AN ECONOMIC ANALYSIS OF THE RED CHERRY INDUSTRY IN MICHIGAN WITH SPECIAL EMPHASIS UPON PRICING

By

LAWRENCE LEROY BOGER

A THESIS

Submitted to the School of Graduate Studies of Michigan State College of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics

1950

ACKNOWLEDGEMENTS

The author wishes to express his gratitude to all those who helped with the completion of this study and the preparation of the manuscript. Valuable guidance was especially given by Professor Lawrence W. Witt of the Agricultural Economics Department in the planning and supervision of the study as well as in the reading of the manuscript. Also, Professor Arthur Mauch gave generously of his time and critically reviewed the entire study.

Thanks are also due for Dr. C. M. Hardin, Director of the Michigan Agricultural Experiment Station for his part in initiating and encouraging the study. Mr. A. J. Rogers, Manager, Cherry Growers', Inc., also contributed materially to the ideas involved in some sections of this study.

The author wishes to acknowledge the assistance given by Miss Joan Bengel and Mrs. Betty Cornelius of the secretarial staff of the Agricultural Economics Department for their assistance in typing the original manuscript and in the preparation of charts, and also the assistance given by Mrs. Mildred Howe for her final typing of the manuscript.

Finally, the author is indebted to his wife, Frances, for her patience and the sincere encouragement extended to him during all the stages in the preparation of this piece of work.

Although the contributions by interested people have been many, the author assumes full responsibility for any errors which may still be present in the manuscript.

LAWRENCE LEROY BOGER

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (Cont'd)

LIST OF ILLUSTRATIONS (Cont'd)

LIST OF ILLUSTRATIONS (Cont'd)

AN ECONOMIC ANALYSIS OF THE RED CHERRY INDUSTRY IN MICHIGAN WITH SPECIAL EMPHASIS UPON PRICING

CHAPTER I

INTRODUCTION

Determining season equilibrium prices in a market for highly seasonal crops is a very difficult task. Usually there is no current price against which current and future conditions of supply and demand can be weighed. These equilibrium prices must be established on the basis of a pattern of price expectations extending for a year into the future if the crop is processable rather than on expectations based upon knowledge of a current market. Processors of these crops usually operate on fairly narrow margins so that a small error in the judgment of future supply and demand conditions often spells the difference between profit and loss for them. Often, the impact of uncertainty that the future holds for the fulfillment of price expectations is transferred in part from processors to producers. Ascertaining the right price, together with obtaining agreement on it among the affected groups not only constitutes a major problem but determines the welfare of each group of entrepreneurs involved. Removing that part of the price uncertainty confronting these entrepreneurs which is caused by lack of knowledge though quite a formidable task for any product, should contribute to the perfectness of a market and aid in the achievement of a better allocation of productive resources. Focussed in a broad framework, these problems confront producers and processors in the Michigan red cherry industry. Production is seasonal, prices must be based upon

future as well as current expectations, and the industry is localized to the extent that price is the sole, though uncertain, determinant of income at harvest time for many producers as well as processors.

This study naturally divides itself into four broad areas. The first area consists of a review and characterization of the red cherry production industry. A second area deals primarily with a consideration of factors affecting farm prices of red cherries. Next, the red cherry processing industry is analyzed in its economic setting and this is followed by an analysis of factors affecting red cherry pack prices. This classification essentially constitutes an analysis of the price uncertainty confronting producers and processors over one time period (10 - 12 month) followed by an analysis of the extent with which this price uncertainty can be reduced by price analysis.

The impact of price uncertainty in the producer and processor markets is manifested in the uncertainty of income and the malallocation of resources which results. In other words, the impact of price uncertainty may be evaluated in the light of its effects upon income and production. Rational production plans are geared to a somehow developed set of price expectations set up as an expected price structure. In some cases, even though price expectations are fulfilled, entrepreneurs may actually produce at a lower level because of its relative safeness. But more often in our economic system, price expectations are not fulfilled, so that with a given set of production plans, which we may assume to be fulfilled, incomes will vary from the expected, and marginal returns will be unequal to the prices of the factors of production. Thus, incomes are uncertain, perhaps also unstable, and resources are not efficiently allocated. It is reasonable to further assume that the

greater the price uncertainty, the greater will be the uncertainty of income and the less efficient will be the allocation of resources.

It is basically assumed in this study that producers' and processors' actions approach some sort of rational price behavior. Therefore if production plans are actually based upon this type of action, the resulting malallocation of resources and the maldistribution of income will be less than when production plans are guided by multi-valued price expectations. A given price expectation even though it may not be fulfilled should reduce the range of uncertainty and lead to a more optimum allocation of resources and a better distribution of income.

In the red cherry industry, processors must name a price at the beginning of the harvest season that will be satisfactory to growers and allow the pack to be moved through the ensuing year at a reasonable profit to the packer. If the price to the grower is established too high, margins for the packer are reduced so that profits are small or even negative or carry-overs result because pack prices are too high for the market to absorb the pack. On the other hand, if prices both at the farm and packer level are too low, the rate of movement of the pack is such that the pack is sold early in the year and returns to both groups are lower than necessary. Storage policies in the industry are only clear-cut to the extent that processors do not desire to carry over part of one year's pack to the next. From the standpoint of coping with industry policy over and above its strictly economic considerations, general economic conditions need only be evaluated for the ensuing pack year and need not be projected into the next pack season.

Naturally, there are methodological limitations to any statistical analysis of factors affecting prices of any product or in the development of a comparatively simple formula for pricing. Independent variables must be capable of numerical expression. All variables must be single-valued. Data must either be known or available. These are limitations which are peculiar to methodology irrespective of the product singled out for study. In this study, a further restriction has been imposed on the character and kind of independent variables which may be used. This restriction is that each individual independent variable must be known or be capable of accurate estimation prior to the harvest season. This is essential if the analysis is to prove useful in reducing the range of price expectations so that production plans may be more carefully made and in order that the formula can be used as an aid to final price determination.

Herein lies the core of this study. First of all, the markets for red cherries must be analyzed as to the forces affecting price determination. Secondly, a small group of meaningful independent variables must be isolated for more precise analysis. Finally, these independent variables must be worked into a formula so that their aggregate effects as well as their separable net effects upon red cherry prices may be measured. The ultimate goal is to reduce the price uncertainty confronting the industry through improved knowledge which should effectuate more certain incomes and a more efficient use of productive resources.

CHAPTER II

REVIEW OF LITERATURE

The literature reviewed in this chapter can be classified under two headings. The first pertains to literature regarding economic problems and practices of the red cherry and related industries. The second is a review of literature pertaining to methodology. Obviously, the list of publications that could logically be classified under each section is almost inexhaustible. An attempt has been made to select those writings which have contributed most to a chronological development of the economic analysis of the red cherry and similar industries or to statistical methodology. Relatively little has been written concerning the economic characteristics of the red cherry industry, but a number of economic studies have been completed dealing with similar industries. The main attention in the methodology section is centered on the relationship between graphic and least squares correlation. In addition, methods of economic analysis are reviewed.

Economic analyses of the cherry industry. The most comprehensive economic analysis of the cherry industry was made by Nelson and Sulerud in Oregon in the early thirties.[1/] Their study was not limited to the confines of the state of Oregon, but contained area comparisons of Oregon with similar producing states on the Pacific coast as well as Oregon and the Pacific coast with the eastern states. Detailed data were gleaned from many sources covering most aspects of the industry including such data as bearing and non-bearing trees by states by years and varieties as well as other previously unassembled information on size and type of

---

1/ Milton N. Nelson and George L. Sulerud, An Economic Study of the Cherry Industry with Special Reference to Oregon, Agricultural Experiment Station, Bulletin 310, Oregon State College, Corvallis, Oregon, February, 1933.

pack by states. Prices received only cursory attention, and from the standpoint of a thorough economic analysis of the industry, this was a serious limitation to the study. The attention that was given to prices was confined to prices at the farm level with no formal consideration whatsoever given to pack prices. In spite of this limitation, the study is well recognized as one of the outstanding works concerning the cherry industry, and a few of their conclusions bear comment.

Nelson and Sulerud pointed out that "in growth of pack (cherries) have not held their own compared to the canned pack of other fruit considered in the aggregate. This is particularly true of canned sweets, which gained only slightly compared to the more pronounced gain made by sours. About 57 percent of the national canned pack of cherries has been sours and 43 percent sweets." 2/ From this they concluded that "the outlook for any considerable expansion of sweets in canned form is not bright." In a following conclusion the authors stated that the outlook for the utilization of sour cherries in cold-pack form was very bright. They pointed out that the frozen pack had already made large inroads on the canned pack and that this trend would continue.

A very interesting summary statement was made with regard to potential markets. Sour cherry production on a commercial scale on the Pacific Coast is limited primarily to the states of Washington and Oregon. In connection with this, they remarked that despite Washington and Oregon's relatively small production they were having to look east of the Rockies for market outlets. This led to the conclusion that because of

---

2/ Ibid, p. 4.

the advantage in transportation or shipping by the eastern producing areas, the western producing area would be unable to compete either with the eastern canned or cold pack. This would infer that the sour cherry industry in Oregon would no longer expand which, of course, was not borne out.3/ Likewise, Nelson and Sulerud's conclusions as to prices did not materialize. They pointed out that even though prices of both sours and sweets had been attractive, the business depression had brought in its wake a pronounced recession in prices. This was followed by the statement that "Even under more normal conditions of market demand, expansion may already have proceeded too far. Unless constructive measures are taken, future price trends for several years to come are likely to be disappointingly low."

Even though this study was masterful in its comprehensiveness, the conclusions were too pessimistic. The sour cherry industry, even in Oregon, had not over-expanded, and the future outlook for prices in 1933 should have been bright.

Also in 1933, Motts, Scholl, and Chapin4/ of the Michigan Agricultural Experiment Station published a very detailed bulletin on cherry production trends. A detailed count of all bearing and non-bearing trees was obtained by nearly 6,000 personal visits in order to accurately evaluate Michigan's relative production potential as well as to project likely future trends in output.

3/ Cf. Figure 1, Chapter IV.

4/ G. N. Motts, C. A. Scholl, and J. W. Chapin, Trends in Cherry Production in Michigan, Michigan Agricultural Experiment Station, Special Bulletin 237, June, 1933.

Using their results as a basis for estimates, forecasts were made of the possible size of the 1936 crop.5/ For Michigan the Division of Crop and Livestock Estimates computed a par of production, or what was considered to be a one hundred percent crop. This par of production figured out to be 55.3 pounds per tree in 1939, which was considered to be conservative for estimating the potential size of the commercial crop. Assuming that 85 to 90 percent of the crop was processed they estimated that 60 percent of normal crop in 1936 would have yielded a pack of 35 to 37 million pounds while a 100 percent of normal crop would have yielded a total pack or 58 to 61 million pounds.

These methods for Michigan were applied to the United States with the result that by 1936, with a normal crop, production would have been 120 million pounds distributed among the states as follows: Michigan, 60 million; New York, 30 million; Wisconsin, 16 million; and Pennsylvania, Ohio and Colorado combined, 14 million.

These estimates were of course, based upon normal weather and economic conditions. It is interesting to note that Michigan's relative position (assuming similar crop conditions in other states) would have been equal to the combined production of all the other sour cherry producing states in the United States. This position has been maintained in recent years.

Another bulletin from the Michigan station appeared in 1935.6/ As stated in the preface the purposes of the bulletin were: 1) to present a picture of the trends of the red pitted cherry industry, 2) to determine the causes of prices that have appeared relatively lower than those

---

5/ Ibid, pp. 39-40.

6/ Roy E. Marshall, Production and Price Trends in the Pitted Red Cherry Industry, Michigan Agricultural Experiment Station, Special Bulletin 258, February, 1935.

for other fruits in recent years, and 3) to point out certain implications contained in the data that should aid both producers and processors in adjusting their business to existing conditions. The problem was clearly low prices in the industry which were attributed to over production. Marshall stated in his opening statement that the red cherry was one of the most profitable of the deciduous tree fruit crops until 1931. Favorable prices had encouraged heavier than usual tree plantings which were beginning to produce by 1931. The summer of 1931 was the first of four consecutive seasons with exceedingly low prices. Prices during these years were little more than enough to cover harvesting and delivery costs thus permitting profits to none except the most efficient producers with orchards situated in favorable locations. Also, some of the processors were forced to close their plants because prices would not cover costs.

The Michigan cherry industry had expanded considerably during this period. From a relative position of 48 percent of the total United States canned pack during 1926-34, Michigan's share of the total pack averaged 60 percent in the two years, 1933 and 1934. The cold or frozen pack, justifying Nelson and Sulerud's prediction, 1/ increased tremendously during the years just prior to 1934, but considerable difficulty was had in moving the large pack of 1930. There were some indications that there was an over expansion in frozen pack relative to canned pack in some of those years.

After analyzing the various rates of movement for the various packs, Marshall turned to a discussion of prices and price trends. Beginning

---

1/ Op. cit. p. 4.

with the pack season in 1931, red cherry prices dropped sharply relative to other fruit prices.[8] Even when compared with all commodities or farm product prices in general, red cherry prices were still relatively low.[9] Marshall attributed this distressed situation primarily to the fact that markets were not expanded to keep pace with the increased production. He further pointed out that prices to growers for the canned pack could not be forecast and explicitly stated that prices for cherries could not be out of line with other fruits used as pie fillers except when there were relative shortages in the production of cherries as compared with the other fruits. And as a rule of thumb, he mentioned that the opening prices on the pack must be such as to allow two-thirds of the pack to be shipped prior to January at a gradually rising market price.

Marshall concluded a discussion section with the following pessimistic statement.[10]

> "There is every indication that during the next decade, red cherry production for canning or frozen pack is warranted only where production costs can be kept substantially below the average predepression prices for cherries delivered at the processing plants. Where orchards exist in which costs are higher, the producers must seek some other outlets for the fruits or go through a process of liquidation."

In 1947, Marshall reevaluated the trends in the red cherry industry.[11] Of course production had increased tremendously to yield a record pack in 1946 of 90 thousand tons for New York, Michigan, Wisconsin,

---

8/ Ibid. p. 19, cf. Figure 7.

9/ Ibid. p. 21, cf. Figure 8.

10/ Ibid. p. 24.

11/ Roy E. Marshall, "Some Trends in the Red Cherry Industry", The Canner, January 4, 1947. 7 pp.

and Ohio. Over the 15 years, 1932 to 1946, the canned pack increased absolutely, but decreased relative to the cold pack. And in 11 of the 15 years, the amount of fruit packed in number 10 cans exceeded that packed in number 2 cans. The quantity frozen thus increased tremendously during these years and led Marshall to the conclusion that there was no indication that the red cherry industry had reached its peak in volume of production. In spite of the huge increase in the amount of frozen pack he foresaw that the volume of canned pack would exceed the cold pack over the next 5 years.

A new development was appearing in the industry as a result of the general over-all increase in the popularity of frozen foods in consumer packages. This was the packing of red cherries in one pound frozen consumer packages to supplement the number 2 can which had previously been the only consumer package. Marshall's observation on this point was that sometime there would be a substantial frozen pack in containers for the consumer. He further stated, however, that there was not likely to happen until frozen packing could be mechanized as fully as the hot pack canning operation.

Another outstanding study on cherries, comparable with Nelson and Sulerud's in Oregon, was Wellman and Braun's in California.[12/] Since sweet cherries were of major importance in California, very little attention was given to the problems of the red cherry industry. Early in the study [13/] it was pointed out that the two distinct types of cherries (sours and sweets) did not compete to any considerable extent either for

---

12/ H. R. Wellman and E. W. Braun, Cherries, University of California College of Agriculture, Agricultural Experiment Station, Bulletin 488, February, 1930.

13/ Ibid, p. 5.

the use of land or in the consuming markets. The sweet cherries could be grown with commercial success in but few and comparatively limited regions. Sweet cherries are somewhat fastidious as to soils, are lacking in hardiness to both heat and cold, are prey to more insects than sour cherries, and subject to nearly all the fungus ills to which stone fruits are heir, suffering in particular from brown-rot and leaf-spot.

The differences in market uses of red and sweet cherries allow the sweet cherry industry more flexibility since sweet cherries have outlets in both the fresh and processed forms. Because of these alternative outlets, the volume of canned pack fluctuates widely — varying with the price as well as the total production.[14/]

Marketing problems of the red cherry industry were analyzed in a pamphlet prepared by the National Canners Association in 1940.[15/] It was stated in the foreword that the price that the consumer willpay for red pitted cherries determines the prices that canners and growers get, and the consumer's dollar spent for cherries filters back through the trade channels giving each marketing agency and the farmer his share. But the chief marketing problem confronting the industry at that time was how to move the increased production more efficiently. The increase in production was holding prices low.[16/] This increase in production which was dictated by favorable prices earlier, was a slow process. But once production is increased, reducing it — which can be very rapid, is too costly. The problem then becomes one of expanding

---

14/ Ibid. pp. 28-9, cf. Figures 14 and 15.

15/ Anonymous, The Marketing of Red Cherries, An Analysis of Problems That Are of Mutual Interest to Canner and Grower, Division of Statistics, National Canners Association, Washington, D. C., January, 1940.

16/ Ibid. pp. 2-4.

consumption at the margin.[17] This was the point at which they were certain that attention was going to have to be concentrated and obviously they were clearly concerned only with the extensive margin of consumption (adding more consumers rather than expanding the consumption of current users). This was one of the major weaknesses since no proof was offered that an increase in consumption by those already using cherries might be most desirable.

The Division of Statistics of the National Canners Association made the first breakdown made of the canner's dollar in this publication[18] The breakdown was based upon packing and selling red cherries in number 2 cans and upon raw product prices of 2 cents per pound.[19] On this basis, 35.8 cents went to growers for the raw product, 36.1 cents went for containers, 10.4 cents went for factory expense, 5.7 cents went for general overhead and depreciation, 5.4 cents went for brokerage, discounts, swell allowances, etc., and 6.6 cents was paid for direct labor. (The farmer's, as compared with the canner's, share of the consumers' dollar would obviously be much lower, but it would partially be compensated for now by the higher price paid to growers for fruit). This study is significant in that the problem areas of both consumers and canners were recognized and explored in the same publication.

Economic analyses of related industries. The above review exhausts the important studies that pertain directly to the cherry in-

---

17/ Ibid. pp. 10-11.

18/ Ibid. p. 11-12, cf. Figure 6, p. 10.

19/ This compares with 9 cents a pound paid to growers in 1948 and an all time high of 15 cents a pound paid to growers in 1946.

dustry and its problems. Many of the studies dealt primarily with problems on the Pacific Coast which produces mostly sweet varieties and their problems were quite different from the problems as they exist in the red cherry industry. There are a host of economic studies available dealing with related fruit crops. California has been the most prolific state in the output of these particular studies, and a nuclear group seems worthy of review.

One of the earlier studies in this group (a contemporary study of Wellman's on cherries) was "Factors Affecting California Raisin Sales and Prices, 1922-1929".[20] The opening question posed in the article was[21]: "At what price can the tonnage of California raisins available during any particular marketing season be sold?" The authors followed this with the statement that: "As important as this question obviously is to those producing and marketing California raisins, many of the basic data needed in its solution were unavailable until July, 1930." These statements are true for many crops in many states and are particularly applicable to the red cherry industry in Michigan.

Shear and Howe used the technique of graphic multiple correlation with the successive elimination of variables in order to isolate the influence of various factors affecting raisin sales and prices. The ultimate aim of the study was to provide a partial basis for the establishment of a marketing sales policy. Adequate data for sound analysis was unavailable and the final section of the report was a plea for needed current statistical data.[22]

20/ S. W. Shear and R. M. Howe, "Factors Affecting California Raisin Sales and Prices, 1922-1929," Hilgardia, University of California Printing Office, Berkeley, California, Vol. 6, No. 4, Sept. 1931.

21/ Ibid. p. 73.

22/ Ibid. p. 95.

A second study dealing with factors affecting annual prices of California fresh grapes, 1921-1929, appeared at the same time.[23] The purpose of this paper was to discover and measure the influence of the major factors that have affected the season's price of each class of California fresh grapes. Total shipments for the season was the most important single factor affecting prices of all types of grapes. Using these shipments against prices, the authors measured the relative elasticity of market demand. In other words, a statistical demand curve was derived from annual prices and shipments. Some of the general limitations of this approach to demand analysis are obvious. For example, quality was said to have been an important factor affecting price, but was unmeasurable.[24] The time period and the inability to differentiate whether two points belong on the same demand curve or whether the demand curve had shifted are further limitations to their approach.

In 1932, Wellman[25] published a study on the supply, demand, and prices of peaches in California. It is significant to note that the peach industry in California instituted controls upon the size of the pack as a mechanism for raising prices. In Wellman's words:

23/ L. D. Mallory, S. R. Smith, and S. W. Shear, "Factors Affecting Annual Prices of California Fresh Grapes, 1921-1929," Hilgardia, University of California Printing Office, Berkeley, California, Vol. 6, No. 4, September, 1931.

24/ Ibid. p. 128.

25/ H. R. Wellman, Supply, Demand, and Prices of California Peaches, University of California College of Agriculture, Agricultural Experiment Station, Bulletin 547, Berkeley, California, December, 1932.

> "With the marked drop in prices in 1927 the industry instituted a number of policies designed to limit the pack. During the past five years, with the exception of 1929 when the crop was very short, only No. 1 fruit . . . has been canned. In 1930 and 1931 large quantities of No. 1 fruit were purchased and left on the trees. Had this not been done, prices paid growers in these two years would have been considerably lower than they were." 26/

The major assumptions of such a policy are, of course, apparent. The demand for processed fruit was so inelastic that total revenues to packers were increased more than enough to compensate for the payments to producers for the unused fruit. Wellman did not attempt to draw a demand curve as such, but did portray a trend in the demand (quantity taken) on the assumption that price, buying power of consumers, and supplies of competing fruits remained constant.27/ Population was the large remaining variable and Wellman's estimate of future growth was very conservative. However, an over-all evaluation of the significance of the study would rank it alongside of the earlier work on cherries and other fruits at the California station.

Hoos and Shear completed a supply-price study of fresh Bartlett pears in 1942 which represents a more recent thorough economic analysis of a fruit.28/ In the introduction,29/ Hoos and Shear stated that a primary purpose of the study was to present more factual information than has ever been available on certain characteristics of the price

---

26/ Ibid. p. 3.

27/ Ibid. pp. 26-7.

28/ Sidney Hoos and S. W. Shear, "Relation Between Auction Prices and Supplies of California Fresh Bartlett Pears," Hilgardia, University of California Printing Office, Berkeley, California, Volume 14, Number 5, January, 1942.

29/ Ibid. p. 233.

behavior of California Bartlett pears. A secondary purpose of the study was to present some analytical background that was necessary in order to view the recent developments in the fresh Bartlett pear industry and understand its present status. To state that these two purposes were fulfilled under-emphasizes the importance and the thoroughness of the study. Up-to-date statistical techniques were applied and the efficiency and usefulness of the results were much better than the previous California studies. Their use culminated in the section dealing with factors affecting California Bartlett pear prices.[30] In this section, five equations were derived to measure the characteristics of the statistical demand functions for California fresh Bartlett pears for the years 1925 to 1940. Each of the equations used three or four independent variables and the adjusted coefficients of multiple correlation ranged from 0.7731 to 0.8988. Net relationships between two variables with the others held constant were derived and portrayed. These relationships led them to the conclusion that within the range of the data at hand, the auction demand for fresh Bartlett pears was elastic. This type of analysis lends itself as a useful base for determining proper market policies.

Hoos and Phelps reevaluated the economic status of California clingstone peaches in 1948.[31] Factors affecting production, use, and prices were considered in a popular fashion. However, the conclusions were based upon thorough analysis, characteristic of Hoos and Shear's previous

---

30/ Ibid. pp. 279 ff.

31/ Sidney Hoos and H. Fisk Phelps, California Clingstone Peaches Economic Status, 1948, California Agricultural Experiment Station, Circular 385, University of California, Berkeley, California, May, 1948.

work on Bartlett pears. Again, consumer demand, which is related to the level and the distribution of consumer income, the retail price, and the prices of competing canned fruits, were important determinants of prices to growers along with some measure of production.

These studies originating from the California station are typical of the past work done with deciduous fruit prices. Essentially the price-quantity relationships have been derived by the use of multiple correlation (graphic or least squares) and the establishment of a series of net relationships between price (the dependent variable) and each of the independent variables. From these relationships, market sales policies have been developed which were based upon the derived elasticities of the statistical demand curves.

Economic policies of related industries. Industry studies are few, and no real economic appraisal of the characteristics of the red cherry industry has been made. There are, nevertheless, a few key studies that should aid in analyzing the effectiveness of various policies and account for or discount certain industry beliefs. For example, there is one policy that cooperatives in general follow that allows some advantage over private corporations. This policy is the payment of a certain proportion of the market price upon delivery to the packing plant, then supplementing this payment later in the season by an allocation of earnings. This gives them an advantage over the private corporation in that the private corporation must pay the full price somewhere near the time of delivery.

Gessner of the Farm Credit Administration has surveyed cooperatives processing horticultural products[32] and summarized the marketing practices of cooperatives processing canned and frozen fruits and vegetables.[33] The handbook listed 8 cooperative fruit and vegetable canning and freezing plants in Michigan in 1946-47. Of the 8 plants, 3 did only canning, 3 did only freezing, and 2 did both canning and freezing of non-citrus fruits, berries and/or vegetables. Of the 3 that canned fruits or vegetables, 2 plants canned only vegetables and 1 canned fruits. Thus, a total of 6 plants were cooperative and packed either cherries, or cherries and some other fruits and vegetables.[34] In the United States as a whole, less than 4 percent of the red pitted cherries packed were packed by cooperatives.[35] In 1946-47, however, almost 20 percent of the red cherry frozen pack was processed in cooperative plants.[36] The report on marketing practices was more comprehensive, covering such points as distribution channels, sales policies, market outlets,and the like. The most important channel of distribution was through brokers. Many plants sold directly to buyers

---

32/ Anne L. Gessner, Handbook of Cooperatives Processing Horticultural Products, 1945-46 and 1946-47, Miscellaneous Report 120, Farm Credit Administration, United States Department of Agriculture, Washington, D. C.

33/ Anne L. Gessner, Marketing Practices of Cooperatives Processing Canned and Frozen Fruits and Vegetables, Miscellaneous Report 130, Farm Credit Administration, United States Department or Agriculture, Washington, D. C.

34/ There were about 6 times as many non-cooperative as cooperative plants packing red cherries in Michigan.

35/ Gessner, op. cit. p. 7.

36/ Gessner, op. cit. p. 13.

such as chains and super markets. Most plants quoted prices f.o.b. shipping point. About two-thirds of the plants solicited orders for future delivery. More than half of the plants sold part or all of their products prior to the packing season. Almost all of the plants sold part of their pack under their own brand-labels. Though these practices are applied directly to cooperatives, they are not peculiar to this type of business organization. Cooperatives are merely following fairly well established practices of the industry.

Product differentiation is common in the industry, and brand labelling is only one of the methods of differentiation employed. Product differentiation is an element of imperfect competition. Nicholls has the following to say about concentration in the fruit and vegetable canning industries:[37]

> "Although concentration appears to be quite small, it should be pointed out, however, that the production of fruits and vegetables is frequently highly localized so that, in many areas, there may be but a single outlet for a farmer's production. Some question as to the possibilities of local monopoly might, therefore, be raised. The most interesting difference between the canned fruit and vegetable industries and most other industries processing farm products is that, unlike these other industries, the canners have considerable control over the volume of their purchases (and hence their output) even fromyear to year. This results from the common practice of canning factories <u>contracting</u> (at a fixed price) <u>in advance</u> for a specific production of the product canned."

Nicholls also points out[38] that chain stores (a highly concentrated segment of industry) buy in considerable volume from small-scale independent canning factories. These independents quite often pack their product under chain store brands which are then sold in competition with the nationally advertised canned goods which the chains buy

---

37/ William H. Nicholls, <u>Imperfect Competition Within Agricultural Industries</u>, Iowa State College Press, Ames, Iowa, 1947, p. 77.

38/ <u>Ibid</u>. pp. 78-9.

from the larger-scale canning companies. And, too, the chain store is also a very common direct outlet for the large-scale producer cooperatives. A further observation by Nicholls[39] is that product differentiation has always been important for canned fruits and vegetables.

Norton has probed into the differentiation in the marketing of farm products, also.[40] Aside from a practical discussion of product differentiation in general, little reference was made to the fruit industry. Norton does treat advertising differentials, which stress quality differences, brand names, and other featured characteristics, as potential methods for expanding sales.

Stigler points out that departures from competition are due to a fundamental characteristic of the consumer markets -- consumer ignorance.[41] The existence of consumer ignorance contributes to the imperfectness of knowledge existing in the markets and allows firms to differentiate virtually identical products and to persuade consumers to buy heavily advertised brands. But the degree of monopoly gained by policies of differentiation varies greatly. The extent with which product differentiation policies are successful is the crucial question, since the variations from competition may be only slight or they may be drastic.

Other schemes of "differentiation" are available to the industry. The industry may "differentiate" among markets or over time. Differentiation among markets leads to price discrimination while differentiation

---

39/ Ibid. p. 233.

40/ L. J. Norton, "Differentiation in Marketing Farm Products", Journal of Farm Economics, XXI (1939), 3 (I), pp. 587-95.

41/ George J. Stigler, The Theory of Price, The MacMillan Company, New York, 1947, p. 214 ff.

over time involves storage in the red cherry industry. In a series of three articles,[42] Waugh, Stigler, and Shepherd analyzed the effects of market prorates. Waugh was concerned with the benefits to both growers and consumers; however, the analysis is applicable to other levels in the trade channels. Waugh was convinced that it was possible to increase growers' incomes and at the same time, benefit consumers and society through a system of market prorates.[43] Stigler's reply to these implications essentially was a challenge of the political feasibility of a system of prorates as well as to someone's ability to make the necessary value judgments in terms of utilities and satisfactions.[44] Shepherd delved further into the theoretical aspects of the problem in an attempt to formulate the additional returns that could be gained with varying degrees of elasticity of demand.[45]

The problem of storage (a form of differentiation through time) is one of serious concern to any industry. Johnson enumerates three

---

42/ Frederick V. Waugh, "Market Prorates and Social Welfare", Journal of Farm Economics, XX (1938), 2, 403-17.

George J. Stigler, "Social Welfare and Differential Prices", Journal of Farm Economics, XX (1938), 3, 573-90 (Including a rejoinder by Waugh).

Geoffrey Shepherd, "Price Discrimination for Agricultural Products", Journal of Farm Economics, XX (1938), 4, 792-807.

43/ Waugh, op. cit. p. 403.

44/ Stigler, op. cit. pp. 586-87.

45/ Shepherd, op. cit. pp. 806-06.

motives for private storage.[46] The first is the convenience motive; the second is the contingency motive; and the third is the speculative motive. From a packer's point of view, the speculative motive would be the principal motive for storage with the other motives being more incidental.[47] Johnson's approach is a ceteris paribus approach using the intangible concept of maximization of utility as a criteria for storage. Yet the principles developed may be applied for most commodities under most situations.

Methods of analysis. Literature pertaining to methods for analyzing prices for the purpose of either measuring the effect of certain factors on prices or for forecasting prices is voluminous. However, there has been very little work done on the quantitative measurement of the relationship between certain pre-determined factors and either farm or pack prices of red cherries.[48] Considerable work, though, has

---

46/ D. Gale Johnson, Forward Prices for Agriculture, The University of Chicago Press, Chicago, Illinois, 1947, pp. 156-58.

47/ The uncertain expectations as to future supplies and demands constitute a problem for those contemplating speculative storage. Yet someone must store in order that consumers have an available supply from one harvest season to the next, and private storage usually accomplishes this. It was pointed out earlier that cherry packers have an aversion to volume storage and someone else usually performs this function. Year to year storage in the red cherry industry is also not considered to be wise by cherry packers. A thorough analysis of storage, similar to Johnson's analysis needs to be applied to the fruit packing industry.

48/ Joseph M. Johnson did an economic study of the cherry industry in 1946 at Cornell University which was unpublished. In an attempt to predict the farm price of cherries, his errors ranged from 17 to 32 percent.

been carried on in the field of price analysis with other non-citrus tree fruits that is very useful in any price analysis of red cherries. A great deal has also been written on methods of price analysis, and the application of methods to research in price analysis. Procedures used for forecasting production of fruits are also interesting and worthy of mention. Some of the more pertinent of these three types of studies will be reviewed in this section.

As was true with literature pertaining to the economic analysis of the cherry and related industries, the California station has also contributed materially to a development of methods of analysis. Following his earlier study on clingstone peaches, Wellman published a mimeograph on the statistical analysis of the annual average f.o.b. prices of canned peaches in 1939.[49/] Wellman was careful to point out that the results he presented explained only what had occurred, and did not forecast what would happen. But the analysis was supposed to serve as a guide to those interested in estimating either the probable price at which a given quantity of canned peaches could be sold or the probable quantity of canned peaches which could be sold at a given price under specified conditions.

Wellman used three price indicators in his analysis, namely, 1) total shipments of California canned peaches, 2) an index of non-agricultural income in the United States, and 3) an adjusted index of prices of competing canned fruits. Using these independent variables, prices were explained within a range of error of 0 to about 6 percent.

49/ H. R. Wellman, Statistical Analysis of the Annual Average F.O.B. Prices of Canned Clingstone Peaches, 1924-25 to 1938-39, University of California Agricultural Experiment Station, Mimeographed Report No. 67, Berkeley, California, June, 1939.

The graphic method of multiple correlation was used and the order of the elimination of variables was as listed above.

This graphic method of multiple correlation has received a great deal of attention and use by agricultural economists. E. J. Working[50] has stated that every step in every type of price analysis can be carried through by graphic methods, because graphic methods may be used not only as a means of displaying data but also as a means of computation. As compared with the formal method of least squares, the accuracy of graphic procedures depends upon the skill of the investigator and upon the particular data to be used. Fitting regression lines by eye usually results in the minimizing of perpendicular, rather than vertical deviations. The formal least squares procedure can accomplish just as much as the graphic procedure if it is adequately supplemented by graphic methods of displaying the data. But its fault lies in the fact that formal methods are time-consuming and difficult to carry through -- especially when curvilinear relationships are involved. However, as Working pointed out, graphic methods lose their importance as a statistical tool as mechanical calculating machines come into use.

Being one of its chief users, Wellman has written an open minded paper on the application and uses of the graphic method of multiple correlation.[51] He approached the problem by asking the following

---

50/ E. J. Working, "Graphic Method in Price Analysis", Journal of Farm Economics, XXI (1939), 1, pp. 337-45.

51/ H. R. Wellman, "Application and Uses of the Graphic Method of Multiple Correlation", Journal of Farm Economics, XXIII (1941), 1, pp. 311-317.

three questions:[52]

1. "To what extent have research workers in agricultural economics actually made use of the graphic method of multiple correlation?"

2. "On what kinds of problems have they used it?"

3. "In what ways have they used it?"

In his summary, Wellman's answers to these questions in part were:[53]

1. "The graphic method is not used universally by research workers in connection with problems involving multiple correlation analysis."

2. "To date it has been used most widely in analyses of factors influencing prices and consumption."

3. "The graphic method is used both as an aid in choosing variables and types of functions prior to mathematical treatment and as a substitute for mathematical correlation."

In the discussions which followed Wellman's paper[54] it was generally conceded that the graphic method was a respectable procedure and that users could employ valid subjective reasoning along with certain objective measurements and get more realistic results. One serious limitation still remained and that was the problem of duplication and verification by two or more individuals. The graphic method is quite flexible.

A mathematical treatment of the two methods was given by Foote and Ives in order that the relationships between the two methods could be

- -

52/ Ibid. p. 311.

53/ Ibid. p. 317.

54/ Warren C. Waite, "Place of and Limitations of the Method", and "Notes on the Discussion", Journal of Farm Economics, XXIII (1941), 1, pp. 317-23.

illustrated.[55] They quoted Bean to the effect that the mathematical bases of the method were that the multiple regression equation becomes the equation of a curve when all the independent variables except one are held constant and that his method of successive approximation is analagous to a mathematical iterative process which converges to the least squares solution.[56] Now this rate of convergence (of the graphic method to least squares) depends upon the intercorrelation of the independent variables[57] and on the size of the error in the first approximation. The correlation coefficient is determined from the variance of the actual minus the regression values of the dependent variable.[58] The correlation coefficient thus obtained is equal to a coefficient computed using the least squares procedure provided the graphic procedure is accurately done. Thus, the two methods are equally valid. The graphic procedure seems to be the most expedient for obtaining preliminary results or analyzing the effects of curvilinear relationships. Least squares seems to be generally accepted as a good method where consistency and complete objectivity is desirable and the relationships are linear.

