THE EFFICIENCY OF THE B.C. APPLE MARKETING SYSTEM: A STRUCTURE, CONDUCT AND PERFORMANCE EVALUATION

by

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE

in

THE FACULTY OF GRADUATE STUDIES
(Dept. of Agricultural Economics)

We accept this thesis as conforming to
the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

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Date April 27, 1988

DE-6 (2/88)

ABSTRACT

The cooperative structure of the B.C. apple marketing system has been in danger of collapse several times over its 70 year history. The most recent upheaval occurred in the early 1980s, when accusations of cost inefficiencies led to several changes in the system. The objective of this study is to provide a structure, conduct and performance evaluation of efficiency of the apple marketing system. This will entail an historical review, a description of the apple industry and an evaluation of its performance with respect to cost efficiency and revenue maximization using the Washington State apple industry as the benchmark.

Apple production in Washington State is about ten times production in B.C., and their typical orchard is about 40 acres versus about 14 acres in B.C. The average Washington packinghouse organization serves about 30 growers to B.C.'s 300, yet their average volume is about 40% larger than the average B.C. packinghouse. Approximately one half of all the Washington packinghouses are cooperatives, whereas nearly all the B.C. packinghouses are cooperatives. Also, the B.C. growers collectively own the central marketing agency and a major processor. The Washington State packinghouses tend to market their own fruit.

The performance of the apple marketing industry is evaluated in terms of revenues, costs and return to growers. The data available from Washington State precludes direct comparisons of prices (and hence revenues). Total and average costs curves are derived for both the packing and marketing functions in the B.C. industry, and these all exhibit the expected shapes. Variable and

fixed costs are also broken out and examined, although it appears the fixed cost data includes some variable costs. But the most interesting finding occurs when B.C. and Washington State per unit costs are compared - it appears the postulated size advantages for Washington State do not exist on average, since B.C. costs are lower. Roughly speaking, it costs about $5/box to pack a box in B.C. versus about $6/box in Washington. Marketing costs in both regions are under $1/box.

Returns to the grower, however, are about $3/box in B.C. versus about $5/box in Washington State. This suggests that price or revenue obtained in B.C. is much lower. This could be due to two diferent factors. First, the marketers in B.C. may be too volume oriented at the expense of obtaining the maximum price possible. This study makes no attempt to test this possibility.

The second reason for B.C.'s lower prices is that the average B.C. product is deemed inferior to Washington State apples. Sensitivity tests are performed to evaluate the effect on grower returns of improving the average apple. When Washington State's average apple quality is imposed on the B.C. cost and price structure, grower returns increase by 63% and 9% for the two years tested. This suggests that if B.C. could match the Washington State performance, its growers would benefit significantly. When the B.C. product mix is varied to include ten percent more long storage fruit, less small sized fruit, and more high grade fruit, the grower returns increase by under 1%, 5 to 12%, and 2 to 3%, respectively. In other words, improving the fruit size of B.C. apples appears to be the most effective means of improving grower returns in B.C.

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ACKNOWLEDGEMENT

This work was the result of several months of interviews and correspondence. I would like to express my thanks to my committee members for their uncustomary interest and input into my project. I'm especially grateful to my major supervisor, George Kennedy, for allowing me free rein to pursue this work while keeping me firmly grounded in my efforts.

I am also grateful to all the apple industry people who offered their assistance throughout this work. Mr. Art Garrish was of particular help when I had questions as to the history and political issues of the industry. Mr. Martin Linder of B.C.Tree Fruits Ltd. was very generous with his time and his data. And Mr. Bill Dell was most helpful throughout the work and saved me from publishing many a mistaken notion.

Finally, I give special thanks to Chris Webber, whose envy of my topic sustained my own interest, and to my family whose involvement in the B.C. fruit industry prompted my endeavors in this area.

CHAPTER 1 INTRODUCTION

1.1 Problem Setting

The B.C. apple industry has undergone extensive structural and economic change in the past 15 years. These upheavals have accelerated of late, due in part to severe financial difficulties among many orchardists. Controlled marketing, since the 1974 agreement to halt enforcement, has given way to a voluntary marketing group plus an independent fringe with increased competition. This competition may become increasingly intense if the voluntary system is further segmented such that individual packinghouses market their own product using the former central selling agency, B.C. Tree Fruits Ltd, merely as a brokerage. While disputes over equity often result in the breakup of cooperative systems, these difficulties should be distinguished from efficiency factors. The relative efficiency of the B.C. apple marketing system[1] has received little rigorous investigation and hence this study will attempt to fill this void.

1.2 Problem Statement

The efficiency of the present apple industry has been questioned from many sides - by media[2], growers,

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1 "Marketing system" will be used as a general term to include both the packing and marketing functions.

2 Eg., Turnbull, M. "Fruit Growers Gamble". The Province. January 23 1987.

industry-commissioned studies[3] and industry experts[4]. While such questioning has been present throughout the history of the apple industry in B.C. (no matter what the marketing structure) it has been most intense of late. While charges of inefficiency tend to be subjective, there may well be a case for claiming the relative efficiency of the industry has decreased.

Apples are the most important tree fruit crop in the B.C. industry, comprising 83% of fruit volume and 67% of cash receipts over the period 1980-1984 (Statistics Canada). This study will therefore primarily restrict itself to an analysis of the apple industry and its efficiency. As discussed in Kennedy and Lee, trends in apple production and producer returns may give credence to the perception of declining efficiency relative to major competitors such as Washington State.

Trends in production in a competitive industry provide clues to the relative profitability of that industry. Apple production figures are reported in Table 1.1 for B.C., Canada, Washington State, and the United States over the period 1970 to 1985. While apple production has increased in all areas (given some yearly variation), these figures show how production in B.C. has actually declined relative to its major competitors. This is better illustrated in Figure 1.1, where relative percentages are graphed. Based on 5-year averages (1972-1976 and 1982-1986), B.C.'s total apple production has risen 11% (not an insignificant

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[3] Eg., Goldberg, R. A Study of the B.C. Fruit Industry for the British Columbia Fruit Growers Association. July 1982.

[4] Eg., Garrish, A., Former B.C.F.G.A. President. Personal communication. July 1986.

amount but low relative to Washington State) while Washington production has increased 38%. The percentage of average B.C. to Washington production has fallen over the same period from 16% to 13%. The percentage of Canadian apples produced in B.C. has changed little, although it did increase somewhat in the early 1980s. This suggests B.C. growers do not envisage increased profits through expansion to the extent growers elsewhere do, (whether due to facing different costs, prices or outside incentives) and therefore implies smaller efficiency gains in B.C. This assumes levels of government incentives are equivalent in both regions.

Table 1.1 Apple Production in B.C., Washington State, Canada and the U.S.A., 1970 - 1986.

	Apple Production (million pounds)			
Year	BC	WA	Canada	USA
1970	291.2	1320.0	877.6	6396.8
1971	190.2	1201.0	833.5	6371.1
1972	242.9	1390.0	868.8	5881.3
1973	321.0	1860.0	826.9	6238.6
1974	240.3	1775.0	890.8	6533.5
1975	366.4	2200.0	985.6	7530.0
1976	380.8	2308.0	901.8	7479.3
1977	314.6	2083.0	921.7	6672.6
1978	331.7	2170.0	998.9	7596.9
1979	333.4	2619.0	959.0	8143.0
1980	463.5	3005.0	1218.5	8828.4
1981	445.5	2760.0	920.3	7753.6
1982	386.7	2615.0	1053.0	8115.0
1983	429.8	3000.0	1068.9	8314.5
1984	320.9	2895.0	957.3	8343.6
1985	305.0	2059.0	1055.1	7949.0
1986	286.0	3087.0	839.4	7845.0

Sources:
Statistics Canada, 1976-1987, #22-003
Washington State Agricultural Statistics, 1986

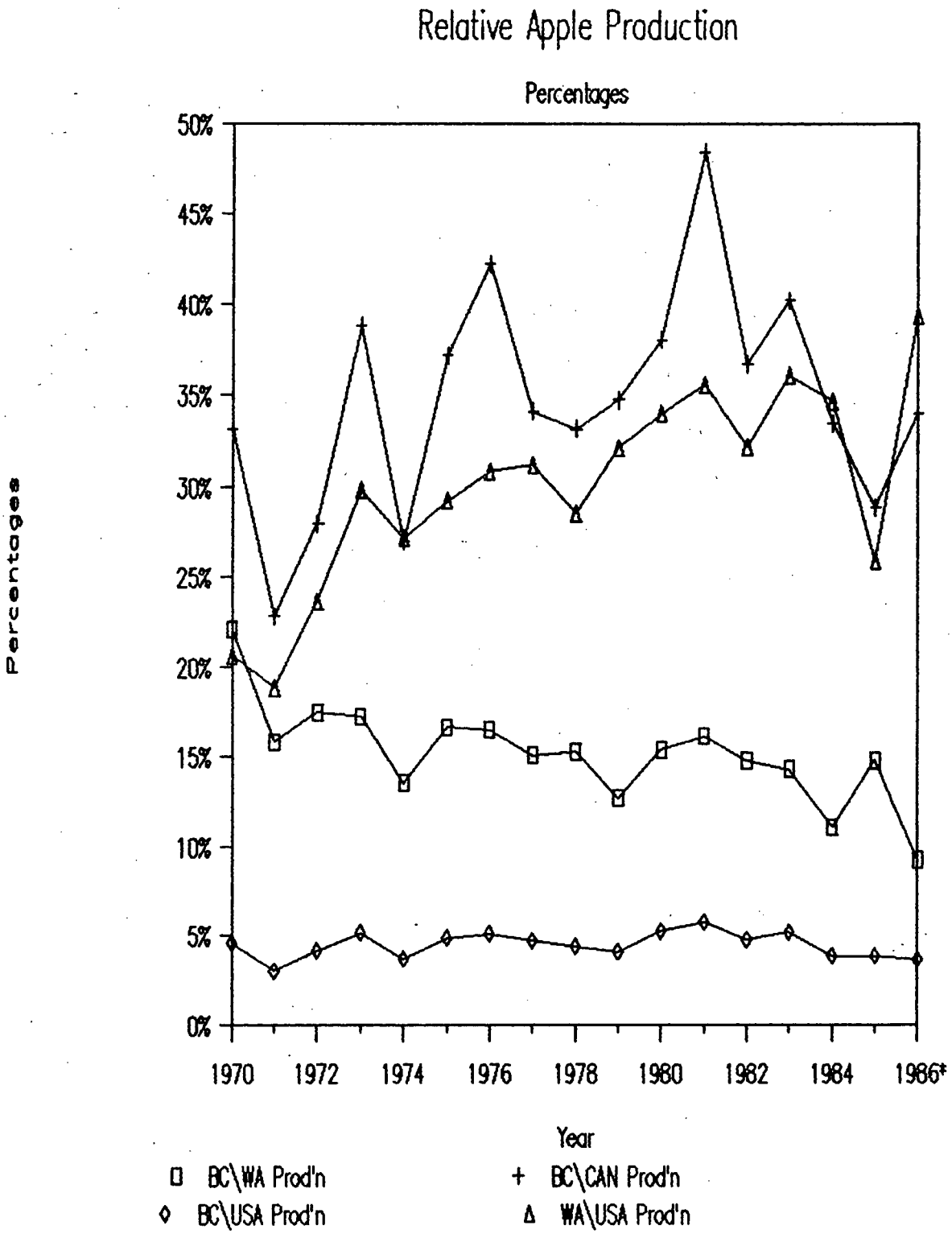

Figure 1.1 B.C. Apple Production Relative to Canadian, Washington, and U.S.A. Production (1970-86)

Trends in producer returns in B.C. relative to other producing areas are another indicator of changes in relative efficiencies. Average producer returns (in Canadian dollars per 42 pound box) for both fresh and processed apples in B.C. and Washington State are reported in Table 1.2. for the period 1976 to 1984. Returns in Washington State have risen slightly each year, although this could simply reflect inflation. However, B.C. returns have fallen during this period from a pre-1980 average of about $3.50/box (roughly on par with Washington State) to a post-1980 average of about $2.50/box (about $2/box less than Washington). This revenue decline in B.C. relative to Washington State again suggests a decline in relative efficiency. However, the data netted out direct subsidies, which occur in B.C., whereas indirect subsidies were not accounted for; therefore the relative efficiency decline of B.C. may be overestimated by this method if indirect subsidies occur and change to a greater extent in Washington State.

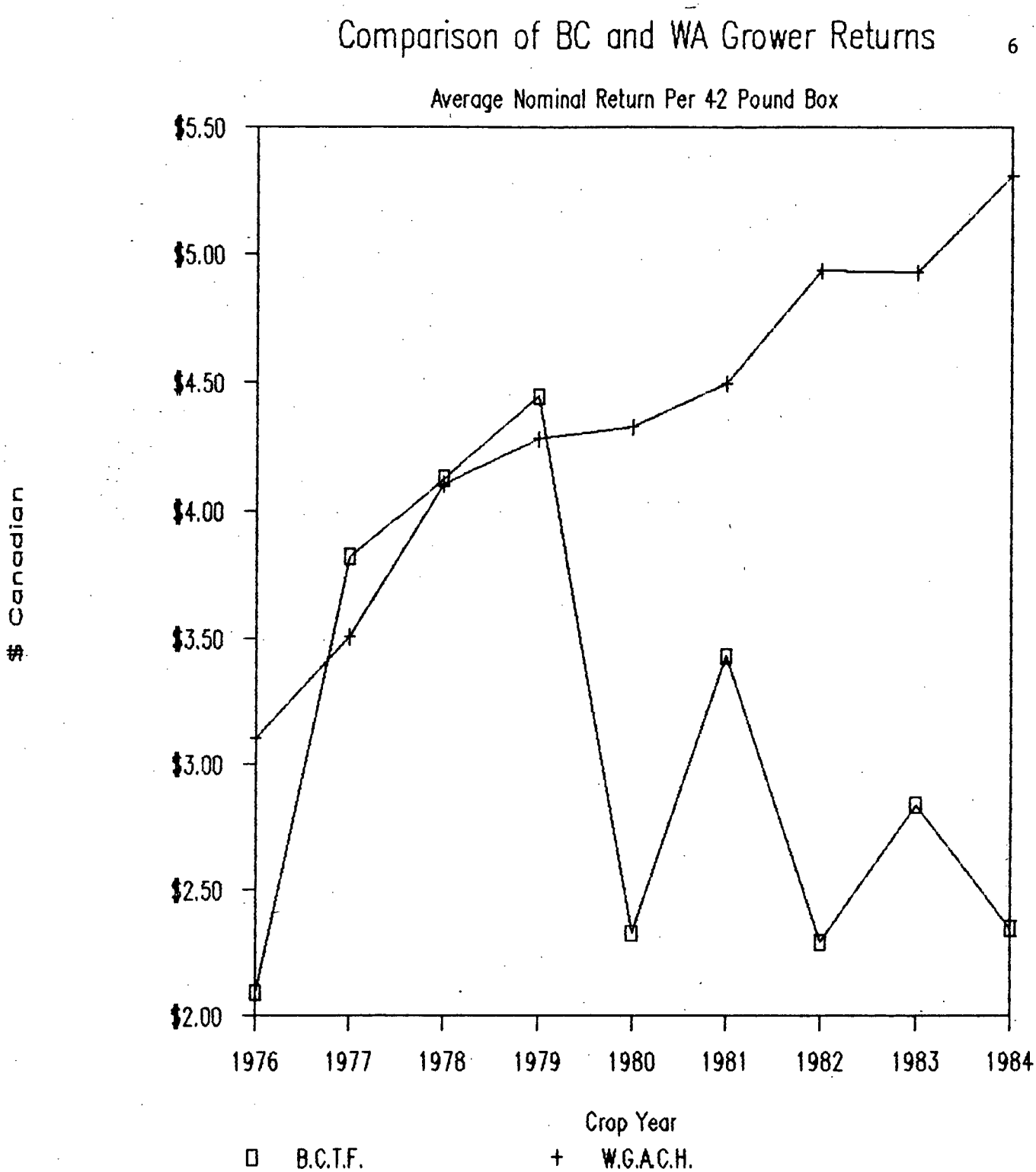

Figure 1.2 Comparison of Average Grower Returns between B.C. and Washington State (1976-84)

Total production and grower returns are not as closely related as are per unit production and grower returns. In the B.C. industry grower returns are the residual after marketing and packinghouse costs are deducted from the wholesale receipts. This residual in turn affects the production decisions of the grower. Therefore any given decline in relative economic efficiency in the B.C. apple industry, as postulated above, may be due to declines in production efficiency and/or marketing (including packinghouse) efficiency. Relative efficiency at the production level has already been examined by Kennedy and Lee. Using a representative farm approach they found lower production costs per acre but higher production costs per pound in B.C. than in Washington State. They concluded yield differences were a substantial factor.

B.C. industry officials also feel that product quality and consistency are major farm-level limitations (Bell). This emphasis on quality control suggests marketing considerations are becoming increasingly important as the competition increases. But while the B.C. marketing system has been blamed for much of the difficulty of the tree fruit industry, the actual level of efficiency of the marketing system is not known. Efficiency is often defined as revenue minus costs, or profit. However, in the predominately cooperative B.C. tree fruit industry where the marketing system is meant to operate at cost, it is the marketing margin per unit handled which is the most accessible measure of efficiency. The problem this study will address is the lack of knowledge concerning the efficiency of the B.C. apple marketing system.

1.3 Objectives

The objective of this study is to examine the relative efficiency of the B.C. apple marketing system. This will include: 1) an historical review of the B.C. apple industry illustrating the cyclical nature of the marketing system; 2) a discussion of recent changes in the industry and their possible implications; 3) a determination of the total packing and marketing costs and their components; 4) an identification of factors affecting efficiency; 5) the determination of relevant measurements of these inefficiencies; 6) a comparison of these efficiency measures with those of Washington State; and 7) recommendations as to how the efficiency level of the marketing system may be improved.

1.4 Procedure

The above objectives will be met by using the structure, conduct and performance techniques of industrial organization theory. The structure and conduct sections will discuss the B.C. industry using the Washington State industry as a comparison wherever possible. The performance section will analyze revenues, costs and grower returns, as well as their sensitivity to various factors. Again Washington State comparisons will be made whenever data permits. Theoretical aspects will be discussed throughout the analysis, since they are many and are better explained *in situ*.

1.5 Thesis Guide

This study will attempt to present the B.C. apple industry in a structure, conduct, performance format. Chapter 2 considers the structure and conduct aspects of the B.C. industry with reference to the Washington industry where applicable. Section 2.1 delves into the history of the industry, with special emphasis on the cyclical nature of its problems. Section 2.2 discusses recent developments and explains some of the terminology employed herein. Section 2.3 details structural components of B.C. and Washington in terms of fruit quality factors, size factors at the orchard, packing and industry level, and the organizational structures. Section 2.4 discusses industry conduct comparisons between B.C. and Washington at both the packinghouse and marketing agency level. And Section 2.4 summarizes the current industry concerns in B.C..

Chapter 3 utilizes some of the information described in Chapter 2 to develop an industrial model of the apple industry. Section 3.1 presents this model in theoretical terms and supports it with qualitative evidence. The price analysis of Section 3.2 provides more quantitative evidence, and it also illustrates the heterogeneity of the apple product mix.

Chapters 4 and 5 concern themselves with the performance of the B.C. packing and marketing functions. Chapter 4 first discusses appropriate measures of efficiency in terms of the goals of a cooperative structure in Section 4.1. Section 4.2 provides an overall picture of the disbursement of sales revenues which is then discussed in depth in Section 4.3. Costs, at the packing and marketing level in turn, are analyzed in Section 4.4. The resultant grower returns are described in Section 4.5.

Chapter 5 performs sensitivity tests on revenues, costs and grower returns in combination. In an attempt to identify why revenues differ between B.C. and Washington State, Section 5.1 mimics the product quality of the average Washington packinghouse. Some of the individual factors which might account for this difference follow, where Section 5.2 tests increased storage capacity, Section 5.3 tests improved fruit size, and Section 5.4 tests improved grade.

Finally, Chapter 6 summarizes the previous chapters in Section 6.1 and discusses the relevancy of their findings in Section 6.2. Recommendations pertaining to possible improvements to the B.C. apple industry are suggested in Section 6.3.

CHAPTER 2 STRUCTURE AND CONDUCT OF THE APPLE INDUSTRY

2.1 HISTORY OF THE B.C. APPLE INDUSTRY[5]

Pre 1950

Tree fruit production in B.C. began in the mid 1800s, centered at first around the Hudson Bay posts and gradually spreading to isolated pockets throughout the southern third of the province. At the time of the first meeting of the B.C. Fruit Growers Association (B.C.F.G.A.) in 1889, the Okanagan valley was dedicated primarily to cattle, but by 1910 it experienced a major land boom as pioneers followed in the footsteps of the wealthy and respected Governor General Lord Aberdeen who had established two large orchards in the North Okanagan. Okanagan land values soared from $1 to $1000 per acre and plantings occurred at a breakneck pace with little regard for marketability - as many as 60 different varieties of apple were planted, primarily north of Penticton.

In organizational terms, 1895 saw the B.C. Fruit Growers Association (initially Fraser Valley dominated) set up the cooperative Fruit Exchange to standardize grading, processing, transportation and marketing of fruit - in essence the same objectives of today's cooperative structure. But the majority of growers were individualists and while Aberdeen's Coldstream Ranch was shipping to the Prairies and Great Britain as early as 1903,

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5 The bulk of this section borrows from: MacPhee,E. The Report of the Royal Commission on the Tree Fruit Industry of British Columbia. 1958.

most growers preferred cash transactions to COD shipments further afield. In 1908 a cooperative packing/selling agency was formed in Vernon, the Okanagan Fruit Union (O.F.U.). The local houses set charges to cover costs, and a 10% commission was deducted to cover selling costs. Some pooling of returns (to be explained below) was practiced.

The story of the O.F.U. is one which subsequently repeated itself many times in the Okanagan valley. The best orchards and best fruit bypassed the O.F.U., and market preferences, pertaining to particulars of variety and grading, were largely ignored. Orchardists used the cooperative when it suited them, and when the price fell dramatically due to Washington's bumper crop of 1912, the O.F.U. went into liquidation. The following season another large crop prompted an attempt to reorganize into the Okanagan United Growers (O.U.G.), a cooperative with more houses and members, and hence greater tonnage. It also diverged from the O.F.U. in its attempt to capture the Prairie market. It succeeded in this regard, at least in part due to a duty increase on U.S.A. apples in 1916. Growers prospered until a 1921 general economic slump. Private fruit packers had also expanded during the good years, and in the 1922/23 season both the private and cooperative house decided to deal with the heavy competition by selling fruit on a consignment basis. Growers throughout the valley met and decided to form a new company, Associated Growers of B.C. Ltd (A.G.), to buy up O.U.G. and most of the private houses.

So, while the first experiment in cooperation, the O.U.G., failed, it was by no means the end of the cooperative movement in

the B.C. apple industry. Pooling of returns over the season became entrenched, and a new sales agency was formed. This agency was influenced by two things: a visit by an American proponent of the cooperative movement, Aaron Sapiro, who suggested that growers could band together to eventually determine price; and Commissioner Lewis Duncan's findings that brokers and wholesalers were cooperating to keep the prices low. In response, A.G. replaced their Canadian brokers with their own subsidiary, and used existing brokers for export fruit.

By 1927 the situation had again deteriorated. Independents and a lack of cold storage resulted in market gluts and low prices. The provincial government created a "Committee of Direction" empowered to set minimum prices for sale within Canada, although in practice it could only instigate a pro rata distribution of orders among shippers. The Depression, followed by the 1931 Supreme Court decision that the B.C. government had acted unconstitutionally, spelt the end of the committee. A shippers council was formed, and during the bumper crop of 1932 an attempt by 90% of the shippers to fix a minimum price and sale dates failed as it lacked power to enforce the agreement.

An even larger crop the following year, combined with very low prices, spawned tremendous grower agitation. Southern locals of the A.G. questioned the selling efficiency of the A.G. and talked of local pools and a separate sales desk for the south. In 1934 Canada and B.C. passed complementing "Natural Products Marketing Act"s enabling the formation of the B.C. Tree Fruit Board. This board had no power to affect prices except by controlling volume, which did not prove efficacious. In the same

year another record crop, increased freight rates and an unfavourable exchange rate combined to thwart the intentions of the scheme, but 90% of the growers remained on side.

While the federal act was struck down in 1937, the provincial act had, in anticipation, been amended and hence was ruled valid. A still larger 1938 crop prompted the A.G. and independents to experiment with one-desk selling, and in 1939 the B.C.F.G.A. resolved that the experiment continue. B.C. Tree Fruits Ltd. handled only the domestic sales in 1939, but soon houses were subverting the intent of the experiment by saving their premium fruit for export. With the imposition of the War Measures Act in 1940, the federal government gave the B.C. Fruit Board complete control of marketing (including pooling, pricing, and subsidies) and delegated sales to the U.S.A. and overseas, respectively, to B.C. Tree Fruits Ltd. in 1940 and 1941 The locals lost rights to quote prices as well as dates and direction of shipments of their fruit. Growers prospered under this new arrangement, and tripartite contracts (between growers, shippers and B.C. Tree Fruits Ltd.) were established to maintain the system once the powers of the B.C. Fruit Board wound down at the end of the war. Given the history of failure of such voluntary schemes in the past, however, a compulsory scheme was still much sought after.

In 1949 the federal government enacted the "Agricultural Products Marketing Act" giving the B.C. Fruit Board control over marketing, but not over pooling or equalization of returns. Pooling was therefore conducted on the legal basis provided by the tripartite contracts. While B.C. Tree Fruits Ltd. conducted the pooling in their role as data processors, the actual pooling

decisions were made by a separate pooling committee made up of industry representatives.

Pooling

At this point, an explanation of the evolution of pooling and its problems is necessary. Pooling was initially instigated to compensate late harvest areas and to smooth out the vagaries of seasonal price fluctuations. It began as direct pooling, whereby the season's returns from each grade and size of apple are apportioned on a per unit basis throughout the industry. As there were many varieties and few grade and size categories this was a relatively quick and simple procedure. However, the pooling committee had the latitude to make adjustments for varietal differences or for aberrant prices (due to unusual shortages). They also experimented with separate early pools or premiums when, in the days of primitive storage and therefore much better early versus mid-season prices, the southern houses resented sharing the returns from their climatic advantage with northern houses.

When WWII broke out price ceilings were set and the traditional U.K. market was lost. Therefore, high quality fruit lost much of its premium over lower quality fruit. As the situation was considered short-term, the pooling committee set up a schedule of price differentials for the various varieties, grades and sizes using a five year average of the pre-war prices. After the war the currency restrictions in foreign markets prevented the market from stabilizing, and so this `yardstick' method was retained. The five year average became a moving average which eventually reduced to a one year `average'. For

instance, in 1958 the yardstick was determined using prices from the previous crop year, and was then adjusted to partially reflect current price changes. Price changes between grades and sizes were more completely reflected than changes between varieties, although a variety was no longer permitted to 'subsidize' another by more than 5%. The yardstick method became increasingly complex as it attempted to approach direct pool results. Pool closing dates, when the final returns were announced, came later and later, although this was also due to advances in cold storage.

While industry pooling obviated the complexity of prorating shipments from the houses, there remained a considerable amount of dissatisfaction with the system. Due in part to higher quality requirements (hence finer grade and size breakdowns), pooling became increasingly harder to understand. Industry pooling also created regional disparities. If all houses packed the same proportions of different varieties (grades, sizes) there would be no inequities. But since houses specialize, to some extent, in different varieties (grades,sizes) and since many of these varieties (grades, sizes) compete amongst themselves, some houses will do better than others as long as the sales agency concentrates on maximizing total apple returns and not variety returns. For instance, in markets where the presence of Spartans lowers McIntosh prices the Spartans may be held back, to the likely benefit of the northern houses which specialize in McIntosh.

Post 1950

Resuming the history, the early 1950s was another predominantly bleak period for the apple industry. A large 1950 crop coupled with the removal of government protection policies resulted in much lower prices. Freight rates to the east were doubled, and the season climaxed with serious winter damage. Frosts continued to plague the area until several house bankruptcies and grower unrest instigated a Royal Commission in 1956. In Dean MacPhee's report of 1958 (from which much of this section is sourced), he was largely favourable to B.C. Tree Fruits Ltd. and the houses, although he suggested house amalgamation, better communication, and standardization of varieties. This was followed by ten years of relative prosperity, until another serious freeze resulted in low returns, especially among those who replanted according to the commissioner's advice.

In 1969-70 two factors combined to bring an end to this period of contentment (Garrish). First, Washington produced its largest crop since 1930, which, at 1695 million pounds was 65% higher than the previous year's crop. Second, a recession occurred in Canada. Prices fell dramatically and once again grower agitation threatened to disband the industry. Growers received early advances, but by the beginning of 1970 the money dried up. Growers began to go under, and with the opening of the Trans Canada the fruit inspector was no longer able to police shipment of fruit, hence peddlers defied the B.C. Fruit Board. This peddling increased in the following years until a caravan of peddlers dispatched to Vancouver after alerting the media. The

peddlers gained public support, and the newly elected NDP Attorney General declined to enforce the Board's regulations (which required vehicles to be searched).

S.C. Hudson, in his 1973 report, denounced the peddlers for using the B.C. Tree Fruits Ltd. price umbrella. He suggested a strengthening of the central authority, in part via packinghouse amalgamation. Modernization of packing, storing and growing was also recommended. Government assistance, which was being proposed to insure producer costs, should rather be directed at assisting this renovation process, according to Hudson.

But in 1974 the government attempted to resolve the control issued by establishing the Agricultural Land Reserve (A.L.R.) and then Farm Income Assurance (F.I.A.).[6] The F.I.A. would only be available to those growers belonging to the B.C.F.G.A. and who 'supported' the affiliated houses, and in return the Board would have no enforcement power. Support for the affiliated houses, however, was not defined and as such growers could still sell to peddlers on the side (and break their contracts with the house) (Garrish).

The renovation process advocated by Hudson first appeared in the Oliver-Osoyoos Cooperative in 1975 when the labour saving pregrade/presize (PG/PS) technology was imported from Washington state. Apples could then be quickly sorted after arrival at the house (or removal from storage) using computerized colour and size sensors. The fruit is then stored and further sorted and

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6 F.I.A. was established to appease growers who stood to lose capital gains when their land was frozen in the A.L.R.

packed, in one operation, to meet the needs of the customer at a much more measured pace. But the industry-wide pooling system could not adequately cope with this uneven adoption of the new technology, and grower dissatisfaction, and hence peddling, increased. The Washington crop continued to grow, and houses continued to amalgamate in an attempt to reduce their per unit overhead and compete with the independents.

In the early 1980s the impact of the independents was most keenly felt, especially in the soft fruits. Independent houses concentrated on scarcely graded fruit quickly moved, and dealt not only with independent growers but also with contracted growers who played both sides. The affiliated houses, whose per unit overhead costs are highly dependent on fruit volume, faced increased competition amongst themselves and so lobbied for a change in the pooling system (Garrish).

In July, 1982, Roy Goldberg completed an industry commissioned study which again denounced peddling and recommended further centralization by way of amalgamating packing and selling functions into one agency to prevent competition among the houses for growers. Failing this, he recommended house pooling and selling, using B.C. Tree Fruits Ltd. as a broker only.

In 1983 a newly independent house, RH MacDonald and Sons, was denied an export license by the B.C. Fruit Board. In response to an appeal, the `superboard', or B.C. Marketing Board, ordered the B.C. Fruit Board to grant export licenses to this and other independent houses for all markets except the U.K. and Taiwan (B.C. Tree Fruits Ltd. strongholds) on a two year trial basis. Before this decision came down the B.C.F.G.A. had already

voted to move to house pooling, and a rival association of independent houses, Okanagan Fruit Producers and Shippers Association (O.F.P.S.A), was formed (Oliver Chronical, 1986). The following winter the second largest house created a storm when it failed to renew the contracts of 29 growers, at least some of whom were disregarding their contracts by shipping to independents (Stariha).

Poor returns from the 1984 crop led up to the most tumultuous year in the recent history of the B.C. apple industry. House pooling came into effect for all fruit, and so two more of the privately owned houses, MacLean & FitzPatrick and Westbank Packers, became independents. B.C. Fruit Packers of Kelowna, the largest house, had wanted the total industry amalgamation as proposed by Roy Goldberg, and their board recommended going independent once the near opposite, house pooling, became a fait accompli. If the general membership hadn't rejected the proposal then the entire industry would likely have disbanded, given the importance of the Kelowna house in spreading the costs of B.C. Tree Fruits Ltd (Dell). At about the same time as the vote was taking place, a trial was being held. Industry officials and packinghouses were charged under the Combines Act of conspiring to limit or deal in fruit storage facilities (in effect, to control prices).

While the trial in B.C. Supreme Court resulted in an acquittal, the federal Crown prosecutors didn't drop their appeal until much later in the year (King, 1985). That winter, as well, saw the B.C. Fruit Board hearings into the possible extension of the temporary export licenses granted two years earlier to

independents. As a result of these hearings, the B.C. Fruit Board decided to deregulate exports in all markets, even the previously untouchable U.K. and Taiwan markets (Oliver Chronical). In the meantime, independents were given another boost when members of the O.F.P.S.A houses were let into the F.I.I. (previously F.I.A.) program. By May of 1986 the B.C.F.G.A. executive demanded the resignation of the three member B.C. Fruit Board, in response to both the export issue and the board's failure to include independent growers in their representation (Garrish). While the crisis at the packinghouse level was somewhat less intense than the previous year, the growers were still restless at the time this study was initiated.

2.2 RECENT DEVELOPMENTS IN THE B.C. APPLE INDUSTRY

While the above historical summary demonstrated the cyclical nature of the organizational problems in the B.C. apple industry, it is vital to emphasize the significance of the most recent developments if industry performance is to be evaluated. This section will describe the industry structure at the end of central pooling, its problems, and how house pooling has attempted to remedy these problems.

Prior to 1984 B.C. Tree Fruits Ltd. dictated grading, packing and storage methods to their affiliated houses, and then sold the fruit. The proceeds from these sales, after B.C. Tree Fruits Ltd. deducted their costs and storage charges, were pooled by variety, grade and size. The packinghouses were sent the remainder in two cheques - one for the growers and the

other to cover the packinghouse costs or differential. The differential is a method of averaging packinghouse costs over the industry for the various types of packs and services provided, and will be further discussed below. When the actual costs diverged from the differential, the grower returns were adjusted accordingly.

The B.C. Tree Fruits Ltd. marketing strategy was to sell all the fruit at maximum prices. They first considered the volume that had to be sold over the year, and then adjusted their price to sell at a steady pace. It must be emphasized that this controlled rate of sale was of primary importance to preclude the politically unpopular disposal of excess fruit. When this steady rate faltered the B.C. Tree Fruits Ltd. reputation for price-gouging (to clear their manifest at the end of a storage period) was reinforced amongst their Washington competitors (Van Wechal).

Many problems with this structure were perceived by participants in the industry. Communication between houses and B.C. Tree Fruits Ltd. salespeople was negligible. The organizational structures of the various boards and committees often permitted only one person (such as the GM of B.C. Tree Fruits Ltd.) to attend both the B.C.F.G.A. and B.C. Tree Fruits Ltd. executive meetings.

Another problem was with the uneven adoption of the PG/PS (pregrade/presize) technology (which allows fruit to be packed to order through the season). B.C. Tree Fruits Ltd. salespeople felt packed fruit should be sold first, leaving the PG/PS fruit as a reservoir which would go to SunRype if it couldn't be sold.

While this fruit received the pooled price for its grade and size, the PG/PS packinghouses would not receive the same differential (only the labour costs) as the houses which had not invested in the labour saving technology. Hence the PG/PS houses felt they were not only NOT being rewarded for their investment, but were also being penalized. Their growers were getting lower returns due to both making payments for the new technology and lower differential payments.

At least two other factors combined with the above problems to cause the move to house pooling. The first was the increased threat of the independents. As mentioned in the previous section, the three privately owned houses left the B.C. Tree Fruits Ltd. organization, lobbied for export licenses and formed the rival O.F.P.S.A. The second other factor was the record Washington crops of the early 1980s, which peaked in 1983. The massive Columbia Basin plantings of the 1970s came into full bearing, and B.C. apple grower returns fell from and average of about $.10/lb in the late 1970s to about $.065/lb in the early 1980s.

Hence the industry underwent a dramatic upheaval in 1984, and house pooling was instigated first for Golden Delicious in 1984, and then for all fruit in 1985. The process has been one of evolution, and has yet to be stabilized. But it can be summarized as a shift in power from B.C. Tree Fruits Ltd. to the individual packing organizations. While B.C. Tree Fruits Ltd. consults with the houses about grading, packing and storage decisions, the final decisions rest with the packinghouses. They

can now decide whether the price offered through B.C. Tree Fruits Ltd. is sufficient.

Some of the changes are essentially accounting transfers. B.C. Tree Fruits Ltd. now sends the packinghouse only one cheque from which the packinghouse must apportion costs and grower returns. SunRype now pays the packinghouses directly for their fruit, not via B.C. Tree Fruits Ltd.. And storage costs are now paid directly by the houses, and not through B.C. Tree Fruits Ltd. (a change which could have some implications on interest charges if B.C. Tree Fruits Ltd. received a preferred rate).

Now the three major packing organizations have PG/PS capacity, and the smaller houses have a "set aside" practice which fills a similar role, albeit on a smaller scale. Most houses pack to order - B.C. Tree Fruits Ltd. knows how much of each grade and size are in inventory, and when packed quantities are dwindling or when a special order has been received they contact the houses on a "prorate" basis. The prorate is an attempt to keep sales volumes proportional among houses as the season progresses. The house then decides whether to fill the order by evaluating the price and anticipating future price movements.

The B.C. Tree Fruits Ltd. marketing strategy has necessarily changed. Movement targets are much more flexible, and the sales people are more familiar with the concerns of the packinghouses. The GM of B.C. Tree Fruits Ltd. is now from the management and not the volume-oriented sales stream (thus well equipped to deal with industry politics), and the accounting function (which

concerns itself with the bottom line) is more central to the organization. Communication among the various organizational boards has been expanded such that all sides of the story can now be heard at industry meetings. For instance, now both a B.C. Tree Fruits Ltd. and an O.F.S.A. (packinghouse organization) representative are present at B.C.F.G.A. meetings so all sides of the issues can be discussed.

Problems still exist under the new situation. One problem is with the prorate - every packinghouse now has a staff member who oversees the allotment of orders to different houses. The prorate is based on sales volumes, not values, as the decision of which house to place the order with goes to a dispatcher who is not informed about the price. Other houses may become jealous when one seems to consistently sell to better markets - that is to buyers who are willing pay more or who are less likely to cause subsequent problems (such as late payment or unreasonable damage claims). Houses are still finding it difficult to establish their individual reputations (and hence increase their sales) and are lobbying to use house end labels on their boxes to facilitate this.

While the packinghouses have always competed with each other for growers, the conversion to house pooling has intensified this. Its important to emphasize the ways in which these houses can differ in order to understand how this competition occurs. Climate, soil, average orchard size and farm management ability vary up the Okanagan Valley, and so the different packinghouses can have quite dissimilar members. These same factors are also responsible for different fruit quality at the houses. Some

organizations are small, and can therefore afford to be choosier about the type of grower they take on as members, whereas it is less political for the larger houses to be as selective. Some organizations choose to increase their costs (and lower short term returns) by hiring additional field staff in hopes of improving orchard management (and possibly reducing production costs[7]) and improving fruit quality (and possibly increasing value) over the long run.

In the packinghouse one must be aware of different techniques houses can use to give the impression of higher grower returns. When fruit is delivered to the packinghouse it can either be weighed in or have an assigned average bin weight. When using the latter method it is possible to hide cull fruit in "shrinkage", that is, bins which actually weigh more than the assigned weight can appear to have a better packout percentage and hence a higher value (and grower return) on a per unit basis, although total return would be the same with both methods. Some houses charge their foreman to variable labour to reduce overhead charges. Some houses depreciate investments as quickly as possible, others prefer a slower, less painful rate. Some houses use cull charges (sliding or fixed point) to offset overhead and hence increase apparent returns per unit (although total returns would only be increased if these charges have a deterrent effect over the long term). Other houses feel it is cheaper and quicker

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7 One house estimated fieldwork costs of $200,000 and a subsequent grower savings in spray costs of $300,000 over one growing season. However, these costs would be spread amongst all members while the benefits may have accrued only to specific growers.

to sort out culls on the grader line than in the orchard and so feel cull charges aren't necessary.

