Economic Performance in the Western Canadian Primary Elevator Industry

by

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ECONOMIC PERFORMANCE IN THE WESTERN CANADIAN PRIMARY ELEVATOR INDUSTRY

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ABSTRACT

The Canadian Grain Commission regulates the rates charged for handling grain in Western Canadian primary elevators. Since 1974-75, the commission has pursued a tariff policy which relies upon competition to achieve sound economic performance. The research reported in this thesis endeavors to determine the effectiveness of this regulation in the face of the competitive environment that prevails in the primary elevator sector.

The approach used in analyzing this problem consists of an Industrial Organization analysis of structure, conduct, and performance. Structure is discussed in terms of economic and institutional constraints to competition. Conduct is analyzed in the context of inter-firm rivalry with regard to rate filing and other competitive strategies. Performance is evaluated in terms of allocative and productive efficiency. A detailed investigation of the nature and level of primary elevator costs is undertaken as part of the performance evaluation.

The results of this research indicate the following:

1. Industry structure is characteristic of the traditional oligopoly model, featuring: high concentration, spatial market power, excess capacity, weak price response by users, and significant barriers to entry.

2. Firm conduct also conforms to the theoretical oligopoly situation, as price leadership directs a subtle form of tacit price collusion in which the recovery of total system costs is the goal. Inter-firm rivalry tends to take forms other than competition on rates.
3. Performance analysis indicates that there is significant production inefficiency in the primary elevator sector. Poor allocative efficiency facilitates this situation, by spreading the cost of inefficient elevators across the entire system of users. The likely result is a transfer of income from farmers to suppliers of inputs to the elevator industry.
4. The Canadian Grain Commission's policy with regard to grain handling tariffs does nothing to counter this inefficiency and actually discourages competitive behavior in some ways.

These conclusions suggest that Canadian Grain Commission regulation of primary elevator tariffs should be reviewed, with the objective of enhancing competition and performance in the industry.

CONTENTS

Chapter I

THE PROBLEM: PERFORMANCE IN THE PRIMARY ELEVATOR SECTOR

1.1 INTRODUCTION: INSTITUTIONAL SETTING

The Western Canadian grain handling and transportation system consists of an operational and a regulatory component. The operational sector includes four subsectors: farm storage and trucking, country elevator operation, rail transportation, and terminal elevator operation. The performance of this system depends jointly upon the efficiency of each individual component, and upon the smooth interaction of all components.

The grain handling sector is directly regulated by institutions such as the Canadian Transport Commission, the Canadian Wheat Board, the Canadian Grain Commission, and the Grain Transportation Agency, while government statutes such as the Western Grain Transportation Act and the Canada Grain Act indirectly influence the physical configuration of the system.

The research reported in this thesis attempts to assess the performance of one aspect of this infrastructure--the grain handling services provided in country elevators. Of specific interest are the tariffs charged for these services. Regulated by the Canadian Grain Commission, the rates charged for moving and storing grain within country elevators provide an opportunity to observe one aspect of grain company pricing

conduct. These observations suggest a number of questions regarding the effects of the rate-setting structure upon industry structure, conduct, and performance. As a result, the basic objective of this study is to evaluate the performance of the existing pricing regime in terms of allocative efficiency, production efficiency, and equity. Secondary objectives include the evaluation of various structural and conduct variables and their potential impacts upon performance.

Accurate estimates of country elevator operating costs are essential if an investigation into the performance of the grain handling system is to be relevant. A number of studies address the issue of primary elevator handling costs, including: Tangri, Zasada, and Tyrchniewicz[1] the Grains Group[2] and Sorenson and Keyes.[3]

The continued timeliness of these studies may be called into question however, as changes in inflation rates, technology, corporate objectives, and the regulatory framework have taken place. It is thus necessary to reassess the nature of grain handling costs in primary elevators. This suggests a further objective, the provision of a timely cost analysis that can be used as input for subsequent private and public research.

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[1] Om P. Tangri, D. Zasada and E. W. Tyrchniewicz, Country Grain Elevator Closures: Implications for Grain Elevator Companies, (University of Manitoba [1973]).

[2] P. S. Ross & Partners, Country Grain Elevators Cost Study, Prepared for the Grains Group, (1970), 69.

[3] V. L. Sorenson and C. D. Keyes, Cost Relationships in Grain Plants, (Michigan State University [1962]).

1.2 RESEARCH OBJECTIVES

The objectives of this research can be summarized as follows:

1. Describe the current rate-regulation infrastructure in terms of its objectives and mechanics.
2. Investigate the nature and level of grain handling costs in primary elevators by conducting an econometric study based upon grain company cost data.
3. Evaluate the impact and effectiveness of the existing regulated rate structure in terms of industry structure, conduct, and economic performance. "Performance" in this context is defined in terms of traditional industrial organization criteria such as production efficiency, allocative efficiency, and equity. The cost study will serve as the basis for this analysis.
4. Draw some conclusions as to the overall impact of current rate setting policies upon performance and suggest appropriate improvements--if any exist.

These objectives imply a linkage between the Canadian Grain Commission's regulatory activities and performance results. The hypothesis to be tested in this research addresses this linkage in terms of the Commission's impact upon structure, conduct, and performance in the primary elevator industry.

1.3 FORMAL STATEMENT OF HYPOTHESES

The null hypothesis to be tested in this thesis is as follows:

Canadian Grain Commission regulation of grain handling tariffs has served to enhance efficiency and performance in the primary elevator sector.

This hypothesis embodies a number of subsidiary hypotheses:

1. The structure of the industry has evolved in a manner that is consistent with the Industrial Organization concept of a competitive environment.
2. Firm conduct in the areas of pricing and adjustment to rivals' behavior is consistent with competitive results.
3. Specific performance criteria - including production efficiency, allocative efficiency, and fairness - are generally achieved in the industry.

1.4 SUMMARY OF APPROACH

The following format is used in undertaking the research to achieve these objectives.

Chapter Two begins by defining the statutory mandate of the Canadian Grain Commission as contained in the Canada Grain Act. A historical survey of the Canadian Grain Commission's role in the regulation of grain handling tariffs follows, leading to a summary of the rules that govern rate determination today.

Chapter Three defines the Industrial Organization concepts of structure, conduct, and performance and discusses the relationships that are hypothesized to exist between the three. This discussion is in the context of the research objectives.

Chapter Four reports on the structure of the industry, discussing the nature of demand, barriers to entry, firm concentration, horizontal and vertical integration, and industry cost structure, and certain regulatory constraints.

Chapter Five analyzes pricing conduct in terms of tariff filing behavior, regional tariff variations, and discrimination between users. This discussion raises several questions regarding the impact of firm conduct on industry performance.

Chapter Six attempts to develop a theoretical base for analyzing grain handling costs. A review of previous empirical research is developed in the context of environmental changes that have occured since those studies were completed. Traditional microeconomic theory is used to describe the cost structure of a typical primary elevator. Several practical issues involved in estimating cost relationships are also addressed. Finally a description of the sample data is put forward, along with a discussion of potential data problems.

Chapter Seven reports the results of the cost analysis, and translates these results into a form that is suited to the performance analysis.

A comprehensive analysis of industry performance is attempted in Chapter Eight. Allocative efficiency is discussed in terms of the proximity between revenues and costs. Production efficiency is determined by comparing actual production costs to least cost scenarios. Finally, the relative impacts on various industry groups are identified.

Chapter Nine summarizes the basic conclusions of the research in terms of the objectives stated in Chapter One. These conclusions are discussed in terms of their limitations, and policy recommendations are developed.

Chapter II

RATE REGULATION IN THE WESTERN CANADIAN PRIMARY ELEVATOR INDUSTRY

2.1 RESPONSIBILITIES OF THE CANADIAN GRAIN COMMISSION

The Canada Grain Act states the "Objects of the Commission" as follows:[1]

> "... the Commission shall, in the interests of the grain producers, establish and maintain standards of quality for Canadian grain handling in Canada, to ensure a dependable commodity for domestic and export markets."

The Canada Grain Act goes on to suggest a number of powers which further define the Canadian Grain Commission's role.[2] These provisions include the rights to:

> "...establish and apply standards and procedures regulating the handling, transportation, and storage of grain and the facilities used therefore; conduct investigations...; undertake, sponsor and promote research in relation to grain and grain products and in so doing, utilize technical, economic and statistical information and advice from any department or agency of the government of Canada,..."

Section 39 of the Canada Grain Act more specifically defines the Commission's responsibilities regarding the setting of grain handling tariffs.[3] In effect, the Commission is given the responsibility of setting and enforcing maximum charges with respect to handling charges.

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[1] Canada Grain Act, 1970, 12.

[2] Ibid., 12-13.

[3] Ibid., 30.

There is, of course, an implied connection between these specific tariff setting duties and the overall mandate of the Canada Grain Act. That is, tariff setting policies should be consistent with the overall objectives of quality and dependability of product and service.

Some analysts have suggested that this fundamental responsibility for ensuring the performance of the industry extends to the realm of rate-setting. To quote Devine and Storey:[4]

> "As the agency responsible for licensing elevators and setting grain tariffs, the Canadian Grain Commission has an unavoidable responsibility in influencing the future direction and development of the grain handling and transportation system. The future efficiency and effectiveness of our marketing system, may largely depend upon how the Canadian Grain Commission and thus the Canadian Government, interprets its responsibility and role under the Canada Grain Act."

The following section discusses the Commission's interpretation of this responsibility, by tracing the history of tariff regulation. Such an understanding of the Commission's role is essential if larger questions of economic performance are to be considered.

2.2 HISTORY OF RATE REGULATION

The Board of Grain Commissioners was established in 1912 under the Canada Grain Act. Its primary functions appear to have been in the areas of measurement and grading, with tariff regulation being of less concern. This was probably due to the market-oriented system that existed at the time. Since grain companies garnered most of their revenue from

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[4] D.G. Devine and G.G. Storey, "Evaluating Implications of Higher Elevator Tariffs on the Performance of the Western Canadian Grain Handling System." Submission to the Canadian Grain Commission Hearings on Elevator Tariffs, Saskatoon, March 30, 1978: 2.

merchandising, not from grain handling, elevator tariffs were of less concern to them. Similarly, with costs built into buying margins, farmers were more interested in net price and the related issues of grade and dockage.

Tariff levels were not completely ignored in the early years, however. In September, 1912, terminal elevator companies were ordered to begin filing notice of intended tariffs, and all costs and revenues were examined in an investigation "as thorough as the Board could make."[5] This investigation appears to have consisted largely of comparisons to cost information supplied by the Grain Growers Grain Company and Canadian Government Elevators. No reductions were ordered as a result of the inquiry.

The 1914 Board of Grain Commissioners Report contains the first mention of maximum rates for terminal and country elevators. As well, the tariff application procedure was formalized. Tariffs were to be filed in September; if objections were voiced, public hearings were held.

The 1914 Report also cites three principles of tariff regulation:[6]

1. Tariffs should be "shown to be reasonable";
2. Tariffs for similar elevators should be relatively uniform; and
3. Tariffs should be published in a "simple, intelligible and unambiguous" form.

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[5] Board of Grain Commissioners, Report of the Board of Grain Commissioners (1912-13), 234.

[6] Board of Grain Commissioners, Report of the Board of Grain Commissioners (1913-14), 38.

The 1915 Report relates one of the first instances of rate rollbacks.[7] The Grain Growers Grain Company attempted to charge 1.25 cents per bushel elevation at Binscarth, while charging 1.75 cents at all other Manitoba points. This reduction was not allowed on the grounds that the Canada Grain Act prescribed uniform rates. The Board also turned down proposed increases by eastern transfer elevators because they discriminated against domestic millers. The forum for these rulings was the public hearing process suggested in 1914. While such rollbacks proved to be isolated occurences, the authority of the Board of Grain Commissioners was thus established.

The low priority given to tariff regulation during subsequent years is illustrated by the Board of Grain Commissioners Annual Reports. The only mention of rate regulation during the years 1916 through 1939 was to list the tariffs, cite the rules and report on public hearings. Rarely was an objection regarding tariffs raised at these annual meetings, as discussions generally involved other issues.

In 1940, maxima were reduced because of high carryover stocks. This would seem to indicate that a major concern of the Board of Grain Commissioners was the revenue/cost position of the elevators. This is substantiated in the next few years, as rates rose and fell with crop volumes and carryovers. Apparently the companies were not to earn large profits, nor take large losses, in any one year. The Board of Grain Commissioners also considered new investment in setting tariffs. In 1941 for example, further tariff reductions were postponed at Thunder Bay to

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[7] Board of Grain Commissioners, Report of the Board of Grain Commissioners (1915-16).

allow for the cost of new storage facilities.

In 1943 the Canadian Wheat Board assumed control of wheat, oats, and barley marketing, and made handling agreements with the various companies operating in the primary sector. These agreements comprised a large portion of the revenues on Board grains. The Board of Grain Commissioners continued to set maximum tariffs for primary elevators, in addition to the Canadian Wheat Board handling agreements. Tariffs in other sectors continued to be the sole responsibility of the Board of Grain Commissioners.

During this period, it was the stated policy of the federal government that storage capacity should be increased in all sectors. The Board of Grain Commissioners thus adjusted storage rates to encourage capacity expansion. This was an important change from earlier years, when the Board was more interested in regulating fairness and equity than directing system expansion.[8] While the stated emphasis upon protecting farmers from unacceptably high tariffs continued, rate increases became an annual occurrence--in keeping with the goal of providing for replacement of old facilities.

In 1974 the Canadian Wheat Board terminated the practice of providing a fee to companies for grain handling, making the Canadian Grain Commission[9] once again solely responsible for revenues from that activity.

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[8] For a comprehensive discussion of the effects of high storage rates on the industry see Don Zasada, "The Regulation of Handling and Storage Tariffs in the Canadian Country Elevator Industry," (Ph.D. Thesis, University of Manitoba, 1982).

[9] The Board of Grain Commissioners became the Canadian Grain Commission in 1970-71.

The Commission was thus placed in a position of leadership with regard to industry revenue concerns.

The Commission's response to this increased responsibility was the investigation by the 1974 Tariff Review Committee. The Tariff Review Committee recommended a number of principles to guide tariff regulation.[10]

1. Tariffs should be as neutral as possible in influencing the configuration and competitive environment of the elevator system;
2. The viability of the industry must be preserved and capital investment encouraged;
3. Entry into the industry must not be restricted by artificial tariff barriers;
4. Price competition should be encouraged, but not to the extent that destructive competition occurs;
5. The actual cost of service should be reflected to the user through its price;
6. Each item should be self-sufficient - ie., no cross-subsidization between services or sectors.

The 1974 Tariff Review Committee confirmed a number of performance related objectives such as the encouragement of capital investment, price competition, cost related rates, and no cross-subsidization. The Canadian Grain Commission's response was to move toward a "flexible" policy of tariff determination. Specifically, a maximum was established for most services, under which companies were allowed to set their rates

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[10] Canadian Grain Commission. Report of the Tariff Review Committee, March 1974, 2.

as they wished. The rationale of the Commission was that effective competition would improve the overall efficiency of the industry, with a minimum of regulatory interference. It was further hoped that a competitive climate would facilitate the pursuit of the numerous objectives outlined in the Review. Effectively, the burden of tariff determination came to fall upon the companies themselves.

Since 1974, maximum tariffs appear to have been set according to rough analyses of country elevator operating costs plus a provision for system reinvestment. During the 1982-83 to 1984-85 period, the Commission adopted a policy based on federal government anti-inflation guidelines. In 1985-86, the Commission adopted a general increase of three percent in most categories.[11]

Between 1975-76 and 1985-86, the maximum tariffs on elevation and removal of dockage for wheat rose from $6.23 per tonne to $11.16 per tonne. Comparisons prior to 1975-76 are difficult, if not misleading due to differences in the way charges were assessed.

2.3 SUMMARY: THE CANADIAN GRAIN COMMISSION'S MANDATE

The Canadian Grain Commission regulates grain handling tariffs in primary elevators. Since 1974, this regulation has consisted of maximum tariffs under which companies are free to file whatever rates they wish. This flexible tariff policy is conducive to economic efficiency, only if competitive conditions prevail in the industry.

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[11] Information regarding maximum tariffs was gathered through discussions with Canadian Grain Commission personnel.

The hypothesis tested in this thesis explicitly assumes that the Canadian Grain Commission is obligated to regulate primary elevator tariffs in a manner that enhances economic performance. This assumption is based upon an interpretation of the intent of the Canada Grain Act, and upon the recommendations of the 1974 Tariff Review Committee. This is not to say that the Commission itself feels a similar responsibility. However, if it is the role of government in general to facilitate sound economic performance in key sectors of the economy, then the Commission seems obligated to fulfill its statutory mandate.