55/ Richard J. Foote and J. Russell Ives, The Relationship of the Method of Graphic Correlation to Least Squares, United States Department of Agriculture, Bureau of Agricultural Economics, Washington 25, D.C., Statistics and Agriculture No. 1, April, 1941.

56/ Ibid. p. 2. L. H. Bean was the originator of the graphic method in 1929.

57/ Ibid. p. 16.

58/ This procedure is valid since the correlation coefficient is essentially an index of the amount of reduction in the variance of the actual values by knowing the influence of the independent variables.

Perhaps more important from a methodological point of view than whether one correlation procedure is used in preference to another is whether correlation is the best method to use in analyzing price relationships with other variables. Working analyzed the methods used in price forecasting in 1930, just at the time correlation was being generally used.[59] He compared several methods that were used to forecast prices. The most simple method absolved itself of any relationship to statistical procedures. A second method involved an informal use of statistics, and a third method involved formal statistical tools. These methods were self-explanatory and Working concluded without question that for the measurement of covariations, the formal statistical procedure was best. Working's final conclusion that "methods of price forecasting should include two processes: first, the statistical analysis -- that is quantitative measurement of the relationships of covariation of the past; and, second, an analysis of whether these particular relationships may be expected to be obtained in the future".[60] Working did not mean to imply that the processes should be separate and distinct, but should be carried on simultaneously as the particular problem requires in the process of reasoning.

Sturges has constructively criticized the use of correlation in price analysis.[61] He pointed out that the current attitude towards

---

59/ Elmer J. Working, "Evaluation of Methods Used in Commodity Price Forecasting", Journal of Farm Economics, XII (1930) 1, pp. 119-39.

60/ Ibid. p. 133.

61/ Alexander Sturges, "The Use of Correlation in Price Analysis", Journal of Farm Economics, XIX (1939), pp. 699-706.

correlation was one of skepticism, or at best, uncertainty. But he stated that "other sciences have found the accurate application of statistical inference essential to progress beyond their initial development".62/ Sturges lists three fundamental steps in the construction of a price analysis. His first step was the construction of an a priori basis for a causal relationship. The next step is to calculate what experience would have been expected if the selected relationship would have been the true one. The final step is to compare the expected relationship with the relationship that actually occurred. The smaller the discrepancy in the final step, the greater is the reason to accept the a priori hypothesis. But this concept of smallness or largeness must be tested using the theory of probability and the concept of sampling. Sturges believes that one should appreciate that: "Correlation procedure is not a means, except quite indirectly, of discovering the truth, but only of testing hypotheses as to what the truth consists."63/ Thus, correlation involves both a causal a priori hypothesis and an agreement of this hypothesis with fact. In order to test the significance of the correlation coefficient it should be derived from data which satisfy the requirements of independence, of homogeneity, and of normality. Correlation then, according to Sturges, becomes a useful tool in price analysis upon which reliance can be placed to the extent of predetermined probability limits.

As an example of the application of correlation to price analysis in this more recent setting, it is interesting to return to the latest

---

62/ Ibid. p. 700.

63/ Ibid. p. 702.

work at the California station with canned clingstone peaches,[64] canned apricots,[65] and canned pears.[66] In these three works, the graphic method of multiple correlation was abandoned in favor of the least squares procedures. The independent variables for peaches were unchanged from Wellman's study in 1939.[67] However, in Hoos' report, a logarithmic relationship was used between the f.o.b. price of canned peaches and the index of United States non-agricultural income. The same sort of relationship existed between the f.o.b. price of canned apricots and the index of non-agricultural income. However, for canned Bartlett pears, there existed in addition to the price-income logarithmic relationship, a logarithmic relationship between f.o.b. prices and domestic shipments. Hoos portrayed all of his results graphically, showing the net relationships between each independent variable and price with the other independent variables held constant at their mean values. By exhibiting the net relationships in this manner the same relationships between price and each of the independent variables as were shown by Wellman with the graphic procedure.

64/ Sidney Hoos, Statistical Analysis of the Annual F.O.B. Prices of Clingstone Peaches, 1924-25 to 1948-49, University of California Agricultural Experiment Station, Mimeo. Rep. No. 96, Berkeley, California, June, 1949.

65/ Sidney Hoos, Statistical Analysis of the Annual Average F.O.B. Prices of Canned Apricots, 1926-27 to 1948-49, University of California, Agricultural Experiment Station, Mimeographed Report No. 97, Berkeley, California, June, 1949.

66/ Sidney Hoos, Statistical Analysis of the Annual Average F.O.B. Prices of Pacific Coast Canned Bartlett Pears, 1926-27 to 1948-49, University of California, Agricultural Experiment Station Mimeographed Report No. 98, Berkeley, California, June, 1949.

67/ H. R. Wellman, op. cit. p. 1.

It is interesting to note that the adjusted index of competing fruit prices in each case includes the other two fruits plus canned pineapples. (The index is adjusted by deflating with the index of non-agricultural income). Thus, for canned clingstone peaches, the index of competing fruit prices was composed of canned pears, canned apricots, and canned pineapples. It is also interesting to note that in spite of the additional years involved in Hoos' study and also the fact that logarithmic relationships were used, the net relationships between prices and individual independent variables were very similar in the two periods.

A comparison of Wellman's with Hoos' study seems to emphasize that the graphic procedure is a valid procedure when well performed. Also, they tend to show that when the correlation coefficient is relatively high, a fairly stable relationship through time can be expected.

Turning now to a brief discussion of demand and the measuring of changes in demand, Thomsen has given the latter some attention.[68] Changes in demand involve the concept time and Thomsen criticizes Henry Schultz's correlation studies for including time as one of the independent variables as an attempt to measure these changes in demand. In Thomsen's words:[69]

> "Attempts have been made to measure such shifts in the same multiple correlation analysis wherein the curve itself is determined. The late Professor Schultz, in his book, "The Theory and Measurement of Demand", measured these shifts by including time as an independent variable in his equations. This is similar to the use of time trends of residuals as a catch-all in graphic multiple correlation, once rather popular but subsequently frowned upon even by those most

---

68/ F. L. Thomsen, "Measuring Changes in the Demand for Farm Products", Journal of Farm Economics, XXI (1939), 1, pp. 132-141.

69/ Ibid. p. 134.

> liberal in their attitude toward correlation procedures. There are some reasons for doubting that the time trends representing so-called shifts in demand really do represent such changes. In any event, such measurements cannot be depended upon in connection with projections into the future, since there is nothing in the analysis itself to indicate when or why a change in degree or direction of trend may occur. Also, they do not help much in discovering the causal factors associated with shifts of a curve."

Thomsen does not discount time as being important in measuring changes in demand but only frowns upon its usage in correlation analysis as such. Variables which have the time effect included in them should be used instead of time alone as an independent variable, according to Thomsen. His discussion of the various measures of purchasing power centered around general price indexes and various national income figures.[70] His conclusion was that some measure of national income was probably best, yet of the various income estimates available, numerous valid arguments could be propounded for any of the measures.

Tintner also criticized the use of time as one of the independent variables.[71] Tintner argues that time is important and in the proper integration of economic theory to statistical procedures it cannot be over-looked. But, Tintner believes that all of the parameters in a demand curve are functions of time and instead of a simple linear demand curve being written as $Y = A + BX$ it should actually be written as $Y_t = A_t + B_tX_t$ where all of the quantities are a function of time. The difficulty, however, lies in the difficulty of being able to derive the time influences and here is where the contribution of economic

---

70/ Ibid. pp. 137 ff.

71/ Gerhard Tintner, "The Theory and Measurement of Demand", Journal of Farm Economics, XXI (1939), 3 (I), p. 610.

theory to statistics can be made.

In a note in the Journal of Farm Economics, Steck[72] pointed out that changes in demand due to increases in population have a different effect on altering the position and shape of the demand curve than changes due to, for example, an increase in income. Steck's argument is that if the population doubles, and the new population has twice the demand (i.e. twice as much product will be taken at every price) the shape of the curve, or the slope if it is a straight line, will change. Closer examination of the new curves reveals that at each price, both curves have the same elasticity, that is, they are iso-elastic. From a statistical point of view in time trend analysis, the cause of the changes in demand are important since the elasticities at each price may or may not be the same causing the quantity taken to react differently with price changes. Again, economic theory plays an important determining role in statistical price analysis.

Forecasting demand and production. The problems in forecasting the demand for agricultural products have been analyzed by Cavin in connection with the outlook work of the Bureau of Agricultural Economics.[73] One phase of this type of forecasting is the preparation of individual commodity outlook statements. Cavin used meat animals for an example and grouped the procedure into three steps.[74] In the first step, a forecast of production and output for the ensuing year is made

---

72/ Leon J. Steck, "Effect of an Increase in Population on the Shape of the Demand Curve", Journal of Farm Economics, XVI (1934), 3, p. 535.

73/ J. P. Cavin, "Forecasting the Demand for Agricultural Products", Address, joint meeting, American Statistical Association, and American Farm Economic Association.

74/ Ibid. p. 7.

without much regard for the outlook for demand. The belief with regard to demand is that it has very little effect upon the supply in the short-run. The second step for meat animals involves a distribution forecast. The distribution forecast involves a determination of the extent to which total supply will be distributed between carry-over stocks, military requirements, foreign shipments, and domestic consumption. The third step is the price forecast. This step consists in relating the forecast of meat consumption to the forecast of disposable income. Cavin describes the method of price forecasting used by the Bureau since the war, the price-structure approach as compared with the multiple correlation of time series. This procedure involves a separate estimate for each item in the price structure starting with retail prices and concluding with farm prices. Many estimates are thus made before the final farm price estimate is reached.

Of economic forecasting in general Cavin states,[75] "Economic forecasting is still exceedingly unsatisfactory, and I am sure that some economists regard it as a vice from which the virtuous should resolutely abstain". But on this he concludes that so long as individuals must make decisions based upon judgments of the future, economic forecasts will be made. The great caution which he asserts is that the user of these economic forecasts should not be misled by inaccuracies inherent in either the data or the methods employed.

Cavin's method as outlined for meat animals would apply fairly well in the analysis of prices for some of the highly perishables or even processed perishables such as red cherries provided that the data were avail-

---

75/ Ibid. p. 10.

able and accurate. The first step as listed by Cavin was the making of an estimate of production. Palmer and Schlotzhauer have evaluated the accuracy of fruit production forecasts.[76] Forecasts of fruit production during the growing season have been made by the Crop Reporting Board since 1914. The par or 100-percent full-crop-condition method has been used to indicate future production. Palmer and Schlotzhauer described and evaluated this method along with a second called "condition correlated with yield per acre", and a third known as "condition correlated directly with total production".

In the par method, the par of production is derived for past seasons by dividing the estimate of the final production by the reported percentage of a full crop. The current season par is then determined by a projection of the trend of pars. Abnormal circumstances are allowed for in addition to the trend projection. The percent of par is then related to production in order to forecast physical production.

The second and third procedures involve the correlation of the percent of full crop with either yields or production, then correlating the residuals with time in order that trends could be removed. Abnormal adjustments are also made in these procedures.

Part of Palmer and Schlotzhauer's conclusions[77] were that there were no great differences among the three methods tested and all of the methods yield estimates that agree very closely with the estimates of the Crop Reporting Board.

- -

76/ Cary D. Palmer and E. O. Schlotzhauer, "Methods of Forecasting Production of Fruit", Agricultural Economics Research, II (1950), 1, pp. 10-19.

77/ Ibid. p. 17.

The variability of the Crop Reporting Board's June 1 estimates of red cherries with the final estimates were interesting to note. For the United States in the years 1940-47, the standard error as a percentage of the mean was 14, but the ratio of the average of the first forecasts to the average of the final estimates was 100.2. Individual states varied tremendously. As an example, for Michigan the relative error was 33 percent and the ratio of the average of the first forecasts to the final estimates was 94. For New York the figures were 43 and 120 respectively. From a cursory observation of the variability of state production forecasts, it appears that error for individual states are averaged out almost entirely for the United States as a whole. Thus, there is considerable error in the estimation of production for individual states even as late as June 1.

Summary. The literature pertaining to the red cherry and similar industries is fairly sketchy. Two of the Pacific Coast states, Oregon and California have made rather thorough economic studies of the cherry industry in their respective states. But, of course, the main emphasis in each case was on sweet rather than red cherries. Two studies pertaining to the economic aspects of red cherries stand out in Michigan. One of these consisted of a very comprehensive survey of cherry tree population by age groups. This was made primarily for the purpose of projecting longer time production trends. The other study consisted of an analysis of red cherry prices and price relationships of the early 'thirties. Very little has been done in Michigan since these two studies except to assemble further data.

Considerable work has been done by the California station with the economics of similar industries. Most of the basic studies were completed several years ago, but the data and the application of results have been kept fairly current. This is especially true for the price analysis portions of the studies.

No attempt has been made to analyze the economic characteristics of the industry from the standpoint of the amount of perfectness or imperfectness of competition existing in the industry. From the standpoint of evaluating various pricing policies in the industry, this type of analysis is fundamental. Also, an understanding of the nature of the demand curve is necessary in order that shortage policies may be accurately evaluated.

Several stations have undertaken many studies in price analysis. California, however, has made the most use of these studies insofar as the fruit industry is concerned. Their studies with clingstone peaches, apricots, and pears are most notable. They have contributed materially to the development and use of methodology. Their early studies were largely developed around the principles involved in the use of graphic multiple correlation techniques. Their later studies have made the transition to the mathematical methods of correlation.

Though the literature is fairly sketchy, there is enough so that a foundation is established for analyzing and evaluating the red cherry industry in Michigan. Procedures are well enough established so that they can be useful within a certain range of discretion. However, new techniques and a further development of present techniques can aid materially in establishing broader sound principles of analysis.

CHAPTER III

SOURCES OF DATA

Secondary sources of data pertaining to the red cherry industry are fairly limited. One of the most thorough compilations of data was published by Cornell in March, 1948.[1/] The purposes of this compilation were to gather together all existing information, to indicate how such information may be revised for greater utility, and to suggest the collection of certain essential statistics not yet available. In short, the data covered most of the economic phases of the cherry industry including location, production, utilization, prices, and costs for both the United States and New York State. Data on production were also tabulated for the important individual commercial states as well as for the United States for both sweet and red cherries.

The Michigan Cooperative Crop Reporting Service completed a cherry survey in Michigan in 1949.[2/] Much of the information collected dealt with the number of trees by age-bearing groups by selected territories in Michigan. This essentially represented a bringing up-to-date of census data on tree numbers. These data aid in estimating future production potentials. Other data collected in the survey included prices and total values of cherries but particular emphasis was on potential production.

The Bureau of Agricultural Economics publishes data of historical importance on fruits and nuts at irregular intervals. For example, data

---

1/ Thomas F. Carroll, Cherries, Background Information and Statistics of Fruit Marketing I, Cornell University Agr. Expt. Sta., A. E. 662, Ithaca, New York, March, 1948.

2/ Anonymous, Michigan Cherry Survey, Michigan Cooperative Crop Reporting Service, Lansing, Michigan, 1949.

on the production and utilization of 13 non-citrus fruits for 1934-46 were published in 1947[3] and data on bearing acreages 1919-1949 were published in 1949.[4] Data pertaining to both red and sweet cherries are included. These publications were drawn upon for various useful historical information.

The most useful estimates of production are those published by the Bureau of Agricultural Economics. These estimates are made by the Bureau on June 1, June 15, and July 1 each year by states for the commercial producing states. The most useful of these forecasts of production is the mid-June forecast.[5] This estimate becomes available about June 21 each year and it is the latest available official estimate of production prior to harvest. Prices for the current season are strongly influenced by this estimate.

There are other very useful publications that carry data of current interest. The National Canners Association publishes a monthly report on stocks in canners hands. Business publications carry vital statistics on the economic situation.[6]

- -

3/ Anonymous, Fruits (13 non-citrus) Production and Utilization 1934-46, United States Department of Agriculture, Bureau of Agricultural Economics, Washington 25, D. C., July, 1947.

4/ Anonymous, Fruits and Nuts, Bearing Acreage 1919-1946, United States Department of Agriculture, Bureau of Agricultural Economics, Washington 25, D. C., January, 1949.

5/ Anonymous, Sour Cherry Production in 5 Eastern States, United States Department of Agriculture, Bureau of Agricultural Economics, Washington 25, D. C., 1 p. mimeo. annually, June 15.

6/ e. g. Annonymous, Survey of Current Business, United States Department of Commerce, monthly.

A very serious limitation to the secondary sources of data pertaining to the red cherry industry is that prior to 1938 the data did not distinguish between red and sweet cherries. It is very difficult to estimate levels of production and prices prior to this time. Other information such as the age distribution of trees and bearing acreages also did not differentiate between the two kinds of cherries.

Many other secondary sources of data appear as other government publications, experiment station bulletins, and the like. Some of these have been reviewed in Chapter II while data in others are largely duplicated in other later publications.

The major portion of the data relating the size of the pack by types of pack was compiled from unpublished reports sent in by canners in Michigan, Wisconsin, and Ohio to Professor Roy E. Marshall, Department of Horticulture, Michigan State College. Other commercially important states also compile this information so that the size of the total pack each year may be known by all canners. These data were available since 1931.

Pack price data on number 2 and number 10 cans, 1927 to 1934, were published by the Michigan Agricultural Experiment Station in 1935.1/ These price series were discontinued in 1935 because of lack of interest on the part of the industry. Consequently, the price data since 1935 had to be gathered directly from packers. These data were collected by personal interview from more than 30 packers in Michigan during March and

---

1/ Roy E. Marshall, Production and Price Trends in the Pitted Red Cherry Industry, Michigan Agricultural Experiment Station, Special Bulletin 258, February, 1935.

April, 1949. Monthly prices, when available, were tabulated on work sheets by type of pack by years for as many years as were available from each of the packers. Average annual prices were recorded by type of pack by years when monthly prices were not available. Data were collected for frozen red cherries in 30 pound tins in addition to that for number 2 and number 10 cans. Average annual prices were computed by weighting average plant prices by size of pack. Prices for 1935, 1936, and 1937 were estimated from average relationships with farm prices since none of the plants surveyed could furnish data for these years.

In addition to the price data tabulated directly on the work sheets at the time of interview, a questionnaire was prepared for the collection of miscellaneous information.[8/] Data on the relationship of cherries to total volume of business, costs of storage, and costs of processing were recorded by years, when possible. These data were designed to supplement other data gathered either from primary or secondary sources in such a way as to aid the accuracy of analysis.

- -

8/ See Appendix A for a copy of the schedule used.

CHAPTER IV

THE RED CHERRY PRODUCTION INDUSTRY

Through the years, the red cherry industry has become a highly specialized business which has localized in the most favorable areas in the United States. Whereas a large number of farms report the growing of a few cherries,[1] the commercially important areas are concentrated in a few townships and on relatively few farms throughout the United States. In the United States in 1947, cherry growing is about a fifty million dollar industry.[2] However, red cherry production is concentrated within the boundaries of twelve states (Figure 1). These twelve states are divided in a ratio of seven to five between the West and the East. In the seven western states (Washington, Oregon, Montana, Idaho, Utah, Colorado, and California), Washington has been the most important producing state followed by Colorado, Oregon, and Utah.

The commercially important areas within these states are located in a small number of counties. Washington and Oregon have ten important producing counties each, but the importance of red cherries has been generally diminishing since the year 1940 in these states. Colorado and Utah seem to be maintaining or increasing their total production while the other western states are of little importance.

Of the five eastern states, Michigan, New York, and Wisconsin are the most important producing states. Michigan is by far the most important producing state of the group, accounting for about one-half of

---

1/ 34,551 farms in Michigan, 1945 census, as compared with 54,021 in 1935.

2/ Thomas F. Carroll, Cherries, Background Information and Statistics for Fruit Marketing I, A. E. 662, Cornell University Agricultural Experiment Station, Ithaca, New York, March, 1948.

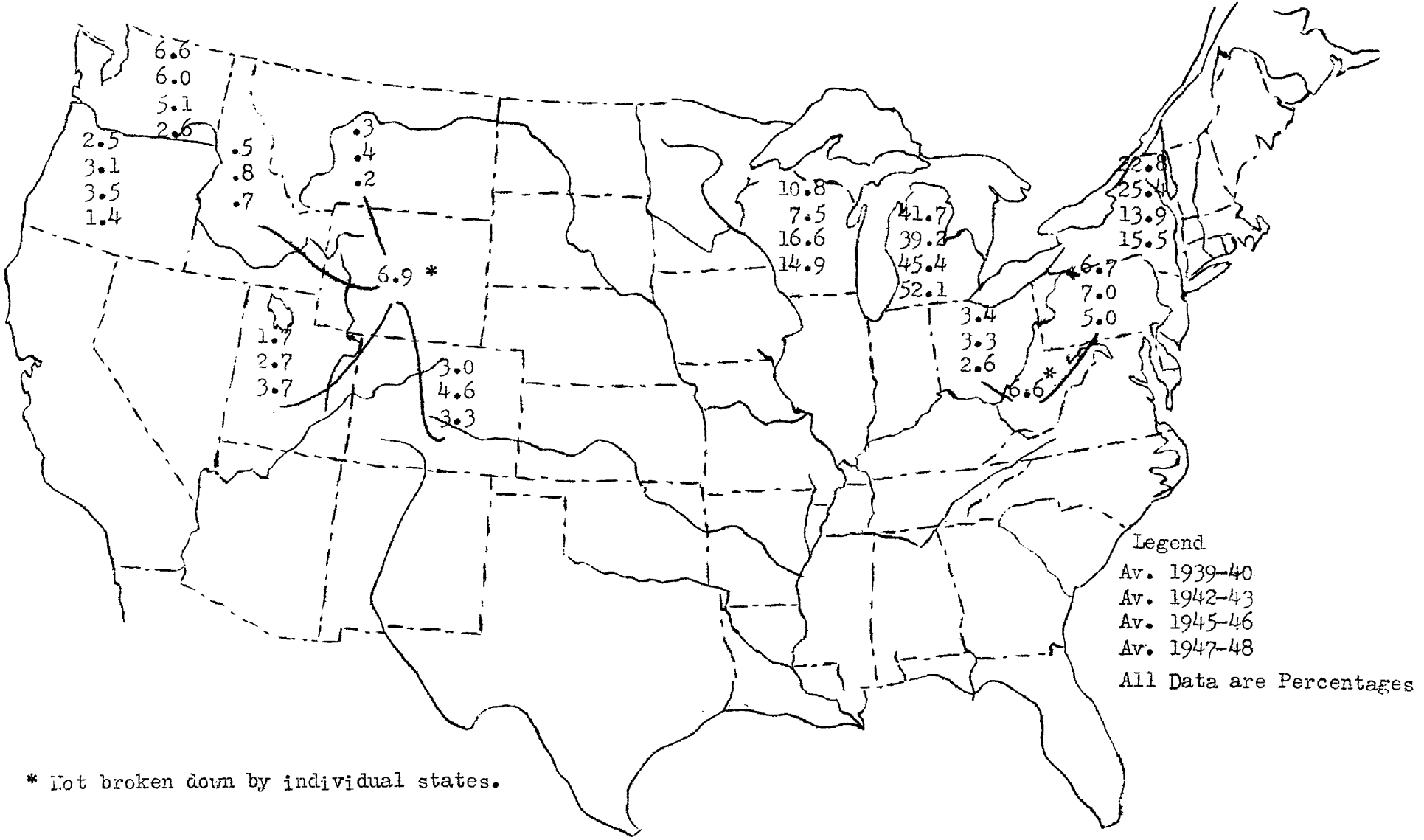


Figure 1. Relative Importance of Major Commercial Areas of Red Cherry Production, United States, Selected Periods, 1939 to 1948.

the red cherries produced in the five-state area. Within Michigan, eleven counties account for almost all of the commercially produced red cherries. New York's production is localized in about seven counties, while there are only one or two important counties each in Ohio and Pennsylvania. Wisconsin is a very important producing state and Door county, Wisconsin, is the most important red cherry producing county in the United States.

As between the seven western and the five eastern states, it should be pointed out that the production of sweet cherries is relatively unimportant in the eastern areas. California, for example, produced enough red cherries to be commercially important at one time, but as of 1946, there were no red cherries reported for commercial purposes.3/ Washington, Oregon, Montana, and Idaho produce about 90 percent sweet cherries and only about 10 percent red cherries. Utah produces about 50 percent of each, but more than 90 percent of Colorado's production is red cherries. In the five eastern states, Wisconsin does not report any sweet cherries as being commercially important. The other four states' production is divided about 90 percent for red cherries and only 10 percent for sweet cherries.4/

- -

3/ Computed from data in Carroll, Op. Cit.

4/ Even though both red and sweet cherries have similar cultural requirements, they are quite different for economic purposes. Sweet cherries are utilized primarily in their fresh form, used canned for desserts, or brined. Red cherries are mostly canned or frozen for use in pies or other bakery products. Thus, the two kinds of cherries, besides being grown in different areas, are handled differently and used for different purposes. They can hardly be considered as competing products even though they compete for the use of land within the same area.

Price and production stability. In general, the total production of cherries has been most stable from year to year in the sweet cherry producing states, while in the red cherry producing states considerable year to year variability has occurred.5/ Of all the states, the relative variability of production in Washington appears to be the least although there has been a marked upward trend in its production. Among the red cherry producing states there is a marked tendency for production to vary directly from year to year especially in the five eastern states. But the larger the production in a state, the greater seems to be the variability in total year to year production.

This tremendous variability in production from year to year would naturally be expected to be a contributor to year to year price instability. Since 1933, both prices and production of red cherries in the United States have exhibited an upward trend. The upward trend has been greater for prices than production. But production has exhibited considerably more variability about the trend than has prices. The expected relationship between production and prices would be inverse, i.e., when production rises from one year to the next, prices fall. However, from 1933 to 1948 this did not appear to be a consistent relationship. In seven of the sixteen years the relationship was direct, i.e., when production rose, prices also rose. The conclusion reached upon examination of these price-production relationships is that the two variables are not highly correlated.6/

- -

5/ Op. Cit. cf. Tables 19-22, pp. 50-53.

6/ Cf. Chapter V.

Although the price of sweet cherries usually follows the price of red cherries very closely, there have been discrepancies through time that have probably been the cause for part of this lack of correlation between prices and production of all cherries in the United States as a whole. Sweet cherries usually sell higher than red cherries, but in 1946 red cherries were about one cent per pound higher than sweet cherries. This discrepancy was even greater in 1949 after they had sold for about the same price in 1948. Thus, there appears to be a narrowing of the spread between the prices of red and sweet cherries.

As was mentioned previously, five of the seven red cherry producing states are located in the East and produce the bulk of the total United States commercial output. Of these five states, Michigan has been the most important producing state (Table I). Michigan's 1948 production of 69 thousand tons represented 56 percent of the total 5 state production. Wisconsin's 25 thousand ton output was almost 20 percent of the total while New York's production of 20.5 thousand tons accounted for about 17 percent of the total 5-state production. Pennsylvania and Ohio together had about 7 percent of the total.

The trends in production in individual states are worth noting. The general trend in production in Michigan has been upward, and in recent years the total production has surpassed the total 5-state output or earlier so-called normal years. New York has had no perceptible trend in production since 1931. As compared with total output, New York's position has declined relative to the total. Wisconsin has shown an irregular upward trend and in recent years has been a higher producing state than New York. Since Wisconsin's commercial producing area is

highly localized in and around Door County, total production is especially susceptable to the vicissitudes of the weather in this vicinity. This, in part at least, accounts for Wisconsin's wide variations in total production from year to year in addition to the variation due to the upward trend. Production in Pennsylvania appears to have been fairly stable since 1931. This means then that Pennsylvania's total production is declining relative to the total. Ohio has been a relatively unimportant producer in comparison with the other states. Ohio's production has tended to decline both absolutely as well as relatively since 1931. Thus, Michigan, New York, and Wisconsin are the large producers with Pennsylvania and Ohio being important only in somewhat of a marginal sense.

5-State production and prices. Narrowing the concept of total production from that used in connection with the output in twelve states, red cherry production only in these five states, as computed in Table I, may be compared with prices (Figure 2). Here the upward trend in production as well as the irregularity in production from year to year shows up. Prices also have tended upward although recently there appears to have been a tendency for them to remain below the trend. Production and prices have moved in the same direction in seven of the eighteen years since 1931. The magnitude of these movements would lead one to the conclusion that the correlation between Michigan farm prices and the 5-state production of red cherries is also low. However, the fluctuations appear to be of less magnitude than those comparing 12-state production and prices which would indicate a somewhat higher correlation.

Table I. -- Production of Red Cherries, 5 States, 1931 to 1948.

YEAR	STATE					
	Michigan	New York	Wisconsin	Pa.	Ohio	Total
	tons	tons	tons	tons	tons	tons
1931	23,300[a]	15,860[b]	8,060[c]	6,700[d]	6,700[e]	60,620
1932	23,300[a]	23,302[b]	10,030[c]	6,610[d]	4,190[e]	67,432
1933	32,200[a]	9,930[b]	11,000[c]	3,400[d]	3,770[e]	62,300
1934	32,900[a]	18,190[b]	7,760[c]	5,420[d]	5,180[e]	69,450
1935	33,900[a]	20,220[b]	10,900[c]	6,749[d]	6,300[e]	78,060
1936	34,600[a]	11,740[b]	2,400[c]	3,410[d]	1,600[e]	53,810
1937	39,300[a]	19,200[b]	10,600[c]	6,290[d]	3,830[e]	79,220
1938	19,000	15,500	7,700	4,000	1,880	48,080
1939	38,400	26,000	7,800	7,200	3,780	83,180
1940	45,600	20,000	13,900	6,300	3,160	88,960
1941	27,700	14,500	15,600	7,300	4,380	69,440
1942	46,500	27,000	8,400	7,400	4,050	93,350
1943	10,800	10,100	2,600	2,900	650	27,050
1944	50,000	19,400	15,000	7,900	2,770	95,070
1945	14,000	7,300	7,300	3,600	2,200	34,400
1946	60,500	15,500	20,000	4,600	2,100	102,700
1947	49,500	14,800	9,000	4,600	2,120	80,020
1948	69,000	20,500	25,000	6,500	1,760	122,760

a/ Estimated from relationship between pack and production in later years.

b/ Estimated from average relationship of 88.3 percent between red and total cherry production in later years.

c/ Estimated at 100 percent of total cherry production.

d/ Estimated from a projection of trend backwards from 1938 at a rate 8.5 percent per year beginning with 74 percent as the average relationship between red and sweet cherry production.

e/ Estimated from average relationship between red and total cherry production at 85.3 percent.

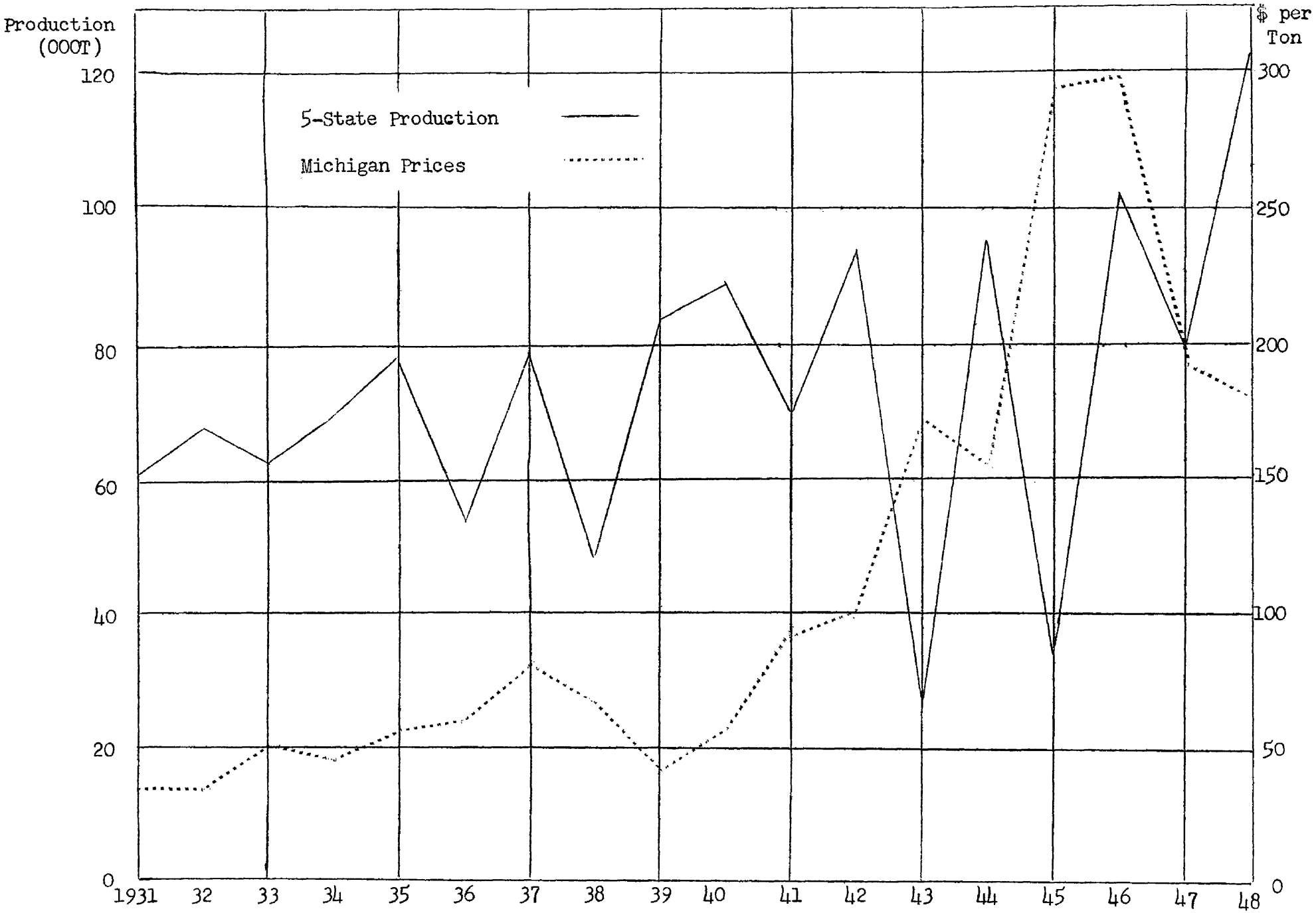


Figure 2. Red Cherry Production in 5-States and Prices per Ton in Michigan, 1931-48.

As has already been mentioned, Michigan has been the most important of the commercial red cherry producing states. Because of this, production in the 5-state area is heavily weighted by the production in Michigan. Consequently, there is a large amount of similarity between the movement of production in the 5-state area and the movement of production in Michigan. There has also been an upward trend in production in Michigan since 1931. Also, there has been tremendous year to year variation, especially since 1940. This phenomenon seems to be consistent with the production patterns of the other producing areas. This could reasonably be due to the fact that as production tends upward, hazards such as weather influence the size of the crop proportionately more. That is, areas representing either a further extension of the margin or a further intensification of the margin would be similarly affected. For example, an extension of the margin by bringing in new lands usually means that the land is less suitable than that already under cultivation. With extremely favorable exogenous conditions the production potential is great, but the hazards are usually equally as great with unfavorable exogenous forces. A further intensification of the margin of cultivation usually increases its vulnerability to these exogenous forces unless they tend to counteract these influences. Applying more fertilizer, following better pruning practices or initiating other similar cultural practices might increase an area's vulnerability to the vicissitudes of the weather. However, if the improved methods included such things as irrigation to combat drouth or smudge pots for protection from frost, the effect of these hazards of nature are reduced. The first group of practices are probably more prevalent than the second so that it is safe to assume that intensification as well as extensification increases the

potential year to year variability of red cherry production.

Red cherries and farm income. As was pointed out earlier, the farm value of cherries in the United States totalled about fifty million dollars in 1947. In Michigan alone, the farm value of the production of red cherries exceeded eighteen million dollars (Table II). In the more recent years, the total value has been about ten million dollars. The total value of the five leading fruit crops (apples, peaches, pears, grapes, and plums), excluding cherries, that are grown in Michigan have been important sources of income for Michigan farmers, totalling a high of thirty-four million dollars in 1946. Percentagewise, cherries have yielded as low as only seven percent as much income as the other five fruits in 1943 and as high as about sixty-four percent in 1948.