Finally, houses can differ due to management abilities, and even pure chance. The astuteness of the marketing manager at overseeing the salespeople at B.C. Tree Fruits Ltd. can contribute to the overall return to the members of the packing organization. They also help determine when to open CA rooms to make their fruit available for packing and sale, as well as the initial distribution of the fruit to these rooms months before, and these decisions can have a large impact on final returns. And there can even be unintentional benefits to faulty prorating. For instance, one house that is complaining loudly about not shipping up to prorate in a certain grade and size may suddenly receive a windfall when the price of that fruit unexpectedly increases enabling that house to profit more than houses which have less inventory. While industry pooling protected individual houses from losses due to falling prices, it also prevented them from anticipating and profiting from price movements.

2.3 STRUCTURAL DIFFERENCES BETWEEN B.C. AND WASHINGTON STATE

Since the purpose of this thesis is to consider the relative efficiency of the packing and marketing sectors of the B.C. apple industry the yardstick against which to measure this is the Washington state system. As mentioned in Section 1.1, the Washington industry has grown at a much faster rate than the B.C. fruit industry. Its production is ten times that of the B.C. industry, and hence has a much larger influence on price. Since the major Washington State regions are quite close to B.C.'s

Okanagan valley the climate, dominant varieties and major markets are fairly similar. Both regions produce far more than they can consume and are some distance from major markets. There are no tariff barriers on apple trade between the U.S.A. and Canada. All these factors, plus the fairly close, if informal, ties between members of the two industries, qualify Washington as the best region for comparison.

As will be explained in Chapter 4, the basis for this performance evaluation will be costs incurred and revenues obtained. But looking at these measures in isolation could be misleading. Structural differences, whether due to physical, intransient factors or to organizational factors may at least explain, if not justify, performance differences. And conduct differences can not only affect relative performance, but may also bias this comparison unless careful consideration is given to factors such as accounting practices. Therefore, while data from Washington State is sketchy, some attempt to understand these differences must be made before performance evaluation can proceed.

2.3.1 Fruit Quality Comparisons

Apple grading in both B.C. and Washington has evolved from a horticulturally based (freedom from flaws, keeping quality) system to one incorporating market preferences or the growing importance of aesthetic qualities such as colour and shape. The various Fancy (FCY) and Extra Fancy (XFCY) grades in B.C. (and their equivalents in Washington State) are primarily distinguished by the amount and pattern of colour as measured by electronic sensors and, at least for the Red Delicious variety,

the length to width ratio and prominence of the points on the end of the apple. For instance, in 1984 a B.C. Red Delicious XFCY1 was 90% red or better with a minimum 1:1 length to width ratio whereas a FCY2 could range from 45 to 74% colour. One must distinguish, however, between judging fruit quality by the level achieved, as above, and by the consistency of the fruit within each level. This distinction will be discussed further below but note it is this consistency factor which is most often bemoaned in the B.C. industry (Dell).

To compare fruit quality between the regions one must understand the various factors that can affect these quality criteria. Condition or keeping quality is primarily determined by maturity at picking time. Shape is most often genetically determined, although management practices and climate have influence. Colour, which seems to be the most important factor in the marketplace, is affected by nutrition, strain, sunlight penetration and diurnal temperature fluctuations. Thus, there are four major factors influencing fruit quality - soil, climate, strain and management practices. These factors, while comparable in these two regions in relation to the rest of the world, are sufficiently different to account for quality level differences.

The climate in the two regions differs not only because of the latitudinal difference (up to 4.5 degrees), but also because of topographical differences. The Okanagan is in the northern fringe of the apple growing region, and so the risk of winter or spring damage is greater (100-180 frost free days versus 200-220) although the moderating effects of the lakes and rivers afford some protection in some areas. The B.C. Okanagan is also a much

narrower valley and more subject to frost pocketing than the Washington Okanogan, and certainly the Columbia Basin is flat in comparison. There is also considerable variation within each area. But while the Columbia Basin receives more heat units than either the B.C. or the Washington State Okanagan valley, this heat may actually be excessive and hurt the condition and colouring of the fruit.

Apples will grow on a variety of soils provided there is adequate drainage (Swales). Acidic soils, which reduce nutrient availability, are a problem in areas with a long history of irrigation and fertilizer use. In addition, problems with apple replant disease occur in soil formerly planted to apples and is therefore more likely in B.C. where the suitable land is more restricted. Both the B.C. and Washington State fruit growing areas are characterized by brown chernozenic soils but within this classification the Okanagan valley soils are more variable than either Washington fruit region (Okanogan Valley or Columbia Basin), again in part due to topographical differences.

A major consideration in apple quality is the apple strain. For instance, within the variety Red Delicious there are more than 40 strains. To further complicate the issue, the rootstock chosen will also affect the fruit attributes. While many of these strains and rootstocks can be grown interchangeably in either Washington State or B.C., Washington growers seem to have been much less catholic in their choice, perhaps at the insistence of their packinghouses. For instance, in Washington State 48% of the Red Delicious trees are of only 3 strains,

whereas in B.C. the top three strains comprise an estimated 25% of the Red Delicious trees (Washington Fruit Survey, 1986).

Farm management differences are even more difficult to quantify. The Okanagan tends to attract retirees and hobby farmers to a greater extent than Washington (perhaps because there are much milder climates than Washington State to retire to in the U.S.A.) (Heinicke). In Washington a little Spanish is probably the only foreign language needed whereas in B.C. there is a large Portuguese community and a growing number of novice growers from the Punjab. The language difficulties complicate extension attempts, as do the varying educational and horticultural backgrounds. Extension in Washington State is carried out by both the packinghouses and the land grant university (and its agricultural experimental station), whereas the packinghouses and the provincial government conduct extension activities in B.C.. In terms of the ratio of growers per packinghouse fieldman, the Washington system supports 40:1 as a rule of thumb, whereas in B.C. 250:1 is more the norm (where the 40 Washington State growers produce as much as the 250 B.C. growers). So management techniques may well be different, at least in the short term, between the two regions.

2.3.2 Size Comparisons

Before embarking on industry size comparisons a reminder of the importance of the economies of size or scale concept would be helpful. Economies of size exist where the operation is on the downward-sloping section of the long run average cost curve (LAC). Expansion would result in reduced average costs via a fall in input per unit of output. According to Green, these

economies can be `real', as just described, or `pecuniary' when obtained by way of monopsony powers. Determining a business entity's exact position on its LAC is difficult, but the presence of the following factors may indicate size or scale economies.

As delineated in Scherer, these factors can be grouped into product-, plant- or multiplant- specific factors. Another way to group them that may be more relevant to the broader functions in the apple industry divides these factors into four categories of concern: specialization, setup costs, engineering relationships and massed reserves. Potential examples of these from the various levels of the industry will best illustrate these concepts.

Economies of size due to specialization is fairly intuitive. Orchardists may benefit from concentrating on the requirements of one crop, both in terms of knowledge and equipment requirements. Specializing labour, whether in term of the task at the production or packinghouse level, or the market region at the sales level, may improve efficiency.

Examples of savings due to reduced setup costs per unit processed are most evident at the production level. For instance, spray treatments in orchards require a considerable amount of start-up time to mix, calibrate and service the machinery, therefore this `fixed cost' can be spread more thinly as orchard size increases. In the packinghouse similar start-up costs accrue when switching package types.

`Engineering' relationships refer to the surface area to volume ratio, where area of a cylinder varies as the 2/3 power of volume. The best examples of this factor would occur in a

packinghouse. For instance, the cost of constructing a cold storage room depends directly on the materials cost of the surface area, and so for a unit increase in volume there is a proportionally smaller increase in construction costs. Similar relationships exist for energy usage and maintenance requirements for the facility.

Economies of massed reserves is a somewhat less obvious concept. It refers to risk spreading when there is a lumpiness in back-up input. For instance, the probability of all electronic colour sensors failing at once declines exponentially with the number used in the sorting lines. Therefore, the cost of keeping a sensor in reserve to replace a failed one also declines with the capacity of the line. This principle can be extended to cash reserves needed to cover exigencies - the amount of this reserve may not need to increase proportionately with the size of the operation.

The above list of possible economies of scale or size in the apple industry is hardly exhaustive. Most of these factors are subject to the law of diminishing returns - economies gained per unit of cost associated with expansion decline as the LAC approaches its minimum. Most industries then exhibit a region of constant returns to size before diseconomies set in. Diseconomies of size are most often attributed to managerial capacity. Eventually the operation becomes too large for the manager/executive to cope, and techniques such as decentralization must be employed. Economies of size in production may also be restricted by market geography concerns where transportation costs play a role.

Problems in both management and transportation costs have been ascribed to the B.C. apple industry by its critics. Although factor prices differ somewhat between the B.C. and Washington regions, the unimpeded flow of technology and the similarity of the product suggest both regions are influenced by the same factors of size efficiency. Assuming both face similar LAC curves a very important distinction between the regions, then, is their relative position along the LAC. The following discussion will itemize some of the size differences, as well as the factors behind these differences, at the orchard, packinghouse and industry levels.

Orchard Level

According to the 1986 Census of Agriculture, as summarized in Table 2.1, there were 3,188 farms reporting 27,798 acres of tree fruit in B.C., or an average of about 9 acres per farm. This was distributed such that 63% of the orchardists farmed only 17% of the land, or about two acres each. The majority of the acreage, 54%, was farmed by 32% of the growers, for an average of about 15 acres each. The 1986 B.C.F.G.A. registry recorded an average farm size of about 14 acres, suggesting that many of the Census orchardists are not included in the B.C.F.G.A.. The 1,914 Okanagan apple orchardists reported in the Census data grow 17,450 acres in apples, for an average apple orchard size of bout 9 acres.

Table 2.1 B.C. Tree Fruit Farm Size Distribution, 1986.

	Farms	Acres
1 - 7 acres	2027	4702
8 - 32 "	1025	15074
33 - 127 "	131	6788
128 acres and over	5	1234
Total	3188	27798

Source: 1986 Census of Agriculture

While exact figures are not available, Washington State sources estimate the average Washington orchard size to be approximately 40 acres, compared with 15 acres (9 of apples) in B.C. reported above. This suggests there exists considerable scope in B.C. to capture economies of size, as supported by Lee's representative orchard cost comparison. Beyond those mentioned above, there are several obvious areas where size economies may exist. Spreading the fixed costs of orchard machinery, record keeping and permanent help are examples of this. As well, the quality consistency aspects mentioned in Section 2.3.1 could also justify expansion. So what prevents B.C. farmers from reaching the same size as those in Washington State?

The first factor preventing industry expansion is B.C.'s lack of land available for expansion relative to the Columbia Basin region. However, amalgamation of farms could still achieve the same effect, although not without incurring transactions costs, either through transportation costs when blocks are separated or through complicated procedures to amalgamate adjacent blocks. Higher land prices in B.C. have traditionally been blamed for its smaller sized farms, but when rental rates

are compared between the two regions this factor loses credibility (Lee). Even if land prices are higher in B.C., economies of size should encourage higher density plantings to compensate. But densities are lower in B.C., averaging 155 trees compared with 190 trees per acre in Washington (Washington Fruit Survey, 1986). This, and the larger acreage in Washington State, may be partly explained by the tax structure in Washington where the capital cost allowance rates are higher than in B.C. and where investors can depreciate trees, as well (Lee).

Packinghouse Level

There are two factors to consider when evaluating scale or size at the packinghouse level and these are directly related to the previous discussion of farm size. Packinghouse size can either be measured in terms of volume or in terms of grower number. The former is important in the standard case of spreading the fixed costs of overhead over a larger volume. The latter measure is only relevant if it has a bearing on packing costs. In a cooperative this is certainly the case, as grower services, especially extension, and paperwork costs increase with the number of members. There could also be possible costs associated with stopping and starting a packinghouse run, but most industry sources discount this since orchard blocks can be pooled before the run (and hence incur only minimal paperwork costs). There may also be costs associated with waiting for enough like fruit to come through the system to fill and close a CA room, which should be done as rapidly as possible maintain fruit quality. This is also related to the quality variability

aspect discussed above, where returns, if not costs, could suffer from a large number of small growers.

Plant size comparisons between B.C. and Washington State are quite difficult, given the different ways of reporting plant capacities, different bin weights, and the different packing season lengths. In his 1983 survey of Washington plants, Schotzko determined daily packing capacities, storage capacities and expansion plans of the 94 respondents (out of an estimated 180 packinghouses) (Schotzko, September 1983). His results showed the average measurements would be downward biased by the relatively large proportion of small packinghouses. While the average capacity was about 330 bins per day (230 for conventional and 400 for PG/PS systems), 60% of the firms accounted for only 1/3 of the production while the top 20% (with 500 or more bin capacities) accounted for 45% of production.

An informal survey of the seven major B.C. packinghouses was conducted (for the 1987 crop year) to obtain similar capacity measurements. Three of the eleven plants where packing operations take place have PG/PS, with an average daily capacity of 325 bins (at about 800 pounds/bin) or about 300 average Washington State bins (at an average 866 pounds/bin) per shift. Among the B.C. Tree Fruits Ltd. houses the average conventional plant packed 258 bins (or 238 Washington State bins) per shift, but among the seven organizations surveyed the average plant packed 224 bins (or 207 Washington bins) per shift. The average plant (conventional or PG/PS) is about 252 bins (233 Washington State bins). While the PG/PS plant capacities varied by only 50 bins, the conventional plants ranged in size from over 300 bins (277

Washington bins) down to 85 bins (78 Washington State bins) per shift.

Thus, in comparing B.C. and Washington State (using Washington bins), it appears that while the average conventional systems are of comparable size, the PG/PS systems are much larger in Washington, 400 bins to 300. The bulk of the B.C. production is packed in the PG/PS houses (with a maximum size of less than 325 bins), and recall that 45% of the Washington production is packed in houses with capacities of over 500 bins. The major Washington packinghouses are therefore 55% larger than the largest packinghouse in B.C., and averaged over both types, a Washington plant is 42% larger than the average B.C. packinghouse. And since the Washington State figures may well have risen in the four years since Schotzko's study was conducted, this size advantage is probably understated.

While this data isn't perfect, it does appear that the bulk of the Washington production occurs in much larger plants than are dominant in B.C.. In terms of growers per house the data seems much more clearcut. In 1986 there were an estimated 4500 growers in Washington State and 175 houses, or about 26 growers per house on average (St John). In the same year there were 1602 full fledged B.C.F.G.A. members (plus 54 affiliated members) and five packing organizations (plus one affiliated) and 10 plants (plus one affiliated). The informal survey of packinghouse organizations mentioned above found an average of 364 members per B.C. Tree Fruits Ltd. affiliated organization, or among the three major organizations an average of 271 members. While a considerable amount of amalgamation has occurred even over the

last five years, it tends to be more in terms of bringing plants under the same management than in terms of combining plants. There is considerable reluctance on the part of the members to create an even larger organization (in terms of grower numbers), which is understandable given the existing numbers of members per plant or organization. The process of capturing plant economies of size may necessarily entail amalgamation at the farm level first.

Industry Level

Economies of size on an industry basis are less obvious than those involving production activities. Yet these economies are probably the most important distinction between B.C. and Washington. A larger industry could support a better infrastructure whereby transportation, materials and machinery costs could face potential reductions. Fixed costs, such as research, extension and promotion can be higher when there is a larger industry to share them.

While there is evidence that Washington State has a better infrastructure (such as more rail links and the Columbia Basin irrigation project), it is difficult to ascribe this to the size of the tree fruit industry when there are several other crops and industries in the same area. But in areas such as research and promotion Washington clearly has an advantage due to the size of the tree fruit industry. Assessments of $US 0.15/box and $US 0.32/Ton fund promotion and research, respectively. This translated into a 1984-85 budget of over $US 7 m for the promotional agency, of which $US 3.8 m funded the advertising budget (GoodFruit Grower, September 1984). The apple-related

research budget approaches $US 500,000, most of which goes into jointly funded horticultural and pest management research (Shelton). A further $US 100,000 is available as an annual emergency fund to deal with exigencies which don't fall under the guidelines of either the promotion or research commissions (GoodFruit Grower, May 1984). These effort dwarf B.C.'s attempts at research and promotion. The B.C.F.G.A. jointly funds research at a 49 acre test orchard and B.C. Tree Fruits Ltd. funds advertising and promotion at a rate of about $CAN 1m per year or about $0.11/box (in Canadian currency) (B.C. Tree Fruits Annual Reports). This comparison does not include the sizeable research budgets at the government level of either region.

Another aspect of size benefits is the lobbying force which improves with size. The Washington State Fruit Commission hires two professional lobbyists, one in each of the state and the federal capitals (Stover). As an example of their realm of concern, the federal lobbyist was recently involved in amendments to the immigration bill which would permit Washington growers to hire `guest' (read alien) migrant labour and hence keep labour costs down. This is not to say that B.C. orchardists have no political power, since professional lobbying is rare in Canada yet farm groups have achieved considerable government support.

2.3.3 Organizational Structure

While the previous discussions have alluded to the structures of the tree fruit industry in both B.C. and Washington State, this section will present these in a more systematic manner. Little attempt will be made to present the interactions between the various components of the industry, as the

composition of the various B.C. boards and committees has been very dynamic over the last few years, and such a discussion will be more relevant in the following conduct section.

According to the 1986 Census of Agriculture mentioned above there were about 3000 growers, 2200 of whom Statistics Canada considers commercial with net sales over $2500, but only 1450 with farm incomes over $10,000. In B.C. there are about 1600 growers who belonged to the B.C.F.G.A. as of 1986 (B.C. Fruit Growers Registry). The B.C.F.G.A. is organized into an executive as well as several different committees, such as the Pooling Committee which has historically made pooling decisions.

The B.C.F.G.A. owns B.C. Tree Fruits Ltd. and SunRype, the marketing and processing arms, respectively. The boards of these two industry-owned companies are interlocking, with representation from the B.C.F.G.A. and the hired management teams. B.C. Tree Fruits Ltd. has 67 personnel located primarily in the main office in Kelowna, but with sales staff in Calgary, Edmonton, Saskatchewan, Winnipeg, Toronto and Montreal as well as an export sales office in Vancouver. The Toronto office has actually become the headquarters of the reincarnated industry-owned brokerage, Canadian Fruit Distributors Ltd, which has recently become involved in importing other types of fruit in order to turn a profit on the branch office side of the operation.

Besides the sales staff of 18 (plus secretarial support), there are 5 marketing service staff who handle traffic, sales statistics, forecasts and claims. There are also three people in the advertising and PR area, eight in accounting and

administration and 17 in data processing. Within the latter group, B.C. Tree Fruits Ltd. provides about 20% of its function for SunRype and 40% for the packinghouses (Linder).

The members are also organized into packinghouses, which are in turn organized into the O.F.S.A.. The full-fledged B.C.F.G.A. members are all members of cooperative houses, of which there are 5 organizations and 10 plants. The O.F.S.A. represents these houses in labour union negotiations, industry meetings and lobbying attempts. They are responsible for making the differential manual which determines the costs of packing used in income insurance calculations.

Outside this `official' stream the information regarding the independents is much more sketchy. The independents have only recently organized into the O.F.P.S.A. and have not developed a system of data collection yet. The exact number of independent growers is not known, in part because many growers are still dealing with both streams. But most of these growers are shipping soft fruits, as only about 6% of the apples bypass the B.C. Tree Fruits Ltd. system. There remain two relatively large independent houses (after the recent bankruptcy of MacLean and Fitzpatrick), RH MacDonald and Westbank Packers (the latter's growers are Associate B.C.F.G.A. members) (King, 1987). These two organizations can either market their own fruit or pay a commission to a private agent, ProFresh, to sell their fruit. The remaining independents are relatively small and less concerned with the fresh apple market than they are with soft fruit and cider fruit producers.

Finally, there is a three member (at last count) marketing board (B.C. Fruit Board) elected by the B.C.F.G.A. membership. While they originally regulated domestic and export sales licenses, in recent years decisions by the superboard have greatly reduced the powers of the B.C. Fruit Board to the point where their role is primarily an advisory one.

As mentioned in the previous section, the Washington industry currently consists of approximately 4500 growers and 175 houses. In the original apple-growing region, around Wenatchee and Chelan, the majority of houses are cooperatives while in the newer Columbia Basin region there is a more even split between cooperatives and private houses. As mentioned previously, the growers have funded two commissions, the Fruit Commission and the Research Commission, to promote and research tree fruits. In conjunction with the Fruit Commission, the Wenatchee Growers Apple Clearinghouse Association (W.G.A.C.H.) collects price and movement data which it disseminates biweekly to its grower members. There also exist some brokers, both private and associated with houses, who market some of the house's products. Many of the packinghouses have their own sales force, often only one or two personnel (although this data is not readily available).

2.4 CONDUCT OF THE B.C. APPLE INDUSTRY

2.4.1 Packinghouse Conduct

While the B.C. Tree Fruits Ltd. affiliated houses are now all cooperatives, there is still quite some variation in their conduct. Areas of difference include variety specialization, emphasis on extension, type of member, storage regime and timing

choices, and `accounting' methods. Within the accounting area one can include the preferred method of financing operating and capital expenses, member equity arrangements, depreciation rates and the use of cull charges. A brief description of these accounting practices and their implications is necessary to understand the complexities of inter house comparisons.

When organized as a non-stock cooperative, a revolving fund of member contributions must be set up. This most often entails a per unit patronage assessment, called capital retains, which is credited to the members account as equity. The `revolving' aspect refers to the sequential nature (often over eight years) in which the members are allowed to cash in their certificates of equity. In this way members who are currently using the cooperative will support its investment plans, which is often called the `currency rule'. A second method, retained patronage refunds, involves retaining a portion of the net savings or net margin that would otherwise be directed to the members. This is a less reliable form of cooperative financing than the capital retains method, as the presence of a substantially positive net margin is less predictable. But this fund provides an operating cushion to facilitate cash flow, and is again credited to the member's equity position (McBride).

Cooperatives can vary greatly in how they implement these methods, and how they permit the members to cash in equity. In the short run these differences can cloud efficiency measures as they can be manipulated to some extent by the board of directors. The same can also be said of the method of depreciation, since a high depreciation rate can increase short run costs (making the

cooperative seem less attractive to members) but shorten the payback period. This leaves room for members to avoid high assessments by switching cooperatives during payback periods, although the houses have tried to discourage this.

The use of cull or in-charges can also affect the appearance of efficiency. These penalize a grower for shipping a relatively high proportion of cull fruit and justify this on the basis of higher incurred handling and bin costs. In Washington State, at least, these cull charges are debited to the member's account immediately, with interest charged, and the subsequent processing returns are not charged overhead. In effect, growers are credited the full price paid by the processors and forget that they have already paid `overhead' in the form of the cull charge. Similar methods are used in some B.C. houses, although others simply share overhead over all the fruit since they don't believe grading high cull percentage runs costs much more than grading normal runs. In fact, they feel the costs to the grower in sorting out culls in the orchard, both in time and money, are higher than the costs of doing the same over the packinghouse graders (Dell).

Information regarding the conduct of Washington houses is primarily anecdotal, as they have no representative association and considerably more variation than is found in B.C.. The houses can specialize in different varieties, in fresh or processed fruit, in export or local markets, in chainstores or terminal markets, or they can be generalists in some or all of the above. Because most houses specialize somewhat, buyers may have to deal with several houses to get the desired product mix. This aspect

provides B.C. Tree Fruits Ltd. with one of its claimed marketing advantages, namely one-stop shopping. In Washington State smaller houses often have specific niches or outlets, which simplifies their sales function. They can also have their fruit sold through brokers, as can some of the larger houses. Some of the houses with the best reputations can have some fairly heavy-handed methods to guard that reputation. They can require new members to have a five year packout record at a certain level, and can strongly suggest varieties, cultural practices and harvest dates.

To separate fruit by condition or keeping ability the Washington houses often use two or three different pools - one or two early pools (for best condition) and a regular pool. This corresponds to Schotzko's study on the effects of the pooling system on different shipping patterns of growers (Schotzko, 1983). He found that with a single pool there is incentive to leave the fruit on the tree as long as possible in order to get a better grade (but poorer condition and hence reduced late season returns). Schotzko felt three pools would reduce this incentive, although there is still room to play these pools.

B.C. houses are emulating those in Washington State more and more. For instance, the move to house pooling and greater house independence (evidenced by their storage opening and pack design decisions) have made them much more comparable to Washington houses. They have fieldmen and make considerable efforts to advise their growers. They have similar storage determination methods (in fact Washington State has taken their lead from B.C. in this area). B.C. houses grade their fruit to the same

standard and sizes and use the same types of packs. Again some houses specialize in certain types of fruit and some have a better reputation amongst the buyers than do others. And some of the smaller houses can be choosier in their membership requirements than the larger houses, who feel they can't afford to appear the bully.

B.C. houses now have at least one employee to watch over the prorate distribution of orders by the B.C. Tree Fruits Ltd. marketers (possibly wasting any economies of size realized by centralized marketing). They are much more concerned about the timing of CA room opening and price fluctuations than before house pooling. They do not have seasonal pools but do separate the fruit into blocks or storage regimes. They feel there is less incentive for growers to leave fruit on the trees and harm the condition than in Washington, possibly since the B.C. climate creates a natural advantage in fruit condition.

2.4.2 Marketing Agency Conduct

Before discussing the conduct of B.C. Tree Fruits Ltd. in terms of its marketing functions, note should again be taken of the non-marketing functions it performs. These functions may or may not be needed to improve the functioning of the industry, but they are often required in a political sense by the houses. Data collection and processing for both SunRype and the packinghouses is centralized in B.C. Tree Fruits Ltd.. They are also relied upon quite heavily to assist with government stabilization and insurance programs and to act on industry committees. Finally, B.C. Tree Fruits Ltd. personnel act as liaison agents between

houses, handle assembly of shipments and deal with buyer's claims.

The market situation faced by B.C. Tree Fruits Ltd. is a rather difficult one. B.C. produces 1/3 of Canada's crop but has only 12% of the country's population. And the B.C. market is also where the main competition from the independents occurs. The Eastern markets are more cheaply serviced by their local producers, and hence B.C. Tree Fruits Ltd. can only compete by differentiating its product. Small amounts of the crop go into the Atlantic provinces, as well, through private brokers. B.C. Tree Fruits Ltd. also competes with the independents, Washington and Eastern producers for the Prairie market, although B.C. still has a sizeable market share (67% excluding independents) (Agriculture Canada, March 1986). But the domestic market cannot absorb all of B.C.'s production at a reasonable return, and so export markets are expected to carry the remaining crop, or about 33% and 35% in 1984 and 1985 crop years.

The export market most preferred by B.C. Tree Fruits Ltd. is the U.S.A.. There are no trade barriers between the two countries for apples, and there is considerable trade in both directions, as will be detailed shortly. There are considerable barriers to contend with in other countries, be they actual tariff, phytosanitary, political or currency restrictions. While B.C. Tree Fruits Ltd. concentrates on its own branch office sales staff for most of the domestic market, they prefer to work with brokers in export markets in order to have someone on hand at all times. They try to build up a rapport with specific brokers, basing their commission on the reliability, quality and going

rate in any specific market. They work almost exclusively with letters of credit, and the EDC underwrites up to 90% of the sale in all overseas markets (Messent). While information is scarce on the export selling methods of Washington State houses, it appears they have less allegiance to the use of brokers, or at least to specific brokers, than does B.C. Tree Fruits Ltd.. In recent years a number of Washington houses lost a great deal of money when they banded together to deal through an offshore broker (Van Wechal).

The sales distribution of B.C. Tree Fruits Ltd.'s crop is outlined in Table 2.2. Alberta, B.C. and the U.S.A. absorbed between 17% and 21% each of the sales of B.C. Tree Fruits Ltd. (by volume) in 1984 and 1985. The remaining Prairie provinces (summed), Eastern Canada and offshore markets made up the remainder of the sales in about equal proportions ranging from 12 to 15%.

Table 2.2 BCTF Sales Distribution to Different Markets

	Percent of Sales	
Market:	1984	1985
BC	17.8	19.2
Alberta	20.4	18.9
Saskatchewan	8.1	6.8
Manitoba	6.6	7.6
Eastern Canada	14.3	12.3
United States	17.6	21.0
Offshore	15.2	14.2

In exporting to the U.S.A., the bulk of the fruit goes to 6 major markets - Los Angeles, San Francisco, Dallas, New York, Atlanta and Chicago. Unlike other export markets, the U.S.A. will buy a wide range of varieties, grades and sizes. Most of the fruit is sold to retail chains, which are more regionalized than in Canada. Terminal markets are also fairly important when attempting to crack the institutional business (Messent).

Offshore exports are encapsulated in Table 2.3, where both B.C. and Washington State exports are given, although the B.C. figures are by calendar year while the Washington figures are by crop year. Even so, the data gives a strong indication of the relative importance of various markets to the B.C. and Washington State marketers. This table also shows the cross border trade conducted by B.C. and Washington, where B.C. exports to the U.S.A. were 55% and 87% (ignoring the difference in accounting period) of the amounts exported from Washington State into Canada in 1985 and 1986, respectively.

Table 2.3 Apple Exports From BC and Washington in Boxes and Percent of Total

	From British Columbia				From Washington					
	1985		1986		1983-84		1984-85		1985-86	
Country To:	Boxes	%	Boxes	%	Boxes	%	Boxes	%	Boxes	%
Europe:	237758	16.0	337081	20.3	876461	8.7	540889	5.7	443395	8.3
UK	216172	14.5	281555	17.0	239305	2.4	122183	1.3	84650	1.6
France	1348	0.1	3401	0.2						
Germany	3857	0.3								
Finland	998	0.1	7986	0.5	216169	2.2	183543	1.9	186856	3.5
Norway	5066	0.3	17243	1.0	191472	1.9	104714	1.1	106590	2.0
Sweden	4327	0.3	19858	1.2	72727	0.7	98864	1.0	34928	0.7
Netherlands					109920	1.1	10939	0.1	26587	0.5
Iceland	4991	0.3	7038	0.4						
Other	998	0.1			46868	0.5	20646	0.2	6784	0.1
Middle East:	10118	0.7	6109	0.4	2333584	23.3	2065850	21.7	572440	10.7
Saudi Arabia	10118	0.7	6109	0.4	1903587	19.0	1599419	16.8	399721	7.4
Dubai					352409	3.5	346931	3.6	140678	2.6
Other					77588	0.8	119500	1.3	32041	0.6
Pacific Rim:	376112	25.2	425089	25.6	4888563	48.8	4990182	52.5	3168332	59.0
Hong Kong	77980	5.2	30583	1.8	1257587	12.6	1514203	15.9	818271	15.2
Malaysia	29762	2.0	39696	2.4	548154	5.5	638526	6.7	307049	5.7
Singapore	38452	2.6	78729	4.7	571335	5.7	630403	6.6	455231	8.5
Japan			881	0.1						
Taiwan	185989	12.5	262708	15.8	2028494	20.2	1852150	19.5	1317755	24.5
Thailand	3363	0.2	7196	0.4	216154	2.2	156637	1.6	138062	2.6
New Zealand	32683	2.2	5297	0.3	217705	2.2	149067	1.6	105514	2.0
Other	7882	0.5			49134	0.5	49196	0.5	26450	0.5
Cent. & S. America:	3736	0.3	16527	1.0	453872	4.5	330948	3.5	180436	3.4
Brazil	1765	0.1	2634	0.2	150	0.001	2700	0.03		
Columbia			3967	0.2	201781	2.0	151774	1.6	59138	1.1
Costa Rica					31163	0.3	39999	0.4	28037	0.5
Mexico					15083	0.1	41943	0.4	26394	0.5
Panama	998	0.1	9925	0.6	5169	0.1	7489	0.1		
Trinidad	973	0.1			86285	0.9	32942	0.3	13571	0.3
Venezuela					33035	0.3	1602	0.02		
Other					81286	0.8	52499	0.6	53296	1.0
Canada					1468000	14.6	1581000	16.6	1006000	18.7
US	862884	57.9	874692	52.7						
TOTAL	1490608		1659497		10020480		9508869		5370603	

As mentioned above, the best export market for B.C.'s apples is the U.S.A., which absorbed 58% and 53% of the total exports in 1985 and 1986, respectively. As a group, Pacific Rim countries were next in importance at around 25% both years. But in terms of individual countries, the United Kingdom is B.C.'s second best market, at 14% and 17% of total exports. This could perhaps be due to the good traditional ties maintained by B.C. Tree Fruits Ltd., although the promotional emphasis on British Columbia apples is claimed to be of help (Messent). This is the only market where B.C. outshines Washington, in part because of the special consignment arrangement B.C. Tree Fruits Ltd. has with a large broker, Glass Glover. This type of financial arrangement is anaethemic to Washington State houses, but it reflects the special marketing requirements of the UK. The third highest exports are to Taiwan, at 12% and 16% over the same two year period. Taiwan has an unusual preference for what is called a `striped' Red Delicious which is quite unpopular in other markets where intense red colour is required. Hong Kong has also been a good market in the past (5% and 2%), although the competition has increased in recent years. It is a more difficult market to penetrate, as they don't want to pay for refrigerated shipments and the supermarket has yet to succeed there. Singapore has market potential as it prefers very small fruit (unwanted elsewhere), has the only supermarkets in the Far East, and has a large institutional market (from freighters). Singapore absorbed 3% and 5% in 1985 and 1986, respectively.

Washington seems to have a much more varied export pattern, possibly necessitated by the lack of one large trading partner

such as B.C. has in the United States. Their biggest market is Taiwan, where about 20% of their exports are absorbed. Their second largest market is in the Middle East, primarily Saudi Arabia, which bought 20%, 17% and 7% of exports in the 1983, 1984 and 1985 crop years. Saudi Arabia is an interesting market in that the consumer buys apples by the box and so the packinghouse must coordinate with the local agent to provide a box top in Arabic. Both Taiwan and Saudi Arabia are strong allies of the U.S.A., and so this may explain their strong preference toward Washington apples in the same way the U.K. favours B.C. apples. And Canada is the next largest market for Washington State fruit, purchasing 15%, 17% and 19% of the total exported crop in 1983, 1984 and 1985 respectively. In those same years Washington exported 19%, 20% and 15% of their total fresh crop. The 1985 crop year was aberrant in many of these figures because it was a short crop year (with about 73% of the previous season's harvest).

None of the above data mentions the revenues from these markets. While this is not available for the Washington State exports, the B.C. data can be manipulated to report on the average price received per box from the different markets. This information is presented in Table 2.4, although one must note that currency fluctuations and different marketing seasons may bias comparisons. The highest prices in 1984 were received in France, Finland and Iceland at $31, $24 and $17, respectively. In 1985 the best prices were from Iceland, Japan (a test shipment) and the U.S.A. at $22, $21 and $19, respectively. In Europe and the U.S.A., where there is local apple production,

Table 2.4 Value of BC Apple Shipments to Different Markets on per Box Basis (1984-85)

Country:	1984	1985
US	$15.27	$18.56
UK	$15.62	$14.24
Ireland	$14.21	
Finland	$23.60	$12.21
France	$31.26	$17.51
Germany	$11.08	
Iceland	$17.17	$22.02
Norway	$10.69	$15.19
Sweden	$8.78	$12.51
Saudi Arabia	$11.21	$14.38
Hong Kong	$10.88	$12.72
Malaysia	$10.34	$13.42
Singapore	$10.91	$14.13
Japan		$21.21
Taiwan	$12.69	$13.41
Thailand	$16.64	$16.05
Fiji	$10.34	
New Zealand	$0.00	$17.61
Brazil	$13.50	$15.08
Trinidad	$11.08	
Columbia		$0.00
Panama	$6.96	

these prices are highly dependent on the size the local crop. This data suggests that while the U.K. and Taiwan may be B.C.'s best markets in terms of volume, they are not where the best prices have been achieved by B.C. Tree Fruits Ltd. in the recent past.

Price determination is an important aspect of the marketing strategies of both B.C. and Washington. As evidenced in the biweekly W.A.G.C.H. reports, there can be a considerable price range within Washington prices for the same grade and size fruit. But even so, in most markets Washington State tends to be the price leader, although B.C. Tree Fruits Ltd. may sometimes go higher if they have a small amount of a particular product of good keeping quality. B.C. Tree Fruits Ltd. primarily works on a quota system, whereby they attempt to move the crop at a controlled pace to clear their manifest. In B.C. there is considerable pressure to sell all the fruit, possibly at the expense of obtaining the best price, because it is not political to have a large proportion of crop sent to the processor (unless of limited quality) (Messent). B.C. Tree Fruits Ltd. has been accused of predatory pricing in past attempts to keep this monthly quota, although such complaints from Washington have decreased since house pooling (and greater house interest in sales) was instigated (Van Wechal).

2.5 INDUSTRY CONCERNS

This section will summarize and perhaps add to the concerns expressed in the preceding sections of this chapter. Probably the most often cited cause for concern is the high cost of the B.C. industry, whether at the grower, packer or marketer level.

Costs are considered much higher in B.C. than in Washington State. These costs include land costs, the cost of orchard renovation and financing, labour and overhead at the packinghouse, and extensive data processing and inefficient sales staff at B.C. Tree Fruits Ltd..

Government support and the strategies employed have also been called into question. Many feel the government can not afford to support the industry at the current rates, and are afraid that growers have become too dependent on this. Support programs are also blamed for allowing growers to place too much emphasis on quantity and not quality, thereby shielding them from market signals.

And the complexities of the cooperative system and the regulations surrounding it have been blamed for much of the grower dissatisfaction. The new house pooling system enhances the competition among houses for the best growers and the most volume (to spread overhead). This can lead to misleading, or at least short-sighted, accounting procedures and investment decisions. The prorate system has created the incentive for houses to devote personnel to watching over B.C. Tree Fruits Ltd.'s distribution of orders, dissipating at least some of the economies of size derived from centralizing the marketing function.

2.6 SUMMARY

This chapter dealt with several aspects of the structure and conduct of the B.C. apple industry. Its history is characterized by cycles of cooperation against a common problem which was mostly continued into periods of relative prosperity but faltered

as soon as the "pie" began to shrink. The recent move to house pooling was an attempt to combine some measure of house independence and market responsiveness without foregoing any economies of size at the marketing level. The role of B.C. Tree Fruits Ltd. has subsequently been reduced.

The performance of the B.C. apple industry cannot be evaluated without at least some benchmark. Washington State, with its similar (albeit somewhat superior) growing and marketing conditions, is the most likely benchmark. In order to make any comparisons, though, structural and conduct comparisons must first be considered.

Structural differences between B.C. and Washington State can be categorized into three areas: fruit quality; scale; and organizational factors. Fruit quality is generally higher in Washington, especially in terms of fruit size and consistency. B.C. is said to have an advantage in terms of colour and keeping quality, but the grade proportions and prices do not seem to reflect this. Washington, with its ten-fold advantage in production, has considerable size economies. The typical Washington orchard is at least twice the size of B.C.'s, and the typical packinghouse services fewer growers (30 versus 300) yet is 40% larger, while the industry as a whole supports large promotional, research and lobbying budgets. Perhaps reflecting some ideological differences in the two countries, B.C.'s organization evolved as a more cooperative one. While about 1/2 of Washington State houses are cooperatives, the houses themselves practice little overt cooperation except in the publication of price and sales figures. Most B.C. houses are

cooperatives, and their members collectively own the central marketing agency and processor, B.C. Tree Fruits Ltd. and SunRype, respectively. There is also a marketing board in B.C., although it has lost nearly all of its power.

In terms of conduct, the two regions are again quite different. Even among the cooperatives, their behaviour varies considerably both between and within regions. Areas of difference include variety specialization, extension, type of member, storage regimes and accounting methods. At the marketing level, B.C. Tree Fruits Ltd. provides more services than the Washington marketers (who are primarily in-house). It also relies more heavily on export markets 35% of production versus 20% for Washington (whose exports are more broadly based, if not more evenly distributed among countries than B.C. exports).