The original rationale for regulating grain handling tariffs appears to have been that grain companies were exercising unfair market power. The shift to a flexible tariff setting policy was seemingly based upon the assumption that competition in the industry had become more effective. Competitive results (prices related to costs, price competition, low barriers to entry) can only occur under relatively competitive conditions. If market power continues to prevail in the industry, then this policy is unable to achieve its objectives.

Chapter III

STRUCTURE, CONDUCT AND PERFORMANCE: A FRAMEWORK FOR ANALYSIS

3.1 INDUSTRIAL ORGANIZATION THEORY: SOME DEFINITIONS

Industrial Organization Theory is based on the fundamental assumptions that competition drives allocation towards efficient results and market power distorts this outcome.[1] It thus follows that the competitive structure of an industry may--through the conduct that results from that structure--significantly alter the level of efficiency, or performance, that is achieved.

3.2 STRUCTURE: DEFINITION AND SIGNIFICANCE

Bain[2] defines structure as:

> "...those characteristics of the organization of a market which seem to influence strategically the nature of competition and pricing within the market."

Bain produces a list of four structural categories that merit investigation. This list includes: the degree of seller and buyer concentration, the extent of product differentiation, and the entry conditions facing new firms.[3] Bain goes on to add that this list could be expanded

[1] F.M. Scherer, Industrial Market Structure and Economic Performance, (Chicago: Rand McNally, 1970), 31.

[2] Joe S. Bain, Industrial Organization (New York: John Wiley and Sons, 1959), 7.

to great lengths, as no two markets are structurally alike. Scherer[4] does broaden this list as he explains the link between the structure of an industry and firm conduct:

> "Conduct depends in turn upon the structure of the relevant market, embracing such features as the number and size distribution of sellers and buyers, the degree of physical or subjective differentiation prevailing among competing sellers' products, the presence or absence of barriers to the entry of new firms, the ratio of fixed to total costs in the short run for a typical firm, the degree to which firms are vertically integrated,... the amount of diversity or conglomerateness characterizing individual firms' product lines, and the geographic dispersion or concentration of buyers or sellers."

For the purposes of this research, six broad structural variables are investigated:

1. Concentration of the firms in the industry--both on an industry-wide and local market basis;
2. The nature of demand, in terms of product differentiation, demand elasticity, dispersion of farmers, and growth of demand over time;
3. The extent of vertical and horizontal integration and its impact on corporate goals and ease of entry;
4. The barriers that potential entrants face in attempting to gain a share of the grain handling business;
5. The cost structure of the industry, especially as it relates to capacity utilization and expansion; and

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[3] Ibid., 8.

[4] F.M. Scherer, Industrial Market Structure and Economic Performance, 4.

6. The regulatory environment, so far as it affects other structural variables or impacts on competitive behavior.

3.3 CONDUCT: COLLUSION IN OLIGOPOLIES

Bain[5] defines market conduct as referring to:

> "...the patterns of behavior which enterprises follow in adapting or adjusting to the markets in which they sell (or buy)."

Market conduct is strongly influenced by market structure and in turn, helps to determine overall industry performance.

Two areas of behavior are of interest--pricing policies and interaction between sellers (buyers). These two areas can be broadened to include a number of individual conduct variables. For the purposes of this research however, three variables will be considered:

1. Tariff filing behavior under the present regulatory structure, with special emphasis on the competitive adjustment process;
2. Attempts by firms to exercise market power, through product differentiation and price shading; and
3. Relative tariff levels charged between provinces, delivery points, and categories of service.

A preliminary analysis of industry structure suggests that the primary elevator sector displays many characteristics of the theoretical oligopoly situation. Received theory suggests that price competition is unlikely under the oligopolistic conditions (few firms, high entry barriers, similar cost structures) that appear to exist in the industry.

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[5] Joe S. Bain, Industrial Organization, 363:387.

Price collusion can be either explicit, where firms formally agree to fix prices; or tacit, in where conditions such as shared knowledge and trust lead to anti-competitive results without explicit agreement. Shepherd[6] suggests that tacit collusion is likely to occur where concentration is high, the product is homogeneous, costs and demand are relatively stable, and there exists a long industry experience.

One particular type of tacit collusion is price leadership. By this arrangement changes in industry prices are first announced by the "leader", usually one of the largest and most experienced firms. Other firms respond by imitating this price change. Prices need not be identical for price leadership to be taking place, as they may differ to the extent that products are differentiated.

Occasionally, an apparently collusive situation (characterized by price leadership) does not necessarily indicate excess profits. If the price leader sets its prices according to cost criteria, rate increases might be consistent with competitive results.[7] One factor that makes this a possibility in the country elevator industry is the presence of the cooperatively-owned grain companies: Manitoba Pool Elevators, Saskatchewan Wheat Pool, Alberta Wheat Pool and United Grain Growers. As farmer-owned entities, these firms might claim to serve as watchdogs over unwarranted price increases.

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[6] William G. Shepherd, The Economics of Industrial Organization, (Englewood Cliffs, New Jersey: Prentice-Hall, 1979), 286-288.

[7] Ibid., 287.

Another phenomenon that is often observed in oligopolistic situations is price discrimination between users.[8] If demand elasticities vary sharply between customers, then a firm that enjoys some extent of market power may offer lower prices to those users with more elastic demand.

3.4 PERFORMANCE: DEFINITION AND MEASUREMENT

Bain defines market performance as:[9]

> "...referring to the strategic end results of market adjustments engaged in by buyers and sellers."

He goes on to add that performance:[10]

> "...is the crucial indicator and measure of how well the market activity of enterprises contributes to the enhancement of general material welfare."

Several criteria can be used in assessing the performance of a given industry. Bain suggests that efficiency in scale and utilization of facilities, the relation of price to cost, and the size of sales promotion costs are most relevant indicators.[11] Authors such as Scherer would add technological progress (dynamic efficiency), economic stability, full employment, and equity to the list of performance criteria.[12]

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[8] Ibid., 316-320.

[9] Joe S. Bain, Industrial Organization 340.

[10] Ibid., 340.

[11] Ibid., 342.

[12] F.M. Scherer, Industrial Market Structure and Economic Performance 3-4.

For the purposes of this inquiry, a few specific criteria must be defined and assessed. These criteria include production efficiency, allocative efficiency, dynamic efficiency, and equity.

3.4.1 Efficiency in Production

Production efficiency, or x-efficiency, means keeping costs to a minimum. In theoretical terms, efficient production is achieved by producing at any point on the long run average cost curve. Market power may contribute to inefficient production, as cost increases can be easily passed on to customers.[13] Production may then occur at a point somewhere above the long run average cost curve (Figure 1).

One method of assessing the extent of production inefficiency is to compare the cost structure of the industry in question to that of a similar industry in another region. This study provides the basis for such an endeavor by estimating grain elevation costs in the prairie region, but an actual comparison with another region is not attempted.

A second evaluative technique is to derive estimates of efficient costs, and compare these costs to those that actually exist in the industry. This is the approach pursued in this research. While primary elevator costs are only one aspect of the question of system efficiency,[14] the analysis of overall efficiency requires a clear concept of relative scale economies at the plant level.

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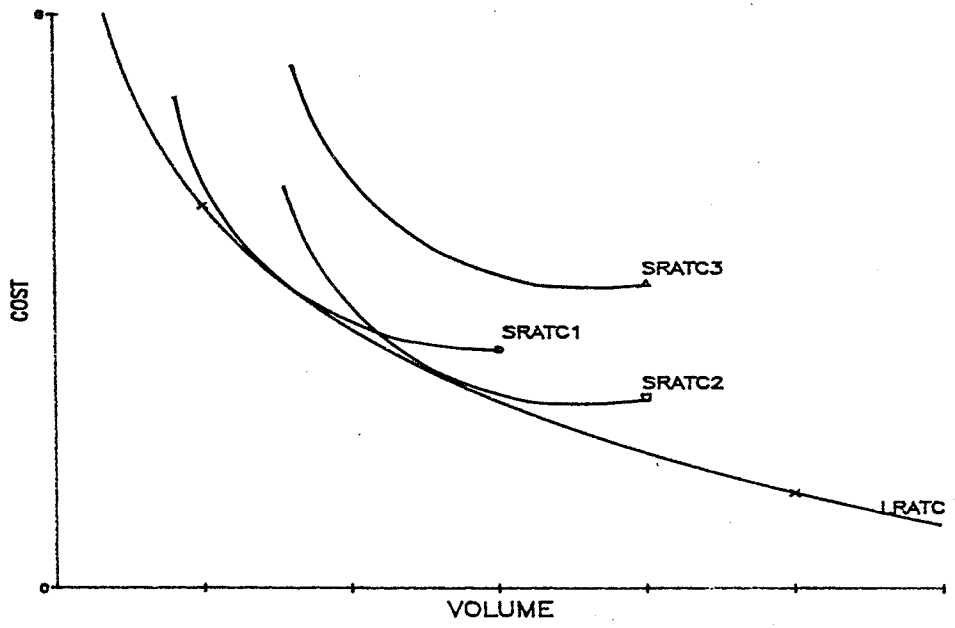
[13] Ibid., 378:380.

[14] Overall system efficiency is a function of total storage, processing and assembly costs. See: A.A. Araji and R.G. Walsh, "Effect of Assembly Costs on Optimum Grain Elevator Size and Location," Canadian Journal of Agricultural Economics 17(2) (July 1969): 36-45.

FIGURE 1
EFFICIENT PRODUCTION



3.4.2 Allocative Efficiency

Allocative efficiency is a set of general equilibrium conditions that occur when output is at a level where marginal cost equals the marginal value (expressed as price) of each product throughout the economy. In a competitive market environment, price will also equal the minimum level of average cost once this equilibrium is reached.[15] While the Theory of Second Best[16] suggests that marginal cost pricing might not be appropriate in an economy where general equilibrium conditions do not hold, it is generally accepted that prices should approximate costs over the long run.

Where prices exceed costs (often due to market power) there is a misallocation of resources away from buyers to sellers. In the case of the primary elevator industry, a measure of the extent of this misallocation would be total grain handling revenue minus total grain handling costs. Such a comparison would seem most appropriate for this research, given the nature of the available information on revenues and costs.

One of the difficulties involved in comparing revenues to costs is the selection of the most relevant cost criteria. According to conventional economic methodology, price should equal the marginal cost of the last unit produced in order to reflect the correct opportunity cost to buyers. Marginal cost is thus preferred to average cost as a basis for setting rates.[17] Average costs do not reflect the cost of the last unit

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[15] William G. Shepherd, The Economics of Industrial Organization, 33.

[16] Richard Lipsey and Kevin Lancaster, "The General Theory of Second Best," Review of Economic Studies 24 (1956).

[17] For a discussion of the rationale behind, and the problems involved

produced, but an average of all past production costs.

In practice however, marginal cost pricing can be very difficult to apply. Marginal costs can be extremely variable over a given range of production, while it is rarely practical to charge each consumer a different price. Second, the marginal cost criterion will not provide sufficient returns to investment if fixed costs are high relative to marginal costs.

If short run marginal costs serve as the basis for pricing, fixed costs will never be covered and reinvestment will not take place. The alternative is to expand the time frame to encompass some type of long run marginal cost. If long run marginal costs approach the long run average total cost curve at some point, capital costs will be covered. In practice, long run marginal costs do tend towards the minimum of long run average costs. Given the difficulties involved in estimating long run marginal costs, long run average costs may serve as a suitable proxy.

3.4.3 Dynamic Efficiency

The analysis of dynamic efficiency in the context of this research is a difficult problem. As a cross-sectional analysis, this thesis does not cover the time range necessary to compare productivity changes. At best, the estimation of the relative efficiency of different scales of elevators may lend itself to a qualitative analysis of the extent to

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in, marginal cost pricing see: Alfred E. Kahn, The Economics of Regulation: Principles and Institutions Vol. 1, (New York: John Wiley and Sons, 1971).

which dynamic efficiency has been achieved. Finally, the cost estimates derived here might well serve as the basis for a subsequent evaluation of efficiency in technological progress. The extent of dynamic efficiency in the primary elevator sector is not evaluated in this thesis.

3.4.4 Equity and Income Distribution

One final aspect of performance to be considered is that of equity. While fairness questions are traditionally suggested to be beyond the realm of positive economics, an evaluation of performance is incomplete without some consideration of its impacts upon income distribution, opportunity, and freedom of choice.

These issues are of particular importance in the primary elevator sector. Income may be redistributed if tariffs are not related to grain handling costs. Opportunity may be denied if significant barriers to entry prevail. Finally, a lack of competition limits farmers' delivery and marketing options.

3.4.5 Role of Cost Analysis in Performance Evaluation

In order to evaluate the various performance criteria, it is necessary to estimate the costs of the services performed in a primary elevator. A generalized estimate of total costs is necessary, as the proximity between revenues and costs is central to the question of allocative efficiency.

While total system costs may be approximately equal to total revenues, allocative inefficiency may still arise where handling charges do

not reflect per-tonne costs. It is therefore necessary to estimate differences in costs owing to differences in plant scale. The issue of cross-subsidization between farmers and between sectors can also be addressed in the context of a cost analysis.

The consideration of relative scale efficiencies also lends evidence to the question of production efficiency, in terms of the most efficient scale of production. A second issue related to production efficiency is that of capacity utilization. Specifically, what is the effect upon average costs if volumes are increased in a given scale of plant? These issues are discussed further in Chapter Six.

3.5 SUMMARY: INDUSTRIAL ORGANIZATION THEORY AND PRIMARY ELEVATORS

Industrial Organization Theory provides a convenient framework for the analysis of the performance of an industry. The prevailing competitive structure influences individual firm conduct, which in turn affects overall performance. This is not, of course, a one way relationship. Firm behavioral patterns may lead to changes in structure, just as continuously poor performance may induce radical changes in structure or conduct.

This analytic framework can be applied in the case of the primary elevator industry to develop an understanding of the industry's performance under the current regulatory framework. Towards this objective, six structural variables are evaluated:

1. Concentration of the firms in the industry--both on an industry-wide and local market basis;

2. The nature of demand, in terms of product differentiation, demand elasticity, dispersion of farmers, and growth of demand over time;
3. The extent of vertical and horizontal integration and its impacts on corporate goals and ease of entry;
4. The barriers that potential entrants face in attempting to gain a share of the grain handling business;
5. The cost structure of the industry, especially as it relates to capacity utilization and expansion; and
6. The regulatory environment, so far as it affects other structural variables or impacts on competitive behavior.

These structural variables help to explain three areas of observable primary elevator company conduct:

1. Tariff filing behavior, with special emphasis on the competitive adjustment process;
2. Attempts by firms to exercise market power, through product differentiation and price shading; and
3. Relative tariff levels charged between provinces, delivery points, and categories of service.

Ultimately, three performance criteria are evaluated in the context of this primary elevator structure and conduct. These criteria are: production efficiency, allocative efficiency, and equity.

Chapter IV

STRUCTURE OF THE PRIMARY ELEVATOR INDUSTRY

4.1 INTRODUCTION: RELEVANT STRUCTURAL VARIABLES

The prairie primary elevator industry displays many of the features that are characteristic of an oligopolistic market situation. Structural variables that lend support to this conclusion in the elevator sector include: firm concentration, demand characteristics, excess capacity, vertical and horizontal integration, barriers to entry, and the industry's cost structure.

4.2 FIRM CONCENTRATION

The primary elevator industry is highly concentrated. This is true on an industry-wide basis, where eight firms handle 95% of all shipments, and on a regional basis, where most grain producers are faced with three or less delivery options within the relevant market region. As might be expected, individual market shares are often high. For example in Manitoba, approximately 50% of the total elevator capacity and 60% of total grain marketings are controlled by Manitoba Pool Elevators.[1]

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[1] Handlings by company are necessarily approximate, as exact figures are unavailable. Information on storage capacity is available in: Canadian Grain Commission, Grain Elevators in Canada, (Winnipeg, 1984).

Location theory suggests that a market is not a point but an extended region.[2] As Bressler and King demonstrate, total cost to the user of a processing service is the sum of the cost of that service and the cost of transporting the product to the plant.[3] This principle applies in the elevator industry, as a farmer must truck his grain to the delivery point. Elevators that are located some distance from competitors thus enjoy a form of market power, in terms of their location in market space. That is, individual delivery points may develop a form of spatial monopoly within the relevant market region.

The significance of spatial market power increases as the elevator "rationalization" process continues. As Table 1 illustrates, the number of delivery points available to farmers has declined significantly since 1971-72. Furthermore, the percentage of single company delivery points (points at which only one firm is represented) out of total delivery points has risen from 29.4% to 35.2%.