Table II -- Total Value of Production of Six Fruits, Michigan, 1936-48.

YEAR	CROP					
	Apples	Peaches	Pears	Grapes	Plums	Red Cherries
	(thousands of dollars)					
1936	6,488	2,841	971	1,246	144	2,076
1937	5,141	2,899	869	1,201	178	3,183
1938	4,600	2,112	901	640	112	1,273
1939	4,802	2,442	727	1,259	179	1,613
1940	5,245	2,394	926	955	192	2,645
1941	6,322	3,275	1,091	1,202	215	2,548
1942	9,406	4,600	1,300	2,622	277	4,650
1943	13,719	6,848	1,077	3,731	410	1,858
1944	15,301	10,368	1,782	3,168	585	7,800
1945	4,225	10,120	350	1,863	224	4,116
1946	15,876	10,200	1,636	4,247	600	18,029
1947	8,296	7,650	1,398	3,740	420	9,504
1948	8,936[a]	6,703[a]	739[a]	2,835[a]	332[a]	12,420[a]

Source: Crop Reports for Michigan, 1947 and 1949.

a/ Preliminary.

The industry in Michigan tends to be localized along the eastern shores of Lake Michigan to a depth of one or two counties and this area probably constitutes the area of first choice insofar as red cherry production is concerned in the United States (Figure 3). Adhering more precisely to the principle of first choice which states that: "Prices will tend to be such that the (commodity) with the more limited total potential area will have the choice of the territory",1/ the optimum location for cherries in Michigan is the Grand Traverse Bay area. In the two counties, Grand Traverse and Leelanau, thirty-seven percent of the bearing trees of the state are located. Midway along the shoreline towards the south is Oceana county which has about twenty percent of the state's tree population. Berrien county in the extreme southwestern corner of the state is the only other county in Michigan with ten percent or more of the tree population of the state. These four counties which have about seventy percent of Michigan's red cherry production potential constitute the heart of the area of first choice for the crop and illustrate the high degree of the localization of the industry within the boundaries of the state.

Aside from the major producing area along the shores of Lake Michigan there are two other areas of minor economic importance. One is located in south-central Michigan and the other is located in the "thumb" area. In the south-central area the soil and its topography is especially adapted to fruit culture but the climate is sometimes rather hazardous. The climate of the thumb area of Sanilac and Lapeer counties is tempered somewhat by the lakes which lie to the east. Neither of these latter two areas is important economically, yet they represent the only commercial production areas outside of what is commonly considered as the cherry producing area in Michigan.

1/ Richard T. Ely and George S. Wehrwein, Land Economics,(New York: The

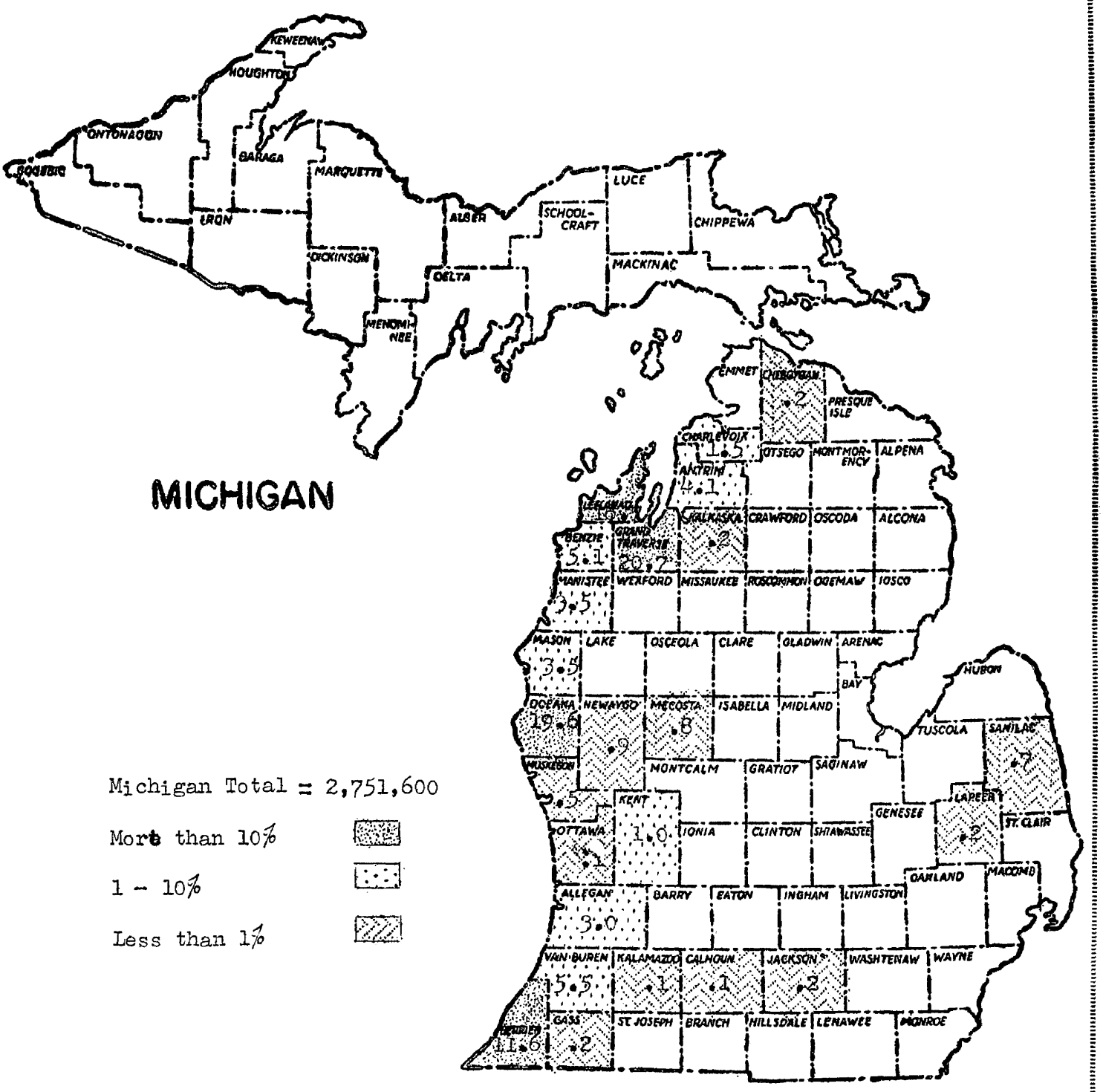


Figure 3. Percent of Bearing and Non-Bearing Red Cherry Trees by Commercial Counties, Michigan, 1948.

Production and price trends. Red cherry production has been increasing over a period of years in the United States as well as in Michigan. One measure of the growth of the production of cherries is the number of bearing trees (Table III). The census makes no distinction between red and sweet trees, yet the data are fairly representative of the red cherry production situation. These data show a steady increase in the number of trees from 1890 to 1935. Following 1935, tree numbers have declined primarily as a result of the lack of replacement stock from the non-bearing group. For Michigan there was an increase in the ratio of non-bearing to bearing trees in 1948 which will tend to offset a future decline in tree numbers. But tree numbers are not accurate measures of production. The weather, of course, is always a hazard that is difficult to reckon. Then, too, technology improves through time. When all factors are considered, and even though tree numbers have fallen since 1935, there has

Table III. -- Red Cherry Tree Numbers in Principal Cherry Producing States, 1890-1945.

Census Year	Trees in Red Cherry Producing States		Trees in Michigan	
	Bearing	Non-bearing	Bearing	Non-bearing
	millions of trees			
1890	1.75	----	.45	---
1900	3.51	----	.90	---
1910	4.17	2.00	.76	.54
1920	4.71	1.21	1.08	.35
1930	3.84	2.20	1.19	.99
1935	5.88	1.61	2.25	.54
1940	5.12	1.07	2.14	.39
1945	4.50*	----	2.07**	.68**

Source: Carroll, op. cit., p. 6.

* Estimated.

** For 1949 from Michigan Cooperative Crop Reporting Service, Lansing, Michigan.

been a general trend upward in total production. Whereas the total production fluctuated around the seventy-five thousand level in the early 'thirties, it had increased about twenty-five thousand tons to one-hundred thousand tons by the late 'forties. This general upward trend was also true for Michigan. In Michigan, the total amount of red cherries produced increased from about thirty-five thousand tons to more than fifty thousand tons from 1933 to 1948. During this period of generally rising price levels, the incentives were for more intensive culture of existing orchards as well as for an expansion in the number of orchards.

The rather severe fluctuations that have occurred in total production in addition to the general trend upward, are characteristic of the production of most other deciduous tree fruits. Production tends to be fairly high one year and small the next. With cherries, and with few exceptions for both the United States and Michigan, this pattern has been borne out. Two exceptions to this pattern during the years 1933 to 1948 were 1935 and 1940 when production increased for the second year in a row in both cases.

Problems associated with growth. This rapid growth of the red cherry industry has caused the magnification of some of the problems that have existed in the past in the red cherry industry in Michigan. At the farm level many exogenous forces wield a decided influence upon the growers actual or anticipated production, price, and income. As is true with most fruit crops, the weather is probably the most important single potential hazard facing the producer. Unfavorable weather in almost any season of the year is dangerous. However, from bloom to harvest time, favorable weather is extremely important in order for growers to be assured of high

production. From an individual grower's standpoint, he is usually interested in high production regardless of the level of aggregate production. It is generally assumed that most fruits have an inelastic demand. In such cases, restricted or low production yields higher total revenues to all growers than unrestricted or high production. But without production control or restrictions, an individual grower will attempt to maximize his profits under his assumptions as to future price expectations and anticipated production. The ideal situations exists of course, when expectations are single-valued and are fulfilled for all growers. However, when an individual's production anticipations are fulfilled and other growers have overestimated production (i.e. aggregate production is low), the individual gains a relatively more advantageous position. Price and production are the big uncertainties confronting producers. As the harvest season approaches, the volume of production becomes more and more certain. When production is fairly well determined, then the price must be established. The price is usually established just prior to or at the beginning of the harvest season. The aim of the growers and packers is to agree on a price that will not change as the harvest season progresses unless other exogenous forces act to materially change the actual production from that estimated.

Summary. Some of the economic problems facing the red cherry industry have been considered. These problems hinge directly on price uncertainty and its effect upon income. An objective analysis, though limited by the kind and quality of the available analysis, should indicate quantitatively what has had to be judged heretofore as qualitative. Further, by employing independent variables in the analysis which can be fairly accurately estimated prior to the harvesting season producers should be provided with a tool which will reduce the price and income uncertainty confronting them.

CHAPTER V

FACTORS AFFECTING FARM PRICES OF CHERRIES

As mentioned in Chapter IV, the volume of production of red cherries had little effect upon farm prices. This statement needs to be explored more thoroughly, but certainly other factors which may have some influence upon prices need to be investigated for possible relationships. All of the factors that can possibly be considered may be categorized as being factors affecting the supply of or factors affecting the demand for the product. After properly evaluating the desirability, as well as the feasibility, of using various price indicators, the relationship may be mathematically developed and analyzed.

Enumeration of factors. One of the largest and most important cherry packers[1/] in the state listed twelve points as important price influencing factors. These points will be considered in the light of how reliably each is either measureable or available as a guide for market price determination.

1. The size of the oncoming crop. This has previously been mentioned as one of the most important and uncertain of the factors affecting prices. There seems to be an upward trend in production, yet there is a high degree of variability from year to year about the trend line. In the Michigan Cooperative Crop Reporting Service's estimates there tends to be a conservative bias, especially in the years following crops with high prices. Then too, individual estimates are usually in terms of the conditions as some percent of normal or of the previous year. This type of estimate largely ignores the new orchards that come into bearing in the current year.

1/ A. J. Rogers, Manager of Cherry Growers, Incorporated, Traverse City, Michigan, in a discussion before a marketing seminar at Michigan State College in March, 1950.

2. The size of oncoming competing crops. There is widespread belief that crops such as peaches, apricots, apples, and strawberries are large competitors with cherries on the market. Since the cherry crop is one of the earliest on the market, it is difficult to predict with any high degree of accuracy, how large these competing crops will be. Even if the size of these crops was accurately known, it would be difficult to measure its influence upon market prices.

3. The amount of the old crop carried over and its rate of movement. These data are accurate and available for stocks in packers hands. For this portion of the pack, the geographic location is available. However, no data are kept to give an indication of stocks at other stages in the channels of trade. Location of these stocks geographically as well as their size are important price influencing factors.

4. The stocks of other processed competing fruits. Most processed fruits that are used in bakery products compete with red cherries. Apples are usually stored in their fresh form and are considered to be fairly strong competitors with red cherries for pies and cobblers. Stocks of these products are available from various sources, and can be used as a guide in price making. But, again, the exact quantitative relationships are difficult to formulate.

5. The levels of and trends in economic conditions. Unemployment caused by strikes or lay-offs even in local market areas can drastically reduce the quantities of cherries utilized. Levels of income and trends in economic activity directly influence the level of demand and consequently the price at which a given pack can be sold.

6. The development and acceptance of new uses for consumption. Attempts are continually being made to expand the market for new uses

or for uses of new forms of the product. To mention a few, cherries may be brined and candied, packed in heavy syrup for use as table desserts, or glaced. These developments tend to increase consumer demand for the product, but their price effects are very difficult to measure.

7. The direct and the derived effects of government purchases. During and since World War II, the government has bought large quantities of cherries for military uses. Naturally this buying helped to increase the demand by augmenting civilian purchases. But just as important as the direct effect of government buying is the derived effect of these purchases through the cultivation of a desire for the product by individuals which continues after their release from the military service.

8. The credit available to packers for financing purchases and storage. A small packer with a poor credit rating and no regular sales outlet must reduce his prices below the prevailing levels in order to attract purchasers. By doing so, he constitutes a bearish factor on the market which adversely affects the well-financed established packer by forcing him to reduce his price.

9. The extent and persistency of grower demands. Growers in some localities are organized to the extent that they are able to exert a monopoly influence upon prices. The strength of their market power is such that concerted action on the part of the group definitely affects prices. Whether the net result has been favorable or unfavorable is difficult to say, but the immediate short-run effect is bullish at the farm level, and probably bullish also at the packer level.

10. The effect of advertising. The National Red Cherry Institute is primarily a promotional organization for red cherries at the nation-

al level. Michigan has an optional grower deduction of .001 dollars per pound which is paid into the Michigan Cherry Commission to be respent for advertising the red cherry. Pie baking contests are sponsored, queens are selected, festivals are held -- all of which are designed for promotional purposes. Aside from the original amount of money spent by the Institute or the Commission, much more advertising is received in connection with the advertising by complementary industries. Bakeries, flour companies, and ice cream manufacturers advertise cherries in connection with their products. Measuring the effects of advertising are very difficult, but in general it also has a bullish effect upon prices.

11. The type of purchases made by consumers. Institutions or even consumers may follow a policy of buying hand-to-mouth because of their deflationary bias. If purchases are made with this intent, the product is moving directly into consumption. However, the same quantity may be purchased and inventoried because of an inflationary bias. This kind of a purchase policy may eventually result in a backlog of the product on the market and have a bearish effect. No data are available to check these policies or measure their influence upon prices.

12. The quality of the pack. Damage from weather, insects, and diseases results in a low quality pack that may discourage sales and cause reduced prices. On the other hand, a pack of exceptionally high quality tends to bolster prices. An evaluation of quality is almost entirely subjective and the relation of quality to price is a qualitative judgment that is very difficult to measure.

These twelve considerations are fairly comprehensive yet at least one addition need be made. That addition would be the cost factor. Changes in the cost of pack other than the fruit costs change with var-

iations in economic activity. Transportation rates, the cost of the package, labor costs, and other marketing costs necessarily influence the price of the pack.

Measures of supply. Let us first consider the supply side. Some measure of production within a prescribed area first comes to mind as a possible factor affecting price. Production figures are numerous as was apparent from the discussion in the last chapter.

For the five eastern states, the results of independent estimates were shown in Table I in Chapter IV. These production figures appear to be fairly accurate and are probably more exact for purposes of price analysis than the more inclusive measurements for all years. And since the actual data are not available, the estimation of total production for five states based upon individual estimates for each state is probably more accurate than the individual estimates. These data should be fairly good as estimates of production on the supply side.

Other than an estimate of total production there are no other data that appear adequate for analytical purposes on the supply side. Some measure of carry-over from one year to the next would be very desirable. The only data available, however, are those pertaining to stocks in canner's hands for case goods plus some data for cold storage holdings. These data are so limited, both in scope and amount, that they fail to be of any real practical value.

Measures of demand. On the demand side the data are more numerous and selection of the proper indicators is more difficult. Some measure of aggregate demand such as national income, disposable income, or the like must be used. The components of national income and product aggre-

gates may be listed as follows:[2/]

A. National Income

1. Compensation of Employees
2. Wages and Salaries
3. Supplements to Wages and Salaries
4. Income of Unincorporated Enterprises
5. Inventory Valuation Adjustments
6. Rental Income of Persons
7. Corporate Profits before Tax
8. Corporate Profits Tax Liability
9. Net Interest

B. Gross National Product

1. Personal Consumption Expenditures
2. Gross Private Domestic Investment
3. Net Foreign Investment
4. Government Purchases of Goods and Services

C. Personal Income and Disposition of Income

1. Wage and Salary Receipts
2. Proprietors' and Rental Income
3. Personal Interest Income
4. Transfer Payments
5. Personal Tax and Non-tax Payments
6. Personal Consumption Expenditures
7. Personal Saving

D. Reconciliation Items Between National Income and Gross National Product

1. Depreciation Charges
2. Accidental Damage to Fixed Capital
3. Capital Outlays Charged to Current Expense
4. Indirect Business Tax and Non-tax Liability
5. Subsidies Minus Corrent Surplus of Government Enterprises
6. Statistical Discrepancy

It should be noted that the gross national product is equal to national income except for the entries listed under item D. Further, the item personal consumption expenditures appears as a component of both gross national product and national income. Under item B, personal

---

2/ Anonymous, National Income Supplement to Survey of Current Business, United States Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D. C., July 1947, pp. 8-10.

consumption expenditures consists of the difference between gross national product and the entries 2, 3, and 4 under item B. However, personal consumption expenditures as listed under item C is equal to the summation of items 1 through 4 less item 5 which equals what is commonly termed disposable personal income. Disposable personal income less personal savings is then equal to personal consumption expenditures. In the income classification, personal consumption expenditures is roughly equal to income to individuals less personal taxes and savings.

Most price analysis studies have used disposable personal income as the measure for aggregate demand. This is particularly true for the studies of the Bureau of Agricultural Economics. However, for general purposes of price analysis, personal consumption expenditures can be justified about as easily as the more inclusive figure of disposable personal income since personal savings is the only difference between the two measurements.

Because of the change in the amount of savings through time, personal consumption expenditures correlates higher with farm prices of red cherries than did disposable personal income.3/ Until the revision of the national income estimates in 1947 there was no such classification as personal consumption expenditures which is a further important reason for its limited use in price analysis.

Personal consumption expenditures have risen in all the years since 1932 except for a slight decline from 1937 to 1938 (Figure 4). From 1929

3/ The two measurements of aggregate demand were checked graphically with farm prices of cherries. Although this should never be the sole criterion for the selection of variables it can be justified in this instance.

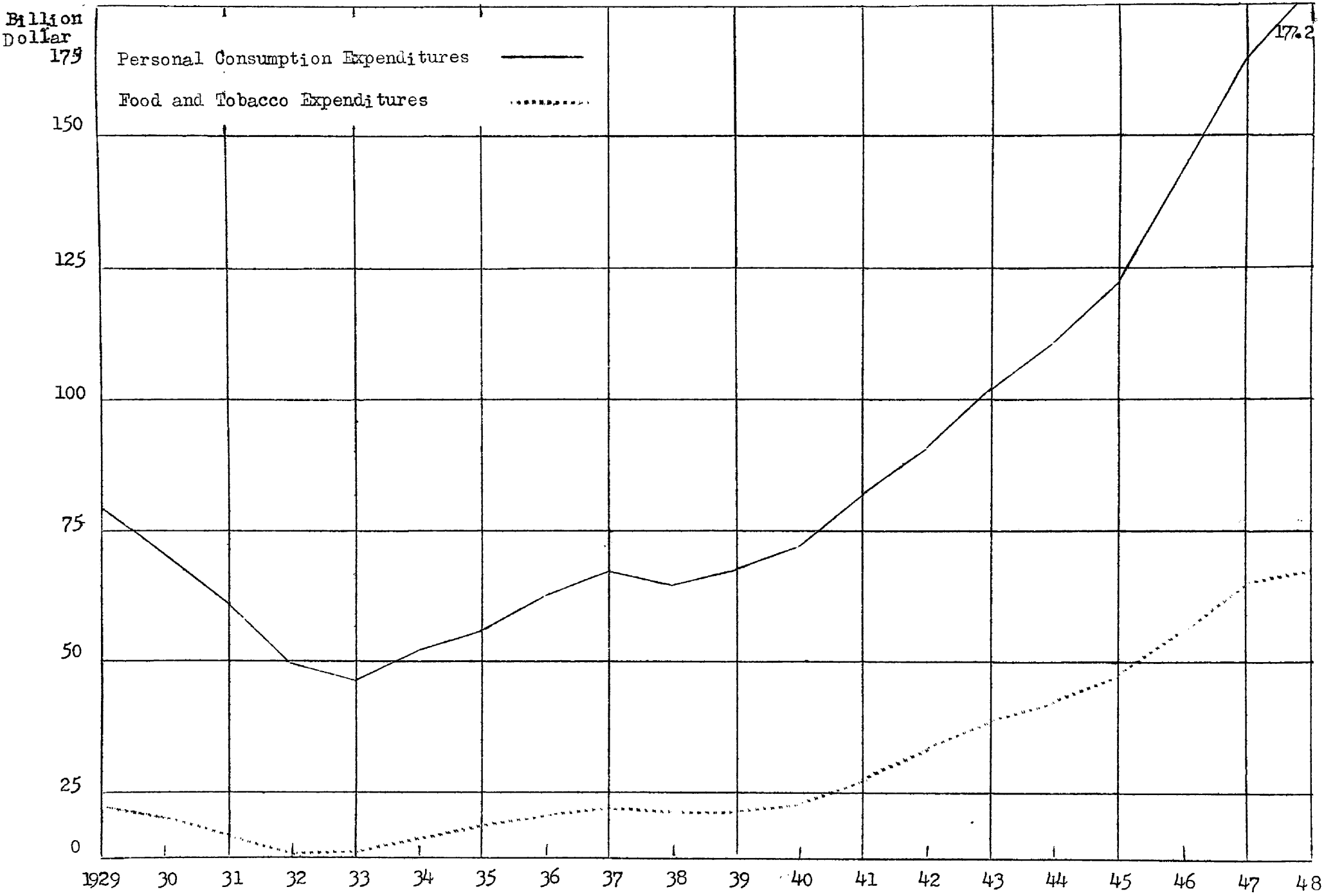


Figure 4. Personal Consumption and Food and Tobacco Expenditure, United States, 1929 - 48.

to 1933 the trend was also downward. Food and tobacco expenditures, which is one category of twelve included in the total figure for personal consumption expenditures, have varied directly with personal consumption expenditures except from 1932 to 1933. However, the magnitude of variation has been considerably less for food and tobacco expenditures than for the total consumption expenditures figure.

Other indicators or reflectors of demand are income of industrial workers, prices received by farmers, and non-farm wholesale prices (Figure 5). The index of income of industrial workers has fluctuated considerably more than the expenditure indicators in Figure 4. Industrial workers' incomes fell from 1929 to 1932, then rose from the depression low to 1944 except for the downward readjustment from 1937 to 1938. The downward slide from 1944 to 1946 was a result of changes in the production process from war to peacetime goods. Beginning in 1943, the correlation between industrial workers' income and cherry prices was negative.

Prices received by farmers have followed the movement of personal consumption expenditures very closely since 1929. The variations in farm prices have been somewhat more pronounced, especially following the slump beginning after 1937. As compared with personal consumption expenditures, farm prices leveled off more from 1943 to 1945 and from 1947 to 1948. On the basis of correlation with farm prices of cherries it is difficult to make a selection of one of these variables in preference to the other.

The last of the three indicators shown in Figure 5, non-farm wholesale prices, exhibited considerably less variation through time than did any of the others. This can be explained in part by the fact that many

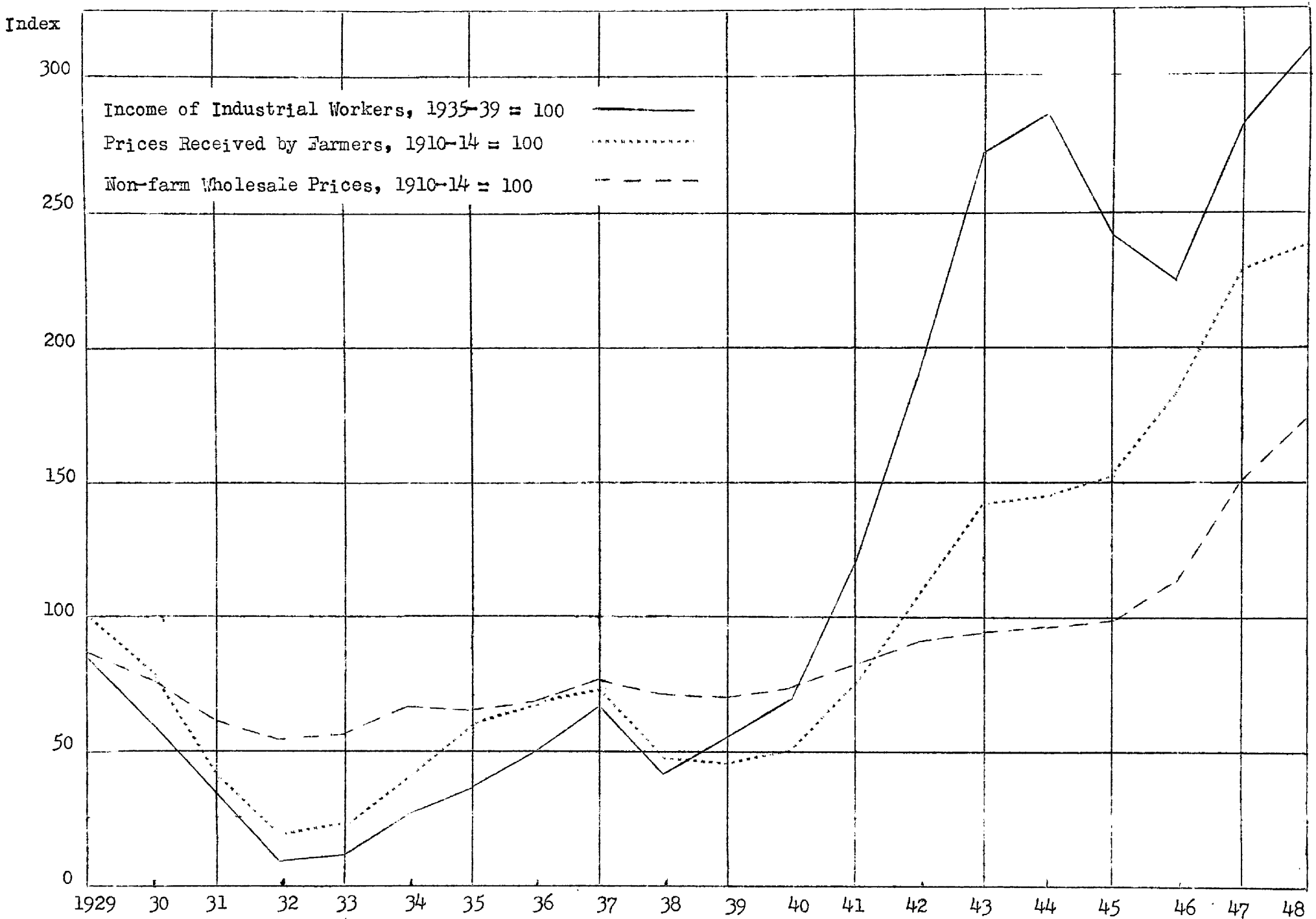


Figure 5. Indexes of Prices Received by Farmers, Income of Industrial Workers, Non-farm Wholesale Prices, United States, 1929-48.

non-farm prices remain rigid while production varies. In agriculture, production in the aggregate is relatively stable while prices fluctuate in order to move the goods into consumption. The relative stability of non-farm prices as compared with the farm price of cherries would tend to reduce the coefficient of correlation between the two variables.

As measures of demand and for purposes of selecting factors for estimating cherry prices, personal consumption expenditures seems to be a good indicator. The other indicator, income of industrial workers has been very erratic, especially since 1943. Aggregate indexes of prices of commodities are reflectors of demand rather than indicators. Of the two reflectors shown in Figure 5, the index of prices received by farmers seems to be superior to the index of non-farm wholesale prices.

The selection of a set of independent variables is difficult. For example, reflectors of demand such as the index of prices received by farmers are symptoms rather than causes of changes and demand. Yet it is possible to get disparities between aggregate indicators and aggregate reflectors of demand. This happened in the 1920's when the economy as a whole was prosperous and profits were expanding while the prosperity of agriculture was declining. Since data for cherry prices are not available during this period it is impossible to ascertain which of the two measurements are most accurate for indicating cherry prices.

Before proceeding with the actual statistical analysis, a decision had to be made concerning the years to include. The inclusion of the abnormal years during the war materially alters the results obtained. But all of the years were not equally abnormal insofar as red cherry prices were concerned. The year 1946 was the most abnormal of any of the years. This could be accounted for in part by the fact that O. P. A. price ceil-

ings were removed during the year and prices skyrocketed in spite of the fact that the largest crop in history was in prospect. In 1945 there was a short crop and the government bought the entire canned pack. In the previous year, 1944, wartime restrictions were keenly felt in the industry, but prior to then the relationships were fairly consistent. The type of controls imposed during the war were not serious yet in 1942, and were relieved somewhat of their full impact by the relatively short crop in 1943. Therefore the years of 1944, 1945, and 1946 were the most serious. By 1947 and 1948, the situation within the cherry industry was nearly normal when viewed in a post war perspective.

Analysis of factors affecting farm prices. The correlation matrix for the Michigan farm price of cherries (X_1), 5-state production (X_2), personal consumption expenditures (X_3), all farm prices (X_4), and time (X_5), for the years 1933 to 1948 including 1944, 1945, and 1946 was,

	$r_{\cdot 1}$	$r_{\cdot 2}$	$r_{\cdot 3}$	$r_{\cdot 4}$	$r_{\cdot 5}$
$r_{1\cdot}$	1	.000	.917	.953	.884
$r_{2\cdot}$	.000	1	.005	.004	.000
$r_{3\cdot}$	.917	.005	1	.982	.938
$r_{4\cdot}$	.953	.004	.982	1	.905
$r_{5\cdot}$	.884	.000	.938	.905	1

and the regression equation[4/] for this matrix was

$$\hat{X}_1 = 0.000X_2 - 0.01428X_3 + 1.272X_4 + 4.81X_5 - 12.219.$$
$$\quad (0.0045) \quad (1.6891) \quad (1.6449) \quad (.4171)$$

Using this regression equation and substituting the mean values for

---

4/ This and subsequent regression equations were computed by the Doolittle method from the matrix of correlation coefficients. The numbers in parentheses below the regression coefficients are the corresponding t-values.

three of the four independent variables at a time into the equation, the net relationships between the dependent and one independent variable may be shown when the other independent variables are held constant at their mean values. This procedure yielded a zero slope to the regression line which expressed the net relationship between the Michigan farm price of cherries and 5-state production (Figure 6). For these two variables, the coefficient of correlation was also zero. In other words, the regression equation is one hundred percent as efficient when total 5-state production is omitted. The net relationship between the Michigan farm price of red cherries and personal consumption expenditures for the same time period turned out to be negative (Figure 7). This occurred in spite of the positive correlation between the two variables. From the net regression equation, a change of one billion dollars in personal consumption expenditures resulted in a change of only 1.43 dollars per ton in the price of cherries in the opposite direction.

The relationship between the index of United States farm prices and the farm price of red cherries with the other independent variables held constant was highly positive (Figure 8). As a measure of demand, the negative effect of personal consumption expenditures was more than counteracted. A rise of 10 points in the index of all farm prices was accompanied by an increase of about 13 dollars per ton in the Michigan farm price of cherries.

The net relationship between time and the Michigan farm price of red cherries was also positive (Figure 9). On the average an increase in time of one year was accompanied by an increase in the price of 4.80 dollars per ton. This is a reflection of the general upward trend in prices through time in addition to the upward trend in the other independent

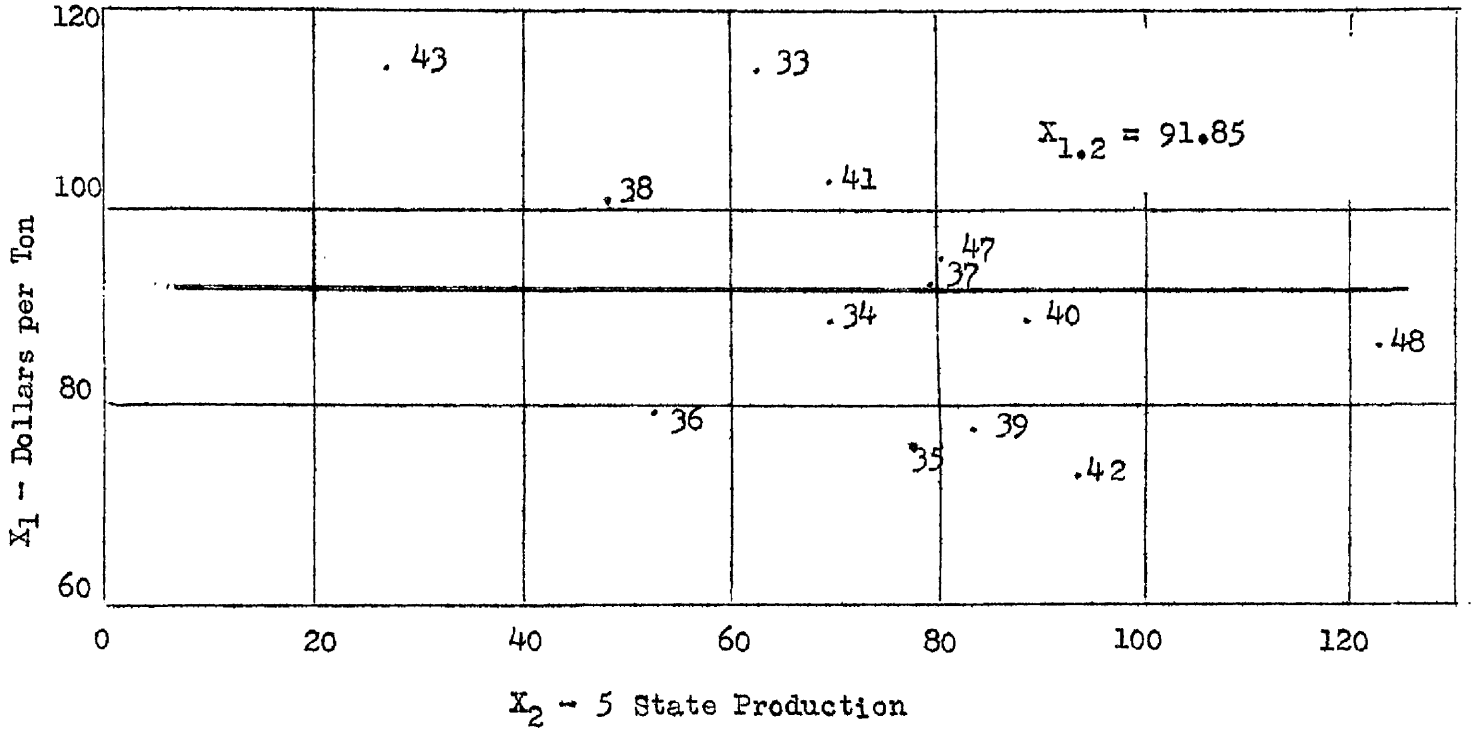


Figure 6. Average Relationship Between Michigan Red Cherry Farm Prices and 5-State Production with Consumption Expenditures, United States Farm Prices, and Time Held Constant, 1933-48, excluding 1944, 1945, and 1946.

