THE UNIVERSITY OF MANITOBA

THE IMPACTS OF CHANGES IN STATUTORY GRAIN RATES AND RAIL BRANCH LINE CONFIGURATION ON FARM SIZE IN MANITOBA

by

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ABSTRACT

The Impacts of Changes in Statutory Grain Rates and Rail Branch Line Configuration on Farm Size in Manitoba

By: Kris Linton Olsen

Major Advisor: Dr. E. W. Tyrchniewicz

Western Canadian grain producers have benefitted from low rail rates established originally by the Crowsnest Pass Agreement of 1897. These rates have reduced one element of their production costs and increased farm income. However, it has been argued that this effect has been offset by reduced railway service; the railways have been reluctant to make large-scale improvements in their grain handling systems due to the high revenue losses associated with export grain movement. Despite the abundance of statutory grain at primary elevator positions on the Prairies, the unreliability of adequate supplies at the terminal port facilities may jeopardize Canada's position in international grain markets. A possible solution to counter this very serious situation is replacement of the current statutory freight rates with compensatory rates which reflect the actual costs involved in transporting export grain by rail.

The general objective of this study was to determine the impacts of replacement of statutory freight rates on export grain with compensatory rates and branch line rationalization on the structure of farm size in Manitoba, with special reference to small farms. Specifically, the objectives were: (1) to determine if changes in transport costs due to replacement of statutory rates and branch line rationalization would

have detrimental effects on small producers and enhance the trend towards larger farm sizes; (2) differentiate the various impacts on a regional basis; and (3) modify an existing model to permit more complete inter-regional trade of intermediate commodities between all crop districts in Manitoba.

Several components were incorporated into the study framework to formulate the data base for the linear programming model used to conduct the final analysis. Firstly, market conditions present circumstances which generate the prevailing supply and demand situation which in turn determine the relative commodity prices. Secondly, farm gate prices for the six principal crops currently being transported under statutory freight rates, were directly affected by transportation costs. Changes in the rail freight rate structure and/or the branch line configuration, which directly influence transport costs, were proportionately reflected in the relative price levels of these commodities. In turn, these prices eventually determined the relative profitability of specific commodities upon which the production-decision process was based.

The model was used to estimate six comparative scenarios: (1) 1978 market conditions, statutory freight rates, the branch line configuration as of December 31, 1978 including all the recommendations of the Hall Commission and PRAC, 1978 farm gate prices, $\pm$20 percent production flexibility, minimum production levels for small farms; (2) same as (1) except for the minimum production levels being removed for small farms; (3) same as (1) except rail rates were changed to 3.4 times the statutory level, farm gate prices were adjusted to account for increased transport costs; (4) same as (1) with production flexibility range expanded to -20 percent to +40 percent; (5) 1978 market conditions, 4.0 times the

statutory rates, 1978 farm gate prices adjusted for increased 1985 transportation costs, ±20 percent production flexibility, no minimum production levels for small farms; and (6) same as (5) with expanded production flexibility to a range of -20 percent to +40 percent. Comparisons between each of these scenarios with Scenario II indicated the potential impacts on gross value of production and net farm income of increased transportation costs on all farm sizes.

The specific findings of this study are outlined as follows:

1. The greatest impact on the value of production of small farms was the removal of the minimum production requirements for small farms. The net income losses generated by high production costs on small farms and the normative nature of the production allocation process, restricted production on small farms to only commodities in which a profit could be generated. On this basis, a large proportion of the total production of each commodity was allocated to large farm sizes.
2. Replacement of statutory freight rates with compensatory rates and branch line rationalization decreased the gross value of production and net farm income levels on all farm sizes. The burden of increased transportation costs enhanced the trend towards increased farm size.
3. There was a large potential for increased production of oilseeds, special crops, and livestock to offset a large proportion of the value of production and income losses generated by the increased transportation costs. Shadow prices for these commodities indicated strong profit potentials for expanded production.

4. Expanded interregional trade of intermediate commodities such as feed grains, stocker cattle, and weanling pigs, between crop districts had the potential to increase production levels by permitting districts to make fuller use of their comparative advantage.

The availability of intermediate commodities became less of a constraining factor to those regions which possessed the potential to produce greater quantities of final commodities such as fed beef or market hogs. Low production levels of certain intermediate commodities were compensated for by the transportation of these constraining commodities from other regions that produced these commodites in more abundance.

