These agricultural products moved under the subsidized freight rates which in terms of the producer's share of the total transport cost were in effect the current "Crowsnest" rates.

The LP model, however, was not able to distinguish between grain

destined for export markets and grain destined for domestic markets outside the Province of Manitoba. Therefore, given the distinction between domestically marketed grains and export grains, and the limitation of the LP model in this respect, it was necessary to employ "weighted" rail rate increases based on historic bulk exports and domestic marketings of the various grains. A detailed discussion of the actual weighting procedure employed in the analysis including the relevant data and calculations can be found in Appendix C.

Scenario III

Scenario III was the so-called "optimistic" scenario in terms of the proposed statutory grain rate alternative where grain producers pay compensatory freight rates on all domestically used grains and they absorb 100 percent of future cost increases in transporting export grain by rail over the 1978-85 study period. This scenario, representative of the agricultural production at the end of 1985, was also essentially the same as Scenario II in terms of utilizing the same 1978 base market conditions, production technologies (i.e., technical coefficients), costs, yields, and rail branch line configuration. Only the rail freight rates on export grains and oilseeds, and the production adjustment constraints were changed to reflect the related assumptions and the time period, and hence isolate the direct impacts on the provincial farm economy that resulted from the grain freight rate alternative.

In terms of changing the freight rates on export grain, this scenario assumed that over the relevant time period the rate of cost increases experienced by the major railways in their Western grain operations would be relatively less than the past rates of increases in

railway costs and the costs of other farm inputs (i.e., fertilizer, machinery, capital buildings, taxes, etc.). In conjunction with this assumption, it was further assumed that the many potential operating, institutional, and major capital improvements in Western grain handling and transportation, and the potential productivity developments (excluding rail electrification) for overall Canadian rail operations would come on stream during the 1978-85 study period even under the assumed Snavely cost-based freight rate. These potential improvements and productivity gains in both grain transportation and overall rail transport would tend to hold down inflationary pressures (cost-push or otherwise) in grain transportation and, consequently, moderate the future increases in grain freight rates.

Thus, from an optimistic point of view, it was assumed that rail grain transportation costs would only increase at a rate of 6 percent per year over the 1978-85 period. This projected increase in railway costs might be considered low relative to past increases in railway costs and other farm input costs. With a projected 6 percent annual increase in railway costs, the producers' share of the total variable cost of rail grain transportation would increase 80 percent in real terms (and 171 percent in nominal terms) over 1978 to 1985. In terms of the study model, this 80 percent real increase in grain freight rates borne by the producer translated into a reduction in the farm gate price received for the six principal grains moving into export markets.

The analytics and, particularly, the changing relative amounts of the Federal Government subsidy component and the grain producer's share of the total cost of transporting grain by rail associated with this optimistic scenario in grain handling and transportation in Western

Canada can be more easily understood by referring to Table 10. As this table illustrates, the costs associated with the rail transport of grain over the 1978-85 period were assumed to increase at an annual rate of 6 percent. This would increase the percentage borne by producers in both nominal and real terms. Indeed, under such a scenario, the Federal subsidy payment would be declining in real value over time from $10.46 per ton or 70.5 percent of the total transport costs to $6.96 per ton or 46.9 percent. In contrast, the producer's share of the total real cost of transporting grain would be increasing from $4.38 per ton (29.5 percent) to $7.88 per ton (53.1 percent).

Scenario III also differed from the two previous model situations in that the farm size specific minimum and maximum production flexibility constraints were generally set at -20 percent and +40 percent, respectively. The six principal crops plus sunflowers were subject to this new range while contract crops such as sugar beets and potatoes were maintained at the $\pm$ 20 percent range. The -20 percent to +40 percent range was also applied to calves, stocker cattle, fed beef, and weanling and market hogs, while farm enterprises that were highly regulated by marketing boards and commissions such as dairy and poultry were left at the $\pm$ 20 percent range. Considering the time span involved (1978-85), it was thought that expanding the original range of production adjustment constraints would be a more realistic test of what the IBI Group referred to as "the long-term static effect" of a change in statutory grain rates.[12] Basically, this hypothesis asserts that there is a potential long-term

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[12] IBI Group, Impact on Transportation Users of Changing Statutory Grain Rates (Report prepared for Alberta Economic Development, August, 1979), pp. VII-2, VII-4 and VII-5.

Table 10. The Changing Distribution of Railway Grain Transportation Costs Over the 1978-85 Period with an Assumed Annual Cost Increase of 6 Percent.

Year	Total Variable Rail Costs[a]	Federal Government Subsidy Payment[b]		User's Share of Total Costs	
		nominal dollars per ton (%)			
1978	14.84	10.46	(70.5)	4.38	(29.5)
1979	15.73	10.46	(66.5)	5.27	(33.5)
1980	16.67	10.46	(62.7)	6.21	(37.3)
1981	17.67	10.46	(59.2)	7.21	(40.8)
1982	18.74	10.46	(55.8)	8.28	(44.2)
1983	19.86	10.46	(52.7)	9.40	(47.3)
1984	21.05	10.46	(49.7)	10.59	(50.3)
1985	22.31	10.46	(46.9)	11.85	(53.1)
		1978 dollars per ton (%)[c]			
1978	14.84	10.46	(70.5)	4.38	(29.5)
1979	14.84	9.87	(66.5)	4.97	(33.5)
1980	14.84	9.31	(62.7)	5.54	(37.3)
1981	14.84	8.79	(59.2)	6.06	(40.8)
1982	14.84	8.28	(55.8)	6.56	(44.2)
1983	14.84	7.82	(52.7)	7.02	(47.3)
1984	14.84	7.38	(49.7)	7.47	(50.3)
1985	14.84	6.96	(46.9)	7.88	(53.1)

[a]The weighted average variable cost per ton for the base year, 1978, was derived using the per ton cost estimates and the shares of statutory grain traffic for the two major railways. For CN and CP in 1977, the average variable cost per ton estimates were $13.77 and $13.29 while their respective shares of total statutory grain movements were 41.4 percent and 58.6 percent. The weighted average cost per ton was then indexed up by 10 percent to give an approximation of the 1978 variable cost of transporting grain by rail. Similarly, thereafter this 1978 figure was indexed up by 6 percent on an annual basis.

[b]The initial Federal Government subsidy payment of $10.46 per ton in 1977 was based on the ratio of total variable cost to user revenue, which was estimated to be 3.39 in 1978. Dividing the total cost of transport through by this ratio yielded the producer's share of the total cost (i.e., 14.84 ÷ 3.39 = 4.38). The government portion was then simply the difference between the total cost and the producer's share (i.e., 14.84 - 4.38 = 10.46). In nominal dollars, the federal payment remained at the 1978 level of $10.46 per ton while the producer's share increased to make up the 6 percent annual cost increase.

Table 10. Continued

[c]"Real" or 1978 dollars are used in order to net out the real change in transport costs borne by the producer and to show how the real value of the government subsidy declines over time with cost increases of 6 percent per annum.

Source: Snavely, King and Associates, 1977 Costs and Revenues Incurred by the Railways in the Transportation of Grain Under Statutory Rates (Report prepared for the Ministry of Transport, Federal Government of Canada, September, 1978).

static reduction in the farm gate price of domestic feed and other grains below what it would be if the statutory rates were maintained. In response to these falling domestic grain prices, livestock production on the Prairies would expand and thus help to mitigate any financial losses suffered by the agricultural economy due to changes in statutory rates. Like the conceptual framework of this study, this hypothesis assumes that transportation capacity, quotas, Wheat Board marketing policies, and other constraints within the grain handling and transportation system and overall marketing of Canadian grain are not contributing factors.

Finally, with respect to Scenario III and the subsequent settings, it is important to stress the following. Dealing in largely real economic terms with all variables (prices, costs, quantities, coefficients, etc.) expressed in 1978 values (i.e., 1978 = 100) obviated the need to adjust or index these other variables in the overall study model over the 1978-85 study period. More important in terms of the analysis of the statutory rate alternative, this isolated any production changes or responses (as measured by the LP model) to only the effects of increased transport charges borne by producers resulting from the alternative as reflected in farm-gate prices for grains and oilseeds.

Scenario IV

Scenario IV was the "intermediate" scenario in terms of the proposed grain rail rate option and particularly with respect to the associated assumptions regarding future cost inflation and productivity gains in rail grain transportation in Western Canada between 1978 and 1985. This scenario was essentially a duplicate of Scenario III in terms of market conditions, production technologies, costs, yields, production

flexibility constraints, and the rail branch line configuration. Only the assumptions regarding the mix of inflationary cost pressures and productivity gains, and, hence the rate of cost increases that may be experienced in the rail transport of grain on the Prairies were different in this scenario as compared to Scenario III and, as well, Scenario V. Specifically, this scenario assumed that rail costs increase at an annual rate of 11 percent over the period 1978 to 1985. In contrast, Scenario III and V, which represent the "most" optimistic and pessimistic situations regarding future cost inflation and productivity developments in rail grain transportation respectively, assumed annual increases in rail costs of 6 and 15 percent, respectively. Because of this bracketing effect with respect to future increases in rail costs, Scenario IV could be referred to as the "intermediate" scenario in grain handling and transportation in Western Canada.

Basically then, the only difference between Scenario IV and the other two, which were also representative of a "static" 1978 Manitoba agricultural economy cast in 1985 railway cost conditions, lies in the total real cost of grain transport services borne by producers. These transport cost differences for the six principal crops were directly reflected in their respective farm gate prices through the same weighting procedure described in Appendix C, which in turn affected their relative profitability.

With a projected 11 percent annual increase in railway costs over the 1978-85 period, grain producers would experience a 124 percent real (or 365 percent nominal) increase in their share of total rail costs. These real and nominal increases in the producer's share of rail costs are illustrated in Table 11. Deflating the Federal Government subsidy

Table 11. The Changing Distribution of Railway Grain Transportation Costs Over the 1978-85 Period with an Assumed Annual Cost Increase of 11 Percent.[a]

Year	Total Variable Rail Costs[a]	Federal Government Subsidy Payment[b]		User's Share of Total Costs	
	nominal dollars per ton (%)				
1978	14.84	10.46	(70.5)	4.38	(29.5)
1979	16.47	10.46	(63.5)	6.01	(36.5)
1980	18.28	10.46	(57.2)	7.82	(42.8)
1981	20.30	10.46	(51.5)	9.84	(48.5)
1982	22.53	10.46	(46.4)	12.07	(53.6)
1983	25.01	10.46	(41.8)	14.55	(58.2)
1984	27.76	10.46	(37.7)	17.30	(62.3)
1985	30.81	10.46	(33.9)	20.35	(66.1)
	1978 dollars per ton (%)[c]				
1978	14.84	10.46	(70.5)	4.38	(29.5)
1979	14.84	9.42	(63.5)	5.42	(36.5)
1980	14.84	8.49	(57.2)	6.35	(42.8)
1981	14.84	7.64	(51.5)	7.20	(48.5)
1982	14.84	6.89	(46.4)	7.95	(53.6)
1983	14.84	6.20	(41.8)	8.64	(58.2)
1984	14.84	5.60	(37.7)	9.25	(62.3)
1985	14.84	5.03	(33.9)	9.81	(66.1)

[a]The weighted average variable cost per ton for the base year, 1978, was derived using the per ton cost estimates and the shares of statutory grain traffic for the two major railways. For CN and CP in 1977, the average variable cost per ton estimates were $13.77 and $13.29 while their respective shares of total statutory grain movements were 41.4 percent and 58.6 percent. The weighted average cost per ton was then indexed up by 10 percent to give an approximation of the 1978 variable cost of transporting grain by rail. Similarly, thereafter this 1978 figure was indexed up by 11 percent on an annual basis.

[b]The initial Federal Government subsidy payment of $10.46 per ton in 1977 was based on the ratio of total variable cost to user revenue, which was estimated to be 3.39 in 1978. Dividing the total cost of transport through by this ratio yielded the producer's share of the total cost (i.e., 14.84 ÷ 3.39 = 4.38). The government portion was then simply the difference between the total cost and the producer's share (i.e., 14.84 - 4.38 = 10.46). In nominal dollars, the federal payment remained at the 1978 level of $10.46 per ton while the producer's share increased to make up the 11 percent annual cost increase.

Table 11. Continued

[c]"Real" or 1978 dollars are used in order to net out the real change in transport costs borne by the producer and to show how the real value in the government subsidy declines over time with cost increases of 11 percent per annum.

Source: Snavely, King and Associates, 1977 Costs and Revenues Incurred by the Railways in the Transportation of Grain Under Statutory Rates (Report prepared for the Ministry of Transport, Federal Government of Canada, September, 1978).

payment and producer's share of the total cost of transporting grain by rail by the 11 percent annual cost increase that was assumed to prevail over the relevant time frame yields a more meaningful overview of the distributional effects by casting the amounts in 1978 dollar equivalents. As illustrated, the grain producer's share of the total real cost of rail movement of grain would rise from $4.38 per ton or 29.5 percent of the total cost to $9.81 per ton or 66.1 percent. On the other hand, the Federal Government's financial commitment as represented by the subsidy would fall in real terms from $10.46 per ton (70.5 percent of the total cost) to $5.03 per ton (33.9 percent).

Scenario V

Scenario V, as previously mentioned, represented the "pessimistic" scenario in the analysis of the proposed statutory grain rate alternative. Like Scenario IV, this scenario was essentially a duplicate of Scenario III in terms of market conditions, production technologies, costs, yields, production flexibility constraints and the Prairie rail branch line network. This scenario represented the pessimistic setting in grain handling and transportation with respect to the assumptions regarding the combination of future cost inflation and productivity increases that may be experienced in rail grain transportation between 1978 and 1985. Thus, as in Scenario IV, only the annual increase in grain transport costs and hence the grain producers' relative share of these costs differed from Scenario III.

Scenario V assumed that over the 1978-85 study period there would be a nominal increase of 15 percent per annum in the total variable cost of transporting grain by rail owing to relatively high inflationary cost

pressures and low productivity gains in railway grain transportation. The basis of this assumed scenario was that relatively strong cost-push inflationary pressures stemming from aggressive railway labor unions, significant domestic oil price hikes, and rapidly rising prices for other railway inputs such as iron, steel and capital investments in general would be experienced by Canada's major railways. At the same time, however, offsetting productivity increases in overall rail transport would be less in 1978-85 period as compared to the 1945-78 period. Moreover, productivity gains specific to grain transportation to 1985 would lag relative to the 1974-77 period when significant gains were achieved. This latter development in grain transportation could occur if many of the potential major improvements in grain handling and transportation fail to come on stream by 1985 under a cost-based freight rate on export grain. Thus, the essence of this scenario was that future productivity gains achieved in grain transportation fail to a large degree to offset the anticipated future high inflationary cost pressures experienced in this sector. Consequently, in terms of the proposed statutory grain rate alternative, annual increases in rail costs, which the producer must absorb, were assumed to run at 15 percent per year from 1978 to 1985. Relative to past increases in rail costs and other farm input prices, a 15 percent annual increase in grain transport costs was considered to be the upper bound of a reasonable range for annual rail cost increases in this analysis.

A 15 percent annual increase in rail grain transportation costs over the study period would, cummulatively speaking, translate into a 149 percent real (or 562 percent nominal) increase in the producer's share of

transport costs. Table 12 illustrates the distributional effects (i.e., the changing relative amounts of the Federal subsidy payment and the grain producer's share of the total grain transport costs) associated with a 15 percent annual increase in grain transport costs. As illustrated, the grain producer's share would rise from $4.38 per ton or 29.5 percent of the total real cost to $10.91 per ton or 73.5 percent. The Federal Government subsidy component, on the other hand, would fall from $10.46 per ton (70.5 percent of the total cost) to $3.93 per ton (26.5 percent). Again, the grain producer's increased relative share of the total grain transportation bill was directly reflected in the farm gate prices for grains and oilseeds by the freight rate increase weighting procedure (see Appendix C).

Table 12. The Changing Distribution of Railway Grain Transportation Costs Over the 1978-85 Period with an Assumed Annual Cost Increase of 15 Percent.

Year	Total Variable Rail Costs[a]	Federal Government Subsidy Payment[b]		User's Share of Total Costs	
		nominal dollars per ton (%)			
1978	14.84	10.46	(70.5)	4.38	(29.5)
1979	17.07	10.46	(61.3)	6.61	(38.7)
1980	19.63	10.46	(53.3)	9.17	(46.7)
1981	22.57	10.46	(46.3)	12.11	(53.7)
1982	25.96	10.46	(40.3)	15.50	(59.7)
1983	29.85	10.46	(35.0)	19.39	(65.0)
1984	34.33	10.46	(30.5)	23.87	(69.5)
1985	39.47	10.46	(26.5)	29.01	(73.5)
		1978 dollars per ton (%)[c]			
1978	14.84	10.46	(70.5)	4.38	(29.5)
1979	14.84	9.10	(61.3)	5.74	(38.7)
1980	14.84	7.91	(53.3)	6.93	(46.7)
1981	14.84	6.87	(46.3)	7.97	(53.7)
1982	14.84	5.98	(40.3)	8.86	(59.7)
1983	14.84	5.19	(35.0)	9.65	(65.0)
1984	14.84	4.53	(30.5)	10.31	(69.5)
1985	14.84	3.93	(26.5)	10.91	(73.5)

[a]The weighted average variable cost per ton for the base year, 1978, was derived using the per ton cost estimates and the shares of statutory grain traffic for the two major railways. For CN and CP in 1977, the average variable cost per ton estimates were $13.77 and $13.29 while their respective shares of total statutory grain movements were 41.4 percent and 58.6 percent. The weighted average cost per ton was then indexed up by 10 percent to give an approximation of the 1978 variable cost of transporting grain by rail. Similarly, thereafter this 1978 figure was indexed up by 15 percent on an annual basis.

[b]The initial Federal Government subsidy payment of $10.46 per ton in 1977 was based on the ratio of total variable cost to user revenue, which was estimated to be 3.39 in 1978. Dividing the total cost of transport through by this ratio yielded the producer's share of the total cost (i.e., 14.84 ÷ 3.39 = 4.38). The government portion was then simply the difference between the total cost and the producer's share (i.e., 14.84 - 4.38 = 10.46). In nominal dollars, the federal payment remained at the 1978 level of $10.46 per ton while the producer's share increased to make up the 15 percent annual cost increase.

Table 12. Continued

[c]"Real" or 1978 dollars are used in order to net out the real change in transport costs borne by the producer and to show how the real value of the government subsidy declines over time with cost increases of 15 percent per annum.

Source: Snavely, King and Associates, 1977 Costs and Revenues Incurred by the Railways in the Transportation of Grain Under Statutory Rates (Report prepared for the Ministry of Transport, Federal Government of Canada, September, 1978).

Chapter VI

RESULTS AND ANALYSIS

The analysis of the proposed statutory rate alternative compared the optimal solution of the base situation, Scenario I, to the optimal solutions of the adjusted situations, Scenario II, III, IV and V, on a provincial, farm-size specific and regional basis. The analysis and interpretation of the results derived from the LP model were carried out in terms of changes in the following economic indicators:

1. the level and mix of the various farm production activities;
2. the gross value of farm production; and
3. net farm income (i.e., gross farm receipts less all costs of production including labor, interest on capital investment, depreciation and transportation charges).

The detailed production, gross value and net income changes for the province and five agricultural regions under the various scenarios are presented in tabular form in Appendix E. A summary of the production values, net income figures and differences in these variables arising from the statutory rate option are presented in Tables 13, 14 and 15. Changes in these economic indicators are particularly important from a policy standpoint; they provide an indication of how the Manitoba farm economy would "adjust" in response to compensatory freight rates on domestically marketed grains and the gradual movement towards compensatory rates on export grains.

Table 13. Summary of Provincial and Regional Gross Farm Production Values and Changes Under Various Scenarios[a] (in thousands of dollars)

Region	Farm Size	1978 Scenario I Production Value	1978 Scenario II Production Value	Change from Scenario I	1985 Scenario III Production Value	Change from Scenario I	1985 Scenario IV Production Value	Change from Scenario I	1985 Scenario V Production Value	Change from Scenario I
Province	Small	169,994	168,643	- 1,351	173,712	3,718	172,592	2,598	171,895	1,901
	Medium	328,034	322,945	- 5,089	336,832	8,796	334,882	6,846	333,781	5,745
	Large	683,957	675,526	- 8,431	700,967	17,010	695,013	11,056	692,060	8,103
	Total[b]	1,182,006	1,167,135	-14,871	1,211,533	29,527	1,202,509	20,503	1,197,759	15,753
South West	Small	48,798	48,162	- 636	50,423	1,625	50,019	1,221	49,805	1,007
	Medium	99,055	96,331	- 2,724	101,255	2,198	100,664	1,607	100,188	1,131
	Large	211,857	209,193	- 2,664	214,437	2,582	212,353	498	211,122	- 733
	Total	359,729	353,706	- 6,023	366,134	6,405	363,053	3,324	361,133	1,404
North West	Small	29,353	29,123	- 230	28,593	- 760	28,413	- 940	28,182	- 1,171
	Medium	51,607	51,059	- 548	52,167	560	51,803	196	51,538	- 69
	Large	87,484	86,223	- 1,261	95,252	7,768	94,400	6,916	93,839	6,355
	Total	168,465	166,425	- 2,040	176,035	7,570	174,639	6,174	173,580	5,115
Central	Small	58,436	58,204	- 232	60,233	1,797	59,850	1,414	59,635	1,199
	Medium	114,781	113,485	- 1,296	118,193	3,412	117,494	2,713	117,198	2,417
	Large	228,493	225,782	- 2,711	229,754	1,261	227,462	- 1,031	226,515	- 1,978
	Total	401,732	397,492	- 4,240	408,201	6,469	404,829	3,097	403,371	1,639
Eastern	Small	16,486	16,395	- 91	17,021	535	16,955	469	16,918	432
	Medium	32,709	32,520	- 189	34,132	1,423	33,994	1,285	33,921	1,212
	Large	81,883	81,145	- 738	85,135	3,252	84,810	2,927	84,635	2,752
	Total	131,098	130,079	- 1,019	136,307	5,209	135,778	4,680	135,492	4,394
Interlake	Small	16,820	16,723	- 97	17,351	532	17,297	478	17,263	444
	Medium	29,685	29,480	- 205	30,897	1,213	30,785	1,101	30,714	1,030
	Large	73,784	72,959	- 825	75,820	2,034	75,490	1,704	75,268	1,482
	Total	120,307	119,176	- 1,131	124,088	3,781	123,589	3,282	123,262	2,955

[a] See Appendix E for details.

[b] Total figure values may not be exact summation of columns due to rounding errors.