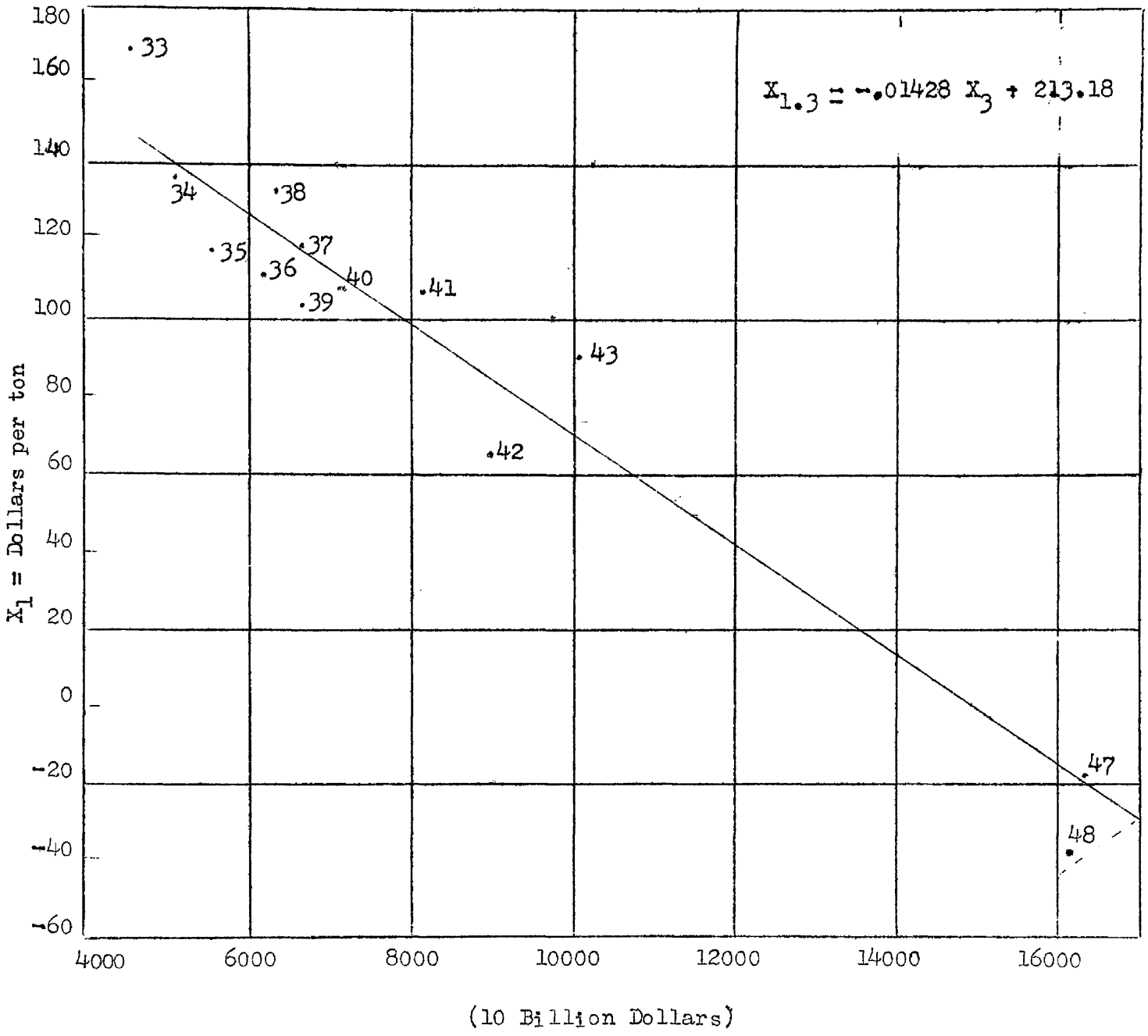


Figure 7. Average Relationship Between Michigan Red Cherry Farm Prices and United States Personal Consumption Expenditures with 5-State Production, United States Farm Prices, and Time Held Constant, 1933-48, excluding 1944, 1945, and 1946.

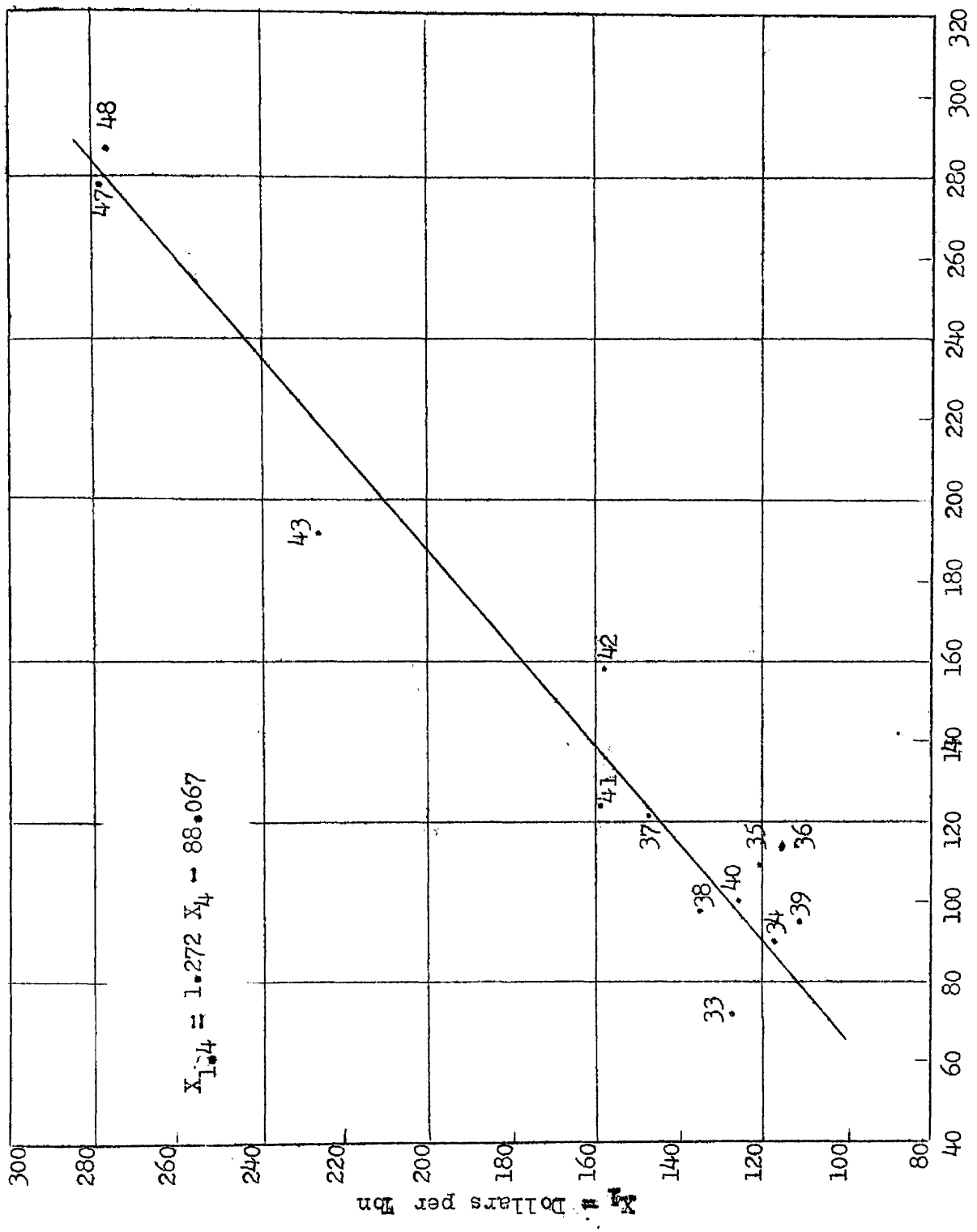


Figure 8. Average Relationship Between Michigan Red Cherry Farm Prices and United States Farm Prices with 5-State Production, United States Personal Consumption Expenditures, and Time Held Constant, 1933-48, excluding 1944, 1945, and 1946.

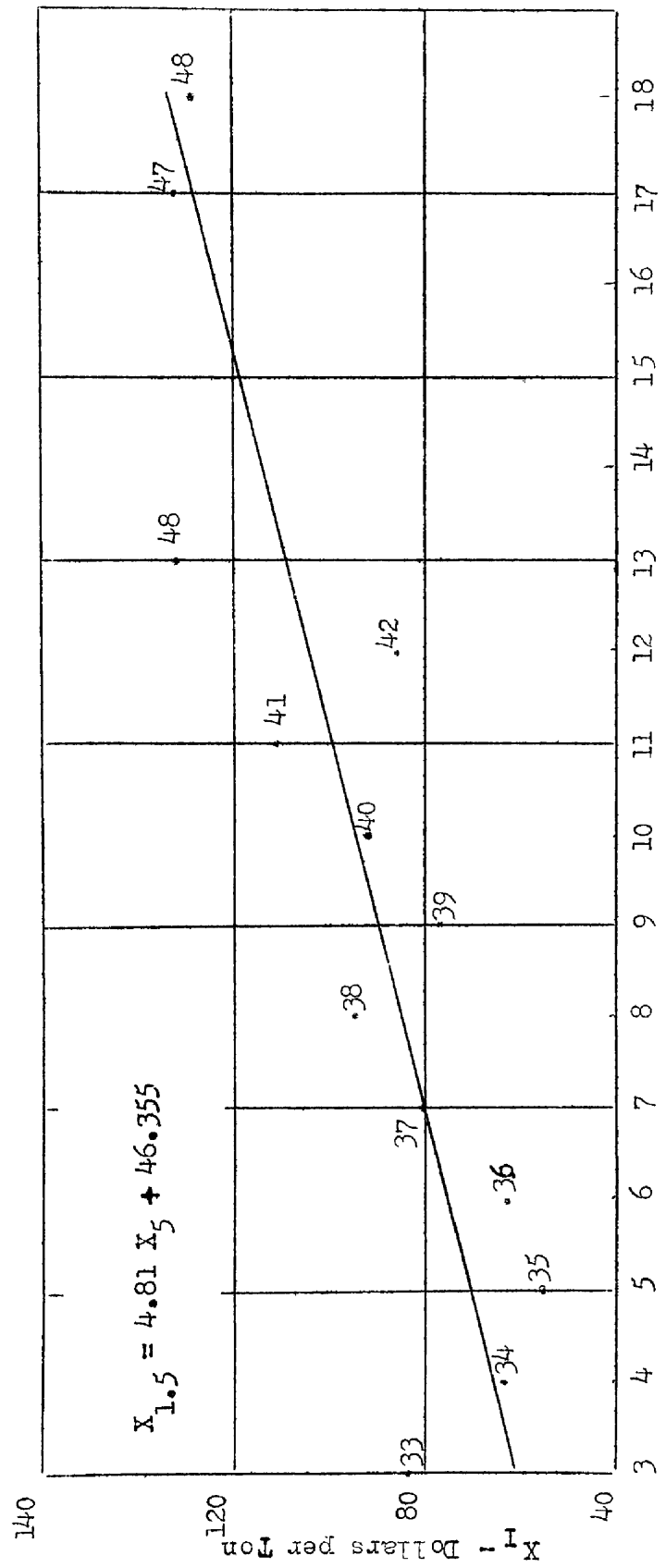


Figure 9. Average Relationship Between Michigan Red Cherry Farm Prices and Time with 5-State Production, United State Personal Consumption Expenditures, and United States Farm Prices Held Constant, 1933-48, excluding 1944, 1945, and 1946.

variables. The inclusion of time seems to be justifiable since the upward trend in cherry prices was not entirely accounted for by any of the other variables. There have been other influences, perhaps qualitative in character, that were measurable by including the variable time. From the standpoint of accurate forecasting, this variable should be reconsidered periodically in order that bias, particularly at a turning point in the business cycle, from its inclusion may be guarded against.

The results of estimating prices from these variables for the included years were fairly good even though the volume production had no net influence (Figure 10)5/. The largest error was about 23 dollars per ton in 1943 and the smallest error was 0.22 dollars per ton in 1937. The standard error as a percent of the mean was about 14 percent. In all of the years except from 1933 to 1934, the direction of the movement in estimated prices was correct. That is, the variables used indicated the proper direction movement of prices even though the estimated level was in error. The greatest use for this analysis is not in forecasting future cherry prices, but in analyzing the separable effects of the independent variables. Then, too, the earlier mentioned precaution that the relationships between the farm price of cherries and the two independent variables, personal consumption expenditures and the index of all farm prices, may be inconsistent sometime in the years ahead just as there was a disparity in the movement of these variables in the 'twenties. If and when such a disparity appears, the validity of these separate effects should be challenged.

5/ The coefficient of multiple linear correlation, $r_{1.2345}$, was equal to .968 and the standard error, $s_{1.2345}$, was equal to 12.9 dollars per ton.

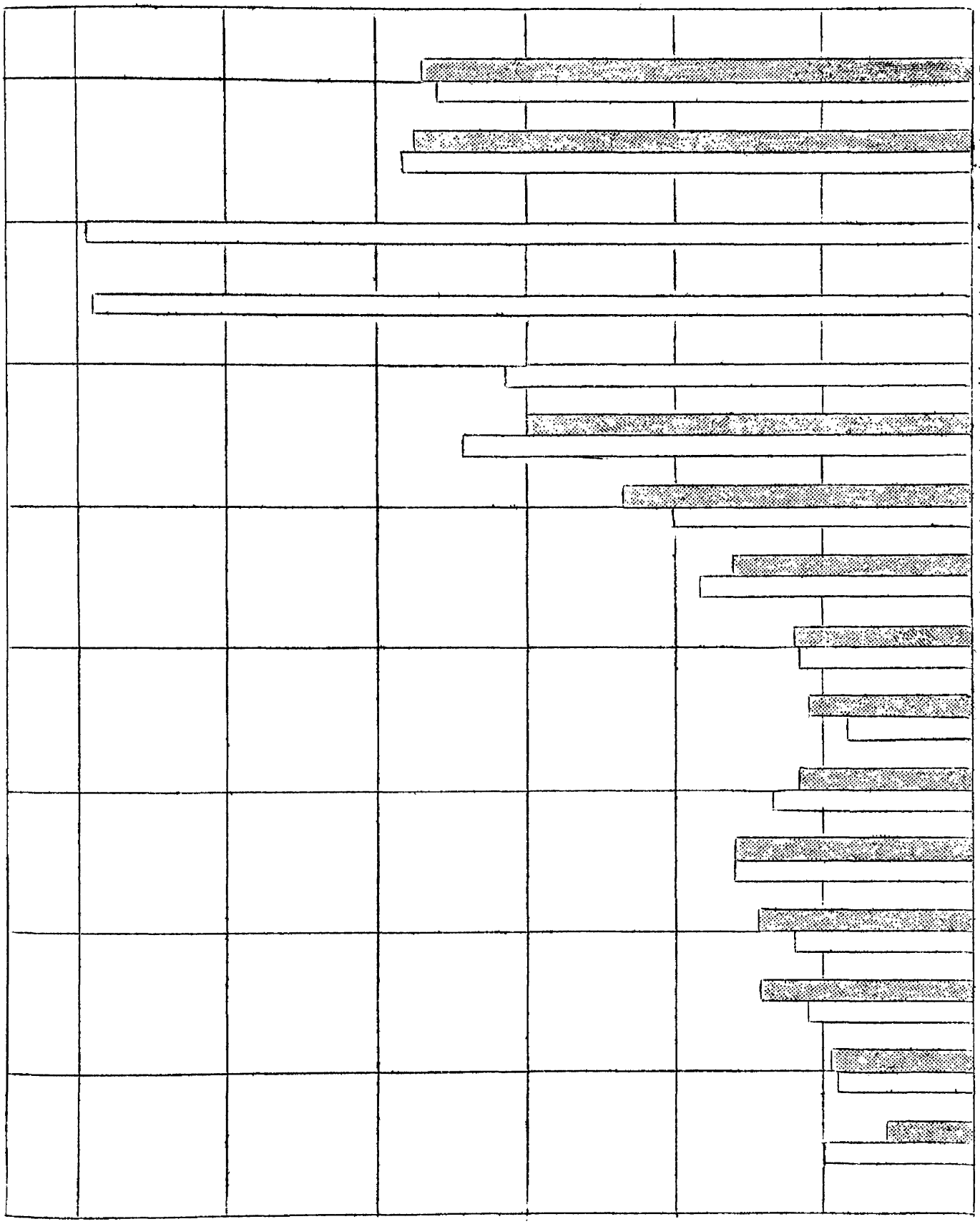


Figure 10. Actual and Estimated Red Cherry Farm Prices, Michigan, 1933-48 excluding 1944, 1945 and 1946.

Summary. The striking feature of the analysis of factors affecting the farm price of red cherries has been the very minor effect of the size of crop upon the price. Certainly, at the farm level, little can be hypothesized from the net relationships concerning the relative elasticity of demand except that it appears to be elastic rather than inelastic. The true facts are probably camouflaged somewhat by the analysis of this time series. There are some indications that the aggregate demand for red cherries has been increasing and that if a truer demand analysis were based upon time series analysis, considerable care would have to be exercised so that points on different demand curve would not be confused with points on the same demand curve. It is extremely difficult and, in many cases, highly subjective to determine when and if the level of demand has actually shifted. No such clustering of years seemed to occur for the years included in the analysis.

Measures of aggregate demand were extremely important in affecting the level of cherry prices. The high simple correlation coefficient between the index of all farm prices as well as that between personal consumption expenditures and red cherry farm prices was verification of this fact. However, in the above analysis, the higher correlation of the farm price of red cherries with all farm prices over-shadowed the effect of personal consumption expenditures when the net relationships were shown.

CHAPTER VI

THE MICHIGAN RED CHERRY PACKING INDUSTRY

Since 1930, the Michigan red cherry packing industry has grown quite rapidly. This growth was in keeping with the general upward trend in production and prices of red cherries which tended to make it lucrative for new firms to enter the industry. Also, since 1930, Michigan's proportion of the total production of red cherries has been increasing. The favorableness of Michigan as a producing area, as was mentioned previously, has been a major factor contributing to the increase in the state's output. With any highly perishable product that must be processed, the industry tends to locate near the source of supply. Hence, in Michigan, the favorable climate in addition to the encouraging economic position of the industry was conducive to expansion. This growth or expansion theoretically could have been of several types -- each of which will be explored. Many of the practices and policies of the packing industry are necessarily conditioned or influenced by this growth. Such considerations as type of pack, diversity of packing plant operations, price determination, and price policy as well as other practices such as storage and sales have been conditioned by the elements of growth in the organization of the industry.

The expansion of the red cherry industry has been marked. In the face of rising production and an upward trend in prices, per capita consumption also expanded (Table IV). The amount of the rise was remarkable considering that only 0.1 pounds were consumed in 1909 compared with more than 1.7 pounds in 1948 of which about one-third was frozen. The per capita consumption of the frozen pack has markedly increased. Data prior to 1937 were not available, yet per capita consumption had increased from

Table IV - Per Capita Consumption of Canned and Frozen Cherries, United States, 1909 to 1948.

Year	Pounds	Year	Pounds	Year	Pounds a/
1909	.1	1923	.6	1937	1.16
1910	.1	1924	.6	1938	1.19
1911	.2	1925	.6	1939	1.59
1912	.2	1926	.9	1940	1.72
1913	.1	1927	.4	1941	1.44
1914	.2	1928	.7	1942	1.41
1915	.2	1929	.7	1943	1.08
1916	.3	1930	.8	1944	1.09
1917	.3	1931	.7	1945	1.04
1918	.3	1932	.7	1946	2.25
1919	.4	1933	1.0	1947	1.57
1920	.5	1934	.8	1948	1.71
1921	.2	1935	1.0		
1922	.5	1936	1.1		

a/ Includes frozen consumption varying from .16 pounds in 1937 to .61 pounds in 1948.

Source: Consumption of Food in the United States, 1909-40, Misc. Publication No. 691, U. S. D. A, Washington, D. C, August, 1949.

.16 pounds in 1937 to .61 pounds in 1948. These data include a small portion of sweet as well as red cherries. The significant point still remains that prices, per capita consumption and production over this period of years all rose.

Alternative methods for expansion. An industry that equips itself to process and distribute larger and larger production can expand in three ways. More firms can enter the industry, thus not materially altering the average size of firms. A second way to expand would be for the firms already present in the industry to grow larger, thus increasing the average size of each firm. A third growth pattern might involve a combination of more firms entering as well as the average size becoming larger. Theoretically, the firms in the industry would become larger if the short-run cost curves still showed increasing returns to scale. More firms would enter if the returns to scale within the firms in the industry were less than the possible returns from new firms entering. This presumes that technology has not changed. New firms would also have the advantage of new technology which may have been developed.

Since 1931 there has been a general upward trend in the number of firms in the industry (Figure 11). In 1931 there were 19 firms packing red cherries in Michigan. There was some increase in the number of firms from 1935 to 1937, a fairly stable number until after World War II, and then a rapid increase. In 1948, 44 firms packed cherries. These plants were concentrated in the areas of heavy production in Michigan. The Grand Traverse Bay area including Leelanau, Grand Traverse, and Antrim counties had a large number of plants. Two other areas -- one centered in Oceana County and the other located in Berrien County

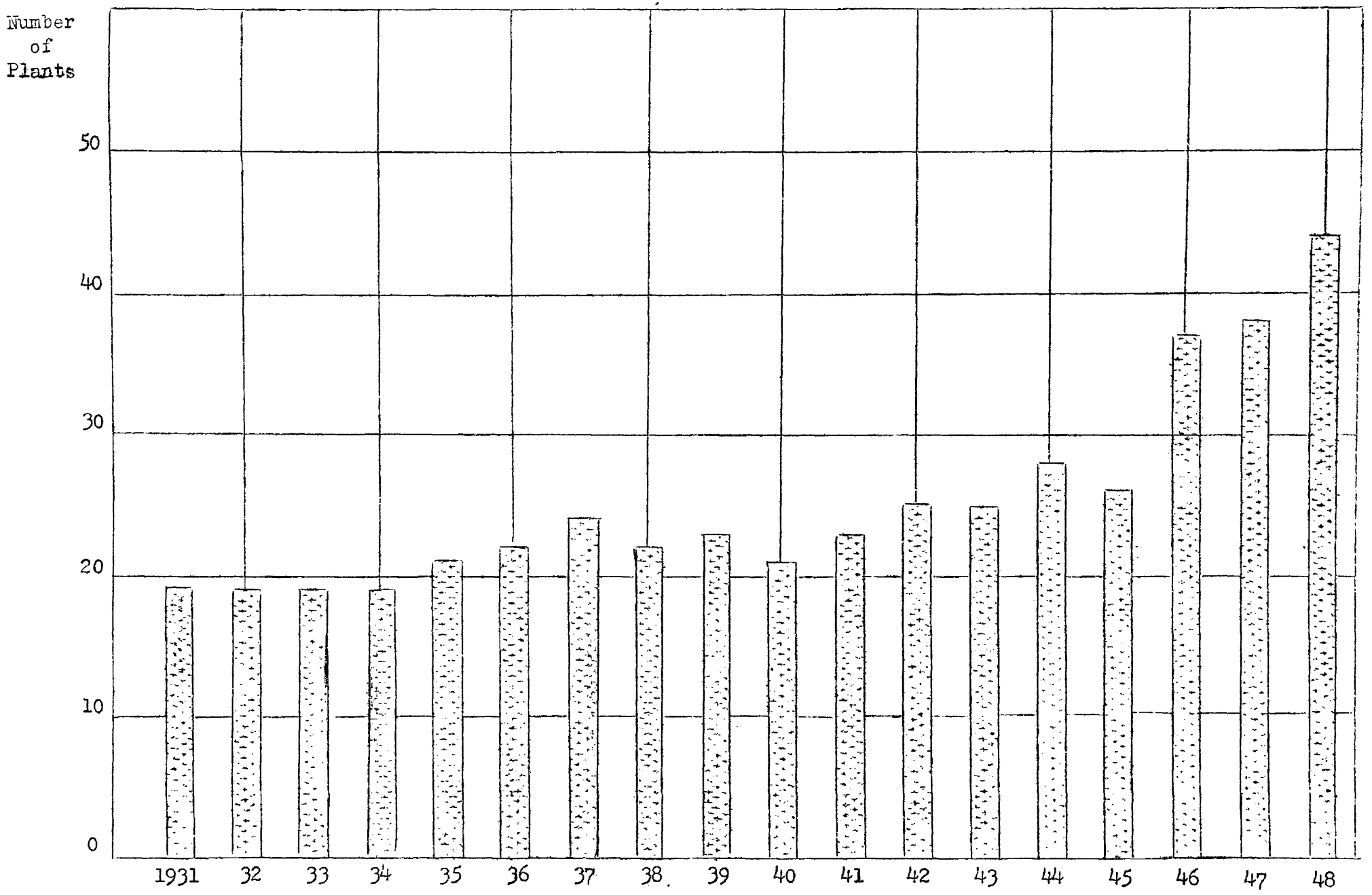


Figure 11. Number of Plants Packing Red Cherries, Michigan, 1931-48.

also had a fairly large number of packing plants in 1948.

The overall year to year variation in the number of plants has been very small (cf. Figure 11). The extreme variability in year to year production of course had a tremendous impact upon the volume of processing in the industry, but particularly upon the volume of processing in the individual firms. For example, some firms could not profitably operate in the short crop year of 1945 and were forced to remain idle. This accounts in part for some of the reduction in the number of plants in 1945 from 1944. One could ask what has happened to the relative size of the firms in the industry. Actually, the proportion of the cherry crop packed by the five largest firms in the industry has become smaller (Figure 12). In 1931 the five largest plants packed almost 73 percent of the total pack of red cherries in Michigan. By 1940, the five largest plants were processing only 45 percent of the total and by 1948 the relative amount packed by this group was the lowest for the period for which data were available -- 44 percent. In these 18 years there were only 9 plants that fell into the first five.[1/] One of these plants has not processed since 1945, and another plant was a growers organization which is no longer in operation. Actually, then, only 7 of the presently existing plants competed for a place in the top five based upon the relative amount packed by each individual plant. The proportion of the total pack packed by the largest plant varied between 13 and 35 percent, while the variation in the smallest of the five ranged

---

1/ These data were gleaned from pack reports submitted to Roy E. Marshall of the Horticultural Department at Michigan State College and are held to be confidential. Therefore, no explicit listing of the exact plants can be made.

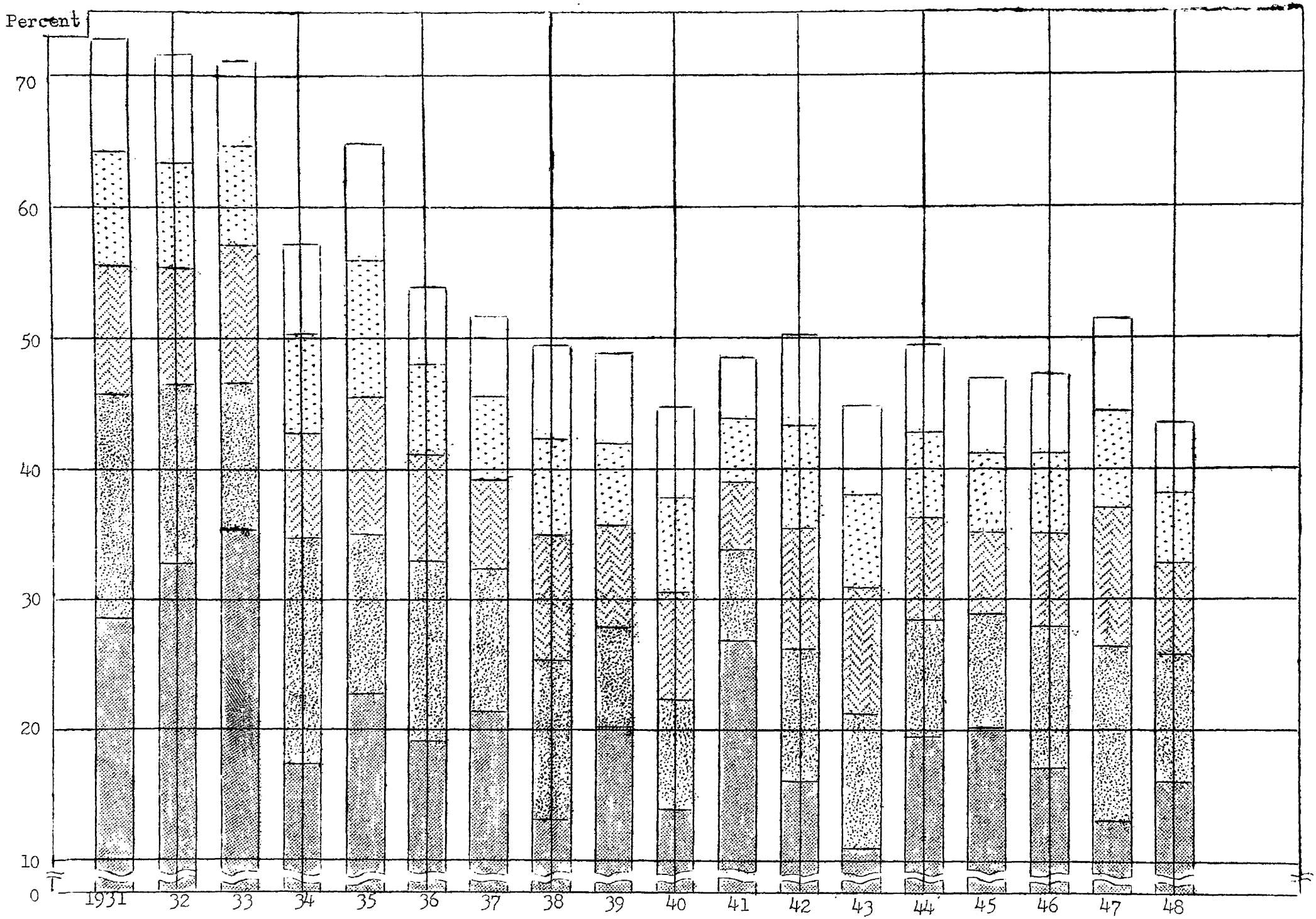


Figure 12. Percent of Total Pack Processed by Five Largest Packers, Michigan, 1931-48

from less than 5 to slightly over 9 percent. In some years there appears to have been quite a heavy concentration in the packing operations in a few firms while in others, the pack was fairly evenly distributed throughout most of the firms in the industry.

Amount produced and amount packed. Through the years since 1931, there appears to have been a narrowing of the difference between the amount produced and the amount packed, measured in the terms of raw product (Figure 13). Judging from the narrowing of this gap and its relationship with the trend in economic propserity, there appears to have been a direct relationship between the two. That is, as the country became more prosperous, a higher proportion of the cherries produced were packed. Of course, discrepancies from this deduction in individual years may be accounted for by special circumstances such as the quality of the pack due to unfavorable weather or the prevalence of certain diseases. Another major factor contributing to this narrowing of the gap may have been the increase in the number of plants and the gradual development of new uses which tends to utilize potential surpluses. With an increase in the number of competitive firms there tends to be more excess plant capacity developed. As this occurs, there is a general overall tendency to process more of the product and thus reduce the absolute quantity of potential surplus. The effect of the development of new uses will be treated more fully later. It is sufficient here to mention that new uses can affect the narrowing of this gap in two ways. Firstly, they can be of such a type as to economically utilize a lower quality of fruit such as that going into jams, jellies, or juice where the identity of the fruit in its natural form is changed. Secondly, new uses can be of the type that require a high quality fruit such as candied or glace cherries,

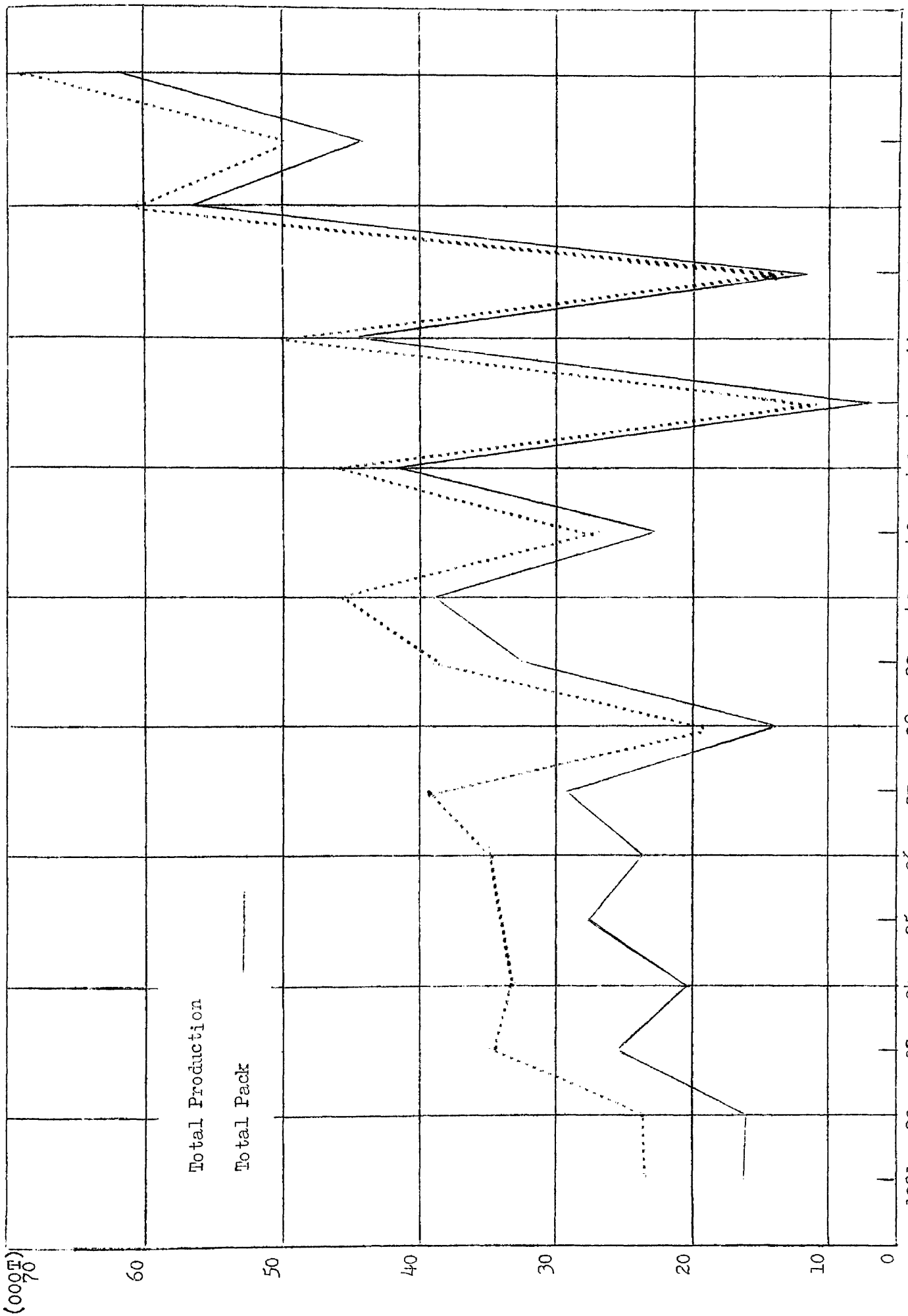


Figure 13. Total Production and Total Pack of Red Cherries, Michigan, 1931 - 48.

and force the utilization of poorer quality fruit in lower uses.

Concentration in the industry. Returning to the problem of concentration in the red cherry packing in Michigan, it appears that the trend has been away from concentration. Nicholls has stated that even though a small percentage of the product is controlled by a single, or a few firms, the impact of concentration may be severe since the industry is so highly localized.2/ This localization may mean that a grower may have only one single outlet for his product and therefore a condition best described as local monopsony might exist. In Michigan it would be difficult to argue that this situation has existed except, perhaps, in the short-run. Members of cooperative packing plants usually sell all of their crop through their own association. In some years the pool price that they receive may average lower than prices paid by private corporations.3/ This could be interpreted as a condition of local monopsony since the grower has a strong obligation to sell his produce through his cooperative. Some plants, however, solicit a group of growers as a kind of semi-insurance that they will receive a reasonably good volume of business. Other plant operators are usually aware of these "lists" so that if a grower becomes dissatisfied, he may encounter difficulty in disposing of his crop elsewhere and may be forced into selling to the original solicitor. These dealings are common with many businesses and are not unique in any sense to the red cherry packing industry. Thus it would appear that if Nicholl's general assertion

---

2/ William H. Nicholls, Imperfect Competition Within Agricultural Industries, Iowa State College Press, Ames, Iowa, 1947.