ACKNOWLEDGEMENTS

It is with deep appreciation that I acknowledge the many people who played such an important part in making this thesis possible. First and foremost, I thank my major advisor, Dr. E. W. Tyrchniewicz, who, with unlimited patience, tolerated my many non-standard deviations from the normative and linear path of academia. Secondly, I thank my major co-advisor, Dr. C. F. Framingham, for without his constant guidance and assistance, I would still be trying to solve my first infeasibility. The opportunity for me to watch the velvet hammer in action was an education in itself. I also express my thanks to Professor R. Harris, whose helpful comments on my final draft brought a whole new meaning of the term long-run average cost (LAC) to me.

Fortunately for me, my life in the Annex was not filled solely with supply and demand curves. I sincerely thank my favourite set of deviations, the North Lab Lovelies and the Annex Animals, who, when they weren't deviating me from taking life too seriously, were plotting future deviations that made our office life anything but routine.

Lastly, I am indebted to the people who helped me through the technical intricacies of model building and thesis writing. I thank Neil Longmuir, who shared with me many of the frustrations of working with a computer that thought it knew everything and we knew nothing. And finally, to all the girls, Gisele Perrault, Cathy Watt, Laverne Coulson, and Lynn Fordyce, who had the difficult task of translating my often illegible writing into the legible text which follows.

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INTRODUCTION

Introduction to the Problem

The railways have always been an important part of the western Canadian economy. The necessity for Prairie agricultural commodities to be linked with domestic and foreign markets has been largely fulfilled by the railways. The railways' contributions to "place utility", which is the value added to products by moving them from areas of abundance to areas where these commodities are more scarce and in higher demand, have been vital to an area such as the Prairies that exports the majority of the commodities it produces. With virtually no alternatives to rail for long distance transport of export grain, western farmers have been heavily reliant upon the railways' performances to meet Canadian export commitments. Consequently, any factors affecting the railways' abilities to fulfill these functions have led to widespread producer concern.

Despite the importance of the railways' roles, they have found it increasingly unprofitable to transport grain under the current freight rate structure. This has allegedly prevented the railways from maintaining their rolling stock, branch line network, and service at levels adequate enough to meet current Canadian export grain commitments. A major source of this disparity has been attributed to the maintenance of the statutory freight rates for export grain made law in 1925 with

amendments to the Railway Act.[1] These amendments were based on the former Crowsnest Pass Agreement of 1897, which was intended to promote agricultural development and expansion on the Prairies. One of the major components of the Crowsnest Pass Agreement was reduced rail rates on export grains. Mounting criticism over the way the Agreement was being implemented between 1897 and 1925, forced the Federal government to terminate the Crowsnest Pass Agreement in 1925. In its place, the Federal government made amendments to the Railway Act which set 1899 grain and flour rates moving eastward to the Lakehead as statutory rates for all rail lines and all railway companies. By 1931, the statutory rates were extended to cover grain and grain by-products moving westward to Vancouver and northward to Churchill.[2] These rates were guaranteed by Parliament and had no time limit placed on them. The 1974 Snavely Commission and a follow-up study in 1977, established numerical estimates for the costs involved in the transportation of statutory

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[1]For more detailed readings on the Crowsnest Pass and Statutory rate Agreements, see the following: R. Sokal, E. W. Tyrchniewicz, and C. F. Framingham, "Statutory Freight Rates on Grain: Background and Economic Effects", Special Report prepared for the Manitoba Department of Agriculture (Winnipeg: University of Manitoba, May, 1979); A. W. Currie, Canadian Transport Economics (Toronto: University of Toronto Press, 1967); G. W. Wilson and L. Darby, "Transportation on the Prairies", The Royal Commission on Consumer Problems and Inflation (Ottawa: Queen's Printers, 1968); The Grain Handling and Transportation Commission, Grain and Rail in Western Canada, Vol. I (Ottawa: Ministry of Supply and Services, 1977), pp. 32-39; Booz-Allen and Hamilton and IBI Group, "Grain Transportation and Handling in Western Canada", Report prepared for the Department of Industry, Trade and Commerce, The Grains Group (Ottawa: Queen's Printer, July, 1979).