The persistence of spatial monopoly power is reinforced by the rail freight rate structure that prevails on the prairies. Numerous studies have pointed out that the non-compensatory freight rates on Western grains, seriously reduce the ability of trucking to compete for grain transportation business.[4] Farmers have a clear incentive to deliver to the closest elevator to take advantage of the low rail freight rates.

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[2] Harold Hotelling, "Stability in Competition," The Economic Journal 39 (March 1929), 44.

[3] R. G. Bressler and R. A. King, Markets, Prices and Interregional Trade (New York: John Wiley and Sons, 1970), 140-149.

[4] IBI Group, The Role of Trucking in the Grain Industry, report prepared for Transport Canada (February 1985).

TABLE 1

The Rationalization Process

Year	Delivery Points	Single Company Points	Operating Units
1971-72	1835	765	3477
1972-73	1672	903	3240
1973-74	1617	860	3073
1974-75	1594	887	2814
1975-76	1556	855	2623
1976-77	1495	811	2546
1977-78	1417	761	2467
1978-79	1394	740	2440
1979-80	1351	715	2376
1980-81	1295	700	2162
1981-82	1246	678	2075
1982-83	1217	669	1975
1983-84	1180	641	1938

If rail freight rates are raised to compensatory levels, trucking might develop into a viable option for grain farmers who wish to bypass their local elevator.

4.3 THE NATURE OF DEMAND

The nature of farmers' demand for grain handling services may have a large influence on the extent to which firms can isolate themselves from competitive forces. As pointed out above, the persistence of spatial monopolies can serve to reduce farmers' responses to tariff variations. Under these conditions, any response to differences in grain handling tariffs might be expected to take into account the relative proximity of the delivery points in question.

A second cause of poor price response is firm and product differentiation. Both cooperatives and privately owned firms might be expected to

enjoy some patronage loyalty. Further, individual elevator managers may effectively differentiate the service by offering generous grades or favorable delivery privileges to certain producers. Farmers often view grain elevation and storage as a small part of a larger service package that includes farm chemicals and grain merchandising. If the farmer views other products within this package as more important (in terms of price) than grain handling, the relevance of handling tariffs may be diminished.

Received theory on perfect competition assumes that consumers have complete and timely information regarding relative prices. This assumption appears untenable in the case of elevation and storage charges. While tariff summaries are published annually by the Canadian Grain Commission, these summaries are not widely circulated and media coverage is often inaccurate or misleading. Individual elevators are required to post a schedule of their charges, as well as the maximum tariffs, inside their elevators--but are not required to report the complete tariff summary. Farmers must therefore incur large search costs in order to compare rates. Finally, deductions resulting from elevation, dockage removal, and storage are not individually detailed anywhere on the farmer's cash ticket, but rather lumped in with transportation costs.[5] These breakdowns in information do not affect price elasticity per se, but do diminish farmer responses to price signals.

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[5] At least one firm has begun to itemize each charge on their cash ticket, but there does not appear to be any research into the impacts of this move.

4.4 INCREASING DEMAND AND EXCESS CAPACITY

As the linear regression in Figure 2 illustrates, the demand for country elevator services has been growing steadily over time. Eaton and Lipsey observe that a spatial market with increasing demand invariably leads to excess capacity.[6]

> "...If the growth of a market is foreseen, it will always pay existing firms to pre-empt the market by establishing new plants before the time when it would first pay new firms to enter. In such markets, monopolies or oligopolies will persist; plants will be built well before their outputs are required and even when current receipts and costs yield losses."[7]

The persistence of excess capacity in the industry is illustrated by the ratio of volumes handled to storage capacity. Over the 1970's and 1980's industry average "turn rates" have ranged from 1.72 to 4.21 turns of elevator capacity per year.[8] Many individual elevators meanwhile, enjoy turn rates of 6 or 7; there are instances of elevators that turn over 20 or more times annually.[9]

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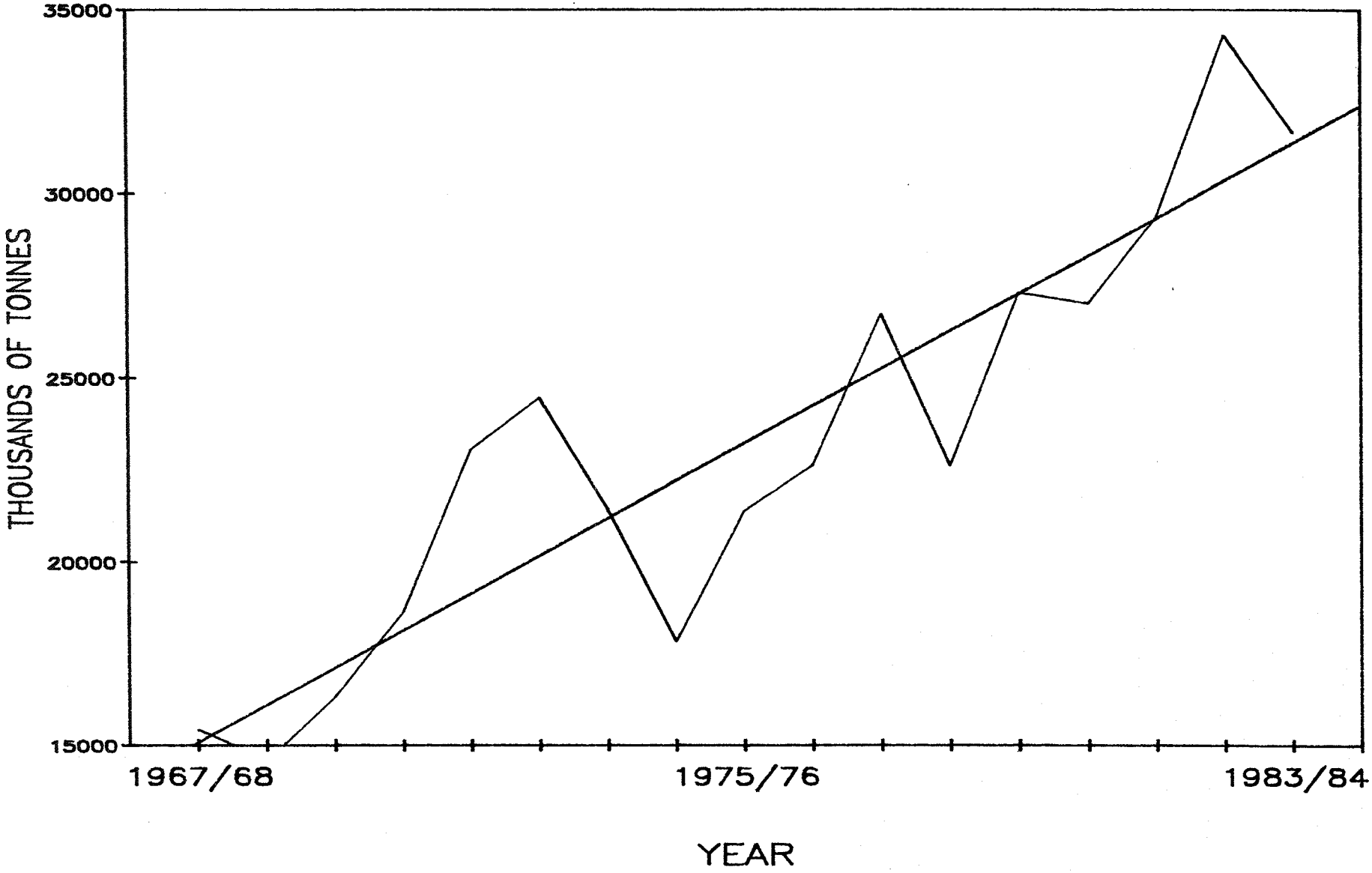
[6] B. Curtis Eaton and Richard G. Lipsey, "The Theory of Market Pre-emption: The Persistence of Excess Capacity and Monopoly in Growing Spatial Markets," Economica 46 (July, 1979): 149-158.

[7] Ibid., 149.

[8] Turn rates are calculated from data provided in: Canada Grains Council, Statistical Handbook 84 Winnipeg (1984): 607,610.

[9] These estimates are derived from the data provided by grain companies for the cost analysis in Chapter Six.

FIGURE 2
SHIPMENTS THROUGH PRIMARY ELEVATORS



Canada Grains Council, Statistical Handbook 84, (1984): 184.

TABLE 2

Primary Elevator System Turn Rates

Year	Turn Rate
1970-71	1.72
1971-72	2.09
1972-73	2.31
1973-74	2.07
1974-75	1.77
1975-76	2.16
1976-77	2.35
1977-78	2.87
1978-79	2.44
1979-80	3.01
1980-81	3.08
1981-82	3.45
1982-83	4.21
1983-84	3.94

4.5 VERTICAL AND HORIZONTAL INTEGRATION

Seven of the eight major primary elevator companies are integrated forward with the terminal sector. The revenues earned at the terminal level (handling tariff, blending gains, and screenings/by product revenue) are a significant source of grain company profits. Terminal elevators' grain movement is based first on the firm's share of country grain deliveries and second, upon its terminal capacity. Specifically, terminals receive grain shipments proportionate to their country handle; if the terminal becomes congested its share is diverted to a rival's facility. Because revenues from terminal operations are directly dependent upon relative market shares in the primary sector, maximization of this market share is a likely objective of pricing policy.

Vertical integration between the terminal and primary sectors may also serve as a barrier to entry in both. Since a country market share

is necessary to obtain significant handlings at the terminal, any firm that is not already a force in the country is unlikely to prosper in the terminal business. This hypothesis is supported by the fact that all eighteen terminal elevators in Thunder Bay and Vancouver are owned by large primary elevator companies. Only the federally-owned terminal at Churchill does not enjoy a country elevator "pipeline".

If it is the case that success in the terminal sector is contingent upon the size of the country elevator system, it follows that the return to primary facilities is not restricted to their handling tariffs plus farm supply sales. Some portion of terminal revenues could be attributed to the activities of the country sector. The implication for potential entrants is clear. If such firms are unable to operate a terminal elevator in conjuction with their primary elevator enterprise, they are deprived of a significant source of revenue that contributes to the viability of the primary operation itself.

Similarly, grain handling services are part of a horizontally integrated service package. Obtaining the grain delivery business of a farmer may well influence the extent to which that farmer tends to purchase other goods and services (pesticide, seed, fertilizer) from his chosen delivery point. Conversely, the attraction of other services may well influence grain delivery preferences.

4.6 BARRIERS TO ENTRY

Traditionally, the major barrier to entry into the primary elevator industry has been the capital requirements of new facilities. For example, one company estimates that a new country elevator costs roughly $950,000 to build and must handle 25,000 tonnes of grain and $175,000 worth of farm supplies each year to break even.[10]

Large capital requirements may also serve as a barrier to exit from the industry, as alternative uses for grain elevators are few. Eaton and Lipsey suggest that where capital is durable and lacks alternative uses, these exit barriers may actually inhibit the entry of new firms.[11]

The significance of capital as an entry barrier has declined to some extent. United Grain Growers for instance have set up a new style of grain handling facility at Thorhild, and Bonneyville, Alberta. These facilities consist of a weigh scale, hydro installation, and grain augers at a cost of approximately $350,000.[12]

In industries that feature high entry costs like this, market contestability is often a key determinant of economic performance.[13] While new firms may find that available returns do not warrant immediate entry

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[10] United Grain Growers, 78th Annual Report (1984), p. 46

[11] B. Curtis Eaton and Richard G. Lipsey, "Exit Barriers are Entry Barriers: The Durability of Capital as a Barrier to Entry," The Bell Journal of Economics 11 (1980): 721-729.

[12] Cost estimates are based on conversations with United Grain Growers' planning personnel. All cost estimates assume the existence of a car spot which may cost up to $250,000.

[13] Don Coursey, et al., "Market Contestability in the Presence of Sunk (entry) Costs," Rand Journal 15 (Spring 1984): 69-84.

into the market due to high fixed costs, the threat of potential entry may serve to discipline current industry firms into keeping costs and profits low. However, where other entry barriers also exist, this threat is reduced as the market becomes less contestable.

One such barrier to new firm entry is the market pre-emption phenomenon discussed in the section on demand characteristics. Suffice to add here, there exist very few spatial gaps in Western Canada which potential entrants might exploit. This is evidenced by the ongoing consolidation process that is taking place. If the system has been overbuilt in the past, it is unlikely that there are any grain delivery areas that lack sufficient primary elevator facilities.

Furthermore, farmer loyalty to existing firms greatly reduces the opportunity for new firms to gain significant business in the traditional elevator sector.

The existing regulatory structure also imposes a number of entry barriers on potential elevator companies. Canadian Grain Commission bonding requirements are unevenly applied in that better financed firms (such as the eight major firms) are required to provide security coverage for only a portion of their outstanding liabilities, while smaller firms (most potential entrants) must generally cover all liabilities.[14] The Canadian Wheat Board may also discourage new entrants through their licensing requirements. In order to handle board grains, a primary elevator must be designated as an agent of the Canadian Wheat Board. This designation depends again on financial backing. The lack of a handling

[14] Comments on bonding requirements are based on conversations with officials of the Canadian Grain Commission's Licensing Section.

agreement means the loss of a major source of revenue.

Competing for grain handling business outside the traditional elevator system is also restricted. Dealer cars (allocated to grain companies that lack elevator facilities) are distributed out of a limited pool. Similarly, producer cars are restricted to a fixed percentage of total movement. Trucking remains an uncompetitive mode in most situations. In sum, access to elevator facilities remains the key to major league status in the grain handling business.

4.7 PREVAILING COST STRUCTURE

The prairie primary elevator industry is characterized by a high level of fixed costs. Costs such as administration expense, property and business taxes, and time-based depreciation charges are fixed independent of volume handled. In addition, many 'operating' costs also contain a large fixed component. The portion of salaries paid to the manager and assistant manager at a point are essentially fixed, regardless of marginal changes in volume during the year. While a major increase in volume handled might well result in a change in staffing or salary structure in the long run, marginal volume changes during the year will only affect short run wages to the extent that extra casual labor is required, or commissions are paid. Similarly, repair and maintenance costs are largely composed of planned improvements and unexpected repairs that are unrelated to current handlings.

A second characteristic of this cost structure is its relative uniformity across the industry. Most firms use similar technology in con-

structing and operating their elevators, leading to good information regarding rivals' costs.

4.8 SUMMARY: STRUCTURE OF THE PRIMARY ELEVATOR SECTOR

The prairie primary elevator industry displays many of the features characteristic of an oligopolistic market.

1. Individual producers generally face three or less delivery options within a cost effective trucking distance.
2. Demand for country elevator services is not highly responsive to variations in the handling tariffs, due to firm loyalty, the high cost of trucking relative to rail, and less than complete price information.
3. Despite an ongoing elevator rationalization process, there continues to be significant excess capacity in the primary sector. Excess capacity seems likely to persist, given the spatial nature of the market and the traditional growth in deliveries to primary elevators.
4. Vertical integration with the terminal sector generally enhances the viability of a country elevator enterprise and vice versa. New entrants that lack terminal facilities are thus placed at a competitive disadvantage relative to existing firms.
5. Horizontal integration between grain handling, farm supplies retailing, and merchandising of non-board grains suggests that grain handling services may be viewed by the farmer as part of a larger service package, and cannot be viewed in isolation.

6. Entry into the traditional country elevator business is restricted by several factors including: the magnitude and durability of capital investment, the regulatory costs of entry, spatial market pre-emption, and vertical integration with the terminal sector.
7. Non-traditional competition for grain handling business--in the form of trucking or off-track elevators--is also resticted due to low rail freight rates.
8. The industry is characterized by a relatively uniform cost structure that features high fixed costs.

As was suggested in Chapter Three, structural conditions of this type might by expected to lead to non-price rivalry as a means towards maximizing market share. Taken to the extreme, it might be discovered that firm conduct is tacitly collusive. Chapter Four addresses these issues.

Chapter V

PRICING CONDUCT: TARIFF FILING BEHAVIOR

5.1 TARIFF FILING REGULATIONS

The mechanics of the current regulatory structure are based upon the recommendations of the 1974 Tariff Review Committee. Specifically, maximum rates are dictated for each service and firms are required to file their individual rates at, or below, these maximums. Each company is free to charge a different rate at each elevator point, but discrimination between individual farmers at any given point is not allowed. Firms are required to file notice of intended rate changes 14 days prior to their implementation and file a complete schedule of rates once a year (usually August 1). The Canadian Grain Commission assembles and publishes these rates publicly. A schedule of rates charged by a given elevator is required to be posted in each elevator.

5.2 PRICE LEADERSHIP AND RATE FILING

The practice of requiring elevator companies to advise the Canadian Grain Commission of proposed tariff changes at least two weeks prior to their implementation, provides an opportunity to observe the process through which equilibrium rates are achieved. Specifically, rate filing practices for individual firms can be evaluated over time.