There are several different areas of concern for participants in the B.C. industry. Purportedly excessive costs are most often cited, followed by the reliance on costly government support programs. The cooperative nature of the industry, when combined with competition within for good growers and revenues, has led to grower confusion, possibly shortsighted investment decisions and dissipated some economies of size at the marketing level.

CHAPTER 3 THEORETICAL ASPECTS OF INDUSTRY STRUCTURE

The previous chapter looked at some structural and conduct components without discussing all their implications. Recall the Washington State industry is composed of an estimated 180 packing firms, of which about 95 responded to Schotzko's survey (Schotzko, September 1983). This study estimated about 60% of the plants account for only 1/3 of the state production, while the top 20 firms account for 45% of the production. In discussions with Washington State industry sources, there appears to be about six to eight very large firms and among those, the two industry "leaders" are Trout and Blue Chelan, in Wenatchee. The production of any one of these leading firms is equivalent to about 1/3 of the total B.C. production. Within the B.C. industry, there are perhaps two dominant packing organizations, B.C. Fruit Packers of Kelowna and the Oliver-Osoyoos Similkameen packinghouses. These two large firms are still significantly smaller than the major Washington State firms. The major B.C. houses do, however, combine their marketing function in the guise of B.C. Tree Fruits Ltd.

While, in the colloquial sense it is competitive at the packing and marketing level, the fruit industry of B.C. and Washington State doesn't seem to qualify as perfectly competitive in economic terms. This chapter will present evidence suggesting the industry is oligopolistic. This will be preceded, in Section 3.1, by a distillation of applicable oligopoly theory. Because an

oligopolistic industry involves price determination, B.C. apple prices will be discussed in Section 3.2.1, first as a function of B.C.'s own apple production and then as a function of production in other regions. Then, given B.C. "apples" are really a heterogeneous product, price relations between the different types will be emphasized in Section 3.2.2.

3.1 OLIGOPOLY

3.1.1 Theoretical Considerations

Under perfect competition, the profit maximization rule is to produce at the output where marginal cost equals marginal revenue. In an oligopoly, the profit maximization rule is much less clear. An oligopoly may attempt to form a cartel to act as a monopoly, but by definition an oligopoly has too many members to keep the cartel functioning. Aspects of game theory, whereby each participant tries to anticipate the response of other participants to any price/quantity action, have created large obstacles to the development of a single theory of oligopolistic behaviour. This section will attempt to outline the basics of one such model which appears to have the most relevance to the northwestern U.S. and Canada apple industry.

If the apple packing/marketing industry is an oligopoly, it is likely one where there are a handful of large, key participants and a large number of smaller, fringe players. If there were only one large firm, it would attempt to set price after observing the supply response of the fringe firms. The fringe firms would operate at the point where their marginal cost equalled the price set by the leading firm, leaving the residual to the price leader. In the case where there is more than one

large firm, there may be an implicit cartel. Price would be set somewhere between the perfectly competitive price and the monopoly price. Such a situation is illustrated in Figure 3.1.

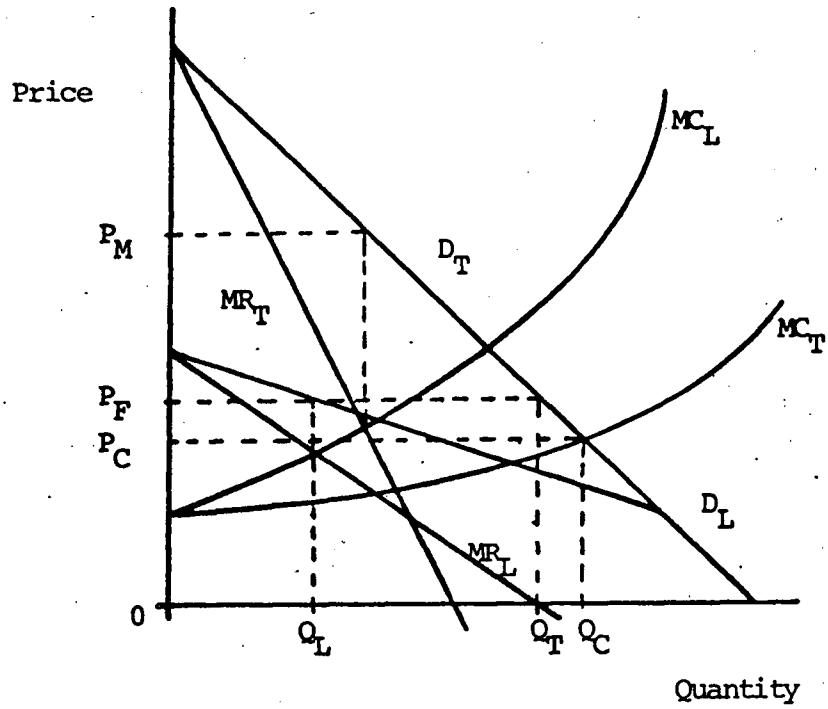

Figure 3.1 Oligopoly plus Fringe Model

This rather complicated diagram depicts the situation where the "cartel" of large, low-cost firms are the price leaders facing a residual demand curve, D_L , and a marginal cost curve (summed over the curves for the cartel members) of MC_L. Under a situation where the cartel could force all players to cooperate, the monopoly price, P_M , would prevail. As in any monopoly, this would be set by reading the price off the demand curve, D_T , at the quantity where their marginal cost, MC_L, equalled the total marginal revenue, MR_T. But with the inclusion of fringe firms who won't cooperate, the cartel must instead set its own quantity

where marginal costs, MC_L, equals the marginal revenue facing the cartel, MR_L. Price, P_F, would then be determined by reading that quantity off the residual demand curve of the cartel members, D_L. Thus, the market is shared such that the cartel supplies from 0 to Q_L and the fringe supplies from Q_L to Q_T. The situation is different from perfect competition in that Q_T is less than Q_C and P_F is greater than P_C.

This model is obviously a simplification. It doesn't represent how the cartel members share their portion of the market, who would want to be the price leader, or how a heterogeneous product could be accommodated. It does, however, provide a framework with which one can surmise the existence of an oligopoly in the packing/marketing function of the apple industry. While no work has been done to verify this is the correct model, the following section will present anecdotal evidence which could qualitatively support this assertion.

3.2.2 Qualitative Evidence of Oligopoly

Price

There are several price "indicators" which could be useful in determining the existence of an oligopoly. An industry publication of current prices would enable firms to monitor each other's actions. If the leaders' prices tend to move together more than the fringe members' prices, one might assume some sort of tacit collusion exists.[8] Finally, if the price leaders' can

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[8] Exploitation of different market segments can explain some of the variation in price at any specific point in time, but differing (between leaders and fringe) price fluctuation over time is less amenable to such explanations.

maintain some sort of "premium" for their product based on intangible factors such as reputation or brand, then one can at least claim perfect competition is not the correct model.

The Washington State industry publishes a weekly price and shipment report which, while it doesn't list organizations by name, has become quite transparent to industry insiders. While the prices quoted by the firms are said to be inflated in an attempt to steal market share, the very fact that this gamesmanship occurs suggests imperfect competition. The data in these publications suggest the leaders' prices do move together and vary much less than the prices of the fringe members. And price wars for market share in specific regional markets have occurred, as discussed in Chapter Two, when B.C. Tree Fruits Ltd. tried to drop its price to meet its sales quotas. Finally, the data from the price publications also confirm the existence of a price premium for a few of the largest Washington State houses, and while quality and consistency can account for some of this, reputation is also a large factor.

Profit

The existence of profit beyond "normal" profit indicates imperfect competition (or else a transition stage in a young industry). But profit may be due to other reasons such as economies of size. These could lead to reduced costs without any increase in price from perfect competition. Moreover, a lack of profit need not mean a perfectly competitive industry, since so-called "X-inefficiencies", whereby costs are allowed to drift upward without the pressure of perfect competition, could dissipate any profits realized from a higher price.

The existence of profit in the apple industry is very difficult to detect. First, the privately owned firms don't release profit information. Second, the cooperatives are supposed to transfer any profit to the growers, hence separating true input (for fruit) costs from the actual payment to the growers would be necessary to detect profit. Third, X-inefficiencies may exist to hide any profits - unionized labour[9] and competition for growers (and therefore increased costs of services to the growers) could be considered examples of these inefficiencies.

Barriers to Entry

There can be two main types of barriers to entry - natural and artificial. Natural barriers exist when the market is small relative to the most efficient scale of plant. While recent difficulty in market expansion might support this, the fact that Washington State growers have been expanding so rapidly (until recently) suggests that either there exists some distortion causing excessive resource allocation in the apple industry or the industry was not constrained by market size during structural evolution. Artificial barriers to entry might include advertising and product differentiation. While some individual Washington houses conduct advertising and promotion campaigns (directed at the consumer or the retailer), this seems fairly limited, especially when compared with the industry-wide campaigns of Washington State (or B.C. Tree Fruits Ltd. to a lesser extent).

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9 While the inception of unions in the packinghouses may well have been due to external, labour market influences, it is possible a privately owned and less organized industry might have better withstood the move toward higher wages and unionization.

Even so, product differentiation is very important, although distinguishing quality from reputation is nearly impossible.

Collusive Behaviour

Collusive behaviour, in terms of monitoring via published prices, has already been discussed. Other forms of collusive behaviour could involve market "sharing", whereby the cartel parcels out different markets to different members, and supply restriction. In discussions with Washington State firms, it appears some of the large firms have "philosophical" differences which cause them to concentrate on different markets ie. domestic versus offshore, chainstores versus terminal markets. Relatedly, these firms have different methods in dealing with their growers and hence can reduce obvious competition for growers (and thereby avoid bidding up fruit costs).

Large firms can tacitly restrict supply in several ways. First, they can select only the "best" growers, that is those who trade off quantity for quality. Second, they can grade to higher standards if there is a ready processing market for the remainder. Third, they can store a higher proportion of fruit than the fringe firms would be willing to store. Fourth, they can restrict supply in different regions by restricting the number of firms selling in each region. Again, while hard data to support these claims are not easy to come by, it appears from discussions with various Washington firms that the large ones do engage in these practices, at least to some extent.

3.1.3 Welfare Implications

The cartel plus fringe model can be analyzed graphically to determine the welfare implications. Figure 3.2 is a simplified

version of Figure 3.1, with the addition of shaded areas depicting welfare gains and losses. Consumers would lose areas 1 and 2 and 4 and 5. Most of this loss would be a transfer to the producers:

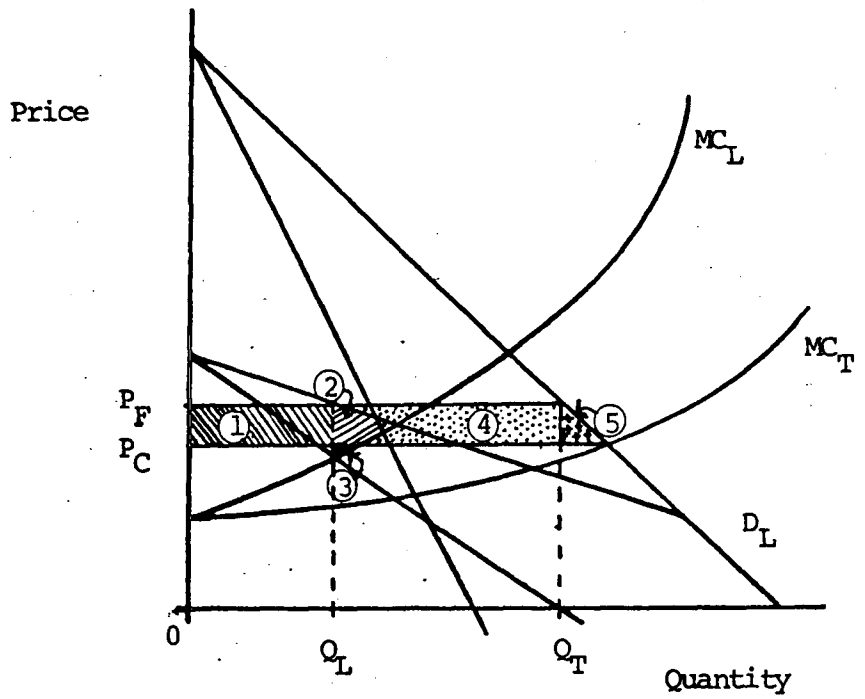


Figure 3.2 Welfare Implications of the Cartel Fringe Model

areas 2 and 4 would be gained by the fringe firms; and the cartel members would share area 1 less area 3 (lost producer surplus). The net loss to society would be areas 3 and 5.

While the deadweight loss is detectable in the diagram, empirically it is very small relative to the value of the purchase (Parker and Connor). Furthermore, interfering with an oligopolistic industry to force the competitive result could force downsizing and subsequent loss of economies of size enjoyed

by the large cartel members. These economies of size could well outweigh the loss in consumer surplus, although it has been argued that the existence of X-inefficiencies would wipe out the size benefits. Thus, the jury is still out, especially since the verdict is so dependent on the specific industry.

In the B.C. tree fruit industry one could claim paying unionized wages in the packinghouse amounts to an X-inefficiency, that is costs have been allowed to soar given limited competition. The labour costs will be discussed in depth in Section 4.5.2, but suffice it to say that wages are considerably higher in the B.C. than the Washington industry. However, there are several factors which could hypothetically detract from the claim that this counts as an inefficiency. First, the amount Washington "over pays" for its fruit may well counteract the amount B.C. "over pays" for its labour, if one considers fruit as simply another input. Second, when the B.C. industry began most packinghouse labour was seasonal, and often consisted of orchardists' family members. Thus, the higher wages were more a transfer from the orchardist to the spouse or offspring. The incentive for spouses to work in the packinghouse was compounded by Unemployment Insurance which provided a transfer from society to the farm family ad improved the orchardists' cash flow during the preharvest season. The fact that this hiring practice has changed with the advent of PG/PS, where smaller, near permanent labour requirements result in fewer families benefitting, could possibly contribute to recent orchardist complaints about labour rates. Thirdly, B.C. may be able to reduce any X-inefficiency due

to labour rates by substituting more capital for labour than does the average Washington State packinghouse.

3.1.4 Methodology Employed

The above discussion of oligopoly in the western North American apple industry asserts that there exists a loosely-bound cartel consisting of perhaps five or six large Washington firms and B.C. Tree Fruits Ltd. Among the Washington firms perhaps only two are price leaders (Trout and Blue Chelan) whereas the others, like B.C. Tree Fruits Ltd., are tacitly expected to play the game. The skirmishes observed, in the form of price wars, occur when cartel members attempt to act as a fringe member. B.C. Tree Fruits Ltd. is in a slightly different position, as it is large, relative to any single Washington firm, but high cost (relative to other cartel members) and it doesn't participate in any price reporting.

Quantitative evidence of this assertion is, however, largely beyond the scope of this study. It would require unprecedented cooperation with and between the various packinghouses. It would also require the ability to index the companies according to type of product, since heterogeneity confuses the issue to such a large extent. A perfectly competitive price would be needed as a basis for comparison with the "prevailing" oligopolistic price. Otherwise, profit data (even more difficult to obtain) would be required. While these problems may not be insurmountable, they will have to be the object of future study.

The following section will, however, attempt to quantify B.C.'s influence over its own price. It will compare this effect

with that of production from other regions in an attempt to determine the most important influence on B.C. price.

3.2 PRICE

3.2.1 Price as a Measure of Market Power

An attempt at illustrating the demand curve for B.C. apples is shown in Figure 3.3, where ten different price/quantity pairs are graphed using annual B.C. Tree Fruits Ltd. data. It is possible to detect some resemblance to the typical downward sloping demand curve, but in some years the standard relationship doesn't hold. Elasticities are impossible to estimate without regression analysis (requiring more data points), but Destorel estimated the Canadian own price elasticity to be -0.30. However, he, too, experienced some difficulties estimating this elasticity, since he had to use the import price as a proxy for own (Canadian) price in this estimation. There are several reasons for such difficulties in estimating the demand curve for apples, most arising from possible shifts in demand caused by taste changes, income changes and substitute price changes.

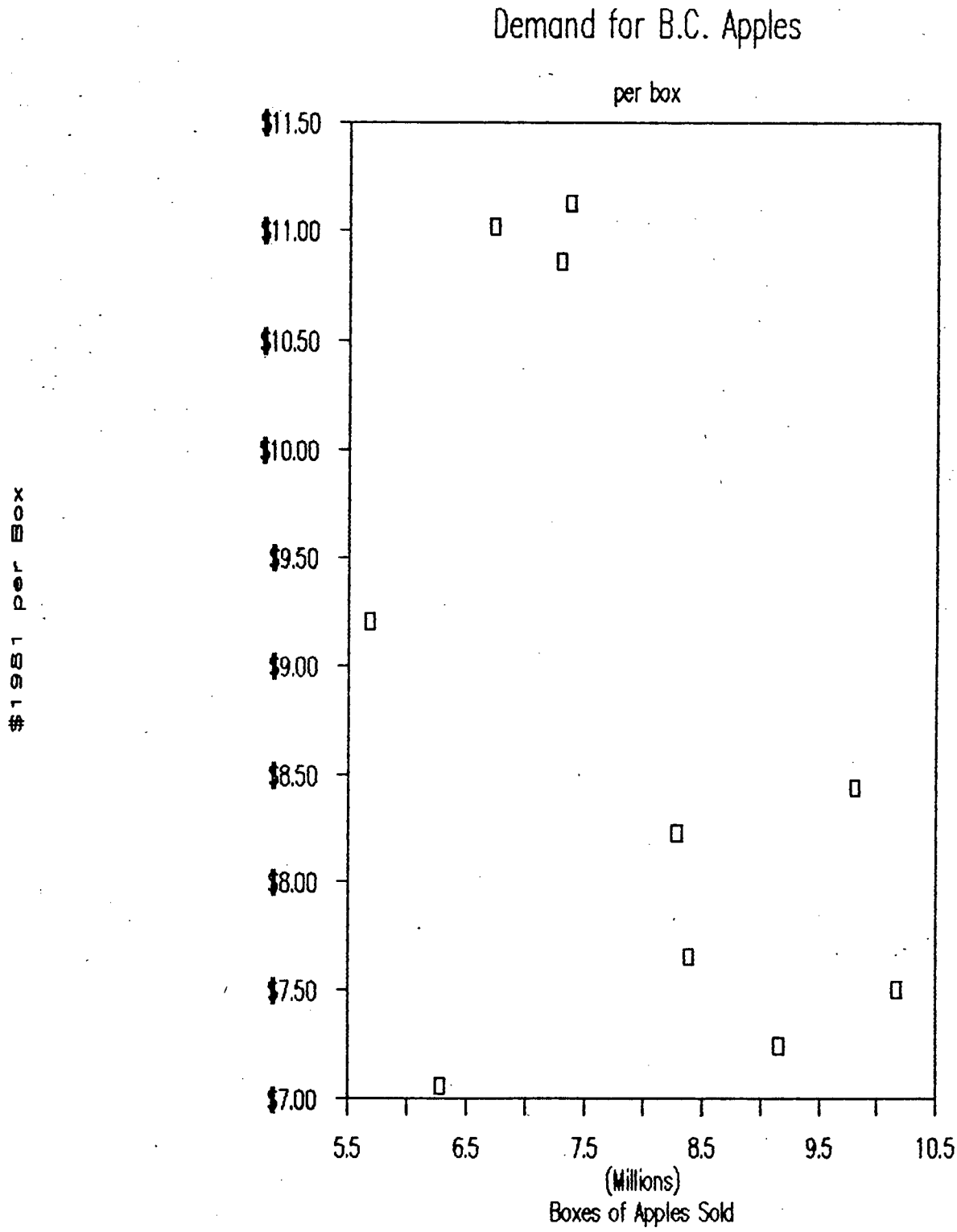


Figure 3.3 Relationship between Price in 1981 dollars and Quantity of B.C. Apples Sold (1976-85)

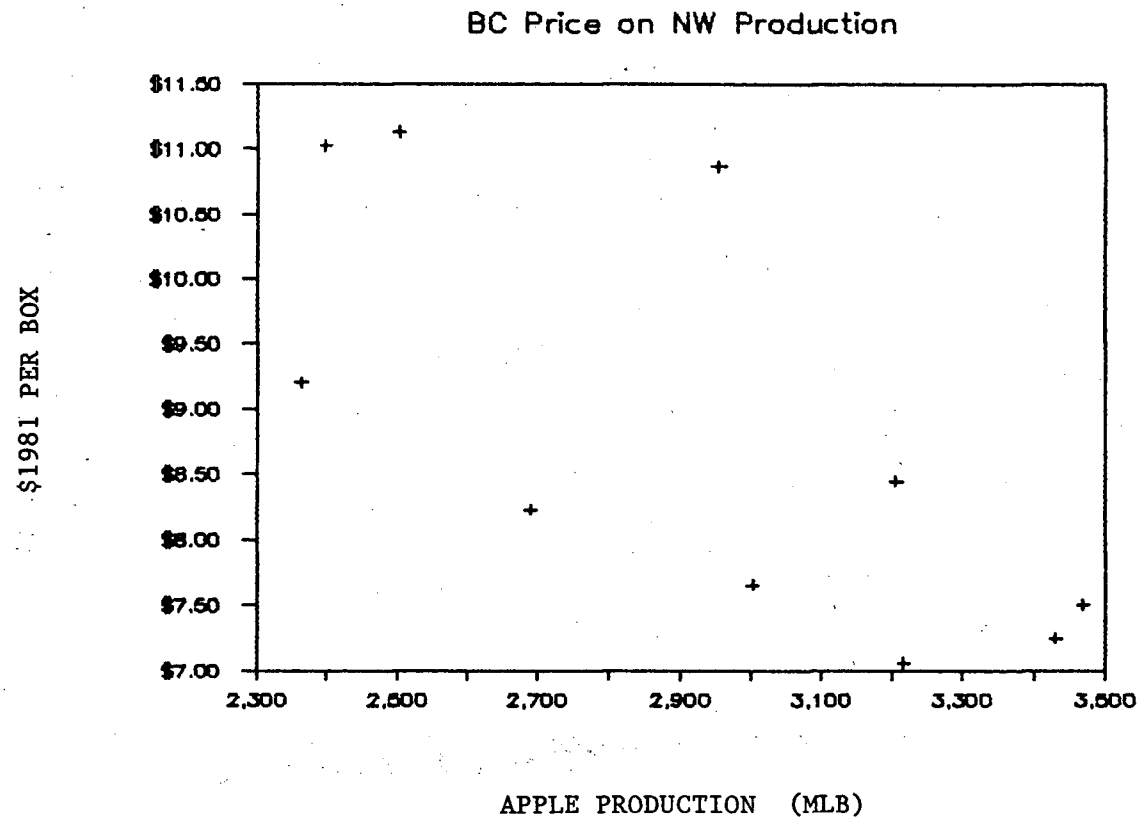
Taste changes seem a very likely cause of shifts in the demand for B.C. apples. These changes can affect the type of apple demanded and the total amount demanded. There has been a very noticeable shift toward green, crunchy apples and away from good keeping-quality or cooking-quality apples. Most recently the trend toward the importance of aesthetics has been augmented by a keener desire for higher flavour, as well. The quantity of apples demanded would also be negatively affected by a reduced demand for cooked apple products while it may be positively affected by the heavy advertising campaigns of Washington State and New Zealand.

Changes in income could affect demand for apples, although the income elasticity of apples in Canada (and presumably the U.S.) is quite low (0.095 according to Destorel). However, income fluctuations in the rest of the world, especially the developing countries with a higher income elasticity, could well result in demand shifts given the 20% offshore export position of the B.C. industry.

Finally, the price of substitutes could cause shifts in the demand curve. This could arise from increased competition from other fruits, increased production in other areas and/or, relatedly, an increased demand for varieties B.C. can't grow economically. These factors all appear to exist to some extent, although quantification is difficult. However, confining the market to North America (where the bulk of B.C.'s production is consumed) one can illustrate the effect of North American production on B.C. price (and hence the degree to which B.C. is a price taker). The graphs in Figure 3.4 depict B.C. price against

North American and Northwestern (B.C. and Washington) quantity sold. The best "fit" exists between B.C. prices and Northwest production, suggesting the average B.C. price is determined by Washington production as well as B.C. production. That this fit is better than the B.C. "demand" curve of Figure 3.3 suggests Washington is a strong influence, and this is confirmed by graphing B.C. price against Washington volume (not shown), where the outliers in the B.C. demand curve are explained by the Washington volume. Of course, Washington production would be expected to have a strong influence, given its larger size, and similar transport costs, variety, and weather conditions.

The simple demand curve attempted above cannot capture all the information regarding apple price since the apple is an extremely heterogeneous product. The following discussion will serve to disaggregate the average price somewhat by illustrating the various factors which can cause the "within" apple price to vary.



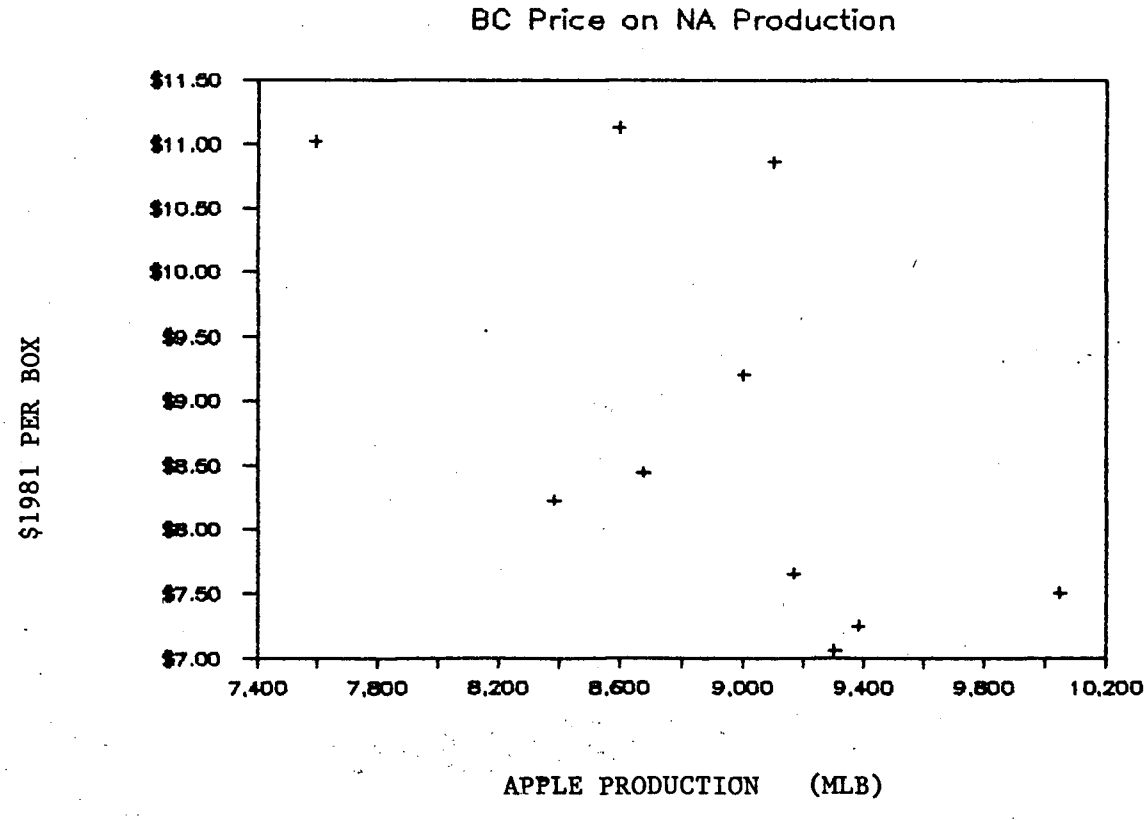


Figure 3.4 Relationship between Price of B.C. Apples and Production Levels for the Pacific Northwest and North America (1976-85)

3.2.2 Factors Affecting Price Variation

As mentioned previously, several factors can affect price, either singly or in combination. The following discussion will attempt to describe the effects of variety, size, grade, storage type and pack type.

Variety

The effect of variety on price is shown in figure 3.5(a) and (b) comparing Red and Golden Delicious (XFCY, CA stored fruit) over the crop years 1984 and 1985, respectively.

In 1984 there existed a considerable gap between Red and Golden Delicious among the large sizes with a maximum of about $14.50/box more for Red Delicious (more than double the Golden price). This gap decreases as size decreases, but Red prices were higher than Goldens for each size. This was not the case in 1985 when Golden prices were greater than or equal to Red prices in all but two sizes (both large sizes). Note how these graphs illustrate the price variation between crop years, where 1984 Red prices peaked higher than 1985 prices by about $5/box. Goldens moved in the opposite direction, increasing from a high of about $17/box in 1984 to about $21/box the following year.

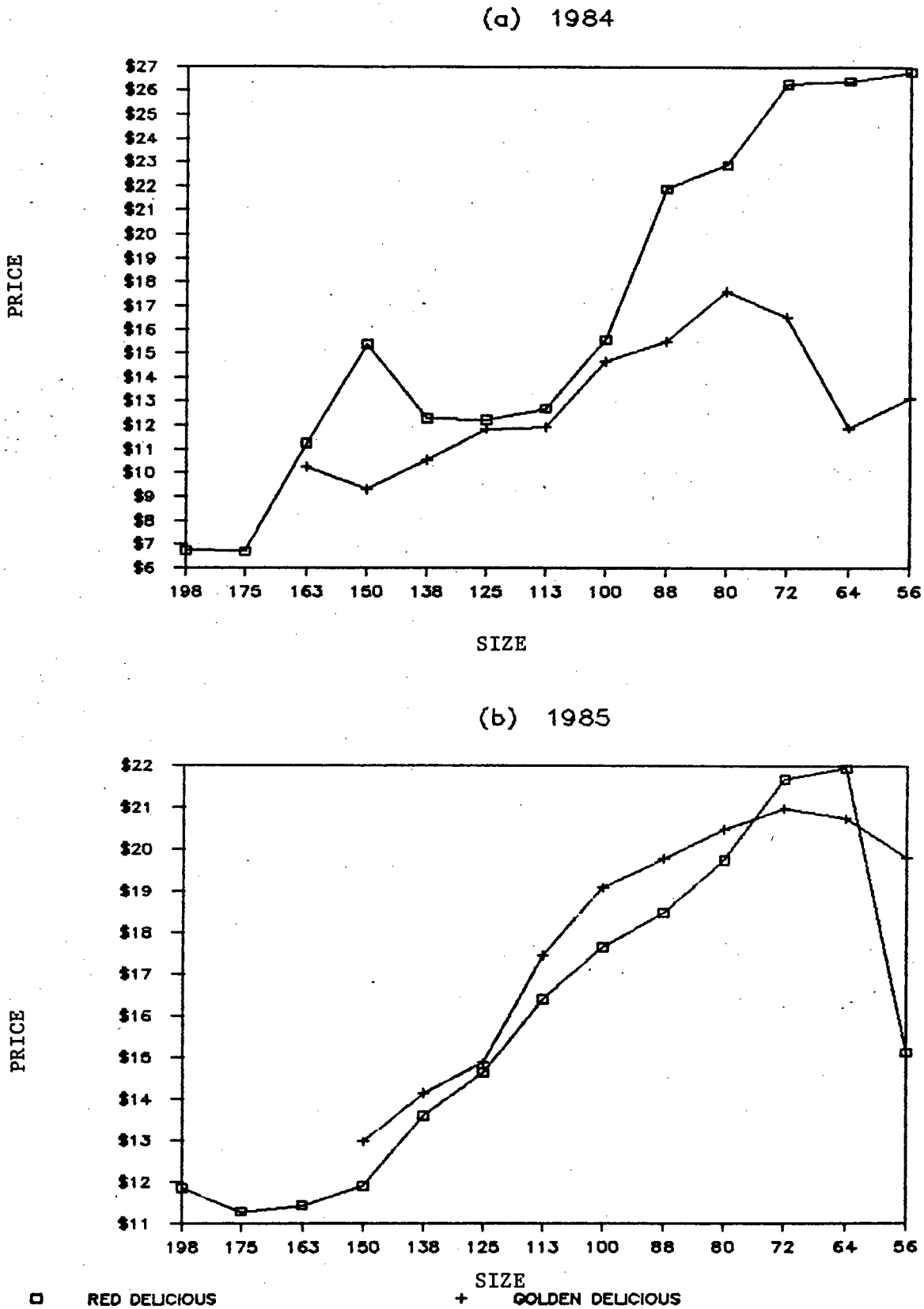


Figure 3.5 Relationship between Price and Size for B.C. Red and Golden Delicious (1984-85)

Size

Price variation over size is also illustrated in Figure 3.5(a) and (b). These graphs show how, in most cases, large fruit commands a higher price than small fruit. This relationship seems to be most pronounced in 1984 Reds, when price fell from $27/box to $7/box as size decreased. In 1985, when most Red prices fell, this decline was less significant (from $22 to $11/box). The relationship is not always smooth, however, as the 1984 size 150 was priced much higher and the 1985 size 56 was priced much lower than would be expected.

Grade

While the relationship between price and size (and variety) changed with crop year, the effects of grade on price are much more predictable. A typical comparison between FCY and XFCY grade prices is depicted in Figure 3.6, using 1985 CA stored Red Delicious as the example. As can be seen, the premium for XFCY ranges between about $5/box (or close to 30% of the FCY price) to about $0.50/box. Once again, the larger sized fruit is likely to realize a larger premium for quality than the smaller sized fruit.

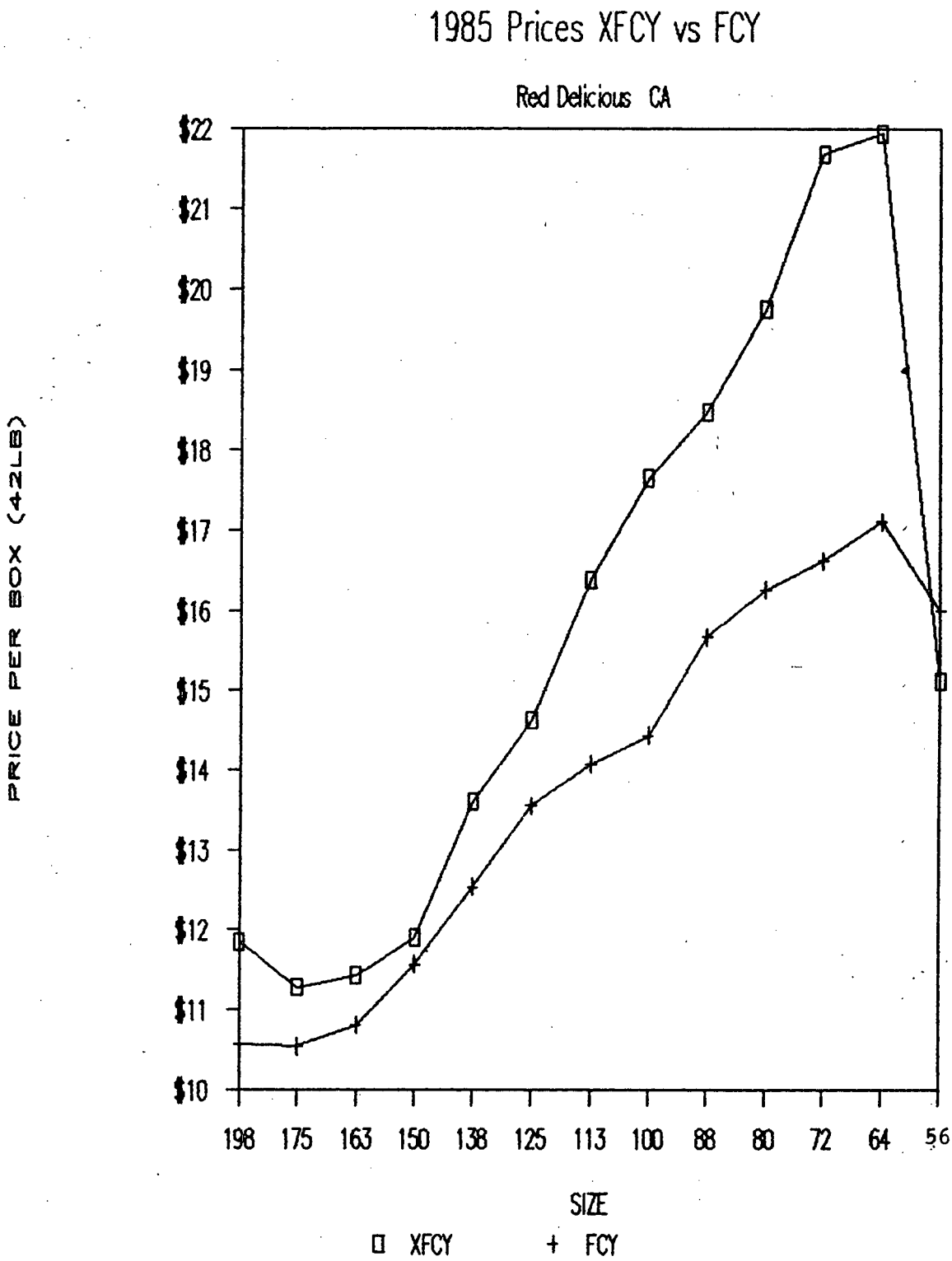


Figure 3.6 Effect of Grade on Price for B.C. Red Delicious XFCY over Different Sizes (1985)

Storage

The type of fruit storage employed doesn't affect the price obtained by affecting the quality of the fruit (to a significant extent). Instead, the price obtained by the different storage regimes reflects the timing of fruit sale. Controlled atmosphere fruit, since it is sold offseason, usually obtains a higher price than regular cold stored fruit, which must be sold within a few months of harvest. The long storage season reduces any price premium for earliness to market. While there may still be some price advantage for the earliest apples, this is dissipated by the time B.C. apples are available, and even early Washington apple prices are hurt by southern hemisphere production.

The relationship between CA and regular storage fruit prices is not always clearcut. Figures 3.7 and 3.8 depict these relationships for two crop years of Red XFCY and Golden XFCY Delicious, respectively. Among the 1984 Red Delicious, the premium for CA apples ranged between $1 to $4/box, except for a few of the small size categories where the CA price was higher than would be expected. In 1985 the premium for CA fruit was much less predictable. Slight changes in size (from a size 72 to size 64) resulted in an increase in the premium from about $3 to $12/box. A similar jump in premium occurred in the 88 (medium) size category.