[2]H. L. Purdy, Transport Competition and Public Policy in Canada (Vancouver: University of British Columbia, 1972), pp. 176-177. For a detailed list of all commodities presently moving under statutory rates see: Canada Grains Council, "Report to the Grain Handling and Transportation Committee" (Winnipeg: Canada Grains Council, June, 1977).

grains.[3] Under the current rate structure, the Snavely Commission determined that producers contributed $114.8 million or 32.4% of the variable costs incurred by the railways in the transportation of the statutory grain in 1977. This compared to $63.7 million or 18.0% contributed by the Federal government and $175.5 million or 49.6% of the total cost being covered by the railways. Overall, a revenue shortfall comparing variable costs incurred over the revenues received from the transportation of all statutory grains amounted to $239.2 million, which was a 52% increase over the 1974 revenue shortfall of $157.4 million. To cover the losses incurred by the railways, Snavely estimated that rates would have to increase 3.1 times the statutory rates in 1977. Only at this level could an equilibrium between revenues and the variable costs be achieved.

More recently, a report by Booz-Allen and Hamilton Inc. and the IBI Group, cited the statutory rates as being a primary source of many grain transportation problems.[4] The losses currently being incurred by the railways have been further exemplified by the increasing profitability of transporting other bulk commodities such as coal, sulphur, and potash. This gap between the revenue margins of transporting these commodities as compared to the revenue losses obtained through statutory

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[3] See the following for further details: The Commission on the Costs of Transporting Grain by Rail, Report, Vol. I (Ottawa: Supply and Services, October, 1976); Snavely, King and Associates, 1977 Costs and Revenues Incurred by the Railways in the Transportation of Grain Under Statutory Rates (Washington, D.C.: Report for the Ministry of Transport, Federal Government of Canada, September, 1978), pp. 78-82.

[4] Booz-Allen and Hamilton Inc., Op. cit., pp. X-4, X-5.

grain movement, has acted as a substantial disincentive to the railways for further investment in plant improvements, locomotives, and freight cars for the purpose of moving grain. The Report concurs that the railways are rapidly exhausting their physical and economic capacities to underwrite the costs of grain transportation. Further, the Booz-Allen and Hamilton report warns that all their recommendations necessary to meet Canada's further grain export potential would be largely negated if the statutory rates issue was not resolved.

Several Federal and Provincial government programs along with some capital expenditures by private industry, have attempted to maintain the handling and transportation costs for statutory grain at current levels.[5] The Federal branch line rationalization and rehabilitation program has spent over $300 million to abandon uneconomical branch lines and upgrade some of the remaining lines to handle hopper cars. Joint programs between the Federal and Provincial governments and the Canadian Wheat Board, have increased the railways' rolling stocks by the purchase of over 15,000 new hopper cars and rehabilitated another 5,000 existing boxcars. Over $400 million in terminal port facilities and over $248 million in expanding and rehabilitating the country elevator system, has been spent by the elevator companies in the last five years to increase the efficiency of the system. Improved cooperation between the Wheat Board, the grain companies, and the railways, have helped reduce the average turn around time for rail cars from Manitoba

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[5]All of the following figures except turn around time, were obtained from the following, The Canadian Wheat Board, "Tallying grain industry investments", Grain Matters (November, 1979), pp. 1-2.

country collection points to Thunderbay and back from 21 days to 17 days.[6] The railways themselves have committed $32 million to increase their locomotive horsepower by purchasing 75 new locomotives. This will help reduce operating costs by increasing train sizes and travelling speeds.

Despite the attempts to maintain and improve the present grain transportation system it is uncertain how long the government will tolerate the grain transport system dependency on government assistance. Increasing the grain producer's proportion of the total cost of transporting statutory grains by modifying the statutory rate structure has been viewed as a very significant factor in the continued maintenance of western Canada's position as a grain exporter. From the wide range of proposals, one of the more straightforward scenarios calls for the replacement of statutory rates with compensatory rates.[7] Instead of the current statutory rate structure, a new set of compensatory rates would be established to offset the current revenue shortfalls in transporting grain by rail.[8]

The consequences of a rate increase may have a significant effect on the structure of western Canadian agriculture. Every grain producer

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[6]Personal communication from Mr. Norman Cobb of Manitoba Pool Elevators based on Canadian Wheat Board memos.

[7]Several alternatives besides complete abolition of the Statutory rates have been suggested. For further details, see: Railway Compensation Sub-Committee, "Report to the Grain Handling and Transportation Committee". (Winnipeg: Canada Grains Council, 1977).

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

would be faced with increments in his transportation costs and a corresponding decline in his net farm income. In particular, smaller farms may have the most trouble adjusting due to their limited resource and production bases. As a result, some of these smaller operations may no longer be able to remain economically viable. In this manner, replacement of statutory rates with compensatory rates may enhance the trend towards increased farm size.