Table 3 portrays the combined elevation and removal of dockage tariffs for each of the major grain companies in the 1983-84 crop year. Rates within each province are similar, if not identical, for most firms. This pattern is repeated in each of the years since 1980-81. While some firms may occasionally deviate from the modal tariff, such behavior is usually short term.

Price uniformity is a characteristic of perfect competition, as prices tend towards the industry long run marginal cost curve. As the discussion of structural variables suggests, the primary elevator industry cannot be described as having a competitive structure and is unlikely to display perfectly competitive behavior. The process by which the uniform rate is achieved is consistent with the hypothesis that price leadership is the prevailing method of price determination in the industry.

A review of tariff filing since the 1980-81 crop year show that elevator companies do have a tendency to file similar rates. This tendency is to be expected, given the similarities in technology and cost structure between companies. In cases where a company's filed tariff diverges from the industry norm, that firm usually refiles within a month or so, adjusting its charges towards the industry standard. The Canadian Grain Commission practice of publishing filed tariffs facilitates this adjustment process, as firms gain complete knowledge of their rivals' rates at no cost to themselves.

In August 1983, Saskatchewan Wheat Pool filed tariffs for elevation and removal of dockage equal to $7.38 per tonne. Cargill, Pioneer, United Grain Growers, and Parrish and Heimbecker all adjusted their Sas-

TABLE 3

Filed Elevation and Removal of Dockage Tariffs For Wheat ($/Tonne)

Manitoba

Company	1982-83	1983-84	1984-85
Alberta Wheat Pool	-	-	-
Cargill	8.05	8.46	8.46
Manitoba Pool Elevators	8.06	8.46	8.46
Parrish and Heimbecker	7.25	7.38	8.46
N. M. Paterson	8.05	8.46	8.46
Pioneer	8.06	8.46	8.46
Saskatchewan Wheat Pool	-	-	-
United Grain Growers	8.06	8.31	8.31
Maximum Tariff	9.90	10.41	10.83

Saskatchewan

Company	1982-83	1983-84	1984-85
Alberta Wheat Pool	-	-	-
Cargill	7.25	7.40	7.55
Manitoba Pool Elevators	-	-	-
Parrish and Heimbecker	7.25	7.38	7.53
N. M. Paterson	7.15	7.39	7.52
Pioneer	7.26	7.38	7.53
Saskatchewan Wheat Pool	7.24	7.38	7.53
United Grain Growers	7.24	7.38	7.38
Maximum Tariff	9.90	10.41	10.83

Alberta

Company	1982-83	1983-84	1984-85
Alberta Wheat Pool	7.16	7.35	7.35
Cargill	7.15	7.37	7.37
Manitoba Pool Elevators	-	-	-
Parrish and Heimbecker	7.10	7.32	7.35
N. M. Paterson	6.90	7.14	7.35
Pioneer	7.16	7.35	7.35
Saskatchewan Wheat Pool	-	-	-
United Grain Growers	7.16	7.35	7.35
Maximum Tariff	9.90	10.41	10.83

Source: Canadian Grain Commission, "Summary of Primary Elevator Tariffs," (1982-1984).

katchewan tariffs downward to within two cents of the Saskatchewan Wheat Pool standard. While this is perhaps the clearest example of price leadership, other instances do exist. In August 1981, Pioneer, United Grain Growers, and Paterson all filed tariffs equal to $6.75 per tonne, Parrish and Heimbecker filed $6.70 per tonne and Cargill filed $6.60 per tonne. On August 27, 1981, the Canadian Grain Commission revealed that Cargill had raised its elevation and dockage removal tariff to $6.75 per tonne.

Who are the leaders in this process? Since 1980, only the three farmer-owned cooperatives, - Manitoba Pool Elevators, Saskatchewan Wheat Pool, and Alberta Wheat Pool - have never adjusted their filed tariffs during the crop year. It therefore seems that the other firms base their pricing practices on those of the Pools. This relationship does not necessarily ensure that tariffs are minimized, as there are examples of firms adjusting their initially filed tariffs upward.

In 1984-85, United Grain Growers held their tariffs at 1983-84 levels. There was no price adjustment by other firms in Manitoba and Saskatchewan while all major Alberta firms froze their tariffs as well. Conversations with United Grain Growers personnel suggests that this strategy was not immediately effective in influencing farmer's delivery choices, but might provide longer term public relations benefits.

Under certain conditions, a rate filing policy such as that required under the Canada Grain Act may actually facilitate collusive behavior. Hong and Plott provide experimental evidence to suggest that higher prices and efficiency losses are the result, when prices are posted in

an oligopolistic market.[1] Hong and Plott conclude that large sellers benefit from increased information at little or no cost, making it difficult for other sellers to cut prices successfully. Under such conditions, one might expect unofficial price or quality adjustments to occur.

5.3 RATE UNIFORMITY AND PRICE SIGNALS

The tariffs listed in Table 3 are those charged at the bulk of each company's elevator points. Some firms occasionally file different rates for certain points. In 1984, Parrish and Heimbecker filed lower elevation tariffs at Moose Jaw, Saskatoon, Yorkton, and Transcona than they did in the rest of Saskatchewan and Manitoba. However, variations in rates at individual points are generally rare.

As stated previously, a rough criterion for allocative efficiency is that prices reflect the cost of providing the service. Some industry representatives have suggested that uniform rates have led to the preservation of older, antiquated elevators at the expense of lower cost, high throughput facilities, because the rates farmers pay do not reflect the relative costs of those facilities. For example, a presentation to the 1984 Canadian Grain Commission Tariff Meeting suggested that farmers are unaware of true grain handling costs:[2]

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[1] J.T. Hong and C.R. Plott, "Rate Filing Policies for Inland Water Transportation: An Experimental Approach," Bell Journal of Economics 1 (Spring, 1982): 1-19.

[2] Canadian Grain Commission, Tariff meeting of April 6, 1984, Winnipeg (Remarks of Barb Isman, Palliser Wheat Growers), 60.

> "That brings us to point three of our brief and that is that farmers do not know how much the system costs. Of course if somebody told me it costs $1.50 more to go to a convenience store to buy pantyhose, than it did to go to a department store I'd go to the department store...If farmers have made that choice (to buy at the convenience store)...I think that the economics of it have not been brought forward clearly enough..."

In other words, it is alleged that farmers continue to lobby for the preservation of existing but inefficient facilities because the true cost of operating those facilities is not reflected in the handling tariffs.

5.4 INTER-PROVINCIAL TARIFF VARIATIONS

Table 3 also indicates that tariffs filed by each firm vary by province. In general, rates are highest in Manitoba and lowest in Saskatchewan. Grain Company spokesmen argue that these rates are based on provincial cost variations. A related hypothesis might be that the three Pools each possess a different cost structure and file rates based upon these costs. Since each Pool operates intra-provincially, the price-followers adjust their rates according to these provincial boundaries.

5.5 CATEGORIES OF TARIFFS: SUITABILITY AND RELEVANCE

The regulations regarding tariffs allow companies to charge different rates for each type of grain handled. Table 4 provides the prescribed maximums for each type of grain.[3] While the evaluation of the appropriateness of these relative levels is beyond the scope of this study, it

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[3] Canadian Grain Commission, "Summary of Primary Elevator Tariffs," (October 10, 1984).

TABLE 4

Maximum Tariffs for Various Grains: 1984-85 ($/Tonne)

	Elevation	Removal of Dockage	Storage
Wheat	8.28	2.55	0.025
Oats	13.58	4.18	0.042
Barley	10.26	3.16	0.031
Rye	8.69	2.67	0.027
Flaxseed	13.02	4.00	0.030
Rapeseed	13.24	4.08	0.030
Corn	9.11	2.80	0.028
Sunflower Seed	29.36	9.03	0.069
Soybeans	11.03	3.39	0.025
Other Grains	11.43	3.52	0.030

is necessary to point out that wheat has served as a proxy for all other grains during the previous discussions of tariff filing. This assumption is justified on two counts. First, rate filing behavior for wheat is similar to that for other major grains. Second, wheat accounted for 65% of the grain shipped through prairie primary elevators in 1982-83.[4] Given that wheat is such a significant source of revenue, observations regarding wheat tariffs are likely to be most representative of overall pricing relationships.

A second characteristic of the existing tariff structure is the categorization of various grain handling services. Separate tariffs exist for the following activities: Receiving, elevating and loading out (elevation), removal of dockage, storage, custom cleaning, and custom drying. For the purposes of this study, elevation and removal of dockage are chosen as the appropriate tariffs for analysis. These two services

[4] Canadian Grain Commission, Grain Deliveries at Prairie Points: Crop Year 1982-83, Winnipeg (1983).

are required for all grain shipped through a primary elevator.

Storage is charged to the farmer on all grain that is not immediately sold. Ten free days are allowed, then storage charges are assessed on a cents-per-tonne per day basis. The Canadian Wheat Board continues to pay for storage on Board Grains after it is sold by the farmer, but any non-board or off-board grains that are purchased by the elevator company become its responsibility. The complexity of including this item as part of the observations regarding tariff filing behavior far outweighs the benefits, as most companies charge the maximum for storage. However, storage charges are a significant source of revenue for primary elevators and must be considered in that context when costs are compared to revenues.

Custom drying and custom cleaning are ignored as they are discretionary services, independent of the grain movement process, and subject to an entirely different set of competitive pressures.

The distinction between removal of dockage and elevation appears to be somewhat arbitrary where rate setting is concerned. For example, Cargill charges (in Saskatchewan) $5.94 and $1.61 for elevation and removal of dockage respectively, while Saskatchewan Wheat Pool charges $6.40 and $1.13. Cargill's total fee is $7.55 while Saskatchewan Wheat Pool's is $7.53 - effectively the same total price.

Removal of dockage actually represents a service performed in the terminal sector and passed on to the farmer through charges at the primary sector. Cargill charges $1.60 at the terminal while Saskatchewan

Wheat Pool charges $1.58.[5] Where terminal dockage charges exceed the primary tariff, the debit is assessed against the primary elevator for accounting purposes, but not charged to the producer. Elevation charges in the terminal are charged to the exporter, but competition regarding this tariff is prohibited by the Canadian Wheat Board.[6] Finally, terminal storage tariffs are uniformly filed at the regulated maximum. Terminal sector charges can thus be ignored in evaluating competitive behavior, as competition does not occur.

5.6 PRICE DISCRIMINATION BETWEEN CUSTOMERS

Canada Grain Act regulations require that grain companies not discriminate between individual farmers, in terms of the handling tariffs assessed. While a company would be unlikely to offer a lower handling tariff to an individual farmer, discounts do occur in several indirect ways. For example, the potential exists for loyal customers at a point to enjoy advantages in grading or dockage (assessed by the elevator manager). The three Pools and United Grain Growers meanwhile, provide patronage rebates to their farmer-members.[7] Filed tariffs for these companies are therefore somewhat greater than what is eventually paid. Finally, some firms have begun introducing "trucking discounts" to se-

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[5] All tariffs are from: Canadian Grain Commission, "Summary of Primary and Terminal Elevator Tariffs." Winnipeg (October 10, 1984).

[6] As evidence of this price fixing, see the correspondence between Canadian Wheat Board Commissioner W. H. Smith to the Western Grain Elevator Association in Appendix One.

[7] For an evaluation of the realized value of these patronage refunds, see: E.H. Andrews and G.A. Mumey, "The Effect of Taxes and Timing on the Value of Producer Co-operative Dividends," Canadian Journal of Agricultural Economics 27 (July, 1979): 35-43.

lected producers. Consider this discussion at the Canadian Grain Commission Tariff Meeting between representatives of Cargill (Mr. Dawson), Palliser Wheat Growers Association (Mr. Watson) and the Commission (Chief Commissioner Pound and Chairman Leith).[8]

> "Mr. Watson: ...What would your reaction be if a farmer would come to your particular elevator and say 'Okay, I have 7,000 bushels of grain. I will deliver half to your elevator if you charge me $4.00 per tonne instead of charging $7.00 per tonne?
>
> Mr. Dawson: If he was talking about 20,000 tonnes I would like to talk to him.
>
> Chairman: Then we would like to talk to both of you.
>
> Mr. Pound: Just for the record could you repeat your question and report your answer.
>
> Mr. Watson: I wonder if you would give producers a reduced tariff for hauling grain if they would haul all their grain to your company.
>
> Mr. Dawson: You didn't say reduced tariff, and I didn't say I would give you a reduced tariff, I just said I would like to talk to you. I might give you a trucking premium."

Under conditions such as these, the restriction on offering reduced tariffs to individual producers is largely ineffective. Indeed, the significance of the filed tariffs themselves is called into question, when enforcement is uneven.

It might also be argued that such premiums are a positive competitive strategy, as producers are effectively offered lower rates to deliver to a specific elevator. If such rates can be justified on the basis of improved cost efficiencies (due to higher capacity utilization), the only defense for the Commission restriction must be related to fairness.

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[8] Canadian Grain Commission, Tariff Meeting of April 5, 1984, Winnipeg (Remarks of Mr. Dawson, Mr. Watson, Mr. Pound, and Chairman Leith), 36.

5.7 SUMMARY: PRICE LEADERSHIP IN AN OLIGOPOLISTIC SETTING

This chapter examines the conduct of Western Canadian primary elevator firms within a theoretical oligopoly framework.

This analysis suggests that the process of tariff determination conforms to the price leadership model. While this leadership may well be tacitly rather than explicitly collusive, upwards price adjustments by some firms suggest that equilibrium rates are not as low as they might be under different competitive conditions. The current practice of publishing filed tariffs may actually serve to diminish, rather than sharpen, competition.

The various types of price shading and service differentiation suggest that regulating rate levels without accompanying attention to the quality of service, makes that regulation less effective than originally intended. In addition, the large cushion between the maximum and filed tariffs shows that the Canadian Grain Commission has largely removed itself from the rate determination process. Consequently, the Pools appear to be the primary actors in determining general rate levels.

Chapter VI

THEORETICAL AND PRACTICAL CONSIDERATIONS IN COST ANALYSIS

6.1 INTRODUCTION: QUESTIONS TO BE ANSWERED

An accurate analysis of grain handling costs is necessary for the evaluation of various performance criteria. Such a cost study must address the following issues:

1. What are the actual costs of the services performed in prairie country elevators?
2. How do these costs vary between different scales of operation, in terms of size of elevator and extent of capacity utilization?
3. Are apparent anomalies in the rate structure, such as tariff variations between provinces, based upon actual cost differences?

In this chapter, an attempt is made to develop a model to provide answers to these questions. There are two relevant bodies of literature involved in this modelling process: prior primary elevator cost studies and received microeconomic theory. A review of the appropriate literature follows.

6.2 COST-VOLUME RELATIONSHIPS: PRIOR EMPIRICAL RESEARCH

A number of studies have indicated that total costs are not highly responsive to variations in volume handled. Zasada and Tangri, for instance, found that "a suitable functional relationship (between total cost and volume) could not be found."[1] A study prepared for the Grains Group in 1970 pointed out that total costs in the country elevator system showed only "moderate sensitivity" to volumes handled.[2] As pointed out earlier, this situation can be partially attributed to the high proportion of fixed costs characteristic of the industry. A second influencing factor is the excess capacity which appears to exist in the Western Canadian elevator industry. The received view states that the industry has overbuilt elevator facilities in response to relatively high storage rates and the quest for locational advantage.[3]

Economic theory suggests that where excess capacity exists, there may be cost economies possible with an increase in capacity utilization. In other words, unit costs vary inversely with volumes handled. The 1970 Grains Group study substantiates this proposition by showing that marginal costs are consistently less than average total costs for all sizes of elevators.[4] Tangri, Zasada, and Tyrchniewicz regress "average operat-

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[1] Don Zasada and Om P. Tangri, An Analysis of Factors Affecting the Cost of Handling and Storing Grain in Manitoba Country Elevators (University of Manitoba [1967]), 70.

[2] P. S. Ross & Partners, Country Grain Elevators Cost Study, Prepared for the Grains Group, (1970), 69.

[3] Don Zasada, "The Regulation of Handling and Storage Tariffs in the Canadian Country Elevator Industry" (Ph.D. Thesis, University of Manitoba, 1982).

[4] P.S. Ross and Partners, Country Grain Elevator Cost Study, 73.

ing costs" against volume handled per elevator.[5] They conclude that average costs decline rapidly at lower volumes and eventually become asymptotic to some constant level at higher volumes. The authors thus imply that there are significant economies available to the grain elevator industry as throughput increases.

It should be noted that a Canada Grains Council study concluded that fixed costs were low relative to variable costs in most elevators.[6] The Council's classification of salaries and power as variable costs is questionable however, as average variable costs behave similar to average fixed costs in their regressions.