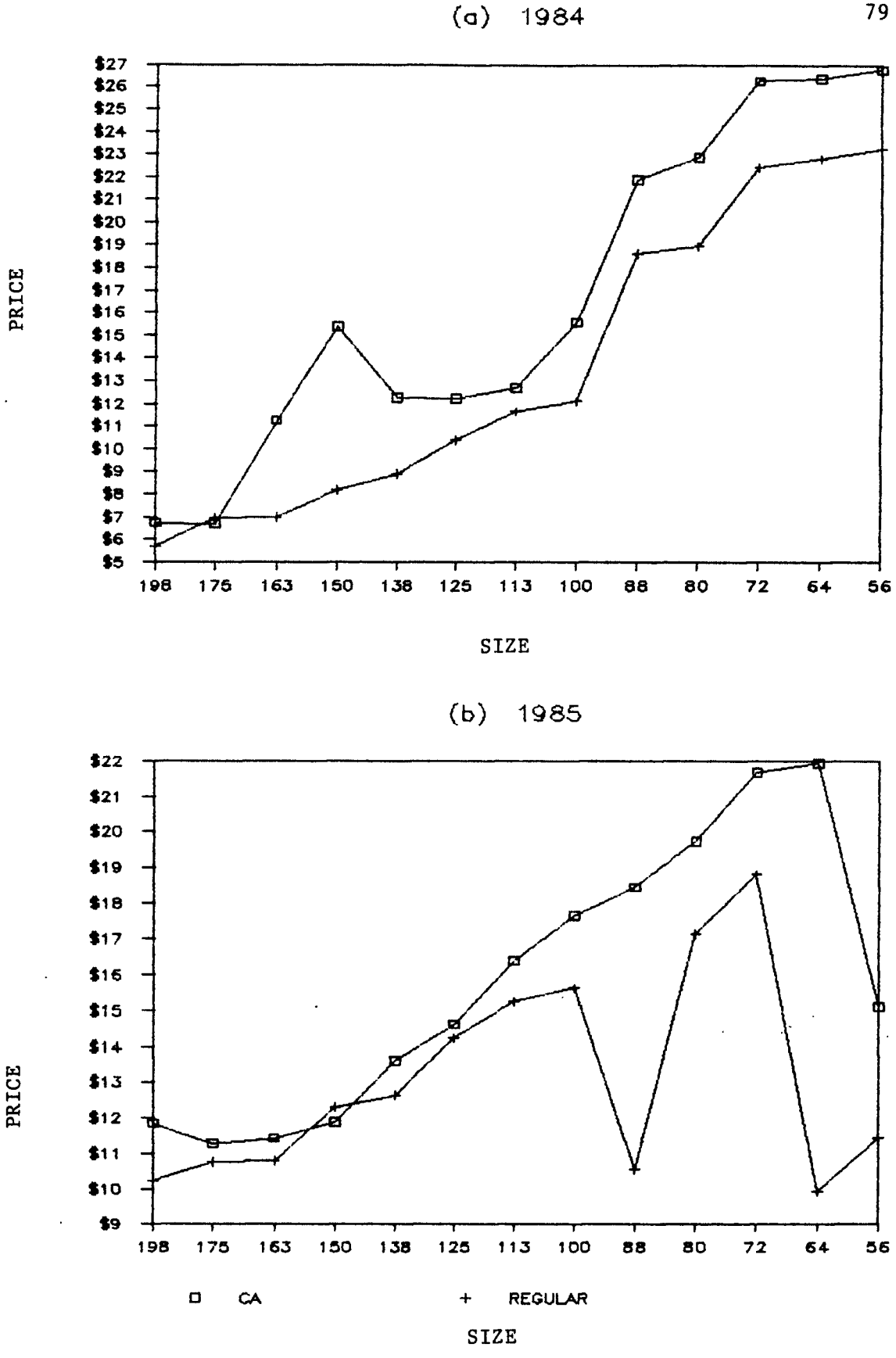


Figure 3.7 Effect of Storage Regime on Price for B.C. Red Delicious XFCY over Different Sizes (1984-85)

Among the Golden Delicious prices(Figure 3.8), the 1985 crop year also exhibited a large dip in regular storage prices for one size category (72). Otherwise the CA premium ranged from about $2 to $4/box. The 1984 Golden crop showed little discernable premium for CA fruit, as the regular stored fruit actually fetched a higher price in some of the size categories. Golden Delicious is less amenable to CA storage (although the technology is improving) since it can undergo serious quality deterioration; thus the price benefits from late season sales were offset by reduced quality.

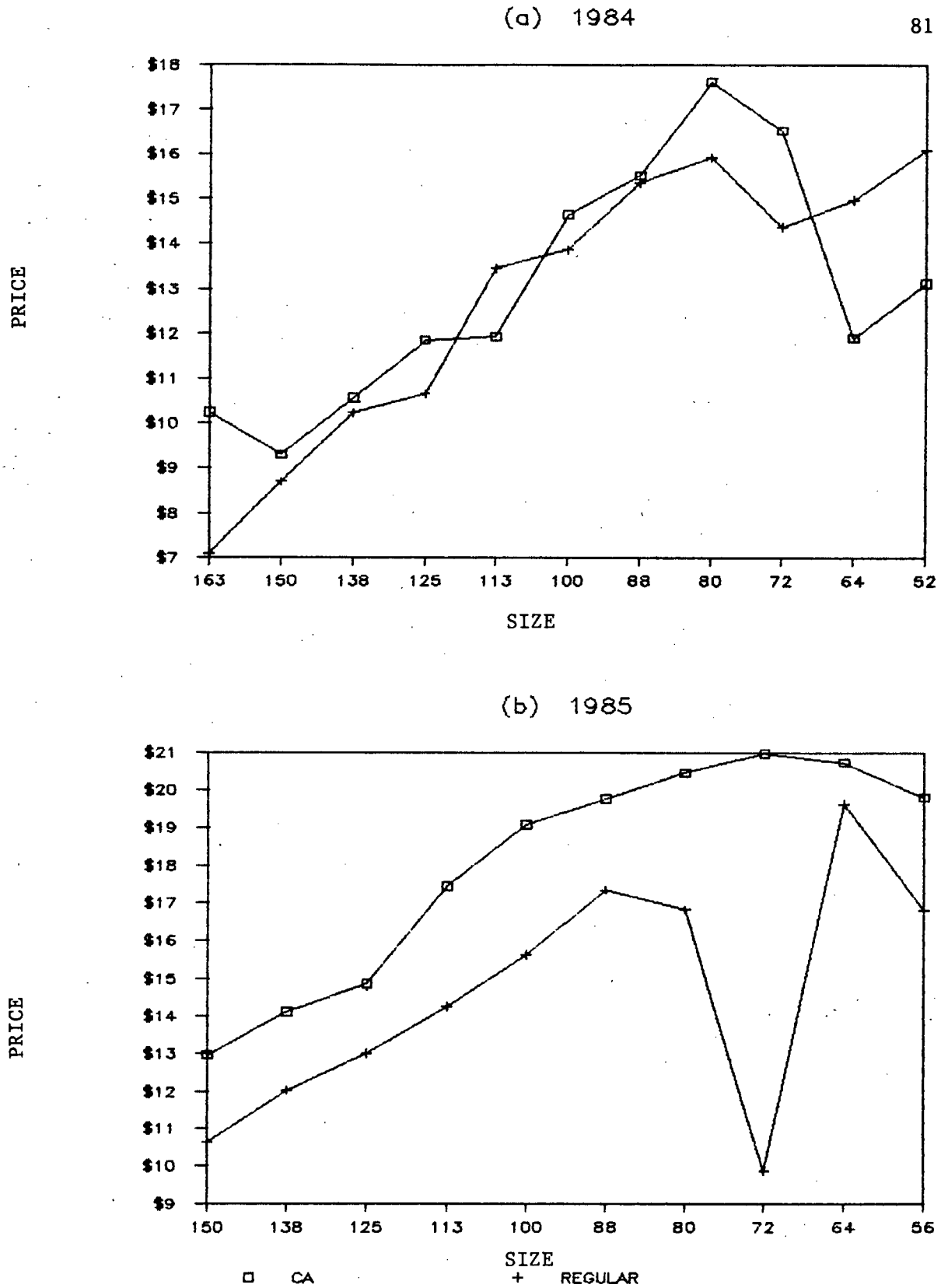


Figure 3.8 Effect of Storage Regime on Price for B.C. Golden Delicious XFCY over Different Sizes (1984-85)

3.3 SUMMARY

This chapter presented the hypothesis that the apple industry is actually oligopolistic in nature, with an implicit cartel of about ten members (including B.C. Tree Fruits Ltd.) and a large number of small fringe firms. In a oligopoly plus fringe model, the price leaders set their supply (and therefore price) at the point where their marginal costs equal their residual marginal curve. The price obtained is between that of perfect competition and monopoly, and hence results in a welfare transfer from consumers to producers (shared amongst fringe and cartel members). Price, profit and collusive behaviour are all evidence which might support this hypothesis, but primarily, this study can only present qualitative evidence. This evidence does, for the most part, support the conclusion that an oligopoly exists. Also, quantitative price evidence does suggest that Washington State production has the greatest impact on B.C. price. This **average** price, though, may not accurately reflect the situation, since apples are such a heterogeneous product. This heterogeneity is reflected in price increases exhibited with variety, with increased size, grade and market date. This "within" variation is considerably greater than the variation "between" B.C. and Washington State prices (which aren't reported here given the general consensus that the available Washington State data is highly suspect).

The structure and conduct discussions of this and the preceding chapter have provided enough background for the performance evaluation of the next two chapters. Any such performance discussion must be viewed with this in mind.

CHAPTER 4 PERFORMANCE OF THE B.C. APPLE MARKETING SYSTEM

Performance of the packing/marketing function of the B.C. apple industry will be presented in this chapter. While performance is often measured in efficiency terms, as in the bulk of this chapter, Section 4.1 discusses other measures which could be used when evaluating the performance of a cooperative structure. Section 4.2 will introduce the analysis by looking at an overall measurement - the margins attributed to the packing function, the marketing function and the growers' residual. Section 4.3 will discuss sales revenues, although primarily in theoretical terms as the factors affecting price (as discussed in Section 3.2.2) are virtually the same as those affecting revenue. Section 4.4 will present relevant cost theory as well as both packing and marketing costs and their relation to those in Washington State. Finally, a brief discussion of grower returns in B.C. and Washington State will be included in Section 4.5.

4.1 COOPERATIVE STRUCTURE CAVEAT

Before performance can be measured one must define the goals that are being sought. That is, performance evaluation of an industry or an organization depends on what they are trying to perform. These goals are somewhat different for private, profit maximizing organizations than for cooperative organizations, although they may share some of the same intermediate or secondary goals. The goals of a cooperative may include (McBride):

1. To provide services to growers they can't get (or at least get as efficiently) on their own. For example, a cooperative can help capture economies of size in packing or marketing, facilitate lobbying efforts, provide extension or advice to growers, and help provide countervailing powers against monopsony powers. While the cooperative nature of the B.C. industry seems to perform these functions, the question remains do they out perform private enterprise at these functions?
2. To control supply and therefore raise prices and capture monopoly rents. While this may have been the hoped for outcome when cooperation first began, the B.C. industry proved too small relative to the rest of the world in apple production, and import restrictions were so unpalatable that B.C. has never been able to determine its own price.
3. To be progressive and innovative in packing and marketing. It is difficult to say if this was ever a goal of the B.C. industry. Certainly they have at least had to follow Washington State's lead in terms of packing technology, while in several areas Washington State has copied B.C.. At the marketing level the Washington State industry has proven itself to be a formidable contender, although B.C. likely surpasses Washington State in packaging research.
4. To provide a basic economic return to its members on an equitable basis. Member equity can be defined by

several measures, which typically include the following considerations: (a) whether member refunds and per unit retains are based on patronage which would tend to reward more loyal, serious members; and

(b) whether capital investments are financed as much as possible by those currently using the cooperative (accomplished by adjusting redemption policies). While these are important questions, the policies governing these issues vary both among B.C. and Washington State houses and within each industry.

5. To increase the economic well-being of its members. This could be evaluated by comparing income figures in the B.C. cooperative and private enterprise houses, the various income support programs and equity positions (in the cooperatives) would cloud the issue. That would also not permit the reason for any inefficiencies to be pinpointed. So this study will concentrate on grower returns which can be affected by either the costs of packing or marketing, or the price obtained.

4.2 MARGINS OR REVENUE ALLOCATION

4.2.1 Theoretical Considerations

Growers' returns are determined by subtracting marketing and packing costs from the gross sales revenue, as shown in Figure 4.1. The share of revenue allocated to the marketers and packers will be referred to as their margins.

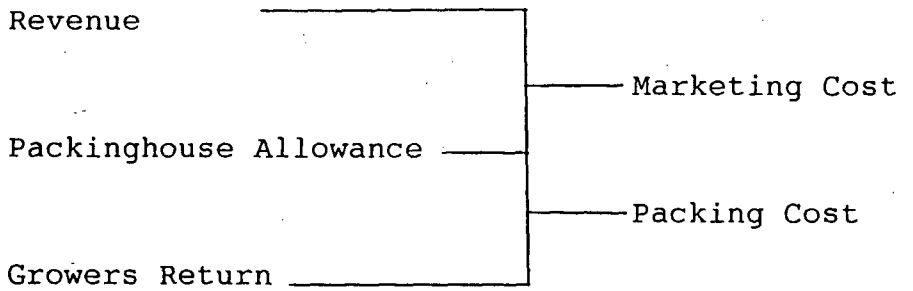


Figure 4.1 Determination of Revenue Allocation

The actual costs incurred by the marketing and packing functions will be examined in depth in Section 4.5, but it is first necessary to understand how these costs are allocated. B.C. Tree Fruits Ltd. allocates its costs to the type of fruit wherever possible, but many of its overhead costs are shared proportionally (by volume) amongst the different fruits. No attempt is made to further subdivide B.C. Tree Fruits Ltd. costs amongst the different apple varieties. This is in contrast to variable packing costs, which are allocated amongst the varieties where they are incurred. Since these costs are little affected by grade and size, there is no attempt to differentiate costs within these categories. Also, while costs do vary with storage and pack type, these are decisions made by the packinghouse and B.C. Tree Fruits Ltd., and hence growers are not penalized (nor rewarded) by charging these costs differentially amongst them. Overhead packing costs are charged proportionally to all fruit types. And while <u>costs</u> aren't allocated differently within a

variety, growers do receive any price differentials when they are based upon factors under their control (such as grade and size).

4.2.2 Results

The two margins and the grower returns per box in 1981 dollars are reported in Figure 4.2 for the period 1976 to 1985. The marketing margin has been fairly steady at just under $1/box. Packinghouse margins were much more variable over this period. At about $4/box, they were lowest in the 1983 crop year, but in the late 1970s, 1982 and 1985 crop years they were close to $5/box. Finally, grower returns, as the residual, exhibited the most variation with revenue. They varied from about $2/box in 1982 and 1984 to about $5/box in the late 1970s. Thus it appears the decline in grower returns is due more to a decline in revenues than to an increase in the cost of the marketing system. This will be further discussed in the next chapter.

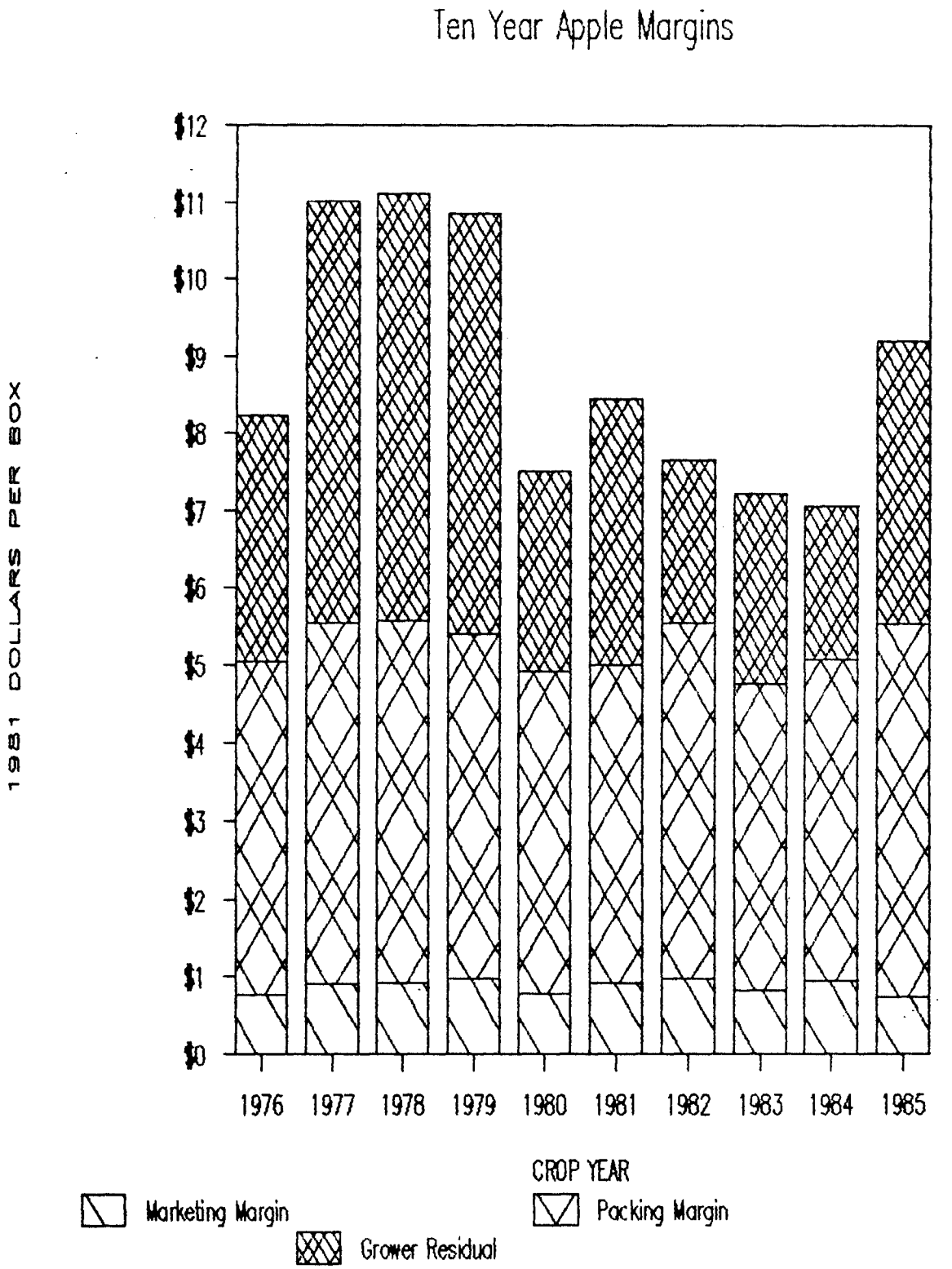


Figure 4.2 Revenue Allocation Among Marketing, Packing and Producing Activities on per Box Basis (1976-85)

4.3 REVENUE

This section will only briefly touch on the actual revenue earned by the apple industry since much of the price discussion of Section 3.2 would simply be repeated. Section 4.3.1 will present theoretical aspects which need to be considered when evaluating the performance of B.C. Tree Fruits Ltd. in maximizing sales revenue. Section 4.3.2 will briefly present the trend in apple sales revenue and how it responds to the quantity sold.

4.3.1 Theoretical Considerations

Under perfect competition, revenue maximization is the same as profit maximization; that is, quantity must be set such that marginal cost equals marginal revenues. There are at least three different areas wherein this simple strategy becomes insufficient when considering the apple industry. The first, the case of oligopoly, has already been discussed at some length in Section 3.1 and need not be reiterated here. The second area of confusion is posed by intra-regional trade. The third aspect of the apple industry is the element of storage and the role of dynamic optimization. The latter two aspects will be explained below.

Simple economic theory suggests that B.C. should not grow apples if it doesn't have the physical and economic comparative advantages of Washington State, and indeed, Washington State apples do enter the B.C. and Prairie markets to compete with B.C. apples. Even so, B.C. apples are still sold to the U.S. in large quantities. The traditional trade theory might accommodate this fact if B.C. had the advantage in transport costs to specific U.S. markets, but this is not the case. Trade models to explain

such intra-regional trade have been developed using heterogeneous products or game theory, but these models have yet to be tested econometrically. Hence, revenue maximization involving trade (as required by the small local market for B.C. apples) does not lend itself to any simple economic truth.

B.C. Tree Fruits Ltd. has been criticized for its use of monthly sales quotas. These quotas have been asserted to be arbitrary and with no regard for maximizing total revenue. How do these quotas coincide with dynamic optimization theory? The following will give a brief overview of this theory and the additional facets implicated in the apple industry.

If there were perfect competition and perfect information, B.C. Tree Fruits Ltd. would have a schedule depicting price variation over the course of the marketing season (about 42 weeks). They would also have a schedule of the costs incurred to store the fruit in each time period. They would then maximize

$$\max_{q_t} \sum_{t=1}^{42} II_t = \max_{q_t} \sum_{t=1}^{42} (P_t - C_t) * q_t \qquad (1)$$

(where q_t is quantity, II_t is profit , P_t is price and C_t is cost, all in period t) by solving simultaneously for all time periods. But in the apple industry there are several complications.

First, imperfect information is more the norm. B.C. Tree Fruits Ltd. does not know P_t at the beginning of the year when it must make its storage/sales quota projections. It must therefore work with expected price, $E(P_t)$. This brings risk theory into the function in equation (1). Also, quantity produced

will vary with weather, etc, and hence the ability to spread fixed costs will vary from year to year, as well. Therefore, risk enters into both the price and cost information needed.

The second complication occurs when there is some oligopolistic behaviour. This implies the decision maker could affect price in any given period by its actions in that period. That is, if

$$E(P_t) = f(q_t) \qquad (2)$$

then the decision maker would need to know not only how its actions affect price (own price flexibility), but also how its competitors (and therefore price) would respond.

Thirdly, total costs are usually a function of quantity, as well. For instance, if costs in any one period are dependent on the quantity of fruit remaining, then

$$C_t = g(Q, q_1, q_2, q_3 \cdots\cdots q_{t-1}) \qquad (3)$$

where Q is the total quantity. If costs in the present period also vary with the quantity sold in the present period (for such quantity dependent costs as transportation, order assembly costs, etc.) then q_t would also be an argument of the cost function in equation (3).

Putting all these factors together, the dynamic optimization problem becomes

$$\max_{q_t} \sum_{t=1}^{42} (E(P_t\{q_t^{own}, q_t^{row}\}) - \sum_{t=1}^{42} c_t\{Q, q_1 \cdots\cdots q_t\} * q_t \quad (4)$$

(where own signifies own quantity and row signifies quantity of the rest of world). With q_t as the decision variable and as an argument in most (if not all) of the terms of the maximand, a problem with simultaneity exists.

What can be concluded about B.C. Tree Fruits Ltd. sales quotas from the above discussion? It is impossible to make any definitive inferences without some attempt to solve the above equations, hence future study is required. While the weekly/monthly sales quota may seem inadequate ex poste, it may be the best policy available ex ante. B.C. Tree Fruits Ltd. should have developed some instinct, at least, for price fluctuations over time and in response to their own behaviour, and for storage costs. Their sales quota system is most likely their best synthesis of this knowledge, tempered by a certain amount of risk aversion. It is perhaps in the risk area where they should be examined most closely, since risk aversion could be innate to B.C. Tree Fruits Ltd. or else it could be imposed upon them by other participants in the B.C. industry (via its cooperative nature).

Thus, revenue maximization is a problematic function to perform in the apple industry. While this study can not determine if B.C. Tree Fruits Ltd. has succeeded in obtaining maximum revenue, given their lack of control over the product mix, it

will report B.C. Tree Fruits Ltd. performance in relative terms. This will be accomplished by first examining revenue trends and quantity response, and later by making some general comparisons with Washington State.

4.3.2 Results

B.C. Tree Fruits Ltd. sales revenues for apples are expressed in constant dollars as a function of time in Figure 4.3. They range from about $45m in 1984 to $83m in 1981. This graph helps to explain the unrest among growers in the early 1980s, since revenues seemed to fall quite substantially from an average of about $75m before 1982 to an average of about $55m from 1982 to 1985.

In Section 3.2.1 the relationship between price and quantity was investigated. In Figure 4.4 the relationship between sales revenue and quantity is illustrated. This seems to be quite a positive relationship, since the lowest revenues occurred during low quantity years and the highest revenues occurred in high volume years. Thus, while quality is an important determinant of price (as discussed in Section 3.2.2), quality without quantity does little to guarantee high revenues.

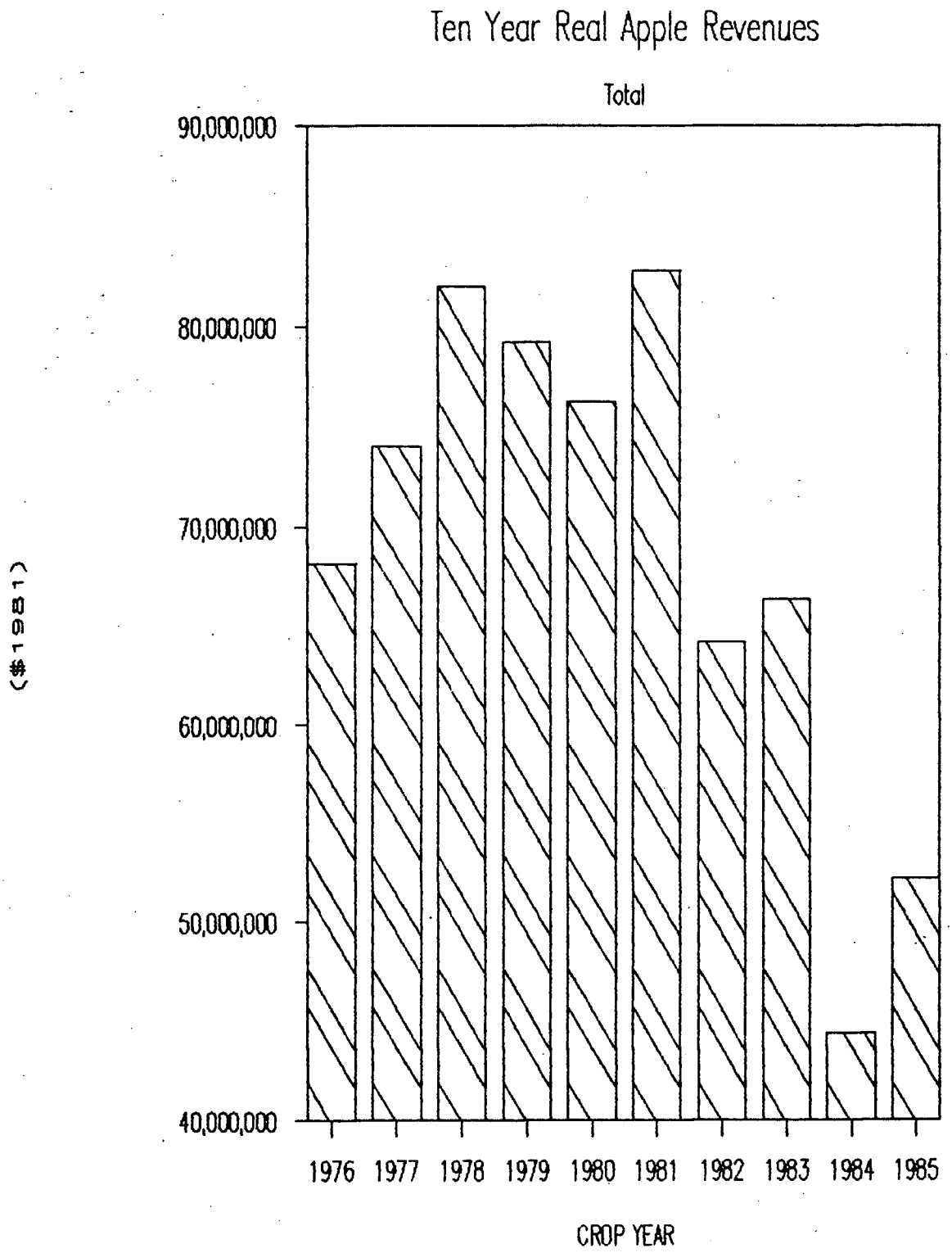


Figure 4.3 Revenue from Sales in 1981 dollars for B.C. Tree Fruits Ltd. (1976-85)

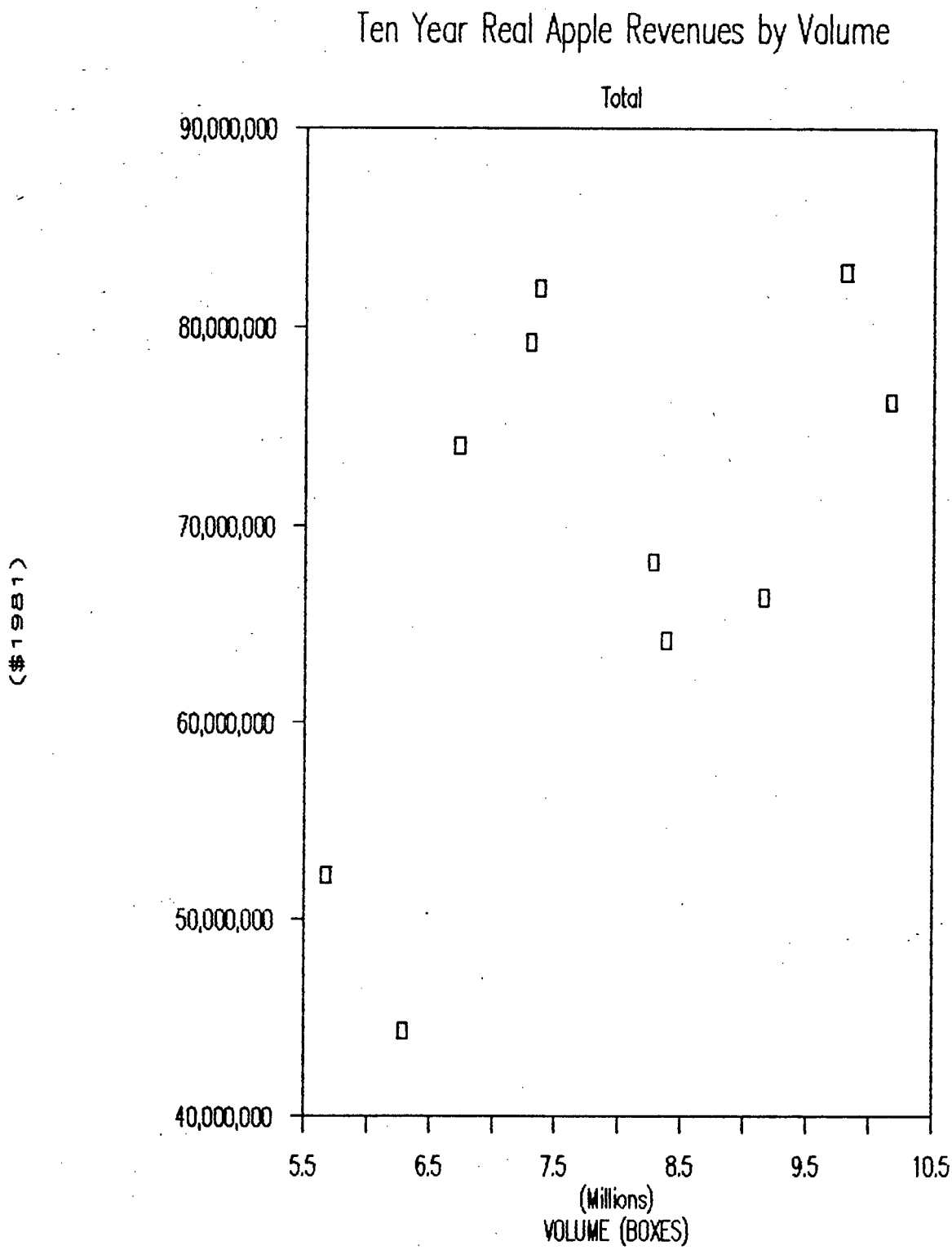


Figure 4.4 Relationship between Revenue from Sales (1981 dollars) and Quantity of B.C. Apples Sold (1976-85)

4.4 COSTS

4.4.1 Theoretical Considerations

There are two aspects of cost analysis which are very important to the B.C. apple industry (primarily to the packing function). The first aspect involves determination of the least cost combination of resources or factors of production. The second aspect involves determining the optimum size of plant. New, labour-saving technology and subsequent plant amalgamation make an understanding of both these aspects important in the apple industry.

The least cost resource combination rule involves determination of a series of isoquant curves (convex to the origin) paired with their tangent isocost curves (at a constant input price ratio). Ridge lines bound the "stage two" resource combinations, that is the region in which a firm should operate to achieve technological efficiency.[10] By operating at the point of tangency between the isocost and relevant isoquant curves, the firm achieves economic efficiency.[11] The expansion path contains all the tangency points (for a given price ratio) and hence depicts how the firm should allocate its resources among the various factors given a choice to change output. This generalized

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10 Technological efficiency must be within the region where the marginal physical product of both (all) inputs is positive. Otherwise, addition of one extra unit of input will impact output not at all or negatively. Thus, marginal rate of technical substitution must be greater than or equal to zero if the firm is to operate efficiently.

11 Economic efficiency involves moving along a given isoquant curve to the point where the given quantity can be produced most cheaply. This is accomplished by hitting the lowest isocost curve possible, which occurs at the point of tangency.

approach enables one to model increasing, constant and decreasing returns to scale conditions.

After technological and economic efficiency have been achieved in terms of the optimal resource combination, the firm must then determine its most efficient output. In the short run, the firm can produce most cost effectively at the output where average cost equals marginal cost, given plant size. Note, imperfect competition in the factor markets would change the slope of the average variable cost curve (and therefore the average cost curve). The firm should produce as long as price is above the average variable cost at the optimal output, and it will earn economic profit when price is above average cost at that output.

The long run average cost curve can be thought of as an envelope curve of the series of short run average cost curves over all outputs. This is shown in Figure 4.5. Initially, the firm is operating on SAC_1 and produces at X_1. Note, this is not the most efficient point on this curve, and so the firm chooses to produce at output X_2. It can accomplish this in two ways. First, it can move along SAC_1 to its most efficient point. Or, it can build a larger plant and move to SAC_2. It is now operating at less than optimal output, again, but it has captured additional economies of size to reduce its costs even further, from C_1 to C_2. The plant is operating at its most efficient output at the point where its short run marginal cost equals the long run marginal cost, as shown below for the second plant size.

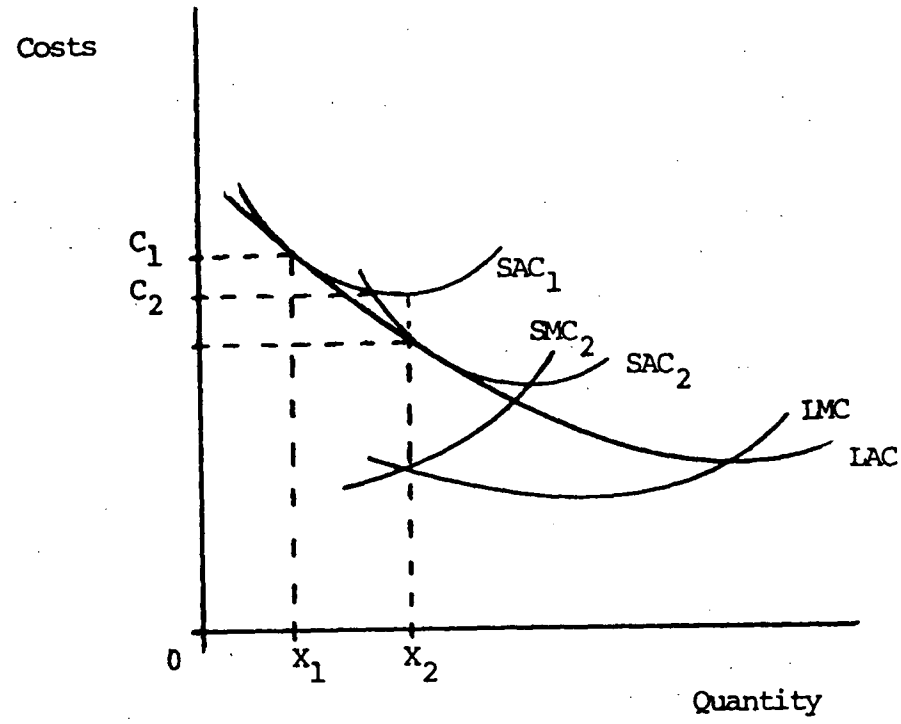

Figure 4.5 Relationship between Short Run and Long Run Cost Curves

There are several reasons why it is difficult to test if the B.C. apple marketing system is operating at the point of least cost plant scale and resource combination. First, it is not operating in a perfectly competitive environment (eg. labour unions) nor does it operate as a perfect competitor (as per the oligopoly discussion above). Second, there is no access to B.C. packing- house accounts and only limited access to B.C. Tree Fruits Ltd. accounts, therefore quantifying the cost curves is very difficult. Third, the data that is available has its own problems. Total packinghouse allowances (as determined by the O.F.S.A. guidelines) and total quantity sold is available for a ten year period, but these figures do not break down costs between types of costs or by fruit type (fresh versus processed). There have been technological advances during this period which have resulted in different resource combinations, hence one is

faced with distinguishing between different curves. For six (discontinuous) years detailed per unit cost data are available, however the quantities within these categories are not available and so total costs cannot be computed.

Given these data constraints, this study will attempt the following cost analysis. Total cost and average cost curves will be proposed, and average costs will be trended. The costs will then be broken down into fixed and variable over time. The fixed costs will be examined to determine the degree to which they really are fixed. These efforts will be made for both packing and marketing costs, data permitting. They will then be compared with Washington State costs.

4.4.2 Packing Cost Analysis

Total and Average Costs

Total packing costs (for B.C. Tree Fruits Ltd. affiliated houses in constant dollars) are trended over a ten year period in Figure 4.6. This graph depicts a substantial jump in total cost of about $10m in 1980 (or about 40%) before costs fell again. This 1980 jump was very large, and so it is necessary to examine how quantity affects cost to account for this. A total cost curve is postulated in Figure 4.7, and it conforms fairly well to the upward sloping curve expected. One would have to extrapolate below historical quantities to find the cost intercept, and therefore fixed costs, using this approach.