Table 14. Summary of Provincial and Regional Net Farm Income Levels and Income Changes Under Various Scenarios (in thousands of dollars)

Region	Farm Size	1978 Scenario I Net Farm Income	1978 Scenario II Net Farm Income	Income Change from Scenario I	1985 Scenario III Net Farm Income	Income Change from Scenario I	1985 Scenario IV Net Farm Income	Income Change from Scenario I	1985 Scenario V Net Farm Income	Income Change from Scenario I
Province	Small	-14,717	-15,473	- 756	-16,322	- 1,605	-16,928	- 2,211	-17,298	- 2,581
	Medium	13,475	11,476	- 1,999	11,005	- 2,470	9,531	- 3,944	8,660	- 4,815
	Large	85,967	80,764	- 5,203	84,272	- 1,695	79,652	- 6,315	77,134	- 8,833
	Total[b]	84,724	76,767	- 7,957	78,955	- 5,769	72,255	-12,469	68,496	-16,228
South West	Small	- 1,339	- 1,487	- 148	- 1,444	- 105	- 1,663	- 324	- 1,786	- 447
	Medium	9,556	8,760	- 796	9,095	- 461	8,640	- 916	8,316	- 1,240
	Large	38,594	36,514	- 2,080	36,994	- 1,600	35,039	- 3,555	34,019	- 4,575
	Total	46,811	43,786	- 3,025	44,646	- 2,165	42,016	- 4,795	40,548	- 6,263
North West	Small	- 2,143	- 2,242	- 99	- 2,748	- 605	- 2,834	- 691	- 2,911	- 768
	Medium	3,366	3,072	- 294	2,594	- 772	2,312	- 1,054	2,163	- 1,203
	Large	15,395	14,534	- 861	16,976	1,581	16,209	814	15,770	375
	Total	16,618	15,364	- 1,254	16,821	203	15,687	- 931	15,023	- 1,595
Central	Small	- 6,440	- 6,890	- 450	- 7,227	- 787	- 7,507	- 1,067	- 7,665	- 1,225
	Medium	3,876	3,113	- 763	2,998	- 878	2,404	- 1,472	2,086	- 1,790
	Large	23,823	21,584	- 2,239	22,563	- 1,260	21,014	- 2,809	20,133	- 3,690
	Total	21,258	17,808	- 3,450	18,334	- 2,924	15,911	- 5,347	14,554	- 6,704
Eastern	Small	- 2,250	- 2,254	- 4	- 2,257	- 7	- 2,260	- 10	- 2,262	- 12
	Medium	- 1,822	- 1,896	- 74	- 1,948	- 126	- 2,026	- 204	- 2,070	- 248
	Large	4,857	4,790	- 67	4,973	116	4,781	- 76	4,673	- 184
	Total	784	638	- 146	767	- 17	493	- 291	340	- 444
Interlake	Small	- 2,543	- 2,599	- 56	- 2,644	- 101	- 2,662	- 119	- 2,672	- 129
	Medium	- 1,501	- 1,572	- 71	- 1,735	- 234	- 1,799	- 298	- 1,835	- 334
	Large	3,296	3,340	44	2,764	532	2,607	689	2,537	- 759
	Total	- 749	- 831	- 82	- 1,614	- 865	- 1,853	- 1,104	- 1,970	- 1,221

[a]Total figure values may not be exact summation of columns due to rounding errors.

Table 15. Estimated Provincial and Regional Net Farm Income Levels Per Farm and Income Changes Per Farm Under Various Scenarios

Region	Farm Size	1978 Scenario I Net Farm Income/Farm	1978 Scenario II Net Farm Income/Farm	Income Change from Scenario I	1985 Scenario III Net Farm Income/Farm	Income Change from Scenario I	1985 Scenario IV Net Farm Income/Farm	Income Change from Scenario I	1985 Scenario V Net Farm Income/Farm	Income Change from Scenario I
Province	Small	- 1,157	- 1,216	- 59	- 1,281	- 124	- 1,330	- 173	- 1,360	- 203
	Medium	1,225	1,043	- 182	999	- 226	886	- 359	787	- 438
	Large	14,741	13,848	- 893	14,449	- 292	13,658	-1,083	13,226	-1,515
	Average	2,867	2,597	- 270	2,671	- 196	2,445	- 422	2,318	- 549
South West	Small	- 446	- 496	- 50	- 481	- 35	- 554	- 108	- 595	- 149
	Medium	2,867	2,628	- 239	2,729	- 138	2,592	- 275	2,495	- 372
	Large	22,130	20,937	-1,193	21,213	- 917	20,092	-2,038	19,506	-2,624
	Average	5,794	5,420	- 374	5,526	- 268	5,201	- 593	5,019	- 775
North West	Small	- 761	- 796	- 35	- 969	- 208	- 1,006	- 245	- 1,033	- 272
	Medium	1,681	1,535	- 146	1,288	- 393	1,155	- 526	1,081	- 600
	Large	17,456	16,479	- 977	19,244	1,788	18,379	- 923	17,881	- 425
	Average	2,915	2,695	- 220	2,950	35	2,751	- 164	2,635	- 280
Central	Small	- 2,302	- 2,462	- 160	- 2,583	- 281	- 2,683	- 381	- 2,740	- 438
	Medium	1,270	1,020	- 250	983	- 287	788	- 482	684	- 586
	Large	11,655	10,560	-1,095	11,039	- 616	10,281	-1,374	9,850	-1,805
	Average	2,693	2,256	- 437	2,323	- 370	2,016	- 677	1,844	- 849
Eastern	Small	- 1,103	- 1,105	- 2	- 1,106	- 3	- 1,108	- 5	- 1,108	- 5
	Medium	- 1,488	- 1,549	- 61	- 1,590	- 102	- 1,654	- 166	- 1,690	- 202
	Large	8,463	8,345	- 118	8,664	201	8,330	- 133	8,143	- 320
	Average	204	166	- 38	200	- 4	129	- 75	89	- 115
Interlake	Small	- 1,232	- 1,259	- 27	- 1,280	- 48	- 1,289	- 57	- 1,294	- 62
	Medium	- 1,082	- 1,133	- 51	- 1,250	- 168	- 1,296	- 214	- 1,322	- 240
	Large	5,606	5,681	75	4,702	- 904	4,435	-1,171	4,315	-1,291
	Average	- 185	- 206	- 21	- 399	- 214	- 459	- 274	- 488	- 303

[a]Total figure values may not be exact summation of columns due to rounding errors.

Provincial, Farm-Size and Regional Analysis

Provincial Basis

The combined effect of compensatory rates on domestically marketed grain and progressively higher export grain freight rates on the gross value of provincial farm output in the four adjusted scenarios relative to Scenario I were as follows: Scenario II registered a decline of $14.9 million (or 1.3 percent) while Scenarios III, IV and V registered increases of $29.5 million (2.5 percent), $20.5 million (1.7 percent) and $15.8 million (1.3 percent), respectively. The province experienced a decline in the gross value of farm output in Scenario II and small gains in the other three situations largely because of the different production flexibility ranges which limited the amount that the output of the various farm commodities could vary from their actual 1978 production levels. In Scenario II the $\pm$ 20 percent range effectively prevented expansion by producers into the relatively more profitable crops and livestock enterprises such as rapeseed, sunflowers, stocker calves, stocker cattle and fed beef. With a more flexible (i.e., -20 to +40 percent) production adjustment range for some activities in the latter three scenarios, producers were able to offset the effect of higher transport charges on export and domestic grains by expanding their production of crops, particularly rapeseed and sunflowers, and livestock including stocker cattle, stocker calves, fed beef and fluid milk. Thus, the negative effect of the progressively higher transport charges for grains and oilseeds on the value of gross farm output really only became apparent in the gradual decline in this value when going from Scenario III to V. During this latter transition, the real increase in export

grain freight rates borne by producers ranged from 80 percent to 149 percent over the 1978-85 period.

In Scenario II with the relatively restrictive ± 20 percent production adjustment range,[1] the production changes in the province resulting from compensatory rates on domestic grain and subsidized (i.e., "Crowsnest") rates on export grain were confined to: (1) very minimal increases in export wheat production as some large-size farms found it more profitable to produce wheat versus oats and barley; (2) minimal increases in veal calf and fed beef production as large- and small-size operators took advantage of relatively lower feed grain costs; and (3) minimal decreases in oats, barley and rye output as the profitability of these crops fell in response to the higher transport charges. In total, the gross value of domestic grains that had previously moved under the statutory rates fell $15.5 million or 2.8 percent in Scenario II. This loss was offset to a small degree by the additional livestock output which totalled $645,000. The net effect of the higher freight rates on domestic grain and the resultant production responses was a $14.9 million (or 1.3 percent) drop in gross provincial farm output.

In Scenario III, there was an increase in the production of all grains except wheat and barley despite the lower net returns for the six

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[1]Using a ± 20 percent production adjustment range could be rationalized in the following manner. The somewhat restrictive range tended to add more realism to the overall model in the sense that it could be interpreted to represent transportation capacity, quotas, Wheat Board marketing policies, growth in consumer demand, and other constraints, factors and structural rigidities that pervade the Canadian agricultural industry. One would not expect these constraints to be removed or considerably reduced in the very short run, which, in terms of the present analysis, was represented by the shift from Scenario I to Scenario II.

principal crops. Producers, particularly large-size ones, took advantage of the new +40 percent upper production adjustment level as evidenced by significant increases in rapeseed and oats output and minor increases in flax and rye output. This limited the loss in the gross value of "statutory" grain to $21.0 million or 3.8 percent of the base year value. With the more flexible production adjustment range, producers were able to expand sunflower production by $4.3 million (15.2 percent). In addition, they were also able to take advantage of lower feed grain prices and expand livestock production, as evidenced by a $46.2 million increase in Scenario III.

Generally speaking, the crop production adjustments in Scenario IV and V were very much the same as the adjustments registered in Scenario III. Wheat, oats, flaxseed and rapeseed output were virtually unchanged from the optimistic 1985 production levels on a province wide basis even though the profitability of these enterprises was further reduced by the higher rail tariffs. Barley output, however, continued to fall while rye output showed sizeable increases over the optimistic 1985 output level.

Throughout the three 1985 scenarios, wheat output fell approximately 0.1 percent or 100,000 bushels as production in many crop districts fell to or near the lower limits of the production adjustment range. In some areas large-size producers, who enjoyed substantially lower costs of production relative to small- and medium-size producers, actually increased their output of wheat, but the production decreases on medium-size farms more than offset these increases.

The production of export barley in the province was drastically reduced in Scenarios III, IV and V as evidenced by declines of 29.3 percent

(11.6 million bushels), 29.9 percent (11.8 million bushels) and 30.0 percent (11.8 million bushels), respectively. Overall barley production in the province, however, declined by only 12.6 percent (8.5 million bushels), 12.9 percent (8.7 million bushels) and again 12.9 percent (8.7 million bushels) for the respective scenarios as producers increased their output of barley for own use as feed and, to a lesser extent, barley for sale as feed. The increased production of feed barley was in response to the need for additional livestock feed supplies in the province.

Similarly, oats production increased on a province wide basis in response to the extra demand for feed created by the expansion of the livestock sector. In the latter three scenarios, oats production increased 6.3 percent (1.6 million bushels), 6.3 percent (1.6 million bushels) and 6.2 percent (1.6 million bushels), respectively.

Throughout Scenarios III, IV and V, rapeseed, flaxseed, rye and sunflowers were relatively profitable crop enterprises, particularly for the more cost efficient large scale operators. As a result, rapeseed output increased about 14.3 percent (3.2 million bushels) in each of the three 1985 production comparisons on a province wide basis. These rapeseed production adjustments indicated that throughout Scenarios III, IV and V, small, medium and large producers were for the most part constrained at the upper level of the production adjustment range. In spite of the increased transport charges, rapeseed continued to be a highly profitable oilseed crop as evidenced by the shadow prices or marginal value products.[2]

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[2]Shadow prices (also known as dual variables or marginal value products) are of interest since they indicate possible gains in income through acquisition of scarce resources and, consequently, the amount added to or subtracted from profit by a one-unit increase in a real activity. In a conventional linear programming interpretation, a negative

For example, in Scenario III in crop district 1, small-, medium- and large-size producers had rapeseed shadow prices of -$1.95, -$2.69 and -$3.03, respectively. These figures indicated that if small, medium and large producers in crop district 1 were able to increase their rapeseed output by one unit or bushel, they would have realized increases in net income of $1.95, $2.69 and $3.03, respectively.

Over the three 1985 production comparisons, flaxseed output increased 2.2 percent (149,000 bushels). This increase was essentially due to the fact that large producers in certain crop districts still found flaxseed a profitable crop in spite of the lower net returns resulting from the rate option. For example, large producers in crop district 4 expanded their output of flax to the upper limit as flax had a shadow price of -$0.17. Small and medium size producers, on the other hand, generally produced the minimum amount of flax allowed by the production adjustment range.

Similarly, rye output increased 2.6 percent (99,000 bushels) in Scenario III, 6.3 percent (243,000 bushels) in Scenario IV and 5.8 percent (224,000 bushels) in Scenario V as large farms found this enterprise relatively profitable despite the higher transport charges. For example, large farms in crop district 4 had rye shadow prices of -$0.33, -$.27, and -$0.24 over the three respective scenarios.

Sunflowers were a highly profitable crop for all farm sizes.

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[2](continued)

shadow price indicates that an increase in the jth real activity will increase profit while a positive shadow price indicates that an increase in the jth activity will decrease profit. See E. O. Heady and W. Candler, Linear Programming Methods (Ames, Iowa: Iowa State University Press, 1958), pp. 84-85.

Consequently, this production activity was constrained at the upper production level throughout the latter three production comparisons at the small-, medium- and large-size farm levels. The additional sunflower output that occurred in Scenarios III, IV and V was therefore identical totalling 43.3 million pounds or 15.2 percent more than the base year amount.

The negative effect of the progressively higher export grain freight rates on the gross value of grains and oilseeds that formerly moved under the statutory rates overshadowed the additional output of oats, flaxseed, rapeseed and rye throughout the latter three production comparisons. This was evidenced by the following respective decreases in the gross value of "statutory" grains: $21.0 million (3.8 percent); $30.1 million (5.4 percent); and $34.8 million (6.2 percent). It is important to bear in mind that these estimates represented the real 1978 dollar loss that the provincial farm economy would have suffered due to annual nominal increases of 6 percent, 11 percent and 15 percent, respectively, in the cost of transporting grain by rail over the 1978-85 period.

In Scenarios IV and V, increased livestock production was valued at $46.2 million which was essentially the same as the increase recorded in Scenario III. This reflected the fact that with the more profitable livestock enterprises, such as stocker cattle and fed beef, producers were invariably constrained from further expanding their output by the upper production constraint. For example, in Scenario III in crop district 6, large producers were constrained at the upper production level in stocker calf, stocker cattle and fed beef enterprises. If it had been possible to expand the output of stocker calves, stocker cattle and fed

beef an additional unit on these particular farms, net farm income from these respective livestock enterprises would have increased $5.81, $126.69 and $37.73 (as reflected in their shadow prices).

As shown previously, the negative effects of higher grain transport costs on the aggregate value of farm output in the Province of Manitoba were relatively minor throughout Scenarios II to V. Production increases in oats, flax, rapeseed, rye, sunflowers and certain livestock products tended to offset the reduced farm-gate prices of the six principal crops. On a provincial net farm income basis, however, the negative effects associated with the proposed grain transportation option were very significant. In Scenario II, net income fell $8.0 million (9.4 percent) while in Scenarios III, IV and V the corresponding losses were $5.8 million (6.8 percent), $12.5 million (14.7 percent) and $16.2 million (19.2 percent). Changes in net farm income on a per farm basis, however, yielded a better indication of the relative magnitude of the economic implications for Manitoba agricultural producers that resulted from the proposed statutory rate alternative. For individual producers in the province, the reductions in net farm income were as follows: $270 (9.4 percent) in Scenario II; $196 (6.8 percent) in Scenario III; $422 (14.7 percent) in Scenario IV; and $549 (19.2 percent) in Scenario V. As these figures illustrate, the provincial net income picture at the end of 1978 to 1985 gradually deteriorated under compensatory freight rates on domestically marketed grains and progressively higher rail tariffs on export grains.

From a provincial perspective, the results of the four production comparisons are summarized as follows:

1. Scenario II:

   (a) The value of agricultural production in Manitoba declined by $14.9 million (1.3 percent). The value of statutory grain output fell $15.5 million (2.8 percent) while the value of livestock production increased $645,000.

   (b) Average net income per farm declined $270.

2. Scenario III:

   (a) The value of agricultural production in the provincial economy increased $29.5 million (2.5 percent). The value of grain that formerly moved under the statutory rates declined by $21.0 million (3.8 percent) while livestock output increased $46.2 million.

   (b) Average net income per farm fell $196.

3. Scenario IV:

   (a) The gross value of farm output in Manitoba increased $20.5 million (1.7 percent). The gross value of statutory grain output fell $30.1 million (5.4 percent) while the value of livestock production increased $46.2 million.

   (b) Average net income per farm fell $422.

4. Scenario V:

   (a) The value of agricultural production in Manitoba increased $15.8 million (1.3 percent). The value of crops that formerly moved under the statutory rates fell $34.8 million (6.2 percent) while the value of livestock output increased $46.2 million.

   (b) Average net income per farm declined $549.

Farm-Size Basis

A farm-size specific analysis of the effects resulting from the proposed statutory rate option was facilitated by the three farm sizes specified in the LP model. These enterprise sizes, which were generally cost specific, included small farms, medium farms and large farms, defined according to combinations of the crop and livestock enterprise sizes.[3]

Small-Size Farms. The patterns and trends in agricultural production, value of production and net farm income on a small-size farm basis were to a very large extent similar to those in a provincial basis for the four production comparisons. For small farms in the province, the value of gross output fell in Scenario II by $1.4 million (0.8 percent). With the relaxed production adjustment range in Scenarios III, IV and V, however, the gross value of output on small farms increased by $3.7 million (2.2 percent), $2.6 million (1.5 percent) and $1.9 million (1.1 percent), respectively.

In Scenario II there were virtually no net production adjustments on small farms in response to the higher compensatory freight rates on domestic grain except for a $316,000 increase in the value of fed beef output. The $\pm$ 20 percent production adjustment range largely prevented any additional physical production changes particularly in livestock enterprises. There were no net changes in the production of grains at the small-size farm level. However, there was considerable switching of grains, particularly with barley from for sale as feed to for own use

[3]See Appendix D of this study for a detailed description of the sizes of enterprises included in the analysis.

as feed. This switching of feed grains reflected the increased demand for feed grains at the small farm level brought about by the increased production of fed beef.

In the three 1985 scenarios, the physical production changes on small farms were virtually the same despite the fact that over the three scenarios transportation charges on export grain increased. These changes, which were facilitated by the +40 percent upper production adjustment constraint, were confined to sizeable increases in the output of rapeseed, sunflowers, stocker cattle and fed beef, and a small decrease in market hog output. There were no absolute changes in the production of wheat, oats, barley, rye and flax, but again there was switching of wheat, oats and barley. This time, however, small-size farms found it more profitable to produce barley for sale as feed rather than for own use as feed. Small-size farms obtained feed grains from medium- and large-size producers who produced feed grains at relatively lower costs. This was consistent with the overall objective of the LP model; namely, the maximization of net farm income which could also be viewed as the minimization of production costs to achieve the specified minimum levels of production. With wheat, small producers found it more profitable to export wheat rather than use it as feed or sell it as feed. To supplement their increased feed requirements, small producers diverted a significant amount of their oats production from for sale as feed to for own use as feed.

As was the case provincially, rapeseed production on small farms remained a relatively profitable enterprise in Scenarios III, IV and V as evidenced by the shadow prices. This occurred despite the lower returns received for rapeseed due to the increased freight rates. Consequently,

production of this oilseed crop increased 234,000 bushels or 8.2 percent throughout all three 1985 settings, largely in response to the relaxed production adjustment range.

Similar to rapeseed output on small farms, sunflowers were a profitable enterprise but constrained in Scenario II by the upper bound of the $\pm$ 20 percent production adjustment range. Thus, when this upper constraint was relaxed to the +40 percent level, sunflower production on small farms expanded the maximum amount allowed in the three 1985 situations. This increase was 6.7 million pounds or 16.7 percent of the base year level.

In response to the lower feed grain prices that prevailed in Scenarios III, IV and V and the relaxed production adjustment range, livestock production on small farms increased in each situation by about $5.0 million. These increases consisted largely of significant expansions in stocker cattle and fed beef. A small reduction (i.e., $574,000) in market hog output on small farms, however, offset the expansions in stocker cattle and fed beef to some extent, as small producers found it more profitable to feed the latter animals rather than hogs.

As expected, the gross value of "statutory" grain output on small farms was adversely affected throughout the four production comparisons by the compensatory rates on domestically marketed grains and progressively higher rates on export grain. In Scenario II, the value of grain that formerly moved under the statutory rates decreased $1.7 million (2.5 percent). In Scenarios III, IV and V with the more flexible production expansion range, the respective losses in the gross value of statutory grain were $2.0 million (3.0 percent), $3.1 million (4.6 percent) and

$3.6 million (5.4 percent). As stated earlier, these losses on small farms were offset to varying degrees by increased output of rapeseed, sunflowers and livestock.

Although small farms were able to offset the negative effects of higher grain freight rates on the gross value of farm output, particularly in the latter three scenarios, such was not the case with respect to net farm income (i.e., when production costs including transport charges were taken into account). In Scenarios II, III, IV and V, small farms as a whole absorbed the following reductions in net farm receipts: $756,000 (5.1 percent); $1.6 million (10.6 percent); $2.2 million (14.9 percent); and $2.6 million (17.4 percent). On a per farm basis, the reductions in net income for small farms in Manitoba were as follows: $59 in Scenario II; $124 in Scenario III; $173 in Scenario IV; and $203 in Scenario V.

The results of the four production comparisons from a small farm basis are summarized below:

1. Scenario II:
   (a) The value of agricultural production on small farms in Manitoba declined by $1.4 million (0.8 percent). The value of grains that formerly moved under the statutory rates declined $1.7 million (2.5 percent) while the value of livestock production increased $316,000.
   (b) The average loss in net income per small farm was $59.
2. Scenario III:
   (a) The value of agricultural output on small farms increased $3.7 million (2.2 percent). The value of statutory grain output fell $2.0 million (3.0 percent) while the value of livestock production increased $5.0 million.

(b) Net income per average small farm declined $124.

3. Scenario IV:

(a) The value of agricultural production on small farms increased $2.6 million (1.5 percent). The value of statutory grain output fell $3.1 million (4.6 percent) while the value of livestock production increased $5.0 million.

(b) The net income loss per small farm was $173.

4. Scenario V:

(a) The value of agricultural production on small farms increased $1.9 million (1.1 percent). The value of statutory grain production declined by $3.6 million (5.4 percent) while the value of livestock production increased $4.9 million.

(b) The average loss in net income per small farm was $203.

Medium-Size Farms. In Scenario II, the gross value of output on medium-size farms fell $5.1 million or 1.6 percent. Meanwhile, in Scenarios III, IV and V, the gross value increased $8.8 million (2.7 percent), $6.9 million (2.1 percent) and $5.8 million (1.8 percent).

The decreased value of farm output in Scenario II was almost exclusively due to reduced outputs of barley and rye, and the reduced farm-gate prices for all grains and oilseeds that formerly moved under the statutory rates. These two effects combined resulted in a 3.5 percent or $5.1 million reduction in the gross value of statutory grain output. Medium-size farms cut back the production of export barley by 20.4 percent or 1.3 million bushels and barley for sale as feed by 62.7 percent or 2.0 million bushels. However, overall barley output only fell

4.7 percent or 769,000 bushels as medium farms increased their output of barley for own use as feed by 37.2 percent or 2.6 million bushels. This switching of barley output reflected the substitution of barley for oats in livestock feed rations at this particular farm level. Rye output fell 7.7 percent or 84,000 bushels also in response to higher transport charges on domestic shipments. No other production adjustments occurred on medium-size farms largely because of the restrictive $\pm$ 20 percent production adjustment range.