3/ Also, the reverse of this is often true, but the illustration of a cooperative as a local monopsony in the short-run necessitates this assumption.

was valid for the red cherry packing industry, it was much less valid in 1948 than it was in 1931. This was seen previously in the tendency for more firms to enter the industry during this period as well as for a smaller proportion of the total pack being packed by the five largest plants each year. But it is doubtful whether even local monopsonistic conditions exist except in certain isolated cases in the short-run. This does not mean that the industry is completely characterized by the doctrine of perfect competition since other imperfect elements obviously exist and their impact upon the market will be considered later.

Types of pack. The type of pack that the industry has processed has varied through the years as a result of changes in the demand for certain products. It was pointed out that there has been almost a continuous upward trend in the per capita, as well as the total consumption of red cherries. Consumer tastes and habits often change through time and these have had a marked influence upon the type and quantity of each type of pack processed by the industry. Special facilities are often needed for the storage and marketing of certain types of pack.

With the Michigan pack, there has been a general upward trend in both the quantity canned as well as the quantity frozen from 1931 to 1948 (Figure 14). The bulk of the yearly variations, however, were due to the yearly variations in production. Michigan's canned pack has increased from about 30 million pounds to a volume of 93 million pounds in 1948. This amounts to an increase of over 200 percent. The frozen pack was relatively unimportant in the early 'thirties accounting for only 2.5 million pounds. But in 1948, 29 million pounds of red cherries were processed as frozen pack which was a phenomenal increase of more than 1,000 percent. The proportion of the total pack which is frozen has also in-

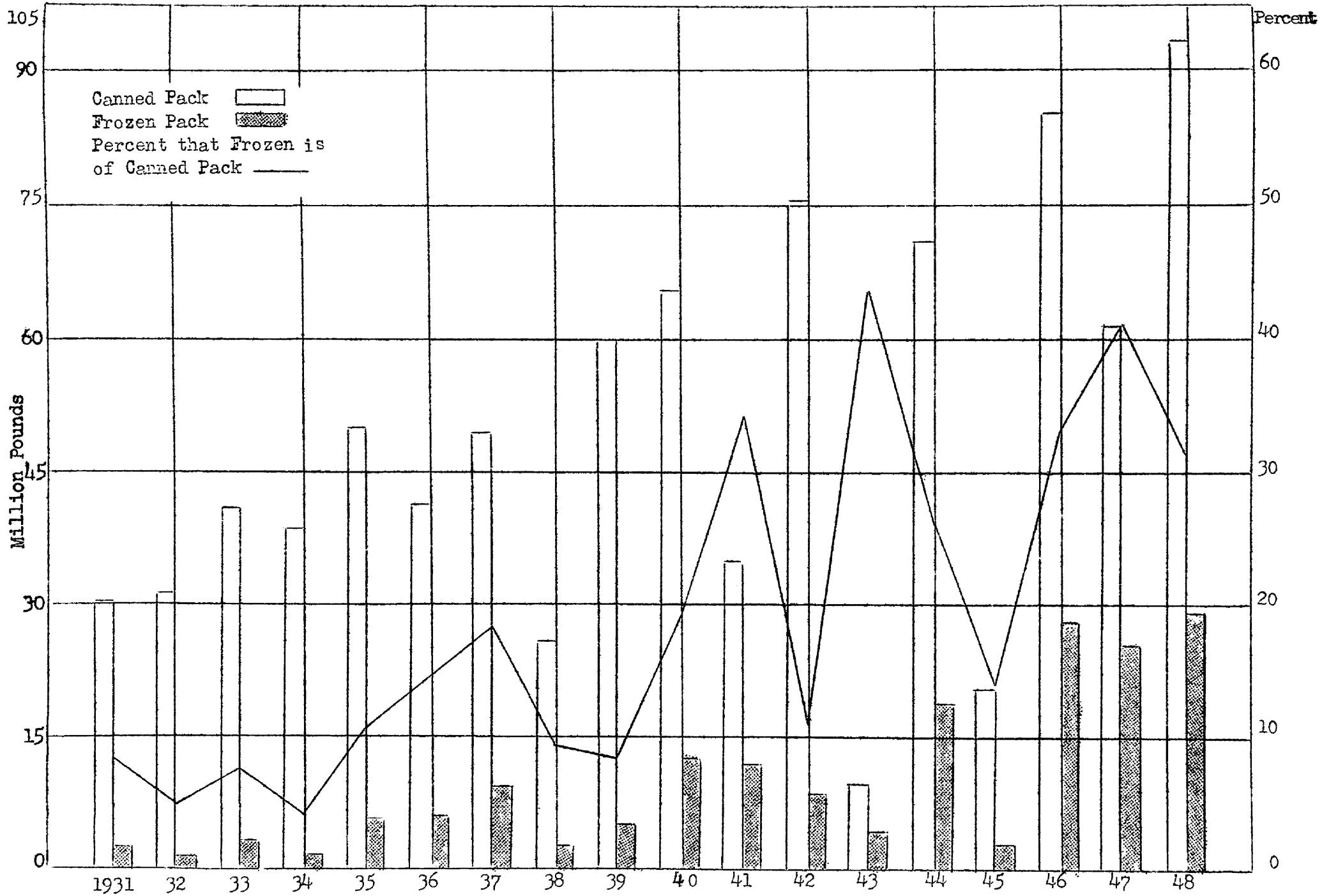


Figure 14. Total Canned and Frozen Pack of Red Cherries, and Percent That Frozen Pack is of Canned Pack, Michigan, 1931-48.

creased though it has varied considerably from year to year. In the early 'thirties the frozen pack was only about 5 percent as large as the canned pack. By the late 'forties, this percentage was averaging about 25. These increases in frozen pack (absolute and relative) coincide with the general increases that have taken place in the manufacture of all frozen foods during these years.

The canned pack is processed in a wider range of packages or cans than the frozen pack. The most common sizes of cans are the number 2 and the number 10. The number 2 can is the consumer canned package that is commonly sold through retail stores while the number 10 can is packed for appeal to the institutional trade. Other can sizes, such as the number 2 1/2 and the number 303 have been used to a limited extent. Some red cherries have also been packed in glass rather than tin cans; however, almost all of them have been packed in tin. Besides these variations in can sizes, there has been some variation in the liquid used in the containers. Most of the red cherries are packed as a water pack, but some are packed in syrup. There can be many variations in the syrup. A water base is usually used, but sometimes a juice base is used. Then the syrup can vary from 30° baume to as high as 60°, or in extreme cases, 70° baume. These cherries are of course very sweet and can be eaten directly as dessert or used without the further addition of sugar in baking. References to the canned pack, insofar as further analysis is concerned, will be made in terms of water pack in number 2 and 10 tin cans only.

The frozen pack has also been packed in various sized containers, but the most popular size has been the 30 pound tin. Other sizes have been used ranging from the 1 pound consumer sized package through the institutional sizes of 10 pound tins to even 400 pound barrels. The 30 pound tin

has and probably will be the most popular size, however.[4]

Even a cursory analysis of the pack data yields the valid conclusion that when the red cherry crop, and consequently the pack, is large, there is a definite tendency to pack a higher proportion of the pack in the consumer sized packages (the number 2 can and the 1 pound frozen package). The institutional trade apparently does not expand and contract their volume of purchases nearly so much as the consumer market. The packers recognize the potentialities of the huge consumer market and treat them as the elastic part of the market.

Volume of business and risk spreading. The red cherry packing business is highly localized and highly specialized. Cherries alone accounted for one-half or more of the average total dollar volume of business done by 15, or 54 percent, of the 28 plants reporting in Michigan[5] (Figure 15). The most common figure given for the relative importance of cherries to the total volume of business fell between 20 and 39 percent. Of the 28 plants, 5, or 18 percent of them packed and sold nothing except cherries. Many firms have not attempted to reduce risk by diversification. This makes some of them highly vulnerable to the economic short-run instability of the red cherry industry.

Spreading the risk of the processing operations may involve the processing of several other products whose processing season differs from that of cherries. One plant that processed other fruits in Michigan in

---

4/ Cf. Roy E. Marshall, "Some Trends in the Red Cherry Industry", The Canner, January 4, 1947.

5/ These data were gathered in answer to the question, "What percent of your total sales are made up of cherries? (a) By years or (b) Average". Data by individual years was too incomplete to be meaningful.

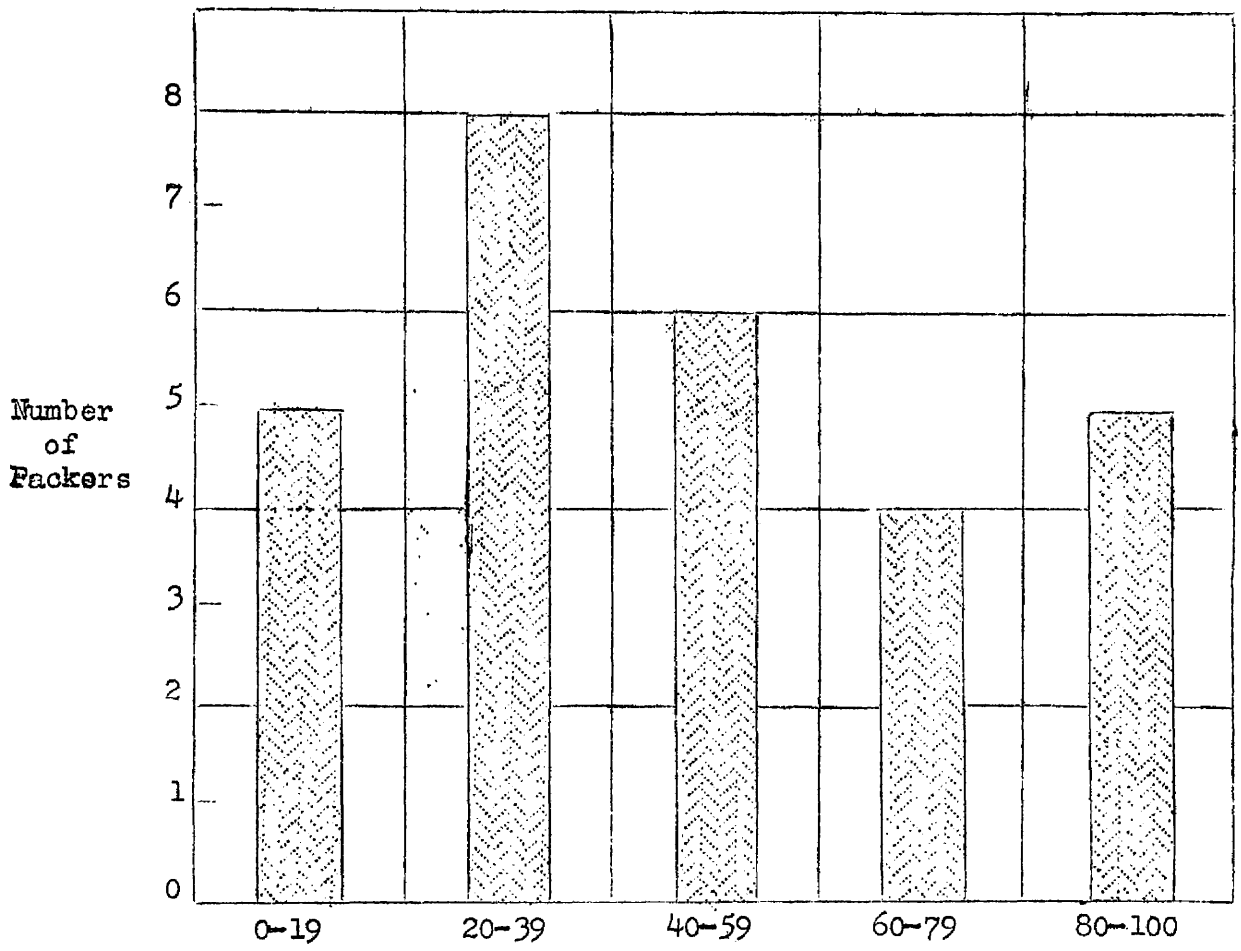


Figure 15. Average Importance of Red Cherry Pack to Total Volume of Business for 24 Plants, Michigan, as of 1948.

1948, processed 14 different products[6] (Figure 16). Most plants did not pack more than six or seven products, and one-half of the plants packed five or less other products. Quite a number of plants, especially those in southwestern Michigan, packed vegetables.[7] One plant packed as many as six vegetables, another packed five and there were two plants in each group that packed four, two, and only one other vegetable product besides some fruit. Most of the plants that did diversify, did so by packing more fruits and fruit products rather than by packing vegetable products.

Price determination. The method of determining prices and various pricing policies followed in the industry are the most important facets of the problem of purchasing and distributing the red cherry crop. The pricing problem is usually exceedingly difficult as the harvest season approaches since the old pack is usually almost if not entirely sold out. Thus there is usually no meaningful price quotation from which to base a new season's price. The grower certainly has no basis for establishing prices except certain qualitative judgments, along with the judgment of reputable canners. Usually, after a price is established, it is several months before anyone can tell whether or not the price was too high or too low. Once this is known, little can be done by way of adjustment

---

6/ The total list of other fruit products included apricots, apples, peaches, pears, plums, sweet cherries, strawberries, blueberries, red and black raspberries, blackberries, boysenberries, gooseberries, dew berries, elder berries, pineapple, currants, crab apples, and grapes. Others included grape jam and raspberry preserves; grape, cherry, apple, red currant, blackberry, gooseberry, and strawberry jelly. Three juices, namely, apple, cherry, and tomato were packed along with apple vinegar.

7/ The total list of vegetables packed either as fresh, frozen or canned consisted of carrots, sweet corn, potatoes, red beets, lima beans, asparagus, cauliflower, onions, pumpkin, rhubarb, peas, and snap-beans.

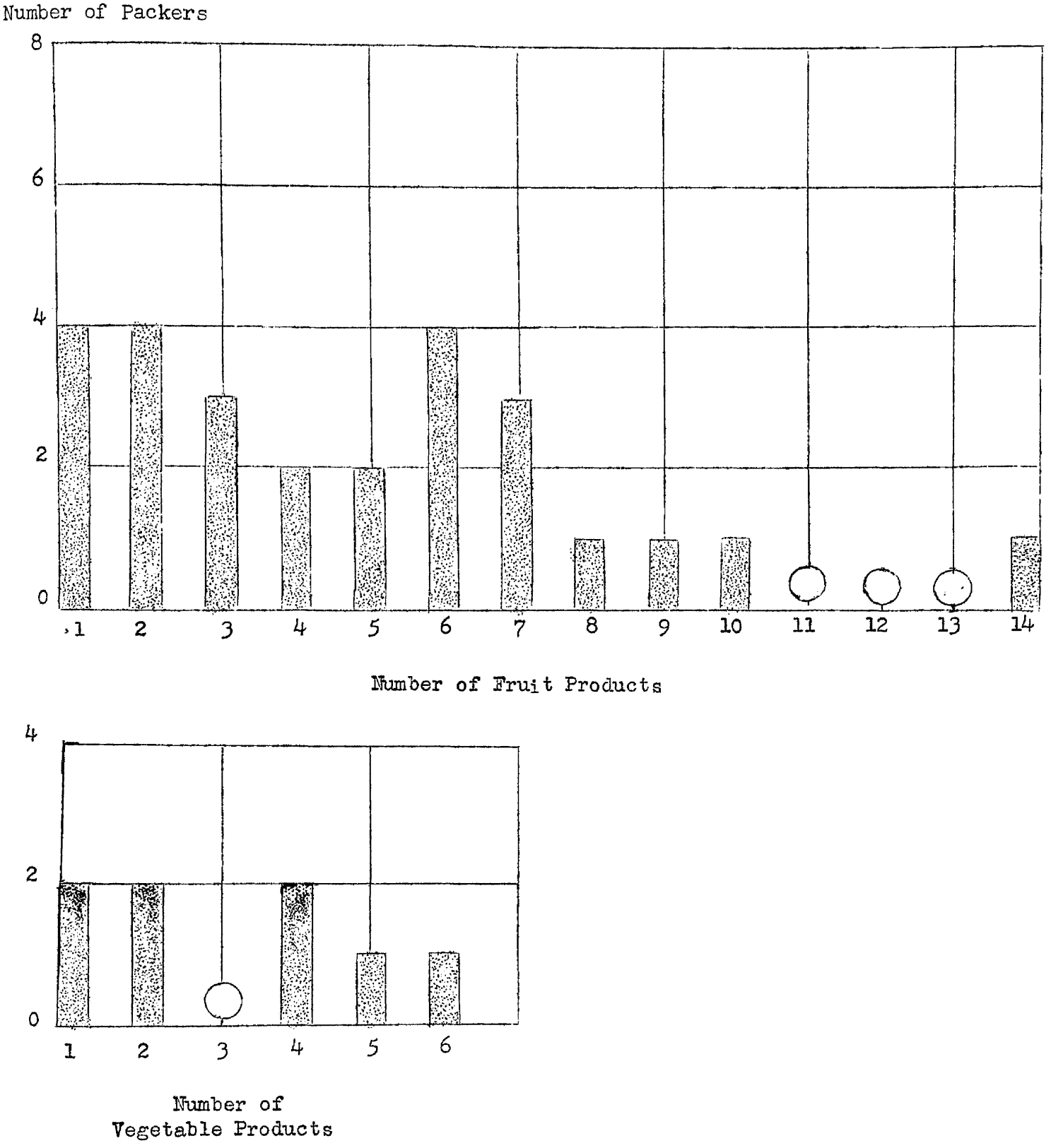


Figure 16. Number of Red Cherry Packing Plants Packing Other Fruit and Vegetable Products, Michigan, 1948.

except by cooperatives which pay for the crop on the basis of a pool price arrangement. The packer though is forced to adjust his price seasonally in keeping with trends in market demands.

Because of the importance of naming the "right" paying price to growers, which to a considerable extent means naming the opening price of the pack, there is a great deal of discussion among various packing plants as well as with growers concerning what the price should be. The actual naming of a producer price is usually done by one of the important private corporations that packs red cherries. Cooperatives have their greatest difficulty in naming their opening pack price since the pool method of payment allows some flexibility of payment at the farm level. The situation is ripe for price leadership by one or two important firms. In discussing oligopoly, Stigler analyzed the situation of a price-leader or what he also called the case of the dominant firm.8/ He stated that as a minimum, such a firm should supply one-fourth of the total sales. Then also, there are numerous small independent rivals. Under these conditions, the situation essentially becomes one of duopoly since the other firms act competitively.

Many assumptions can be made regarding the behavior of duopolists and their demand curves, but Stigler lists the following as relevant factors influencing the demand curves.9/

"1. The speed with which one rival reacts to changes in the other's policy.

"2. The relative sizes of the two firms.

8/ George J. Stigler, The Theory of Price, The Macmillan Company, New York, 1947, p. 227.

9/ Ibid. p. 229.

"3. The mobility of purchasers, including the extent to which long-term contracts are used.

"4. The possibility of keeping price concessions secret.

"5. The costs and gains in driving the rival out of business."

The exact extent to which imperfect competition exists within the red cherry industry in the form of either duopoly or oligopoly is difficult to determine. But certainly some of the conditions for these types of imperfectness do exist. With regard to the point on price leadership, one of the most common answers received from people in the industry to the question of how they determine prices was that they asked the competitive price. They would emphasize that they were not "price cutters". Obviously these folks were looking towards someone or some few who set the price and they charged the same price for their pack. From an analytical viewpoint, the industry in Michigan probably has had and may continue to have price leadership and a condition approaching that of practical oligopoly.

To go so far as to say that price determination at the farm level conforms to the principles of perfect competition is also an exaggeration of the facts. There is a formal, though somewhat ineffective, bargaining association of growers or representatives of the production industry who have some regard for the selfish advantages to be gained from the possession of market power. Growers also possess some semblance of market power as informal groups or through a cooperative association. The firms in the industry also exchange ideas on equitable paying prices. These groups occasionally do not agree upon paying prices and a certain amount of bargaining ensues. The industry appears to be on the conservative side in these cases, but some satisfactory agreement is usually reached prior to

the harvest season. To the extent that growers on the one hand and the firms on the other are organized, some of the principles applying to bilateral monopoly are present. The principles, according to Stigler,10/ similarly exist but in a more complicated form, as bilateral oligopoly. Theoretically, this situation yields a range of prices rather than one price at which a given quantity will sell. This range must be reconciled by the opposing groups and is finally settled in relation to the market power that each group is able to exert. At the farm level, this situation has existed.11/

Product differentiation. Another factor making for imperfectness in the market for red cherries is the differentiation of homogeneous products. Twenty-three plants reported that they used a brand name (either their own or their distributor's) in 1948. Most of the plants either packing or distributing under a brand name used more than one name. In total, these 23 plants either packed or distributed under 44 different brand names.12/ Those red cherries that were neither packed nor distributed under a brand name were used primarily in the institutional trade where apparently no further differention was needed. Some of the larger firms differentiated their products so that competing retail outlets in the same market area could stock seemingly different products.

- -

10/ Ibid. p. 266-7.

11/ Growers have held mass meetings similar to one held in the Hart area in 1948 at which they protested the packers offer of 9 cents a pound and held out for $9\frac{1}{2}$ cents. The price was finally settled at about $9\frac{1}{4}$ cents in this particular area.

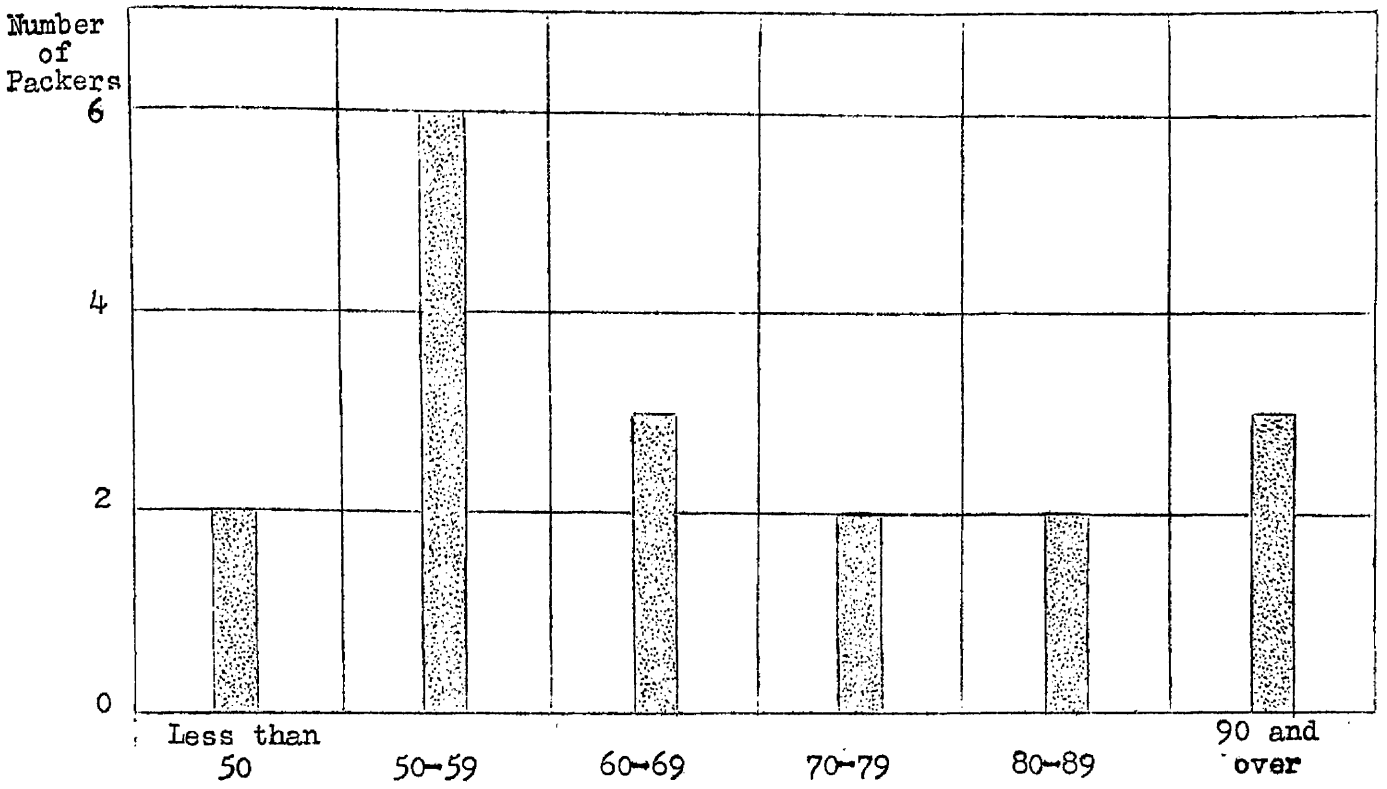
12/ These 44 brands were not used exclusively on homogeneous products. Variations in quality as well as variations in the pack such as heavy vs. light syrup were also included.

The most common amount of a plant's output either packed or distributed under its own brand name(s) fell between 50 and 59 percent (Figure 17). Only 2 plants in each case packed or distributed less than 50 percent under their own brand(s). Five plants packed or distributed 90 percent or more under their own brand(s).

Sales agreement. A further consideration, in addition to the unilateral features of the price or sales agreement,[13/] is a form of legal price cutting insofar as the features of the Robinson-Patman Act are concerned. Brokers fees are 3 percent of the sales price. If the broker is by-passed, the price to the wholesaler can be somewhat less since the brokerage fee is not paid. This is bearish on the market and encourages retaliation by those who sell through brokers, and this in turn sets up a chain reaction leading to further price reductions. For example, suppose that a packer sells a dozen number 2 cans to a wholesaler at 2.00 dollars. The packer's net price is 1.94 dollars (2.00 dollars less 3 percent). The packer who by-passes the broker can sell to the wholesaler, ceteris paribus, at 1.94 dollars. The packer selling through a broker must sell to the wholesaler at 1.94 dollars, if he wants to effect a sale which means that his net price is then only a fraction over 1.88 dollars. If this price is still profitable, the direct seller can then sell at 1.88 dollars, causing perhaps a further reduction in prices by the firm selling through a broker. These price cutting wars are usually of a less magnitude than illustrated since the broker does perform a marketing function which saves the packer some costs. Yet these reactions can have a tremendous bearish impact upon a jittery or weak market, and must be guarded against or at least recognized as being temporary by the more stable firms in the industry. The ex-

---

13/ Cf. Chapter I.



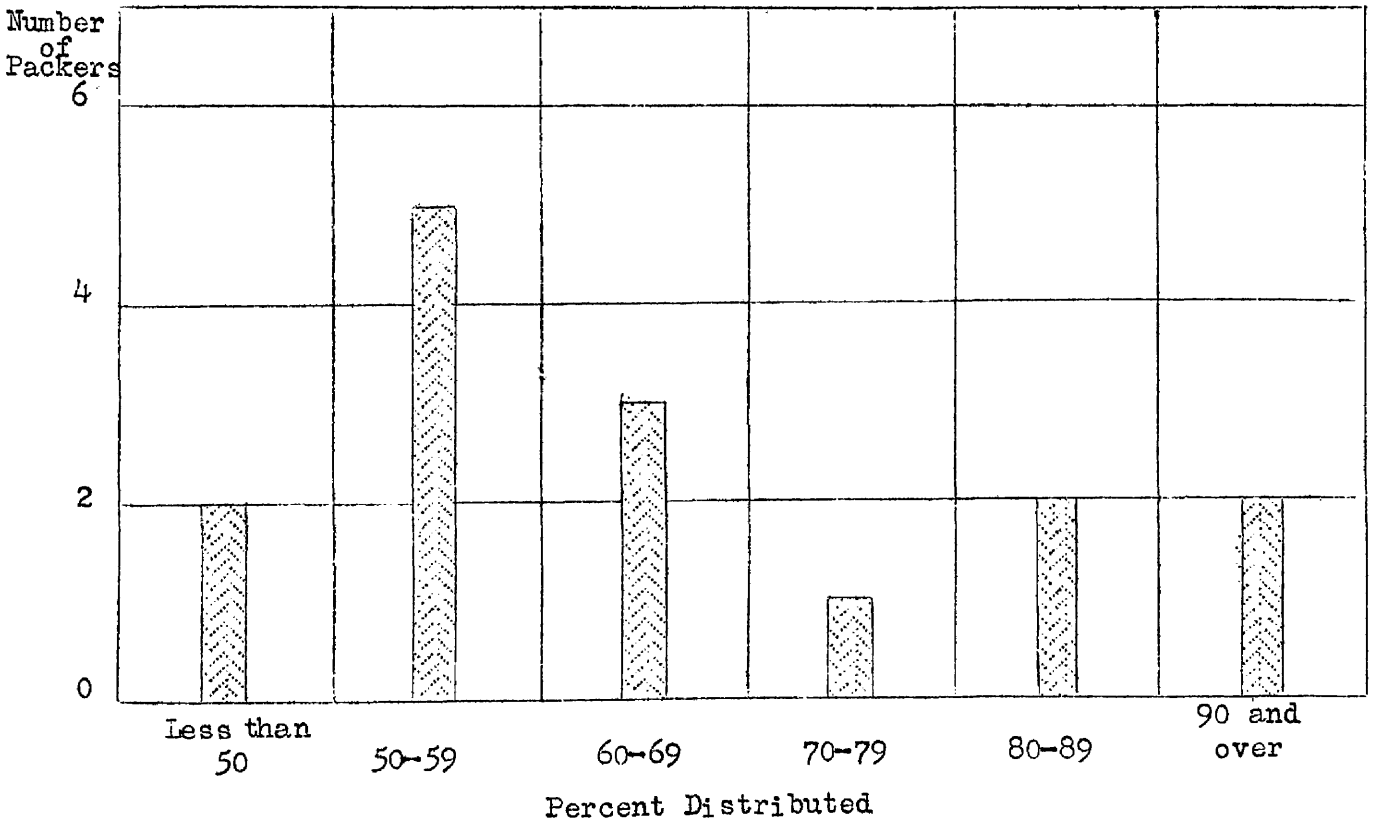


Figure 17. Percent of Red Cherries Packed or Distributed Under the Packer's Own Brand Name by Number of Packers, Michigan, 1948.

istence of such a legal policy plus the unilateral sales agreement regarding prices, tends to magnify the pricing problem that exists within the industry. A combination of all these forces makes an individual firm without sufficient working capital or other financing particularly vulnerable to such practices.

Storage policies. Storage policies pursued by the packers appear peculiar to outsiders. Taking the industry as a whole there has been a natural aversion to year-to-year storage. Most plant operators feel that an index for the measure of success of operations in a particular year is how fast the pack is moved. Marshall stated that at least 60 percent of the pack in number 10 cans should be moved by December 1, and a slightly higher proportion of the number 2 canned pack should be sold also by December 1 each year if the pack is to be moved prior to the next harvest season.[14/] This feeling still prevails in the thinking of the industry partly because the quality of the new pack is usually such that sales of the old pack are retarded or price concessions are so drastic that losses occur. These are dangers, but if there is any relationship between packs and quality, one would expect that the large packs would be of highest quality and the small packs of poorer quality. Therefore the higher quality of the large packs should be able to compete with the poorer quality of the short pack. Prices should also be sufficiently different based upon these differ-

---

14/ Roy E. Marshall, Production and Price Trends in the Pitted Red Cherry Industry, Michigan State Agricultural Experiment Station, Special Bulletin 258, February, 1935.

ent volumes packed that there need be little fear from getting a satisfactory price for the carry-over pack. A larger fear would seem to be the depressing effect of last year's pack on this year's pack prices if there is a carry-over. The pressure at this point comes from growers who do not care to receive a penalty in the price this year because the packers were trying to make more money on last year's pack.

Storage or distributing quantities through time (in years) maximizes total revenues provided the elasticity of demand is such that the curve becomes more inelastic as quantities are reduced.[15/] Storage reduces total revenue if the elasticity of demand is such that the curve is more inelastic as quantities are reduced. As has been pointed out above, the practical problems of price negotiation may be so numerous that storage is not feasible. Then, too, the practical problems may also be theoretically sound, because any straight line demand curve fulfills the requirements conducive to non-storage. In this case the extent of any storage policy carried on depends upon the potential good will from the dependability of the source of supply, other non-monetary advantages, as well as who may be able to store at lowest cost.

Costs of storage and processing. Costs of storage vary considerably as between the frozen and canned packs. Much of the storage and warehousing for the canned pack are performed by the packers themselves and costs are merely pro-rated over the total volume of business and not segregated as a separate function. Frozen pack is usually frozen and stored by

---

15/ Cf. George J. Stigler, "Social Welfare and Differential Prices", Journal of Farm Economics, xx (1938), 3, 573-90 (Including a rejoinder by F. V. Waugh) for a discussion of the principles involved.

specialized cold storage warehouses. Costs in 1948 ranged from 0.015 dollars per pound for freezing and the first month's storage to 0.0281 dollars per pound. Costs for additional months ranged from 0.0007 to 0.00583 dollars per pound. The most common cost figure for storage after the first month was 0.0015 dollars per pound.

The sales policies followed affect the storage policies of individual firms. If a buyer or a number of buyers back-up on orders because of price drops or slow sales, the packer is sometimes forced to perform the storage function for longer periods than originally expected. Backups on orders are serious and have dire consequences since selling costs must be increased in order to sell the pack and in the meantime additional storage costs accrue. These back-ups thus put a double squeeze on margins.

Processing costs in 1948 for number 2 cans varied from 0.0566 to 0.0844 dollars per pound for those reporting. For number 10 cans the costs per pound varied from 0.0343 to 0.057 dollars. The average cost of the fruit was about 0.09 dollars per pound. Based upon these data, total costs could vary as much as about 0.025 dollars, and assuming identical retail prices, profits could also vary by the same amount. For the frozen pack in 1948, processing costs varied from a low of 0.0433 dollars per pound to 0.0805 dollars per pound. Adding about 0.09 dollars per pound for the cost of fruit and the total costs less storage and warehousing ranged from 0.1333 to 0.2105 dollars per pound. This range of nearly 0.0772 dollars per pound was almost three times as high as the range in costs for the canned pack and means that there is a wide range in the efficiency of individual firms. These variations can be partially explained by the fact that the capital investment for plants packing only

cold pack are very low as compared with the investment necessary for purchasing and maintaining the equipment necessary for hot packing. New firms usually begin operations by cold packing. Hot lines are added to the plant as business expands. But getting started may entail higher costs than those of competitors. High interest costs on borrowed capital, lack of quantity discounts, high selling costs, and higher paying prices for fruit as compared with more efficient firms makes entry into the industry a difficult process. Even so, the fixed costs are lower in relation to variable costs for cold packing as compared with hot packing and with the existence of capital rationing, it is much easier to finance short-term working capital than long-term fixed capital.

Summary. The red cherry industry in Michigan has been a rapidly growing industry since 1931. Prices rose in the face of expanding production making it conducive to the entry of new firms. Consequently, the number of firms packing red cherries in Michigan increased from 19 to 44 during the 18 years. The percentage of the total pack packed by the five largest firms has declined during the same period, lessening the amount of economic concentration present. The quantity of frozen pack has increased relative to the canned pack and the most popular type of containers has been the number 2 and 10 cans for the hot pack and the 30 pound tin for the frozen pack. The industry is highly specialized but a few firms diversify their operations by processing other fruits and vegetables. There is some evidence of price leadership as well as bilateral oligopoly existing in the industry. Product differention is one of the sales principles followed by most firms. Storage, and particularly processing costs, vary among firms with the most variation occurring

for the processing costs for the cold pack. This analysis sets the stage for a more thorough analysis of prices in the subsequent chapters.

CHAPTER VII

THE RED CHERRY PACK AND PRICE TRENDS

One of the main purposes of this study was to attempt to develop an historical price series for the various important types of pack by surveying the cherry packers in the state and collecting price data from 1934 until the present time. Many problems were encountered. For instance, most firms place all their records in dry storage after the elapse of a few years. Thus, there was no possible way to get data from these plants for those years. But data were reasonably complete for at least a few of the major firms for the years beginning in 1938. For the three years, 1935, 1936, and 1937 prices had to be estimated for the major types pack. These prices were estimated from the regression of farm prices of red cherries on prices of number 2 and number 10 cans. Combining all of the alternatives for determining prices, a complete historical series was developed for number 2 and number 10 cans.