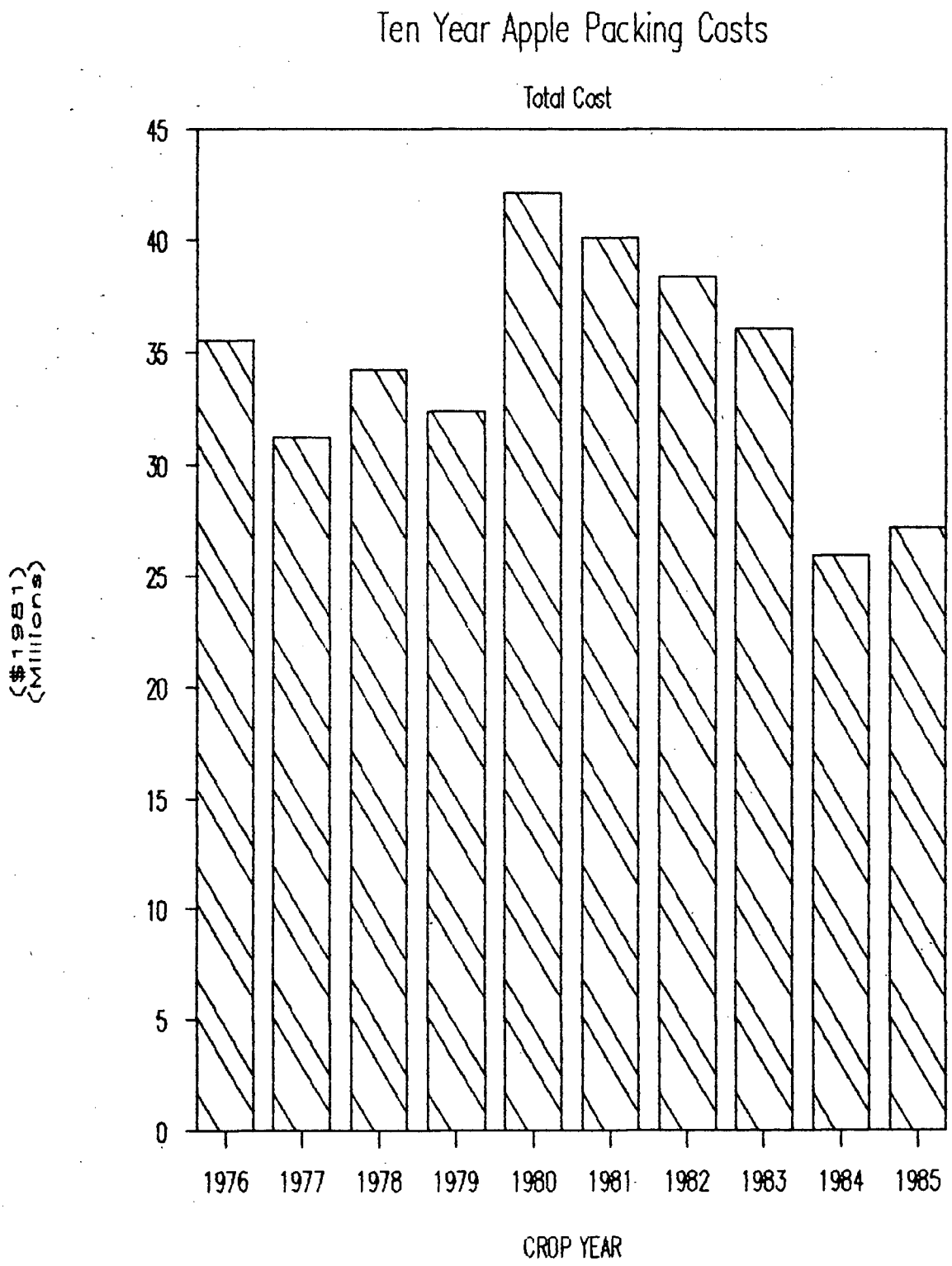

Figure 4.6 Total Packing Costs in 1981 dollars for O.F.S.A. Packing-houses (1976-85)

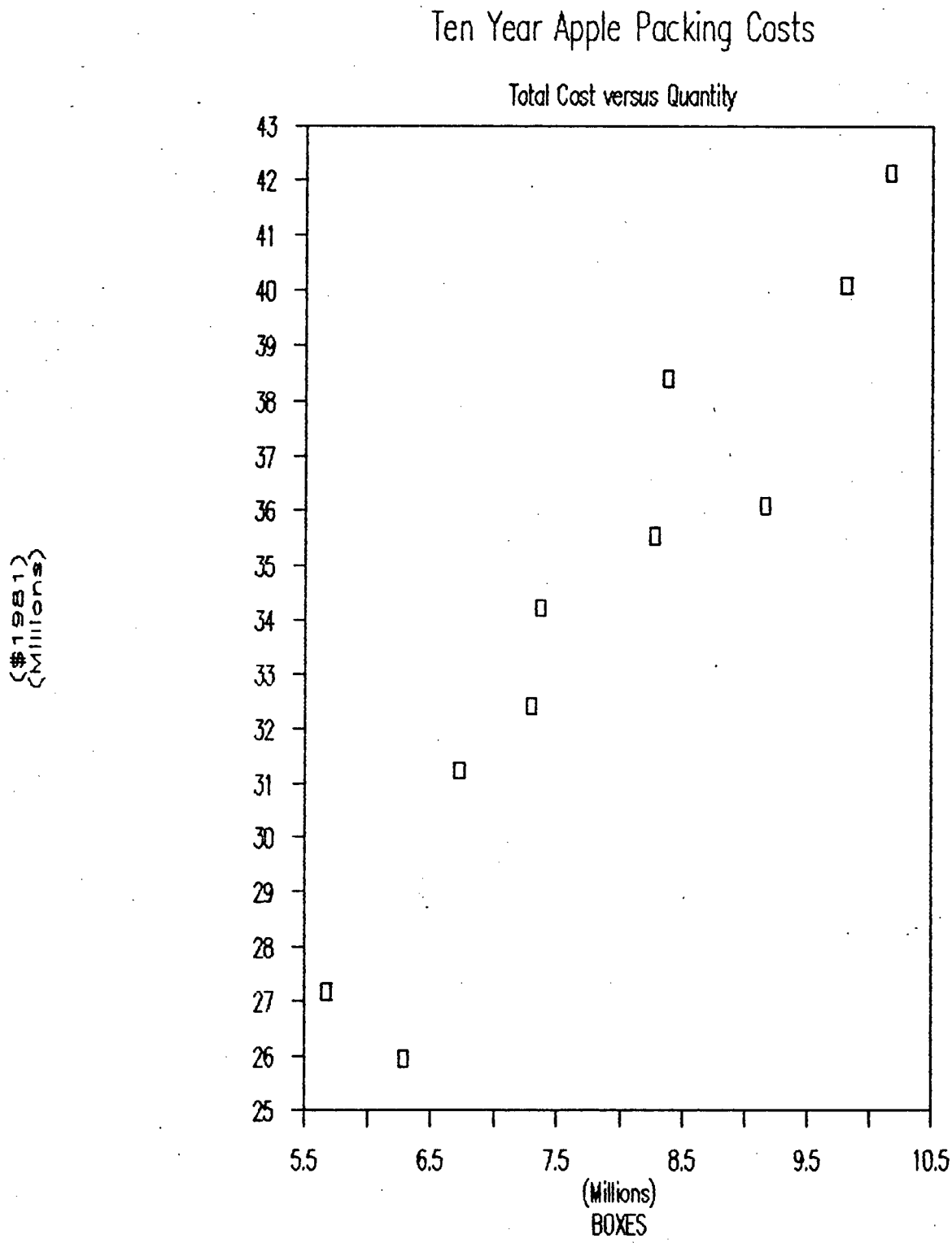

Figure 4.7 Relationship between Total Packing Cost (1981 dollars) and Quantity of B.C. Apples Sold (1976-85)

This total cost curve permits the average cost curve to estimated, as in Figure 4.8. The most serious outlier of this curve occurred in 1984, the first year of house pooling. This could be due to strong incentives to trim costs, even to the point of operating at a loss in the short term, in an attempt to appease growers during a most contentious time. Ignoring this one outlier and assuming this depicts only one short run average cost curve, then the graph pictures the downward sloping section of the SAC curve depicted in Figure 4.5. Since only part of the curve is shown, it is impossible to say where it would be minimized (and hence begin to climb), but one can say the industry is not operating at its most technically efficient output given its plant scale. But, recall from Section 4.5.1 that the most technically efficient point does not equal the most economically efficient point unless it is operating at the minimum of the long run cost curve. Thus, economies of size dictate that it is cheaper to operate at less than optimal capacity.

Total costs can be broken down into fixed and variable costs using information from the O.F.S.A. guidelines. The fixed costs, or overhead, are determined on the basis of a representative house model of given size, technology and staffing, and hence it is likely the least robust of the cost figures. It is determined before the packing year and is apportioned on a per ton basis by using total fruit crop predictions.

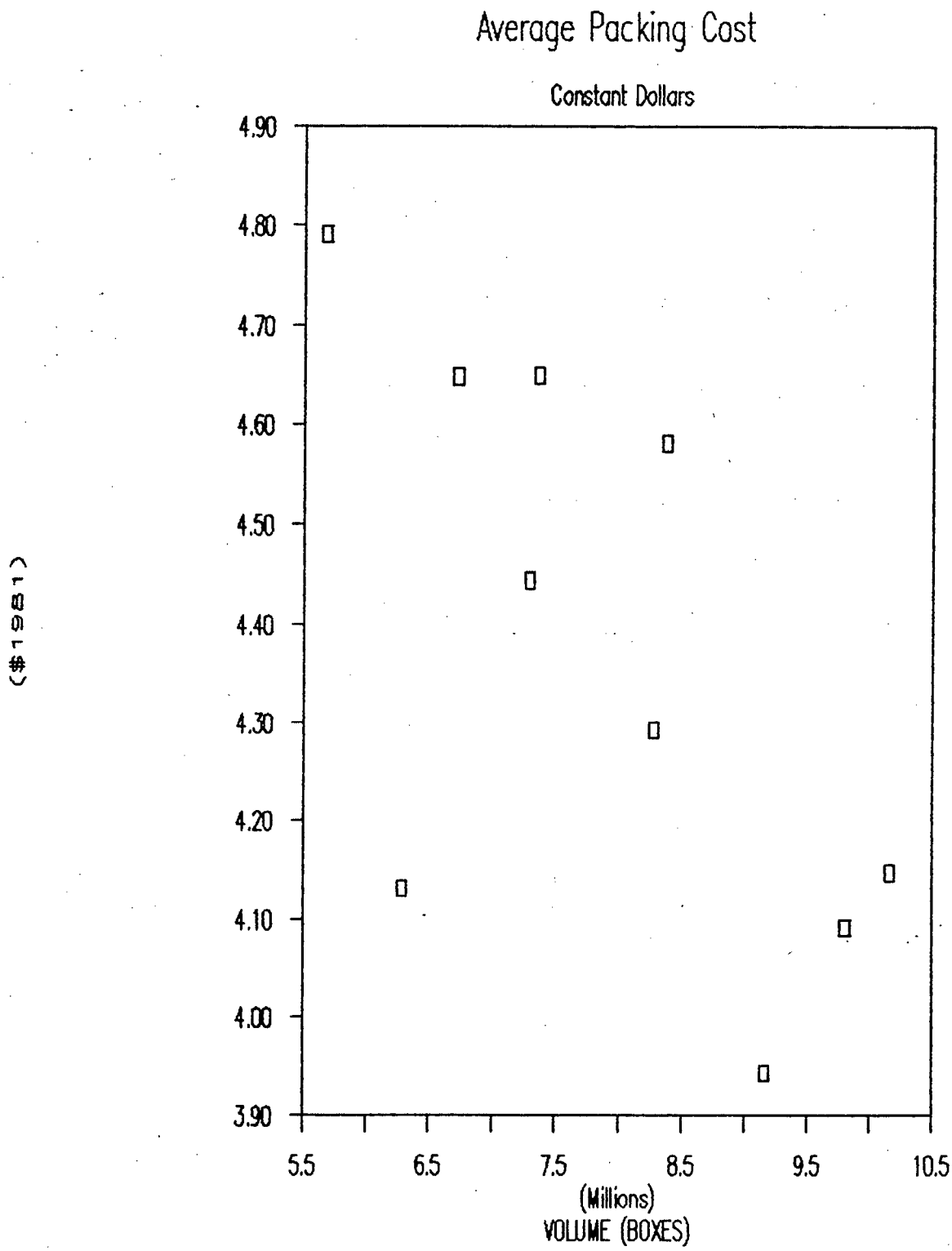

Figure 4.8 Relationship between Average Packing Cost (1981 dollars) and Quantity Sold for B.C. Apples (1976-85)

Variable costs attributed to different products include labour and materials. Since labour wages are set industry-wide, labour costs would only vary much between houses if they differed in labour productivity. Any productivity differences would likely be due to differences in capitalization (namely PG/PS), but this distinction is beyond the scope of this study. Materials costs include packaging, waxes and special spray treatments. The latter two costs are very small and standard to most products and houses, and hence are not shown or discussed below. The packaging costs are standard amongst the houses, but vary considerably with product type.

The relation between fixed and variable costs per apple box is illustrated in Figure 4.9, using 1986 Red Delicious as an example.[12] The tray pack[13], with by far the largest production, is almost as cheap to produce as the Econopak, at $3.19 and $2.97 (when overhead costs are excluded), respectively. While labour costs remain fairly standard (for all except the quart basket) at between $1.60 and $2.30 per box, it is the materials cost which accounts for most of the range in total cost.

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12 Overhead costs per box will, of course, vary with the size of the crop, and so will require more careful treatment below.

13 While the pack types in fact contain different fruit weights, for the sake of this analysis all packs have been scaled to 42 pounds.

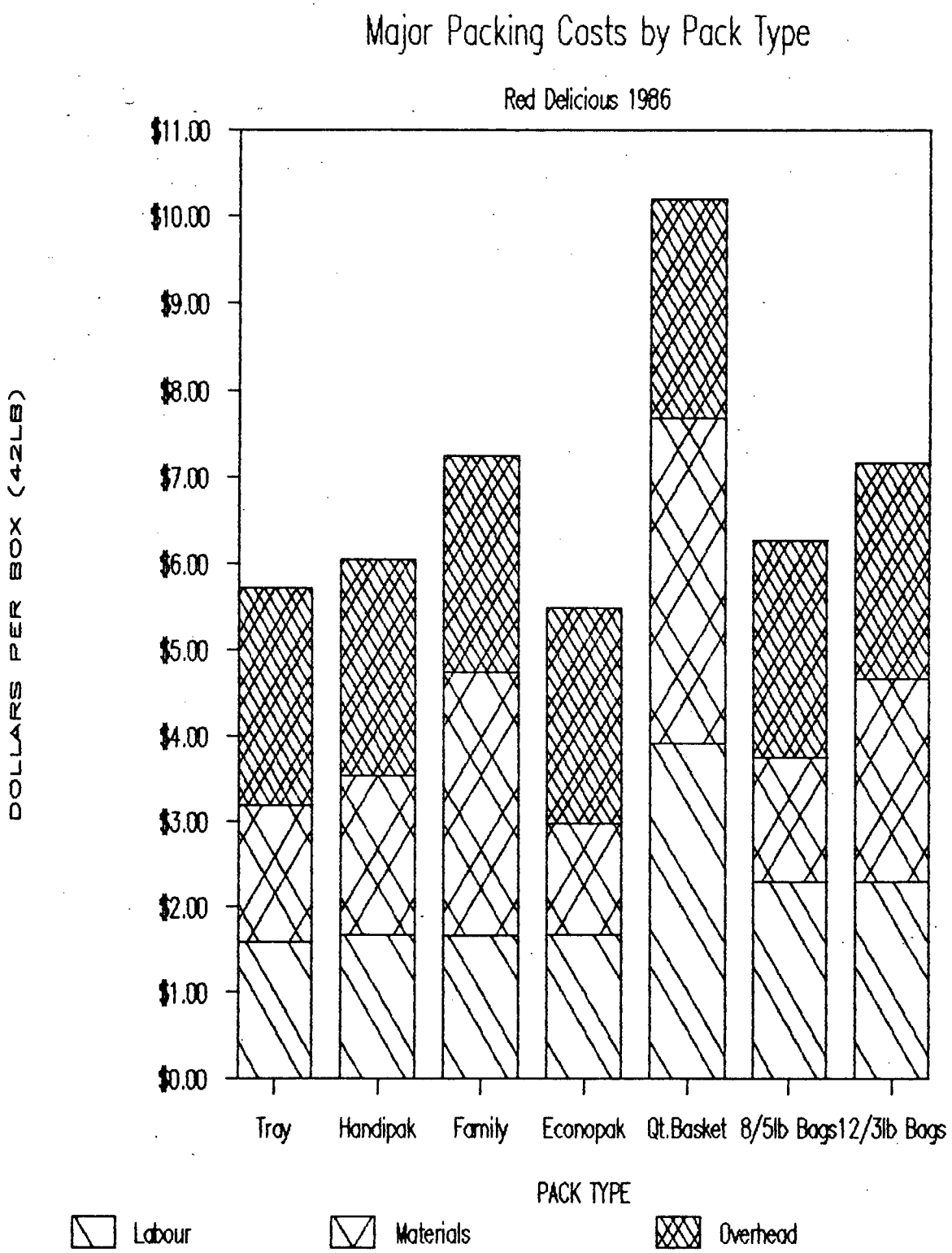

Figure 4.9 Major Packing Costs by Pack Type for B.C. Red Delicious (1986)

Fixed Costs

To analyze overhead costs, the per unit figures from the O.F.S.A. guidelines (available from 1979-1981 and 1984-1986) must be combined with apple production figures in order to calculate the total overhead set-asides. These figures, converted to constant dollars, are trended in Figure 4.10. While not a continuous sample, this graph does show how two crop years, 1980 and 1981, cost about $5m more than the other three years, where overhead was charged approximately $11m. As these were heavy crop years it appears the overhead costs are not completely fixed (or the heavy crops were very poorly predicted when the overhead cost guidelines were established).

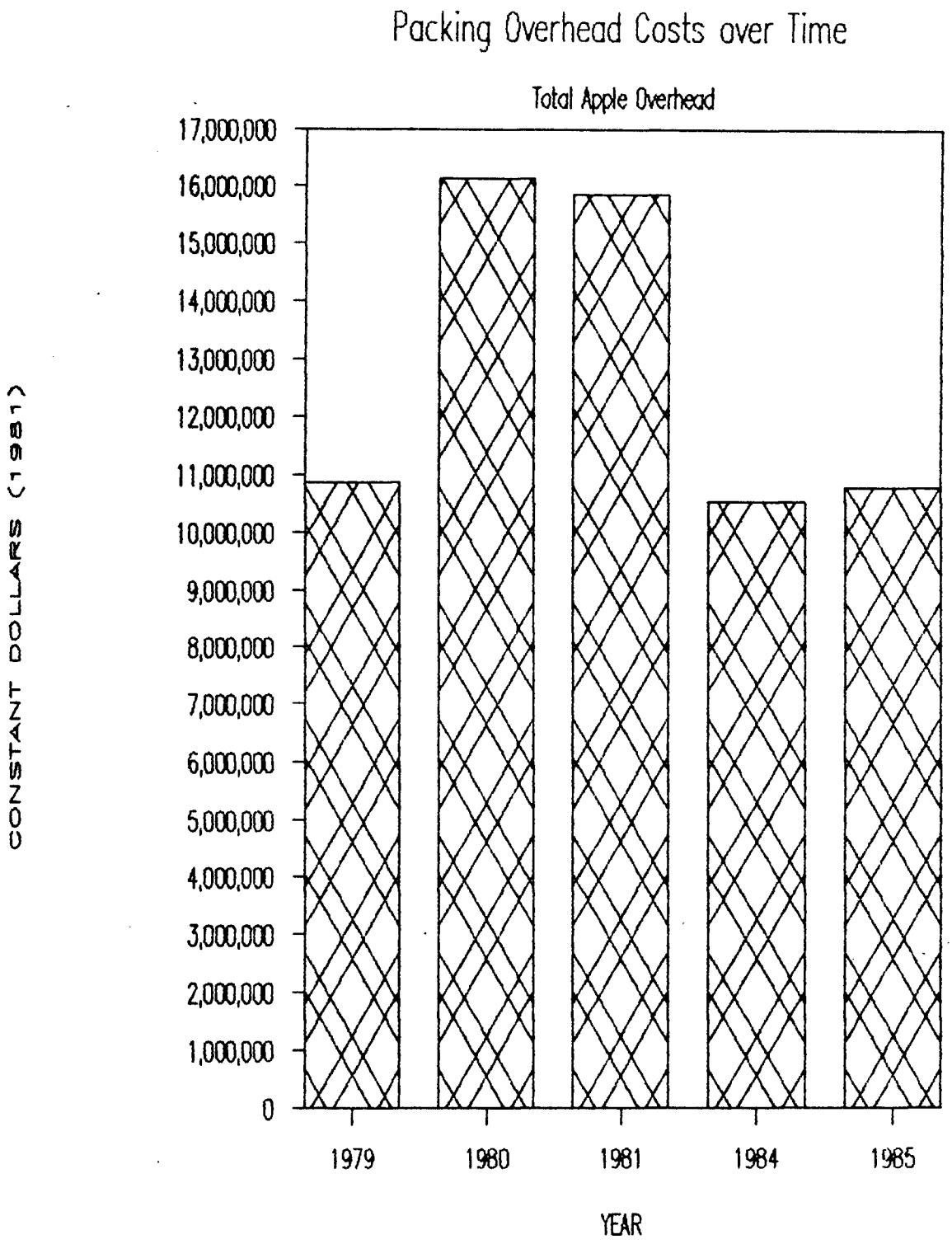

Figure 4.10 Overhead Costs in 1981 dollars for O.F.S.A. Packinghouses (Selected years 1979-85)

Plotting the same overhead figures against quantity in Figure 4.11 confirms this. While overhead costs were relatively fixed between 5.5 and 7.5 million boxes, the jump to over 9.5 million boxes seems to account for the large (45%) increase in the overhead figures. However, the overhead figures could also have been allowed to balloon if the packinghouses suspected increased revenues would permit them to increase costs (in total but not per unit) in order to make capital investments without alarming the growers. If the grower returns could be kept at the historical level the growers may be less adverse to financing capitalization. The rapid depreciation methods favoured by the houses[14] could well accommodate this scenario. To determine if this was the case, or if the higher overheads were simply the result of poor crop predictions, one would need to see actual cost data or grower rebate data (to see the difference between actual costs per packinghouse and O.F.S.A. established costs).

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[14] Rapid depreciation of capital expenditures is in accordance with the cooperative financing theory of ensuring "the users are the payers", as per Section 4.1.

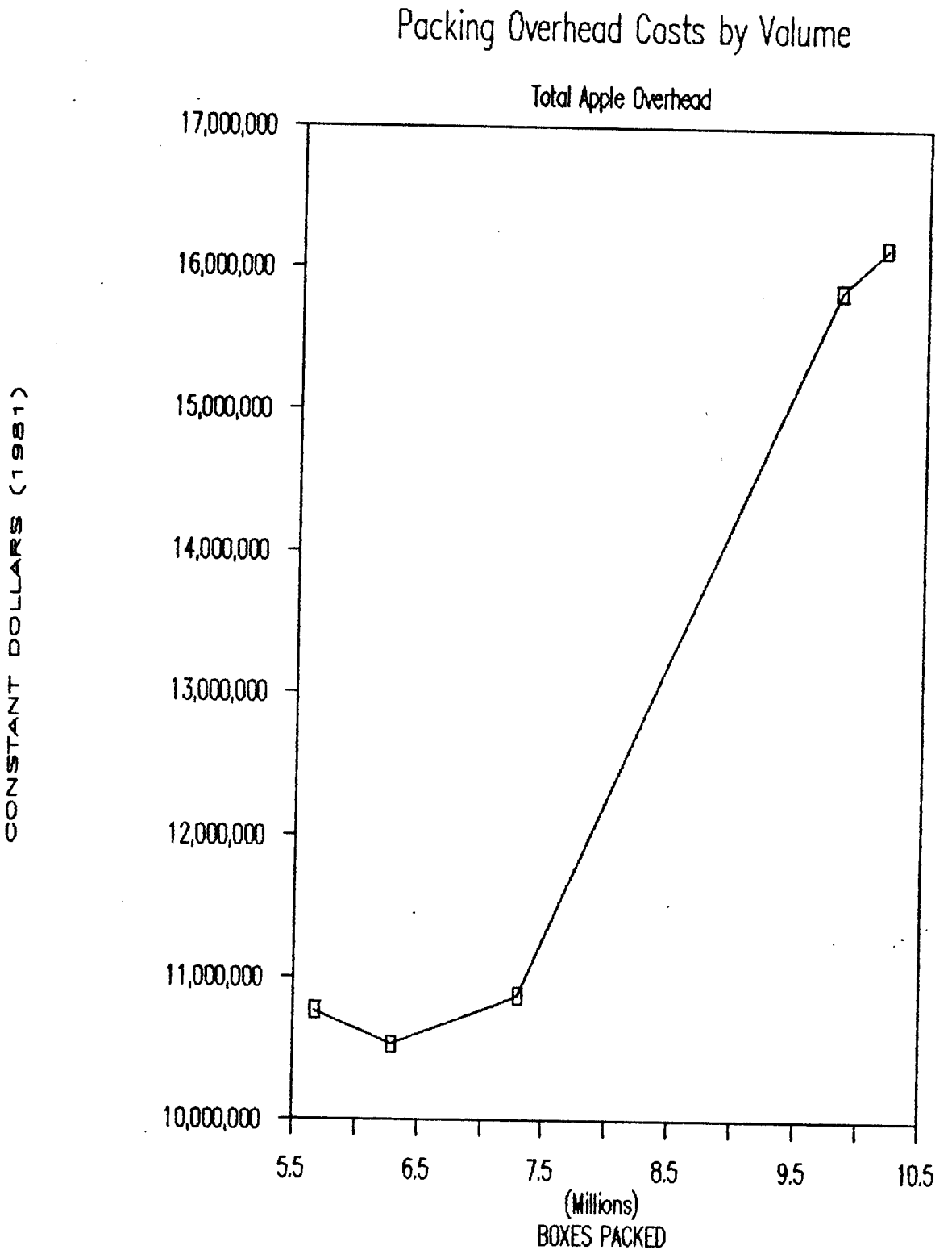

Figure 4.11 Relationship between O.F.S.A. Overhead Costs (1981 dollars) and Quantity Sold (Selected years 1979-85)

Variable Costs - Labour

Wage rates have risen in the packinghouses at a pace with other industrial wages in B.C., as shown in Figure 4.12.[15] The 1985 rate of nearly $11/hour is considerably higher than the packinghouse wage rate of about $7.35/hour ($CAN) in Washington State (Schotzko and O'Rourke). However, this may or may not be reflected in total costs, since there have been considerable technological (labour-saving) advances, as well.

A more informative discussion of labour costs would involve per unit costs, as calculated in the O.F.S.A. guidelines and illustrated in Figure 4.13. This graph shows the trend in labour cost per 42 lb. box, and also shows how labour costs vary with pack type. In constant dollars, labour costs have actually fallen for all pack types from 1979 to 1985. Most of this fall seems to have occurred between 1981 and 1984, where, unfortunately, the data is lacking. This also coincides with the adoption of PG/PS. But, between 1984 and 1985 labour costs rose in real terms, suggesting no more technological gains were being made (or at least the gains did not keep up with wage gains), and hence the average cost curve experienced no further shifts.

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15 Manufacturing and industrial average data derived from British Columbia Industrial Review 1986, and assumes a 40-hour work week. OFSA "heavy" wage rates are from the OFSA Differential Guide, 1986.

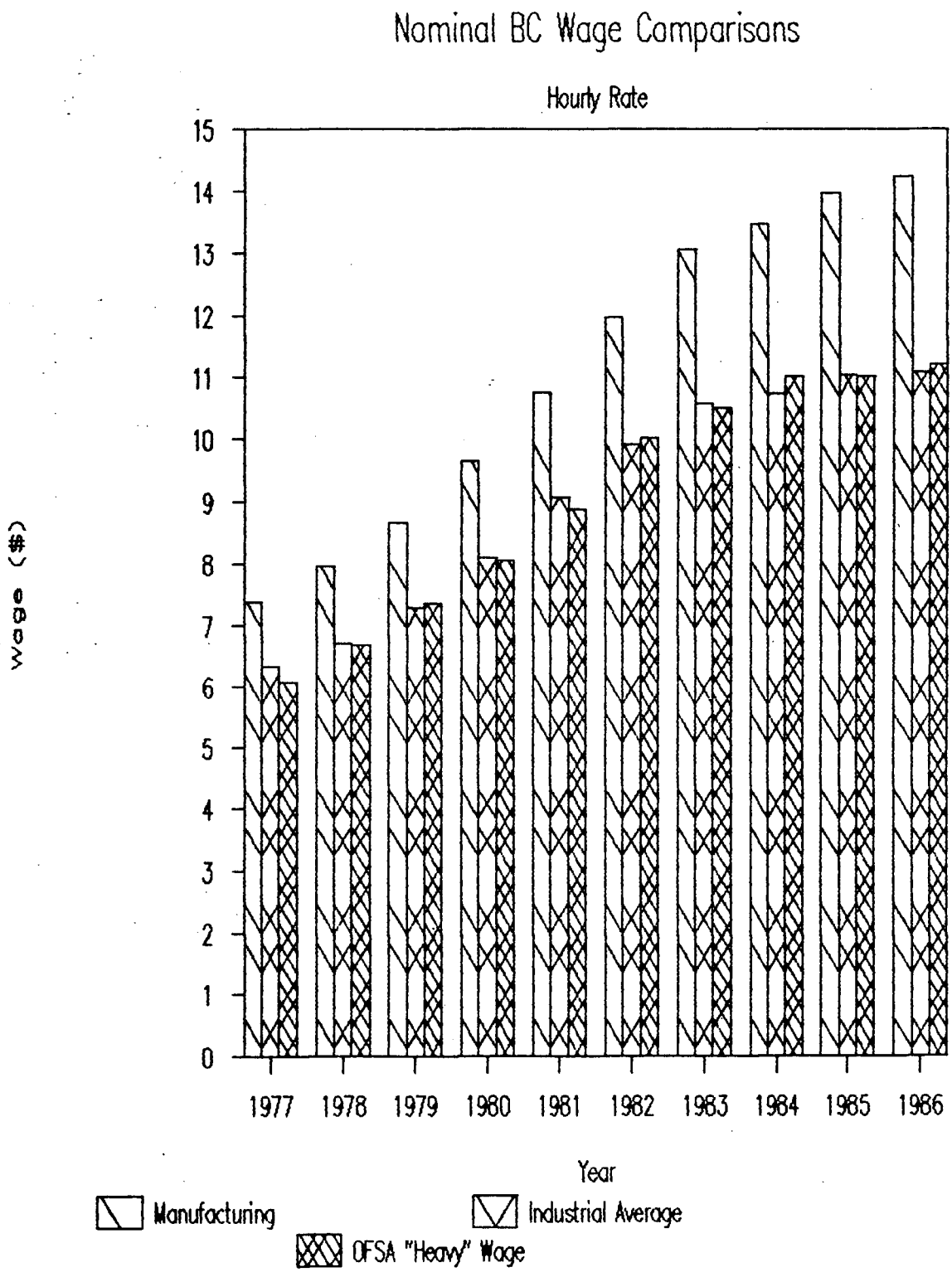

Figure 4.12 O.F.S.A. Hourly Nominal Wage Compared with Average Wages in B.C. Manufacturing and Industrial Sectors (1977-86)

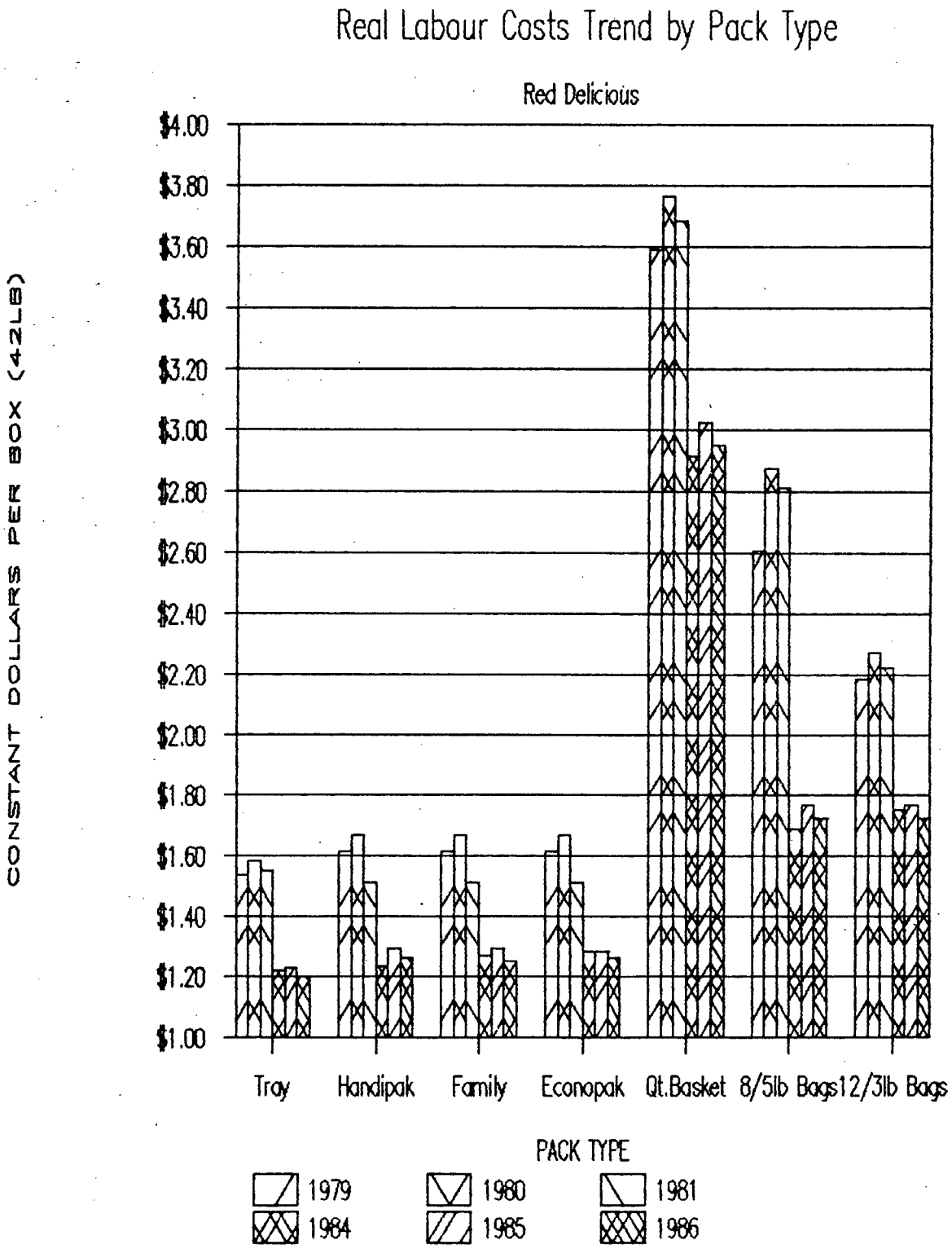

Figure 4.13 Trend in Real Labour Costs by Pack Type for B.C. Apples (Selected years 1979-86)

It is also interesting to compare the labour costs over pack types. The box-type packs, namely tray, Handipak, Family pack and Econopak, have the lowest labour component. The quart basket, at a labour cost of over $3, requires more than twice the labour input than the standard tray pack. While higher in actual terms, between 1980 and 1984 the labour input for the bagged packs improved in relative terms by declining by a larger proportion (42%) than did the standard tray pack (23%).

Variable Costs - Materials

Packaging costs (the bulk of materials costs) are only available for the crop years 1984 to 1986. They will vary with variety to some extent (as will labour costs), but pack type causes much more variation. The constant dollar packaging costs for the seven pack types over three years are illustrated in Figure 4.14. They vary little over time, except for the three pound bags which increased in cost by nearly three times between 1984 and 1985.

In a standard box, the Econopak is the least cost packaging choice at about $1.30. The five pound bags and the tray pack are the next lowest, at about $1.50 and $1.60, respectively. The Family pack and the quart basket are the most expensive packages, at about $3.15 and $3.75, respectively.

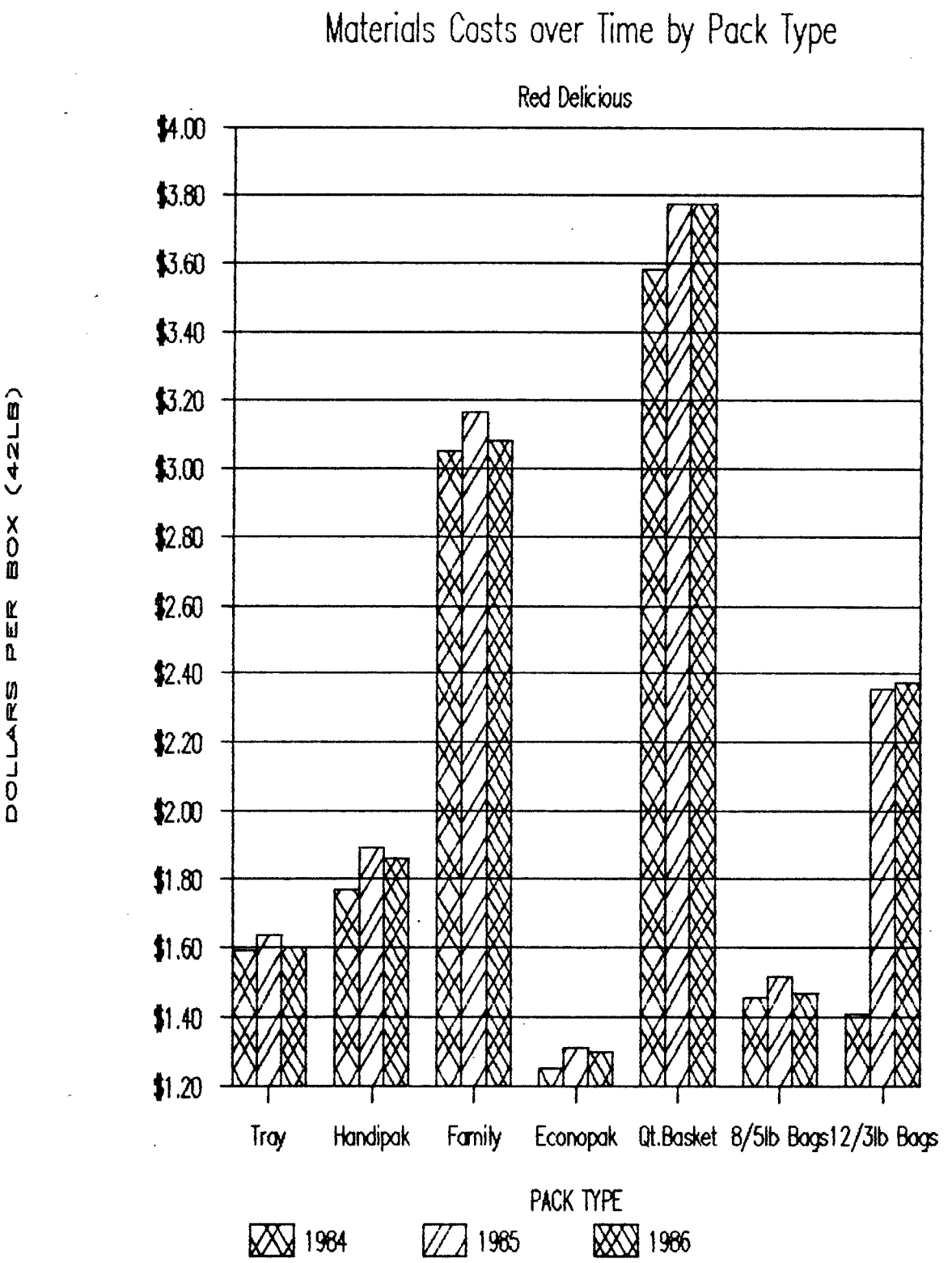

Figure 4.14 Trend in Cost of Materials by Pack Type for B.C. Apples (1984-86)

4.4.3 Marketing Costs

B.C. Tree Fruits Ltd. deducts its marketing costs, as well as the costs for non-marketing services provided, from the sales revenue. There appears to be a trend in total cost, as illustrated in Figure 4.15. Marketing cost, in constant dollars, rose steadily, for the most part, from 1976 to 1981 where it peaked at just under $9m before beginning to slide down to around $4m in 1985. Part of the decline in marketing costs can be accounted for by the transfer of some of the non-marketing charges, CA storage and `Production and Assembly', to the packinghouses. These will be discussed in more depth below.

Perhaps some of the trend observed above could be explained by the importance of variable costs. To capture these, marketing costs are plotted against production in Figure 4.16, which shows a highly positive relationship between cost and volume. As with packing costs, this graph alone does not permit an estimate of fixed costs, since that would entail a large extrapolation to detect the cost intercept.

The average cost relationship as depicted in Figure 4.17 is less informative than that for packing costs. A functional relationship is very difficult to discern from the point scatter. If the function isn't a constant (not a flat average cost curve) then the graph could possibly depict more than one curve (or a shift in costs during the ten year period).