The production adjustments in Scenarios III, IV and V that resulted from progressively higher freight rates on export grain were very much the same in each situation. In Scenario III, wheat, barley and rye output fell while the output of rapeseed, sunflowers and oats increased. With even higher freight rates on grain relative to Scenario II, medium-size farms found it cheaper to buy barley and oats feed supplies from large farms rather than grow these crops themselves. This was evidenced by 143,000 bushel (1.6 percent) and 639,000 bushel (12.8 percent) reductions in the output of barley and oats for own use as feed, respectively. This reduction in feed barley output was supplemented by a 34.4 percent (2.2 million bushel) decline in export barley output. However, an offsetting increase in barley for sale as feed left the overall decline in barley output at 4.7 percent or 769,000 bushels. Similarly, medium producers increased their output of oats for sale as feed which accounted for the overall minimal increase in oats production. Rapeseed and sunflower production on medium farms were profitable enterprises throughout the three latter production comparisons as evidenced by their shadow prices. Consequently, output of these two crops increased significantly (i.e., 13.2 percent or 823,000 bushels and 11.7 percent or 9.7

million pounds) as medium producers exploited the new +40 percent upper production adjustment level.

The combined effect of the crop production adjustments (excluding sunflowers) and the reduced farm gate prices for those grains that formerly moved under the "Crowsnest" statutory rates was a $4.9 million or 3.4 percent reduction in the gross value of these grains in Scenario III. For Scenarios IV and V, which were essentially the same as Scenario III as far as production changes were concerned, the respective gross value reductions were $6.9 million (4.8 percent) and $8.2 million (5.6 percent).

The livestock production adjustments that were facilitated by the +40 percent upper expansion limit in Scenarios III, IV and V were also virtually the same throughout. In response to the lower feed grain prices that prevailed in Scenario III, livestock producers expanded their output of stocker calves, stocker cattle, fed beef and market hogs by $12.9 million. This increase, however, was offset to a small extent by a $173,000 decline in veal calf production as medium-size farms found it more profitable to finish these animals off as beef with the relatively cheaper feed grains. As noted previously, the livestock production changes that occurred on medium farms in the three 1985 scenarios in response to reduced feed costs were virtually the same as evidenced by the following net increases in livestock output: $12.8 million; $12.8 million; and $13.0 million, respectively.

As was the case on a provincial and small-farm size basis, medium-size farms were able to offset the decreased value of grain production with increased livestock production in Scenarios III, IV and V and hence experience mild increases in gross farm output. The production

responses that resulted from the higher grain transport charges can be put into better perspective, however, by considering the changes in net farm income that the medium-size farm sector in Manitoba experienced as a result of the higher rates. For the four production comparisons, medium farms as a whole experienced the following respective sharp decreases in net income: $2.0 million (14.8 percent); $2.5 million (18.8 percent); $4.0 million (29.7 percent); and $4.9 million (36.1 percent). On a per farm basis, the reductions in net income for medium-size farms were $182 in Scenario II, $226 in Scenario III, $359 in Scenario IV and $438 in Scenario V.

From a medium farm-size basis, the results of the four production comparisons are summarized as follows:

1. Scenario II:
   (a) The value of agricultural production on medium farms in Manitoba declined by $5.1 million (1.6 percent). The value of grain that formerly moved under the statutory rates declined by $5.1 million (3.5 percent) while the value of livestock production remained at the base level.
   (b) Net income per medium farm declined $182.
2. Scenario III:
   (a) The value of agricultural production on medium farms increased $8.8 million (2.7 percent). The value of statutory grain output fell $4.9 million (3.4 percent) while the value of livestock production increased $12.8 million.
   (b) The net income loss per medium farm was $226.
3. Scenario IV:
   (a) The value of agricultural production on medium farms

increased $6.9 million (2.1 percent). The value of statutory grain output fell $6.9 million (4.8 percent) while the value of livestock production increased $12.8 million.

(b) Net income per medium farm declined $359.

4. Scenario V:

(a) The value of agricultural output on medium farms increased $5.8 million (1.8 percent). The value of grains that formerly moved under the statutory rates fell $8.2 million (5.6 percent) while the value of livestock production increased $13.0 million.

(b) Net income per medium farm declined $438.

Large-Size Farms. To a large extent, the overall trends in production adjustments and changes in the gross value of farm output and net farm income that were prevalent on small- and medium-size farms were also evident on large-size farms. Essentially, only the relative magnitudes and degree of severity differed with respect to the impacts associated with the rail rate option.

In Scenario II, large farms experienced an overall reduction in the gross value of farm output of $8.4 million (1.2 percent) due to compensatory rates on domestically marketed grain. In the latter three production comparisons, however, the situation with respect to changes in the gross value of farm output was reversed; the value of gross farm output increased although at a decreasing rate as evidenced by the following increases: $17.0 million (2.5 percent) in Scenario III; $11.1 million (1.6 percent) in Scenario IV; and $8.1 million (1.2 percent) in Scenario V. As in the case of small- and medium-size producers, these

increases occurred inspite of progressively higher transport charges for grains and oilseeds because the new production adjustment range allowed large producers to expand their output of the highly profitable enterprises.

In Scenario II, the transition from a 1978 "Crow" situation to a 1978 situation with compensatory rates on domestic grain and subsidized (i.e., "Crow") rates on export grain, the production adjustments were largely confined to the crops sector. There was a minimal increase in wheat output and there were minimal decreases in oats and barley production as large producers found the former enterprise relatively more profitable. With the weighted freight rate increase in Scenario II confined to domestic shipments only, oats and barley were more adversely affected as compared to wheat since historically more oats and barley move into extra-provincial domestic markets. In addition, large producers switched sizeable amounts of oats and barley produced for own use as feed to oats and barley for sale as feed. The decline in the gross value of grain that formerly transported under statutory rates was $8.8 million or 2.5 percent of the base year value. This decline of course was due to the reduced farm-gate prices for grain and, to a lesser extent, the crop production adjustments. Because of the restrictive production adjustment range, the additional livestock output that occurred in response to the lower feed grain prices was limited to $330,000, largely in veal calves and, to a lesser extent, fed beef.

With the +40 percent upper production adjustment constraint in Scenarios III, IV and V, large-size producers were able to offset the negative effects of higher grain freight rates on the gross value of farm

output as reflected in the following respective increases: $17.0 million (2.5 percent); $11.1 million (1.6 percent); and $8.1 million (1.2 percent). In Scenario III, large producers expanded their output of all grains and oilseeds, except barley. This resulted in a loss in the value of statutory grains of $14.1 million or 4.1 percent of the base year value. The crop production adjustments by large producers in Scenario III were highlighted by a 29.9 percent (9.4 million bushel) reduction in export barley. This sharp decrease, however, was offset to a large degree by increased production of barley for own use as feed. In total, the overall reduction of barley on large farms was 17.7 percent (7.7 million bushels) valued at $18.7 million. The production of oats for sale as feed and for own use as feed increased on large farms by 10.0 percent (1.6 million bushels). Like the additional output of feed barley, the extra oats production was used to meet the additional livestock feed requirements on all farm sizes. The largest crop production increases on large farms were registered in rapeseed (i.e., 16.2 percent or 2.1 million bushels) and sunflowers (i.e., 16.7 percent or 26.9 million pounds) as producers expanded their output of these crops by essentially the maximum amounts permissible.

The additional livestock production that occurred in Scenario III in response to lower feed costs totalled $28.4 million. The value of additional livestock output was essentially the same throughout the other two 1985 scenarios. Similar to the additional rapeseed and sunflower production, this indicated that the more profitable livestock enterprises (as reflected in their shadow prices) had expanded the maximum amount permitted by the upper bound of the production adjustment range. The major portion of the additional livestock output that was experienced in

the latter three production comparisons was in stocker cattle, stocker calves, fed beef, market hogs and fluid milk. The additional market hog output on large farms plus the additional output on medium farms offset the reduction in market hog output on small-size farms. Relative to small farms, it was more profitable for both medium- and large-size producers to raise market hogs since the latter two farm sizes produced barley, a major part of a hog ration, for substantially less.

As grain freight rates continued to rise in Scenarios IV and V relative to Scenario III, large-size farm enterprises made small reductions in their output of wheat, oats and barley while flax, rapeseed, and rye production remained at their Scenario III levels. As a result, the downward trend in the gross value of statutory grain persisted as reflected in the following losses: $14.1 million (4.1 percent) in Scenario III; $20.0 million (5.8 percent) in Scenario IV; and $23.0 million (6.6 percent) in Scenario V. Compared to these figures, the corresponding loss in Scenario II was $8.8 million (2.5 percent).

The changes in the value of agricultural production that large-size farms experienced over the four production comparisons tend to suggest that over the 1978-85 study period large farm enterprises were not adversely affected by the proposed statutory rate alternative. When production costs were taken into account, however, large-size producers suffered the following reductions in net farm income over the four production comparisons: $5.2 million (6.1 percent); $1.7 million (1.9 percent); $6.3 million (7.3 percent); and $8.8 million (10.2 percent). The per farm losses for large producers over the four production comparisons were: $893 in Scenario II; $292 in Scenario III; $1083 in Scenario IV; and $1515 in Scenario V.

In summary, the results of the four production comparisons from a large-size farm perspective are as follows:

1. Scenario II:
   (a) The value of agricultural production on large farms in Manitoba decreased $8.4 million (1.2 percent). The value of grains that formerly moved under the statutory rates fell $8.8 million (2.5 percent) while the value of livestock production increased $330,000.
   (b) Net income per large-size farm declined $893.
2. Scenario III:
   (a) The value of agricultural production on large farms increased $17.0 million (2.5 percent). The value of statutory grain output declined $14.1 million (4.1 percent) while the value of livestock production increased $28.4 million.
   (b) The net income loss per large-size farm was $292.
3. Scenario IV:
   (a) The value of agricultural production on large farms increased $11.1 million (1.6 percent). The value of statutory grain production fell $20.0 million (5.8 percent) while the value of livestock production increased $28.4 million.
   (b) The net income loss per large-size farm was $1,083.
4. Scenario V:
   (a) The value of agricultural output on large farms increased $8.1 million (1.2 percent). The value of statutory grain output declined $23.0 million (6.6 percent) while the

value of livestock production increased $28.4 million.

(b) Net income per large-size farm declined $1,515.

Regional Basis

This part of the analysis looks at the impacts that the statutory rate alternative had on the five agricultural administrative regions of the Manitoba Department of Agriculture (see Figure 3). Since the trends and patterns with respect to changes in the value of gross farm output, shifts in agricultural production and changes in net farm income were generally the same as those registered on a provincial and farm-size specific basis the following discussion is brief. It highlights, however, those impacts and changes resulting from the proposed rate option that reflect the nature of the various regions (i.e., the diversity of agricultural production within a region, the opportunities to diversify and the comparative advantage of a region with respect to the various crop and livestock production activities) and hence their susceptibility to higher grain transport charges.

Interlake Region. The Interlake Region, a heavy livestock producing area, experienced a reduction of $1.1 million (0.9 percent) in gross farm output in Scenario II. This loss was almost exclusively due to the reduced value and output of grains that formerly moved under the statutory rates. In response to the higher rail rates on domestic grain, oats production declined quite significantly (i.e., 10.5 percent or 287,000 bushels) while stocker calf production increased slightly (i.e., 200 head or $34,000). Essentially, no other production adjustments occurred because of the restrictive output expansion limits. Because of the reduced farm gate prices received for the six principal

grains, net farm income in this region fell $82,000 (11.0 percent) with the average loss per farm totalling $21. In comparison, the provincial average per farm loss in net income for Scenario II was $270 (see Table 16).

With relaxed production expansion limits in Scenarios III, IV and V, the Interlake Region experienced increases of $3.8 million (3.1 percent), $3.3 million (2.7 percent) and $3.0 million (2.5 percent) in gross farm output. Over these three production comparisons, the production adjustments were virtually the same indicating that the profitable enterprises were constrained by the upper bound of the production adjustment range. Highlighting the crop production responses that occurred in the three 1985 scenarios were increased oats production and decreased rye production. Rapeseed production did not increase in spite of the relaxed production adjustment range since the Interlake had a comparative disadvantage in growing rapeseed as reflected in its relatively high production costs and poor yields.[4] Over the 1985 production comparisons, the reduced value of grain production ranged from $1.5 million (5.2 percent) in Scenario III to $2.3 million (8.0 percent) in Scenario V. The increased livestock output that occurred in response to the lower feed prices was mainly in stocker calves, stocker cattle, fed beef and fluid milk. This increased livestock output, however, was offset to some degree by decreased veal calf and market hog output. These

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[4]For example, in crop district 11 in the Interlake Region, small, medium and large producers were producing the minimum amount of rapeseed in Scenario III with the following shadow prices: $8.03; $5.41; and $3.18. These shadow prices essentially mean that if each of these particular farm-size enterprises were allowed to reduce their output of rapeseed by one bushel in Scenario III, net income for each enterprise would have increased $8.03, $5.41 and $3.18, respectively.

Table 16. Estimated Provincial and Regional Net Farm Income Levels Per Farm and Income Changes Per Farm Resulting From the Proposed Statutory Rate Alternative.

Scenario	Region	Net Income[a] Per Farm (Dollars)	Income Change From Scenario I (Dollars)
Scenario I	Province	2,867	----
	South West	5,794	----
	North West	2,915	----
	Central	2,693	----
	Eastern	204	----
	Interlake	-185	----
Scenario II	Province	2,567	-270
	South West	5,420	-374
	North West	2,695	-220
	Central	2,256	-437
	Eastern	166	- 38
	Interlake	-206	- 21
Scenario III	Province	2,671	-196
	South West	5,526	-268
	North West	2,950	35
	Central	2,323	-370
	Eastern	200	- 4
	Interlake	-399	-214
Scenario IV	Province	2,445	-422
	South West	5,201	-593
	North West	2,751	-164
	Central	2,016	-677
	Eastern	129	- 75
	Interlake	-459	-274
Scenario V	Province	2,318	-549
	South West	5,019	-775
	North West	2,635	-280
	Central	1,844	-849
	Eastern	89	-115
	Interlake	-488	-303

[a]Net income includes return to physical labor requirements paid at the 1978 minimum wage.

adjustments yielded a net increase in livestock output of $5.3 million in each of the three 1985 situations.

With respect to net farm income, a more meaningful economic indicator from a producer's standpoint, the Interlake suffered losses that totalled: $865,000 (115.5 percent) in Scenario III; $1.1 million (147.4 percent) in Scenario IV; and $1.2 million (163.0 percent) in Scenario V. The corresponding average per farm losses were $214, $274 and $303, respectively. In contrast, the provincial average per farm losses were $196, $422 and $549, respectively.

Eastern Region. The Eastern Region, another area heavily dependent on livestock production, experienced a $1.0 million (0.8 percent) drop in gross farm revenues under Scenario II conditions. This loss was almost entirely attributable to the reduced value and output of the six principal grains. The production adjustments that occurred in response to lower net returns for grains included a small decrease in feed oats production and a resultant minor decrease in stocker calf output. Net income in this region fell $146,000 or 18.6 percent with the average per farm loss amounting to $38.

In the latter three production comparisons, the Eastern Region was able to offset the effect of higher rail tariffs on the gross value of farm output through sizeable increases in rapeseed, sunflower and livestock output. Over these three 1985 scenarios, the reduced value of crop production ranged from $1.5 million (4.6 percent) in Scenario III to $2.3 million (7.1 percent) in Scenario V. The increased livestock production, which consisted largely of market hogs and, to a lesser extent, fed beef, stocker cattle, stocker calves and veal calves, was

virtually the same throughout Scenarios III, IV and V totalling $6.6 million. And, as in all other agricultural regions, sunflower production, a highly profitable enterprise, was expanded the maximum amount (i.e., 1.1 million pounds worth $112,000).

The net income losses that accrued to producers in the Eastern Region totalled $17,000 (2.2 percent), $291,000 (37.1 percent) and $444,000 (56.6 percent) for Scenarios III, IV and V, respectively. On a per farm basis, the net income losses ranged from $4 to $115 over the three 1985 scenarios.

Central Region. Unlike the two previous agricultural areas, the Central Region is a heavy grain growing area as evidenced by the fact that slightly more than 50 percent of the gross value of output in the area consisted of statutory grain production (the comparative figures for the Interlake and Eastern Regions were about 24 and 25 percent, respectively). Despite this dependency on grain production, the Central Region only incurred a $4.6 million (2.3 percent) drop in the value of crop production under Scenario II conditions. This loss, which was due to lower farm-gate prices for grain and reduced outputs of barley and rye, was offset to a small degree by a $316,000 expansion in fed beef output. Net farm income, a more reliable indicator of the effects associated with increased grain transport charges, fell $3.5 million or 16.2 percent with the average loss per farm in the region amounting to $437.

In Scenarios III, IV and V, the losses in statutory grain value ranged from $5.7 million (2.8 percent) to $10.1 million (5.0 percent) as producers reduced both barley and wheat output and increased rapeseed and rye output. The losses on grain, however, were offset by increased

livestock production, which ranged from $9.8 million in Scenario III to $8.4 million in Scenario V, and additional sunflower output that totalled $3.3 million in each of the latter three scenarios. The additional livestock output was concentrated in the more profitable stocker cattle, stocker calf, fed beef and veal calf enterprises as producers in the Central Region shifted out of market hogs.

In terms of net income, the Central Region was particularly susceptible to higher grain freight rates as evidenced by losses of $2.9 million (13.8 percent), $5.4 million (25.2 percent), and $6.7 million (31.5 percent) in the latter three scenarios, respectively. On a per farm basis, the average losses in net income for the three respective production comparisons were $370, $677 and $849.

South West Region. The South West Region is another predominantly grain growing area. Over 57 percent of the gross value of farm output in this region originated from grain in Scenario I.

With the higher grain freight rates in Scenario II, the gross value of statutory grain declined $6.4 million or 3.1 percent. In response to reduced farm-gate prices for grain, barley output fell off significantly while wheat and oats output registered small increases. Offsetting the reduced value of crops to some extent were increases in veal calf, fed beef and stocker calf production which totalled $375,000. This left the net reduction in gross farm receipts for the region at $6.0 million or 1.7 percent of the base year value. Producers in the South West Region were adversely affected by the rate option in Scenario II as evidenced by a $3.0 million (6.5 percent) reduction in net farm income. On a per farm basis, the loss in net farm income was $374 for

producers in the South West Region.

With substantially higher freight rates in Scenarios III, IV and V, the South West Region incurred crop value reductions of $10.6 million (5.2 percent), $13.8 million (6.7 percent) and $15.7 million (7.6 percent), respectively. The crop production adjustments that occurred over the three 1985 scenarios were similar. Highlighting these adjustments were significant increases in oats, rapeseed, and flax output, and minor increases in wheat and rye output. These increases tended to mitigate to some extent the drastic cut-back in barley production which totalled roughly 19 percent or 5.3 million bushels. The offsetting livestock production increases that occurred in response to the reduced feed grain prices were virtually the same throughout the latter three scenarios. These changes, which included increased stocker cattle, stocker calf, fed beef and market hog output and decreased veal calf output, returned an additional $15.7 million in Scenario III and $16.3 million in both Scenarios IV and V.

In spite of the net increases in the gross value of farm output in Scenarios III to V, the South West Region suffered substantial losses in net farm income. For the three 1985 scenarios, this region absorbed losses of $2.2 million (4.6 percent), $4.8 million (10.2 percent) and $6.3 million (13.4 percent), respectively. On a per farm basis, the net income losses were $268, $593 and $775. These losses were quite substantial considering that the corresponding losses on an average provincial farm basis were $196, $422 and $549.

North West Region. In the North West Region of the province, crop production is very important. In the base year, Scenario I, the six

principal grains accounted for over 53 percent of total gross farm receipts in this region.

Under Scenario II conditions, the North West Region experienced a $2.0 million (2.2 percent) reduction in the value of grains that formerly moved under the statutory rates. All of the grains yielded less gross returns with reduced farm-gate prices, but only barley sustained a decrease in output. In this scenario, the only other production adjustment was a slight reduction in stocker calf output. Net farm income fell in this region $1.3 million (7.6 percent) with the average loss per farm being $220.

In the latter three production comparisons, the reduced value of grain production that resulted from higher rail rates ranged from $2.3 million (2.6 percent) in Scenario III to $4.6 million (5.1 percent) in Scenario V. Over the three 1985 scenarios, the crop production changes that occurred as a result of reduced farm-gate prices for grains and oilseeds were virtually the same. Both wheat and barley output fell while rapeseed and flaxseed output increased. Rye output increased in Scenarios III and IV but by Scenario V it had almost fallen back to its original base year production level as rail rates became progressively higher. As in the other regions, sunflower output increased the maximum amount permissable within the model constraints. The additional livestock output that resulted from the lower feed grain prices was essentially the same throughout Scenarios III, IV and V. This additional livestock output consisted mainly of increased stocker calf, stocker cattle and fed beef production. These increases offset a significant decrease in market hog output and returned added revenues that ranged from $9.9 million in Scenario III to $9.7 million in Scenario V.

Despite the relatively high dependency of the North West Region on grain production, the impact of higher grain freight rates on net farm income in the region was not as severe relative to other areas. In Scenario III, the North West Region actually experienced a $203,000 (1.2 percent) increase in net farm receipts while in Scenarios IV and V it suffered losses of $931,000 (5.6 percent) and $1.6 million (9.6 percent). On a per farm basis in this region, the corresponding changes in net income were: +$35; -$164 and -$280, respectively.

Chapter VII

SUMMARY, CONCLUSIONS AND LIMITATIONS

Summary and Conclusions

The statutory grain rates have been identified as "the primary source" of many grain transportation problems in Western Canada. The rates, which essentially evolved out of the Crowsnest Pass Agreement of 1897, are responsible for the losses sustained by the railways in the carriage of grain and the resultant lack of railway system renewal and expansion. The statutory rates are so pervasive in the structure, operation and logistics of the grain handling and transportation system that the elimination of them is seen as a method of permitting additional grain exports that would not otherwise occur to the same extent by 1985.

This study analyzed an alternative to the present preferrential freight rates on Western grain in terms of its potential economic impacts on the Manitoba agricultural economy. The proposed alternative to the present statutory freight rates on grain essentially involved a per ton constant dollar payment to the railways to make up their revenue shortfall on statutory grain traffic in a base year (i.e., 1978). Thereafter, Prairie grain producers were assumed to be fully responsible for any future increases in railway grain transportation costs.

Future anticipated cost increases in railway grain transportation were the essence of the proposed statutory rate alternative. To gain a conceptual understanding of cost changes in an industrial sector, it was

therefore necessary to review two important determinants of cost changes; namely, inflationary cost pressures and offsetting productivity increases. This, in turn, provided a conceptual and analytical understanding of the proposed rate alternative.