In the constantly changing realm of western Canadian agriculture, the trend towards ever increasing farm size is threatening to engulf the small producers. An article by Veeman and Veeman, indicated that the number of farms in western Canada have been steadily decreasing while average farm size has been increasing.[9] Evidence found in the 1976 Canada Census, indicated that the total number of farms in Manitoba had decreased 20% from 37,363 in 1951 to 29,963 in 1976. The average farm size, in the same period, increased from 261 acres to 427 acres.[10] Faced with unfavourable price conditions and high production costs, small producers are unable to take advantage of economies of size inherent on larger farm sizes. This limitation may not allow smaller producers the flexibility to adapt to new cost conditions imposed by compensatory rates. Under constant price conditions, this cost increment is expected to force many of these small producers out of business.

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[9] T. S. Veeman and M. M. Veeman, "The Changing Organization, Structure, and Control of Canadian Agriculture," American Journal of Agricultural Economics, Vol. 60, No. 5, December, 1978, pp. 759-768.

[10] Statistics Canada, 1976 Census of Canada - Agriculture, Manitoba (Ottawa: Ministry of Industry, Trade and Commerce, March, 1978), Table 3.

Scope and Objectives

Through the use of a linear programming model originally developed by Framingham, Craddock and Baker,[11] replacement of statutory rates with compensatory rates and branch line rationalization will have detrimental effects on small producers and continue the trend towards larger farm sizes. Further, this study will break down the differential effects these policies will have on the various production levels of different agricultural commodities on a regional basis.

This study will also remove a major limitation present within the model adopted in this analysis.[12] In former applications of the model, all interregional transportation of grains and livestock were restricted to adjacent crop districts. This had a restraining effect on many districts by preventing them from taking full advantage of the comparative advantage present within each district. For example, the Interlake region of Manitoba may have had the potential for increased livestock production, yet it couldn't produce enough grain or import enough grain from adjacent crop districts to satisfy the feed requirements

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[11] 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, Research Bulletins 78-1, Vol. 1 and 2 (Winnipeg: Department of Agricultural Economics, University of Manitoba, October, 1978).

[12] For further discussion of the limitations present in former studies utilizing this model, 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. 411-431; K. Olsen, E. W. Tyrchniewicz and C. F. Framingham, "Impacts of Changes in Statutory Grain Rates and Rail Branch Line Configurations on Manitoba's Agricultural Economy". Report prepared for the Manitoba Department of Agriculture (Winnipeg: University of Manitoba, March, 1980).

for this expansion. Similar to this problem was the Southwest region of Manitoba's potential to fulfill the Interlake's feed demands but the constraints of the model prohibited the transfer of feed grains to anywhere except adjacent crop districts. By removing this constraint, this study will determine whether expanded interregional trade will allow producers to take better advantage of the comparative advantages present in each region. As well, the study will focus on smaller producers to consider whether this expansion will assist small producers to remain economically viable.

Organization of Thesis

The remainder of this thesis is designed to determine the impacts of replacement of statutory freight rates with compensatory rates and branch line rationalization on different farm sizes. Chapter 2 gives a theoretical overview of farm structure and its relationship to economies of size. This chapter further explains the relationship between the theory of economies of size and the linear programming model used in this study. Chapter 2 concludes with a theoretical explanation of the significance of interregional trade.

Chapter 3 outlines the details and limitations of the linear programming model utilized in this study. Chapter 4 describes the details of each scenario examined and lists the results of each analysis conducted. Chapter 5 summarizes the major conclusions and implications derived from the analysis.

Chapter 2

THE COMPONENTS OF FARM STRUCTURE

This chapter examines the theoretical basis for this analysis. The purpose of this chapter is to give a theoretical overview by: (1) defining and examining farm structure; (2) explaining the theory of economies of size and its pertinence to agriculture; (3) examining the factors effecting farm structure; (4) showing the relationship between economies of size and the model used in this analysis; (5) examining the theory behind interregional trade; and (6) explaining the theoretical hypothesis behind this analysis.

Defining Farm Structure

The concept of farm structure has many interpretations and cannot be precisely defined. Generally, farm structure is composed of several different components:[13]

> "- Organization of resources into farming units;
> - Size, management and operations of those units;
> - Form of business organization (i.e., partners, corporations, etc.);
> - Manner in which the firm procures its inputs and markets its products;
> - Extent of ownership and control of the resources that comprise the farming unit."