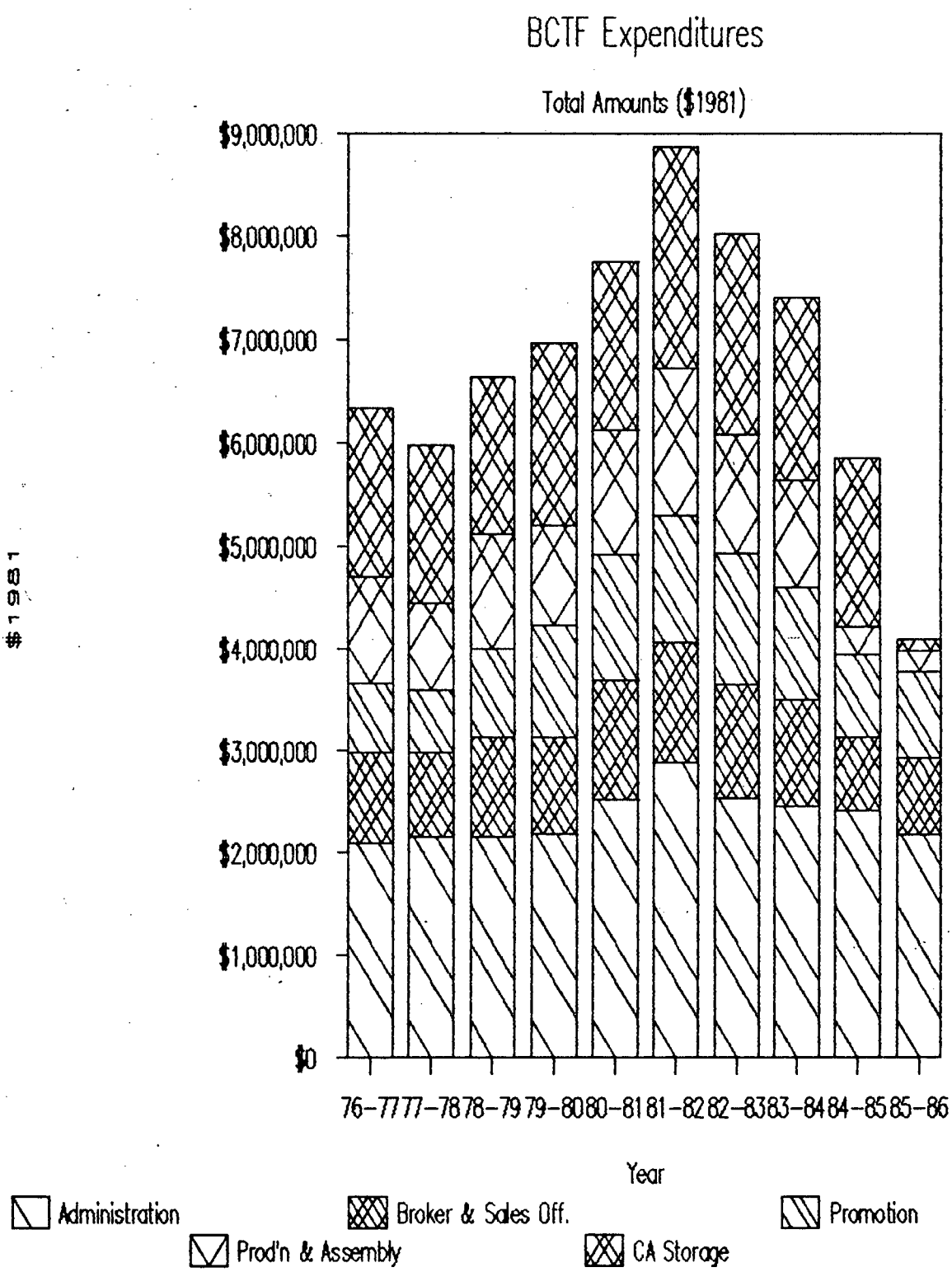

Figure 4.15 Structure of Total Costs for B.C. Tree Fruits Ltd. by Crop Year (1976-85)

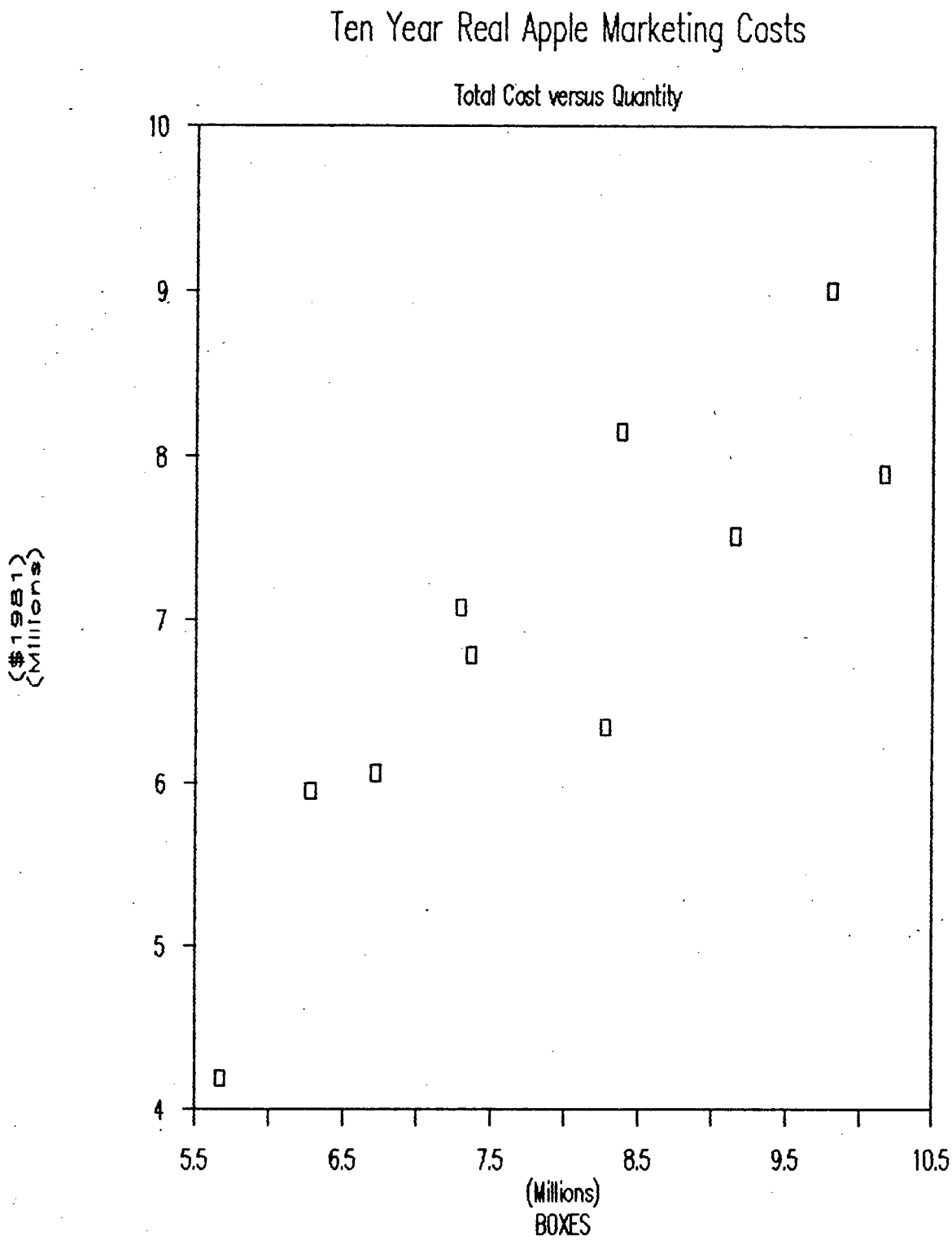

Figure 4.16 Relationship between Total Marketing Cost (1981 dollars) and Quantity of B.C. Apples Sold (1976-85)

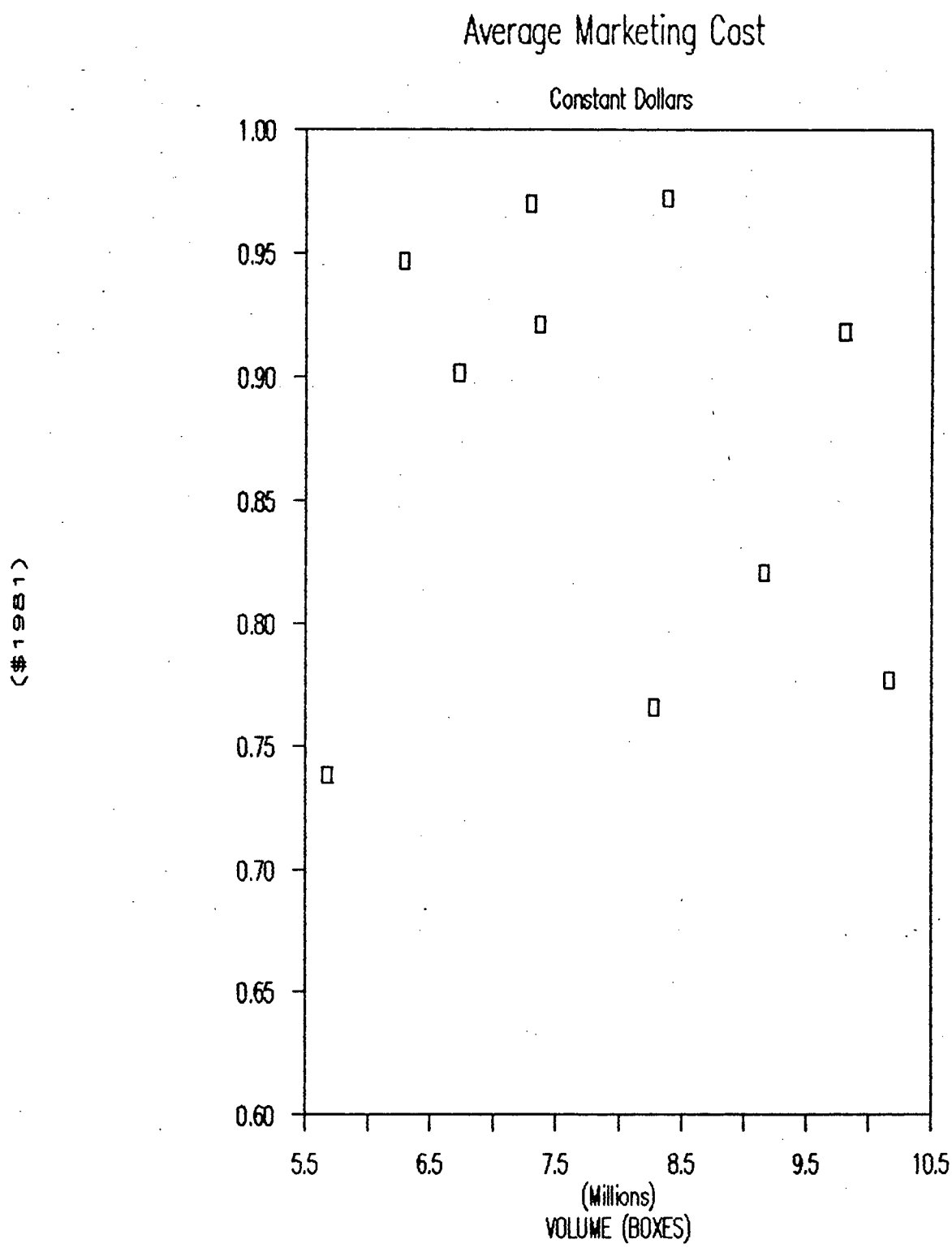

Figure 4.17 Relationship between Average Marketing Cost (1981 dollars) and Quantity of B.C. Apples Sold (1976-85)

Total marketing cost can be broken down into five major categories - `Administration', `Sales Offices and Brokerage Fees', `Promotion', `Production and Assembly' and `CA Storage'. The latter two have been devolved to some extent to the packinghouses in recent years. These costs, as shown in constant dollars in Figure 4.15, were fairly constant until the 1984 and 1985 crop years. Administrative costs, which make up the largest portion, vary between $2m and $3m. Brokerage fees and sales office costs range from $0.75m to $1.2m and promotion ranges from $0.6m to $1.3m.

Some of the variation in these costs can again be explained by their relationship to quantity. Figures 4.18 to 4.22 plot these five marketing costs against quantity sold. The most obvious functional relationship with quantity exists for CA storage (Figure 4.22), production and assembly (Figure 4.20), and sales office and brokerage fees (Figure 4.21). The former two would be expected to depend fairly heavily on quantity, but the sales office and brokerage fee relationship suggests brokerage fees could play a larger part than previously expected (although the cost is still quite low).

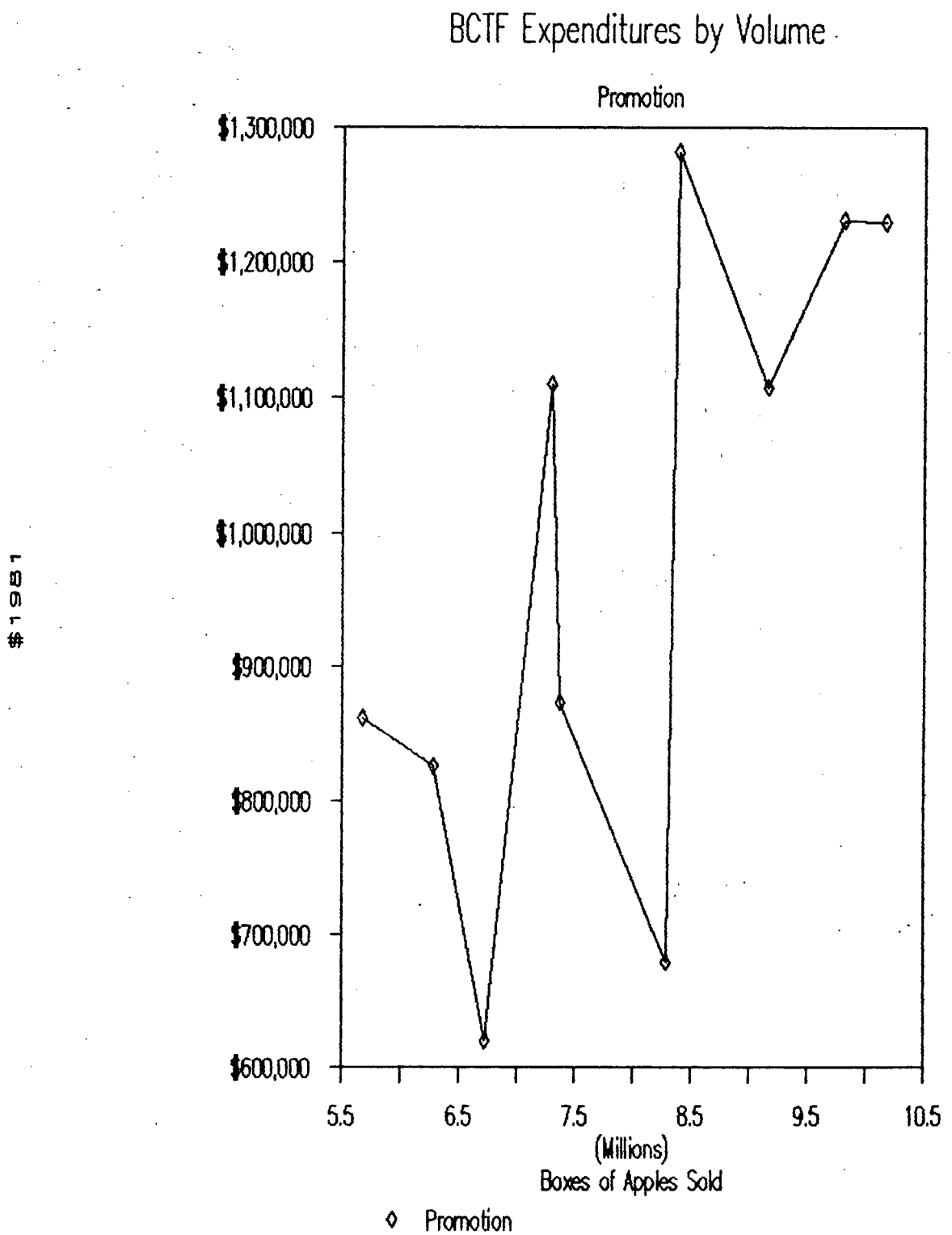

Figure 4.18 Relationship between Promotion Costs (1981 dollars) and Quantity of B.C. Apples Sold (1976-85)

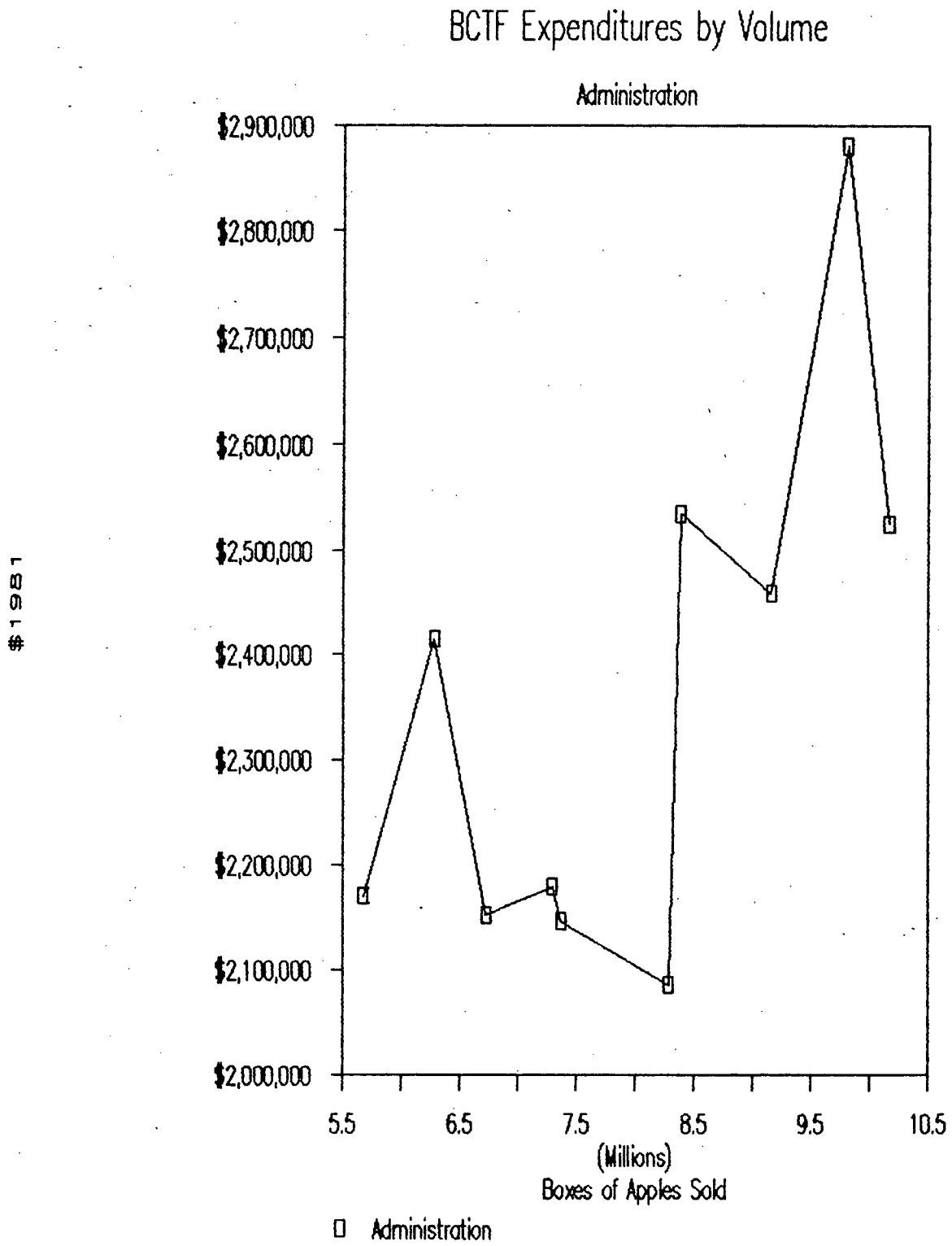

Figure 4.19 Relation between Administration Costs (1981 dollars) and Quantity of B.C. Apples Sold (1976-85)

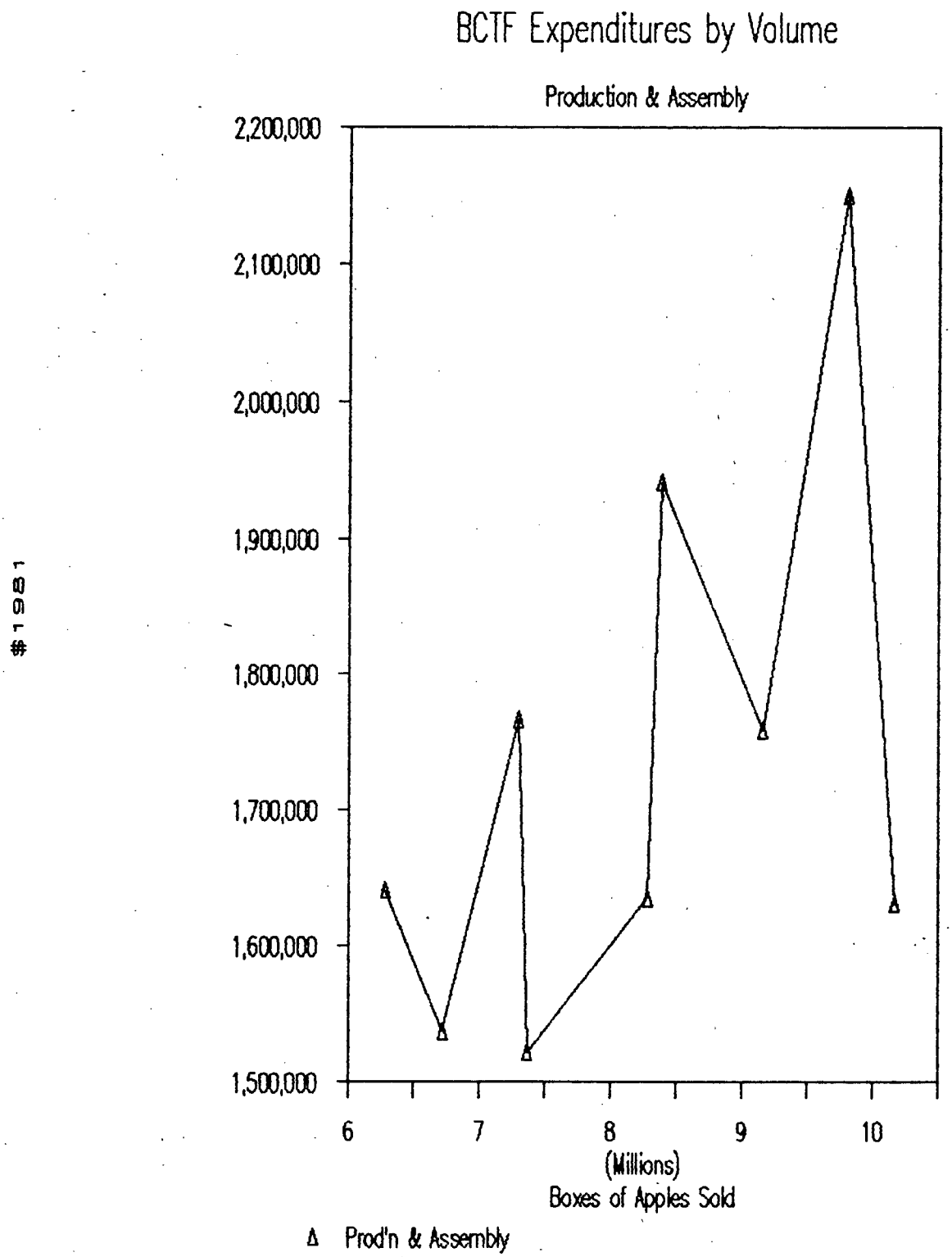

Figure 4.20 Relation between Production and Assembly Costs (1981 dollars) and Quantity of B.C. Apples Sold (1976-85)

Another area where one might expect a high variable component is promotion, which is depicted in Figure 4.18. This also seems quite dependent on volume, although the existence of several outliers suggests some other factor in the relationship. Perhaps promotion expenses are less necessary when B.C. has a large crop at the same time Washington has a small crop (and hence price is high).

Finally, administration costs appear to be somewhat dependent on quantity (Figure 4.19), although this may be more of a discontinuous relationship (as was packinghouse overhead) than a smooth function. Overall, while fixed costs are definitely a major contributor to B.C. Tree Fruits Ltd. costs, they appear to have considerable flexibility to respond to changing crop conditions.

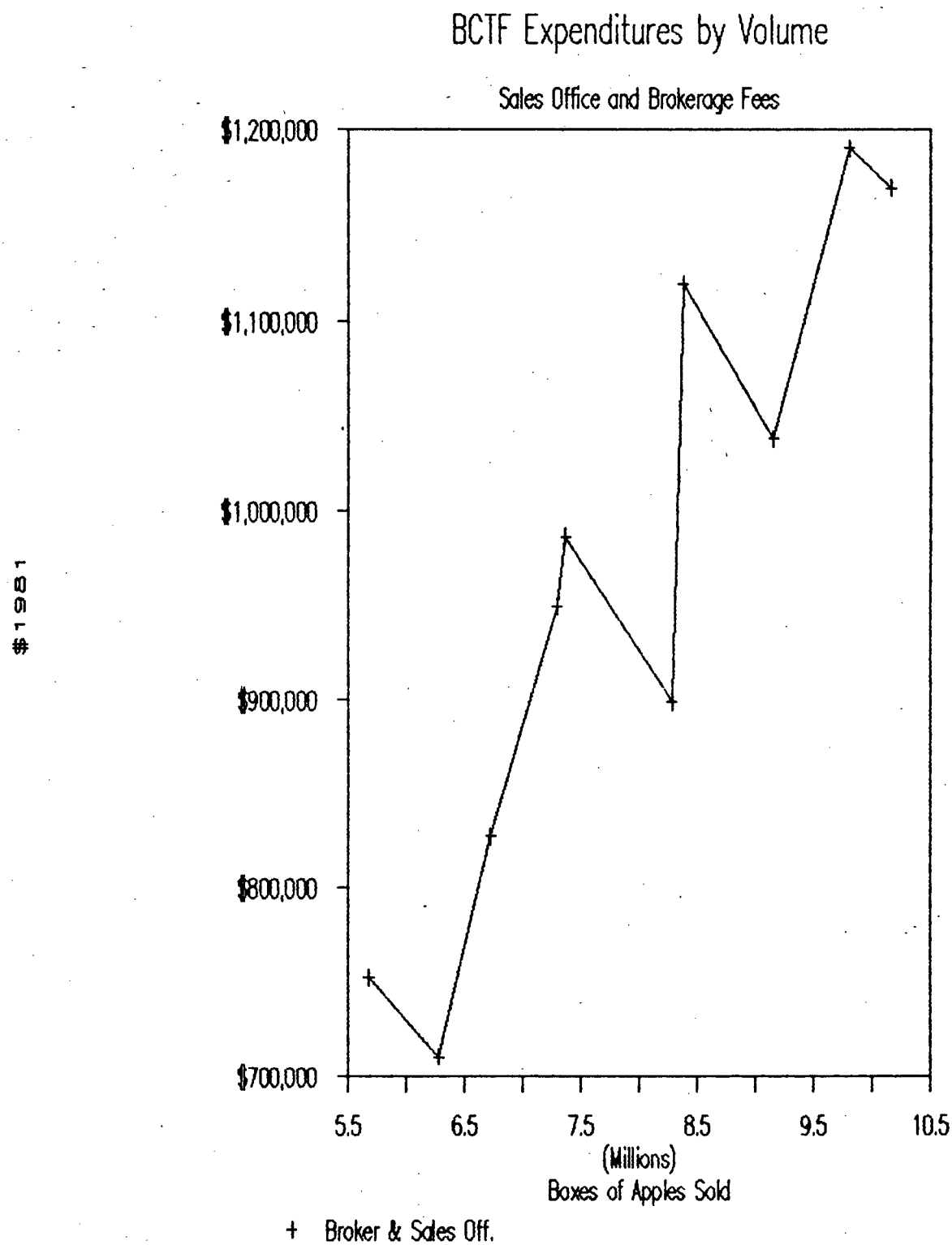

Figure 4.21 Relation between Sales Office and Brokerage Fees (1981 dollars) and Quantity of B.C. Apples Sold (1976-85)

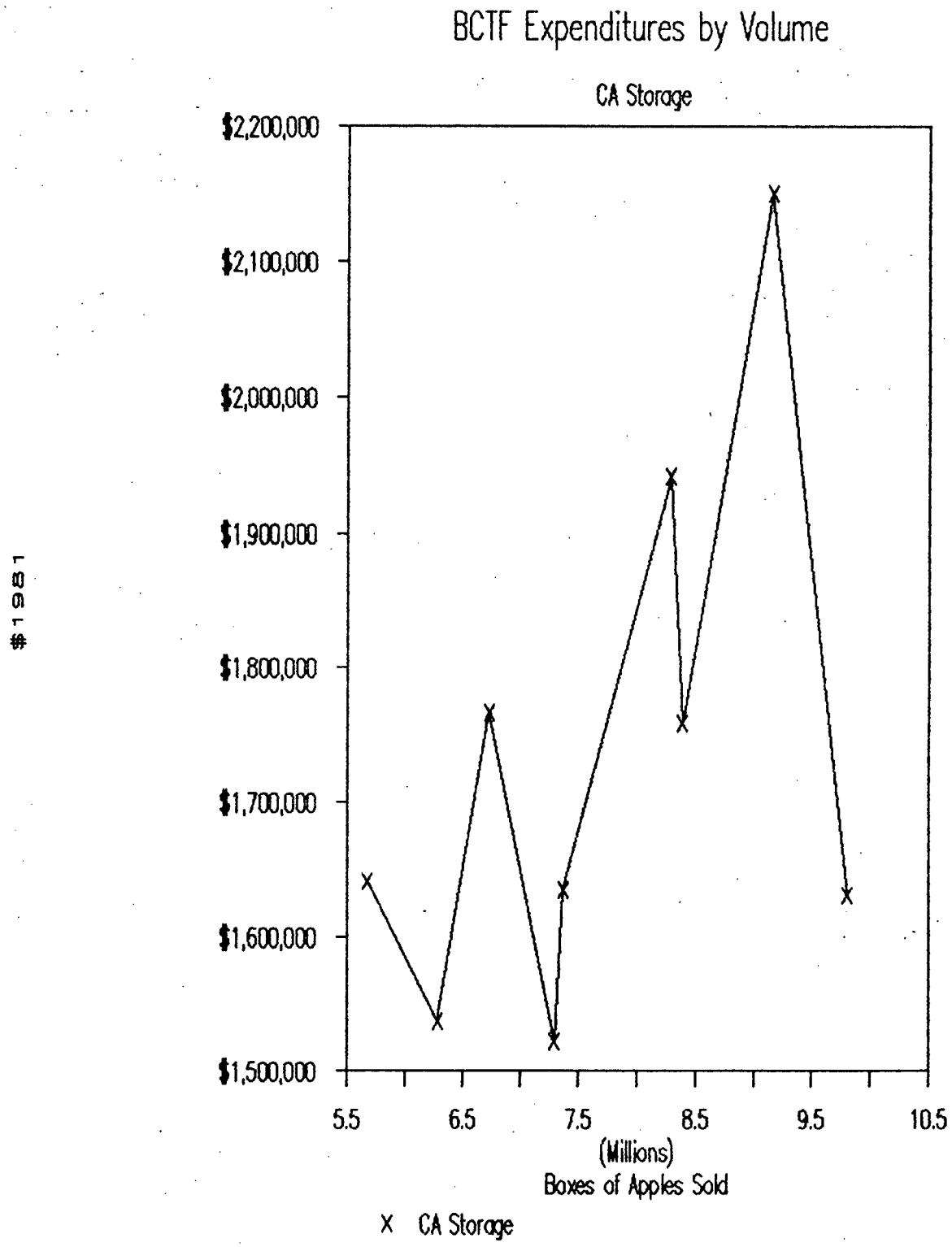

Figure 4.22 Relation between CA Storage Costs (1981 dollars) and Quantity of B.C. Apples Sold (1976-85)

4.4.4 Comparison with Washington State

In Figures 4.23 and 4.24 the actual B.C. nominal packing and marketing costs (per box) are compared with those in Washington State over a six year period. The B.C. costs are from the B.C. Tree Fruits Ltd. Annual Reports and hence are averaged over all varieties and grades of fruit. The costs of data processing, inventory insurance and CA storage have been deducted from B.C. Tree Fruits Ltd. and added, where applicable, to the packinghouse costs. The Washington State costs come from two sources: Trout Cooperative and the W.G.A.C.H. (for the Washington State average). These costs have been separated as much as possible into packing and marketing costs and then adjusted by the exchange rate (which was averaged from harvest to harvest instead of on a calendar year basis).

British Columbia packing costs are consistently below the Washington State industry average and those of a leading Washington State firm (Trout), as shown in Figure 4.23. But the Trout costs after financing assessments are removed (not shown since there the data only covers two years) are lower than the B.C. costs, and hence it is difficult to say if B.C. costs are lower than the costs of the largest Washington State houses.

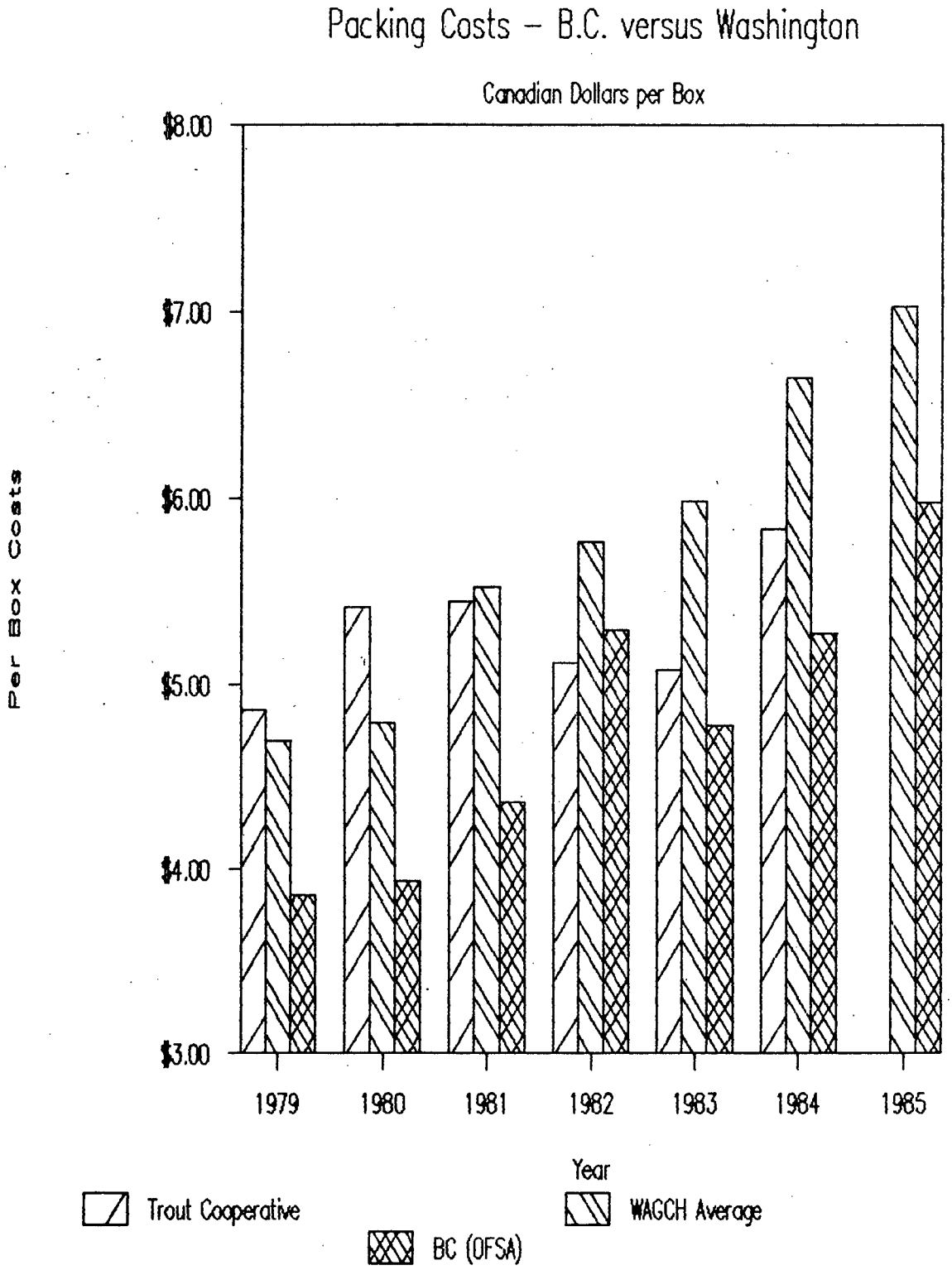

Figure 4.23 Comparison of Nominal Unit Packing Costs between B.C. and Washington State (1979-85)

The marketing cost comparisons, in Figure 4.24, suggest that while the adjusted B.C. Tree Fruits Ltd. costs are lower than the Washington State industry average, they are higher than the per box costs incurred by Trout. For instance, in 1984 B.C. Tree Fruits Ltd. costs were about 70 cents (nominal) per box, whereas they were about 82 cents for the Washington State industry as a whole and 54 cents for Trout.

The above comparison was covered rather quickly because of the reliability of the data used. The adjustment process whereby the costs covered in the above analyses were forced to be similar was hampered by the varying degrees of data reporting. In addition, there was no attempt to correct for differences in variety, size, grade or storage regime, all of which could bias the costs (and prices).

However, the comparisons do point out several intresting features of the marketing system. First, the marketing costs are relatively small in both regions, and it appears that B.C.Tree Fruits Ltd. size gives it only a slight advantage in cost, over the Washington average and a disadvantage in cost when compared with Trout. Thus, it does not appear that there exist significant cost economies of size in marketing. Similarly, while the average Washington house is over forty percent larger than the B.C. average house, this does not seem to have resulted in a cost advantage for Washington State.

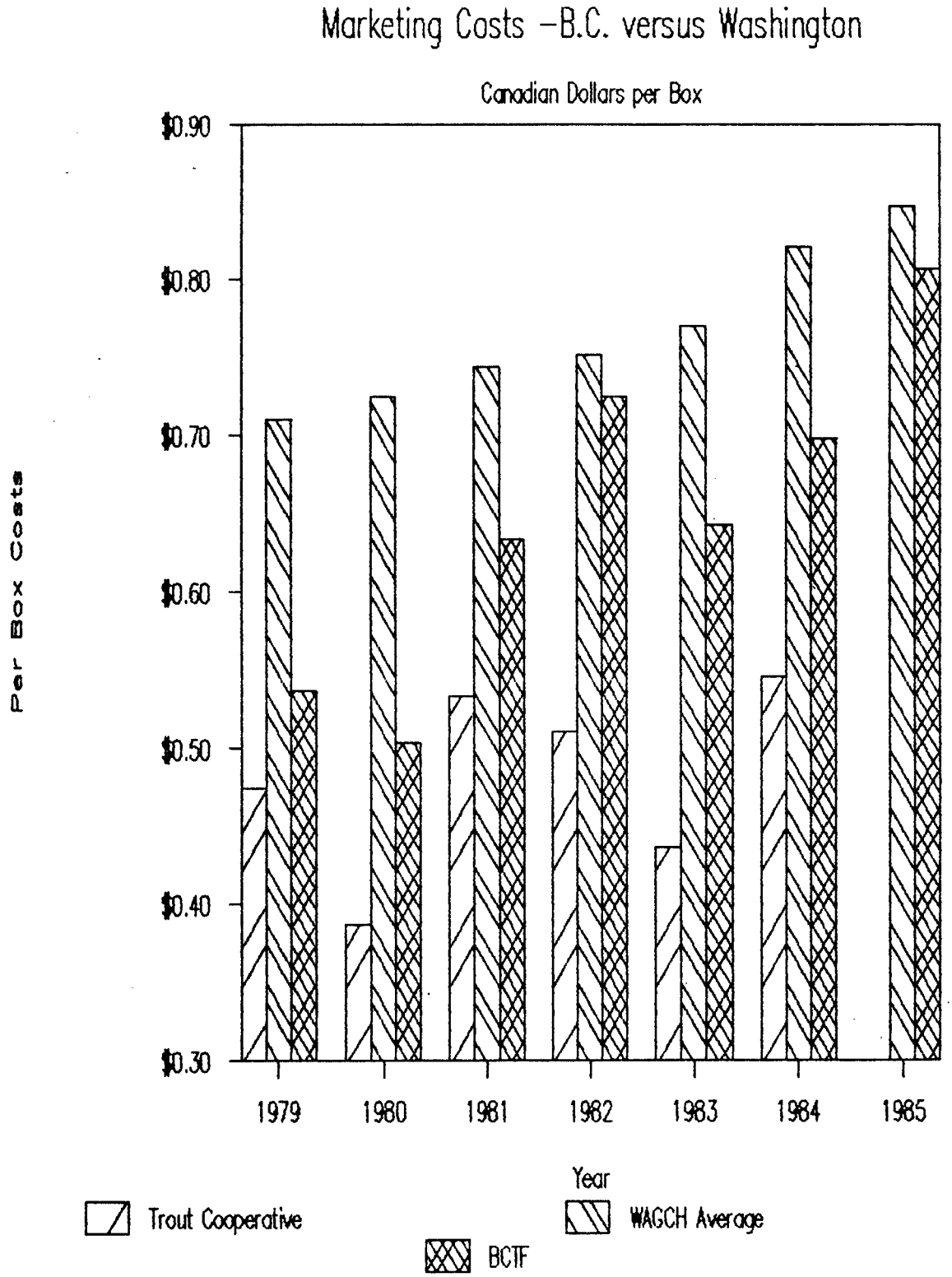

Figure 4.24 Comparison of Nominal Unit Marketing Costs between B.C. and Washington State (1979-85)

4.5 GROWER RETURNS

Since grower returns are residual in nature, that is they are solely a function of the packing/marketing revenue and costs, the theoretical discussions on the various aspects of these need not be repeated here. Hence, any theoretical consideration of grower returns would not be very illuminating. This section will focus instead on a brief description of grower returns, how they vary, and how they compare with Washington State.

4.5.1 Results

Total grower returns (in constant dollars) is graphed over time in Figure 4.25. Apple returns ranged from a high of over $41m down to around $12m in 1984. This variation is not easily explained by quantity as illustrated in Figure 4.26, where there appears to be no functional relationship between grower returns and production. This is despite the strong relationships between revenues and quantity and between costs and quantity, but it is not surprising given the residual nature of the grower returns payment.