Modeling the constant subsidy payment over the 1978-85 study period required that one make certain assumptions regarding the mix of inflationary cost pressures and productivity growth that might be experienced in Western railway grain transportation over the same period. Setting a range of possible inflation/productivity scenarios in grain handling and transportation that were used in the analysis required a review of both past and future trends in rail cost and productivity developments with special reference to grain transportation. This process, in turn, allowed one to specify what was thought to be a reasonable range of annual cost increases that might prevail in Western grain transportation between 1978 and 1985. At the upper or pessimistic end, an annual cost increase of 15 percent was assumed to prevail due to minimal productivity increases and "hyper-inflation" in railway input costs. At the lower or optimistic end, on the other hand, a rate of 6 percent was assumed to prevail on account of significant productivity growth and "creeping" inflation. For analytical purposes, an "intermediate" scenario in terms of the mix of future inflationary cost pressures and productivity growth in rail transport of grain was also specified. This scenario utilized an annual cost increase of 11 percent.

The analysis of the proposed alternative to the statutory grain rates essentially involved four production and net farm income comparisons using a linear programming model dimensioned for the Province of Manitoba. By comparing a base situation (i.e., Scenario I) in the

Manitoba farm economy to four adjusted situations (i.e., Scenarios II, III, IV and V), it was possible to determine how the provincial farm economy would "adjust" in response to compensatory freight rates on domestically marketed grain and a movement towards compensatory rates on export grain. Scenario I (or the base situation) employed statutory grain rates; 1978 prices, costs and production levels; 1971 production technology; and a production flexibility range of $\pm$ 20 percent relative to 1978 output levels. The four adjusted situations were as follows:

1. Scenario II represented the Manitoba farm economy also in 1978 but with compensatory rates (i.e., 3.4 times statutory rates) on domestic grain and subsidized rates (i.e., statutory rates) on export grain. As in Scenario I, a production flexibility range of $\pm$ 20 percent relative to 1978 output levels was applied.

2. Scenario III was the "optimistic" situation. It represented the provincial farm economy at the end of the 1978-85 period during which a 6 percent annual increase in railway grain transportation costs was assumed to prevail. The production flexibility range was relaxed to -20 percent and +40 percent relative to 1978 levels.

3. Scenario IV, the "intermediate" situation, was virtually the same as Scenario III except rail grain transport costs were assumed to increase at an annual rate of 11 percent between 1978 and 1985.

4. Scenario V, the "pessimistic" situation, employed a 15 percent annual increase in rail grain transport costs over 1978-85. Except for the annual increase in grain freight rates, this scenario was also a duplicate of Scenario III.

The four production and net farm income comparisons were carried out on a provincial, farm-size specific and regional basis. They were designed to show the shifts in agricultural production and changes in the gross value of farm output and net farm income that would result from increased grain transportation charges. Since the patterns and trends with respect to shifts in agricultural production and changes in the gross value of farm output and net farm income were generally the same on

a provincial, farm-size and regional basis, essentially only the results from the provincial perspective are presented here in summary form:

1. Scenario II:
   (a) The value of agricultural production in the Manitoba farm economy declined by $14.9 million (1.3 percent). The value of statutory grain output fell $15.5 million (2.8 percent) while the value of livestock production increased $645,000.
   (b) Average net income per farm declined $270.
2. Scenario III:
   (a) The value of agricultural production in the provincial economy increased $29.5 million (2.5 percent). The value of grain that formerly moved under the statutory rates declined by 21.0 million (3.8 percent) while livestock production increased $46.2 million.
   (b) Average net income per farm fell $196.
3. Scenario IV:
   (a) The gross value of farm output in Manitoba increased $20.5 million (1.7 percent). The gross value of statutory grain output fell $30.1 million (5.4 percent) while the value of livestock output increased $46.2 million
   (b) Average net farm income per farm fell $422.
4. Scenario V:
   (a) The value of agricultural production in Manitoba increased $15.8 million (1.3 percent). The value of crops that formerly moved under the statutory rates fell $34.8 million (6.2 percent) while the value of livestock production

increased $46.2 million.

(b) Average net income per farm declined $549.

The farm-size specific and regional part of the analysis demonstrated that the various farm-size enterprises and regions were not equally affected by the statutory rate alternative in terms of changes in the level and distribution of agricultural production, value of farm output and, most importantly, net farm income. With respect to farm-sizes, differences in the above economic indicators were due to the comparative advantages and disadvantages of the three farm sizes as reflected in their costs of production. Similarly, regional differences in changes in the level and gross value of farm output and net farm income were due to the comparative advantages and disadvantages of the various regions as reflected in their yields and costs of production for the crop and livestock production activities. The differential impacts of the statutory rate alternative on farm sizes and regions were perhaps best reflected in the changes in net farm income. These changes are summarized as follows:

1. For small farms net income losses ranged from $59 per farm in Scenario II to $203 per farm in Scenario V while for medium and large farms the corresponding losses per farm ranged from $182 to $438 and $893 to $1,515, respectively. In comparison, the provincial average loss in net farm income per farm ranged from $270 to $549.
2. Regionally, the Eastern Region was the least adversely affected by the rate option as evidenced by net income losses that ranged from $38 to $115 over the four production comparisons. Following this region were the North West, Interlake, South West and

Central Regions with losses that ranged from $220 to $280, $21 to $303, $374 to $775 and $437 to $849, respectively.

From the results and analysis, the following conclusions and policy implications can be drawn:

1. Increasing the producer's real share of railway grain transport costs by way of the proposed rate option only had minor effects on the aggregate value of farm production in Manitoba. However, from a net income perspective (i.e., when costs of production including transport charges were taken into account), the negative effects associated with higher grain transportation charges were much more significant. As the producer's share of grain transport charges increased over the four scenarios, the net farm income picture on a provincial, farm-size and regional basis gradually deteriorated.
2. With increased oilseed and livestock production, producers had the potential to offset some of their net income losses resulting from the higher freight rates on domestic and export grain shipments. However, the extent to which producers could actually offset net income losses resulting from higher freight rates on grain through further farm diversification of this nature would depend upon the existing market conditions for agricultural products including the availability of markets for any additional agricultural output.
3. The production adjustments that occurred in Scenarios III, IV and V were very similar throughout the analysis on a provincial, farm-size and regional basis even though the profitability of grains was progressively reduced while that of livestock

production was progressively enhanced. This might lead one to suspect that the difference between a 6 percent annual increase in railway grain transportation costs and a 15 percent annual increase was relatively insignificant in an LP context for the rail rate alternative. However, it must be remembered that in many cases throughout the latter three production comparisons the production adjustment range was operative; the upper bound of the range effectively prevented additional expansion of the more profitable crop and livestock enterprises while the lower bound prevented additional production cut-backs of the less profitable enterprises.

4. Aggregation on a provincial or even a large regional basis tended to cancel out the production adjustments that took place on a crop district basis and among different sizes of farms. In other words, aggregation of this nature tended to mask the differences (i.e., comparative advantages and disadvantages) between the 12 crop districts and 3 farm sizes that were reflected in their respective yields and costs of production.

Although the study framework did not directly address all of the various economic and political criteria for changing statutory rates (see Chapter II), it is possible to evaluate the proposed statutory rate alternative in relation to the broad criteria matter in a very general way. By drawing upon both the empirical results of the analysis and the nature and characteristics of the constant payment to the railways, the following economic generalizations and policy implications can be made about the rate option:

1. The railways would be compensated for their variable costs

incurred in the movement of grains that formerly moved under statutory rates. The new rail rates for grain, however, would not include any allowance for contribution to the constant or fixed costs burden of the railways. Therefore, it is very doubtful that the new rates would make a "positive contribution" to an ongoing, viable railway grain transportation system.

2. The economic dis-incentives associated with the handling and transportation of statutory grain would be removed gradually as both grain producers and grain companies become increasingly aware of the true economic cost of rail service. This should promote a more efficient use and development of the overall grain handling and transportation system (institutional factors and constraints notwithstanding).
3. However, with the proposed rate option and its inherent compensatory grain rates, there would be no guarantee that the railways would provide acceptable levels of service to grain shippers (as evidenced by the U.S. experience in grain transportation).
4. Virtually all uncertainties regarding resolution of the "Crow" debate should be removed once the new rail rate policy is operative.
5. As producers gradually experience the true economic cost of transporting grain by rail, the statutory rate alternative would become relatively neutral with respect to promoting production efficiency in Prairie agriculture including the promotion of agricultural production in accord with comparative advantage. Over time, the rate option would presumably also

become neutral and independent from the marketing and pricing of grains and other agricultural products.

6. The proposed statutory rate alternative restricted the subsidy payment to export grains. Consequently, the rate option would not be equitable in the sense of providing full compensation to all producers who lose the present benefits of the statutory rates.

7. From the empirical analysis, it was difficult to tell whether the production adjustments resulting from the rate option would be smooth or traumatic at the farm level. The value of production and physical production changes tended to suggest that adjustment at the farm level would be smooth and gradual. The changes in net farm income, however, suggested that some economic dislocation would be experienced by producers.

8. Similarly, from the analysis it was not possible to say whether a Federally-funded constant payment to the railways would be a politically acceptable means of resolving the statutory rate debate. Nevertheless, the proposed rate alternative does appear to have some political merit since the Federal Government's real share of grain transportation costs would be declining over time assuming current inflationary trends persist.

Therefore, it is quite evident that the proposed statutory rate alternative would not meet all of the economic and political criteria for changing statutory rates and, presumably, it would not be acceptable to all concerned parties in the Canadian grain trade.

The final conclusions of this study are, to recapitulate, that the proposed alternative to the present statutory grain freight rates

would only have minor effects on the aggregate value of output in the Manitoba farm economy. However, increasing the producers' share of railway grain transportation costs by having them fully absorb future cost increases would result in significant reductions in net farm income for grain producers. The potential to offset these losses in net farm income through further farm diversification into oilseed and livestock enterprises would exist only to the extent that favorable market conditions and available market opportunities prevail for these agricultural commodities. Lastly, like other alternatives to the present preferrential freight rates on Western grain, the proposed alternative would not satisfy all of the economic and political considerations involved in changing the present statutory rates.

Limitations and Suggestions for Further Research

The results, conclusions and policy implications derived from this study must be tempered in light of the limitations and weaknesses associated with the analysis of the proposed statutory rate alternative. This includes those limitations and weaknesses associated with the large number of prior studies and related assumptions as well as those limitations and weaknesses specific to the present study.

The major limitation of this study that was specific to the proposed statutory rate alternative was the relationship between export and extra-provincial marketings of grain which determined the relative proportions of grain eligible for the transport subsidy. Because of modeling constraints, the relationship between export and extra-provincial marketings of grain over the 1978-85 period was fixed according to recent historic marketings of both grains. For example, for every bushel of

wheat a producer exported under the subsidized freight rates, he had to ship 0.23 bushels of wheat under higher compensatory rates into the extra-provincial domestic market.[1] Fixing the export/domestic marketing balance in such a manner, however, prevented an accurate test in an LP context of whether a constant dollar subsidy on export grains would tend to continually decrease the attractiveness of export grain production under anticipated future inflationary conditions. In future studies, a more accurate test of the explicit export bias inherent in the proposed rate alternative could be facilitated by assigning separate production activities in the LP model for both exports and domestic marketings of the six principal grains.

The export/domestic grain marketing proportions used in this study were based on the historic marketings for the whole Prairie region. Separate data on Manitoba marketings alone was not available. Therefore, the financial impacts on the Manitoba farm economy resulting from the proposed statutory rate option would tend to be on the conservative side. Relative to Saskatchewan and Alberta, a smaller proportion of Manitoba-produced grain enters export markets and qualifies for the proposed transport subsidy.

Another major limitation was that the overall study model operated within a closed economy; that is, the LP model analyzed the effects of the

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[1]The domestic/export coefficient of 0.23 was derived from the export and domestic marketing proportions of Prairie grain presented in Appendix C. In recent years, exports of wheat accounted for 81.62 percent of total marketings of Prairie wheat while domestic marketings accounted for 18.38 percent. Dividing 18.38 by 81.62 yielded a coefficient of 0.23 which essentially meant that for every bushel of wheat exported, 0.23 bushels were marketed domestically outside the Prairies.

proposed statutory rate alternative on a Manitoba farm economy that was isolated from outside influences such as inter-provincial and international trade flows and agricultural policies. In other words, this study did not give any consideration to the possible effects that the rate option and the resultant changes in the Manitoba farm economy might have on other agricultural sectors both within Canada and internationally. For example, the possible influence of increased livestock production from Alberta or the Mid-West U.S. on prices received in Manitoba livestock markets was ignored. As well, the effects of marketing policies and strategies that might be adopted by competing provinces for certain agricultural products as a consequence of the proposed rate option were excluded from the analysis. However, the weakness of the study in this latter respect would only be relevant to the extent that changes in supply and demand in the Manitoba farm economy do significantly impact on the domestic and international price discovery mechanisms for the relevant agricultural products.

Closely related to the above limitation was that the LP model represented a virtually static Manitoba farm economy in that throughout the analysis 1978 market conditions (i.e., prices and costs) were used. The intent of the analysis was to isolate the effects of higher grain transport charges on the pattern of agricultural production. However, no price alterations due to changes in the supply and demand conditions resulting from changes in the provincial production patterns were considered. In this context, an interesting extension of this study would be to model the proposed statutory rate alternative under market conditions similar to 1973-74 when grain prices were at historically high levels in real terms. Another means of putting increased grain transport

charges arising from the proposed statutory rate alternative into better perspective would be to study the effects of higher costs for other farm inputs (i.e., higher interest charges) on the Manitoba farm economy.

The LP model assumed that an efficient marketing system existed in the sense that all additional livestock and crop production could be sold in some market. The LP model also assumed that the transportation part of the overall marketing function was efficient. That is, no consideration was given in the empirical part of the analysis to the inefficiencies and lack of physical capacity in the West's grain handling and transportation system particularly with respect to putting grain into export position. The movement towards a compensatory rate structure on Prairie grains with the resultant changes in primary agricultural production patterns, however, would have important implications on the overall capacity and throughput of the grain transportation system. A detailed study of these secondary impacts from a whole Prairie perspective merits serious consideration as Canada strives to increase its volume of grain exports fifty percent by 1985.

As described in Chapter V, the linear programming model used in this study sought to maximize net farm income from the various agricultural production activities subject to a number of constraints limiting production. Accordingly, the production estimates derived from this optimizing operations research tool were limited to the extent that no consideration was given in the study to the achievement of other possible farm objectives that society views as important (i.e., maintaining certain levels of income and employment).

As mentioned earlier, this study made use of a large number of prior studies and related assumptions. Combination of these previous

studies required adjustments and modifications to make them compatible in the present analysis particularly in terms of the time period the studies referred to, the geographical areas the studies were based on, and their conceptual frameworks. Thus, the results presented in this study contain several "system average figures" and, accordingly, they must be used with caution when applied to specific situations. The extent to which the operating conditions at any particular point deviate from the "average" situation (as depicted in this study) will determine the extent to which the actual impacts at that point deviate from those measured. This is an inherent drawback of attempting to disaggregate an aggregate analysis of this nature.

The LP model used in the present study was largely based on a 1971 study which incorporated 1971 production technologies (i.e., cultural practices and the kind of machines used in production) and 1971 costs of production. In the present study, these costs were simply indexed up to a 1978 level. Clearly, the accuracy of the present analysis could have been enhanced if it had been feasible to update the LP model with present production technologies and costs.

Finally, this study utilized three enterprise or production activity sizes for each of the production activities contained in the model. The reader, however, should be aware that this breakdown of farm sizes was still very general in the sense that all farms within each class or farm size were assumed to be "average" and possess the same mixed enterprises. Thus the results presented in this study cannot be attributed towards a particular farm enterprise type such as large-size fed beef farms but rather to large-size farms in general.

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A P P E N D I C E S

Appendix A

GOVERNMENT INVOLVEMENT IN GRAIN TRANSPORTATION

Since 1972 virtually all major maintenance and capital expenditures for railway plant and equipment used in the transportation of statutory grain have been financed by the Federal Government and, more recently, the Canadian Wheat Board and Prairie provincial governments. Such government involvement in grain transportation was, of course, necessitated by the massive deterioration in the physical state of the railway grain transportation system that was largely due to the unremunerative statutory grain rates. The number of government measures that have been taken over the last decade or so to counter railway disinvestment in grain cars, locomotives, and branch line maintenance, and ensure continued operation of the system at reasonable capacity levels within the context of continuing statutory grain rates include the following:

1. Branch Line Subsidy Payments: Branch line subsidy payments, which originated in the late 1960's, are made to the railways by the Federal Government for the continued operation of uneconomic branch lines that the railways have been forbidden, or have not yet been authorized by the Canadian Transport Commission (CTC) to abandon. Such uneconomic branch lines include many of Snavely's designated grain dependent branch lines which are almost exclusively used for grain traffic. Thus, while termed a branch line subsidy, the subsidy payments effectively

reflect the loss (as calculated by the CTC) incurred in the transportation of statutory grain originating on light density lines that are being operated on an abandonment or going-out-of-business basis.[1]

2. Hopper Cars: Since 1972, the Federal Government has bought on behalf of the Canadian Wheat Board 8,000 steel and aluminum hopper cars costing $258 million to augment the grain fleet of the railways which has declined from approximately 26,000 cars in 1972 to approximately 13,000 in 1978.[2] Besides these 8,000 hopper cars built several years ago, the CWB, itself, placed an $82 million order in 1979 for 2,000 steel hopper cars which are being paid for out of pool accounts from grain producer sales, while the Federal Government recently announced that it will spend $200 million leasing 2,000 hopper cars in the next two decades.[3] The provincial governments of Alberta and Saskatchewan have complimented the efforts of the Federal Government and the CWB to enhance the grain car fleet by announcing that they will each purchase 1,000 covered hopper cars.[4] In total, the Federal

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[1]See The Commission on the Costs of Transporting Grain by Rail, Report, Vol I (Ottawa: Supply and Services, Canada, October, 1976), p. 98.

[2]Booz-Allen & Hamilton, Inc. and IBI Group, Grain Transportation and Handling in Western Canada (Report prepared for the Department of Industry, Trade & Commerce, The Grains Group, Federal Government of Canada, July, 1979), p. I-5.

[3]R. Edwards, "New hopper cars could pose big problems for transport chief," Winnipeg Free Press, September 28, 1979, p. 44; and "Ottawa to rent 2000 extra hoppers," Winnipeg Free Press, September 22, 1979, p. 4.

[4]A. Binkley, "Provincial hopper car role pleases minister," Winnipeg Free Press, October 13, 1979, p. 32.

Government, the two provincial governments and the CWB have purchased and leased 14,000 90 ton and 100 ton carrying capacity hopper cars that are used by the railways exclusively for hauling grain. Although it is only a short term measure, it should be noted that the Province of Manitoba recently leased 400 hopper cars to assist in grain movements during the 1980 shipping year.[5]

3. Branch Line Rehabilitation Program: The Prairie Branch Line Rehabilitation Program, which was started in 1977, is designed to rehabilitate and upgrade rail branch lines to acceptable standards. It is to be completed by 1987 at a total cost to the taxpayer of $1 billion. In 1977 and 1978, $100 million was spent for the rehabilitation of grain dependent branch lines and for the purchase of roadway machines used in the rehabilitation process. In 1979, $70 million was spent to rebuild branch lines and a further $830 million expenditure is planned.[6]

4. Boxcar Repair Programs: Boxcar repair programs originated in the early 1970's when it became apparent that the existing number of boxcars devoted by the railways to grain movements would be insufficient to meet current and future needs. Under these "one-time" programs, the Federal Government has provided funds to the railways for the repair and rehabilitation of

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[5]"Agriculture Spending Increased," The Manitoba Co-Operator, Vol. 37, No. 41, May 15, 1989, p. 1.

[6]O. Lang, "Can Canada really export 1¼ billion bushels of grain a year by 1985? Let's make sure!" Insert advertisement supplement to Grainews, March, 1979.

specific boxcars which are to be used exclusively for the carriage of grain traffic. The boxcar repair program initiated in 1979 was a 50/50 cost sharing agreement between the Federal Government and the two major railways that resulted in the repair of 5,000 boxcars at a total cost of about $40 million.[7]

5. Tax Incentives: The Federal Government has also provided tax incentives to the railways for infrastructure investments to offset the disinvestment effect of the statutory rates.[8]

Further to the above government involvement in grain transportation, the Federal Government recently appointed the Booz-Allen & Hamilton, Inc. and IBI Group study largely in response to a growing concern regarding the ability of the grain transportation system to handle increasing volumes and, in particular, meet anticipated export increases of more than 50 percent by the mid-1980's.[9] This technical study, an operations analysis, identified numerous operating, institutional and capital improvements that would help to overcome the logistical problems encountered in moving Prairie grain from farm to vessel. In terms of the present study, the most significant recommendations which would likely enhance productivity in railway grain transportation and hence diminish cost-push inflationary pressures experienced by the railways are summarized as follows:

1. Information, Planning and Control Systems: The following improvements to the forward planning and monitoring of the

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[7] Edwards, op. cit., p. 44.

[8] Booz-Allen & Hamilton, Inc. and IBI Group, op. cit., p. I-5.

[9] Ibid., p. I-1.

CWB's Block Shipping System which should improve delivery performance and reduce car requirements can be made in the short term and longer term:

a) Monitor cars in transit (empty and loaded) to and from ports on a daily basis.

b) Create an information system for longer term improvements.

c) Provide for protein identification and grading in the information system.

d) Introduce use of computer simulation models to assist in inventory management and related system management decisions.

2. Other Operational and Institutional Improvements: Highlighting the lengthy agenda of these other improvements relative to grain producers, primary elevators and the railways which may enhance the throughput of the grain transportation system are the following:

a) Producers' actions need to be integrated into the overall logistics system (i.e., on-farm storage, on-farm grain drying, etc.).

b) Primary elevators can contribute to improved system performance through variable tariffs and reduced misshipments of grain.

c) Railway related changes (i.e., car spotting and branch line abandonments) have an impact on overall operations.

3. Capital Investments: In addition to the operating and institutional improvements recommended, major capital expenditures ranging from $1.3 billion to $2.0 billion (in 1979 dollars) may be required between now and 1985/86 to provide the rail and

terminal elevator capacity necessary to meet the top range of high projections of grain movements. As Table A1 illustrates, the potential major capital expenditures to 1985/86 are targeted for hopper cars, locomotives, Prince Rupert Terminal Elevator capacity expansion, grain branch line rehabilitation, and CN and CP main line capacity improvements. The branch line rehabilitation and Prince Rupert terminal elevator expansion are being financed by the Federal Government and private grain trade, respectively. But at this point in time it is unclear as to the exact magnitude of the other required major capital investments and who should make them. As Booz-Allen et al[10] have stated, various factors including actual growth in grains and other traffic, improvements in the efficiency of calling up grain for transport, improvements in loaded and empty car cycles, the rate of retirement of locomotives and cars, and the possible introduction of compensatory grain rates in the near future should all be considered by their proposed "Grain Transportation Improvement Task Force" in developing its detailed capital expenditure recommendations.

4. Grain Transportation Improvement Task Force: To expedite implementation of the recommended improvements, a Grain Transportation Improvement Task Force was recommended by the study group. The Task Force would propose, oversee and monitor the implementation process during its limited lifetime of up to four years, and would make recommendations regarding a body to

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[10] Ibid., p. XI-4.

Table A1. Potential Major Capital Investments 1979/80 to 1985/86.

	(MILLION $) Low Estimate	High Estimate
Grain Cars	400	572
Locomotives	106	171
Prince Rupert Terminal Elevator	100	100
Branch Line Rehabilitation[a]	700	700
CN Main Line Capacity[b]	-	160
CP Main Line Capacity[b]	-	100
Joint Fraser Canyon Operations[b]	-	148
Total Projected Investments	$1,306	$1,951

[a]Some of this amount already expended.