Prices for the frozen pack were not collected by Marshall[1/] along with prices for number 2 and number 10 cans. Therefore there were no published prices for the frozen pack prior to 1934. The only series that could be developed then was that from prices obtained by survey. These were available from enough packers for the development of a price series on the frozen pack from 1937 through 1948.

Prices for each of the above mentioned types of pack moved fairly close together (Figure 18). Prices for number 10 cans are shown as so much per ¼ dozen[2/] since the value of 3 number 10 cans has been approx-

---

1/ Cf. Roy E. Marshall, Production and Price Trends in the Pitted Red Cherry Industry, Michigan State Agricultural Experiment Station, Special Bulletin 258, February, 1935.

2/ Number 10 and number 2 cans are usually quoted as so much per dozen. A case of number 10 cans consists of six cans while a case of number 2 cans consists of twenty-four cans.

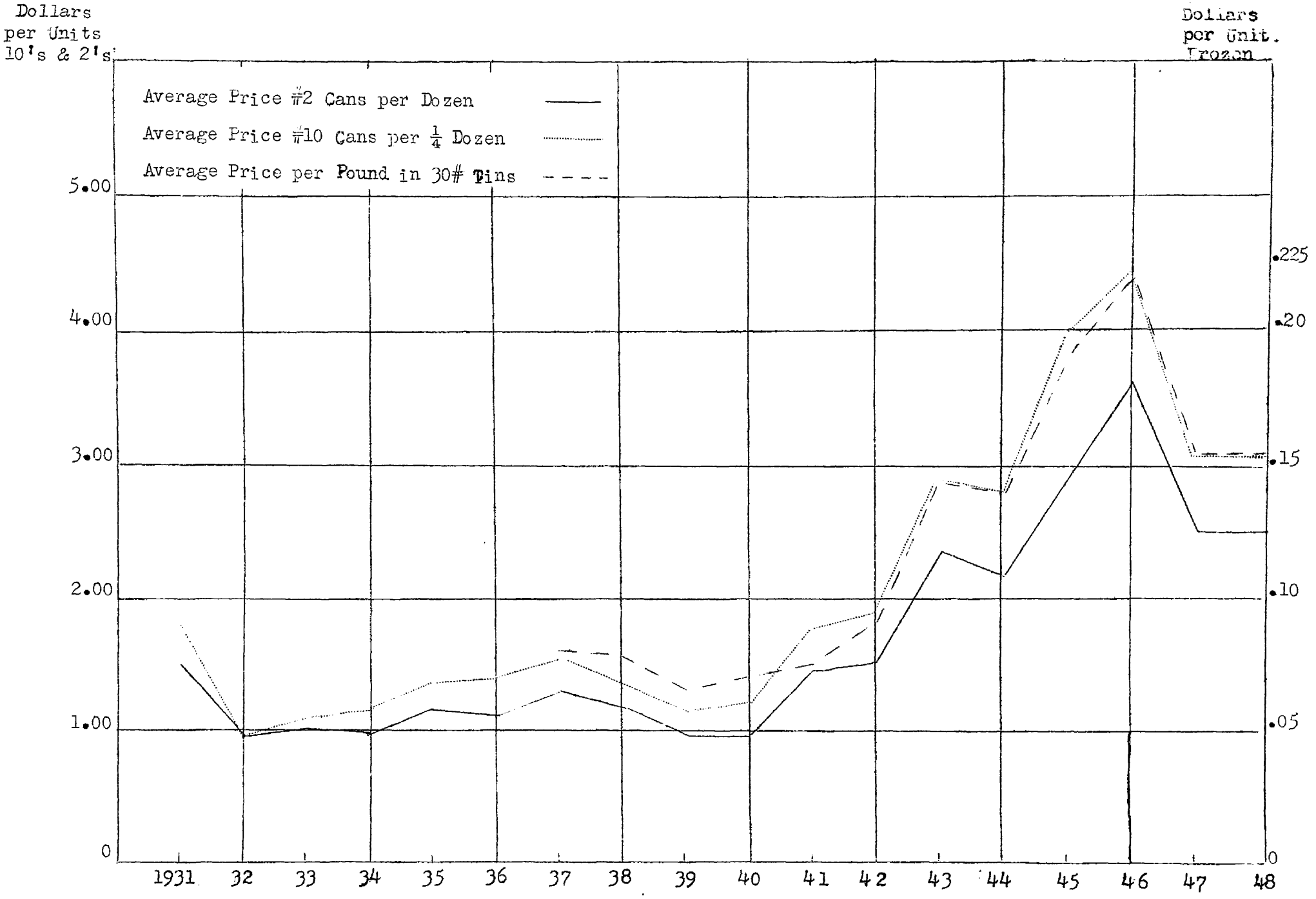


Figure 18. Average Prices of Packed Red Cherries, Michigan, 1931 - 48.

imately equal to prices for a dozen number 2 cans. The spread between the prices of number 2 and number 10 cans has increased through the years 1931 to 1948. The price advantage in the later years was more in favor of number 10 cans as compared with the number 2's.

For 30 pound tins, prices followed the movement of number 10 cans very closely. More discrepancy between the two series appeared prior to 1942 than afterwards. From 1937 through 1940 prices on the frozen pack were relatively more favorable than prices on number 10's. The reverse of this appeared to be true following 1940.

Opening and average prices. As has been mentioned before, there is a great deal of importance attached to the opening price. A good opening price, regardless of the type of pack, would be such that prices would advance from the opening price at a seasonal rate approximately equivalent to the costs of storage. These prices would be such that the pack would be sold just prior to the next pack season. However, economic conditions may change through the season so that the "right" opening price may either be higher or lower than the season's average price. When the factors affecting the prices of cherries are expected to strengthen, pack prices can be expected to rise more than a normal seasonal amount. If, on the other hand, these factors are expected to weaken, average prices may either be equal to or even below opening prices.

Apparently, all of the above situations have occurred (Figures 19 and 20). Here the regression values of opening on average prices are shown for the years 1931 to 1948. The slope of the regression line is almost unity for both number 2 and number 10 cans.3/ (A slope of unity

---

3/ The coefficients of correlation were 0.9977 and 0.9939 respectively. The mean values for both series were almost identical in each case.

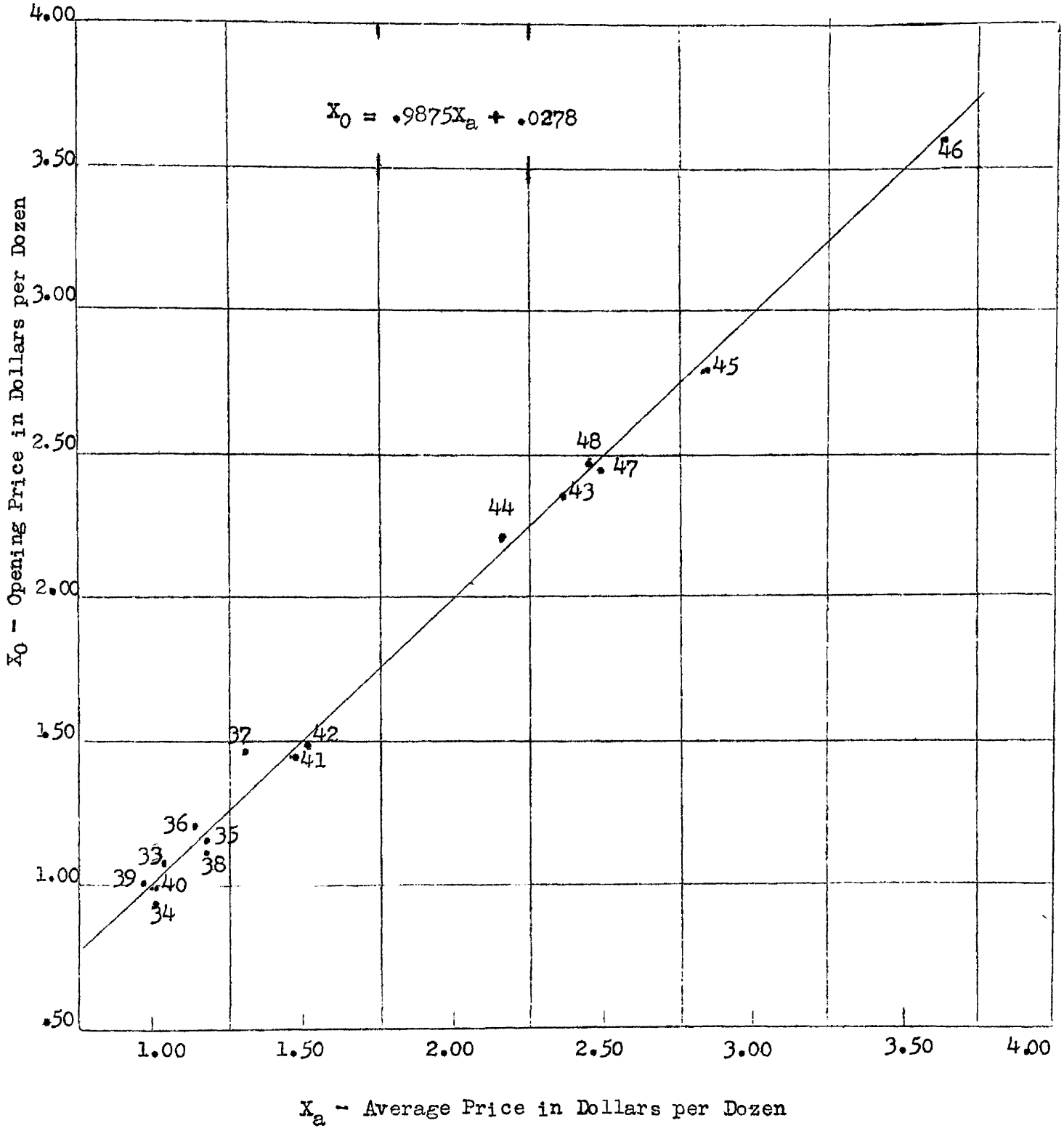


Figure 19. Average Relationship Between Opening and Average f.o.b. Plant Prices of Red Cherries in Number 2 Cans, Michigan, 1933-48.

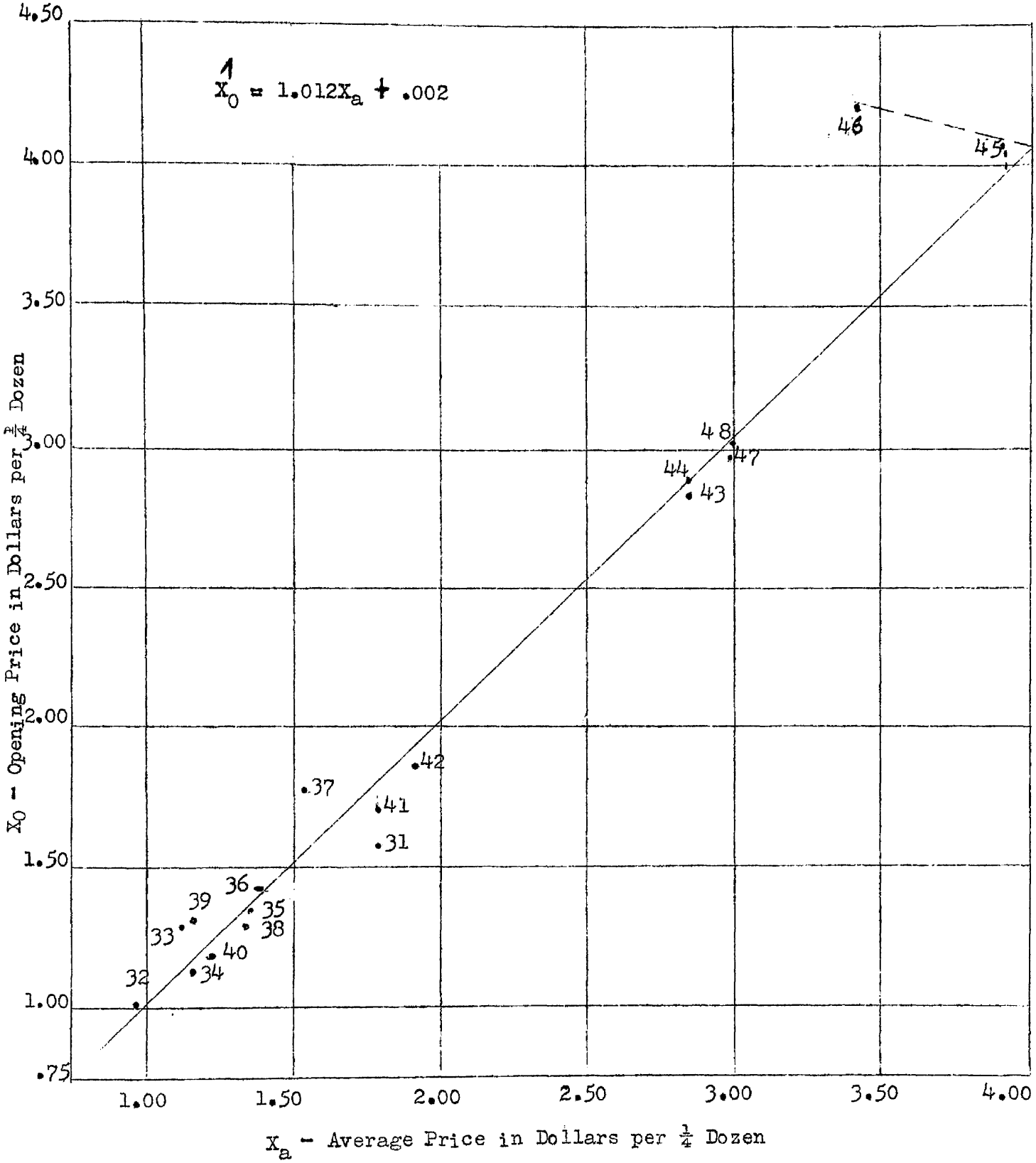


Figure 20. Average Relationship Between Opening and Average f.o.b. Plant Prices of Red Cherries in Number 10 Cans, Michigan, 1931-48.

with no constant value would have meant that on the average, opening prices would have equaled average prices). For number 2's, there were six years in which opening prices exceeded the regression values, eight years in which average prices exceeded the regression values, and two years for which they were both equal to the regression values (Cf. Figure 19). For number 10's, there were six years that opening prices exceeded the regression values, ten years for which average prices exceeded the regression values, and two years for which both opening and average prices equaled the regression values (Cf. Figure 20). These deviations can be attributed to two things: 1) errors in judgment or 2) changing economic conditions. Except for those years when economic data affecting red cherry prices were imposing a bearish influence upon prices, opening prices should have been below average prices, thus inferring a seasonal rise in prices. A slope of unity to the regression lines would have yielded this situation a majority of the time but in varying degrees. There would still be more years above the line than could seemingly be accounted for by bearish economic factors affecting prices. Errors in judgment thus seem to play a considerable role in causing variations about the regression lines shown or even about a regression line whose coefficient is unity and which has no constant term.

Price and pack relationships. As was true with farm prices of red cherries there was little gross relationship between prices and either the amount packed or the amount produced.4/ The total pack in Michigan expanded more in proportion through time than did total production. The

---

4/ Compare Figures 13 and 18.

pack thus increased at the same time prices for the various types of pack also increased. As compared with prices, however, the total pack was highly variable from year to year and its size apparently had little influence upon prices. The crop years of 1943 and 1945 were considered to be very short pack years. Prices in 1943 were higher than those in 1942. In 1944 with a larger pack, prices were lower. Prices were up in 1945 with the short pack, but in 1946 there was a tremendous increase in the size of the pack and also a sizeable increase in prices. The year 1946 was the year that the Office of Price Administration removed price ceilings. But the indecisiveness of O.P.A. caused a great deal of concern in the industry. In the spring of 1946, O.P.A. announced the removal of price ceilings. Growers in the Traverse City area were asking a minimum of 0.15 dollars per pound for the raw fruit. With these demands in the face of a record-sized crop, O.P.A. decided to reimpose price ceilings at a level of about 0.095 to 0.100 dollars per pound, or only equal to two-thirds of the prospective price. The industry won the decision, ceilings remained off, and growers received approximately 0.15 dollars per pound for a then record crop. The unique thing about 1946 prices and production was the magnitude of the movements involved. Actually in 11 of the 18 years, prices and production responded contrary to the theoretical conclusion[5/] that an increase in production is accompanied by a decrease in the price or conversely, a decrease in production is accompanied by an increase in the price. General overall inflation or increases in income accounted for the fact that in only 7 of the 18 years prices and

---

5/ The theory here of course assumes ceteris paribus.

production moved in opposite directions.

Since the movements in the volume packed have been regulated by the volume produced, there was little to choose between using one or the other as a price influencing factor. About the only difference between the two measurements that has emerged through time has been the higher proportion of the total production going to make up the pack.6/ The big disadvantage of using the total pack as a price influencing factor is the fact that it is usually not known prior to the need for establishing an opening price and must be estimated from the outlook for production. Thus, a production figure which has been estimated would have to be used in order to estimate the total pack.

With farm prices, the total production in five states7/ seemed to be the best supply indicator of price although the net relationships were low. Pack prices tend to follow farm prices fairly closely and the 5-state production figure should also be the best supply indicator for the analysis of pack prices.

Prices and container sizes. Price relationships seem to have had some effect upon the sizes and types of containers used for the pack. As a general rule, the larger the pack, the greater is the proportion of the pack that is packed in the consumer sized packages. With a small pack, a greater proportion is utilized in the institutional trade. The logic of these policies is clear. The institutional trade consists of quantity buyers which means that fewer sales contacts need be made to move a fair-

---

6/ This is apparent from Figure 13.

7/ These states include Michigan, Wisconsin, Ohio, New York, and Pennsylvania.

ly large quantity of the pack. These quantity buyers are the so-called steady buyers to which the industry has catered to through time. Unit costs for processing as well as unit sales costs are usually less for this group of buyers. The broad consumer market is quite different. The amount purchased by a single consumer at one time is much less than the amount purchased in the institutional trade. Individual contacts by industry-minded individuals are impossible and mass media appeals are resorted to in order to arouse interest and acquaint individual consumers with the product. If one was to hypothesize the relative elasticities of demand for these two groups of buyers, it would be that the demand by the institutional trade would be relatively more inelastic than the demand by individual consumers. This being true, the industry policy of packing a greater proportion of a large pack in consumer sized packages is sound. Referring again to the price movements illustrated in Figure 18, prices of red cherries in number 2 cans have remained as favorable through time as prices of red cherries in number 10 cans and 30 pound tins. Since total production and consequently total pack have increased (though irregularly) through time, the above hypothesis dealing with the relative elasticities of demand seems to be supported. But before such an hypothesis can be rigorously supported, more knowledge as to the relative elasticities of substitution of other products with red cherries both at the institutional and consumer levels must be gained. The necessary data are beyond the scope of this study and considerable work along these lines are needed in many areas outside of the red cherry industry as well.

The seasonal movements of stocks and prices are difficult to analyze and are of secondary importance as compared with either opening or

average prices and the movement of stocks from packers hands. Opening and average price data were more easily obtainable from packers than monthly prices. Monthly prices can easily vary because of the different number and amounts of quantity discounts granted in one month as compared with another. Usually, invoiced accounts were the only source of seasonal sales information. Occasionally, some plants kept a monthly accumulative record of average prices by type of pack along with average costs by type of pack. From these data, along with quantities sold, average monthly prices could be determined. Otherwise, modal or median prices had to be accepted as the average price for the month. Some plants naturally sell their entire pack before others at identical, or even somewhat higher prices. As soon as the pack is moved, no further price is quoted. But back-ups on orders may put a given packer back into the market. In the interim no price can be used and a weighted price is skewed since the entire pack was not considered.

Stocks in trade channels. Data on stocks in canners' hands also are inadequate from the standpoint of yielding valid price-quantity relationships. Wholesalers or retailers vary their inventory policy according to present as well as anticipated economic conditions and physical capacities. If prices are expected to rise, building up inventory is sound policy. If prices are expected to fall, hand-to-mouth buying is sound policy if anticipations are eventually fulfilled. But suppose expectations are not fulfilled. If this situation arises, either a sudden rush for orders gets under way, or packers have a period of very slow sales even though their stocks are very low. Marketing institutions further along in the channels of trade than the packer thus have a lot to do with the rate of movement of any given pack and for these institu-

tions, accurate data pertaining to stocks has not been available. Until these data are available it will be very difficult for packers to institute wise seasonal sales and price policies. The impact of inventory policies are very great upon the industry if the entire pack has not been moved. Aside from the impact of a large, slow-moving inventory at the higher levels of the trade channels on the volume of sales by packers, there is the added psychological effect on the market as packers are forced to reduce prices in order to effect sales. This is especially dangerous as a harvest season approaches since it imposes a bearish psychology on the market. This quite often happens with a large crop when the anticipated crop is smaller and should perhaps be able to command a higher price, other things being equal.

Summary. By way of summary it should be mentioned that both the total pack and pack prices for red cherries have generally moved upward since 1931. The rise in prices for the institutional sized containers was relatively greater than the rise for consumer sized packages — perhaps a reflection of the differences in the elasticity of demand. The relationship between opening and average prices was the most reliable indication of the seasonal movement of prices. Adequate data for stocks at different levels in the trade channels have not been available and are essential for the wise development of seasonal sales and price policies.

CHAPTER VIII

FACTORS AFFECTING F.O.B. PLANT PRICES OF RED CHERRIES IN MICHIGAN

The analysis of factors affecting f.o.b. plant prices of red cherries in Michigan is more complicated than that for farm prices. The complications stem primarily from the fact that there are several types of pack that demand attention. The first task is to select the variables that bear logical influencing relationships to pack prices, keeping in mind that the independent variables must be capable of estimation if they are not accurately known prior to the pack season. Of those variables used for analyzing factors affecting the farm price of red cherries in Michigan, in Chapter V, theindex of all farm prices in the United States would seem to be the most illogical for an analysis of pack prices. Using the analysis of the farm price of red cherries as a basis, plus the consideration of the various independent variables, the preliminary remarks concerning analysis of pack prices can be materially reduced.

Selection of supply factors. The previous chapter dealt with pack prices and supply factors. The total pack as a measure of supply, even though it bears a close relation ship to the total production for like production areas, is not a good practical indicator since it would have to be estimated from indications of total production. Then, so long as the pack would have to be estimated from an estimation in order to be useful, there is little doubt that a production figure would be most valid. The question then resolves itself into which production area to use. The same three alternatives exist as existed with the analysis of prices at the farm level: 1) total production in Michigan which now accounts for about one-half of the red cherry production in the United States, 2) the total production of red cherries in Michigan, Wisconsin, Ohio, New York, and Pennsylvania (the 5 major eastern red cherry producing states), and 3) a

broader producing area would include at least the two western states that produce sizeable quantities of red cherries. The mid-June forecast of red cherry production, however, does not include estimates for any of the western states.

On the supply side, the question of stocks or carry-overs again arises. Canned stocks have been adequately considered. Frozen stocks are reported by the Production and Marketing Administration, Marketing Facilities Branch, as of the first of each month. They include all quantities stored in public cold storage warehouses, regardless of who has title. This series dates back only to July 1, 1938. The limitations of these data are obvious. First of all, they may be owned by packers, wholesalers, retailers, or any other marketing agency within the system. And as was mentioned in the previous chapter, it is extremely important at which level in the trade channel the stocks are held because of the differences in the impact upon pack prices in the ensuing year. Stocks data then for both the canned and the frozen pack are grossly inadequate, yet they may be useful guides to seasonal sales and price policy.

Quality, with all of its abstractness, is usually thought to be an important price influencing factor. The difficulty with quality lies in the difficulty of ascribing objective measurements to the subjective facts concerning quality. It was thought that some measurement of quality could be obtained from a figure indicating the percentage of the new product lost in the packing process. This figure would include juice losses, pit losses, pick,[1/] and other wastes. However, these losses do not necess-

---

1/ Pick is a term used to identify that portion of the raw fruit that is picked from a sorting belt, usually by hand.

arily vary directly with quality. A high juice loss may be indicative of high quality fruit, while a large pit loss or a high percentage pick usually results from a low quality of fruit. Then, too, there was a tremendous variation in the percentage waste figure that was reported by individual plants.2/ For example, in 1948 the percentage waste by individual plants varied from a reported low of 16 percent to a high of 29 percent, with an average loss of 20.4 percent per plant. Data for previous years were incomplete, but the lowest figure reported was 14 percent for one plant in 1946 and the highest reported was 29 percent in 1948. Plants reporting these high losses usually trucked fruit in from other areas, and consequently, more of the fruit was damaged. Quality is thus a factor that is difficult to measure and also difficult to determine through time.

Marketing costs. In addition to the possible factors affecting farm prices, pack prices have an additional cost -- that for marketing. Marketing charges, based upon the average annual purchases of farm food products by a family of three average consumers, are reported monthly by the Bureau of Agricultural Economics.3/ These data are available since 1910. An index of these marketing charges was computed for comparison purposes based upon 1935-39 = 100. Other data for marketing costs are available in a narrower form. The farmers share of the consumer's food dollars and its complement, marketing charges as a percentage of the retail cost, are published for many commodities.4/ Yet, for practical usage, the gross figure

---

2/ In answer to the question, "What percent of your receipts was pick?" which was broadened to include all waste because of the inadequacy of data kept by the packers.

3/ Anonymous, The Marketing and Transportation Situation, Bureau of Agricultural Economics, United States Dept. of Agriculture, Washington 25, D. C

4/ Ibid.

seemed to bear the highest relationship with red cherry pack prices. Perhaps there is an averaging of extreme values that makes it more pertainable to red cherry pack prices.

Demand indicators. On the demand side, the same problems existed with respect to the various measures of aggregate demand. Disposable personal income is the most common indicator used inprice analysis, yet total personal consumption expenditures yield the best results with red cherry pack prices. As was mentioned in an earlier chapter, the category personal consumption expenditures of national product and income estimates was not made prior to 1946. Either of the two measurements can be equally defended as measures of the level of aggregate demand.

The use of the variable time as an independent variable was also one of the important ones considered. None of the variables changed as much as red cherry pack prices, therefore leaving a residual trend after the elimination of the influence of other variables. Special conditions justifying its use depend primarily upon unmeasurable, qualitative, or subjective factors. Many of these factors are still present today insofar as the red cherry industry is concerned, yet one can only hypothesize as to their influence in the past as well as their likely influence in the future. Advertising programs, the development of new uses, improved varieties, and more efficient processing methods are only a few of the many non-quantitative factors that fall into this group. If this variable remains in the predicting equations, its usefulness should be reevaluated each year so that it can be eliminated before results become too much in error.

Indicators used. The selection of the factors for use in the analysis was made on approximately the same basis as that for farm prices. Personal

consumption expenditures were used as the aggregate measure of demand. Disposable personal income, which includes savings in addition to personal consumption expenditures, could have been justified since there is some adjustment in the amount saved with changes in price levels. But the data reported 5/ on income includes the seasonally adjusted figure without savings, and therefore is probably more accurate to use as an indicator of aggregate demand for consumption goods. Food, or food and tobacco expenditures are also estimated along with the other income and expenditure estimates, but they were not as good an estimate of the aggregate demand for red cherries. This may be explained in part by the fact that there is a great deal of substitution among the different food products as well as between food expenditures and other non-durable goods, and perhaps also between food and durable goods insofar as expenditures are concerned.

On the supply side, total production of red cherries in the five eastern states was used since packers in these states compete in essentially the same markets. Then, too, the Bureau of Agricultural Economic's mid-June forecast of production is based upon these states. The usual time of full bloom in these states begins about April 14 in Ohio and extends through June 1 in Michigan. Harvesting usually begins about June 25 in Pennsylvania, Ohio, and New York and about one week later in Michigan and Wisconsin. The harvesting season usually ends by August 15.6/ The mid-June forecast of production occurs about two weeks after the

---

5/ These data appear on a quarterly basis in the Survey of Current Business published monthly by the United States Department of Commerce.

6/ Cf. Cherries: Usual Time of Bloom and Harvest, by States and Commercial Areas, U. S. D. A., B. A. E., Washington, D. C., May 1948, pp. 6-7.

period of full bloom, and yet about ten days prior to the beginning of the harvest season. Naturally this estimate can vary considerably from the actual amount harvested since weather, even during the harvest season, sometimes materially alters both the size of the crop as well as the quality of the fruit.

Further on the supply side, marketing charges were included as an independent variable. This variable was substituted for the index of all farm prices which was used in the analysis of the farm price of red cherries. It is obtained by computing the retail cost of the food for an average family of three minus the farm value of the food adjusted for by-products. This margin is then adjusted by subtracting any processor taxes and adding government payments to marketing agencies. Since an index of these charges was used, this result is divided by the 1935-39 average and multiplied by 100.

The last of the independent variables used in the analysis was time. The merits and criticisms of its use has been discussed previously. Further justification for its use will be made in the subsequent chapter.

The dependent variables. With prices of each of the three types of pack used singly as the dependent variable, the correlation and regression was computed with 5-state production, personal consumption expenditures, an index of marketing charges, and time as the independent variables (Table V). In the analysis the abnormal years of 1944, 1945, and 1946 were omitted. The peculiar characteristics of these years that make them unadaptable to analysis have been discussed previously. The analysis for each of the types of pack will be considered beginning with that for number 2 cans and proceeding through that for number 10 cans and ending with that for 30 pound tins.

Prices of number 2 cans. The correlation matrix for the f.o.b. price of number 2's against the independent variables for the years 1931 - 1948 excluding 1944, 1945 and 1946 was

Table V - Average Annual f.o.b.Prices of Packed Red Cherries in Michigan with the Values of the Price Indicators, 1931-48.

Year	X_1 Average Price #2 cans per doz.	X_1 Average Price #10 cans per 3 cans	X_1 Average Price 30# tins per lb.	X_2 Production[b/] Mich., Wisc., Ohio, N.Y. Pa.	X_3 Personal Consumption Expenditures	X_4 Index of Marketing Charges (1935-39 = 100)	X_5 Time (1930 +X)
	Dollars	Dollars	Dollars	Tons	10 million dollars	Percent	Years
1931	1.53	1.79		60,620	6,115	108	1
1932	.99	.96		67,432	4,921	96	2
1933	1.03	1.10		62,300	4,635	92	3
1934	1.00	1.16		69,450	5,188	97	4
1935	1.17[a/]	1.35[a/]		78,060	5,622	100	5
1936	1.13[a/]	1.40[a/]		53,810	6,252	102	6
1937	1.30[a/]	1.55[a/]	.080	79,220	6,712	102	7
1938	1.17	1.33	.078	48,080	6,451	100	8
1939	.97	1.14	.065	83,180	6,747	96	9
1940	.99	1.21	.070	88,960	7,205	94	10
1941	1.45	1.77	.075	69,440	8,226	96	11
1942	1.51	1.90	.090	93,350	9,084	105	12
1943	2.35	2.84	.143	27,050	10,163	113	13
1944	2.15	2.80	.138	95,070	11,042	112	14
1945	2.83	3.94	.190	34,400	12,170	113	15
1946	3.62	4.42	.219	102,700	14,367	127	16
1947	2.47	2.98	.152	80,020	16,438	148	17
1948	2.46	3.01	.153	122,760	17,772	166	18

Source: Prices of #2 and #10 cans were taken from Roy E. Marshall's data op. cit. and gathered from direct survey of packers following 1937. Personal Consumption Expenditures were gathered from the Survey of Current Business. The Index of Marketing Charges was computed from data appearing in the Marketing and Transportation Situation.

a/ Estimated from available data.

b/ Estimated for years 1931-37 from relationships of sweet and sour cherry production in each state.

	$r_{\cdot 1}$	$r_{\cdot 2}$	$r_{\cdot 3}$	$r_{\cdot 4}$	$r_{\cdot 5}$
$r_{1\cdot}$	1	.138	.899	.876	.769
$r_{2\cdot}$	.138	1	.477	.465	.410
$r_{3\cdot}$	.899	.477	1	.950	.900
$r_{4\cdot}$	.876	.465	.950	1	.736
$r_{5\cdot}$	.769	.410	.900	.736	1

which yielded the regression equation[7]

$$\hat{X}_1 = \underset{(0.381)}{- 0.00000947X_2} + \underset{(1.483)}{0.0002049X_3} - \underset{(0.122)}{0.00327X_4} - \underset{(0.319)}{0.0338X_5} + 1.940$$

The net regression[8] of prices on 5-state production was negative (Figure 21). This occurred despite the fact that the gross relationship was positive. An increase in the size of the red cherry crop in the five states of 1,000 tons was associated with a decrease in the price of about 0.01 dollars.

Personal consumption expenditures was the most important factor of the four affecting the price of red cherries in number 2 cans (note the high t-value of 1.483 in the regression equation). The association between these expenditures and prices was fairly high and the net regression was highly positive, (Figure 22). An increase of 1 billion dollars in personal consumption expenditures was associated with a net increase of about 0.02 dollars per dozen.

Although the coefficient of correlation between prices in number 2 cans and the index of marketing charges was fairly high and positive

---

7/ The numbers in parentheses below the regression coefficients are the t-values for each of the independent variables.

8/ The term net regression as used here and so subsequently will be used, means the effect of one independent variable on the dependent variable when the other independent variables are held constant at their mean values.

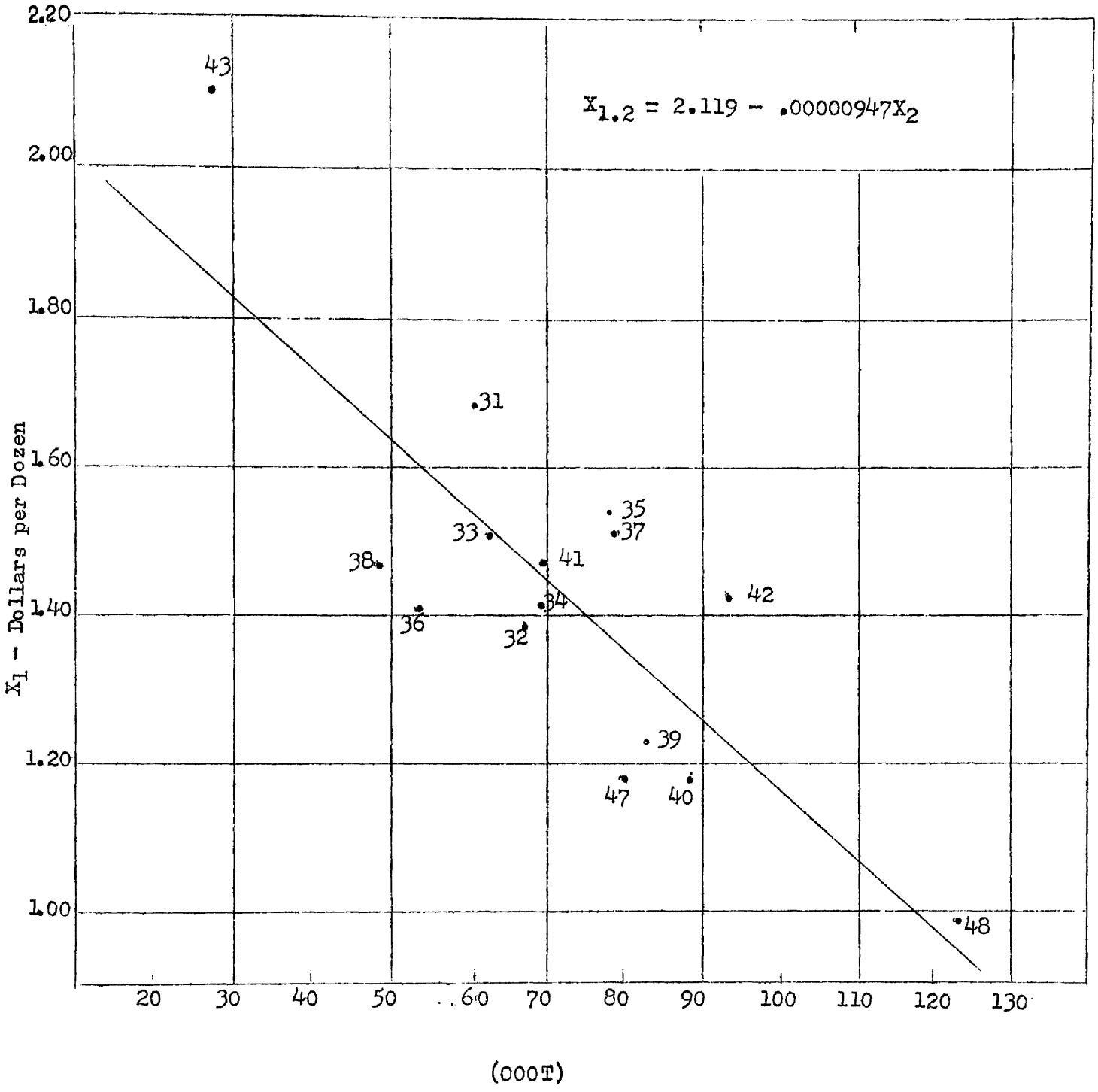


Figure 21. Average Relationship Between f.o.b. Plant Price per Dozen Number 2 Cans of Red Cherries in Michigan and 5-State Production with United States Personal Consumption Expenditures, United States Marketing Charges, and Time Held Constant, 1931-48, excluding 1944, 1945, and 1946.