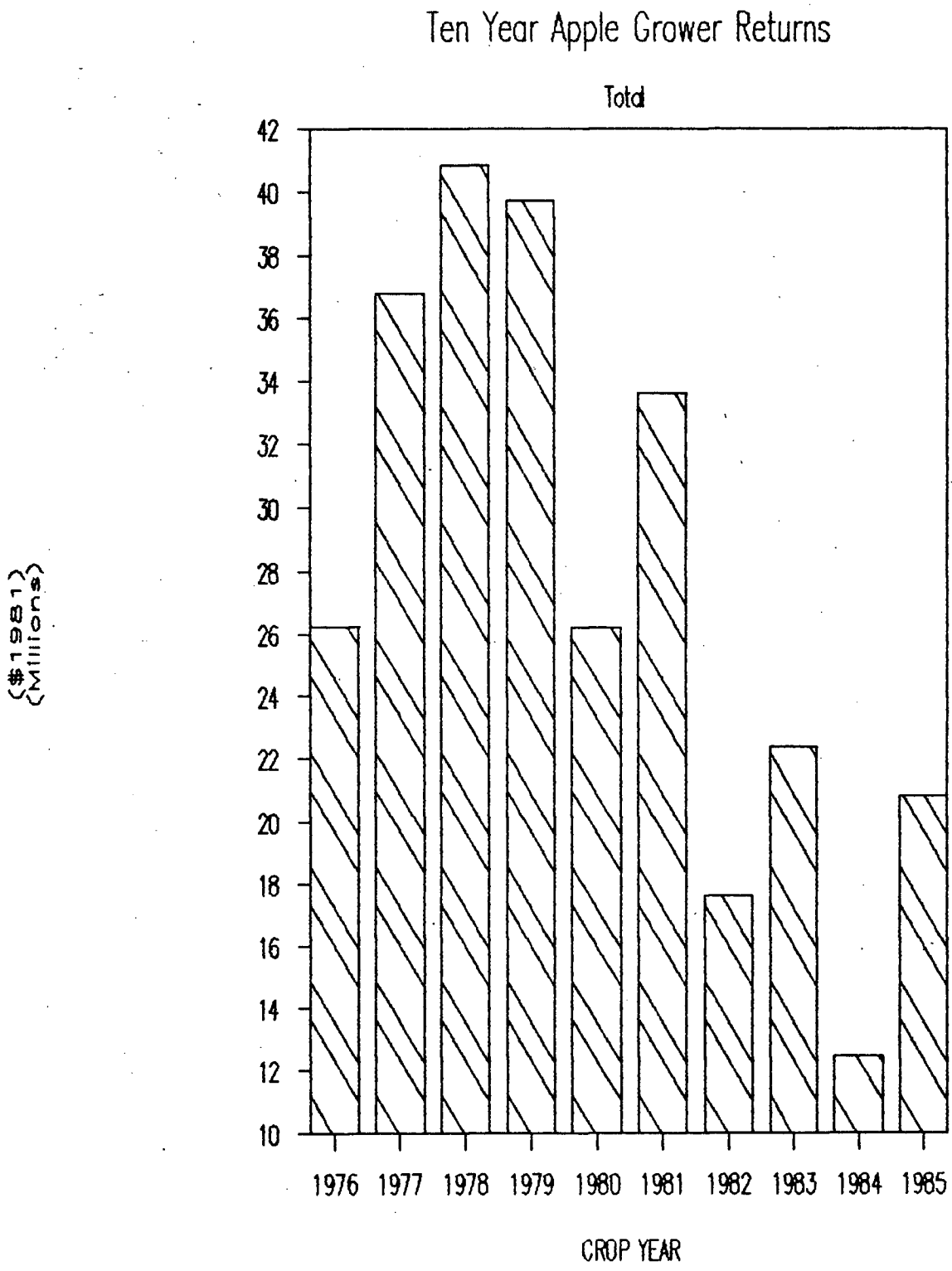

Figure 4.25 B.C. Grower Returns in 1981 dollars by Year (1976-85)

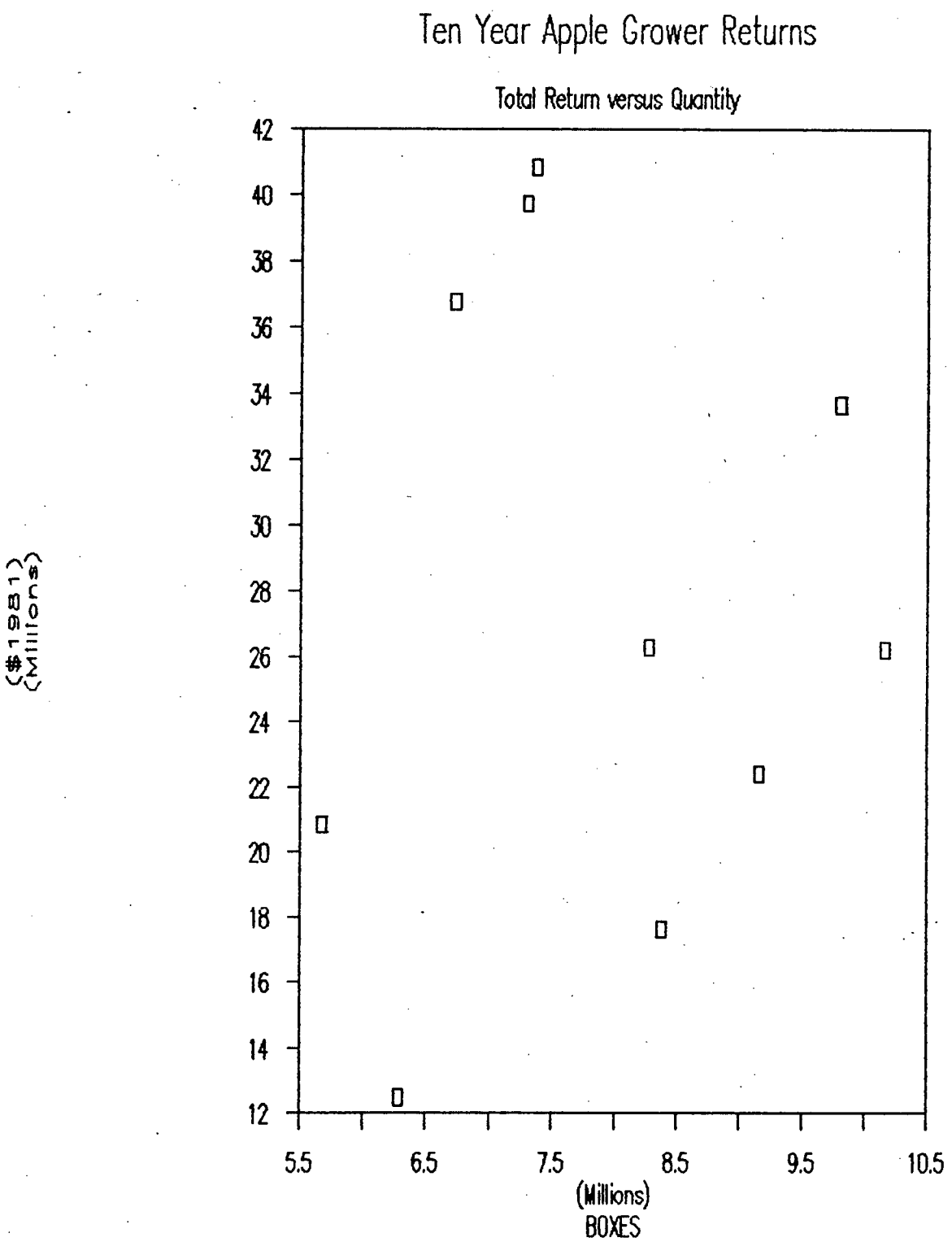

Figure 4.26 Relation between Grower Returns (1981 dollars) and Quantity of B.C. Apples Sold (1976-85)

Grower returns not only differ on a total basis, but also on a per unit basis. As do prices, they can vary with variety, grade, size and storage type. Variation with variety of apple can be seen in Figure 4.27 for 1984 Red and Golden Delicious, XFCY CA fruit. In 1984, Red Delicious returned more than Golden- considerably more in the large sizes (up to $15/box more) but as little as $1/box more in the small sizes. In 1985 (not shown) Golden Delicious returned more than Red in most size categories, although the difference was slight. In both years the size of fruit was important, as already discussed in Section 3.2.2 on price.

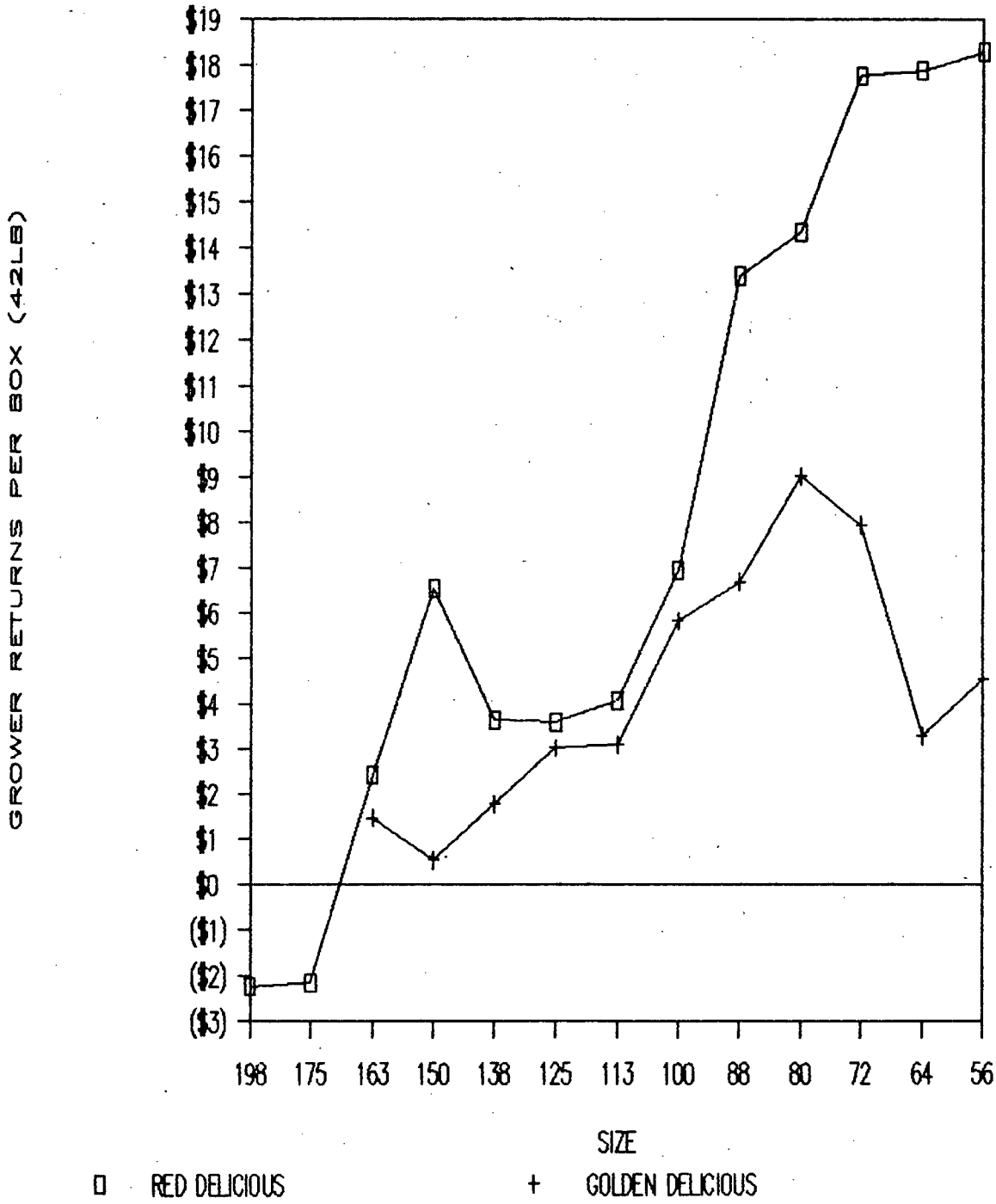

Figure 4.27 Effect of Variety and Size on B.C. Grower Returns (per unit basis) in 1984

Grade is also an important determinant of grower returns, as shown in Figure 4.28. In 1984 Red Delicious, the XFCY premium ranged from $3 to $9/box, with a negative return in the small sizes. Golden Delicious in the same year exhibited a curious reversal in the large sizes, where FCY returned more than XFCY, but from size 72 and smaller XFCY again commanded a premium of between $1 and $5/box. In 1985 (not shown) Red Delicious the XFCY premium ranged from $0.50 to $5/box, while the Golden premium ranged from $0.50 to $4/box.

Finally, grower returns can vary somewhat with the storage regime, and hence the keeping ability of the fruit can affect grower returns. This is depicted in Figure 4.29 for 1984 Red Delicious XFCY where, except for the two smallest sized fruit categories, the CA fruit returned between zero and $5.50/box more.

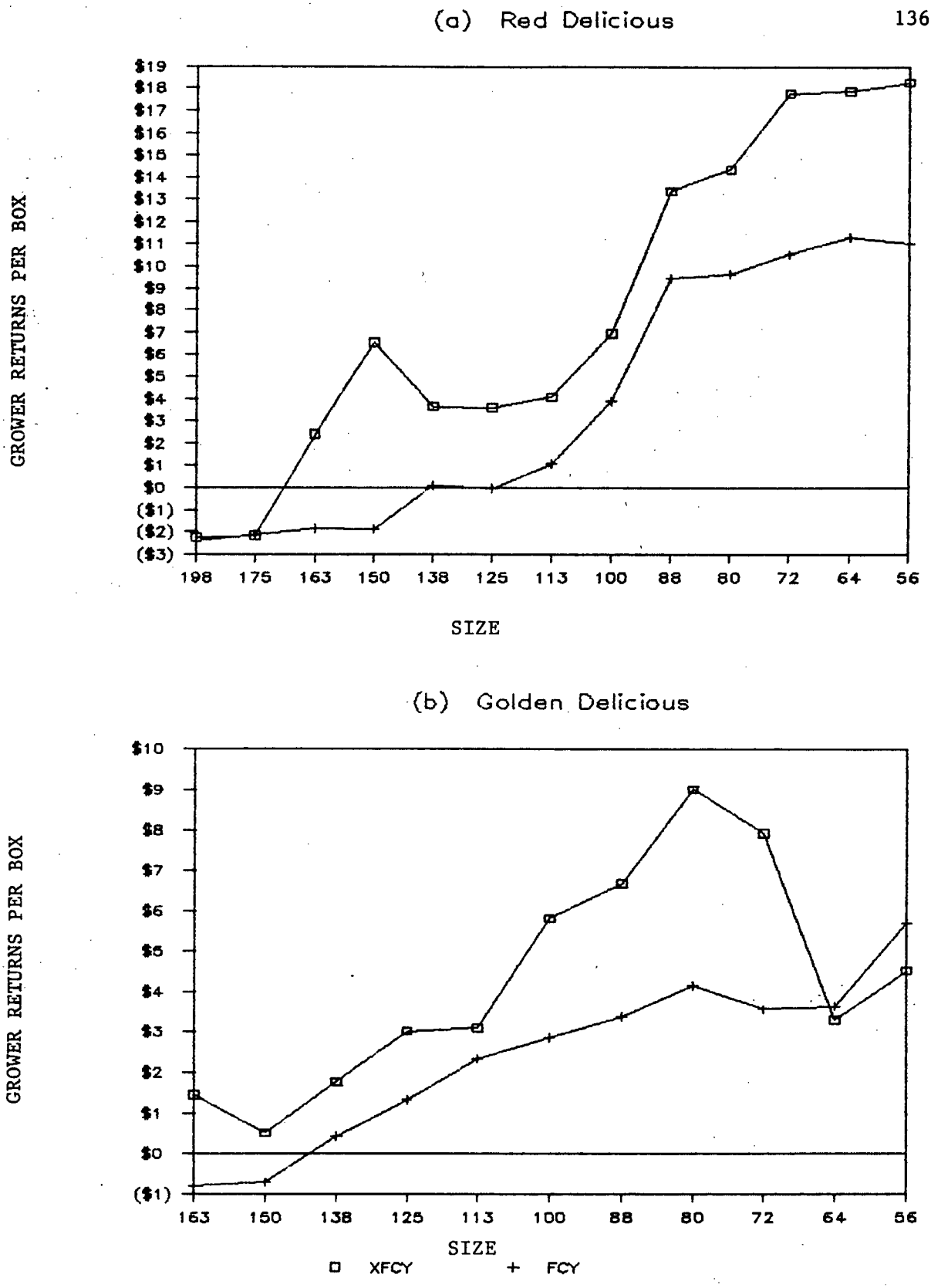

Figure 4.28 Effect of Grade and Size on B.C. Grower Returns (per unit basis) in 1984 CA Fruit

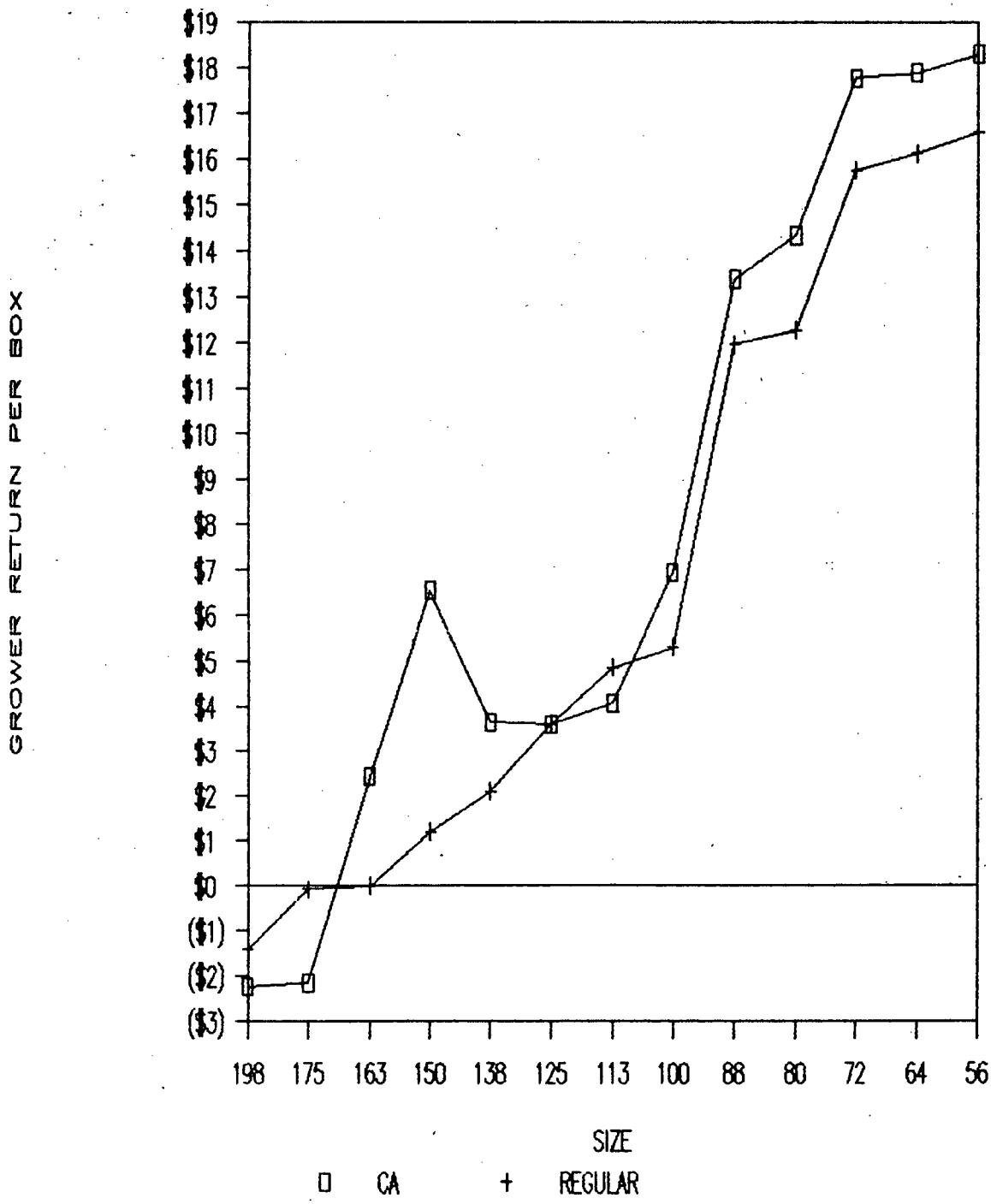

Figure 4.29 Effect of Storage Regime and Size on B.C. Grower Returns (per unit basis) for 1984 Red Delicious XFCY

4.5.2 Comparison with Washington State

The above discussion described grower returns disaggregated within each variety to the grade, size and storage levels. Since the Washington State data only reports one such data point per year, the B.C. data was similarly aggregated over all apple types. These values are converted to nominal Canadian currency and reported in Figure 4.30 over nine years. The Washington data is from two sources - the W.G.A.C.H. industry average and the average from one of their leading firms, Trout, for six of the nine years.

As Figure 4.30 illustrates, the B.C. grower received approximately the same per unit return as the Washington industry average grower through 1979. But from 1980 the average Washington grower earned substantially more (on average about double) than the B.C. grower. The returns of Trout growers were well above either the B.C. or the Washington State average. Considering just the last two years reported, the B.C. grower earned under $3/box, the average Washington grower earned about $CAN 5/box and the average Trout grower earned over $CAN 9/box. This is a most significant finding, and it is unlikely that data problems could account for all of this difference. The previous cost comparison suggested the discrepancy between the Washington average and B.C. average grower returns cannot be explained by higher costs in B.C.'s marketing system; thus revenues must be significantly different in the two regions. The following chapter will attempt to explain this difference in revenues.

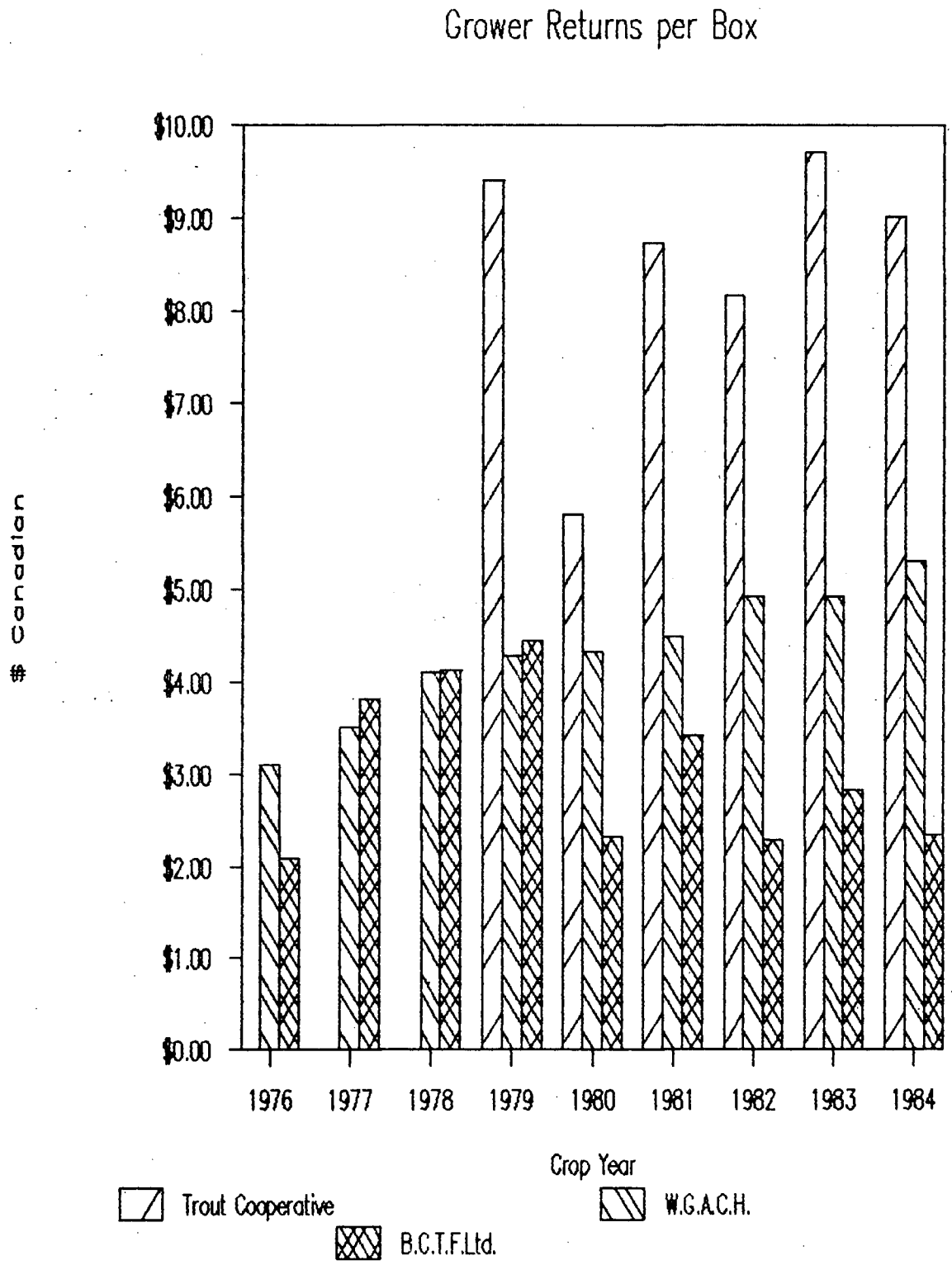

Figure 4.30 Comparison of Nominal Unit Grower Returns between B.C., Average Washington State and Trout Cooperative (1976-84)

4.6 SUMMARY

This chapter has discussed several different measures of industry performance, focussing on efficiency measures. In margin terms, packing margins and marketing margins have varied little compared with the variation in grower returns. But these returns do vary significantly with revenue, suggesting it is more important than costs in determining grower returns. The components of the margins were then discussed individually, beginning with total sales revenue.

The theoretical simultaneity problem of revenue maximization in the apple industry is caused by its oligopolistic nature and the dynamic optimization required with such a long storage product. Actual B.C. revenues have fallen from a pre-1982 average of about $75m to about $55m from 1982 to 1985 (in 1981 dollars). Given the minimal effect B.C. has on prices, it is not surprising to find that real revenues also increased with production.

Two aspects of cost theory are most relevant to the B.C. industry - the determination of the least cost combination of resources and of the least cost plant size. The packing costs curves were fairly well behaved and suggested the industry can still benefit from increased plant scale. The packing costs were also analyzed as fixed and variable costs. The overhead costs varied from $11m to $16m, and since this variation was due in part to quantity, it is uncertain as to the size of the fixed component of overhead. Variable costs, both labour and materials, vary with pack type, although the labour component has actually fallen over time, reflecting technology changes. The marketing

costs did not conform to the usual average cost curve, suggesting the costs can vary somewhat with quantity. The comparisons with Washington State suggest that both the B.C. packing and marketing costs are lower than the Washington State industry average but are usually higher than the leading Washington State firm costs (after conversion to Canadian dollars).

Finally, grower returns have undergone significant fluctuations during the period 1976 to 1985 - from a high of $41m in 1978 down to $12m in 1984. The return per box versus quantity relationship does not hold well, possibly because grower returns are a residual (and hence incorporates more residual variation). Instead, the variation that occurs is partly due to variety, quality, size and storage regime. Comparisons with Washington State show the average B.C. grower received about the same as the average Washington State grower until 1980, when B.C. returns fell. This suggests Washington apples received a better price than B.C. apples, and this will be examined as far as possible in the next chapter. The average return from one of the leading Washington State houses was considerably better than both the B.C. and Washington State average.

This analysis looked at each measure in isolation. In the next chapter the effects of different product mixes on revenues, costs and grower returns will be analyzed in combination, assuming no change in the per unit prices and costs.

CHAPTER 5 SENSITIVITY ANALYSES OF B.C. PERFORMANCE

The previous chapter suggested that, on average, B.C. packing and marketing costs do not explain the difference in grower returns between B.C. and Washington State. Grower returns averaged roughly $3/box in B.C. and $5/box in Washington from 1980 to 1984. Since grower returns are a residual, adding packing and marketing costs will give the average selling price obtained by the marketers. When roughly $5/box of packing costs and $1/box of selling costs (from Chapter 4) are added to B.C.'s grower returns, the average price becomes about $9/box. This is in contrast to $6/box of packing costs and $1/box of selling costs in Washington, which, when added to their grower returns, suggest an average price of $12/box. Thus, it appears that the B.C. marketing system costs do not cause lower grower returns, but instead actually improve them. The lower grower returns in B.C. seem to be primarily due to lower prices obtained and not due to higher costs.

There are two possible reasons for this reduced price for B.C. apples. First, it is possible that the average B.C. apple is considered inferior to the average Washington apple by those who buy apples. Second, it is possible that the B.C. marketers are less successful at obtaining the best possible price for a given product. The latter possibility is empirically difficult to test and beyond the scope of this study, but the former will be tested using various sensitivity analyses below.

The first sensitivity test will overlay the Washington

State product mix[16] on to the B.C. system, while retaining B.C.'s total quantity[17], per unit prices and per unit costs for the two years in question. This will illustrate the total impact of the product mix on grower returns. Once this is known, it would be ideal if it were possible to overlay each of the Washington State product mix parameters in turn in an attempt to show their relative importance. However, the aggregate form of the Washington State data precludes such analyses.

Since this single factor overlay cannot be performed in this study, Sections 5.2 to 5.4 will attempt to approximate the analysis by conducting individual sensitivity tests only on the B.C. product mix. This will enable an indirect estimate of the relative importance of the parameters affecting Washington State's product mix. This will also suggest which factor would have the greatest impact on B.C.'s grower returns.

The results are presented in graphic form, but in order to reduce the complexity and the scale problems the actual revenues (costs, returns) and the new sensitivity revenues (costs, returns) are not reported. Instead, the differences between the scenarios and actual case are shown.

All the analyses assume that each fruit type will only fetch its original B.C. per unit price, and the per unit B.C. costs will also be held constant. These may not be valid if the

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16 Product mix refers to the distribution of apples within the various size, grade and storage categories while assuming constant variety and pack type totals.

17 There may,in fact, be a reduction in quantity when quality is improved.

B.C. quantity within each category can affect its own price (ie. if B.C. is not a price taker) or if the per unit costs determined in the O.F.S.A. guidelines are dependent on volume within each category. The discussions in the previous two chapters suggest otherwise, and so the assumptions of constant price and costs are considered valid. In fact, the revenue results may be understated if it is possible that improved "reputation" due to quality improvements could actually increase the per unit prices received by B.C. apples.

5.1 WASHINGTON STATE PRODUCT MIX

Simulating the Washington State product mix involves imposing Washington's quality, size and storage regimes in one step. Thus, pinpointing the most important factor in the results is difficult.

5.1.1 Method

This scenario was constructed by tallying data from W.G.A.C.H. summary reports which were then used to determine the proportion of sales attributed to each product category. These proportions were then imposed on the B.C. crop, keeping a constant total Red and Golden Delicious volume. This was calculated for both 1984 and 1985 crops. The actual B.C. costs and prices were then applied to the new volumes within each category, and the total revenues, costs and grower returns were summed. The sums for the actual and the scenario were then compared, and the differences were plotted.

There are two things to note about this analysis. First, the B.C. data had to be reclassified to conform with the sizes from the Washington State data. Second, the grades in the two

producing areas may not be perfectly interchangeable, especially if they contain different proportions of sub-grades.

Before presenting the results, it will be useful to delineate the changes in product mix composition imposed upon the B.C. crop. The 1984 and 1985 crop comparisons are depicted in Table 5.1 and 5.2, respectively.

Table 5.1 Washington and B.C. Packout Comparisons for Red and Golden Delicious, 1984.

	Red Delicious		Golden Delicious	
1984	B.C.	WA.	B.C.	WA.
Size:				
Large	9%	28%	21%	28%
Medium	56%	56%	60%	62%
Small	35%	16%	19%	10%
Grade:				
XFCY	35%	65%	45%	83%
FCY	65%	35%	55%	17%
Storage:				
CA	45%	48%	48%	53%
Regular	55%	52%	52%	47%

For 1984 Red Delicious, Washington State produced a larger proportion of large and fewer small fruit than B.C., as shown in Table 5.1. Twenty-eight percent of the Washington crop was large, versus 9% in B.C., and 16% were small, versus 35% in B.C. Grade was also substantially better in Washington, where 65% of the crop was XFCY versus 35% in B.C. Both regions stored more fruit in regular than CA storage, at 55% in B.C. and 52% in Washington State.

For 1984 Golden Delicious, Washington again outperformed B.C. in size. The Washington State packout was 28% large, 62%

medium and 10% small versus the B.C. packout of 21% large, 60% medium and 19% small fruit. In terms of grade, B.C. produced only 45% XFCY versus 83% in Washington State. Again, there was only a small difference in storage type in B.C. and Washington, with 52% of B.C. Golden Delicious in regular storage versus 47% in Washington State.

Table 5.2 Washington and B.C. Packout Comparisons for Red and Golden Delicious, 1985.

	Red Delicious		Golden Delicious	
1985	B.C.	WA.	B.C.	WA.
Size:				
Large	20%	29%	21%	23%
Medium	57%	47%	57%	54%
Small	23%	24%	22%	23%
Grade:				
XFCY	58%	75%	52%	93%
FCY	42%	25%	48%	7%
Storage:				
CA	48%	59%	53%	57%
Regular	52%	41%	47%	43%

In 1985, there was a less pronounced difference in Red Delicious size between the two areas. In Washington the packout was 29% large, 47% medium and 24% small while in B.C. the packout was 20% large, 57% medium and 23% small. Both regions produced a higher quality of fruit than in the previous year, with 75% XFCY in Washington versus 58% in B.C. In terms of storage decisions, B.C. placed 52% in regular storage versus 41% in Washington State (representing a large shift toward CA storage in Washington State).

Among 1985 Golden Delicious, B.C. again produced less large fruit, but did manage to close the gap with Washington State. B.C. produced 21% large, 57% medium and 22% small versus 23%, 54% and 23% in Washington State. Again, B.C. improved its grade over the previous year, but it still lagged far behind Washington State. They produced 52% XFCY versus 93% in Washington State. And CA storage was also increased in both areas, with 53% of the Goldens CA stored in B.C. versus 57% in Washington State.

5.1.2 Results

The effects on grower returns of imposing the 1984 and 1985 Washington State product mix are illustrated in Figure 5.1. The effects were very pronounced in 1984, where total grower returns increased by close to $4m, but less significant in 1985, where total grower returns increased by $1m. The 1984 Red Delicious grower returns increased by $3.4m, or about $2.50/box (a 77% increase). This was primarily due to increased revenues, since cost changes were relatively minor. The 1984 Golden Delicious grower returns were also increased, this time by about $1m, or about $1.10/box (a 28% increase). This was due to both an increase in revenues and a decrease in costs.

The 1985 results were less significant. The Red Delicious grower returns improved by $0.5m, or $0.41/box (a 6% increase). Once again, additional costs incurred were minor (about $0.1m). The Golden Delicious grower returns rose by $0.45m, or $1.13/box (a 17% increase).

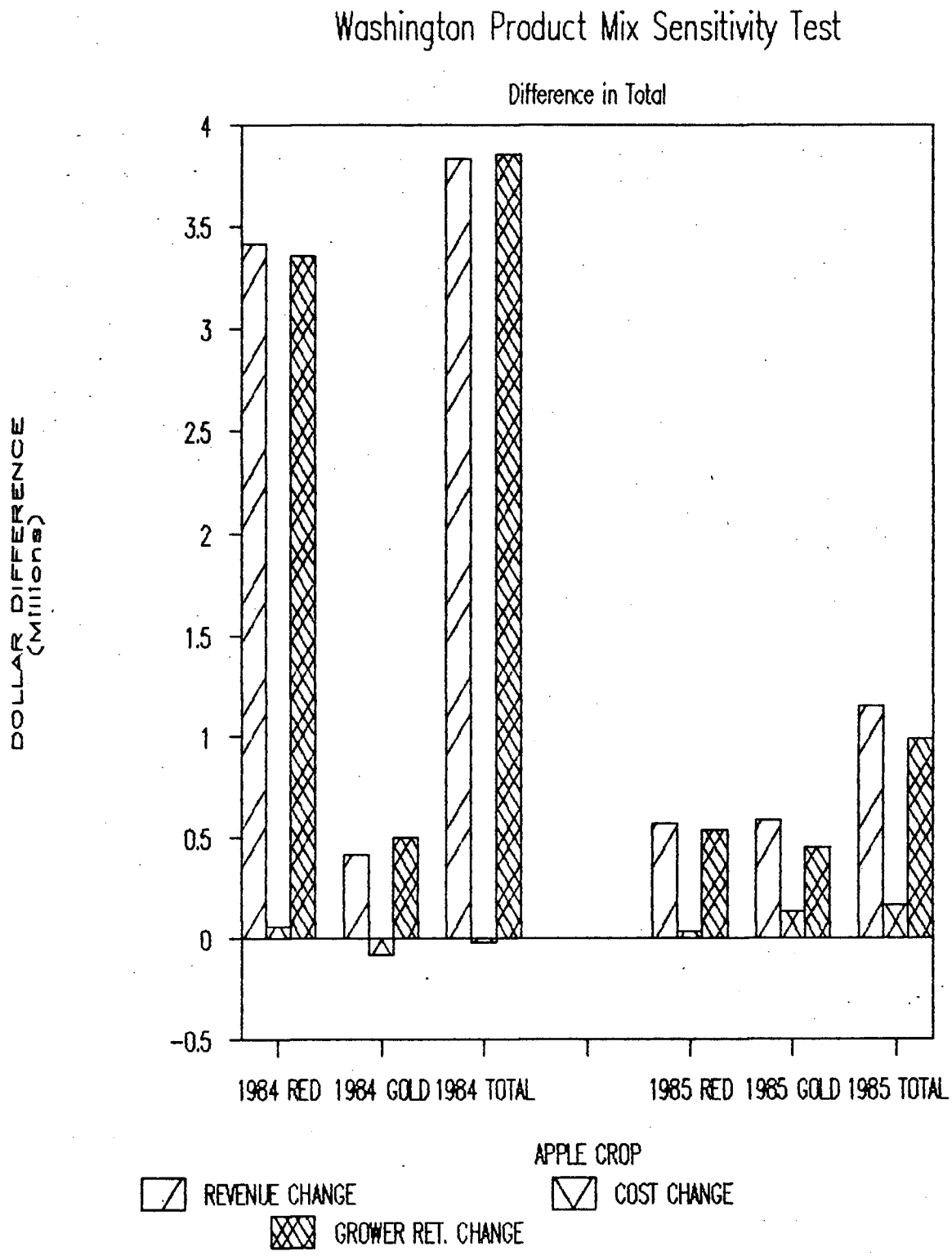

Figure 5.1 Change in Revenue, Packing Costs, and Grower Returns for B.C. assuming Washington's Product Mix (1984-85)

In comparing the results over the two crop years, the 1985 Red Delicious were much less improved by using the Washington State product mix than in 1984, at $0.5m versus $3.4m in grower returns. This might imply diminishing returns to improvements in size and grade. The 1985 crop had less of a disadvantage in size when compared to Washington State than it had in 1984. In addition, the B.C. grade improved by more between 1984 and 1985 than the Washington crop did (over 20% improvement in B.C. versus 10% in Washington State). At the same time, the gap between CA storage utilization increased (from 3% to 11%), which might suggest that increasing CA alone would not outweigh the deficiencies in grade and size in B.C. Amongst the Golden Delicious the improvement in performance varied little between crop years.

This scenario test suggests that roughly $1/box[18] of the $3/box shortfall in B.C.'s average price (as described in the introduction to this chapter) can be explained by a product mix inferior to Washington's. If B.C. growers had attained the same product mix, the shortfall in their grower returns could have been halved (since costs are roughly $1/box lower in B.C.). Thus, a significant problem in the B.C. industry is the average quality of its apples. This is in marked contrast to boasts of higher quality apples grown in B.C. While some growers may be able to back up this claim, it seems possible that the average grower's

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18 The $1/box figure is a rough average of the 1984 and 1985 Red and Golden Delicious increases in grower returns calculated above.

ability to produce a consistently high quality apple has contributed to much of his/her reduced returns.