To this point, we have only discussed the potential for economies of capacity utilization within elevators. Theoretically, there should be some scale of elevator capacity that is optimal for minimizing average operating costs. However, in the face of excess capacity it is difficult to determine what that size might be. The Canada Grains Council, for example, found that average total costs actually increased as the scale of elevator increased.[7] This conclusion is likely due to the failure to account for the impact of capacity utilization on average total costs. If larger facilities are less fully utilized than smaller elevators, costs would not be spread across as large a base.

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[5] Om P. Tangri, D. Zasada and E. W. Tyrchniewicz, Country Grain Elevator Closures: Implications for Grain Elevator Companies, (University of Manitoba [1973]).

[6] Canada Grains Council, Grain Handling and Transportation Area Eleven Study (Winnipeg, 1975), 69-89.

[7] Ibid., 82.

Sorenson and Keyes[8] observed that the alleged economies of scale to be gained by operating larger elevators, only occur if these plants are producing at a level approaching full capacity. When there are long periods of underutilization, the high overhead costs associated with large elevators might well offset such advantages. A small plant used more intensively might well have lower unit costs than a large plant with excess capacity. In conclusion, Sorenson and Keyes stated that "factors affecting plant utilization are more important in determining economies of operation than plant size."[9]

The question of whether these cost-volume relationships still hold in the Western Canadian primary elevator sector is an important one, given recent changes in the industry. For example, the availability of significant economies of utilization within elevators suggests that the level of handlings per elevator should be increased. Since the early 1970's there has been a major increase in the volume of grain handled by the primary elevator sector, while the number of elevators in use has declined substantially. Existing elevators are therefore likely to be operating at a different point on the average cost curve. It is possible that potential gains from increasing elevator capacity utilization are much less than was the case in the early 1970's.

A second area of concern is the estimation of the most efficient scale of elevator. The 1970's and 1980's have witnessed significant construction programs by many elevator companies. Cost estimation based

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[8] V. L. Sorenson and C. D. Keyes, Cost Relationships in Grain Plants, (Michigan State University [1962]).

[9] Ibid., 28.

upon data for these firms might reveal changes in the relative cost effectiveness of various sizes of elevators.

An expressed concern of earlier studies was that elevators are not a homogeneous group when it comes to cost structure. As one study put it:[10]

> "...it is apparent that the size of elevator is not a precise concept as it is conceptually difficult to know if a modern plant of 150,000 bushels is operationally identical to a recently built 80,000 bushel elevator attached to a 70,000 bushel elevator built, for example, 40 years ago..."

This problem persists today and poses some difficulties in classifying elevators for the purposes of defining scale of operations. One change that has taken place, is the replacement of the individual elevator by the delivery point as the appropriate operating unit making cost data unavailable on an individual elevator basis.

A key factor underlying the thesis of available economies of utilization, is the observation that a large portion of total costs are fixed independent of volume. As larger volumes are handled, these fixed costs are spread across a larger base. Changes in the extent of fixed costs might well affect this theory. The composition of a typical elevator's cost structure has undoubtedly changed in the past ten years. For example, property and business taxes are now likely to be a much less significant factor relative to items such as fuel and power, which have experienced high inflation rates. Secondly, there may have been a shift in the physical quantities of the inputs used (ie. Is a modern elevator more capital intensive than a 1970-era facility?). Finally, have firms

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[10] Tangri, Zasada, and Tyrchniewicz. Country Grain Elevator Closures: Implications for Grain Elevator Companies, 21.

become more flexible in terms of varying their costs, through such things as the use of more casual labour? Any of the above changes might well have an effect upon the extent of fixed costs and the persistence of excess capacity.

6.3 MICROECONOMIC THEORY APPLIED TO PRAIRIE GRAIN ELEVATORS

Figure 3 portrays the familiar short run average and marginal cost curves characteristic of an individual plant producing a single product. Up to production level A returns to the plant are increasing, as average total costs decline due to increased volumes. Beyond that point (where marginal costs equal average total costs) diminishing returns set in. Optimal output occurs where marginal cost equals marginal revenue (price).

The cost situation that prevails in the primary elevator industry seems to differ somewhat from this situation. In Figure 4 the primary elevator industry is characterized by extremely high fixed costs (such as capital expenditures and costs such as salaries and power) that are largely invariate in the short run. Marginal costs are extremely low over most ranges of output, then rise rapidly as the elevator's fixed resources approach their productive limit. For example, at some level of output overtime and casual wages begin to accrue. Depending on the size of capital costs, the marginal cost curve might not intersect the average total cost curve at reasonable output levels.

The extent to which this hypothesis holds is important in assessing the potential profitability of the industry. If marginal costs are in-

FIGURE 3
THEORETICAL COST STRUCTURE

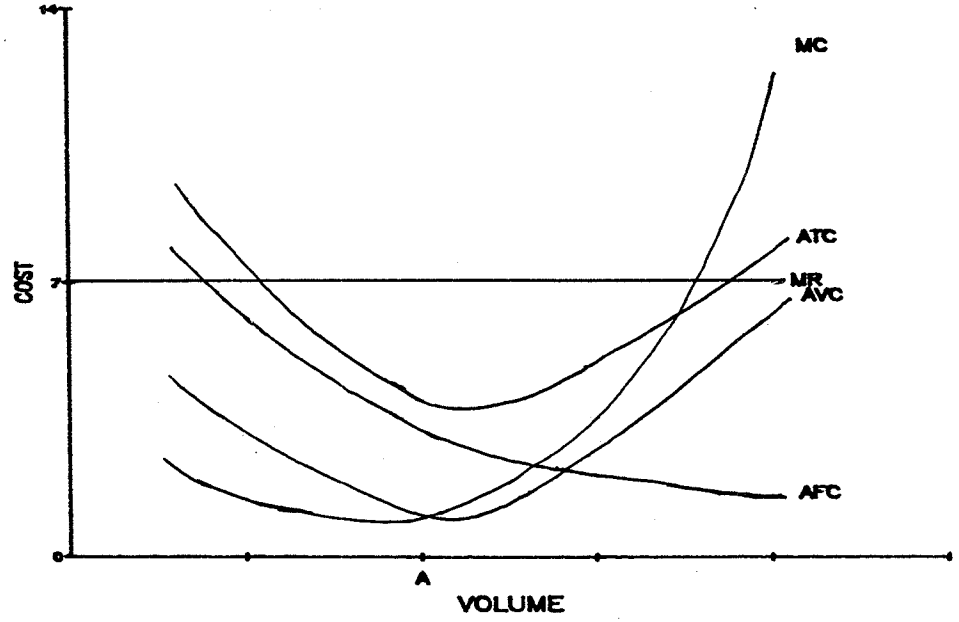
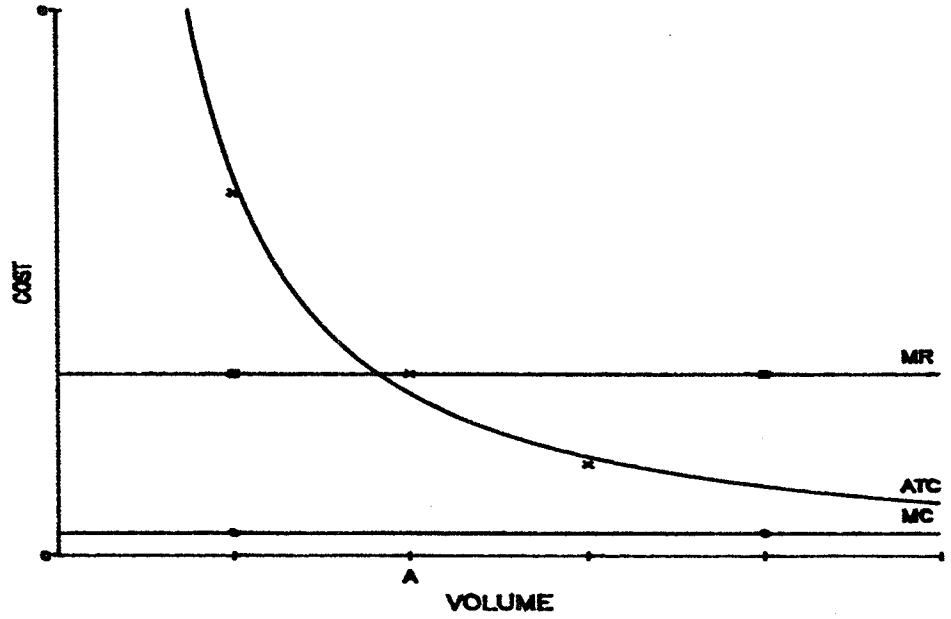


FIGURE 4
ELEVATOR COST STRUCTURE



deed small relative to average total costs, increasing returns to scale will prevail. That is, higher volumes will lead to lower average total costs. When average total costs fall below marginal revenue, significant profits result.

Similar short run average total cost curves can be drawn for various scales of elevators. The envelope of the minima of each of these curves defines the long run average cost curve for the industry as a whole (Figure 5).

6.4 DISCUSSION OF COSTS AND DATA REFINEMENT

A statistical cost function is representative of a theoretical cost curve only to the extent that all extraneous cost determinants can be accounted for. Joel Dean refers to this process as "cost purification" and offers the following advice:[11]

> "In general, three steps are needed to eliminate the influence of these irrelevant cost forces. The first is to select a plant and a period of observation in which dynamic elements, such as changes in the size of the plant, technical production methods, managerial efficiency, and so forth, are at a minimum. The second is to rectify the cost and output data recorded in the firm's accounts in order to remove the effect of remaining irrelevant factors such as changes in wage rates, prices of materials, tax rates, special accounting allocations, lags caused by the production cycle and so forth.
>
> The third step in removing other cost influences is to hold their effect constant by means of multiple regression analysis. Cost may be affected by operating variables and other dimensions of output... Hence it is necessary to take account of those additional independent determinants which reflect operating conditions suspected to exercise an important influence on short period fluctuations in cost."

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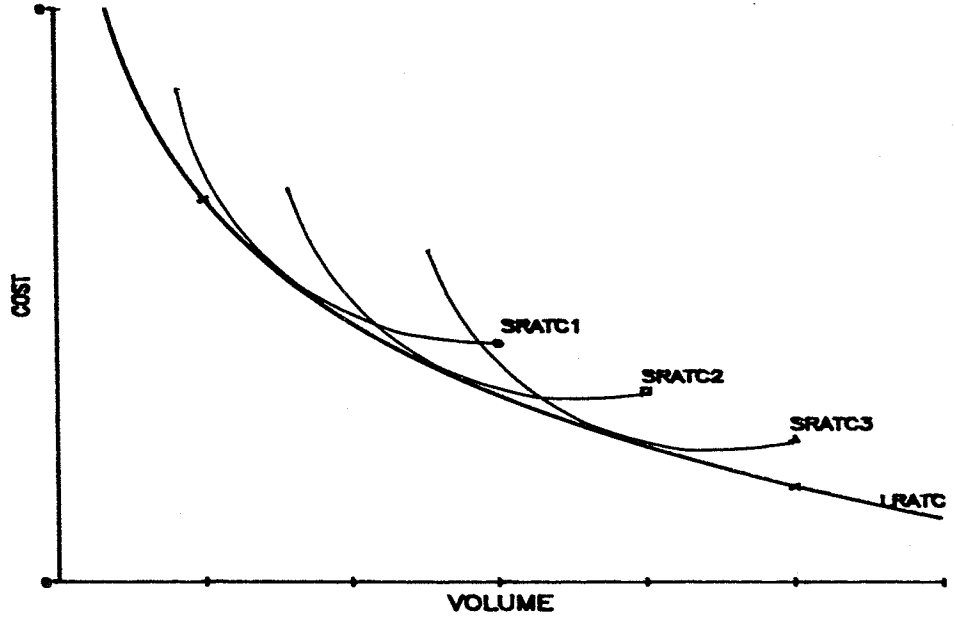
[11] Joel Dean, Statistical Cost Analysis (New York; McGraw-Hill Book Company, 1960), 10.

FIGURE 5
LONG RUN AVERAGE TOTAL COSTS



Dean's suggestions[12] regarding data refinement are applied in this analysis of grain handling costs.

6.4.1 The Sample in General

The data sample employed in this research consists of the individual operating unit accounts for three grain companies - Pioneer Grain Company Limited, United Grain Growers Limited, and Manitoba Pool Elevators.

Appendix 2 provides some descriptive statistics regarding the sample. Generally, the sample consists of 1472 observations spread over the prairie provinces and the Peace River region of British Columbia. Data are for two consecutive one year periods (from August 1, 1982 to December 31, 1984). The periods are not identical as two firms use the crop year for reporting, while the other firm uses the calendar year. The period is generally short enough that there are likely to be few changes in management practice, technology, or reporting, and recent enough to be relevant.

Accounting procedures necessitate that observations be based on annual units. This does not allow for the capture of the impact of different seasonal operating intensities upon costs. Using two years of observations introduces the problem of inflation. This is dealt with by including a dummy variable representing the year of observation.

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[12] Ibid., 11-17.

6.4.2 Categories of Costs

Two categories of costs are associated with the movement of grain through a primary elevator. "Plant related" or operating costs, can be defined as those costs which are clearly related to the operation of the elevator--including salaries, repairs, power, insurance, rentals and taxes, miscellaneous costs, and depreciation.

"Salaries" consist of the wages and benefits paid to managers, assistants, and casual labour.

"Repairs" are made up of all repair costs incurred at a point, excluding those repairs that are defined as "major" or "long-term" in nature. Major repairs are treated differently by each firm, but in each case a portion (or all) of such repairs are allocated to capital costs. The rationale behind this procedure is that an item such as installing a larger scale is more of a capital improvement than a repair.

"Power" is defined as charges for electricity and fuel. "Insurance" includes premiums on policies covering property and grain-in-store. "Rentals and taxes" include all rentals of land, buildings, and equipment as well as municipal property taxes. "Miscellaneous costs" cover a variety of out-of-pocket expenses such as office supplies and telecommunications.

"Depreciation" is accepted as reported by individual firms. While each firm uses a slightly different formula for calculating depreciation charges, the difference is slight relative to the difficulties in adjusting for these differences.

One alternative to the inclusion of reported depreciation is to consider capital expenditures as "sunk costs" that cannot be recovered once the investment is made. Where the objective is to evaluate the total cost of providing grain handling services however, overlooking depreciation expense is not likely appropriate. Depreciation is a recognized cost of doing business and reflects, to a varying extent, the capital costs of the operation. As Lytle and Hill point out, capital costs are particularly relevant if an industry is to attract new investment.[13]

Unfortunately, book depreciation is generally based on the age of an investment, not necessarily upon physical deterioration and obsolescence of equipment. The implications of this situation are discussed by Dean:[14]

> "Ideally, use-depreciation should be separated from time depreciation, since it alone is relevant in determining the cost occasioned by different levels of operation. The shape of the marginal cost function depends on whether use-depreciation is present and whether it is a linear, increasing, or decreasing function of intensity of utilization. This relation depends upon the effects of differing intensity of utilization upon the deterioration of equipment...Depreciation caused by physical deterioration due solely to the passage of time and by losses in value as a result of technological progress or changes in product specification (obsolescence) affects merely the height of the intercept of the total cost function on the cost axis, not the shape of the function itself and not its marginal cost."

Where depreciation is time-based, marginal cost is understated to the extent that repair and maintenance outlays do not fully cover use-related losses in value. This situation is extremely likely in the case of

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[13] P.W. Lytle and L.D. Hill, "The Optimum Combination of Resources Within and Among Country Elevators," American Journal of Agricultural Economics 55 (May 1973); 205.

[14] Joel Dean, Statistical Cost Estimation, 15.

older, fully depreciated elevators that are scheduled for closure by their respective owners.

A second cost category includes those costs which are not directly related to plant operation. "Share of administration expense" for example, is usually an assigned portion of head or district office operating expenses. In the firms included in this sample, this cost category generally excludes costs related to activities other than grain handling.

Should "share of administrative expense" be included in the analysis of total costs attempted in this study? While some economists claim that administration expenses generally bear little relation to the operating conditions of individual plants,[15] this argument is weak in the specific case of the elevator industry. Many administrative activities previously performed within the primary elevator itself, are now completed by head office personnel. Furthermore, items such as grain accounting and computer services are closely related to country operations. Where the objective is an evaluation of cost-based performance criteria, the definition of total costs should include a share of administration expense. For the purposes of this research, administration expense is calculated by dividing the firm's total administration expenses by the number of operating units - resulting in a fixed cost per operating unit.