These components form the basis by which different groups can be separated and compared. However, the actual structures of enterprises

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[13] J. B. Penn, "The Structure of Agriculture: An Overview of the Issue," in Structure Issues of American Agriculture. Agricultural Economic Report 438 (Washington, D.C.: USDA Economics, Statistics and Cooperatives Service, November, 1979), p. 5.

are relatively minor. More important are the performances of the alternate structural forms for agriculture and the relative priority levels assigned each of these forms. The nature of some of these forms are:[14]

"- Quantity, quality and price of food available for consumers;
- Care and preservation of the environment;
- Relationship to rural communities;
- Welfare of the participants;
- Efficiency of resource use and contribution to national economic growth;
- Flexibility and adaptability to new consumer trends, technological changes, environmental shocks, etc."

This study was primarily concerned with the last two elements and their pertinence with respect to the performance of small farms within the Manitoban agricultural system.

Economics of Size in Agriculture

Related to this discussion are the questions of the existence of economies of size in modern farming and the possibility that one particular farm size could best achieve the most efficient operation.[15] The static theory of economies of size is usually viewed in terms of long and short-run situations.[16] Referring to Figure 1, the short-run average total cost curves (SAC) assume that one or more resources are available

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[14] Ibid., p. 5-9.

[15] For a description of the differences between economies of size and economies of scale, see: J. P. Madden, Economies of Size in Farming (Washington, D.C.: Economic Research Service, U.S.D.A., February, 1967), p. 1.

[16] For more detailed theory regarding firm sizes and cost curve formulation, see: J. P. Madden, Op. cit., pp. 2-6; J. Viner, "Cost Curves and Supply Curves" in A.E.A. Readings in Price Theory, Vol. 6, edited by K. E. Boulding and G. J. Stigler (Chicago: Richard D. Irwin, 1952), pp. 198-232; A. A. Walters, "Production and Cost Functions: An Econometric Survey," Econometrica, Vol. 31, No. 1 and 2, 1965, pp. 1-66.