[b]Not all attributable to grain.

Source: Booz-Allen & Hamilton, Inc. and IBI Group, Grain Transportation and Handling in Western Canada (Report prepared for the Department of Industry, Trade & Commerce, The Grains Group, Federal Government of Canada, July, 1979), p. XI-4.

continue the improvement and monitoring process.[11]

5. CWB Transportation Staff: Prior to March, 1989, the staff responsible for administering the Block Shipping System reported to the CWB. However, under this arrangement, there were problems in the level of coordination and cooperation among the staff, railways and grain companies. As Booz-Allen et al claimed, some of the problems were due to a potential conflict of interest by the CWB which has a direct interest in marketing Board grains yet whose staff controlled rail car allocations for both Board and Non-Board grains. Consequently, from the viewpoint of operational efficiency the question was raised whether it would be better for the Block Shipping Staff to report to another body such as the Canadian Grain Commission or the "Grain Transportation Improvement Task Force". The Booz-Allen consultant team recommended relocation of the Block Shipping Staff to report to the "neutral" Managing Director of the proposed Task Force.[12]

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[11]Largely in response to this recommendation, former Federal Transport Minister and Minister Responsible for the CWB, the Honorable Don Mazankowski, appointed in mid-1979 a three-man task force to study grain transportation problems on the Prairies. This latest Federal Government study examined possible ways of quickly implementing Booz-Allen et al's suggestions which should make Prairie grain movements more efficient.

[12]At this point, it should be noted that the Federal Government appointment of Dr. Hugh Horner to the position of grain transportation coordinator in the latter part of 1979 stemmed largely from this recommendation and one put forward by the "Hall" Commission in 1977. Dr. Horner, the so-called "grain czar", has been given order-in-council powers to get all segments of the grain transportation system working together efficiently and meet the target of a 50 percent increase in grain movements by 1985. See J. Francis, "Horner 'grain czar' - reaction mixed," Winnipeg Free Press, September 25, 2979, p. 30.

6. Compensatory Rail Rates For Grain: While this issue was specifically excluded from the terms of reference of the Booz-Allen report, the consultant team noted throughout their report that compensatory grain rates are desirable. They felt that the introduction of compensatory rates was most important,

> not only to the required cash flow for locomotives and for expanded main line capacity but also to enhance the likelihood of achieving many of the identified operational improvements through the incentives provided by a flexible rate structure which would reward efficient use of rail services for grain transport.[13]

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[13] Booz-Allen & Hamilton, Inc., and IBI Group, op. cit., p. 5.

Appendix B

REVIEW OF RELATED RESEARCH WORK

The body of literature on alternatives to the retention of the statutory grain freight rates is both relatively recent and very limited. Up to now, almost all of the empirical research work in this area has been confined to investigating the economic effects resulting from the removal of the statutory rates in favor of higher, compensatory freight rates on grain. Very little research work has been done on the various other possible alternatives or options to the statutory rates and the work that has been done has been largely of an exploratory, non-quantitative, descriptive nature.

The financial impacts on Prairie grain producers resulting from the removal of the statutory rates in favor of higher compensatory rates have been estimated in various recent studies. Included among these studies are the following: The Transportation Agency of Saskatchewan;[1] Arcus;[2] Tyrchniewicz, Framingham, MacMillan and Craven;[3] and, most

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[1]The Transportation Agency of Saskatchewan, The Crow Rate and National Transportation Policy (Regina: Queen's Printer, 1977), p. 7.

[2]P. L. Arcus, "The Impact of Changes in the Statutory Freight Rates for Grain," Freight Rates and the Marketing of Canadian Agricultural Products, Occasional Series No. 8, edited by R. M. A. Loyns and E. W. Tyrchniewicz (Winnipeg: Department of Agricultural Economics, University of Manitoba, 1977), p. 86.

[3]E. W. Tyrchniewicz, C. F. Framingham, J. A. MacMillan and J. W. Craven, "The Abandonment of Uneconomic Branch Lines and Unremunerative Grain Rates: Effects on Agriculture and Regional Development," The Logistics and Transportation Review, Vol. 14, No. 4, 1978, pp. 416-419.

recently, IBI Group.[4]

Both the Agency and Arcus estimated the direct loss in gross farm income of Prairie grain producers in 1977 resulting from the removal of the statutory rates in favor of market rates (based on Snavely's variable cost estimates in 1974 plus an inflation factor). The Agency's estimate was $330 million while Arcus' estimate was $341 million.

The IBI Group study, which is discussed in greater detail later, also estimated the gross income loss to grain producers resulting from higher freight rates on grain. Assuming compensatory grain rates to be 3.1 times and 5.0 times the statutory rates, IBI estimated the 1977 gross income losses suffered by Prairie grain producers to be $241 million and $459 million, respectively, based on the 1977 volume of grain shipped under statutory rates.

In a more narrowly defined study, Tyrchniewicz et al estimated that for Manitoba grain producers delivering grain to primary elevators under 1973-74 conditions, the increase in rail costs resulting from rail rates 2.58 times the statutory rate level (i.e., Snavely's figure in 1974) was $17.7 million or 13 cents per bushel of statutory grain. They also estimated the indirect (multiplier) costs associated with this option to the regional economies of the Parklands and Interlake areas of Manitoba. Under 1973-74 conditions, they predicted that the Parklands and Interlake regions would have experienced reductions in gross output, employment and household income of $1.9 million, 206 man years and $3.7

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[4]IBI Group, Impact on Transportation Users of Changing Statutory Grain Rates (Report prepared for Alberta Economic Development, August, 1979), pp. VII-4, VII-5.

million, and $1.8 million, 86 man years and $0.7 million, respectively.

Another study, by Richter, Malczyk and Allen,[5] modeled the effects of freight rate changes for Prairie grain producers under various scenarios. Included in their analysis were the following two general scenarios:

1. the effect of higher transportation rates (i.e., 1.5 and 3.0 times the statutory level) on grain for human consumption, screenings, malt and rapeseed meal; and
2. the effect of change in statutory rates on the prices and values of Prairie grains (Board and Non-Board) when shipments to Eastern Canada are transported at higher freight rates (i.e., 1.5 to 3.0 times the statutory level) under three supply situations.

In the first scenario, the authors concluded that the major effect of the higher transportation charges for all domestically used grain, oilseeds and their respective processed forms and by-products would be a shift towards the export market since all commodities to be exported continue to move at statutory rates. In the second scenario, they identified the potential gains and losses for the Prairie livestock and grain sectors, respectively.

The Railway Compensation Sub-Committee of the Canada Grains Council[6] was one of the first to investigate the potential economic

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[5] J. J. Richter, K. Malczyk and E. Allen, Freight Rate Changes For Prairie Grain: A Perspective, Occasional Paper No. 1 (Edmonton: Department of Rural Economy, University of Alberta, 1977).

[6] Canada Grains Council, "Report of the Grain Handling and Transportation Committee" (Winnipeg: Canada Grains Council, June, 1977).

effects resulting from a wide array of alternatives for compensating the Prairie grain producer for the removal of the statutory grain rates. In this exploratory analysis, the Council assumed that the producer would be compensated by the Federal Government for the difference between the present grain freight rates and whatever level is deemed appropriately remunerative to the railways. Although this descriptive analysis does not provide many quantitative estimates of the possible impacts resulting from the various compensation schemes, it does provide a good overview of the potential economic effects that could result from such basic proposals as payments to grain producers, direct compensation to the railways, and direct payments to elevator companies, with variants of each basic proposal.

In a more recent paper, A. G. Wilson,[7] the Research Director of the Canada Grains Council, extended the work of the Railway Compensation Sub-Committee in the area of alternatives or options to the statutory grain rates. Wilson evaluated in a descriptive manner a variety of alternatives to the statutory rates in relation to several pre-specified economic and political criteria. Like the Committee's work, Wilson's paper showed that these criteria severely restrict the number of alternatives worthy of consideration when selecting one that would be acceptable to each of the affected parties (i.e., primary agricultural producers, the railways, the elevator companies, government and society).

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[7] A. G. Wilson, "The Statutory Grain Rates: The Options" (Paper presented at the University of Manitoba Agricultural Economics Conference at Oak Bluff, Manitoba, March 20, 1979).

Apedaile's study,[8] "Compensating for the Crow Gap," was similar to the Canada Grains Council's in that it was not an empirical analysis. By assuming that the removal of the statutory rates in favor of market rates would yield an overall increase in net welfare to the Prairie economy, Apedaile proceeded to look at various means of recouping the "Crow Gap" or financial losses suffered by the Prairie grain producers with the removal of the rates. Central to his analysis was an annuity type compensation scheme which would compensate producers for the irretrievable portion of their losses".

Palisser Wheat Growers' Association[9] was one of the first concerned parties to propose a specific detailed alternative to the present freight rates on grain. In a recent paper, the group proposed that the railways be compensated in full for moving grain by removing the statutory rates in favor of full compensatory grain freight rates. In return for giving up the current subsidized grain freight rates, the Prairie grain producer would be directly compensated on an annual basis by the Federal Government for the anticipated sharp increase in transport costs. The level of compensation paid to grain producers would be based on 1978 Snavely determined rail costs. This sum would amount to $350 million in 1979 and rise over the next seven years to $480 million. It would be adjusted annually according to a simple inflation-related escalation formula with the producer absorbing 100 percent of any rail freight cost

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[8] L. P. Apedaile, "Compensating for the Crow Gap," Meat-Grain Interface Project 1976-77, Vol. 2, edited by D. G. Devine (Saskatoon: Department of Agricultural Economics, University of Saskatchewan, 1977).

[9] Palisser Wheat Growers' Association, "Statement of Principles to Resolve Problems Associated With the Crow Rate" (Regina, February 9, 1979).

increases attributable to inflationary pressures, subject to an upper limit of 6 percent per year. Every fourth year (beginning in 1982) would involve an "expensive and detailed" recosting of all variable costs incurred in transporting grain by rail, to reflect any productivity gains achieved in grain transportation in the new cost basis. Individual grain producers with a Canadian Wheat Board permit book would receive compensation payments (or "Crow Benefits") based on their seeded acres in all crops as weighted by land productivity. The Association appears to have the mechanics of this statutory rate alternative worked out in some detail, but their cursory analysis of the potential economic effects resulting from it can only be described as qualitative.

The most comprehensive study yet regarding possible changes to the statutory grain rates was the impact analysis conducted by the consulting firm, IBI Group,[10] for Alberta Economic Development. This study, a microeconomic and macroeconomic analysis, was intended to provide a "broad-bush" yet reasonably comprehensive assessment of the economic impacts on producers, carriers, governments and other relevant parties to changes in the existing statutory rail rates for grain transportation. It was not based upon rigorous analysis (i.e., detailed econometrics or operations research) but, instead, on existing studies, and its own analyses and judgements.

As mentioned previously, the IBI study considered two levels of "compensatory" rates: one equal to 3.1 times statutory rates (in accordance with Snavely's variable cost estimates for 1977) and the other equal to 5.0 times statutory rates (more in accordance with rates for other

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[10] IBI Group, loc. cit.

bulk commodities in Canada, or for single car grain shipments in the United States). The impacts of such rate changes were quantified in terms of the following factors: railway financial performance, railway labor settlements, railway dividends, railway investment and level of service, non-grain-using industries, grain-using industries, trucking, and government revenues. In addition, the study team analyzed six alternative means of introducing compensatory grain rates in terms of the probable influence of each alternative on the economic impacts referred to earlier. These six alternatives which would pay compensation for the difference between statutory and higher compensatory rates included the following:

1. A single lump sum to producers based on past volumes at statutory rates.

2. An annual payment based on acreage.

3. An annual payment based on a stabilization principle, being high when grain prices are low, and low when grain prices are high.

4. A payment to the railways each year equal to the difference between revenues at compensatory and statutory rates.

5. A constant payment to the railways each year equal to the difference between 1977 revenues at compensatory and statutory rates (which is essentially the same as the statutory rate alternative evaluated in the present study).

6. A payment to the grain companies equal to the difference between the cost of shipment at single-car compensatory rates (which the railways would be free to charge) and shipment at statutory rates.

The analysis of the above alternative compensation methods (referred to as Scenarios 1 to 6) also showed the relative attractiveness of each method in terms of economic efficiency, the legacy of Federal Government funds, and perceived long term benefits to the grain trade and Canadian economy.

Some of the important findings of this report centered on: the major use of additional funds available to the railways before taxes; railway capital investments and level of service; future expansion of grain handling and transportation system capacity; the relationship between prices for domestic and export grain; the export/domestic grain balance; additional grain exports facilitated through additional transportation capacity; the potential gains and losses of the grain and livestock sectors; and additional trucking from farms to lower rail rate zones. To present these findings in any detail, however, would be too lengthy an exercise. Rather, in terms of the relevant literature on the question of moving to compensatory grain rates in Canada with compensation paid in some acceptable manner, the following general conclusions or consensus of the review panel regarding their assessment of the aforementioned alternative payment methods should be noted.

- Scenarios 4 and 6 were judged least attractive. They affected the free choice of market by the producers, required an open-ended commitment for ever-increasing payments, and channelled the payments through a small number of bodies (two railways or six major grain companies) thereby limiting the opportunity for innovation.

- Scenario 5, which essentially phases the subsidy out over time depending on the rate of inflation, was seen as a relatively weak compromise.

- Scenarios 1, 2, and 3 were all seen as acceptable, with some preference for a scheme based on a stabilization principle, if a mechanism could be worked out in connection with one of the existing or proposed stabilization plans. These scenarios are all ones which pay compensation to the producer.[11]

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[11] Op. cit., p. E-8.

Appendix C

THE RAIL RATE INCREASE METHODOLOGY

The proposed Federal Government subsidy payment applied only to grains and oilseeds moving into export markets with domestically marketed grains moving under higher compensatory rates (in accordance to Snavely's estimates of variable rail costs). Thus, over the 1978-85 study period, the real rate increases that resulted from the assumed mixes of inflationary cost pressures and productivity growth in rail transport of grain only applied to that amount of grain that was exported abroad. On the other hand, over the same period, the freight rates on domestic grains remained fixed at a real 1978 compensatory level.

The LP model, however, was not able to distinguish between grain destined for export markets and grain destined for domestic markets outside the Province of Manitoba. Grain produced for export and grain produced for extra-provincial domestic markets were treated as one production activity or decision variable for each of the six principal grains within the LP model. Hence, the grain objective function coefficients (or "cj" values), which represented the net return to producers for the various grain production activities, applied to grain that was both exported and grain that was marketed domestically.

Given this modeling constraint, it was necessary to weight the real freight rate increase absorbed by grain producers by the relative proportion of grain that was exported in recent years. These proportions or weighting factors, which were derived based on historic bulk exports and domestic marketings of the various grains, are shown in Table C1.

Table C1. Export and Domestic Marketings of Prairie Grain: 5 Year Averages - 1973/74 to 1977/78.

	Bulk Exports		Domestic		Total Marketings[a]
	thousands of tonnes (percentage)				
Wheat[b]	12,140	(81.62)	2,733	(18.38)	14,873
Oats	179	(24.93)	539	(75.07)	718
Barley	3,306	(65.53)	1,739	(34.47)	5,045
Flaxseed	293	(81.39)	67	(18.61)	360
Rapeseed	839	(69.22)	373	(30.78)	1,212
Rye	195	(73.58)	70	(26.42)	265

[a]Total "export and domestic" marketings did not include the amount of grain and oilseeds used for seed requirements, livestock and animal feed, wastage and dockage. In the present analysis, it was therefore assumed that the "total marketing" figures represented that amount of grain sold outside the Prairie Provinces in both domestic (largely Eastern Canada) and export markets.

[b]Includes durum wheat.

Source: Canada Grains Council, Canadian Grains Industry Statistical Handbook 79 (Winnipeg: Canada Grains Council, 1979), pp. 33-35, 67.

The actual rate increase methodology employed in Scenario II, the shift from a 1978 "Crow" situation to a 1978 "No Crow/Export Subsidy" situation is illustrated in Table C2. The higher compensatory rates only applied to domestically marketed grains in this scenario since exports continued to move under subsidized freight rates. Consequently, the grain producer absorbed a weighted freight rate increase in the start-up year that reflected the proportion of grain marketed in domestic markets outside the Prairies and a Snavely determined cost-based freight rate on grains and oilseeds. In the case of wheat, for example, the producer was subjected to a rate increase that was 0.441 times the present statutory rate level. This multiplication factor of 0.441 was based on domestic wheat marketings outside the Prairies that averaged 18.38 percent of total wheat sales outside this region, and an estimated compensatory rate level of 3.4 times the statutory rates in 1978. Multiplying this factor times the statutory rate yielded a weighted rate increase.

On the other hand, in Scenarios III, IV and V, the real rate increases on grain that producers absorbed only applied to export bound grains and oilseeds. As railway grain transportation costs increased, the real value of the transport subsidy on export grains declined with the producer absorbing a larger proportion of the real cost of transporting these grains. Consequently, in the latter three scenarios, the cost to the producer of shipping domestic grain remained at a real 1978 compensatory level while the cost to the producer of shipping export grain rose in real 1978 dollars.

The weighted freight rate increases for Scenarios III, IV and V are illustrated in Tables C3, C4 and C5, respectively. In Scenario III for example, the producer would have been subject to a rate increase on

Table C2. Freight Rate Increase Methodology for Scenario II: (Statutory Rate) x (2.4)[a] x (Percentage of Non-Export Grain)[b] = Weighted Freight Rate Increase.

Wheat:	(Statutory Rate) · (2.4) · (0.1838)	= (Statutory Rate) · (0.441)
Oats:	(Statutory Rate) · (2.4) · (0.7507)	= (Statutory Rate) · (1.802)
Barley:	(Statutory Rate) · (2.4) · (0.3447)	= (Statutory Rate) · (0.827)
Flaxseed:	(Statutory Rate) · (2.4) · (0.1861)	= (Statutory Rate) · (0.447)
Rapeseed:	(Statutory Rate) · (2.4) · (0.3078)	= (Statutory Rate) · (0.739)
Rye:	(Statutory Rate) · (2.4) · (0.2642)	= (Statutory Rate) · (0.634)

[a]The number 2.4 represents the factor increase that was necessary to bring the present statutory rate up to a compensatory level. For 1978 it was estimated that compensatory rates (according to Snavely's findings) were 3.4 times the present rail tariffs; hence, the increase from statutory to compensatory grain rates in 1978 was 3.4 - 1.0 = 2.4.

[b]As illustrated in Table C1.

Table C3. Freight Rate Increase Methodology for Scenario III: (Weighted Freight Rate)[a] x (80 Percent Real Cost Increase Absorbed by Producers)[b] x (Percentage of Export Grain)[c] = Weighted Freight Rate Increase.

Wheat:	(Weighted FR)	·	(0.80)	·	(0.8162)	=	(WFR) · (0.653)
Oats:	(Weighted FR)	·	(0.80)	·	(0.2493)	=	(WFR) · (0.199)
Barley:	(Weighted FR)	·	(0.80)	·	(0.6553)	=	(WFR) · (0.524)
Flaxseed:	(Weighted FR)	·	(0.80)	·	(0.8139)	=	(WFR) · (0.651)
Rapeseed:	(Weighted FR)	·	(0.80)	·	(0.6922)	=	(WFR) · (0.554)
Rye:	(Weighted FR)	·	(0.80)	·	(0.7358)	=	(WFR) · (0.589)

[a]The weighted freight rate (WFR) was simply the statutory rate plus the weighted rate increase that was determined in Scenario II (see Table C2).

[b]The assumed 6 percent annual increase in railway grain transportation costs between 1978 and 1985 translated into an 80 percent increase in the producer's share of the real total costs.

[c]As illustrated in Table C1.

Table C4. Freight Rate Increase Methodology for Scenario IV: (Weighted Freight Rate)[a] x (124 Percent Real Cost Increase Absorbed by Producers)[b] x (Percentage of Export Grain)[c] = Weighted Freight Rate Increase.

Wheat:	(Weighted FR) · (1.24) · (0.8162) = (WFR) · (1.012)
Oats:	(Weighted FR) · (1.24) · (0.2493) = (WFR) · (0.309)
Barley:	(Weighted FR) · (1.24) · (0.6553) = (WFR) · (0.813)
Flaxseed:	(Weighted FR) · (1.24) · (0.8139) = (WFR) · (1.009)
Rapeseed:	(Weighted FR) · (1.24) · (0.6922) = (WFR) · (0.858)
Rye:	(Weighted FR) · (1.24) · (0.7358) = (WFR) · (0.912)

[a]This weighted freight rate (WFR) was simply the statutory rate plus the weighted rate increase that was determined in Scenario II (see Table C2).

[b]The assumed 11 percent annual increase in railway grain transportation costs between 1978 and 1985 translated into a 124 percent increase in the producer's share of the total real costs.

[c]As illustrated in Table C1.

Table C5. Freight Rate Increase Methodology for Scenario V: (Weighted Freight Rate)[a] x (149 Percent Real Cost Increase Absorbed by Producers)[b] x (Percentage of Export Grain)[c] = Weighted Freight Rate Increase.

Wheat:	(Weighted FR)	· (1.49) ·	(0.8162)	=	(WFR)	· (1.216)
Oats:	(Weighted FR)	· (1.49) ·	(0.2493)	=	(WFR)	· (0.372)
Barley:	(Weighted FR)	· (1.49) ·	(0.6553)	=	(WFR)	· (0.976)
Flaxseed:	(Weighted FR)	· (1.49) ·	(0.8139)	=	(WFR)	· (1.213)
Rapeseed:	(Weighted FR)	· (1.49) ·	(0.6922)	=	(WFR)	· (1.031)
Rye:	(Weighted FR)	· (1.49) ·	(0.7358)	=	(WFR)	· (1.096)

[a]The weighted freight rate (WFR) was simply the statutory rate plus the weighted rate increase that was determined in Scenario II (see Table C2).

[b]The assumed 15 percent annual increase in railway grain transportation costs between 1978 and 1985 translated into a 149 percent increase in the producer's share of the total real costs.

[c]As illustrated in Table C1.

wheat of 0.653 times the weighted freight rate, which was simply the statutory rate plus the weighted rate increase as determined in Scenario II. The factor increase of 0.653 reflected the 80 percent real cost increase absorbed by producers over the 1978-85 period under Scenario III conditions (i.e., an assumed 6 percent annual increase in railway grain transportation costs) and bulk exports of wheat that averaged 81.62 percent of total marketings of wheat outside the Prairie Provinces in recent years. The weighted rail rate increase methodology used in the latter two scenarios was the same as in Scenario III except that the real cost increase on export grains absorbed by producers differed according to the assumed inflation/productivity conditions in railway grain transportation.

Weighting the freight rate increases in the described fashion was consistent both conceptually and in practice since producers delivering their grain stocks to primary elevators largely do not know at that time whether or not their grain will end up in the extra-provincial domestic market or export market. By using such a weighting procedure, however, the strong but unavoidable assumption was made in the analysis that the relative proportions of export grain and domestic marketings of grain outside the Prairies (where the present freight rates apply) remained fixed over the 1978-85 period. In reality, however, these relative proportions would almost certainly change in favor of exports over the relevant time period. Given that the potential for increased grain exports is significantly greater than the potential for increased domestic sales, one would expect the relative proportion of exports to increase as total Canadian grain production increases (marketing and, particularly, grain handling and transportation problems notwithstanding).