"Interest on Investment" represents the opportunity cost of the undepreciated portion of capital investment. The justification for charging interest on investment is that the elevator is a liquid asset that

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[15] Ibid., 17.

could be put to other uses.[16] However, only one of the sample firms includes this item on its books as a cost of doing business. This study similarly takes the approach that interest on investment is an artificial cost, that relates more to a firm's expected rate of return than to cost realities. Estimating the actual cost of capital for individual firms would be a difficult task and might prove pointless, if it is accepted that the recovery of such costs actually represent profits for the firm.

6.4.3 Definition of Specific Variables

Dependent variables used in the analysis include total costs and average total costs. Regressors include volume, storage capacity, turn rate and dummy variables representing province and size of elevator. These variables are defined below.

"Total costs" consist of the sum of the seven plant related cost categories (salaries, repairs, power, insurance, rentals and taxes, miscellaneous, and depreciation), as well as administration expense. "Average total costs" are defined as total costs divided by volume.

"Volume" is strictly defined as the total tonnes of grain received into an elevator during the observation period.

"Storage capacity" is used as a proxy for size of plant and is defined as the total storage capacity (in tonnes) of the operating unit in question. While other physical characteristics, such as size of leg or

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[16] Donald Zasada, "The Cost of Handling and Storing Grain in Manitoba Country Grain Elevators," 68.

length of car spot, are also important in determining an elevator's grain handling capacity, storage capacity provides a convenient and strongly correlated proxy for these factors.

The "turn rate" of an elevator provides a measure of the extent of capacity utilization and is defined as the ratio of volume handled to storage capacity.

The presence of multicollinearity between the variables "capacity" and "turn rate", makes it necessary to categorize elevators by capacity and use dummy variables for each range. Elevators are broken down into the following ranges: 700-2000, 2001-3000, 3001-4000, 4001-5000, 5001-6500, and 6501-13000 tonnes storage capacity.

6.5 MODEL SPECIFICATION

The approach taken in estimating primary elevator grain handling costs is that of single equation, multiple regression analysis. Intrilligator suggests several functional forms that an average total cost curve might take and discusses the estimation of each.[17] Several functional forms were considered in developing estimates of total cost and average total costs, including quadratic, linear, and logarithmic formats. Prior empirical work[18] suggests that a logarithmic function often provides a good estimate of an average total cost curve in a prairie primary elevator. This consensus was confirmed by extensive pre-test-

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[17] M.D. Intrilligator, Econometric Models, Techniques, and Applications, 251-298.

[18] Canada Grains Council, Grain Handling and Transportation Area Eleven Study (Winnipeg, 1975), 69-89.

ing, during which the only form of equation to consistently provide good results was log linear of the type:[19]

Log(AVERAGE TOTAL COST) = a1 +[a2 x Log(VOLUME)]+[a3 x Log(TURN RATE)]

Pre-testing involved trying different equation formats under various ranges of elevator capacity. Linear equations generally did not fit the data very well, with R-square statistics ranging from 0.20 to 0.30. Quadratic equations provided a better fit in most cases, but still resulted in R-square statistics of less than 0.50.

The dummy variables technique is employed in order to determine the impact of capacity and provincial location of elevators upon costs, and to remove the impact of inflation. The use of dummy variables in this study is in accordance with Miller and Rao.[20]

6.6 SUMMARY: THE NATURE OF THE COST ANALYSIS

Prior empirical research suggests that the prairie primary elevator industry displays high fixed costs, a low level of capacity utilization, and (as a result) decreasing average total costs. The cost analysis undertaken in this thesis attempts to determine whether these conditions continue to exist today.

The data sample employed in this analysis is comprised of the unit accounts for three primary elevator companies. Costs are generally accepted as reported, with two exceptions. Administration expense is cal-

[19] Natural logarithms are taken in all cases.

[20] M. Miller and P. Rao, Applied Econometrics (Belmont, California: Wadsworth Publishing Company, 1971).

culated as a fixed cost per operating unit and interest on investment is excluded. Costs that are clearly related to non-grain handling activities are excluded as well.

Previous research and model pre-testing indicate that a log linear equation form is best suited for the estimation process.

Chapter VII

RESULTS OF THE COST ANALYSIS

7.1 GENERAL RESULTS: THE COST-VOLUME RELATIONSHIP

As Chapter Six suggests, it is possible to estimate a number of scenarios from the data available for this research. However, strict attention to the objectives of the cost study serves to limit these options.

Ultimately, four regressions summarize the results of the cost study and provide a basis for subsequent performance analysis. Table 5 summarizes these results. In all cases, average total cost is the dependent

TABLE 5

Regression Results from the Analysis of Primary Elevator Costs

VARIABLE	MODEL 1	MODEL 2	MODEL 3	MODEL 4
Intercept	6.0666	5.1200	6.1201	5.4127
Log Volume	-0.3847	-0.3622	-0.3801	-0.3523
Log Turn Rate	-0.2274	-0.2484	-0.2516	-0.2774
Log Year	-0.0253a	-0.0259a	-0.0235a	-0.0241a
6501-13000 Tonnes	N.I.	-0.2570	N.I.	-0.1877a
5001-6500 Tonnes	N.I.	-0.2327	N.I.	-0.1766
4001-5000 Tonnes	N.I.	-0.2036	N.I.	-0.1705
3001-4000 Tonnes	N.I.	-0.1752	N.I.	-0.1452
2001-3000 Tonnes	N.I.	-0.1305	N.I.	-0.1014
Saskatchewan	N.I.	N.I.	-0.1400	-0.1397
Alberta	N.I.	N.I.	-0.0327a	-0.0333a
R-Squared	0.6546	0.6585	0.6847	0.6879

Level of Significance: All coefficients are significant to 99% except:
a - 95% significance.
N.I. indicates that the variable is not included in that model.

variable.

Model 1 is designed to provide an understanding of the basic relationship between average total cost and the volume of grain handled. The results indicate that increasing volume has a significant impact in reducing costs--both absolutely (the Volume coefficient) and in terms of volume's impact on capacity utilization (the Turn coefficient). Since all estimates are in logarithmic form, the coefficients actually represent cost elasticities. For example, Model 1 yields the following equation:

$$ATC = 431.2121 \times VOLUME^{-.3847} \times TURN^{-.2274} \times YEAR^{-.0253}$$

In this equation, the elasticity of average total cost with respect to volume is -0.3847. That is, a 10% increase in volume handled induces a 3.847% decrease in average total cost.[1]

Inflation in grain elevator costs is shown to be approximately 2.53% (the Year coefficient) between the two years that the data covers.

The Turn Rate coefficient provides an estimate of the impact that capacity utilization has on costs. In Model 1, this coefficient is -0.2274, indicating that increasing capacity utilization by 10% reduces average total cost by 2.274%. Individually assigning cost reductions to Volume and Turn Rate changes is neither possible nor useful, as these two variables are directly related.

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[1] This conclusion ignores the effect of an increased turn rate on average total cost.

7.2 IMPACT OF SIZE AND LOCATION ON COSTS

Model 2 introduces the impact of elevator scale upon average total costs, by including dummy variables for various elevator capacities. As in Model 1, T-statistics are all highly significant, but the R-squared statistic is slightly improved.

The coefficients of the capacity dummy variables indicate the relative cost structures of various sizes of elevators. For example, a 2001-3000 tonne elevator is 13.05% cheaper to operate than a 700-2000 tonne facility, operating under the same conditions.

In general, the results from Model 2 support the hypothesis that larger scale elevators are less costly to operate (in terms of average costs) than small facilities, when both are operated at the same level of utilization.[2]

Model 3 tests the theory that primary elevator costs vary from province to province. Dummy variables are included in the usual model that includes volume, turn rate, and year. Results show costs in Alberta to be roughly 3% lower than in Manitoba, and Saskatchewan to enjoy a 14% cost advantage over Manitoba.

Model 4 confirms the hypothesis that larger scale elevators display lower average total costs than relatively smaller facilities. However, these coefficients attribute lower (although still significant) cost savings to larger elevators, than the coefficients in Model 2.

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[2] This conclusion is more clearly demonstrated in the next chapter.

When two categories of dummy variables are used (as in Model 4), there is the potential for multicollinearity to develop between the provincial and capacity dummy variables. Specifically, if larger elevators tend to be located in one province rather than another, individual influences of capacity and location upon costs may be difficult to distinguish. Generally, the overall regression remains significant (high R-Squared) but individual coefficients are less reliable and sometimes insignificant.[3] Analysis of the correlation matrix between provinces and capacity does not indicate that any such tendency exists. This suggests that Model 4 may be more appropriate for cost estimation given its higher R-squared statistic and the fact that it explains both provincial and size-related cost variations.

7.3 GENERAL SIGNIFICANCE OF RESULTS

As the T-statistics indicate, individual regressors discussed in this chapter are all significant within reasonable confidence bounds. Tests for multicollinearity between independent variables proved negative once the capacity variable was converted to a series of dummy variables. Plotting of residuals against the independent variable (Average Total Cost) failed to reveal any indication of heteroskedasticity.[4]

Given the difficulty in accounting for the diversity of cost determinants in a grain elevator, R-squared statistics between 0.65 and 0.69 are satisfactory.

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[3] For further explanation of multicollinearity see: A. Koutsoyiannis, Theory of Econometrics 2nd ed., 177-182.

[4] For an explanation of the consequences of, and tests for, heteroskedasticity see: Peter Kennedy, A Guide to Econometrics, 76-83.

7.4 COMPARISON WITH RESULTS OF OTHER STUDIES

The results of this cost analysis are generally consistent with those of other such studies.[5] Tangri, Zasada, and Tyrchniewicz conclude that average total costs decline rapidly at lower volumes, eventually becoming asymptotic to some constant level at higher volumes.[6] The economies of capacity utilization discussed by Sorenson and Keyes[7] are also substantiated by this research. The conflicting results of the Canada Grains Council study[8] (in which average total costs were higher in larger elevators) are refuted by this cost research. It seems that the Council's results stem from a failure to identify capacity utilization as a significant factor in elevator cost.

7.5 SUMMARY OF LEADING RESULTS

The results of the cost analysis confirm and illustrate a number of theories regarding primary elevator costs.

1. Increased volumes lead to lower average total costs, as might be expected when fixed costs are high.
2. As capacity is more fully utilized (reflected in the turn rate) average total cost declines. This reflects widespread excess capacity in the elevators that were sampled.

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[5] A literature review is provided in Chapter Six.

[6] Om P. Tangri, D. Zasada, and E. W. Tyrchniewicz, Country Grain Elevator Closures: Implications for Grain Elevator Companies.

[7] V. L. Sorenson and C. D. Keyes, Cost Relationships in Grain Plants.

[8] Canada Grains Council, Grain Handling and Transportation Area Eleven Study.

3. A larger elevator operated at the same level of utilization (turn rate) as a smaller elevator generally has lower average total costs. This demonstrates that there are economies of size available to the industry, although these economies become less pronounced as size increases.
4. There are significant geographical cost differences in the primary elevator industry.

While these conclusions are interesting in themselves, the primary objective of this cost study remains the provision of actual primary elevator costs for the purpose of a performance evaluation. Given the significant variation in costs between different scales of elevator, as well as the differences between provinces, Model 4 seems best suited for this purpose.

Chapter VIII

PERFORMANCE UNDER RATE REGULATION

8.1 THE BASIS OF PERFORMANCE EVALUATION

For the purposes of this analysis, performance is evaluated in three areas. The question of efficiency in production is addressed by comparing least cost scenarios to actual operating costs. Efficiency in resource allocation is defined in terms of the proximity between filed tariffs and average total costs. Consideration is also given to sources of revenue other than the official tariff schedule. Finally, fairness is discussed in terms of income transfers between groups.

8.2 PRODUCTION EFFICIENCY AND CAPACITY UTILIZATION

The basic grain handling service performed in country elevators is quite straightforward in nature. Grain is received into the elevator, stored temporarily, and loaded out (usually into a rail car). The total cost of moving one tonne of grain through the elevator is a dual function of the size of the elevator and the intensity of utilization.

A larger elevator incurs higher fixed costs but allows greater grain handling capacity, hence wider spreading of those fixed costs. Ideally, there is a scale of elevator at which the increased fixed costs are not offset by increased handling economies. At this point, the optimal scale of elevator is reached.

Regardless of the scale of elevator in question, increased utilization of facilities leads to lower average costs. Total costs are spread over larger volumes so unit costs fall. In general, production is efficiently organized when the most efficient scale of elevator operates at the least cost level of utilization.

Over-expansion of capacity contradicts this desired result. If too many elevators compete for a finite amount of grain handling, there is unlikely to be sufficient grain for effective capacity utilization. Similarly, if an elevator is too large relative to the cost effective grain collection area, fixed costs cannot be spread so as to achieve the lowest level of average total cost.

Table 6 portrays the relative costs of various scales of elevator. The results suggest that the largest prairie elevators generally exhibit the lowest average total costs. Conversely, the smallest scale of elevator (700-2000 tonnes) possesses the highest average total costs. At a turn rate of four, the cost of moving one tonne of grain through a 700-2000 tonne Saskatchewan elevator is $10.45, while the cost in the 6501-13000 facility is $5.60.

So how can elevator companies continue to operate these small "inefficient" elevators? The answer lies in the capacity utilization concept. Many smaller elevators operate at turn rates that are much higher than the industry average. Logically, it is easier to obtain 15,000 tonnes of business for a 2,500 tonne elevator than 60,000 tonnes for a 10,000 tonne elevator. Table 7 summarizes the average turn rates for each scale of elevator in the sample.

TABLE 6

Average Total Cost at Various Turn Rates

	AVERAGE TOTAL COST		
CAPACITY/TURN RATE	MANITOBA	SASKATCHEWAN	ALBERTA
6501-13000 Tonnes			
10 Turns	$3.62	$3.15	$3.50
6 Turns	4.99	4.34	4.83
5 Turns	5.60	4.87	5.42
4 Turns	6.44	5.60	6.23
3 Turns	7.72	6.72	7.47
2 Turns	9.97	8.67	9.65
5001-6500 Tonnes			
10 Turns	4.02	3.49	3.89
6 Turns	5.54	4.82	5.36
5 Turns	6.62	5.41	6.01
4 Turns	7.15	6.22	6.92
3 Turns	8.58	7.46	8.29
2 Turns	11.07	9.63	10.71
4001-5000 Tonnes			
10 Turns	4.30	3.74	4.16
6 Turns	5.93	5.16	5.74
5 Turns	6.65	5.79	6.44
4 Turns	7.66	6.66	7.41
3 Turns	9.18	7.98	8.88
2 Turns	11.85	10.30	11.46
3001-4000 Tonnes			
10 Turns	4.73	4.11	4.57
6 Turns	6.52	5.67	6.31
5 Turns	7.32	6.36	7.08
4 Turns	8.42	7.32	8.15
3 Turns	10.09	8.78	9.76
2 Turns	13.03	11.33	12.60
2001-3000 Tonnes			
10 Turns	5.41	4.70	5.23
6 Turns	7.46	6.49	7.21
5 Turns	8.37	7.27	8.09
4 Turns	9.63	8.37	9.31
3 Turns	11.54	10.03	11.16
2 Turns	14.90	12.95	14.41
0-2000 Tonnes			
10 Turns	6.75	5.87	6.53
6 Turns	9.31	8.10	9.00
5 Turns	10.44	9.08	10.10
4 Turns	12.02	10.45	11.62
3 Turns	14.40	12.53	13.93
2 Turns	18.59	16.17	17.98

TABLE 7

Average Turn Rates by Scale of Elevator

	Turns Per Year		
Size of Elevator	Maximum	Minimum	Mean
700-2000 Tonnes	16.27	1.42	5.50
2001-3000 Tonnes	28.91	0.44	4.45
3001-4000 Tonnes	13.33	0.95	3.99
4001-5000 Tonnes	9.93	1.07	3.95
5001-6500 Tonnes	8.63	0.95	3.57
6501-13000 Tonnes	6.93	0.33	2.78
All Sizes	28.91	0.33	4.06