THEORETICAL ILLUSTRATION OF SHORTRUN AVERAGE COST CURVES AND ENVELOPE CURVE

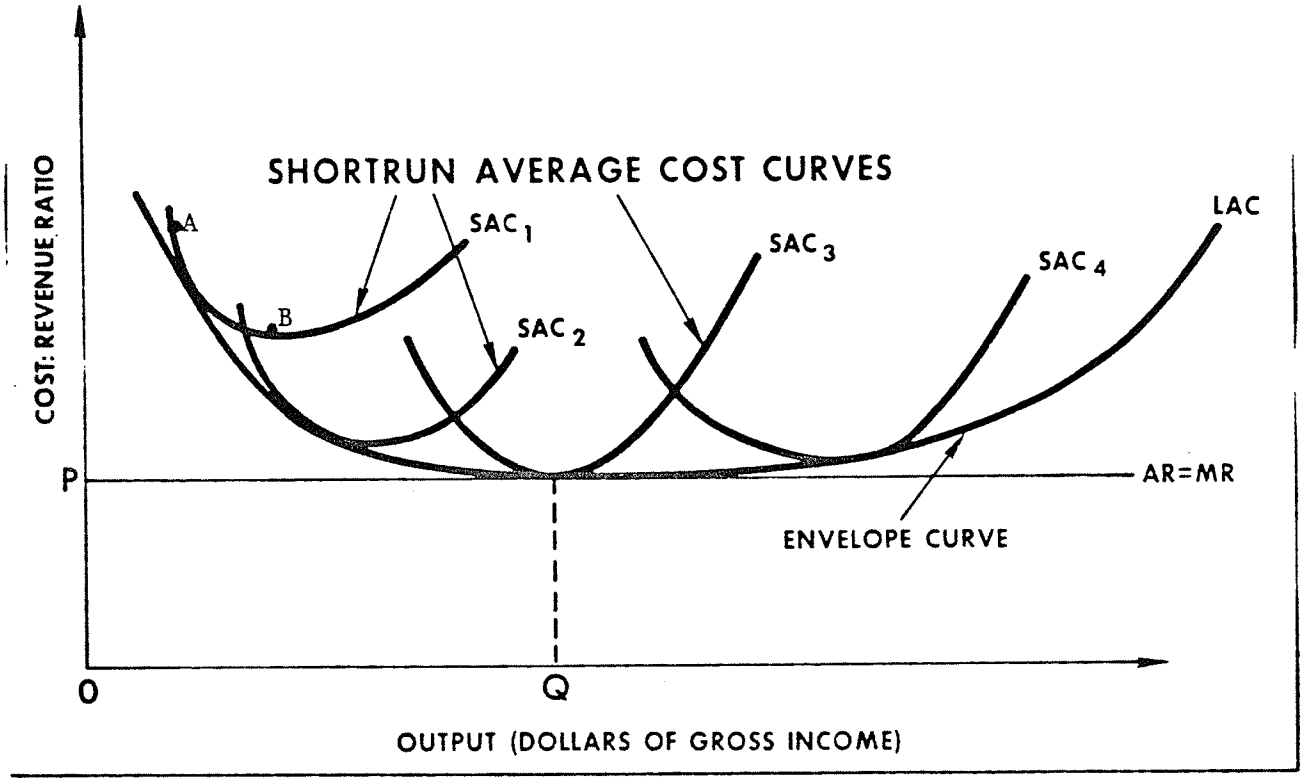

Figure 1

Source: J.P. Madden, Economies of Size in Farming (Washington, D.C.: Economic Research Service, U.S.D.A., February, 1967), p. 3.

only in specific fixed quantities. The typical "U" shape of these SAC curves are summarized by Madden and Partenheimer as follows:

> "Average costs per unit of output decline with an initial increase of output as fuller utilization of resources is achieved and fixed costs are spread over more units. Eventually, however, average costs level off and then rise, as variable resources must be added in increasing proportions to the fixed resources to reach greater levels of output. A separate SAC curve applies for each level of the fixed resources, i.e., for each size of plant."[17]

All resources are variable in the long run. A curve that is drawn tangent to all the SAC curves approximates the long-run economies-of-size curve (LAC). This curve represents the average total cost of production that would be experienced by firms of different sizes under assumed price relationships and technologies in the static sense.

There are three main principles implicit within the theory of economies of size. Firstly, a firm will continue producing in the short-run, as long as revenue is great enough to cover the variable costs. In this instance, average variable costs must be less than or equal to the average revenue (price). The second principle states that a firm can remain in production in its present form in the long-run only if revenue is great enough to cover the total costs. Thirdly, under atomistic competition, prices will shift towards a level such that all but normal profits will be erased and all firms are producing at the lowest points on their average total cost curves (level Q in Figure 1).

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[17] J. P. Madden and E. J. Partenheimer, "Evidence of Economies and Diseconomies of Farm Size" in Size, Structure and Future of Farms edited by A. G. Ball and E. O. Heady (Ames, Iowa: Iowa State University Press, 1972), pp. 92-93. For empirical evidence and methods of analysing economies of size, see the following: J. P. Madden, Op. cit., pp. 24-71; J. P. Madden and E. J. Partenheimer, Op. cit., pp. 93-98.

Within the framework of this conventional theory lies four major factors; the length of run, divisibility of resources and costs, uncertainty, and coordination, which significantly limit the applicability of the theory to actual situations. An exact demarcation of where the long-run starts and the short-run ends is a very difficult undertaking. The short-run implies that at least one resource is available in a fixed quantity within a specific production period while the quantity of all resources is variable in the long-run. Due to the varying lengths of time each class of resources are held fixed within an actual farm production cycle, the short-run can be regarded as a large number of successively longer lengths of run, as additional resources are allowed to vary in quantity. This eventually leads to the long-run situation where all components are variable. Complicating this issue is that there is no predetermined order in which these resources become variable. Further, the length of run and the amount of time a certain subset of resources is held fixed, are fictional time periods that cannot be related by any amount of calendar time. Both these items may be in continual change and are highly dependent on the producer's frame of mind. Madden uses the following description of distinguishing between the long and short-run:

> "Let us denote the variable resources as subset V, and the fixed resources as subset F... The firm will tend to continue operating as long as it receives enough revenue to at least cover the cost of all the variable resources. As the planning horizon is lengthened, these resources are conceptually shifted from the fixed to the variable subset, and the revenue must be correspondingly larger if the firm is to remain in production. In the longest possible run, all the firm's resources are in the variable subset (V), and the fixed subset (F) becomes empty. Therefore, in the long-run, revenues must be equal to or greater than total cost -- including the direct cash cost of operating expense