Appendix D

SIZE OF ENTERPRISE AND FARM

A farm-size specific analysis of the effects resulting from the proposed statutory rate option was facilitated by the three farm sizes specified in the LP model, namely small farms, medium farms and large farms. The nature and composition of each of these enterprise sizes included in the analysis are shown as follows in Table D1.

Table D1. Farm Size Composition Used in the Analysis

	Small	Medium	Large
Crops[a]	Less than $19,950 in capital value of machinery and land investment	$19,950 - $49,949	$49,950 and over
Beef	Less than 33 cows	33 - 77 cows	78 cows and over
Hogs	1 - 9 sows	10 - 29 sows	30 sows and over
Weanling to Finish	1 - 49 feeders	50 - 199 feeders	200 feeders and over
Dairy	1 - 19 dairy cows	20 - 49 dairy cows	50 dairy cows and over
Poultry[b]	Less than $50,000	$50,000 - $100,000	over $100,000
Chickens, broilers and turkeys	Capital value invested in poultry equipment and barns		

[a]Production was allocated according to the capital value of machinery and investment in land used for crop production as reported in the 1976 Canada Census.

[b]Production was allocated according to the capital value of land, buildings, machinery, and equipment used for poultry production as reported in the 1976 Canada Census.

Source: Statistics Canada, 1976 Census of Canada, Agriculture Manitoba, Catalogue No. 96-807 (Ottawa: Supply and Services, Canada, March, 1978).

Appendix E

TABLES SHOWING THE PROVINCIAL AND REGIONAL GROSS FARM PRODUCTION VALUES AND CHANGES UNDER VARIOUS SCENARIOS

In this appendix, the detailed production, gross value and net income changes for the province and five agricultural regions under the various scenarios are presented in tabular form. Note these conditions for the following tables:

(a) all production values are in thousands of dollars;

(b) wheat, oats, barley, flaxseed, rapeseed and rye production figures are in thousands of bushels;

(c) sunflower production figures are in thousands of pounds;

(d) potato production figures are in thousands of hundredweights;

(e) sugar beet production figures are in thousands of tons;

(f) all livestock production figures are in thousands of animals;

(g) fluid milk and cream production figures are in thousands of pounds;

(h) egg production figures are in thousands of dozens; and

(i) broilers and turkey production figures are in thousands of animals.

Table E.1. Province (Small Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	9,260	26,854	9,260	26,391	0	-463	9,260	25,558	0	-1,296	9,260	25,095	0	-1,759	9,260	24,817	0	-2,037
Oats	3,274	3,143	3,274	2,783	0	-360	3,274	2,685	0	-458	3,274	2,619	0	-524	3,274	2,586	0	-557
Barley	7,424	12,844	7,424	12,250	0	-594	7,424	11,730	0	1,114	7,424	11,359	0	-1,485	7,424	11,210	0	-1,634
Flax	898	4,823	898	4,778	0	-45	898	4,706	0	-117	898	4,661	0	-162	898	4,634	0	-189
Rapeseed	2,849	18,239	2,849	18,068	0	-171	3,083	19,302	234	1,063	3,083	19,179	234	940	3,083	19,117	234	878
Rye	414	978	414	944	0	-34	414	907	0	-71	414	891	0	-87	414	878	0	-100
Sunflowers	40,317	4,031	40,317	4,031	0	0	47,037	4,703	6,720	672	47,037	4,703	6,720	672	47,037	4,703	6,720	672
Potatoes	909	3,446	909	3,446	0	0	909	3,446	0	0	909	3,446	0	0	909	3,446	0	0
Sugar Beets	61	1,973	61	1,973	0	0	61	1,973	0	0	61	1,973	0	0	61	1,973	0	0
Veal Calves	6	1,036	6	1,036	0	0	6	1,082	0	20	6	1,073	0	11	6	1,098	0	36
Stocker Calves	48	8,626	48	8,626	0	0	48	8,579	0	-21	48	8,588	0	-12	48	8,562	0	-38
Stocker Cattle	49	23,638	49	23,638	0	0	55	26,594	6	2,956	55	26,558	6	2,920	55	26,488	6	2,850
Fed Beef	51	20,114	52	20,430	1	316	58	22,772	7	2,658	58	22,772	7	2,658	58	22,708	7	2,594
Weanling Hogs	112	5,648	112	5,648	0	0	112	5,648	0	0	112	5,648	0	0	112	5,648	0	0
Market Hogs	137	13,815	137	13,815	0	0	131	13,241	-6	-574	131	13,241	-6	-574	131	13,241	-6	-574
Fluid Milk	129,521	16,837	129,521	16,837	0	0	129,521	16,837	0	0	129,521	16,837	0	0	129,521	16,837	0	0
Cream	33,367	2,335	33,367	2,335	0	0	33,367	2,335	0	0	3,367	2,335	0	0	33,367	2,335	0	0
Eggs	2,380	1,428	2,380	1,428	0	0	2,380	1,428	0	0	2,380	1,428	0	0	2,380	1,428	0	0
Broilers	43	65	43	65	0	0	43	65	0	0	43	65	0	0	43	65	0	0
Turkey	13	121	13	121	0	0	13	121	0	0	13	121	0	0	13	121	0	0
TOTALS		169,994		168,643		-1,351		173,712		3,718		172,592		2,598		171,895		1,901

Table E.2. Province (Medium Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	19,856	57,582	19,856	56,589	0	-993	19,475	53,752	-381	-3,830	19,475	52,778	-381	-4,804	19,475	52,194	-381	-5,388
Oats	6,900	6,624	6,900	5,865	0	-759	6,942	5,693	42	-931	6,942	5,554	42	-1,070	6,942	5,484	42	-1,140
Barley	16,553	28,638	15,784	26,045	-769	-2,593	15,784	24,940	-769	-3,698	15,784	24,150	-769	-4,488	15,784	23,835	-769	-4,803
Flax	1,816	9,753	1,816	9,662	0	-91	1,816	9,517	0	-236	1,816	9,426	0	-327	1,816	9,371	0	-382
Rapeseed	6,238	39,923	6,238	39,549	0	-374	7,061	44,204	823	4,281	7,059	43,909	821	3,986	7,059	43,768	821	3,845
Rye	1,097	2,590	1,013	2,311	-84	-279	949	2,078	-148	-512	1,093	2,350	-4	-240	1,074	2,278	-23	-312
Sunflowers	83,171	8,317	83,171	8,317	0	0	92,864	9,286	9,693	969	92,864	9,286	9,693	969	92,864	9,286	9,693	969
Potatoes	1,774	6,724	1,774	6,724	0	0	1,774	6,724	0	0	1,774	6,724	0	0	1,774	6,724	0	0
Sugar Beets	121	3,887	121	3,887	0	0	121	3,887	0	0	121	3,887	0	0	121	3,887	0	0
Veal Calves	7	1,198	7	1,198	0	0	5	950	-1	-199	5	955	-1	-194	5	930	-1	-219
Stocker Calves	88	15,564	88	15,564	0	0	91	16,029	3	414	90	16,024	2	409	91	16,050	3	435
Stocker Cattle	89	42,789	89	42,789	0	0	103	49,462	14	6,673	103	49,497	14	6,708	103	49,568	14	6,779
Fed Beef	96	37,539	96	37,539	0	0	110	43,069	14	5,530	110	43,101	14	5,562	111	43,165	15	5,626
Weanling Hogs	214	10,799	214	10,799	0	0	214	10,799	0	0	214	10,799	0	0	214	10,799	0	0
Market Hogs	261	26,305	261	26,305	0	0	264	26,640	3	335	264	26,640	3	335	264	26,640	3	335
Fluid Milk	162,757	21,158	162,757	21,158	0	0	162,757	21,158	0	0	162,757	21,158	0	0	162,757	21,158	0	0
Cream	31,451	2,201	31,451	2,201	0	0	31,451	2,201	0	0	31,451	2,201	0	0	31,451	2,201	0	0
Eggs	9,252	5,551	9,252	5,551	0	0	9,252	5,551	0	0	9,252	5,551	0	0	9,252	5,551	0	0
Broilers	108	164	108	164	0	0	108	164	0	0	108	164	0	0	108	164	0	0
Turkey	81	728	81	728	0	0	81	728	0	0	81	728	0	0	81	728	0	0
TOTALS		328,034		322,945		-5,089		336,832		8,796		334,882		6,846		333,781		5,745

Table E.3. Province (Large Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	50,318	145,924	50,672	144,416	354	-1,508	50,608	139,678	290	-6,246	50,597	137,119	279	-8,805	50,594	135,593	276	-10,331
Oats	15,910	15,274	15,879	13,497	-31	-1,777	17,505	14,354	1,595	-920	17,509	14,007	1,599	-1,267	17,477	13,806	1,567	-1,468
Barley	43,441	75,153	42,939	70,849	-502	-4,304	35,743	56,474	-7,698	-18,679	35,521	54,348	-7,920	-20,805	35,516	53,630	-7,925	-21,523
Flax	4,142	22,245	4,142	22,038	0	-207	4,292	22,491	150	246	4,292	22,276	150	31	4,292	22,148	150	-97
Rapeseed	13,004	83,231	13,004	82,451	0	-780	15,113	94,610	2,109	11,379	15,113	94,006	2,109	10,775	15,113	93,703	2,109	10,472
Rye	2,321	5,478	2,321	5,293	0	-185	2,568	5,624	247	146	2,568	5,521	247	43	2,568	5,444	247	-34
Sunflowers	161,510	16,151	161,510	16,151	0	0	188,429	18,842	26,919	2,691	188,429	18,842	26,919	2,691	188,429	18,842	26,919	2,691
Potatoes	3,662	13,882	3,662	13,882	0	0	3,662	13,882	0	0	3,662	13,882	0	0	3,662	13,882	0	0
Sugar Beets	240	7,693	240	7,693	0	0	240	7,693	0	0	240	7,693	0	0	240	7,693	0	0
Veal Calves	8	1,530	10	1,813	2	283	8	1,433	-1	-121	8	1,437	-1	-117	8	1,437	-1	-117
Stocker Calves	140	24,687	140	24,687	0	0	180	31,871	40	7,208	180	31,867	40	7,204	180	31,867	40	7,204
Stocker Cattle	138	65,996	138	65,996	0	0	161	76,963	23	10,967	161	76,963	23	10,967	161	76,963	23	10,967
Fed Beef	153	59,575	153	59,622	0	47	178	69,467	25	9,892	178	69,467	25	9,892	178	69,467	25	9,892
Weanling Hogs	578	29,104	578	29,104	0	0	578	29,104	0	0	578	29,104	0	0	578	29,104	0	0
Market Hogs	506	50,983	506	50,983	0	0	509	51,222	3	239	509	51,222	3	239	509	51,222	3	239
Fluid Milk	172,935	22,481	172,935	22,481	0	0	174,531	22,689	1,596	208	174,531	22,689	1,596	208	174,531	22,689	1,596	208
Cream	16,762	1,173	16,762	1,173	0	0	16,762	1,173	0	0	16,762	1,173	0	0	16,762	1,173	0	0
Eggs	51,183	30,710	51,183	30,710	0	0	51,183	30,710	0	0	51,183	30,710	0	0	51,183	30,710	0	0
Broilers	928	1,411	928	1,411	0	0	928	1,411	0	0	928	1,411	0	0	928	1,411	0	0
Turkey	1,268	11,276	1,268	11,276	0	0	1,268	11,276	0	0	1,268	11,276	0	0	1,268	11,276	0	0
TOTALS		683,957		675,526		-8,431		700,967		17,010		695,013		11,056		692,060		8,103

Table E.4. Province (Total): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	79,434	230,361	79,788	227,397	354	-2,964	79,343	218,988	-91	-11,373	79,333	214,993	-101	-15,368	79,330	212,604	-104	-17,757
Oats	26,086	25,042	26,054	22,146	-32	-2,896	27,722	22,732	1,636	-2,310	27,726	22,181	1,640	-2,861	27,694	21,878	1,608	-3,164
Barley	67,419	116,635	66,148	109,145	-1,271	-7,490	58,952	93,145	-8,467	-23,490	58,731	89,858	-8,688	-26,777	58,726	88,676	-8,693	-27,959
Flax	6,857	36,822	6,857	36,479	0	-343	7,006	36,715	149	-107	7,006	36,364	149	-458	7,006	36,154	149	-668
Rapeseed	22,092	141,394	22,092	140,069	0	-1,325	25,258	158,118	3,166	16,724	25,256	157,094	3,164	15,700	25,256	156,589	3,164	15,195
Rye	3,833	9,046	3,749	8,549	-84	-498	3,932	8,611	99	-436	4,076	8,763	243	-284	4,057	8,602	224	-445
Sunflowers	285,000	28,500	285,000	28,500	0	0	328,330	32,833	43,330	4,333	328,330	32,833	43,330	4,333	328,330	32,833	43,330	4,333
Potatoes	6,346	24,053	6,346	24,053	0	0	6,346	24,053	0	0	6,346	24,053	0	0	6,346	24,053	0	0
Sugar Beets	423	13,555	423	13,555	0	0	423	13,555	0	0	423	13,555	0	0	423	13,555	0	0
Veal Calves	22	3,766	23	4,048	1	282	20	3,466	-2	-300	20	3,466	-2	-300	20	3,466	-2	-300
Stocker Calves	277	48,878	277	48,878	0	0	320	56,481	43	7,603	320	56,481	43	7,603	320	56,481	43	7,603
Stocker Cattle	277	132,424	277	132,424	0	0	320	153,019	43	20,595	320	153,019	43	20,595	320	153,019	43	20,595
Fed Beef	301	117,229	302	117,592	1	363	348	135,309	47	18,080	348	135,341	47	18,112	348	135,341	47	18,112
Weanling Hogs	905	45,552	905	45,552	0	0	905	45,552	0	0	905	45,552	0	0	905	45,552	0	0
Market Hogs	905	91,104	905	91,104	0	0	905	91,104	0	0	905	91,104	0	0	905	91,104	0	0
Fluid Milk	465,214	60,477	465,214	60,477	0	0	466,811	60,685	1,597	208	466,811	60,685	1,597	208	466,811	60,685	1,597	208
Cream	81,581	5,710	81,581	5,710	0	0	81,581	5,710	0	0	81,581	5,710	0	0	81,581	5,710	0	0
Eggs	62,817	37,690	62,817	37,690	0	0	62,817	37,690	0	0	62,817	37,690	0	0	62,817	37,690	0	0
Broilers	1,080	1,641	1,080	1,641	0	0	1,080	1,641	0	0	1,080	1,641	0	0	1,080	1,641	0	0
Turkey	1,364	12,126	1,364	12,126	0	0	1,364	12,126	0	0	1,364	12,126	0	0	1,364	12,126	0	0
TOTALS		1,182,006		1,167,135		-14,871		1,211,533		29,527		1,202,509		20,503		1,197,759		15,753

Table E.5. Interlake Region (Small Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	547	1,591	547	1,564	0	-27	547	1,514	0	-77	547	1,490	0	-101	547	1,473	0	-118
Oats	245	235	245	209	0	-26	245	202	0	-33	245	197	0	-38	245	194	0	-41
Barley	496	859	496	822	0	-37	496	787	0	-72	496	767	0	-92	496	755	0	-104
Flax	53	288	53	285	0	-3	53	281	0	-7	53	278	0	-10	53	277	0	-11
Rapeseed	59	378	59	375	0	-3	59	370	0	-8	59	368	0	-10	59	367	0	-11
Rye	4	10	4	9	0	-1	4	9	0	-1	4	9	0	-1	4	9	0	-1
Sunflowers	128	12	128	12	0	0	150	15	22	3	150	15	22	3	150	15	22	3
Potatoes	44	168	44	168	0	0	44	168	0	0	44	168	0	0	44	168	0	0
Sugar Beets	0	27	0	27	0	0	0	27	0	0	0	27	0	0	0	27	0	0
Veal Calves	1	188	1	188	0	0	1	205	0	-8	1	205	0	-8	1	205	0	-8
Stocker Calves	7	1,294	7	1,294	0	0	7	1,276	0	8	7	1,276	0	8	7	1,276	0	8
Stocker Cattle	7	3,453	7	3,453	0	0	8	3,838	1	385	8	3,838	1	385	8	3,838	1	385
Fed Beef	7	3,077	7	3,077	0	0	8	3,419	1	342	8	3,419	1	342	8	3,419	1	342
Weanling Hogs	13	703	13	703	0	0	13	703	0	0	13	703	0	0	13	703	0	0
Market Hogs	14	1,479	14	1,479	0	0	14	1,479	0	0	14	1,479	0	0	14	1,479	0	0
Fluid Milk	19,850	2,580	19,850	2,580	0	0	19,850	2,580	0	0	19,850	2,580	0	0	19,850	2,580	0	0
Cream	4,718	330	4,718	330	0	0	4,718	330	0	0	4,718	330	0	0	4,718	330	0	0
Eggs	195	117	195	117	0	0	195	117	0	0	195	117	0	0	195	117	0	0
Broilers	1	1	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0
Turkey	3	30	3	30	0	0	3	30	0	0	3	30	0	0	3	30	0	0
TOTALS		16,820		16,723		-97		17,351		532		17,297		478		17,263		444

Table E.6. Interlake Region (Medium Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	1,115	3,240	1,115	3,184	0	-56	1,115	3,084	0	-156	1,115	3,034	0	-206	1,115	3,000	0	-240
Oats	583	559	583	498	0	-61	625	515	42	-44	625	503	42	-56	625	497	42	-62
Barley	1,005	1,739	1,005	1,664	0	-75	1,005	1,593	0	-146	1,005	1,553	0	-186	1,005	1,528	0	-211
Flax	108	583	108	578	0	-5	108	569	0	-14	108	564	0	-19	108	561	0	-22
Rapeseed	121	779	121	772	0	-7	121	762	0	-17	121	758	0	-21	121	755	0	-24
Rye	9	23	9	22	0	-1	8	19	-1	-4	8	18	-1	-5	8	18	-1	-5
Sunflowers	257	25	257	25	0	0	300	30	43	5	300	30	43	5	300	30	43	5
Potatoes	88	336	88	336	0	0	88	336	0	0	88	336	0	0	88	336	0	0
Sugar Beets	1	54	1	54	0	0	1	54	0	0	1	54	0	0	1	54	0	0
Veal Calves	1	186	1	186	0	0	1	187	0	-6	1	187	0	-6	1	187	0	-6
Stocker Calves	12	2,192	12	2,192	0	0	12	2,190	0	6	12	2,190	0	6	12	2,190	0	6
Stocker Cattle	12	5,890	12	5,890	0	0	14	6,731	2	841	14	6,731	2	841	14	6,731	2	841
Fed Beef	13	5,336	13	5,336	0	0	15	6,084	2	748	15	6,084	2	748	15	6,084	2	748
Weanling Hogs	26	1,310	26	1,310	0	0	26	1,310	0	0	26	1,310	0	0	26	1,310	0	0
Market Hogs	39	4,003	39	4,003	0	0	39	4,003	0	0	39	4,003	0	0	39	4,003	0	0
Fluid Milk	20,292	2,638	20,292	2,638	0	0	20,292	2,638	0	0	20,292	2,638	0	0	20,292	2,638	0	0
Cream	4,470	312	4,470	312	0	0	4,470	312	0	0	4,470	312	0	0	4,470	312	0	0
Eggs	488	293	488	293	0	0	488	293	0	0	488	293	0	0	488	293	0	0
Broilers	3	4	3	4	0	0	3	4	0	0	3	4	0	0	3	4	0	0
Turkey	20	183	20	183	0	0	20	183	0	0	20	183	0	0	20	183	0	0
TOTALS		29,685		29,480		-205		30,897		1,213		30,785		1,101		30,714		1,030

Table E.7. Interlake Region (Large Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	3,008	8,740	3,008	8,589	0	-151	3,008	8,319	0	-421	3,008	8,183	0	-557	3,008	8,093	0	-647
Oats	1,893	1,817	1,606	1,373	-287	-444	2,169	1,789	276	-28	2,146	1,727	253	-90	2,108	1,676	215	-141
Barley	2,599	4,497	2,599	4,302	0	-195	2,599	4,120	0	-377	2,599	4,016	0	-481	2,599	3,951	0	-546
Flax	283	1,521	283	1,507	0	-14	283	1,484	0	-37	283	1,471	0	-50	283	1,463	0	-58
Rapeseed	353	2,262	353	2,241	0	-21	353	2,214	0	-48	353	2,200	0	-62	353	2,193	0	-69
Rye	33	79	33	77	0	-2	28	62	-5	-17	28	61	-5	-18	28	60	-5	-19
Sunflowers	604	60	604	60	0	0	705	70	101	10	705	70	101	10	705	70	101	10
Potatoes	208	789	208	789	0	0	208	789	0	0	208	789	0	0	208	789	0	0
Sugar Beets	3	126	3	126	0	0	3	126	0	0	3	126	0	0	3	126	0	0
Veal Calves	1	214	1	181	0	-33	0	155	-1	-26	0	155	-1	-26	0	155	-1	-26
Stocker Calves	31	5,486	31	5,521	0	35	31	5,548	0	27	31	5,548	0	27	31	5,548	0	27
Stocker Cattle	31	14,865	31	14,865	0	0	36	17,302	5	2,437	36	17,302	5	2,437	36	17,302	5	2,437
Fed Beef	34	13,459	34	13,459	0	0	40	15,637	6	2,178	40	15,637	6	2,178	40	15,637	6	2,178
Weanling Hogs	79	4,008	79	4,008	0	0	79	4,008	0	0	79	4,008	0	0	79	4,008	0	0
Market Hogs	56	5,705	56	5,705	0	0	38	3,875	-18	-1,830	38	3,875	-18	-1,830	38	3,875	-18	-1,830
Fluid Milk	34,726	4,514	34,726	4,514	0	0	36,000	4,680	1,274	166	36,000	4,680	1,274	166	36,000	4,680	1,274	166
Cream	3,458	242	3,458	242	0	0	3,458	242	0	0	3,458	242	0	0	3,458	242	0	0
Eggs	4,203	2,522	4,203	2,522	0	0	4,203	2,522	0	0	4,203	2,522	0	0	4,203	2,522	0	0
Broilers	26	40	26	40	0	0	26	40	0	0	26	40	0	0	26	40	0	0
Turkey	319	2,838	319	2,838	0	0	319	2,838	0	0	319	2,838	0	0	319	2,838	0	0
TOTALS		73,784		72,959		-825		75,820		2,034		75,490		1,704		75,268		1,482