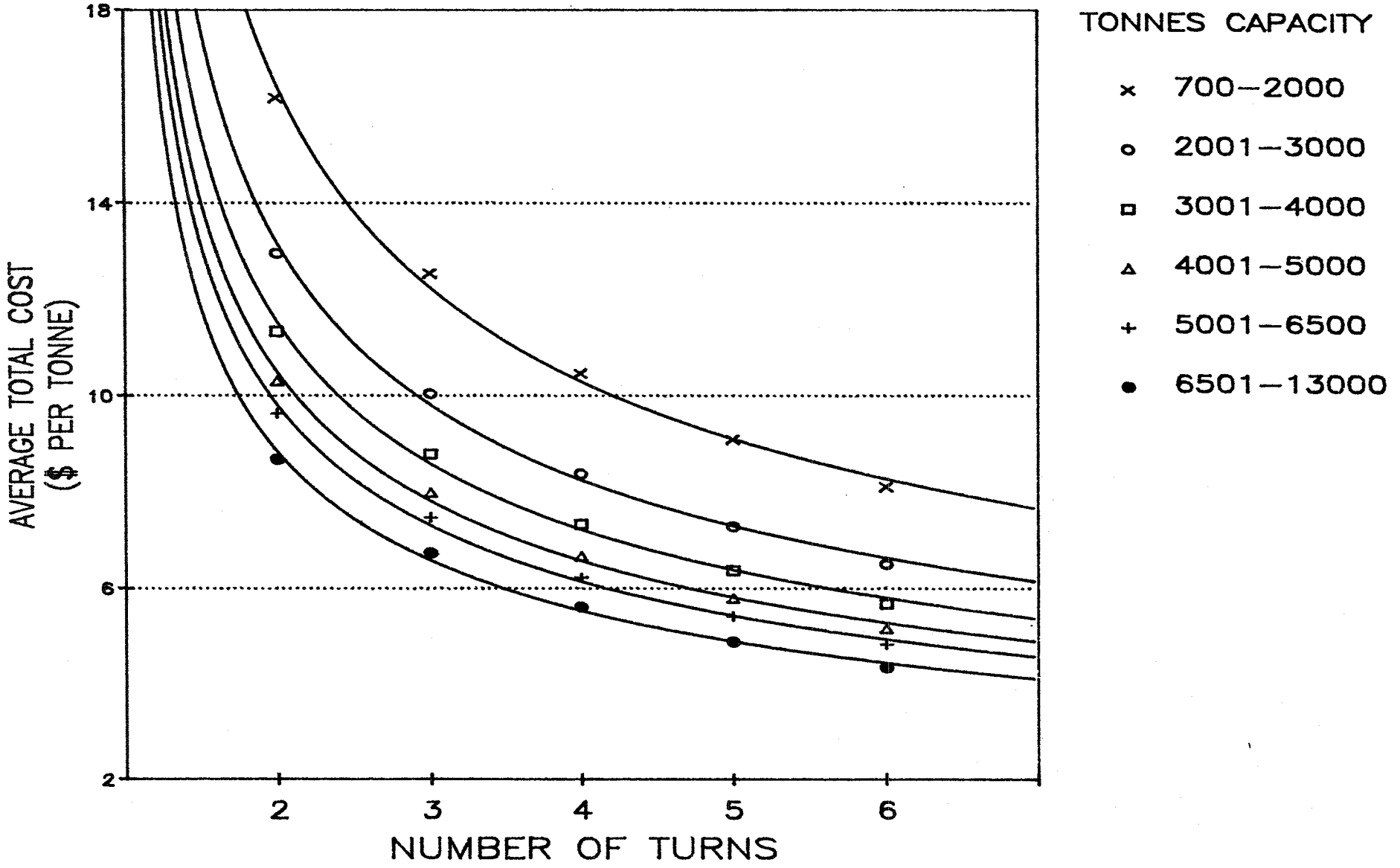
Figure 6 also demonstrates the impact of the turn rate on average total cost. A 3001-4000 tonne Saskatchewan elevator has an average total cost of $8.78 when turning over three times and an average total cost of $6.36 when turning over five times.

The cost savings due to capacity utilization do partially explain the continued existence of small scale elevators on the prairies. However, many of these facilities do not enjoy high turn rates and generate average costs in the range of $12.00 to $18.00 per tonne. The persistence of these small, inefficient elevators suggests that the industry has not yet evolved into its most efficient cost configuration.

8.3 ALLOCATIVE EFFICIENCY: REVENUES VERSUS COSTS

A standard criterion for allocative efficiency is that revenues and costs should be approximately equal. Marginal revenue from moving a tonne of grain should equal the long run average cost of that service.

FIGURE 6
IMPACT OF TURN RATE ON COSTS



(SASKATCHEWAN)

Marginal revenue in primary elevator grain handling consists of the elevation and removal of dockage tariffs, the storage tariff, and by-product revenue (dockage). The following example illustrates typical revenue available from elevating a tonne of wheat in Saskatchewan.

The primary elevator tariff for elevation and removal of dockage in Saskatchewan is approximately $7.38 per tonne (1983-84).

Storage charges are assessed after ten days on all Board grains and all unsold non-Board or off-Board grains. Most firms charge the maximum rate of $0.25 per tonne per day. The revenue gained from this charge varies according to the amount of grain on storage tickets during the year. This complex process makes it difficult to determine an appropriate average level of storage revenue. On average however, storage revenue is approximately one fourth of elevation and dockage removal revenue, or $1.85 per tonne in the hypothetical example.

A complication that arises when comparing prices and costs is that of by-product revenue. Dockage removed from grain deliveries becomes the property of the elevator company and is thus a source of revenue. However, the fact that farmers do not clean their grain prior to delivery would seem to indicate that they do not value this foregone revenue very highly, and might not consider this loss in evaluating delivery options. Still, the revenue gained by the firm should be accounted for in any price-cost evaluation.

If dockage removed from a tonne of wheat is three per cent, thirty-three tonnes of wheat will provide one tonne of screenings. If screen-

ings sell for $60 per tonne,[1] one tonne of wheat provides $1.80 worth of dockage.

The total revenue earned by moving fifty tonnes of wheat from a Saskatchewan farmer's truck to a rail car is thus approximately $11.03 per tonne. A caution is in order. This figure is a rough calculation and cannot be compared to primary elevator costs without adjusting those costs for the dockage removal service (which is usually performed at terminal elevators). Adjusting for the cost of dockage removal would involve an investigation of terminal elevator costs. Cleaning costs at terminal elevators are difficult to specify, due to the jointness of costs in the cleaning operation.

In fact, primary revenues cannot be separated from terminal revenues when evaluating firm profits, due to the potential for cross-subsidization discussed earlier. However, the estimated marginal revenue figure is useful in that it represents the price to the user of primary elevator services. If the farmer chooses to bypass the country elevator system, he may save as much as $11.03 per tonne.

Does a comparison between this amount and the average total cost figures yield a useful indication of allocative efficiency? The answer is a qualified yes.

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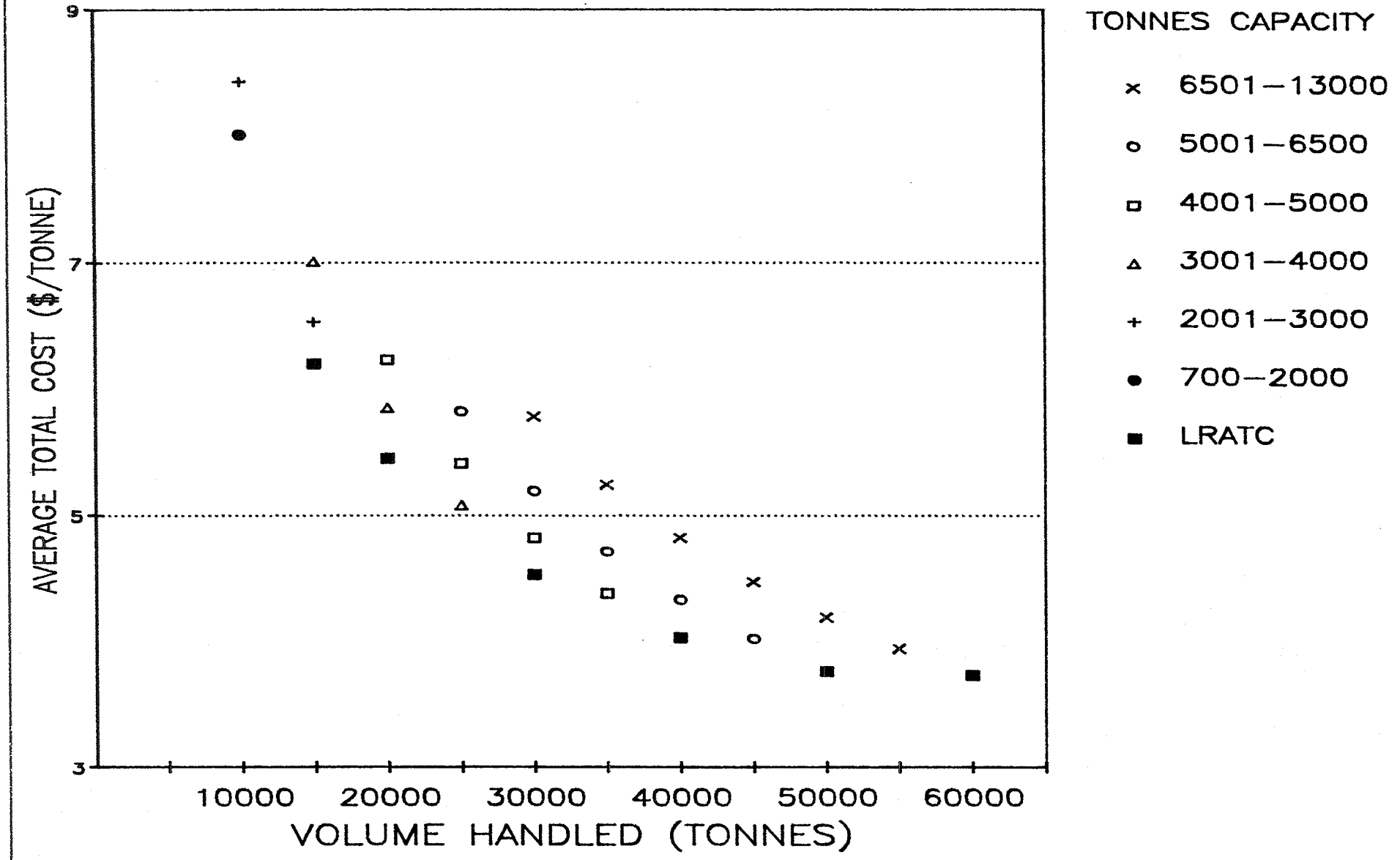
[1] This assumed price is based on the relative prices of various grades of screenings. Weyburn Inland Terminals for example, pays producers $60 per tonne for wheat screenings. For a good discussion of the value of various types and grades of screenings on the prairies, see: E. M. Ludwick and Associates Inc., Effect of Alternative Methods of Payment on Dockage Practices and the Shipment of Screenings, paper prepared for the Commission of Inquiry on the Crow Benefit Method of Payment (October, 1984).

The long run average total cost curve in Figure 7 portrays costs approximately ranging from $5.00 to $7.00 per tonne. Elevator companies would, under these condition, appear to be adequately compensated - even when the cost of terminal dockage removal is considered. Indeed, given the arbitrary assumptions regarding the value of screenings and storage revenues, a case could be made to suggest that marginal revenue does approximate unit cost.

However, there are very few "average farmers" who deliver to these low cost facilities. Some Saskatchewan farmers deliver to a 10,000 tonne facility that turns over five times (average cost equals $4.87) and some deliver to a 1,500 tonne facility that turns over twice (average cost equals $16.17). Since handling tariffs are generally constant between elevator points, these users are not cognizant of the cost of the service. High cost facilities are likely to retain business that might go elsewhere if rates were based on costs. Low cost facilities do not pass economies of scale and utilization on to their customers.

The skeptical response to this discussion is this: If it costs $16.17 to move a tonne of grain through an 'uneconomic' facility, why doesn't the grain company close the facility? This question implies that either the cost figure is incorrect or grain company executives are irrational. Neither is true. In any business, total firm profits are more important than the profitability of individual components. The primary sector serves to collect grain for the terminal sector, where additional revenues are earned. Providing grain handling services also aids in the marketing of horizontally integrated products and services, such as farm supply sales. It may thus pay to keep an uneconomic point

FIGURE 7
LONG RUN AVERAGE TOTAL COSTS



(SASKATCHEWAN)

open, even if it does cost $16.17 per tonne to process grain. Finally, there seems to be a tradition of generalized rate levels that firms are hesitant to break.

This logic is even more appealing if costs can be spread across a system of elevators. If two elevators located in the same market area charge $16.17 and $4.87 respectively, which elevator would garner most of the business (and enjoy even lower costs as capacity was better utilized)? Of course, the higher priced rival would not charge $16.17 for long; its options would be to drop its price or close the facility.[2]

As Figure 8 indicates, primary elevator operating costs do vary significantly between provinces. However, as observations on tariff-filing behavior indicate, inter-provincial tariff variations seem to be the result of regional price leadership.

8.4 THE CANADIAN GRAIN COMMISSION'S IMPACT

When setting maximum rates, the Canadian Grain Commission reviews cost information supplied by some grain companies.[3] The accuracy of any estimates of grain handling costs is thus largely dependent upon the accuracy and integrity of the information submitted. Even if precise estimates of grain handling costs (based on this data) are available, this does not ensure that costs are minimized if production inefficiency is widespread.

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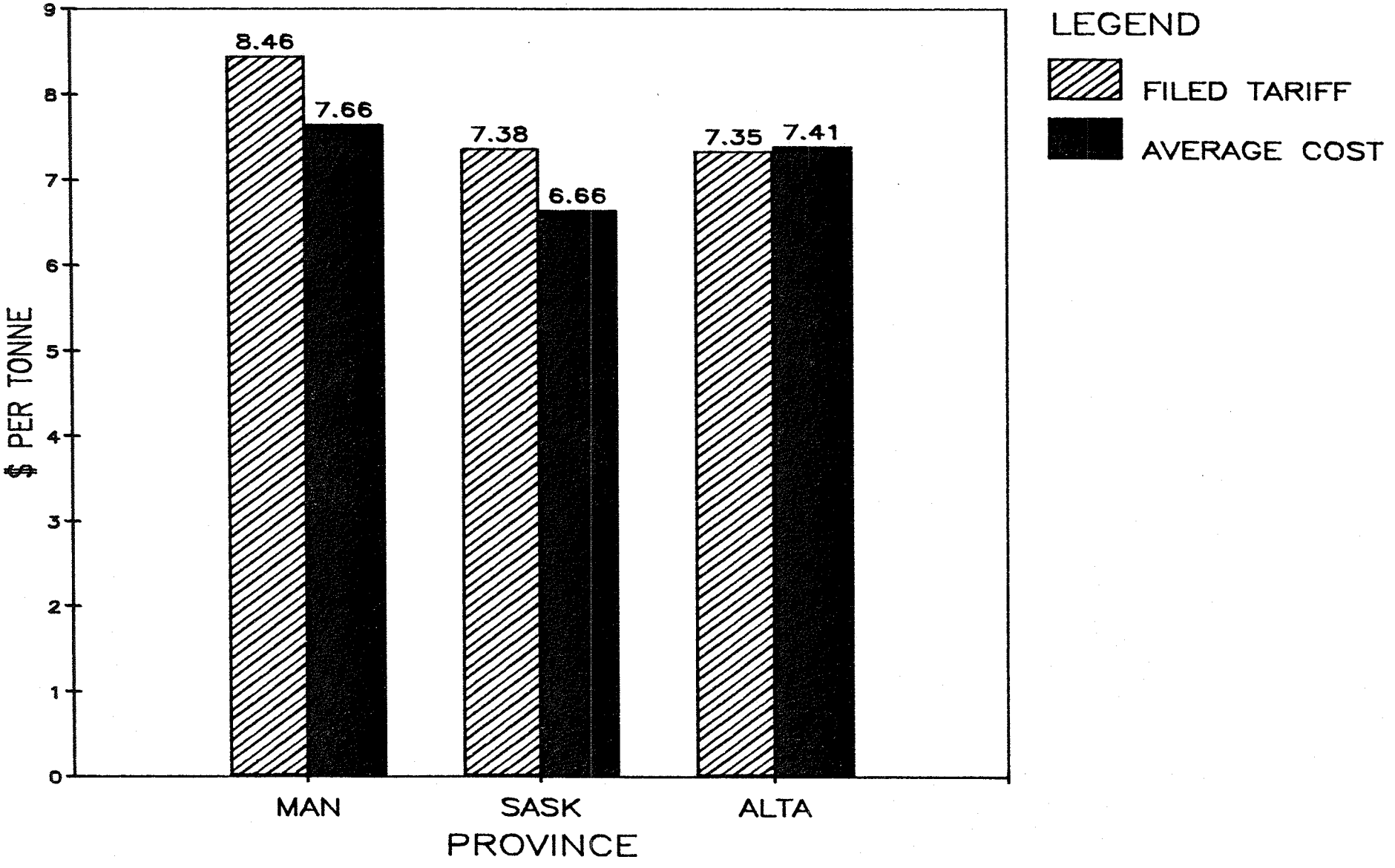
[2] This assumes that some demand is somewhat price elastic.