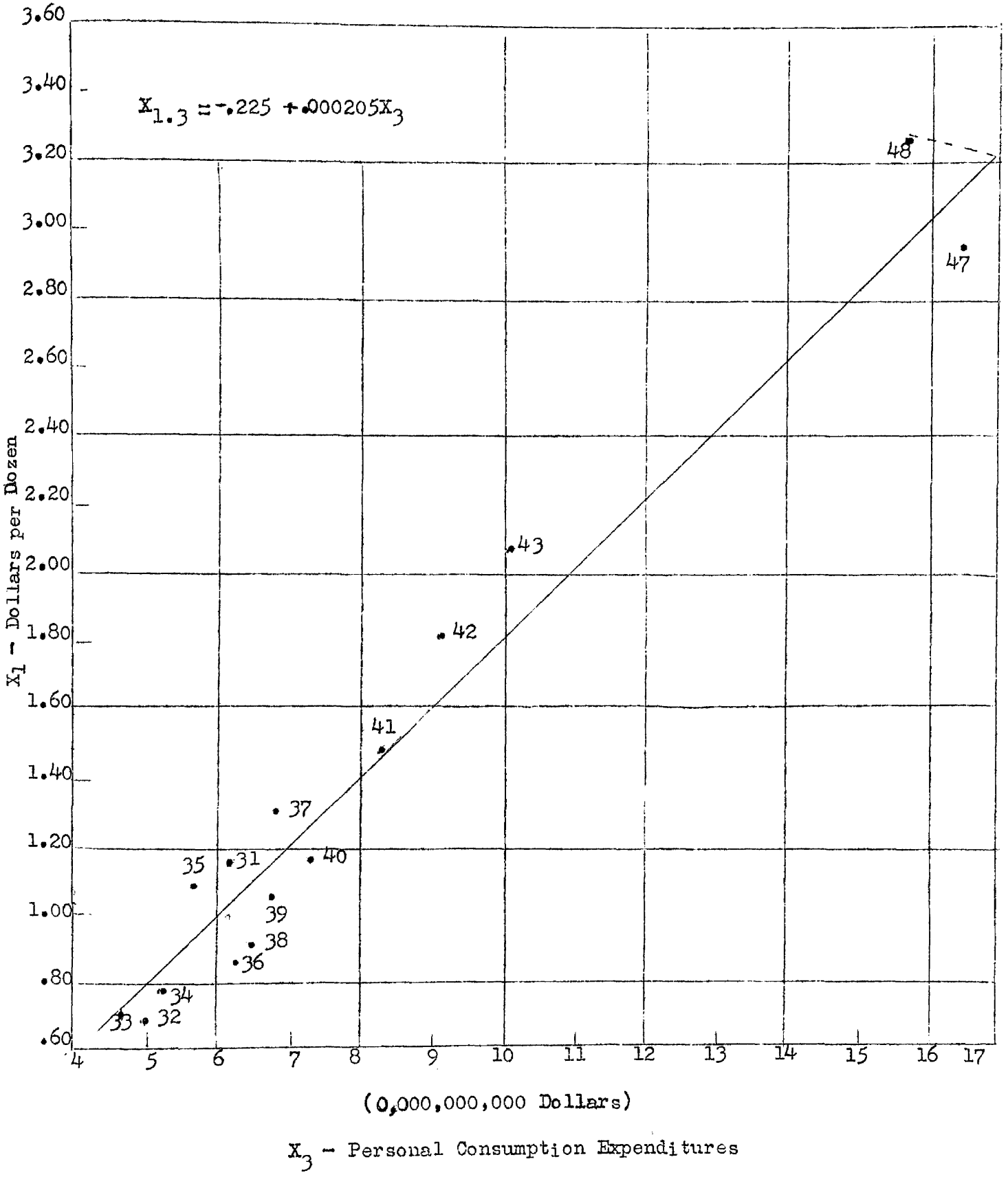


Figure 22. Average Relationship Between f.o.b. Plant Price Per Dozen Number 2 Cans of Red Cherries and United States Personal Consumption Expenditures with 5-State Production, United States Marketing Charges, and Time Held Constant, 1931-48, excluding 1944, 1945, and 1946.

(0.876), the net relationship between the two was slightly negative (Figure 23). Its weight in the regression equation was the smallest of all the variables as evidenced by its low t-value. In general, an increase of 10 points in the index of marketing charges was associated with a decrease of about 0.03 dollars per dozen.

Time was a fairly important variable in the regression equation (Figure 24). Its net regression value was negative to the extent that each additional year caused a price reduction of about 0.03 dollars per dozen.

The regression equation was fairly efficient in estimating the average f.o.b. price of red cherries in number 2 cans (Figure 25).[9] The estimate of 1943 was 0.24 dollars per dozen too low, which represented the largest absolute error for any year. In 1941 the estimated price was only 0.01 dollars too low. The average error was equal to 8.6 percent of the mean value for the 15 years.

Prices of number 10 cans. The same analysis applied to the pack in number 10 cans yielded very similar results. The correlation matrix was

	$r_{\cdot 1}$	$r_{\cdot 2}$	$r_{\cdot 3}$	$r_{\cdot 4}$	$r_{\cdot 5}$
$r_{1\cdot}$	1	.166	.908	.869	.803
$r_{2\cdot}$	.166	1	.477	.465	.410
$r_{3\cdot}$	.908	.477	1	.950	.900
$r_{4\cdot}$	.869	.465	.950	1	.736
$r_{5\cdot}$	.803	.410	.900	.736	1

which yielded the multiple regression equation[10]

9/ The coefficient of multiple linear correlation, $r_{1.2345}$, was equal to 0.964 and its standard error, $s_{1.2345}$, was equal to 0.141 dollars per dozen.

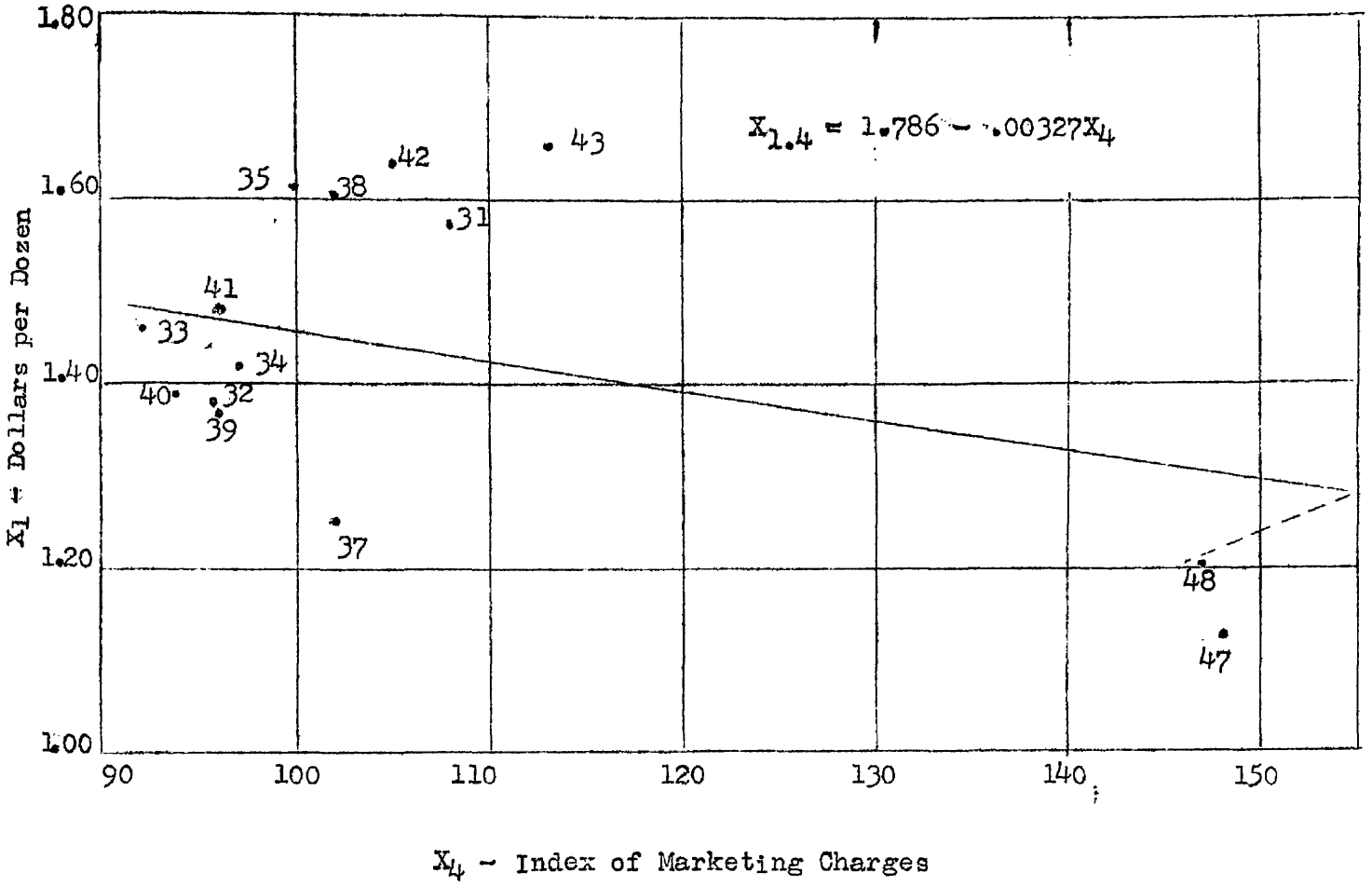


Figure 23. Average Relationship Between f.o.b. Plant Price per Dozen Number 2 Cans of Red Cherries and United States Marketing Charges with 5-State Production, United States Personal Consumption Expenditures, and Time Held Constant, 1931-48, excluding 1944, 1945, and 1946.

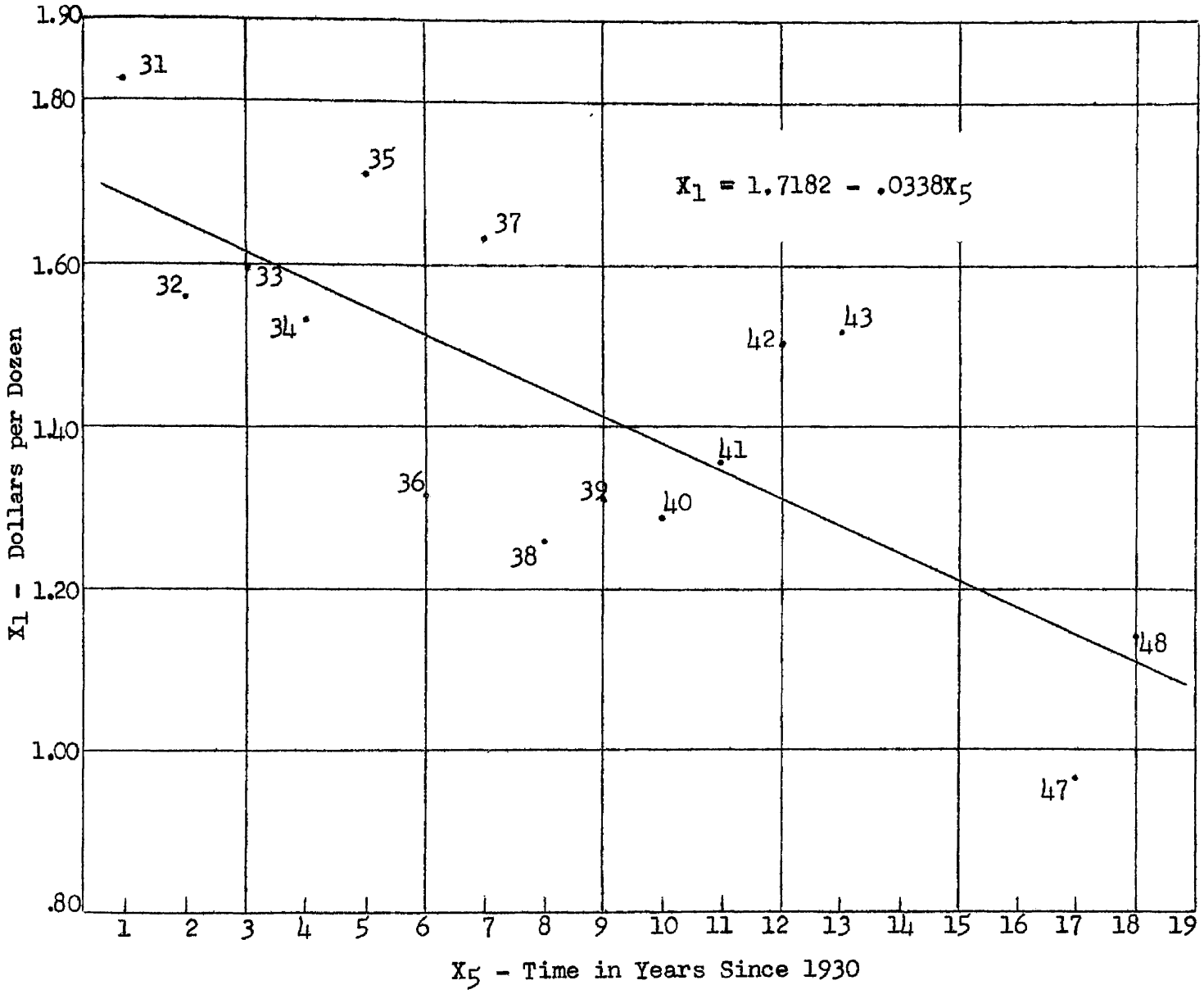


Figure 24. Average Relationship Between f.o.b. Plant Price per Dozen Number 2 Cans of Red Cherries and Time with 5-State Production, United States Personal Consumption Expenditures and Marketing Charges Held Constant, 1931-48, excluding 1944, 1945, and 1946.

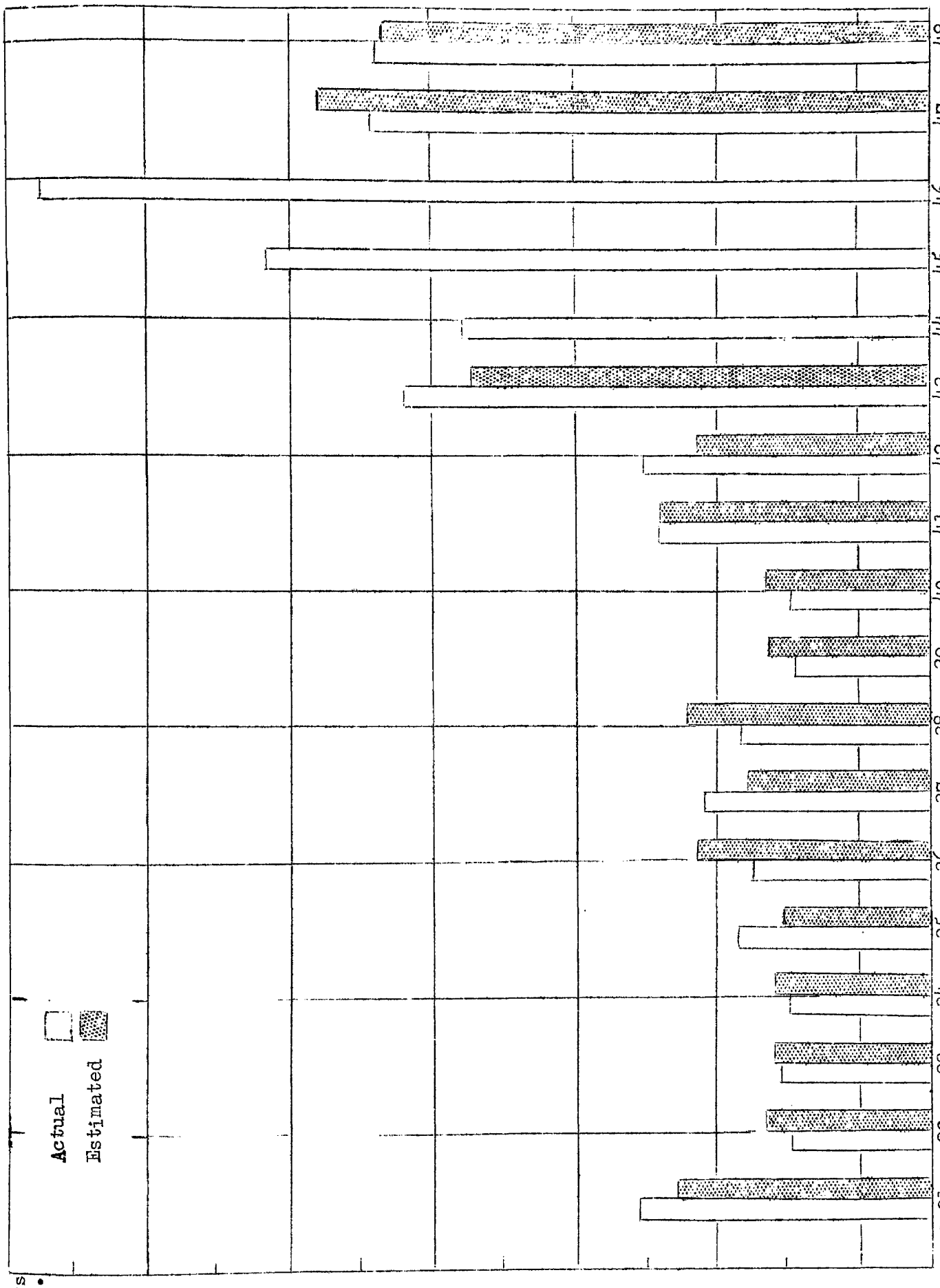


Figure 25. Actual and Estimated f.o.b. Plant Prices of Red Cherries per Dozen Number 2 Cans, Michigan, 1931-48, excluding Estimated for 1944, 1945, and 1946.

$$\hat{X}_1 = -0.0000110X_2 + 0.0002192X_3 - 0.00172X_4 - 0.183X_5 + 1.059.$$
$$\qquad\qquad (0.347) \qquad (1.243) \qquad (0.050) \qquad (0.135)$$

All of the t-values in this regression equation are lower than those for the analysis of number 2 cans. Taking the net relationships of each of the independent variables with the dependent variable, the first, 5-state production, was a negative relationship (Figure 26). An increase of 1,000 tons in production was associated with a decrease of 0.01 dollars per $\frac{1}{4}$ dozen of number 10 cans.

With number 10 cans as with number 2's, personal consumption expenditures was again the most important factor of the group. The relationship was highly positive to the extent that a rise of 1 billion dollars in expenditures was associated with a price increase of 0.02 dollars per $\frac{1}{4}$ dozen number 10 cans (Figure 27).

Marketing charges and time both exhibited negative relationships with prices (Figures 28 and 29). Both variables were relatively unimportant, moreso than was the case with the price of number 2 cans.

The multiple coefficient of correlation was almost identical with that for number 2 cans, also. The coefficient, $r_{1.2345}$, for number 10's was 0.962 as compared with 0.964 for number 2's.[11/] The average error as a percentage of the mean value was about 9.9 percent. Thus, the estimates of prices were fairly close to the actual values, and the highest absolute error of 0.29 dollars occurred in 1938 (Figure 30). Three estimated values were within 0.05 dollars (1934, 1941, and 1948).

10/ The figures in parentheses below the regression coefficients represent the t-values of the equation.

11/ The standard error, $S_{1.2345}$, was 0.184 dollars.

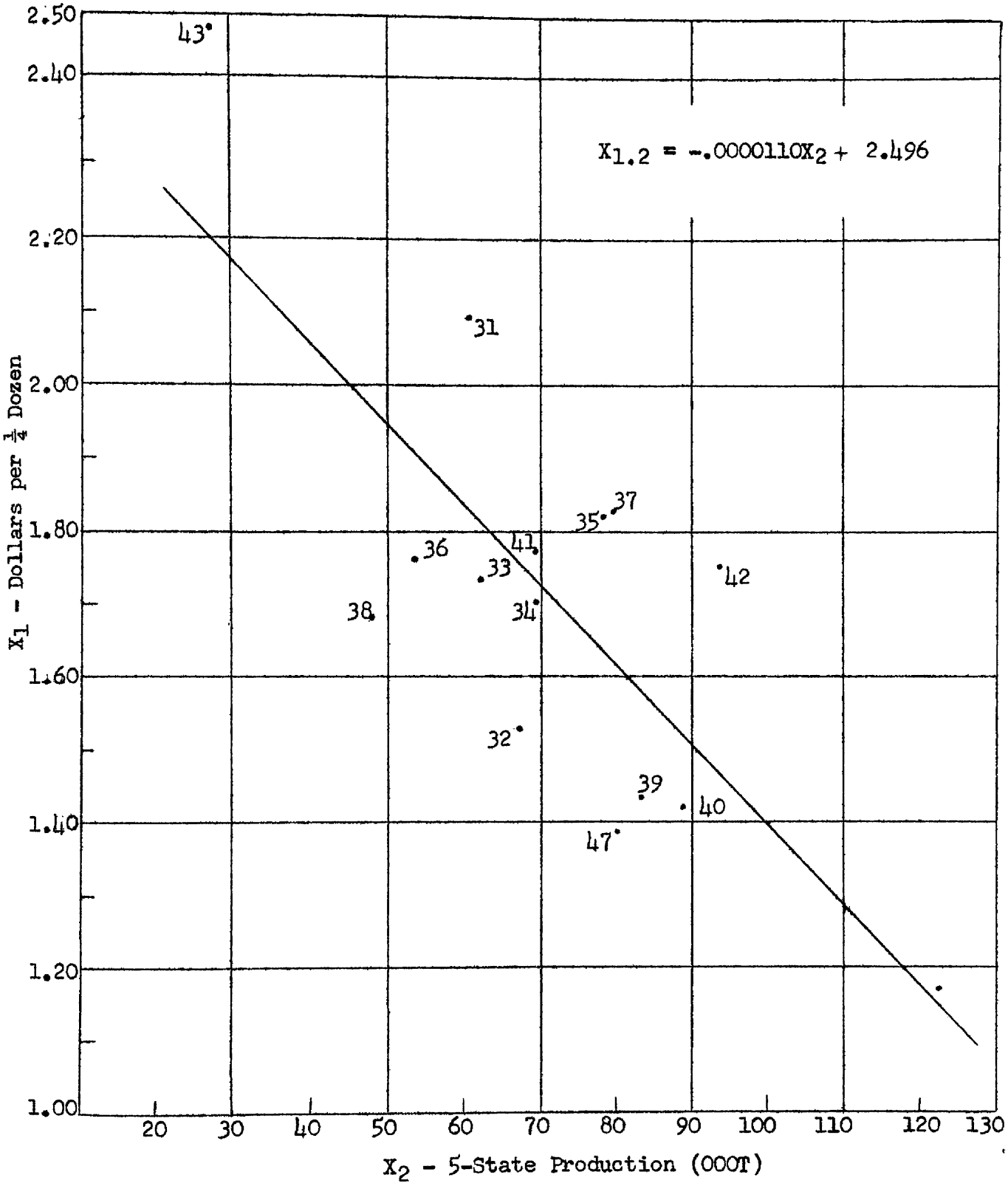
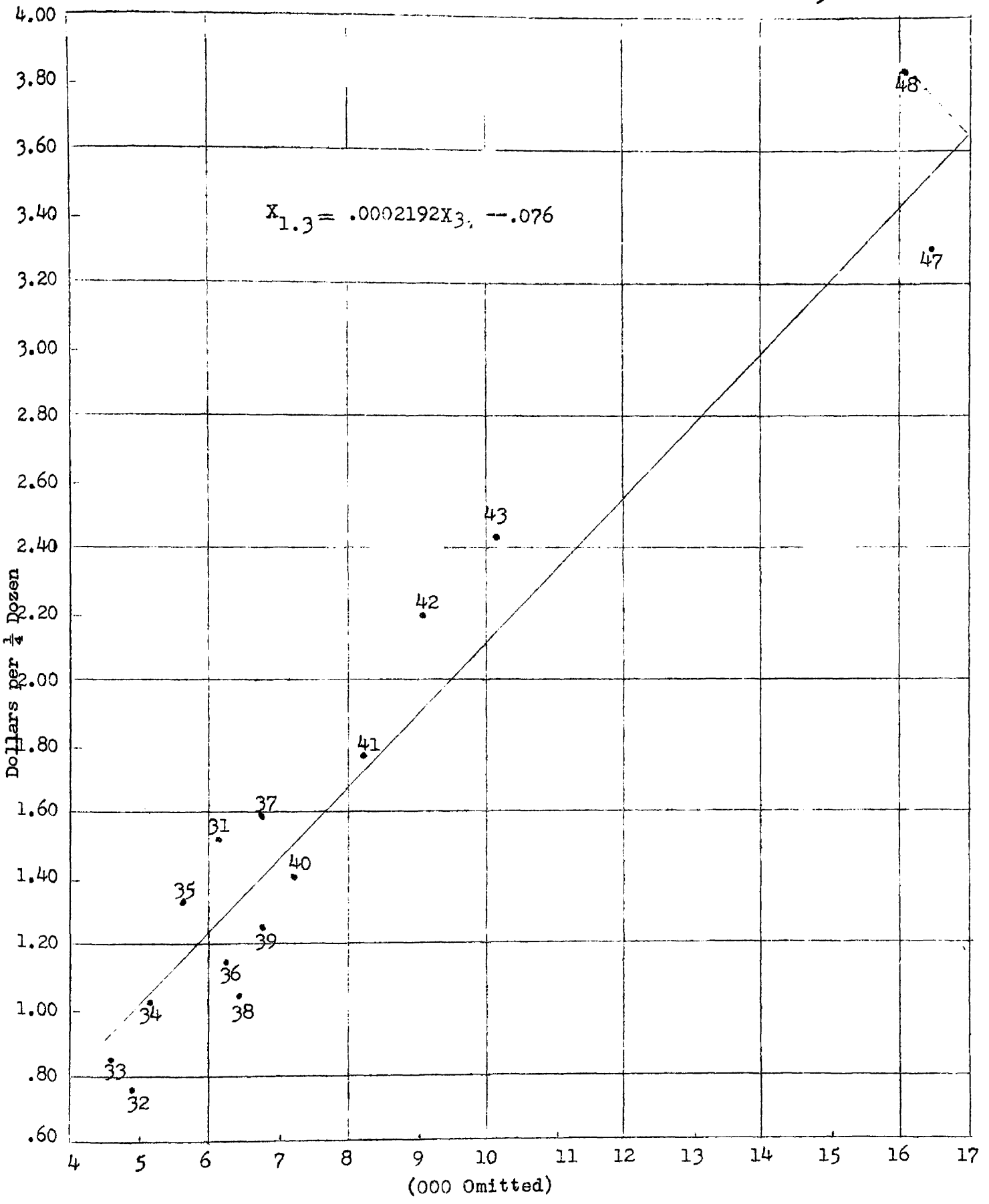


Figure 26. Average Relationship Between f.o.b. Plant Price per $\frac{1}{4}$ Dozen Number 10 Cans of Red Cherries in Michigan and 5-State Production with United States Personal Consumption Expenditures, United States Marketing Charges, and Time Held Constant, 1931-48, excluding 1944, 1945, and 1946.



X_3 - Personal Consumption Expenditures (10 Million Dollars)

Figure 27. Average Relationship Between f.o.b. Plant Price per ¼ Dozen Number 10 Cans of Red Cherries in Michigan and United States Personal Consumption Expenditures with 5-State Production, United States Marketing Charges, and Time Held Constant, 1931-48, excluding 1944, 1945, and 1946.

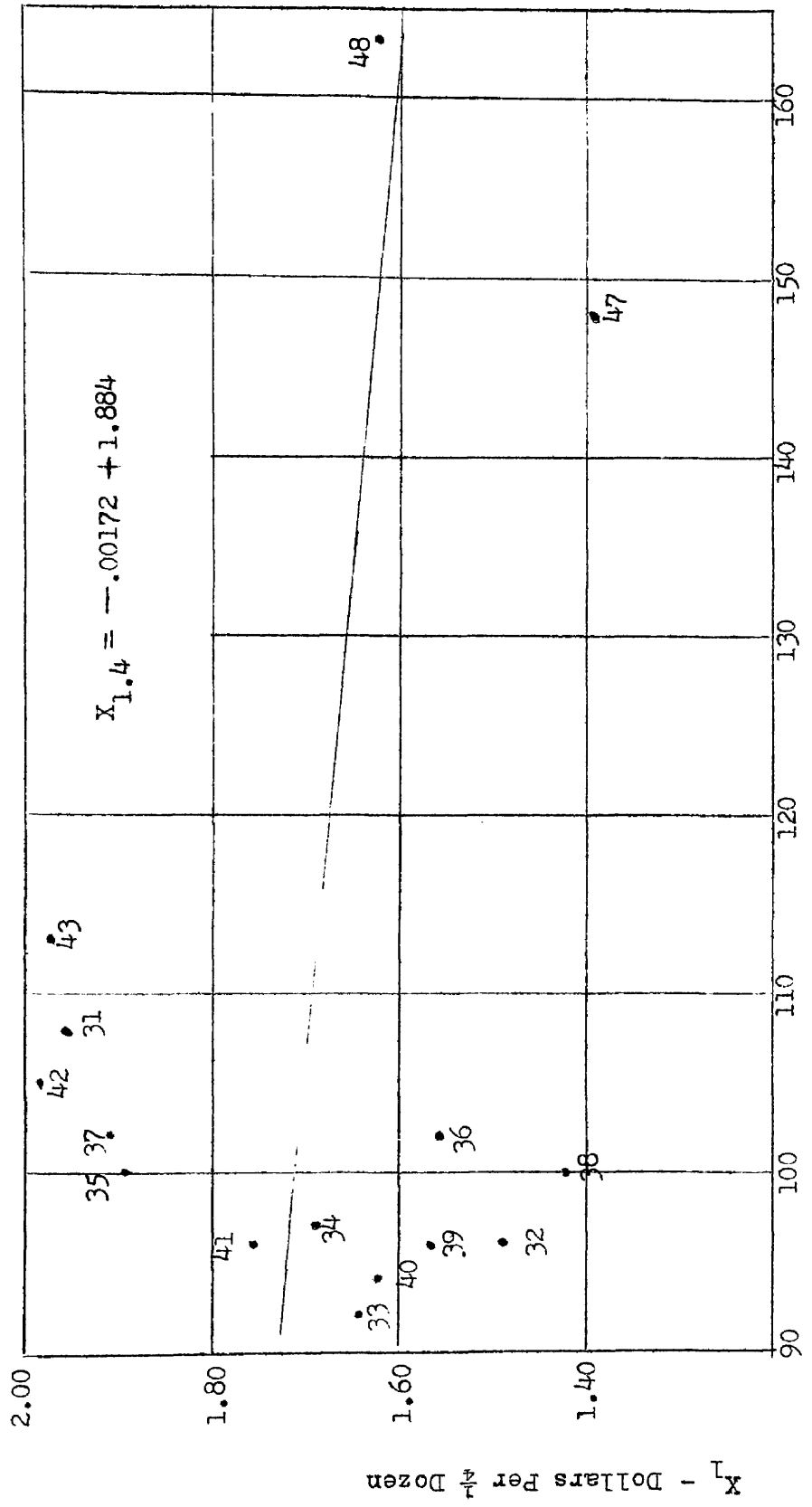


Figure 28. Average Relationship Between f.o.b. Plant Price Per ½ Dozen of Number 10 Cans of Red Cherries in Michigan and United States Marketing Charges with 5-State Production, United States Personal Consumption Expenditures, and Time Held Constant, 1931-48, excluding 1944, 1945, and 1946.

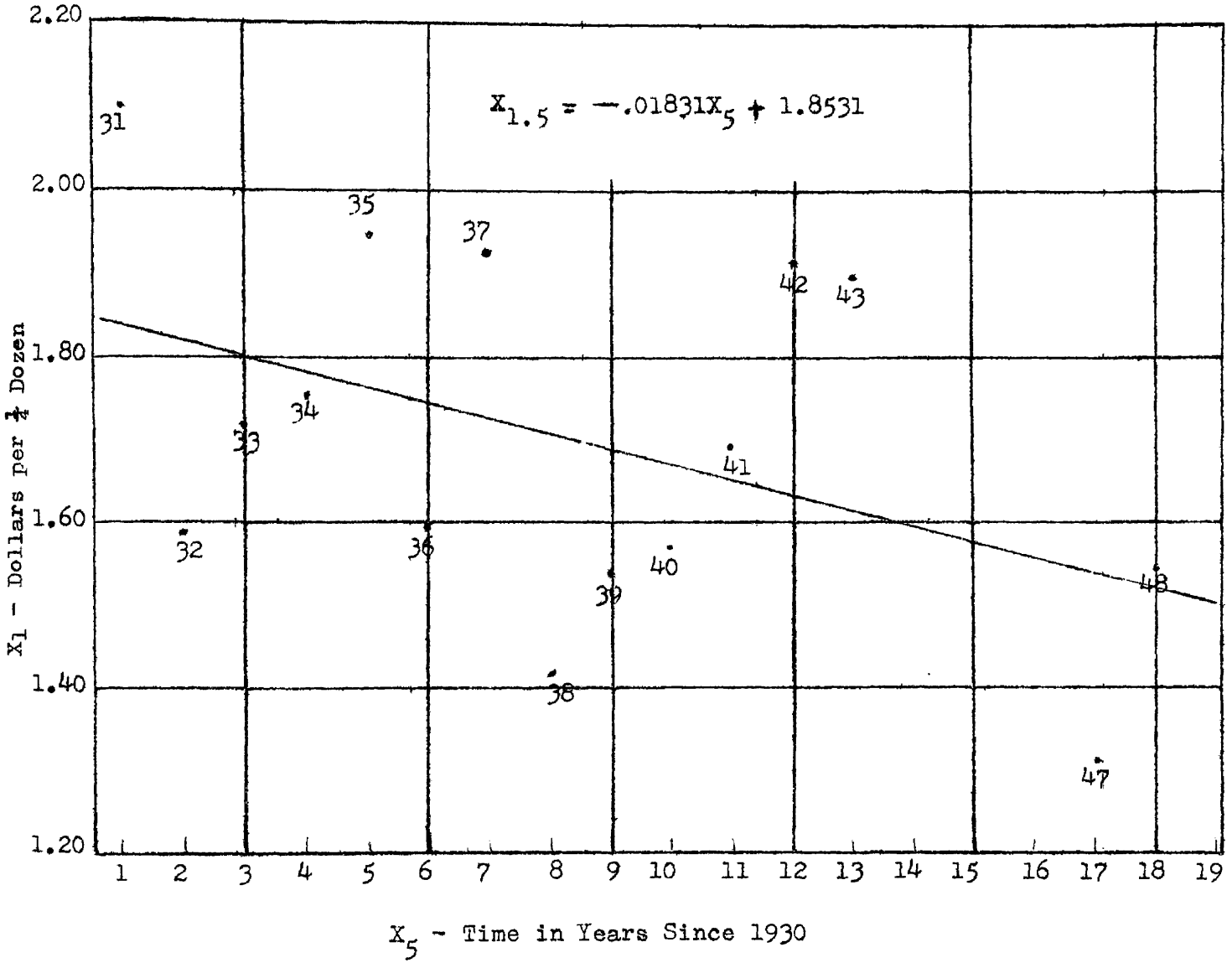


Figure 29. Average Relationship Between f.o.b. Plant Price Per ¼ Dozen Number 10 Cans of Red Cherries in Michigan and Time with 5-State Production, United States Personal Consumption Expenditures and United States Marketing Charges Held Constant, 1931-48, excluding 1944, 1945, and 1946.