Table E.8. Interlake Region (Total): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	4,672	13,572	4,672	13,338	0	-234	4,672	12,918	0	-654	4,672	12,707	0	-865	4,672	12,567	0	-1,005
Oats	2,721	2,612	2,434	2,081	-287	-531	3,040	2,508	319	-104	3,016	2,428	295	-184	2,979	2,368	258	-244
Barley	4,102	7,096	4,102	6,788	0	-308	4,102	6,501	0	-595	4,102	6,337	0	-759	4,102	6,235	0	-861
Flax	445	2,393	445	2,370	0	-23	445	2,335	0	-58	445	2,315	0	-78	445	2,301	0	-92
Rapeseed	534	3,420	534	3,388	0	-32	534	3,348	0	-72	534	3,326	0	-94	534	3,316	0	-104
Rye	48	113	48	109	0	-4	41	91	-7	-22	41	89	-7	-24	41	88	-7	-25
Sunflowers	991	99	991	99	0	0	1,156	115	165	16	1,156	115	165	16	1,156	115	165	16
Potatoes	341	1,294	341	1,294	0	0	341	1,294	0	0	341	1,294	0	0	341	1,294	0	0
Sugar Beets	6	208	6	208	0	0	6	208	0	0	6	208	0	0	6	208	0	0
Veal Calves	3	589	3	556	0	-33	3	548	0	-41	3	548	0	-41	3	548	0	-41
Stocker Calves	50	8,973	51	9,007	1	34	51	9,015	1	42	51	9,015	1	42	51	9,015	1	42
Stocker Cattle	50	24,209	50	24,209	0	0	58	27,873	8	3,664	58	27,873	8	3,664	58	27,873	8	3,664
Fed Beef	56	21,872	56	21,872	0	0	64	25,141	8	3,269	64	25,141	8	3,269	64	25,141	8	3,269
Weanling Hogs	119	6,022	119	6,022	0	0	119	6,022	0	0	119	6,022	0	0	119	6,022	0	0
Market Hogs	111	11,188	111	11,188	0	0	93	9,358	-18	-1,830	93	9,358	-18	-1,830	93	9,358	-18	-1,830
Fluid Milk	74,869	9,732	74,869	9,732	0	0	76,143	9,898	1,274	166	76,143	9,898	1,274	166	76,143	9,898	1,274	166
Cream	12,647	885	12,647	885	0	0	12,647	885	0	0	12,647	885	0	0	12,647	885	0	0
Eggs	4,887	2,932	4,887	2,932	0	0	4,887	2,932	0	0	4,887	2,932	0	0	4,887	2,932	0	0
Broilers	30	47	30	47	0	0	30	47	0	0	30	47	0	0	30	47	0	0
Turkey	343	3,051	343	3,051	0	0	343	3,051	0	0	343	3,051	0	0	343	3,051	0	0
TOTALS		120,307		119,176		-1,131		124,088		3,781		123,589		3,282		123,262		2,955

Table E.9. Eastern Region (Small Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENATIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	809	2,355	809	2,326	0	-29	809	2,258	0	-97	809	2,221	0	-134	809	2,201	0	-154
Oats	337	324	337	293	0	-31	337	285	0	-39	337	280	0	-44	337	276	0	-48
Barley	525	909	525	880	0	-29	525	846	0	-63	525	825	0	-84	525	814	0	-95
Flax	38	204	38	203	0	-1	38	200	0	-4	38	198	0	-6	38	197	0	-7
Rapeseed	28	180	28	179	0	-1	28	177	0	-3	28	176	0	-4	28	175	0	-5
Rye	7	16	7	16	0	0	7	15	0	-1	7	15	0	-1	7	15	0	-1
Sunflowers	869	86	869	86	0	0	1,014	101	145	15	1,014	101	145	15	1,014	101	145	15
Potatoes	9	37	9	37	0	0	9	37	0	0	9	37	0	0	9	37	0	0
Sugar Beets	7	239	7	239	0	0	7	239	0	0	7	239	0	0	7	239	0	0
Veal Calves	0	133	0	133	0	0	0	132	0	-1	0	132	0	-1	0	132	0	-1
Stocker Calves	4	769	4	769	0	0	4	770	0	1	4	770	0	1	4	770	0	1
Stocker Cattle	4	2,130	4	2,130	0	0	4	2,366	0	236	4	2,366	0	236	4	2,366	0	236
Fed Beef	4	1,918	4	1,918	0	0	5	2,118	1	200	5	2,118	1	200	5	2,118	1	200
Weanling Hogs	15	792	15	792	0	0	15	792	0	0	15	792	0	0	15	792	0	0
Market Hogs	21	2,122	21	2,122	0	0	24	2,413	3	291	24	2,413	3	291	24	2,413	3	291
Fluid Milk	25,811	3,355	25,811	3,355	0	0	25,811	3,355	0	0	25,811	3,355	0	0	25,811	3,355	0	0
Cream	3,141	219	3,141	219	0	0	3,141	219	0	0	3,141	219	0	0	3,141	219	0	0
Eggs	998	598	998	598	0	0	998	598	0	0	998	598	0	0	998	598	0	0
Broilers	28	43	28	43	0	0	28	43	0	0	28	43	0	0	28	43	0	0
Turkey	6	57	6	57	0	0	6	57	0	0	6	57	0	0	6	57	0	0
TOTALS		16,486		16,395		-91		17,021		535		16,955		469		16,918		432

Table E.10. Eastern Region (Medium Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	1,670	4,860	1,670	4,802	0	-58	1,670	4,660	0	-200	1,670	4,584	0	-276	1,670	4,543	0	-317
Oats	692	665	692	602	0	-63	692	585	0	-80	692	575	0	-90	692	568	0	-97
Barley	1,086	1,880	1,086	1,820	0	-60	1,086	1,749	0	-131	1,086	1,706	0	0174	1,086	1,684	0	-196
Flax	78	420	78	417	0	-3	78	411	0	-9	78	407	0	-13	78	406	0	-14
Rapeseed	86	553	86	549	0	-4	100	633	14	80	100	629	14	76	100	627	14	74
Rye	14	34	14	33	0	-1	14	32	0	-2	14	31	0	-3	14	31	0	-3
Sunflowers	1,803	180	1,803	180	0	0	2,103	210	300	30	2,103	210	300	30	2,103	210	300	30
Potatoes	20	76	20	76	0	0	20	76	0	0	20	76	0	0	20	76	0	0
Sugar Beets	15	497	15	497	0	0	15	497	0	0	15	497	0	0	15	497	0	0
Veal Calves	1	311	1	311	0	0	1	219	0	-92	1	219	0	-92	1	219	0	-92
Stocker Calves	6	1,135	6	1,135	0	0	6	1,231	0	96	6	1,231	0	96	6	1,231	0	96
Stocker Cattle	6	3,151	6	3,151	0	0	7	3,678	1	527	7	3,678	1	527	7	3,678	1	527
Fed Beef	7	2,848	7	2,848	0	0	8	3,324	1	476	8	3,324	1	476	8	3,324	1	476
Weanling Hogs	24	1,239	24	1,239	0	0	24	1,239	0	0	24	1,239	0	0	24	1,239	0	0
Market Hogs	47	4,742	47	4,742	0	0	54	5,470	7	728	54	5,470	7	728	54	5,470	7	728
Fluid Milk	59,405	7,722	59,495	7,722	0	0	59,405	7,722	0	0	59,405	7,722	0	0	59,405	7,722	0	0
Cream	6,380	446	6,380	446	0	0	6,380	446	0	0	6,380	446	0	0	6,380	446	0	0
Eggs	2,495	1,497	2,495	1,497	0	0	2,495	1,497	0	0	2,495	1,497	0	0	2,495	1,497	0	0
Broilers	72	109	72	109	0	0	72	109	0	0	72	109	0	0	72	109	0	0
Turkey	38	344	38	344	0	0	38	344	0	0	38	344	0	0	38	344	0	0
TOTALS		32,709		32,520		-189		34,132		1,423		33,994		1,285		33,921		1,212

Table E.11. Eastern Region (Large Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	3,886	11,309	3,886	11,173	0	-136	3,886	10,843	0	-466	3,886	10,668	0	-641	3,886	10,571	0	-738
Oats	2,061	1,979	1,801	1,567	-260	-412	1,860	1,572	-201	-407	1,860	1,544	-201	-435	1,860	1,525	-201	-454
Barley	2,500	4,325	2,500	4,188	0	-137	2,500	4,025	0	-300	2,500	3,925	0	-400	2,500	3,875	0	-450
Flax	207	1,116	207	1,109	0	-7	217	1,142	10	26	217	1,132	10	16	217	1,128	10	12
Rapeseed	216	1,389	216	1,379	0	-10	252	1,590	36	201	252	1,580	36	191	252	1,575	36	186
Rye	36	85	36	83	0	-2	36	80	0	-5	36	78	0	-7	36	78	0	-7
Sunflowers	4,063	406	4,063	406	0	0	4,740	474	677	68	4,740	474	677	68	4,740	474	677	68
Potatoes	45	171	45	171	0	0	45	171	0	0	45	171	0	0	45	171	0	0
Sugar Beets	34	1,105	34	1,105	0	0	34	1,105	0	0	34	1,105	0	0	34	1,105	0	0
Veal Calves	1	312	1	312	0	0	3	540	2	228	3	540	2	228	3	540	2	228
Stocker Calves	9	1,585	8	1,551	-1	-34	11	2,072	2	487	11	2,072	2	487	11	2,072	2	487
Stocker Cattle	8	4,278	8	4,278	0	0	10	4,993	2	715	10	4,993	2	715	10	4,993	2	715
Fed Beef	10	3,980	10	3,980	0	0	11	4,645	1	665	11	4,645	1	665	11	4,645	1	665
Weanling Hogs	125	6,287	125	6,287	0	0	125	6,287	0	0	125	6,287	0	0	125	6,287	0	0
Market Hogs	121	12,239	121	12,239	0	0	141	14,279	20	2,040	141	14,279	20	2,040	141	14,279	20	2,040
Fluid Milk	90,409	11,753	90,409	11,753	0	0	90,409	11,753	0	0	90,409	11,753	0	0	90,409	11,753	0	0
Cream	5,882	411	5,882	411	0	0	5,882	411	0	0	5,882	411	0	0	5,882	411	0	0
Eggs	21,460	12,876	21,460	12,876	0	0	21,460	12,876	0	0	21,460	12,876	0	0	21,460	12,876	0	0
Broilers	621	944	621	944	0	0	621	944	0	0	621	944	0	0	621	944	0	0
Turkey	599	5,333	599	5,333	0	0	599	5,333	0	0	599	5,333	0	0	599	5,333	0	0
TOTALS		81,883		81,145		-738		85,135		3,252		84,810		2,927		84,635		2,752

Table E.12. Eastern Region (Total): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	6,366	18,525	6,366	18,302	0	-223	6,366	17,761	0	-764	6,366	17,474	0	-1,051	6,366	17,315	0	-1,210
Oats	3,092	2,968	2,831	2,463	-261	-505	2,891	2,443	-201	-525	2,891	2,399	-201	-569	2,891	2,370	-201	-598
Barley	4,113	7,115	4,113	6,889	0	-226	4,113	6,622	0	-493	4,113	6,457	0	-658	4,113	6,375	0	-740
Flax	323	1,741	323	1,730	0	-11	333	1,754	10	13	333	1,739	10	-2	333	1,732	10	-9
Rapeseed	331	2,123	331	2,108	0	-15	381	2,401	50	278	381	2,386	50	263	381	2,378	50	255
Rye	57	136	57	132	0	-4	57	128	0	-8	57	125	0	-11	57	124	0	-12
Sunflowers	6,736	673	6,736	673	0	0	7,859	785	1,123	112	7,859	785	1,123	112	7,859	785	1,123	112
Potaotes	75	285	75	285	0	0	75	285	0	0	75	285	0	0	75	285	0	0
Sugar Beets	57	1,842	57	1,842	0	0	57	1,842	0	0	57	1,842	0	0	57	1,842	0	0
Veal Calves	4	757	4	757	0	0	5	892	1	135	5	892	1	135	5	892	1	135
Stocker Calves	19	3,491	19	3,456	0	-35	23	4,074	4	583	23	4,074	4	583	23	4,074	4	583
Stocker Cattle	20	9,560	20	9,560	0	0	23	11,038	3	1,478	23	11,038	3	1,478	23	11,038	3	1,478
Fed Beef	22	8,746	22	8,746	0	0	25	10,087	3	1,341	25	10,087	3	1,341	25	10,087	3	1,341
Weanling Hogs	165	8,318	165	8,318	0	0	165	8,318	0	0	165	8,318	0	0	165	8,318	0	0
Market Hogs	189	19,104	189	19,104	0	0	220	22,163	31	3,059	220	22,163	31	3,059	220	22,163	31	3,059
Fluid Milk	175,626	22,831	175,626	22,831	0	0	175,626	22,831	0	0	175,626	22,831	0	0	175,626	22,831	0	0
Cream	15,404	1,078	15,404	1,078	0	0	15,404	1,078	0	0	15,404	1,078	0	0	15,404	1,078	0	0
Eggs	24,953	14,972	24,953	14,972	0	0	24,953	14,972	0	0	24,953	14,972	0	0	24,953	14,972	0	0
Broilers	722	1,098	722	1,098	0	0	722	1,098	0	0	722	1,098	0	0	722	1,098	0	0
Turkey	645	5,735	645	5,735	0	0	645	5,735	0	0	645	5,735	0	0	645	5,735	0	0
TOTALS		131,098		130,079		-1,019		136,307		5,209		135,778		4,680		135,492		4,394

Table E.13. Central Region (Small Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	3,512	10,222	3,512	10,064	0	-158	3,512	9,765	0	-457	3,512	9,590	0	-632	3,512	9,502	0	-720
Oats	996	956	996	857	0	-99	996	832	0	-124	996	812	0	-144	996	802	0	-154
Barley	3,030	5,242	3,030	5,045	0	-197	3,030	4,833	0	-409	3,030	4,727	0	-515	3,030	4,651	0	-591
Flax	430	2,315	430	2,295	0	-20	430	2,261	0	-54	430	2,241	0	-74	430	2,231	0	-84
Rapeseed	1,192	7,646	1,192	7,581	0	-65	1,391	8,740	199	1,094	1,391	8,684	199	1,038	1,391	8,656	199	1,010
Rye	135	320	135	311	0	-9	135	300	0	-20	135	294	0	-26	135	291	0	-29
Sunflowers	29,224	2,922	29,224	2,922	0	0	34,095	3,409	4,871	487	34,095	3,409	4,871	487	34,095	3,409	4,871	487
Potatoes	600	2,274	600	2,274	0	0	600	2,274	0	0	600	2,274	0	0	600	2,274	0	0
Sugar Beets	53	1,706	53	1,706	0	0	53	1,706	0	0	53	1,706	0	0	53	1,706	0	0
Veal Calves	1	286	1	286	0	0	2	348	1	62	2	348	1	62	2	348	1	62
Stocker Calves	12	2,156	12	2,156	0	0	11	2,091	-1	-65	11	2,091	-1	-65	11	2,091	-1	-65
Stocker Cattle	12	5,928	12	5,928	0	0	13	6,486	1	558	13	6,486	1	558	13	6,486	1	558
Fed Beef	12	5,030	13	5,346	1	316	14	5,755	2	725	14	5,755	2	725	14	5,755	2	725
Weanling Hogs	25	1,277	25	1,277	0	0	25	1,277	0	0	25	1,277	0	0	25	1,277	0	0
Market Hogs	32	3,310	32	3,310	0	0	32	3,310	0	0	32	3,310	0	0	32	3,310	0	0
Fluid Milk	44,430	5,776	44,430	5,776	0	0	44,430	5,776	0	0	44,430	5,776	0	0	44,430	5,776	0	0
Cream	7,014	491	7,014	491	0	0	7,014	491	0	0	7,014	491	0	0	7,014	491	0	0
Eggs	929	557	929	557	0	0	929	557	0	0	929	557	0	0	929	557	0	0
Broilers	5	8	5	8	0	0	5	8	0	0	5	8	0	0	5	8	0	0
Turkey	1	14	1	14	0	0	1	14	0	0	1	14	0	0	1	14	0	0
TOTALS		58,436		58,204		-232		60,233		1,797		59,850		1,414		59,635		1,199

Table E.14. Central Region (Medium Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	6,980	20,312	6,980	19,998	0	-314	6,980	19,404	0	-908	6,980	17,055	0	-1,257	6,980	18,881	0	-1,431
Oats	2,011	1,930	2,011	1,729	0	-201	2,011	1,679	0	-251	2,011	1,639	0	-291	2,011	1,618	0	-312
Barley	6,048	10,464	6,048	10,071	0	-393	6,048	9,647	0	-817	6,048	9,435	0	-1,029	6,048	9,284	0	-1,180
Flax	856	4,609	856	4,570	0	-39	856	4,502	0	-107	856	4,463	0	-146	856	4,442	0	-167
Rapeseed	2,369	15,190	2,369	15,060	0	-130	2,764	17,362	395	2,172	2,764	17,252	395	2,062	2,764	17,196	395	2,006
Rye	410	968	326	749	-84	-219	353	782	-57	-186	353	766	-57	-202	353	757	-57	-211
Sunflowers	57,821	5,782	57,821	5,782	0	0	67,458	6,745	9,637	963	67,458	6,745	9,637	963	67,458	6,745	9,637	963
Potaotes	1,189	4,509	1,189	4,509	0	0	1,189	4,509	0	0	1,189	4,509	0	0	1,189	4,509	0	0
Sugar Beets	104	3,336	104	3,336	0	0	104	3,336	0	0	104	3,336	0	0	104	3,336	0	0
Veal Calves	2	385	2	385	0	0	2	344	0	-41	1	332	-1	-53	1	307	-1	-78
Stocker Calves	19	3,399	19	3,399	0	0	19	3,442	0	43	19	3,455	0	56	19	3,481	0	82
Stocker Cattle	19	9,373	19	9,373	0	0	22	10,709	3	1,336	22	10,744	3	1,371	22	10,815	3	1,442
Fed Beef	21	8,471	21	8,471	0	0	24	9,679	3	1,208	24	9,710	3	1,239	25	9,774	4	1,303
Weanling Hogs	75	3,805	75	3,805	0	0	75	3,805	0	0	75	3,805	0	0	75	3,805	0	0
Market Hogs	104	10,481	104	10,481	0	0	104	10,481	0	0	104	10,481	0	0	104	10,481	0	0
Fluid Milk	58,457	7,599	58,457	7,599	0	0	58,457	7,599	0	0	58,457	7,599	0	0	58,457	7,599	0	0
Cream	9,703	679	9,703	679	0	0	9,703	679	0	0	9,703	679	0	0	9,703	679	0	0
Eggs	5,634	3,380	5,634	3,380	0	0	5,634	3,380	0	0	5,634	3,380	0	0	5,634	3,380	0	0
Broilers	13	20	13	20	0	0	13	20	0	0	13	20	0	0	13	20	0	0
Turkey	10	89	10	89	0	0	10	89	0	0	10	89	0	0	10	89	0	0
TOTALS		114,781		113,485		-1,296		118,193		3,412		117,494		2,713		117,198		2,417

Table E.15. Central Region (Large Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	17,586	51,176	17,586	50,385	0	-791	17,451	48,515	-135	-2,661	17,451	47,641	-135	-3,535	17,449	47,201	-137	-3,975
Oats	3,927	3,770	3,927	3,377	0	-393	3,927	3,279	0	-491	3,927	3,200	0	-570	3,927	3,161	0	-609
Barley	14,699	25,429	14,584	24,283	-115	-1,146	11,778	18,786	-2,921	-6,643	11,778	18,374	-2,921	-7,055	11,778	18,079	-2,921	-7,350
Flax	1,667	8,970	1,667	8,895	0	-75	1,667	8,761	0	-209	1,667	8,686	0	-284	1,667	8,644	0	-326
Rapeseed	4,608	29,543	4,608	29,290	0	-253	5,377	33,768	769	4,225	5,377	33,553	769	4,010	5,377	33,445	769	3,902
Rye	801	1,891	801	1,838	0	-53	934	2,070	133	179	934	2,028	133	137	934	2,005	133	114
Sunflowers	112,338	11,233	112,338	11,233	0	0	131,061	13,106	18,723	1,873	131,061	13,106	18,723	1,873	131,061	13,106	18,723	1,873
Potatoes	2,313	8,766	2,313	8,766	0	0	2,313	8,766	0	0	2,313	8,766	0	0	2,313	8,766	0	0
Sugar Beets	201	6,461	201	6,461	0	0	201	6,461	0	0	201	6,461	0	0	201	6,461	0	0
Veal Calves	0	158	0	158	0	0	3	680	3	522	3	680	3	522	3	680	3	522
Stocker Calves	23	4,153	23	4,153	0	0	34	6,042	11	1,889	34	6,042	11	1,889	34	6,042	11	1,889
Stocker Cattle	24	11,482	24	11,482	0	0	28	13,396	4	1,914	28	13,396	4	1,914	28	13,396	4	1,914
Fed Beef	26	10,377	26	10,377	0	0	31	12,107	5	1,730	31	12,107	5	1,730	31	12,107	5	1,730
Weanling Hogs	268	13,479	268	13,479	0	0	268	13,479	0	0	268	13,479	0	0	268	13,479	0	0
Market Hogs	225	22,642	225	22,642	0	0	214	21,533	-11	-1,109	208	20,938	-17	-1,704	208	20,938	-17	-1,704
Fluid Milk	39,767	5,169	39,767	5,169	0	0	40,089	5,211	322	42	40,089	5,211	322	42	40,089	5,211	322	42
Cream	3,470	242	3,470	242	0	0	3,470	242	0	0	3,470	242	0	0	3,470	242	0	0
Eggs	19,982	11,989	19,982	11,989	0	0	19,982	11,989	0	0	19,982	11,989	0	0	19,982	11,989	0	0
Broilers	115	175	115	175	0	0	115	175	0	0	115	175	0	0	115	175	0	0
Turkey	156	1,388	156	1,388	0	0	156	1,388	0	0	156	1,388	0	0	156	1,388	0	0
TOTALS		228,493		225,782		-2,711		229,754		1,261		227,462		-1,031		226,515		-1,978

Table E.16. Central Region (Total): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	28,079	81,711	28,079	80,447	0	-1,264	27,944	77,686	-135	-4,025	27,944	76,287	-135	-5,424	27,942	75,585	-137	-6,126
Oats	6,934	6,657	6,934	5,963	0	-694	6,934	5,790	0	-867	6,934	5,651	0	-1,006	6,934	5,582	0	-1,075
Barley	23,778	41,136	23,663	39,400	-115	-1,736	20,857	33,267	-2,921	-7,869	20,857	32,537	-2,921	-8,599	20,857	32,016	-2,921	-9,120
Flax	2,954	15,894	2,954	15,761	0	-133	2,954	15,525	0	-369	2,954	15,392	0	-502	2,954	15,318	0	-576
Rapeseed	8,171	52,380	8,171	51,931	0	-449	9,533	59,871	1,362	7,491	9,533	59,490	1,362	7,110	9,533	59,299	1,362	6,919
Rye	1,347	3,180	1,263	2,900	-84	-280	1,423	3,153	76	-27	1,423	3,089	76	-91	1,423	3,054	76	-126
Sunflowers	199,384	19,938	199,384	19,938	0	0	232,615	23,261	33,231	3,323	232,615	23,261	33,231	3,323	232,615	23,261	33,231	3,323
Potatoes	4,103	15,551	4,103	15,551	0	0	4,103	15,551	0	0	4,103	15,551	0	0	4,103	15,551	0	0
Sugar Beets	359	11,504	359	11,504	0	0	359	11,504	0	0	359	11,504	0	0	359	11,504	0	0
Veal Calves	4	830	4	830	0	0	8	1,373	4	543	8	1,361	4	531	7	1,335	3	505
Stocker Calves	55	9,709	55	9,709	0	0	65	11,576	10	1,867	65	11,589	10	1,880	65	11,615	10	1,906
Stocker Cattle	56	26,784	56	26,784	0	0	64	30,592	8	3,808	64	30,628	8	3,844	64	30,698	8	3,914
Fed Beef	61	23,880	62	24,196	1	316	70	27,542	9	3,662	70	27,574	9	3,694	71	27,638	10	3,758
Weanling Hogs	369	18,562	369	18,562	0	0	369	18,562	0	0	369	18,562	0	0	369	18,562	0	0
Market Hogs	362	36,434	362	36,434	0	0	351	35,324	-11	-1,110	345	34,729	-17	-1,705	345	34,729	-17	-1,705
Fluid Milk	142,656	18,545	142,656	18,545	0	0	142,978	18,587	322	42	142,978	18,587	322	42	142,978	18,587	322	42
Cream	20,187	1,413	20,187	1,413	0	0	20,187	1,413	0	0	20,187	1,413	0	0	20,187	1,413	0	0
Eggs	26,546	15,928	26,546	15,928	0	0	26,546	15,928	0	0	26,546	15,928	0	0	26,546	15,928	0	0
Broilers	134	204	134	204	0	0	134	204	0	0	134	204	0	0	134	204	0	0
Turkey	167	1,492	167	1,492	0	0	167	1,492	0	0	167	1,492	0	0	167	1,492	0	0
TOTALS		401,732		397,492		-4,240		408,201		6,469		404,829		3,097		403,371		1,639