[3] Between 1982-83 and 1984-85, tariff increases have paralleled the federal government's general anti-inflation guidelines of 6%, 5%, and 4% respectively.

FIGURE 8
PROVINCIAL COST VARIATIONS



BASED ON A 4500 TONNE ELEVATOR TURNED FOUR TIMES

The Commission might argue however, that precise estimates of grain handling costs are unnecessary given that only maximum tariff levels are regulated. Competition should ensure that production is efficient. The validity of this claim of course depends upon whether price competition actually occurs. If rates are not set low enough to discipline inefficient firms, those companies will naturally pass cost inefficiencies on to consumers.

However, as earlier observations regarding tariff setting demonstrated, broad rate competition does not occur. Nor does the Canadian Grain Commission encourage such competition through its policy of maximum tariff regulation. In sum, maximum tariffs are generally set high enough that elevator companies can recover total primary elevator system costs, regardless of the level of those costs.

8.5 EQUITY CONSIDERATIONS

Assuming that production efficiency and allocative efficiency are the objectives of tariff regulation, the following welfare transfers are currently taking place.

1. Widespread production inefficiency on the part of elevator companies translates into higher outlays for production inputs. This implies redistribution of income from all grain farmers to the suppliers of these inputs.
2. To the extent that primary elevator firms are able to exercise market power, there is the possibility of an income transfer from farmers to those firms. The extent of excess profits due to oli-

gopolistic market power in the primary elevator sector cannot be accurately estimated, given the complex revenue structure in place. In the absence of such an estimate, it should not be assumed that excess profits actually exist. It is very possible that the potential for monopoly-type profits has been eroded by capacity over-expansion and production inefficiency.

3. Those firms that face significant barriers to entry into the grain elevator business forego income that remains in the hands of existing firms.

The existence of these various equity concerns does not necessarily indicate poor performance. Past regulatory actions suggest that the federal government has a well-defined concept of fairness, which it relies upon when equity decisions are made in the prairie grain sector. If the federal government accurately represents the wishes of society in general, then any evaluation of equity must take this concept into account.

The over-riding theme of federal grain policy appears to be equality of treatment between farmers. This is illustrated through Canadian Wheat Board policies such as price pooling and acreage-based delivery quotas; in Canadian Grain Commission restrictions on offering lower tariffs to individual farmers; and in the rail freight rate structure that assesses all farmers similar freight charges, regardless of rail costs or individual location.

Spreading elevator system costs among all users conforms closely to this equality of treatment philosophy. However, the pursuit of this goal (if it is indeed consciously pursued) has so muted price signals that grain farmers as a group may be significantly worse off.

8.6 SUMMARY: MUTED PRICE SIGNALS AND PRODUCTION INEFFICIENCY

This chapter establishes the connection between allocative inefficiency and production inefficiency. Specifically, the spreading of system costs among all users prevents efficient allocation of resources. Oligopolistic conditions allow companies to pass cost inefficiencies on to system users. The ultimate result is a transfer of wealth from the agricultural sector to other sectors of the economy. The Canadian Grain Commission's maximum tariff policy facilitates this inefficiency by providing a comfortable cushion between regulated maximums and the costs of efficient elevators.

Chapter IX

CONCLUSIONS, LIMITATIONS, AND RECOMMENDATIONS FOR REGULATORY REFORM

9.1 THE OBJECTIVES RESTATED

As discussed in Chapter One, the objectives of this research can be broadly stated as follows:

1. Describe the current rate regulation infrastructure in terms of its objectives and mechanics.
2. Investigate the nature and level of grain handling costs in primary elevators by conducting an econometric study based upon grain company cost data.
3. Evaluate the effectiveness of the existing regulated rate structure in terms of industry structure, conduct, and performance.
4. Draw some conclusions as to the overall impact of current rate setting policies upon industry performance and suggest appropriate improvements.

The null hypothesis tested in this thesis addresses this implied linkage between Canadian Grain Commission tariff regulation and performance in the primary elevator industry. Specifically, the hypothesis states:

Canadian Grain Commission regulation of grain handling tariffs has served to enhance efficiency and performance in the primary elevator sector.

This hypothesis embodies a number of subsidiary hypotheses:

1. The structure of the industry has evolved in a manner that is consistent with the Industrial Organization concept of a competitive environment.
2. Firm conduct in the areas of pricing and adjustment to rivals' behavior is consistent with competitive results.
3. Specific performance criteria--including production efficiency, allocative efficiency, and fairness--are generally achieved in the industry.

The major conclusions resulting from this research are best stated in terms of these hypotheses.

9.2 STRUCTURE OF THE INDUSTRY

Since 1974-75, the Canadian Grain Commission has pursued a policy of tariff regulation which relies upon inter-firm competition to achieve sound economic performance. Specifically, primary elevator companies are allowed to file rates at, or below, prescribed maximas for each grain handling service.

Industrial Organization Theory suggests that there are a number of structural conditions that serve as the basis for competitive behavior. In the country elevator sector, several of these conditions do not appear to hold. The industry is highly concentrated, both on an industry-wide and regional basis. Demand for grain handling services is not especially responsive to price signals in the form of handling tariffs. There is significant excess capacity, in terms of both storage and han-

dling capability. There are several effective barriers to entry, including: vertical integration on the part of existing firms, the magnitude and durability of required investment capital, the regulatory costs of entry, and market pre-emption through capacity over-building.

These conditions reflect many of the characteristics of the theoretical oligopoly situation.

9.3 PRICING CONDUCT AND INTER-FIRM RIVALRY

Firm conduct that results under these conditions also conforms to the oligopoly model. Price leadership directs a subtle style of tacit price collusion in which the recovery of total system (terminal and primary) costs is the goal. Price competition occurs only occasionally, as most firms follow the rate-setting lead of the three provincial Pools. Upwards price adjustments in some cases, suggest that equlibrium rates are not as low as they might be under different competitive conditions.

Inter-firm rivalry tends to take on many forms other than competition on rates. Trucking allowances are offered to large producers in some cases. Grooming of patronage, loyalty and elevator construction plans are key elements of the battle for market share.

9.4 PERFORMANCE: ALLOCATIVE AND PRODUCTIVE EFFICIENCY

Under-utilization of elevator capacity and the preservation of aging facilities, have led to production costs significantly higher than those represented by the industry's long run average total cost curve. An oligopolistic structure combined with limited competition on rates, allows

these increased costs to be passed on to farmers who use the elevator system.

The spreading of total system costs among all users facilitates this cost recovery process, as individual producers are not cognizant of the actual cost of handling grain at their own delivery point. Allocative efficiency is therefore reduced, as elevator closure decisions become political rather than economic processes.

9.5 POLICY IMPLICATIONS

The Canadian Grain Commission has been charged with regulating primary elevator grain handling tariffs in the interest of grain producers, so as to facilitate and encourage sound economic performance. To this end, the Commission has pursued a regulatory policy whereby firms are required to file individual rates at or below stipulated maxima. In order for this policy to succeed in encouraging efficient production and resource allocation, grain companies must be disciplined by competitve forces to file rates that are closely related to the actual costs of individual elevators.

As this study demonstrates however, grain handling tariffs are not the focus of competitive behavior between elevator companies. While filed tariffs may very well reflect average costs on a system-wide basis, they do not reflect the costs of individual elevators. Nor do the rates approach efficient production costs. High cost elevators are therefore funded by spreading their losses over the entire system. Prairie farmers pay the increased cost of system inefficiency through higher primary elevator tariffs.

The Canadian Grain Commission's policy with regard to primary tariffs actually facilitates this process in the following ways:

1. Maximum tariffs are set too high to be effective in limiting windfall profits on efficient elevator operations.
2. High maximum tariffs facilitate the spreading of system costs among all users, as rates can be filed above efficient long run average costs.
3. Uneven application of bonding requirements serve as a barrier to the entry of smaller firms, reducing market contestability.
4. The restriction against offering different rates to individual producers at the same elevator is unenforcable. To the extent that this regulation is observed, however, it restricts grain companies' ability to utilize excess capacity by offering discounts to those producers with elastic demand.
5. The publication of filed tariffs may actually encourage price leadership, as firms enjoy immediate, free, and accurate information on rivals' rates.
6. Farmers meanwhile, do not enjoy free information regarding the cost of elevating their grain, as firms are not required to include details of these deductions on their cash tickets.
7. Tariff regulation may lead to the perception among farmers that filed tariffs are "fair" since they fall within maximum limits. Complacency in accepting rates as offered removes farmer pressure on elevator firms to compete on rates.

Ultimately, Canadian Grain Commission regulation of primary elevator tariffs is ineffective in enhancing economic performance and may actually hinder efficient market operation in some ways.

9.6 POLICY RECOMMENDATIONS

With regard to Canadian Grain Commission regulation of handling tariffs in primary elevators, it is recommended that:

1. The system of maximum tariffs be discontinued, with firms free to set rates at any level;
2. The tariff filing requirement be retained only to allow monitoring of rate levels;
3. The authority to order rate reductions in extreme cases be reinstated;
4. The publication of tariff summaries be discontinued;
5. Details of all grain handling and transportation deductions be detailed on grain company cash tickets;
6. Current licensing and bonding requirements be reviewed, with the objective of reducing regulatory barriers to entry;
7. The restriction preventing firms from offering a variable rate structure to producers be eliminated.

The overall impact of these recommendations, if implemented, would be to encourage competition on handling tariffs. As the following section suggests however, these recommendations do not assure improved economic performance in the primary elevator sector--but they would create an environment condusive to such improvements.

9.7 LIMITATIONS AND AREAS OF FURTHER RESEARCH

While the Canadian Grain Commission may not be regulating primary elevator tariffs in a manner that encourages sound economic performance, this is not to suggest that it bears sole, or even primary, responsibility for the allocative and productive inefficiency that persists in the industry. A second major impediment to the evolution of a dynamic, low cost elevator system may well be the perpetuation of the Crow's Nest freight rate structure, now embodied in the Western Grain Transportation Act.

If rail freight rates were allowed to rise to cost compensatory levels, several changes in industry structure might develop:

1. Improved viability of trucking relative to rail movement might be expected to increase the size of the effective market region, reducing the extent of spatial market power.
2. Smaller firms would be better able to contest the grain handling market, as access to rail cars becomes less of a restriction on grain movement. Of course, access to Canadian Wheat Board grains remains tied to storage facilities and a Board handling agreement.
3. Increased rail freight rates may awaken farmer interest in the cost of handling and transporting grain, as such costs consume a larger portion of grain revenues. Heightened consumer awareness can only enhance market performance.

A third source of inertia in the primary elevator industry may involve the Canadian Wheat Board policy of making handling agreements only

with firms that have storage capacity. This factor need not necessarily restrict competition between existing firms, but it does increase the entry costs facing new grain companies.

This thesis does not assess the impact of these two factors upon industry performance. However, such an assessment would enhance the analysis conducted here.

The conclusion that production inefficiency is widespread in prairie primary elevators does not take into account the importance of assembly costs in the overall grain handling and transportation process. A reduction in the number of delivery points might result in increased trucking costs for some farmers. On the other hand, many elevators could be closed without significant dislocation of grain deliveries, due to the over-expansion of capacity that has occurred in many regions. Second, total transportation costs may be reduced if elevator consolidation is accompanied by selective branchline closures.[1] This thesis does not address these broader issues, but provides elevator cost estimates that might be used in such an undertaking.

The conclusions regarding allocative inefficiency are not affected by this criticism. Muted price signals prevent producers from making rational delivery decisions based on economic criteria. Spreading of system costs across all users facilitates the preservation of older, high cost elevators and allows elevator companies to pass these costs on to producers more easily.

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[1] At least one recent study has suggested significant positive benefits to rail line rationalization. See: Canadian Transport Commission, Effects of a Reduction in the Number of Grain Delivery Points on the Canadian Prairies (February 1985).

A reduction in elevator numbers may possibly lead to reduced service for some producers. A counter argument might be that the quality of grain handling services (dockage levels, grading, delivery privileges, et cetera) is strictly regulated by the Canadian Grain Commission and should not be affected. Second, the development of a better trucking infrastructure might serve to increase delivery options and improve market contestability. Research into this area may help clarify the controversial question of the impact of elevator closures on individual farmers.

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Appendix A

CANADIAN WHEAT BOARD CORRESPONDENCE

The Canadian Wheat Board

423 Main Street, Winnipeg, Canada / P.O. Box 816, Postal Code R3C 2P5
Area Code 204, Telephone 949-3416 / Cable: Wheatboard / Telex 07-57801

W.E. JARVIS Chief Commissioner
R.L. KRISTJANSON Assist. Chief Commissioner
F.M. HETLAND Commissioner
J.L. LEIBFRIED Commissioner
W.H. SMITH Commissioner

July
Twentieth
1 9 8 4

Western Grain Elevator Association,
Winnipeg Square Complex,
Suite 720 - 360 Main Street,
Winnipeg, Manitoba.
R3C 3Z3

Dear Sirs:

Canadian Wheat Board sales are made basis trade levels at various Canadian ports, and not basis any specific terminal. Handlers who quote tariffs higher than others cause problems, as we attempt to market grain for producers at the least cost. Even if we did quote basis various different F.O.B. levels in a port, buyers would naturally choose the lowest level. The Canadian Wheat Board cannot justify the payment of a higher tariff to any particular elevator, and is therefore forced to advise your Association that the following F.O.B. levels will be paid by the Canadian Wheat Board at Vancouver and Prince Rupert:

Wheat	$4.18 per tonne
Oats	$6.96 per tonne
Barley	$5.30 per tonne

These F.O.B. levels are effective August 2, 1984.

Yours very truly,

G. Jordan
for

W.H. Smith,
Commissioner.

WHS*jj

cc: Mr. G. Hedalen
Mr. E. Isaac

Appendix B

CHARACTERISTICS OF VARIOUS CAPACITY RANGES

	Capacity (tonnes)					
	0-2000	2-3000	3-4000	4-5000	5-6500	>6500
Volume (tonnes)						
-Mean	8833	11149	14020	17724	20051	21912
-Standard Dev.	4127	6104	5899	8029	8694	9944
-Minimum	2450	1016	3518	4537	5337	2149
-Maximum	24737	64755	49872	47250	54943	59231
-Coef. of Var.	46.73	54.75	42.08	45.30	43.36	45.38
Total Cost ($)						
-Mean	81273	92138	109665	128342	142500	165510
-Standard Dev.	18708	26234	29616	40081	45682	71280
-Minimum	55876	50997	55914	61825	66345	66268
-Maximum	133367	246654	272078	296169	339928	487169
-Coef. of Var.	23.02	28.47	27.01	31.23	32.06	43.07
Avg Total Cost ($)						
-Mean	10.73	9.71	8.68	8.17	7.87	8.31
-Standard Dev.	4.62	4.75	3.30	3.12	2.79	3.52
-Minimum	4.39	1.61	3.41	3.24	3.57	4.11
-Maximum	31.87	59.26	35.67	22.48	22.61	30.93
-Coef. of Var.	43.04	48.92	37.98	38.21	35.45	42.37
Capacity (tonnes)						
-Mean	1639	2528	3497	4495	5619	7867
-Standard Dev.	282	272	288	261	407	1278
-Minimum	870	2010	3010	4010	5010	6560
-Maximum	2000	3000	4000	5000	6500	12290
-Coef. of Var.	17.21	10.75	8.22	5.81	7.24	16.25
Turn Rate						
-Mean	5.50	4.46	4.02	3.94	3.58	2.81
-Standard Dev.	2.64	2.59	1.65	1.78	1.52	1.24
-Minimum	1.42	0.44	0.95	1.07	0.95	0.33
-Maximum	16.27	28.91	13.33	9.93	8.63	6.93
-Coef. of Var.	47.91	58.04	40.99	45.17	42.41	44.05
Saskatchewan (%)	28	44	37	37	49	54
Alberta (%)	29	25	32	21	26	28
Manitoba (%)	43	31	31	42	25	18
Pioneer (%)	26	37	30	27	34	40
U.G.G. (%)	43	44	50	42	51	49
Manitoba Pool (%)	31	19	20	31	15	11
Observations (#)	93	405	351	275	236	112

CHARACTERISTICS OF THE ENTIRE SAMPLE

	Mean	Standard Deviation	Coef. of Variation
Salaries ($)	44423	17357	39.07
Repairs ($)	8945	10034	112.18
Utilities ($)	2371	1480	62.40
Insurance ($)	4673	2800	59.93
Depreciation ($)	9635	14960	155.26
Administration ($)	32159	6706	20.85
Rentals/Taxes ($)	9123	7207	79.00
Miscellaneous ($)	4723	5998	126.99
Volume (tonnes)	15162	8181	53.96
Capacity (tonnes)	3972	1680	42.29
Turn Rate	3.82	1.94	50.79