5.2 INCREASED CONTROLLED ATMOSPHERE STORAGE PRODUCT MIX

This sensitivity test is the first in a series of single factor tests conducted to estimate the importance of the various parameters of Washington's product mix. As explained above, Washington's data was aggregated such that the factors could not be separated for individual sensitivity analyses. Therefore, the focus shifts to examining the relative importance of these factors on the average B.C. grower return.

The first of these single factor analyses will focus on increasing the proportion of both the Red and Golden Delicious fruit in Controlled Atmosphere storage by ten percent. This will be conducted over two years, 1984 and 1985. Increasing the CA proportion will reflect a change in the timing of sales, since CA fruit is sold up until May or June (following the fall harvest), when prices are generally higher. Thus, one might expect a higher proportion of CA fruit would result in a higher average price and, possibly, a higher average grower return.

5.2.1 Method

This sensitivity test is accomplished by increasing the volume of apples (fresh sales) stored in controlled atmosphere storage (CA). Within each variety and grade category the total fruit in CA was increased by ten percent and the total fruit in regular storage was decreased by the same amount. Thus the total fruit in each variety and grade is constant. The costs assigned to CA storage are simply the per unit costs assigned in the applicable year, and do not include any capital costs associated

with building extra CA storage (thus assuming excess CA capacity).

Since the medium sized fruit make up the largest proportion in all cases, this is the category which is most changed in the new scenario. Among the 1984 Red Delicious XFCY, the actual product mix already contained more CA than regular storage fruit, and so the new scenario exaggerated this tendency. Within the FCY grade fruit the opposite was the case - the existing disparity between CA and regular storage fruit was reduced. The 1984 Golden Delicious were affected in a similar pattern.

In 1985 the XFCY Red Delicious originally had more regular than CA storage fruit, and the new product mix reversed this. The FCY grade was little affected. The original 1985 Golden XFCY crop was CA stored to a much larger proportion than in 1984. The scenario exaggerated this separation among XFCY and reduced the separation in FCY.

5.2.2 Results

The effects of the scenario are summarized in Figure 5.2. In 1984 the total effect was about a $40,000 decline (about $0.02/box or 0.5%) in grower returns, caused by a greater increase in costs than in revenues when CA fruit was increased. In 1985, the grower returns increased by about $100,000 (about $0.06/box or close to 1%), since increased revenues exceeded increased costs.

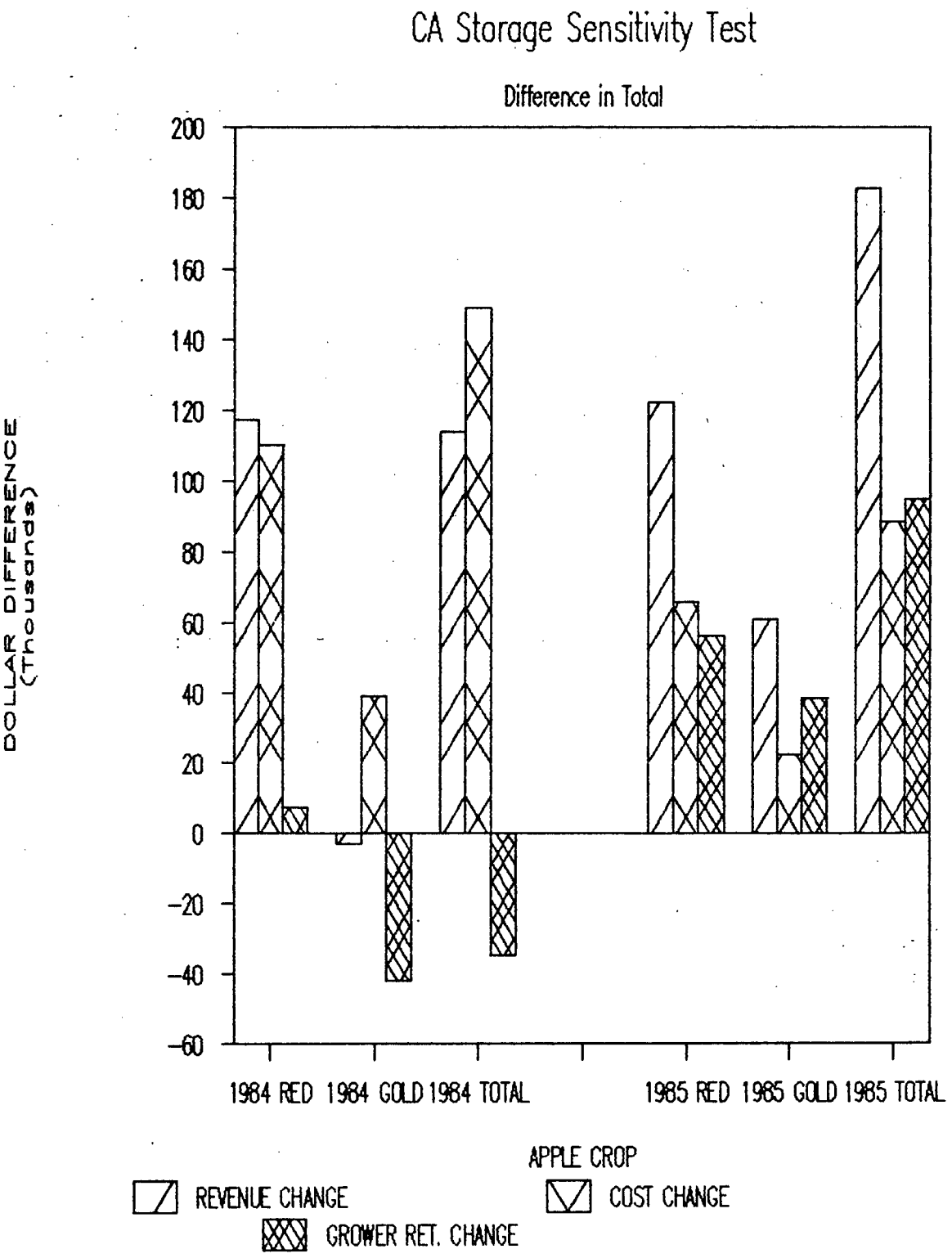

Figure 5.2 Change in Revenue, Packing Costs, and Grower Returns for B.C. assuming 10% More CA Storage (1984-85)

When considered by variety, the effects are slightly more illuminating. For 1984 Red Delicious, grower returns rose by only about $10,000 for less than 0.25% difference. Golden Delicious lost revenues and increased costs for a net decline in grower return of close to $40,000 (just over 2%). For 1985 Red Delicious, revenues, costs and grower returns all increased by just over 0.5% for a nearly $60,000 increase in grower returns. The Golden Delicious, while achieving a smaller absolute increase in grower returns of about $40,000, underwent a relative increase of 1.5%.

Therefore, the increased CA scenario had nearly opposite effects in the two crop years. Blindly increasing CA (regardless of grade) reduced grower returns in 1984 by less than 0.5% but benefited growers in 1985 by nearly $100,000 (or about 1%). This divergence points out the need to differentiate between fruit grades before committing the fruit to storage. It also points out the variability from year to year, and thus the importance of early price signals. Any efforts to determine quantities and grades of fruit, particularly of Washington State fruit, and the subsequent effects on price would be most useful in choosing the storage distribution. Finally, the overall benefit was still quite small, at most $0.09/box.

Thus, it appears increasing the proportion of fruit in CA by 10% would have done little to improve grower returns over the two crop years tested. However, the model did not permit per unit prices to change and so it would not reflect any increase in regular stored fruit price which might occur if its proportion is decreased. In addition, the results may reflect a lower than

average price differential between CA and regular storage fruit. Nonetheless, the analysis does imply that there is some risk involved in delaying sales by increasing CA storage.

5.3 INCREASED SIZE PRODUCT MIX

The purpose of this scenario is to approximate the effects on grower returns of increasing the size of fruit in the product mix. Of course, this analysis does not consider any extra cultural costs incurred in achieving this increased size.

5.3.1 Method

In order to increase the size of fruit in the product mix, the fruit (within each variety, grade and storage type) was first divided into three size categories, small, medium and large. Then, the small category was reduced by ten percent, and this amount was added to the medium and large categories. The added fruit was distributed proportionally amongst the various size categories within the medium and large designations. The results are classed not only by grade, as per the CA storage results, but are also differentiated by storage type (since the storage results are no longer as transparent).

5.3.2 Results

The effects of decreasing the proportion of small sized fruit are illustrated in Figure 5.3. One of the most notable results is the near identical response in the two years tested. In both 1984 and 1985, the total crop grower returns increased by nearly $600,000 (close to $0.35/box), and revenues and costs were virtually identical. In relative terms, though, the 1984 crop scenario increased grower returns by more, at nearly 10%, than the 1985 scenario increase of only 5%.

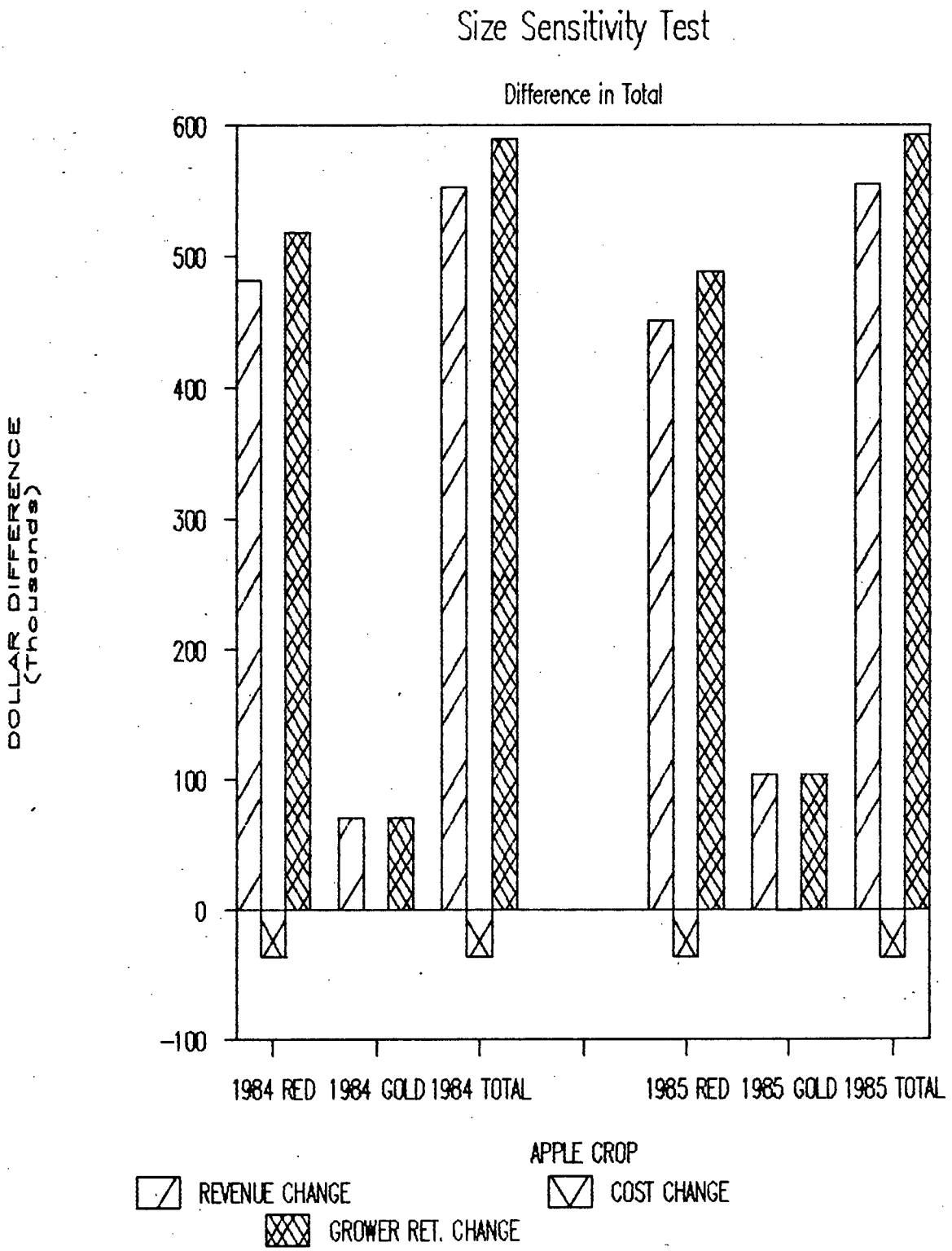

Figure 5.3 Change in Revenue, Packing Costs, and Grower Returns for B.C. assuming 10% Decrease in Small Sized Apples (1984-85)

When considered by variety, the absolute results are once again very comparable. In 1984 and 1985, the Red Delicious revenues increased and the costs decreased such that grower returns rose by over $500,000, or close to $0.40/box (which translates to a 12% and a 6% increase in 1984 and 1985, respectively). The Golden Delicious underwent virtually no change in costs in either year, and the grower returns increased by about $70,000 in 1984 (about $0.15/box or nearly 10%) and by about $100,000 in 1985 (over $0.25/box or 4%).

Thus, a 10% improvement in size resulted in grower returns increasing by a 9.5% in 1984 and by 5% in 1985. In fact, growers of Red Delicious would have felt their average return increase by nearly 12% in 1984. Size, therefore, is a much more important determinant of product price than sales timing, ceteris parabis. This should not be too surprising when one recalls the price discussion of Section 3.2.2, where the variability in price was shown to be much greater over size than over storage type. In addition, increased size decreases packing costs while increased CA storage increases costs, so the price or revenue effect would be magnified.

5.4 QUALITY

The final sensitivity analysis conducted involved increasing the proportion of XFCY grade fruit by 10%, at the expense of the FCY grade fruit. Grade is the parameter which is most disparate between Washington and B.C., and it is also a factor which is often cited as problematic for B.C. growers. This analysis, by necessity, can only test the average quality level

and not the consistency within that level which accounts for most of B.C.'s quality complaints (as discussed in Section 2.3.1).

5.4.1 Method

The methodology of this test is much like the previous single factor tests. The fruit within each variety and storage regime are reproportioned such that the XFCY proportion increases by ten percent. The new product mix is then used to determine the new total revenues, costs and grower returns.

5.4.2 Results

The results of increasing the XFCY grade by 10% are shown in Figure 5.4. They were again quite similar, in absolute terms, for the two years tested, since grower returns rose by about $200,000 each year. When considered on a per unit basis, the 1984 and 1985 crop grower returns increased by $0.12/box and $0.11/box, respectively. But in relative terms the 1984 grower returns increased by close to 3.5% versus only just over 1.5% in 1985.

In 1984, the Red Delicious were most affected by improved quality, since grower returns rose by about $170,000 (about $0.13/box or nearly 4%) while Golden Delicious rose by less than $50,000 (about $0.09/box or 2.25%). In 1985, the absolute increase in Red Delicious returns was over $130,000 versus $50,000 for Golden Delicious, but on a per box basis the returns for Golden Delicious rose by more, at $0.12/box versus $0.10/box. This was further evidenced by a slight advantage for Golden Delicious grower returns in relative terms, although neither variety had improved returns of more than 2%. Costs were virtually unchanged throughout.

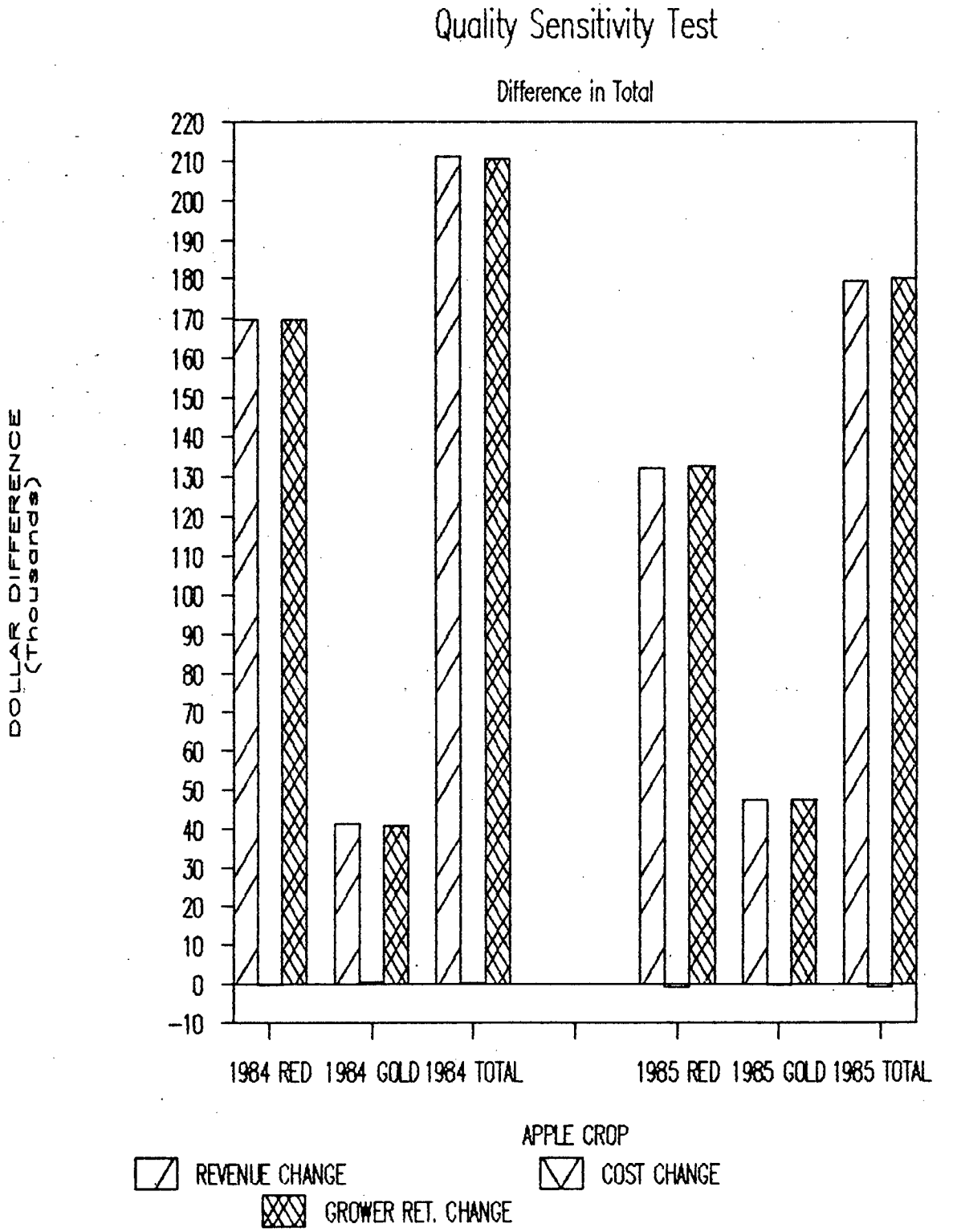

Figure 5.4 Change in Revenue, Packing Costs, and Grower Returns for B.C. assuming 10% Increase in XFCY Grade Apples (1984-85)

Thus, the largest improvement in grower returns due to grade was still less than 4%. Grade, it seems, is not necessarily the important determinant of price that it has been purported to be. Perhaps this helps to explain the inertia faced by extension workers in their attempts to encourage improved quality. Of course, it may also be a function of the crop years tested if the price range between XFCY and FCY was abnormally small. It could also be a function of B.C. Tree Fruits Ltd.'s supposed inability to obtain high prices. That is, if B.C. Tree Fruits Ltd.'s pricing success with higher quality fruit is less than with lower quality fruit (perhaps a function of reputation or of market segmentation), this small improvement in grower returns with increased XFCY grade might be explained.

To conclude these single factor analyses, Figure 5.5 depicts the effects of each of the scenarios on grower returns. A ten percent change in storage has the least effect over both varieties and years, with a negative effect in 1984. The size improvement scenario resulted in the largest effect over both varieties and years, with a total effect of nearly $600,000 or a 12% improvement in 1984. The quality effect was the most surprising, since its effect on grower returns was less than a third the effect of size for the total crop in both years.

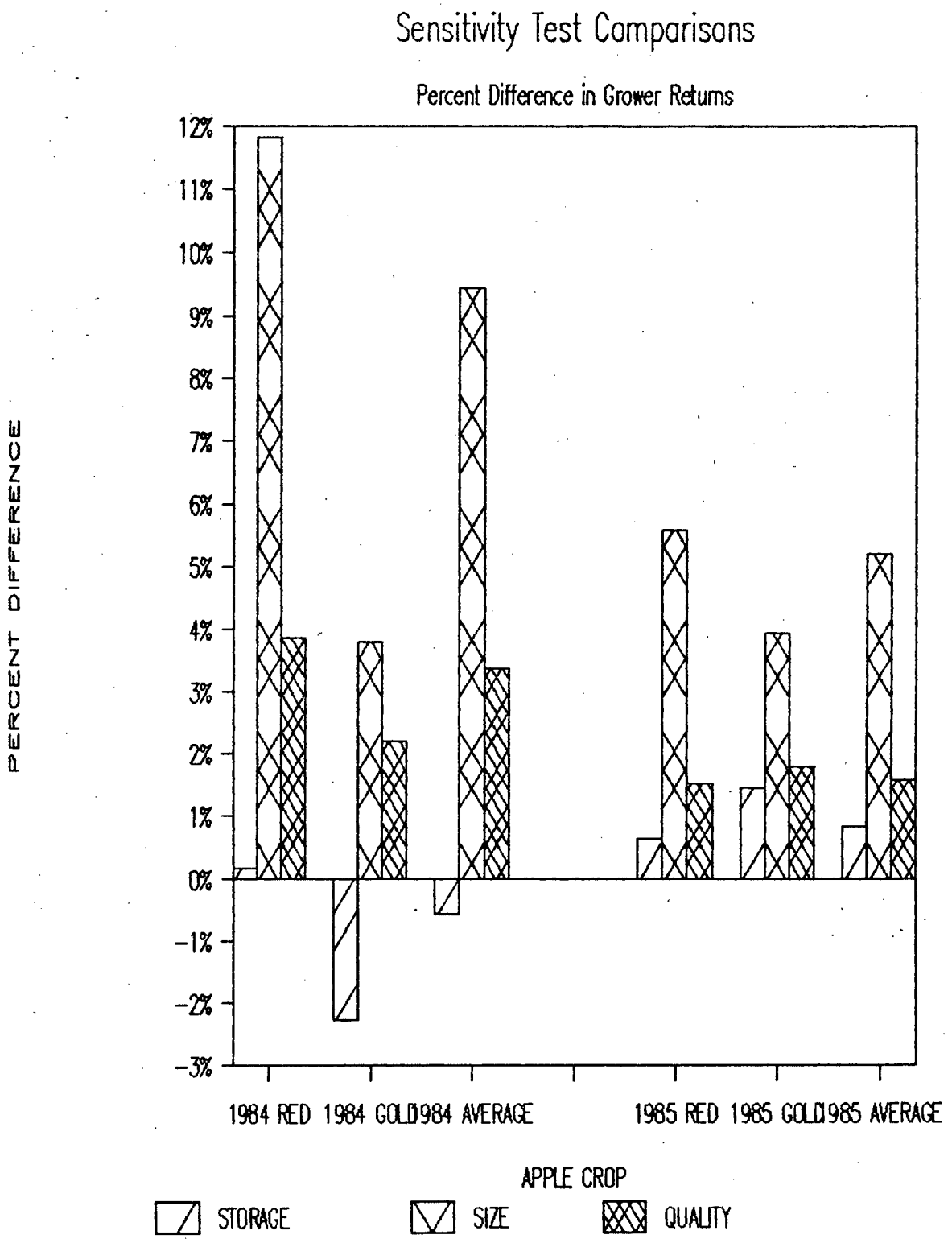

Figure 5.5 Percentage Change in Grower Returns for B.C. for Different Sensitivity Tests (1984-85)

5.5 SUMMARY

This chapter performed sensitivity tests on the revenues, costs and grower returns of the B.C. apple industry. The Washington State product mix was first assumed. Then the B.C. product mix was varied to reflect a ten percent increase in CA storage, in fruit size, and in quality. The results are presented in terms of percentage change in grower returns in Table 5.3.

Table 5.3 Summary of Percentage Change in Grower Returns under Different Sensitivity Analyses

	Washington Product Mix	10% More CA	10% Less Smalls	10% More XFCY
1984				
Total	+62.7%	-0.6%	+9.4%	+3.4%
Red	+77.1%	+0.2%	+11.8%	+3.9%
Gold	+27.7%	-2.3%	+3.8%	+2.2%
1985				
Total	+8.7%	+0.8%	+5.2%	+1.6%
Red	+6.1%	+0.6%	+5.6%	+1.5%
Gold	+17.3%	+1.5%	+4.0%	+1.8%

A most dramatic result was obtained from the Washington State product mix scenario, where the 1984 grower returns were increased by more than 77% for Red Delicious and 28% for Golden Delicious. Not all of these gains were repeated in 1985, since Red Delicious grower returns only rose by 6% and Golden Delicious by 17%. Thus, even if B.C. fruit cannot command the same prices as Washington State fruit, a dramatic improvement in quality,

grade and size proportions would result in a very large improvement in grower returns.

With a 10% increase in CA fruit, grower returns would not have benefited significantly, and in fact would have fallen in 1984 by about 0.5%. In 1985 the grower returns would have increased by $100,000 (or 1%). The effects did, however, vary considerably with fruit grade (not shown) and suggest some improvement is possible if more better quality fruit were to be stored at the expense of lower quality fruit. Thus, higher CA utilization does not seem to be a very important factor in increasing grower returns, especially since the analysis did not include any fixed costs which might be associated with increasing CA.

Decreasing the amount of fruit in the smaller sizes by 10% (and therefore increasing medium and large fruit) had a larger effect. In both crop years tested, the Red Delicious grower returns would have been increased by at least $500,000, or about 4%. The Golden Delicious would have benefitted by between $70,000 (or 9.5%) and $100,000 (or 5.2%) in 1984 and 1985. Thus, the size effect could account for a considerable proportion of the increased returns obtained in the Washington State scenario.

Finally, increasing the proportion of higher grade fruit, XFCY, by 10% only resulted in less than 3.5% improvement in grower returns in 1984 and 1.5% improvement in 1985. This is likely the most surprising result of the single factor sensitivity tests, since grade is the major difference between B.C. and Washington and was therefore expected to account for a much larger change in grower returns.

In summary, the difference in grower returns between Washington State and B.C. can be partly attributed to the difference in product mix. The exact proportion of the difference attributable to product mix cannot be calculated from this analysis, but it appears significant. Of the approximately $2/box difference in B.C. and Washington grower returns, maybe $1/box can be accounted for by the product mix. The most important factor of the B.C. product mix, in terms of its ability to improve grower returns, is surprisingly not quality (grade level) but size. A ten percent improvement in size resulted in a five to ten percent increase in grower returns. However, this study does not attempt to discover the added costs incurred to improve either grade or size in the orchard.

CHAPTER 6 SUMMARY AND RECOMMENDATIONS

6.1 SUMMARY

The history of the B.C. apple industry is characterized by cycles, beginning with cooperation against a common problem followed by periods of relative prosperity and the breakdown of cooperation as soon as the "pie" began to shr^R
ink. The recent move to house pooling was an attempt to combine some measure of house independence and market responsiveness without foregoing any economies of size at the marketing level. The role of B.C. Tree Fruits Ltd. has subsequently been reduced.

The performance of the B.C. apple industry is evaluated with Washington State as a benchmark. Washington State has similar (albeit somewhat superior) growing and marketing conditions, is the most likely benchmark. In order to make any comparisons, though, structural and conduct comparisons must first be considered.

Structural differences between B.C. and Washington State can be divided into three areas: fruit quality, scale, and organizational factors. Fruit size and consistency is generally higher in Washington . B.C. is said to have an advantage in terms of colour and keeping quality, but the grade proportions and prices do not seem to reflect this. Washington, with its ten-fold advantage in production, has some size economies. The typical Washington orchard is at least twice the size of B.C.'s, and the typical packinghouse services fewer growers (30 versus 300) yet is 40% larger, while the industry as a whole supports large promotional, research and lobbying budgets. Unlike Washington

State, B.C.'s organization evolved as a primarily cooperative one. While about 1/2 of Washington State houses are cooperatives, the houses themselves practice little overt cooperation except in the publication of price and sales figures. Most B.C. houses are cooperatives, and their members collectively own the central marketing agency and processor, B.C. Tree Fruits Ltd. and SunRype, respectively. There is also a marketing board in B.C., although it has lost nearly all of its power.

In terms of conduct, the two regions are again quite different. Even among the cooperatives, their behaviour varies considerably both between and within regions. Areas of difference include variety specialization, extension, type of member, storage regimes and accounting methods. At the marketing level, B.C. Tree Fruits Ltd. provides more services than the Washington marketers (who are primarily in-house). It also relies more heavily on export markets, at 35% of production versus 20% for Washington (whose exports are much more evenly distributed among countries than B.C. exports).

There are several different areas of concern for participants in the B.C. industry. Purportedly excessive costs are most often cited, followed by the reliance on costly government support programs. The cooperative nature of the industry, when combined with competition within for good growers and revenues, has led to grower confusion, possibly shortsighted investment decisions and dissipated some economies of size at the marketing level.

This study hypothesized that the apple industry is actually oligopolistic in nature, with an implicit cartel of

about ten members (including B.C. Tree Fruits Ltd.) and a large number of small fringe firms. Price, profit and collusive behaviour are all evidence which might support this hypothesis, but primarily, this study has only presented qualitative evidence. However, quantitative price evidence does suggest that Washington State production has the greatest impact on B.C. price. This **average** price, though, may not accurately reflect the situation, since apples are such a heterogeneous product. This heterogeneity is reflected in price increases exhibited with variety, with increased size, grade and market date. This "within" variation is considerably greater than the variation "between" B.C. and Washington State prices (although they aren't reported here given the general consensus that the available Washington State price data are highly suspect).

There are several different measures of industry performance but this study focused on efficiency measures. In margin terms, packing margins and marketing margins have varied little compared with the variation in grower returns. But these returns do vary significantly with revenue, suggesting sales are more important than costs in determining grower returns.

The theoretical simultaneity problem of revenue maximization in the apple industry is caused by its oligopolistic nature and the dynamic optimization required with such a long storage product. The actual B.C. revenues have fallen from a pre-1982 average of about $75m to about $55m since (in 1981 dollars). Given the minimal effect B.C. has on prices, it is not surprising to find that real revenues also increased with production.

This study derived cost curves at both the packing and marketing levels. The packing costs curves were fairly well behaved and suggested the industry can still benefit from increased plant scale. The packing costs were also analyzed as fixed and variable costs. The overhead costs varied from $11m to $16m, and since this variation was due in part to quantity, it is uncertain as to the size of the fixed component of overhead. Variable costs, both labour and materials, vary with pack type, although the labour component has actually fallen over time, reflecting technology changes. The marketing costs did not conform to the usual average cost curve, suggesting the costs can vary somewhat with quantity. But the most interesting finding was demonstrated in the comparisons with Washington State, which suggested that both the B.C. packing and marketing costs are lower than the Washington State industry average (although possibly higher than the costs of a leading Washington State firm).

Finally, grower returns have undergone significant fluctuations during the ten year period - from a high of $41m down to $12m. The variation that occurred was partly due to variety, quality, size and storage regime. Comparisons with Washington State showed the average B.C. grower received about the same as the average Washington State grower until 1980, when B.C. returns fell. But since costs were (mostly) exonerated, as above, the reason for this decline must lay with the revenues. In order to pinpoint the reason for the revenue decline, a series of sensitivity tests were performed.

Sensitivity tests were performed on the revenues, costs and grower returns of the B.C. apple industry. The scenarios tested the Washington State product mix as well some of as its components of increased CA storage (and hence more late season marketing), increased fruit size (which Washington State researchers consider the most important factor), and increased grade.

In the Washington State product mix scenario the 1984 grower returns were increased by more than 77% for Red Delicious and 28% for Golden Delicious. Not all of these gains were repeated in 1985, since Red Delicious grower returns only rose by 6% and Golden Delicious by 17%. Thus, even if B.C. fruit cannot command the same prices as Washington State fruit, a dramatic improvement in quality, grade and size proportions could make up some of the gap in grower returns in the two areas. For instance, in 1984 the average Washington grower return was 126% higher than the B.C. average; thus, the 63% average gain afforded by altering the packout of Red and Golden Delicious is very significant.

With a 10% increase in CA fruit, grower returns would not have benefited significantly, and in fact would have fallen in 1984 by about 0.5%. In 1985 the grower returns would have increased by $100,000 (or 1%). Thus, higher CA utilization does not seem to be a very important factor in increasing grower returns, especially since the analysis did not include any fixed costs which might be associated with increasing CA.

Decreasing the amount of fruit in the smaller sizes by 10% (and therefore increasing medium and large fruit) had a larger effect. In both crop years tested, the Red Delicious grower

returns would have been increased by at least $500,000, or about 4%. The Golden Delicious would have benefitted by between $70,000 (or 9.5%) and $100,000 (or 5.2%) in 1984 and 1985. Thus, the size effect could account for a considerable proportion of the increased returns obtained in the Washington State scenario.

Finally, increasing the proportion of higher grade fruit, XFCY, by 10% only resulted in less than 3.5% improvement in grower returns in 1984 and 1.5% improvement in 1985. This is likely the most surprising result of the single factor sensitivity tests, since grade is the major difference between B.C. and Washington and was therefore expected to account for a much larger change in grower returns.

6.2 IMPLICATIONS

The average costs of packing and marketing appear to be lower in B.C. than in the average Washington house, but still a leading Washington firm could pack and market its fruit for somewhat less than the B.C. firms. At the packing level further amalgamation would likely result in considerable cost savings, especially if grower numbers could be reduced (through orchard amalgamation) and if crop consistency could be improved. At the marketing level, where B.C. Tree Fruits Ltd. has a size advantage over all the Washington houses, there appears to be a cost disadvantage when compared to on of the best Washington firms. This increased cost is most likely due to extra services which may or may not be cost effective, as well as their larger export market reliance. However, it is uncertain as to whether disbanding B.C. Tree Fruits Ltd. would reduce costs, since their

marketing costs are still lower than the average Washington house.

Thus, costs do not appear to explain the smaller grower returns in B.C. than in Washington. This difference must be due to differences in sales revenue, as exhibited in the Washington product mix sensitivity test where B.C. grower returns were improved significantly with altered packout. It is unlikely, however, that these crudely defined "quality" improvements can account for all of the difference in revenue. As mentioned in the background (Chapter 2), consistency of quality is often claimed to be of equal importance to level of quality, at least in the opinion of the marketers. Since marketing is not a single period venture, long run sales rest largely on reputation factors (of which consistency is very important) which defy measurement. Finally, there may be some differing degrees of monopsony powers between the major markets of B.C. Tree Fruits Ltd. and Washington State. Concentration in Western Canada's (which accounts for about 40% of B.C. Tree Fruits Ltd. sales, by volume) retail food outlets has increased considerably during the 1980s, at the same time grower returns have been losing ground to those earned in Washington State. If this concentration trend has been less pronounced in Washington's markets, there may be some extra downward pressure on B.C. prices.

Even if quality is the major component of B.C.'s problem, physical conditions seem to dictate that the Washington product mix couldn't be equalled in B.C. without incurring increased horticultural costs. Thus, while improvements in size, quality and consistency would improve returns, perhaps more refined

marketing techniques are required in B.C. than in Washington (to further segment the market and differentiate the B.C. product).

Can the cooperative structure of the B.C. industry accommodate these improvements? The cooperative structure, in itself, does not seem to exclude efficiency, since the leading Washington firm used in this study is also a cooperative. However, Washington growers have more viable alternatives to this structure, and so growers who choose to be cooperative members may be more committed to the concept and therefore more willing to take orders from the marketers. In B.C., with its smaller industry, the cooperatives are more vulnerable to increased costs due to lost volume; thus, they are more diffident in their dealings with growers.

At the marketing level, B.C. Tree Fruits Ltd. has a disadvantage due to this lack of clout over the product mix they must sell. They also have less access to some of Washington's best markets. But the major complaint about B.C. Tree Fruits Ltd., in terms of the cooperative nature of the B.C. industry, seems to be the lack of incentive to focus on value instead of volume. B.C.Tree Fruits Ltd. has a strong incentive to sell everything and to spread the sales fairly amongst the houses, but this may be at the expense of maximizing sales revenues (by achieving the best price possible).

In a cooperative industry there often is a conflict between equity and efficiency considerations. On the costs and grower returns side, it appears there is little conflict - costs are assigned to growers as they are incurred (for the most part) and returns are based on the price received. But on the revenue

side, equity considerations may well handicap B.C. Tree Fruit Ltd.'s ability to maximize revenues and achieve economic efficiency. Given B.C. Tree Fruit Ltd.'s inability to determine its own price, the presence of a near monopoly in B.C. does not affect social welfare in terms of consumer surplus, but the cooperative nature of the sales monopoly may well reduce the subsequent producer surplus obtained by the growers.

6.3 RECOMMENDATIONS

Since costs were not found to be the major component in the decline of grower returns in B.C. relative to Washington State, the tried and true recommendation to amalgamate packinghouses will only be mentioned in passing. Given the average size difference in the two regions, B.C. could possibly become the lower cost region if it could capture some more economies of size. However, this should only be attempted if grower numbers are concurrently reduced, since any cost savings could be lost in servicing more members.

This study concluded that a relative decline in revenue is the main reason for the decline in grower returns. The revenue problem is likely a combination of average fruit "quality", or packout, and of marketing difficulties. The following recommendations will answer each in turn.

At the orchard level, "quality" level and consistency must both be improved. While studies of the benefits to the growers of improving quality have frequently been conducted, research into the **costs** involved in improving horticultural standards might help motivate farmers to implement the suggested techniques.

Further incentives, to increase density and to standardize strains, would serve to improve the consistency of quality.

Some of these measures have been attempted in the past, but it seems to be very difficult to encourage grower cooperation. The industry is heavily weighted down by the small, non-commercial orchardists whose land is overpriced (given its productivity) to account for its non-farm use value. Some attempt should be made to remedy this situation. Perhaps if the lower limit for F.I.I. payments and B.C.F.G.A. membership were raised to exclude more of these growers, their land might either devalue to the point where amalgamation with commercial operations is more viable or it might be removed from the land reserve. While preservation of farmland is considered important by many, if this land is inaccessible to commercial farmers it may just as well be used for non-farm purposes. At least the industry would become more efficient if those who cooperate in it are less dissimilar.

At the marketing level, it would be very useful if the marketing staff of both B.C. Tree Fruits Ltd. and the independents had access to up-to-date retail price information. If relative F.O.B. prices are not being translated accurately at the retail level, the consumers are less likely to respond to surpluses. This information would be particularly useful where the retail industry is highly concentrated, since the retailers currently have the information advantage.

It would also be in the best interests of both the marketing and packing levels to optimize their storage/sales timing decisions. If B.C. Tree Fruits Ltd. were to report its sales information on a weekly, noncumulative basis it would be

much easier for the packinghouses to allocate storage using previous sales figures. But to get the optimal pattern, further research into developing a model of dynamic optimization would be most beneficial.

In considering the industry as a whole, further organizational changes would likely enhance its efficiency. If the voting structure of the B.C.F.G.A. were changed such that value of sales determines the weight behind the orchardists vote, the decision process would be more in tune with revenue maximization and less concerned with equity. Further, all growers, both independent and affiliated, should be represented such that the industry can cooperate in promotional campaigns, lobbying efforts and information gathering programs.

The prorate system is also problematic, since it hampers marketers and requires a watchdog at each packinghouse to ensure equity. If the B.C.Tree Fruits Ltd. dispatchers were to balance value as well as volume among houses, there could at least be a savings in packinghouse personnel. House pooling is good if it gets market signals closer to the growers, but further research into streamlining the prorate system should still be undertaken.

In conclusion, efforts should be taken to both improve the quality and consistency of B.C. apples and the marketing success of B.C. Tree Fruits Ltd. Various equity factors have worked against the efficient operation of the apple industry, and these factors should now be examined in light of the increased supply forecasted for the foreseeable future.

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