Table E.17. South West Region (Small Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	3,121	9,020	3,121	8,843	0	-177	3,121	8,531	0	-489	3,121	8,354	0	-666	3,121	8,250	0	-770
Oats	1,224	1,163	1,224	1,016	0	-147	1,224	971	0	-192	1,224	947	0	-216	1,224	934	0	-229
Barley	2,450	4,214	2,450	4,001	0	-213	2,450	3,805	0	-409	2,450	3,683	0	-531	2,450	3,634	0	-580
Flax	322	1,727	322	1,708	0	-19	322	1,679	0	-48	322	1,663	0	-64	322	1,654	0	-73
Rapeseed	911	5,825	911	5,764	0	-61	1,063	6,640	152	815	1,063	6,587	152	762	1,063	6,555	152	730
Rye	218	513	218	494	0	-19	218	473	0	-40	218	461	0	-52	218	454	0	-59
Sunflowers	9,914	991	9,914	991	0	0	11,566	1,156	1,652	165	11,566	1,156	1,652	165	11,566	1,156	1,652	165
Potatoes	251	954	251	954	0	0	251	954	0	0	251	954	0	0	251	954	0	0
Sugar Beets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veal Calves	1	290	1	290	0	0	1	241	0	-49	1	241	0	-49	1	241	0	-49
Stocker Calves	14	2,471	14	2,471	0	0	14	2,521	0	50	14	2,521	0	50	14	2,521	0	50
Stocker Cattle	14	6,821	14	6,821	0	0	16	7,822	2	1,001	16	7,822	2	1,001	16	7,822	2	1,001
Fed Beef	14	5,585	14	5,585	0	0	16	6,406	2	821	16	6,406	2	821	16	6,406	2	821
Weanling Hogs	31	1,577	31	1,577	0	0	31	1,577	0	0	31	1,577	0	0	31	1,577	0	0
Market Hogs	33	3,324	33	3,324	0	0	33	3,324	0	0	33	3,324	0	0	33	3,324	0	0
Fluid Milk	27,605	3,588	27,605	3,588	0	0	27,605	3,588	0	0	27,605	3,588	0	0	27,605	3,588	0	0
Cream	8,521	596	8,521	596	0	0	8,521	596	0	0	8,521	596	0	0	8,521	596	0	0
Eggs	196	117	196	117	0	0	196	117	0	0	196	117	0	0	196	117	0	0
Broilers	6	10	6	10	0	0	6	10	0	0	6	10	0	0	6	10	0	0
Turkey	1	12	1	12	0	0	1	12	0	0	1	12	0	0	1	12	0	0
TOTALS		48,798		48,162		-636		50,423		1,625		50,019		1,221		49,805		1,007

Table E.18. South West Region (Medium Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	6,868	19,848	6,868	19,458	0	-390	6,868	18,772	0	-1,076	6,868	18,382	0	-1,466	6,868	18,153	0	-1,695
Oats	2,564	2,436	2,564	2,128	0	-308	2,564	2,034	0	-402	2,564	1,983	0	-453	2,564	1,957	0	-479
Barley	6,334	10,894	5,566	9,090	-768	-1,804	5,566	8,644	-768	-2,250	5,566	8,366	-768	-2,528	5,566	8,255	-768	-2,639
Flax	651	3,491	651	3,454	0	-37	651	3,395	0	-96	651	3,363	0	-128	651	3,343	0	-148
Rapeseed	2,066	13,201	2,066	13,063	0	-138	2,410	15,048	344	1,847	2,410	14,927	344	1,726	2,410	14,855	344	1,654
Rye	538	1,266	538	1,219	0	-47	442	959	-96	-307	586	1,240	48	-26	586	1,222	48	-44
Sunflowers	22,895	2,289	22,895	2,289	0	0	22,541	2,253	-354	-36	22,541	2,253	-354	-36	22,541	2,253	-354	-36
Potatoes	468	1,774	468	1,774	0	0	468	1,774	0	0	468	1,774	0	0	468	1,774	0	0
Sugar Beets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veal Calves	1	239	1	239	0	0	0	160	-1	-22	0	160	-1	-22	0	160	-1	-22
Stocker Calves	30	5,422	30	5,422	0	0	32	5,712	1	231	32	5,712	1	231	32	5,712	1	231
Stocker Cattle	31	14,971	31	14,971	0	0	36	17,388	5	2,417	36	17,388	5	2,417	36	17,388	5	2,417
Fed Beef	31	12,385	31	12,385	0	0	36	14,277	5	1,892	36	14,277	5	1,892	36	14,277	5	1,892
Weanling Hogs	56	2,831	56	2,831	0	0	56	2,831	0	0	56	2,831	0	0	56	2,831	0	0
Market Hogs	47	4,794	47	4,794	0	0	47	4,794	0	0	47	4,794	0	0	47	4,794	0	0
Fluid Milk	18,810	2,445	18,810	2,445	0	0	18,810	2,445	0	0	18,810	2,445	0	0	18,810	2,445	0	0
Cream	5,419	379	5,419	379	0	0	5,419	379	0	0	5,419	379	0	0	5,419	379	0	0
Eggs	481	288	481	288	0	0	481	288	0	0	481	288	0	0	481	288	0	0
Broilers	16	25	16	25	0	0	16	25	0	0	16	25	0	0	16	25	0	0
Turkey	8	77	8	77	0	0	8	77	0	0	8	77	0	0	8	77	0	0
TOTALS		99,055		96,331		-2,724		101,255		2,198		100,664		1,607		100,188		1,131

Table E.19. South West Region (Large Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	18,643	53,874	18,997	53,820	354	-54	18,802	51,389	159	-2,485	18,792	50,297	149	-3,577	18,790	49,665	147	-4,209
Oats	5,705	5,419	6,220	5,162	515	-257	7,223	5,730	1,518	311	7,250	5,606	1,545	187	7,256	5,538	1,551	119
Barley	18,408	31,659	18,022	29,433	-386	-2,226	14,084	21,875	-4,324	-9,784	13,862	20,838	-4,546	-10,821	13,862	20,560	-4,546	-11,099
Flax	1,710	9,166	1,710	9,070	0	-96	1,842	9,602	132	436	1,842	9,510	132	344	1,842	9,455	132	289
Rapeseed	4,539	29,004	4,539	28,701	0	-303	5,296	33,061	757	4,057	5,296	32,796	757	3,792	5,296	32,637	757	3,633
Rye	1,196	2,810	1,196	2,706	0	-104	1,300	2,818	104	8	1,300	2,749	104	-61	1,300	2,710	104	-100
Sunflowers	43,581	4,357	43,581	4,357	0	0	50,845	5,084	7,264	727	50,845	5,084	7,264	727	50,845	5,084	7,264	727
Potatoes	1,080	4,093	1,080	4,093	0	0	1,080	4,093	0	0	1,080	4,093	0	0	1,080	4,093	0	0
Sugar Beets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veal Calves	4	819	6	1,135	2	316	0	44	-5	-832	0	44	-5	-832	0	44	-5	-832
Stocker Calves	49	8,756	49	8,769	0	13	60	10,714	11	2,017	60	10,714	11	2,017	60	10,714	11	2,017
Stocker Cattle	47	22,465	47	22,465	0	0	54	26,211	7	3,746	54	26,211	7	3,746	54	26,211	7	3,746
Fed Beef	52	20,220	52	20,267	0	47	60	23,613	8	3,393	60	23,613	8	3,393	60	23,613	8	3,393
Weanling Hogs	95	4,793	95	4,793	0	0	95	4,793	0	0	95	4,793	0	0	95	4,793	0	0
Market Hogs	94	9,493	94	9,493	0	0	104	10,481	10	988	110	11,076	16	1,583	110	11,076	16	1,583
Fluid Milk	6,394	831	6,394	831	0	0	6,394	831	0	0	6,394	831	0	0	6,394	831	0	0
Cream	2,112	147	2,112	147	0	0	2,112	147	0	0	2,112	147	0	0	2,112	147	0	0
Eggs	4,214	2,528	4,214	2,528	0	0	4,214	2,528	0	0	4,214	2,528	0	0	4,214	2,528	0	0
Broilers	142	216	142	216	0	0	142	216	0	0	142	216	0	0	142	216	0	0
Turkey	135	1,207	135	1,207	0	0	135	1,207	0	0	135	1,207	0	0	135	1,207	0	0
TOTALS		211,857		209,193		-2,664		214,437		2,582		212,353		498		211,122		-733

Table E.20. South West Region (Total): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	28,633	82,743	28,987	82,123	354	-620	28,792	78,692	159	-4,051	28,782	77,034	149	-5,709	28,780	76,069	147	-6,674
Oats	9,494	9,019	10,010	8,307	516	-712	11,013	8,736	1,519	-283	11,040	8,537	1,546	-482	11,046	8,430	1,552	-589
Barley	27,193	46,768	26,038	42,525	-1,155	-4,243	22,100	34,326	-5,093	-12,442	21,879	32,888	-5,314	-13,880	21,879	32,450	-5,314	-14,318
Flax	2,684	14,385	2,684	14,233	0	-152	2,815	14,678	131	293	2,815	14,537	131	152	2,815	14,453	131	68
Rapeseed	7,517	48,031	7,517	47,529	0	-502	8,770	54,750	1,253	6,719	8,770	54,311	1,253	6,280	8,770	54,048	1,253	6,017
Rye	1,953	4,589	1,953	4,420	0	-169	1,962	4,251	9	-338	2,106	4,450	153	-139	2,106	4,387	153	-202
Sunflowers	76,391	7,638	76,391	7,638	0	0	84,953	8,494	8,562	856	84,953	8,494	8,562	856	84,953	8,494	8,562	856
Potatoes	1,800	6,822	1,800	6,822	0	0	1,800	6,822	0	0	1,800	6,822	0	0	1,800	6,822	0	0
Sugar Beets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veal Calves	7	1,349	9	1,664	2	315	2	445	-5	-904	2	445	-5	-904	2	445	-5	-904
Stocker Calves	94	16,650	94	16,663	0	13	107	18,948	13	2,298	107	18,948	13	2,298	107	18,948	13	2,298
Stocker Cattle	92	44,258	92	44,258	0	0	107	51,422	15	7,164	107	51,422	15	7,164	107	51,422	15	7,164
Fed Beef	98	38,192	98	38,239	0	47	114	44,297	16	6,105	114	44,297	16	6,105	114	44,297	16	6,105
Weanling Hogs	183	9,202	183	9,202	0	0	183	9,202	0	0	183	9,202	0	0	183	9,202	0	0
Market Hogs	175	17,612	175	17,612	0	0	184	18,600	9	988	190	19,195	15	1,583	190	19,195	15	1,583
Fluid Milk	52,809	6,864	52,809	6,864	0	0	52,809	6,864	0	0	52,809	6,864	0	0	52,809	6,864	0	0
Cream	16,052	1,123	16,052	1,123	0	0	16,052	1,123	0	0	16,052	1,123	0	0	16,052	1,123	0	0
Eggs	4,892	2,934	4,892	2,934	0	0	4,892	2,934	0	0	4,892	2,934	0	0	4,892	2,934	0	0
Broilers	165	252	165	252	0	0	165	252	0	0	165	252	0	0	165	252	0	0
Turkey	146	1,298	146	1,298	0	0	146	1,298	0	0	146	1,298	0	0	146	1,298	0	0
TOTALS		359,729		353,706		-6,023		366,134		6,405		363,053		3,324		361,133		1,404

Table E.21. North West Region (Small Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	1,268	3,665	1,268	3,602	0	-63	1,268	3,479	0	-186	1,268	3,412	0	-253	1,268	3,365	0	-300
Oats	470	446	470	395	0	-51	470	377	0	-69	470	370	0	-76	470	363	0	-83
Barley	920	1,583	920	1,513	0	-70	920	1,439	0	-144	920	1,399	0	-184	920	1,371	0	-212
Flax	53	289	53	286	0	-3	53	281	0	-8	53	278	0	-11	53	277	0	-12
Rapeseed	657	4,203	657	4,164	0	-39	540	3,377	-117	-826	540	3,351	-117	-852	540	3,339	-117	-864
Rye	49	115	49	111	0	-4	49	106	0	-9	49	104	0	-11	49	102	0	-13
Sunflowers	179	17	179	17	0	0	209	20	30	3	209	20	30	3	209	20	30	3
Potatoes	3	11	3	11	0	0	3	11	0	0	3	11	0	0	3	11	0	0
Sugar Beets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veal Calves	0	138	0	138	0	0	0	153	0	15	0	145	0	7	1	170	1	32
Stocker Calves	10	1,934	10	1,934	0	0	10	1,918	0	-16	10	1,927	0	-7	10	1,901	0	-33
Stocker Cattle	11	5,302	11	5,302	0	0	12	6,078	1	776	12	6,042	1	740	12	5,972	1	670
Fed Beef	11	4,501	11	4,501	0	0	13	5,070	2	569	13	5,070	2	569	12	5,007	1	506
Weanling Hogs	25	1,296	25	1,296	0	0	25	1,296	0	0	25	1,296	0	0	25	1,296	0	0
Market Hogs	35	3,578	35	3,578	0	0	26	2,713	-9	-865	26	2,713	-9	-865	26	2,713	-9	-865
Fluid Milk	11,824	1,536	11,824	1,536	0	0	11,824	1,536	0	0	11,824	1,536	0	0	11,824	1,536	0	0
Cream	9,970	697	9,970	697	0	0	9,970	697	0	0	9,970	697	0	0	9,970	697	0	0
Eggs	61	36	61	36	0	0	61	36	0	0	61	36	0	0	61	36	0	0
Broilers	1	1	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0
Turkey	0	5	0	5	0	0	0	5	0	0	0	5	0	0	0	5	0	0
TOTALS		29,353		29,123		-230		28,593		-760		28,413		-940		28,182		-1,171

Table E.22. North West Region (Medium Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	3,221	9,309	3,221	9,148	0	-161	2,841	7,793	-380	-1,516	2,841	7,641	-380	-1,668	2,841	7,537	-380	-1,772
Oats	1,048	996	1,048	880	0	-116	1,048	842	0	-154	1,048	824	0	-172	1,048	810	0	-186
Barley	2,077	3,573	2,077	3,414	0	-159	2,077	3,247	0	-326	2,077	3,157	0	-416	2,077	3,095	0	-478
Flax	121	650	121	644	0	-6	121	633	0	-17	121	627	0	-23	121	623	0	-27
Rapeseed	1,594	10,185	1,594	10,089	0	-96	1,663	10,392	69	207	1,661	10,301	67	116	1,661	10,262	67	77
Rye	124	291	124	281	0	-10	130	283	6	-8	130	276	6	-15	111	234	-13	-57
Sunflowers	394	39	394	39	0	0	459	45	65	6	459	45	65	6	459	45	65	6
Potatoes	6	26	6	26	0	0	6	26	0	0	6	26	0	0	6	26	0	0
Sugar Beets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veal Calves	0	75	0	75	0	0	0	37	0	-38	0	55	0	-20	0	55	0	-20
Stocker Calves	19	3,413	19	3,413	0	0	19	3,451	0	38	19	3,433	0	20	19	3,433	0	20
Stocker Cattle	19	9,399	19	9,399	0	0	22	10,951	3	1,552	22	10,951	3	1,552	22	10,951	3	1,552
Fed Beef	21	8,494	21	8,494	0	0	24	9,702	3	1,208	24	9,702	3	1,208	24	9,702	3	1,208
Weanling Hogs	32	1,613	32	1,613	0	0	32	1,613	0	0	32	1,613	0	0	32	1,613	0	0
Market Hogs	22	2,282	22	2,282	0	0	18	1,890	-4	-392	18	1,890	-4	-392	18	1,890	-4	-392
Fluid Milk	5,791	752	5,791	752	0	0	5,791	752	0	0	5,791	752	0	0	5,791	752	0	0
Cream	5,478	383	5,478	383	0	0	5,478	383	0	0	5,478	383	0	0	5,478	383	0	0
Eggs	152	91	152	91	0	0	152	91	0	0	152	91	0	0	152	91	0	0
Broilers	2	3	2	3	0	0	2	3	0	0	2	3	0	0	2	3	0	0
Turkey	3	33	3	33	0	0	3	33	0	0	3	33	0	0	3	33	0	0
TOTALS		51,607		51,059		-548		52,167		560		51,803		196		51,538		-69

Table E.23. North West Region (Large Farm-Size): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	7,193	20,786	7,193	20,427	0	-359	7,458	20,459	265	-327	7,458	20,061	265	-725	7,458	19,788	265	-998
Oats	2,323	2,207	2,323	1,951	0	-256	2,323	1,866	0	-341	2,323	1,827	0	-380	2,323	1,796	0	-411
Barley	5,233	9,000	5,232	8,597	-1	-403	4,780	7,472	-453	-1,528	4,780	7,265	-453	-1,735	4,775	7,115	-458	-1,885
Flax	274	1,470	274	1,457	0	-13	282	1,476	8	6	282	1,461	8	-9	282	1,453	8	-17
Rapeseed	3,286	20,998	3,286	20,801	0	-197	3,834	23,949	548	2,951	3,834	23,770	548	2,772	3,834	23,680	548	2,682
Rye	254	597	254	576	0	-21	267	583	13	-14	267	569	13	-28	267	560	13	-37
Sunflowers	922	92	922	92	0	0	1,076	107	154	15	1,076	107	154	15	1,076	107	154	15
Potatoes	15	60	15	60	0	0	15	60	0	0	15	60	0	0	15	60	0	0
Sugar Beets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veal Calves	0	25	0	25	0	0	0	13	0	-12	0	17	0	-8	0	17	0	-8
Stocker Calves	26	4,703	26	4,691	0	-12	42	7,493	16	2,790	42	7,489	16	2,786	42	7,489	16	2,786
Stocker Cattle	27	12,902	27	12,902	0	0	31	15,054	4	2,152	31	15,054	4	2,152	31	15,054	4	2,152
Fed Beef	29	11,534	29	11,534	0	0	34	13,459	5	1,925	34	13,459	5	1,925	34	13,459	5	1,925
Weanling Hogs	10	534	10	534	0	0	10	534	0	0	10	534	0	0	10	534	0	0
Market Hogs	8	901	8	901	0	0	10	1,052	2	151	10	1,052	2	151	10	1,052	2	151
Fluid Milk	1,638	212	1,638	212	0	0	1,638	212	0	0	1,638	212	0	0	1,638	212	0	0
Cream	1,839	128	1,839	128	0	0	1,839	128	0	0	1,839	128	0	0	1,839	128	0	0
Eggs	1,322	793	1,322	793	0	0	1,322	793	0	0	1,322	793	0	0	1,322	793	0	0
Broilers	22	34	22	34	0	0	22	34	0	0	22	34	0	0	22	34	0	0
Turkey	57	508	57	508	0	0	57	508	0	0	57	508	0	0	57	508	0	0
TOTALS		87,484		86,223		-1,261		95,252		7,768		94,400		6,916		93,839		6,355

Table E.24. North West Region (Total): Production and Value Differences Between Statutory and Subsidized Grain Rail Rates.

COMMODITY	1978 SCENARIO I		1978 SCENARIO II		DIFFERENCE		1985 SCENARIO III		DIFFERENCE		1985 SCENARIO IV		DIFFERENCE		1985 SCENARIO V		DIFFERENCE	
	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE	OUTPUT	VALUE
Wheat	11,683	33,762	11,683	33,177	0	-585	11,568	31,732	-115	-2,030	11,568	31,115	-115	-2,647	11,568	30,691	-115	-3,071
Oats	3,842	3,650	3,842	3,227	0	-423	3,842	3,086	0	-564	3,842	3,022	0	-628	3,842	2,971	0	-679
Barley	8,232	14,157	8,230	13,524	-2	-633	7,779	12,160	-453	-1,997	7,779	11,823	-453	-2,334	7,774	11,582	-458	-2,575
Flax	449	2,410	449	2,389	0	-21	458	2,392	9	-18	458	2,367	9	-43	458	2,354	9	-56
Rapeseed	5,538	35,387	5,538	35,055	0	-332	6,038	37,718	500	2,331	6,036	37,423	498	2,036	6,036	37,282	498	1,895
Rye	427	1,003	427	969	0	-34	447	973	20	-30	447	950	20	-53	428	897	1	-106
Sunflowers	1,496	149	1,496	149	0	0	1,745	174	249	25	1,745	174	249	25	1,745	174	249	25
Potatoes	26	98	26	98	0	0	26	98	0	0	26	98	0	0	26	98	0	0
Sugar Beets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veal Calves	1	238	1	238	0	0	1	204	0	-34	1	217	0	-21	1	242	0	4
Stocker Calves	57	10,051	56	10,039	-1	-12	73	12,863	16	2,812	72	12,850	15	2,799	72	12,824	15	2,773
Stocker Cattle	57	27,604	57	27,604	0	0	67	32,084	10	4,480	67	32,049	10	4,445	67	31,978	10	4,374
Fed Beef	63	24,530	63	24,530	0	0	72	28,232	9	3,702	72	28,232	9	3,702	72	28,168	9	3,638
Weanling Hogs	68	3,444	68	3,444	0	0	68	3,444	0	0	68	3,444	0	0	68	3,444	0	0
Market Hogs	67	6,762	67	6,762	0	0	56	5,655	-11	-1,107	56	5,655	-11	-1,107	56	5,655	-11	-1,107
Fluid Milk	19,253	2,502	19,253	2,502	0	0	19,253	2,502	0	0	19,253	2,502	0	0	19,253	2,502	0	0
Cream	17,288	1,210	17,288	1,210	0	0	17,288	1,210	0	0	17,288	1,210	0	0	17,288	1,210	0	0
Eggs	1,536	922	1,536	922	0	0	1,536	922	0	0	1,536	922	0	0	1,536	922	0	0
Broilers	26	39	26	39	0	0	26	39	0	0	26	39	0	0	26	39	0	0
Turkey	61	547	61	547	0	0	61	547	0	0	61	547	0	0	61	547	0	0
TOTALS		168,465		166,425		-2,040		176,035		7,570		174,639		6,174		173,580		5,115