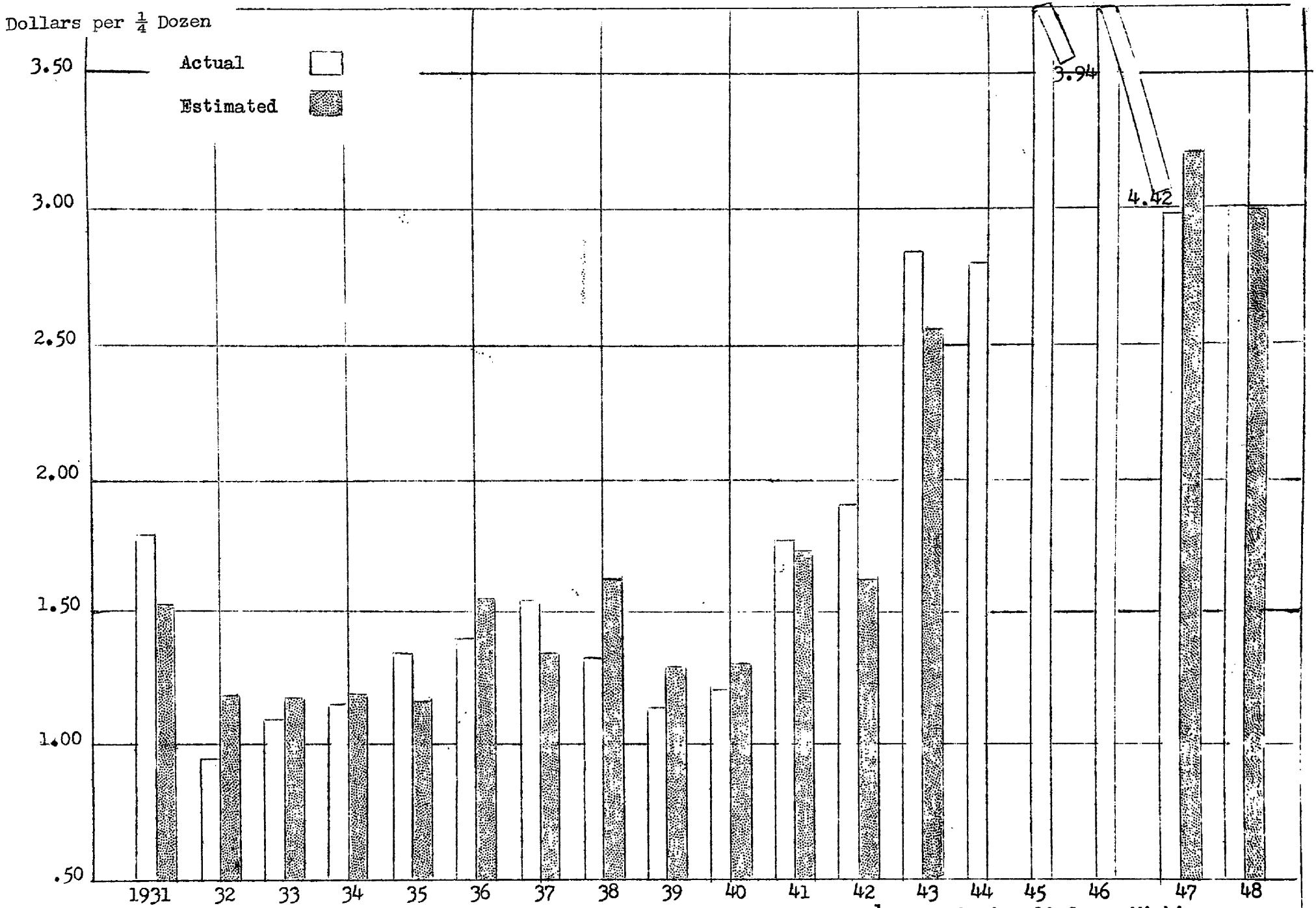


Figure 30. Actual and Estimated f.o.b. Plant Prices of Red Cherries Per ¼ Dozen Number 10 Cans, Michigan, 1931-48, excluding Estimated for 1944, 1945, and 1946.

Prices of 30 pound tins. For 30 pound tins, the analysis was similarly performed, but price data were only available beginning with 1937. Therefore, for the purposes of getting the net relationships for each of the independent variables with prices, and not for the purposes of prediction, data for the years 1944, 1945, and 1946 were included. The correlation matrix for the five variables was

	$r_{\cdot 1}$	$r_{\cdot 2}$	$r_{\cdot 3}$	$r_{\cdot 4}$	$r_{\cdot 5}$
$r_{1\cdot}$	1	.199	.792	.646	.825
$r_{2\cdot}$	.199	1	.526	.558	.436
$r_{3\cdot}$	.792	.526	1	.955	.967
$r_{4\cdot}$	.646	.558	.955	1	.883
$r_{5\cdot}$	.825	.436	.962	.853	1

which yielded the regression equation

$$X_1 = -0.000000636X_2 + 0.0000496X_3 - 0.00450X_4 - 0.0153X_5 + 0.332.$$
$$\qquad\qquad (0.259) \qquad (3.757) \qquad (1.889) \qquad (1.066)$$

The use of different years materially altered the importance of each of the variables in the regression equation. In general, the importance of production was reduced and the importance of personal consumption expenditures was increased relative to the other variables in the system. The net relationships for each of the variables is shown in Figures 31 through 34.

Because of the inclusion of the so-called abnormal years the accuracy of estimation was somewhat reduced[12/] (Figure 35). Errors ranged from almost 4½ cents in 1941 to a low of one-tenth of a cent per pound in 1948. It is recognized that this is a poor predicting equation and should be used only to compare net relationships.

12/ The coefficient of multiple linear correlation, $r_{1.2345}$ was 0.906 and the standard error, $S_{1.2345}$, was 0.021 dollars per pound.

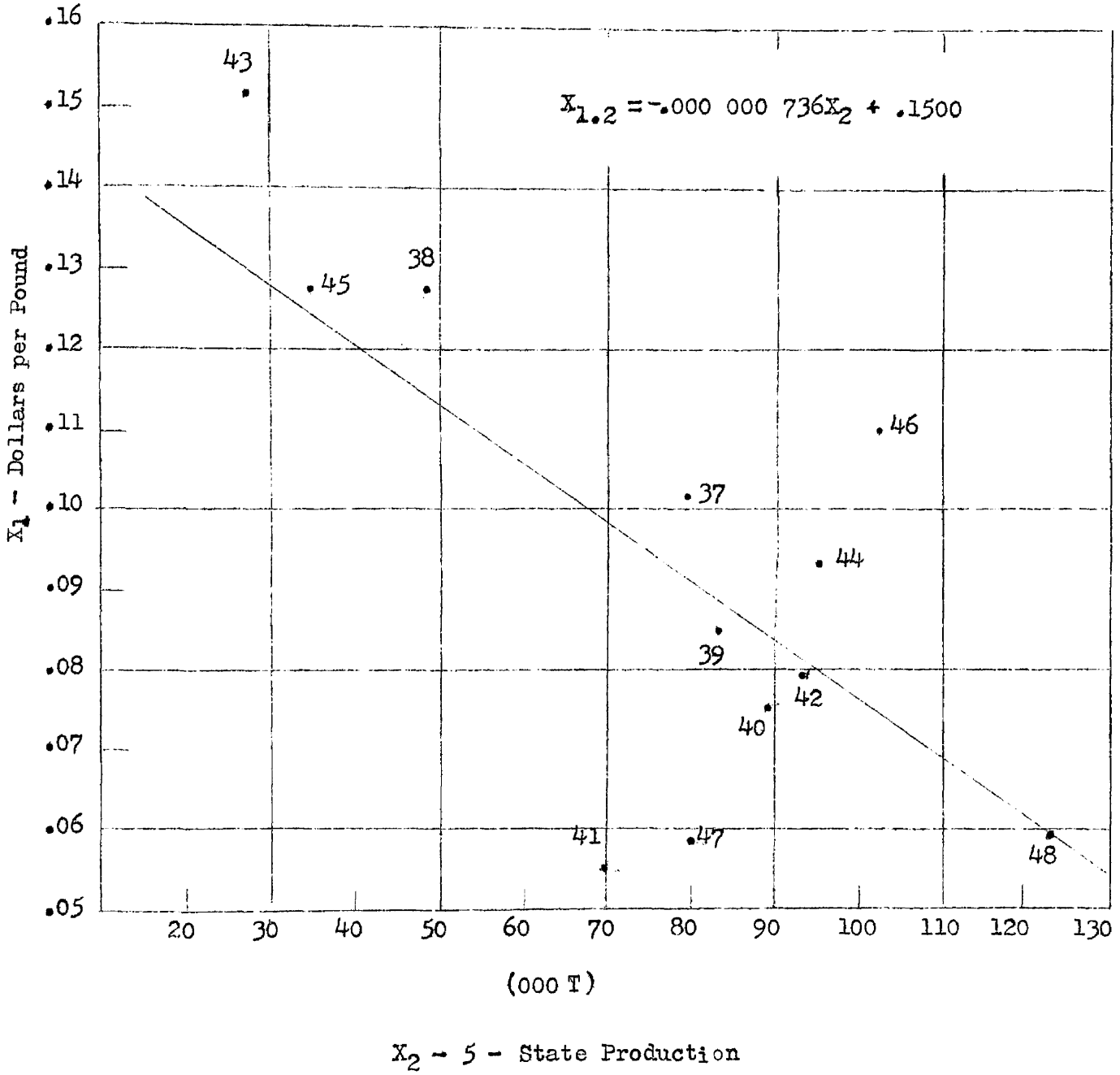


Figure 31. Average Relationship Between f.o.b. Plant Price per Pound in 30 Pound Tins of Red Cherries in Michigan and 5-State Production with United States Personal Consumption Expenditures, United States Marketing Charges, and Time Held Constant, 1937-48.

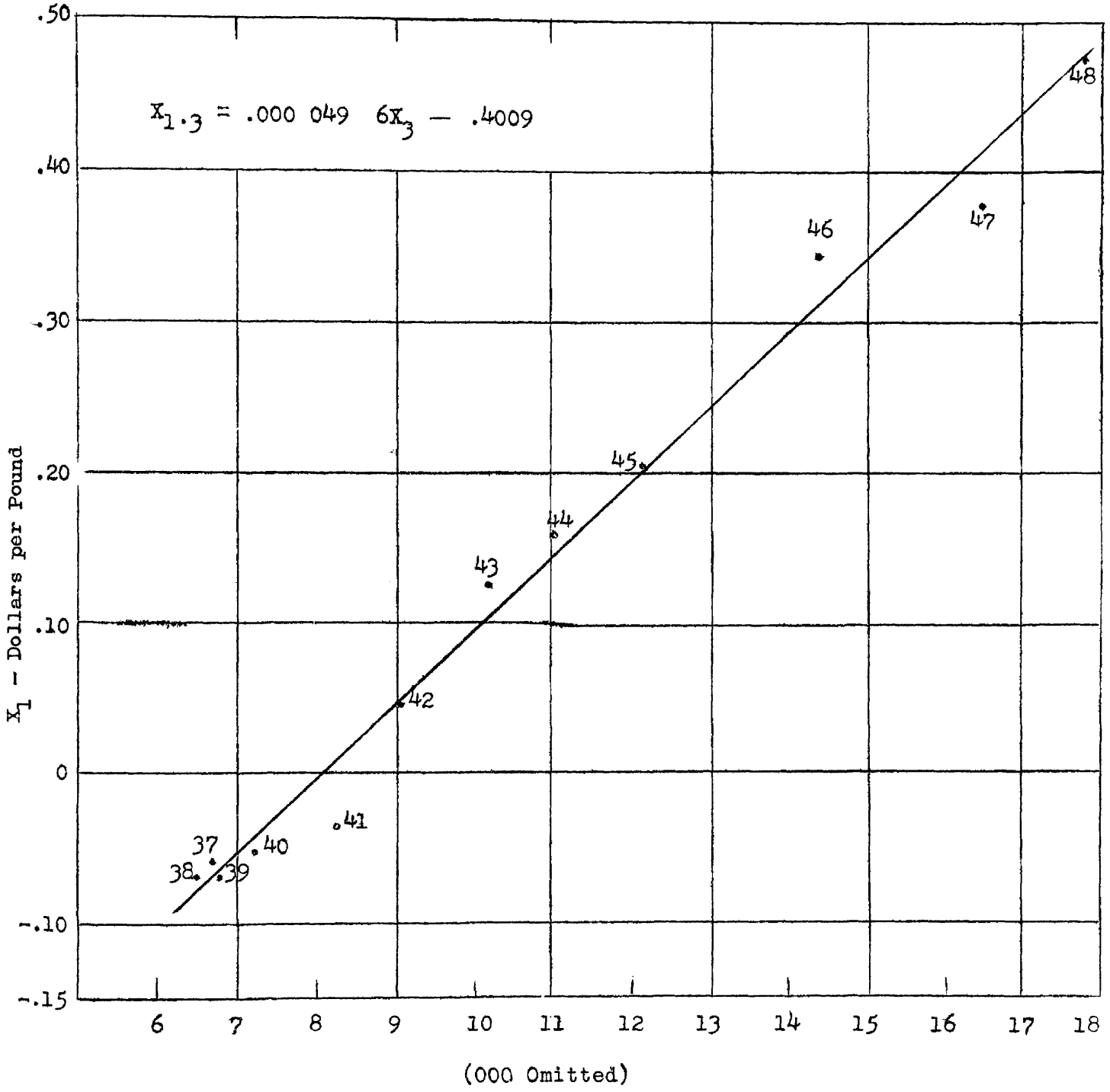


Figure 32. Average Relationship Between f.o.b. Plant Price Per Pound in 30 Pound Tins of Red Cherries in Michigan and United States Personal Consumption Expenditures with 5-State Production, United States Marketing Charges, and Time Held Constant, 1937-1948.

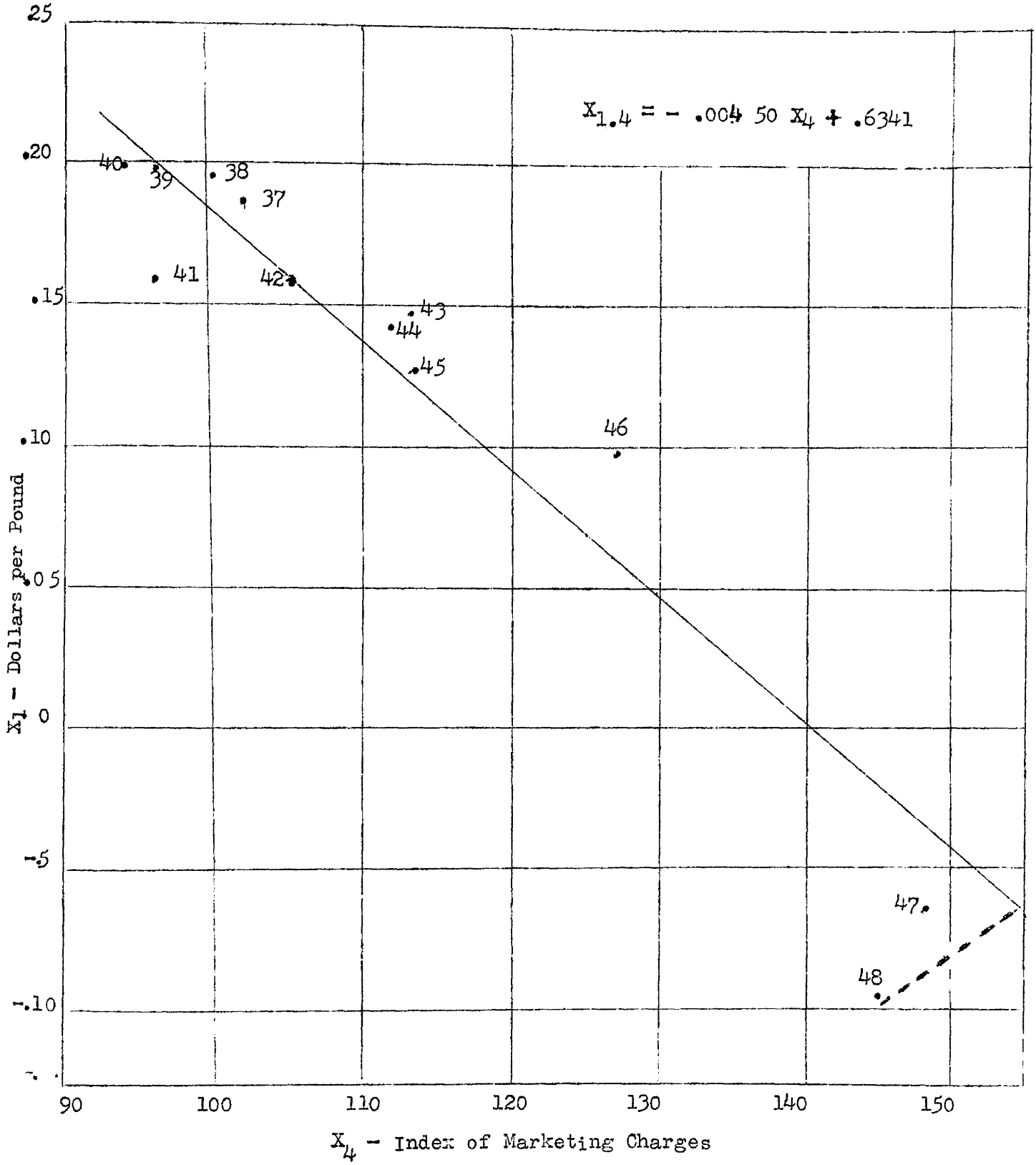


Figure 33. Average Relationship Between f.o.b. Plant Prices Per Pound in 30 Pound Tins of Red Cherries in Michigan and United States Marketing Charges with 5-State Production, United States Personal Consumption Expenditures and Time Held Constant, 1937-48.

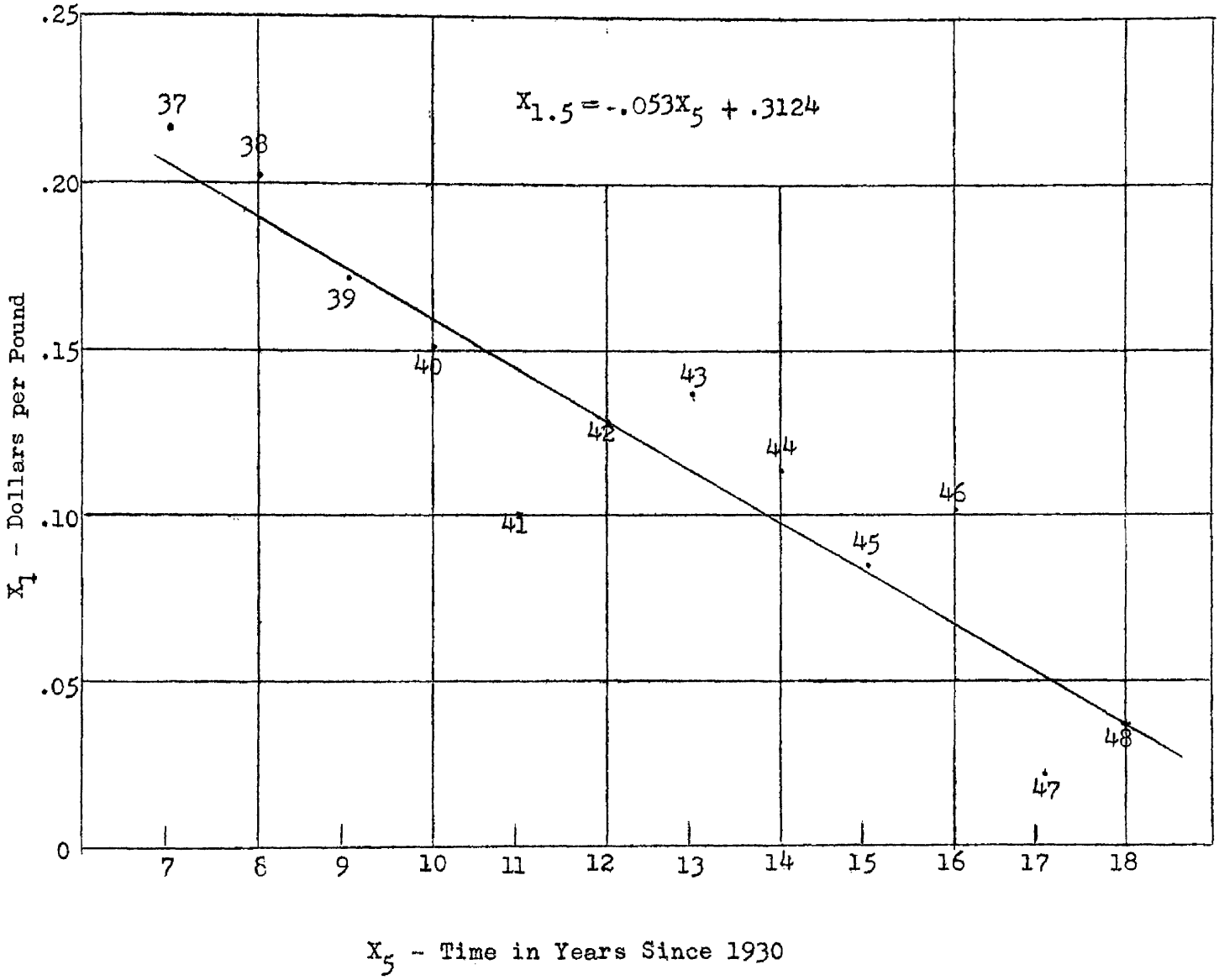


Figure 34. Average Relationship Between f.o.b. Plant Prices Per Pound in 30 Pound Tins of Red Cherries in Michigan and Time with 5-State Production, United States Personal Consumption Expenditures, and United States Marketing Charges Held Constant, 1937-1948.

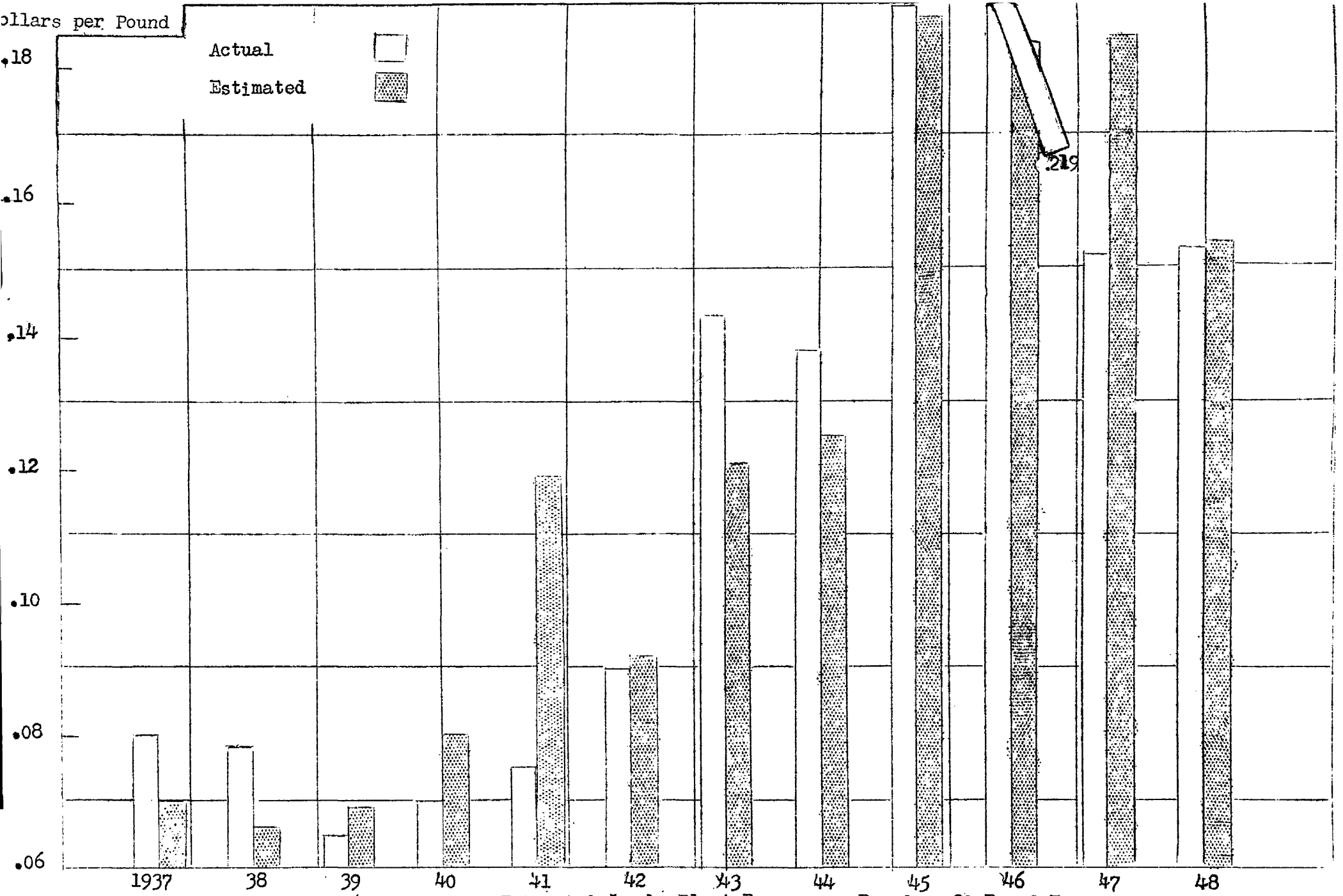


Figure 35. Actual and Estimated f.o.b. Plant Prices per Pound in 30 Pound Tins of Red Cherries, Michigan, 1937-38.

Relationships among pack prices. Since f.o.b. pack prices of number 2 and number 10 cans correlated almost identically with the independent variables, and since 30 pound tin price movements were almost identical with those for number 10 cans, there appears to be sufficient justification for purposes of expediency to relate pack prices with each other rather than proceed from the basic analysis. For farm prices, an additional factor may have to be considered.

The coefficient of correlation for the price of number 10cans and the price of 2's was 0.992 which yielded a regression equation for 10's, in terms of 2's of $Y = 1.32X - 0.17$, where Y equals the price of number 10's per $\frac{1}{4}$ dozen and X equals the estimated price of number 2's per dozen.[13/] Using this procedure to estimate theprice of 10's per $\frac{1}{4}$ dozen, the standard error was only increased about 0.02 dollars.[14/] These two procedures are illustrated in Figure 36 where they are compared with the actual prices as they existed 1931 to 1948.

For the years 1937 to 1948, the price of red cherries frozen in 30 pound tins also correlated very high with the average f.o.b. price of red cherries in number 2 cans -- the coefficient of correlation being 0.989. The regression equation was $Y = 0.061X + .002$ where Y equals the price per pound in 30 pound tins and X equals the estimated price of red cherries per dozen number 2 cans. The standard error of this procedure was about 0.01 dollars smaller[15/] than for the original analysis which included the abnormal years (Figure 37).

13/ See Table VIII for the basis data used.

14/ 0.202 dollars as compared with 0.184 dollars.

15/ 0.020 dollars as compared with 0.009 dollars.

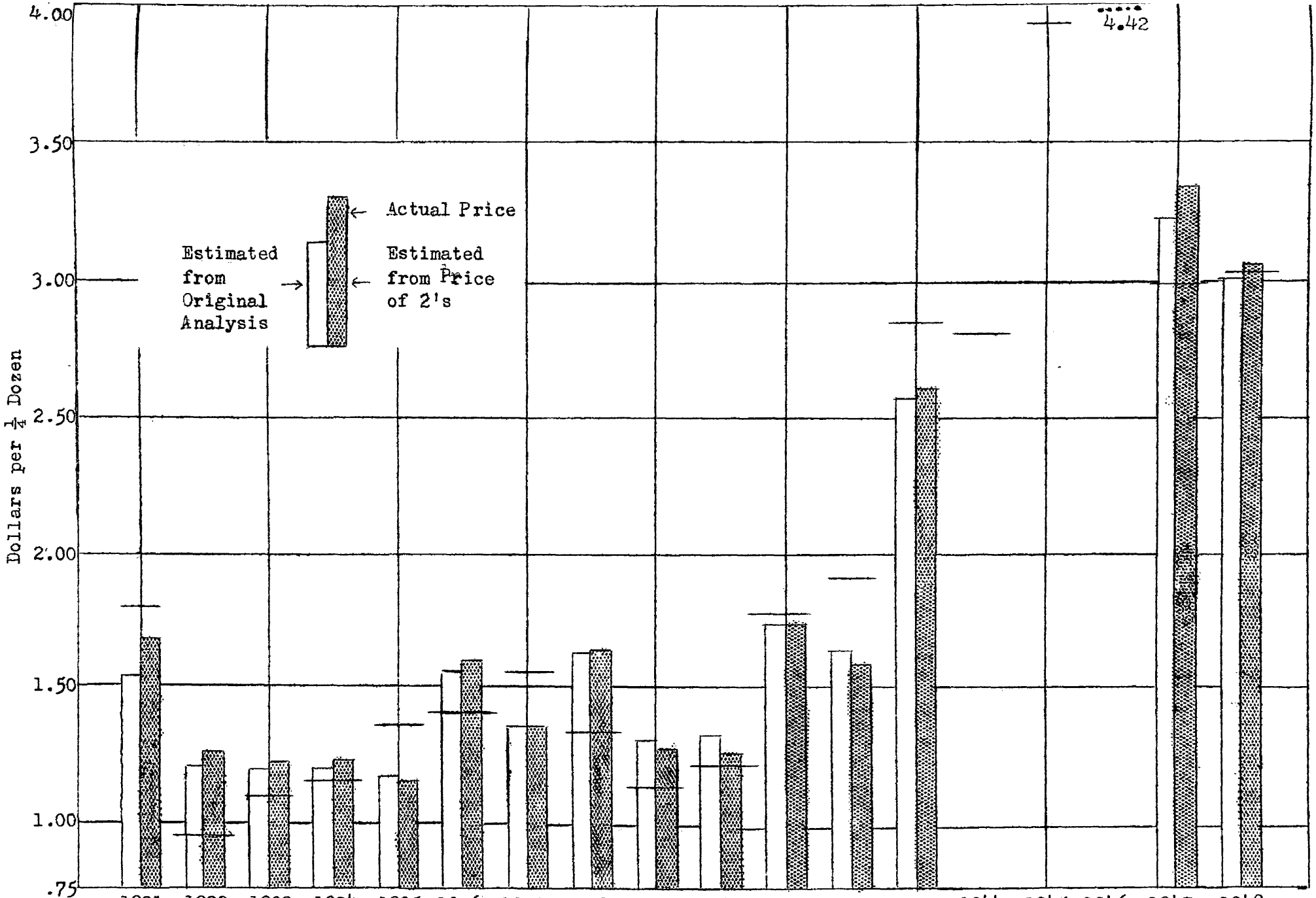


Figure 36. Comparison of Estimated f.o.b. Plant Prices of Red Cherries in Number 10 Cans Per ¼ Dozen From Original Analysis and from the Price of Number 2 Cans Per Dozen with Actual Prices, Michigan, 1931-1948.

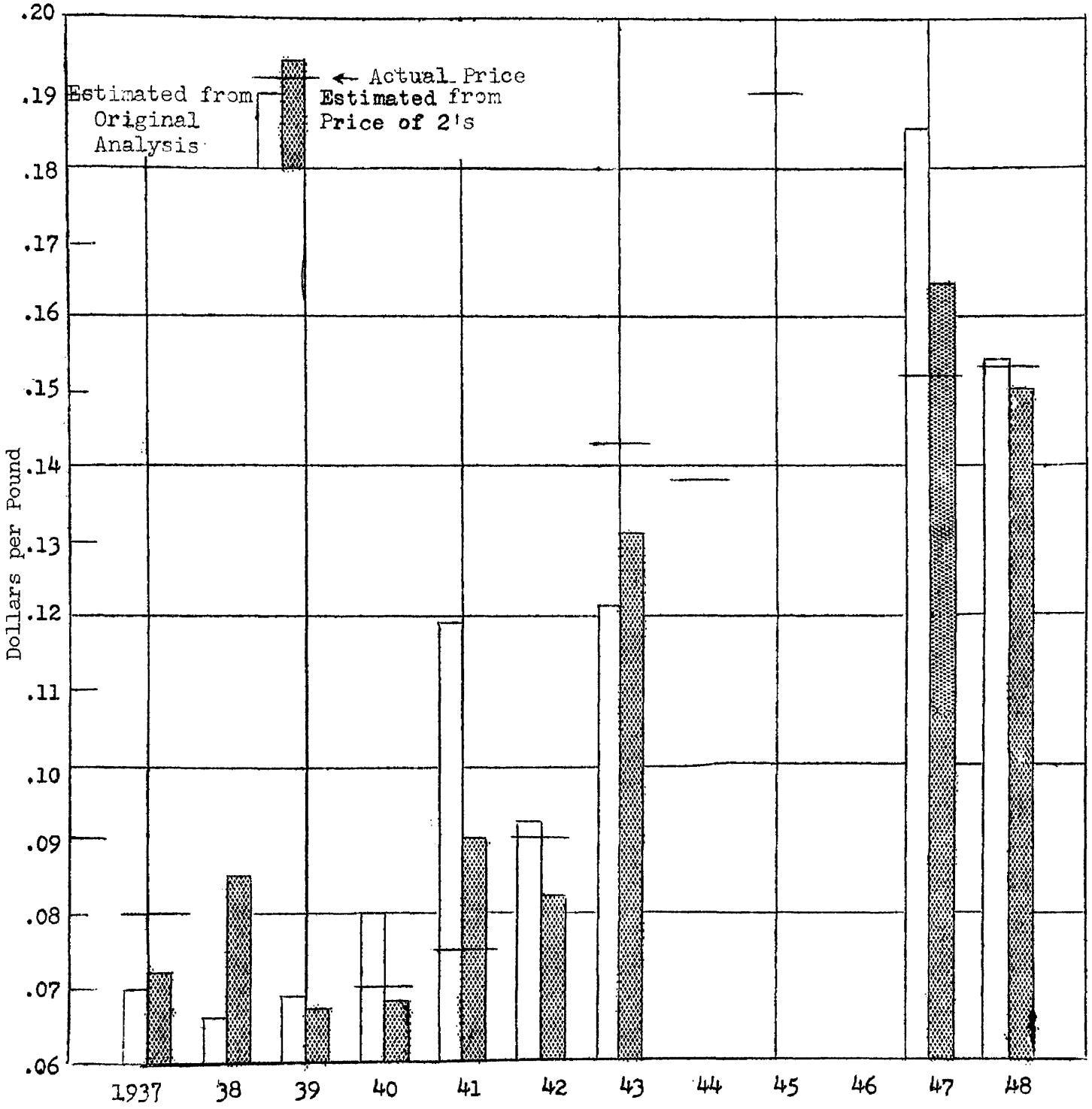


Figure 37. Comparison of Estimated f.o.b. Plant Prices of Red Cherries per Pound in 30 Pound Tins from Original Analysis and from the Price of Number 2 Cans per Dozen with Actual Prices, Michigan, 1937-48.

Using a three variable system for farm prices also yielded fairly good results. Reasoning that, as compared with f.o.b. prices, farm prices do not include certain of the marketing costs that are present in the processed pack, some measure of these costs should be included in addition to the level of pack prices for determining farm prices. The cost of the pack involves charges for labor, equipment, services, and other items -- allowances for which are included in the item marketing charges.

Farm prices related to pack prices. Using the Michigan farm price of cherries as the dependent variable and the f.o.b. price of number 2 cans per dozen and the index of marketing charges as the independent variables the correlation matrix for the years 1933 - 48 was

	$r_{\cdot a}$	$r_{\cdot b}$	$r_{\cdot c}$
$r_{a\cdot}$	1	.978	.642
$r_{b\cdot}$	.978	1	.712
$r_{c\cdot}$	.642	.712	1

and the multiple linear regression equation[16] was

$$X_a = 110.67X_b - 0.460X_c - 18.98$$
$$(1.055) \qquad (0.109)$$

Where X_a equals the Michigan farm price of red cherries in dollars per ton, X_b equals the annual average f.o.b. price of number 2 cans per dozen, and X_c equals the index of marketing charges.

The net relationship between the farm price of red cherries and the average annual f.o.b. price was highly positive (Figure 38). An increase of 0.50 dollars per dozen in the average annual f.o.b. price of number 2 cans was associated with an increase of a little more than 50 dollars per

---

16/ The t-values for the coefficients of regression are again shown in parantheses below the regular coefficients.

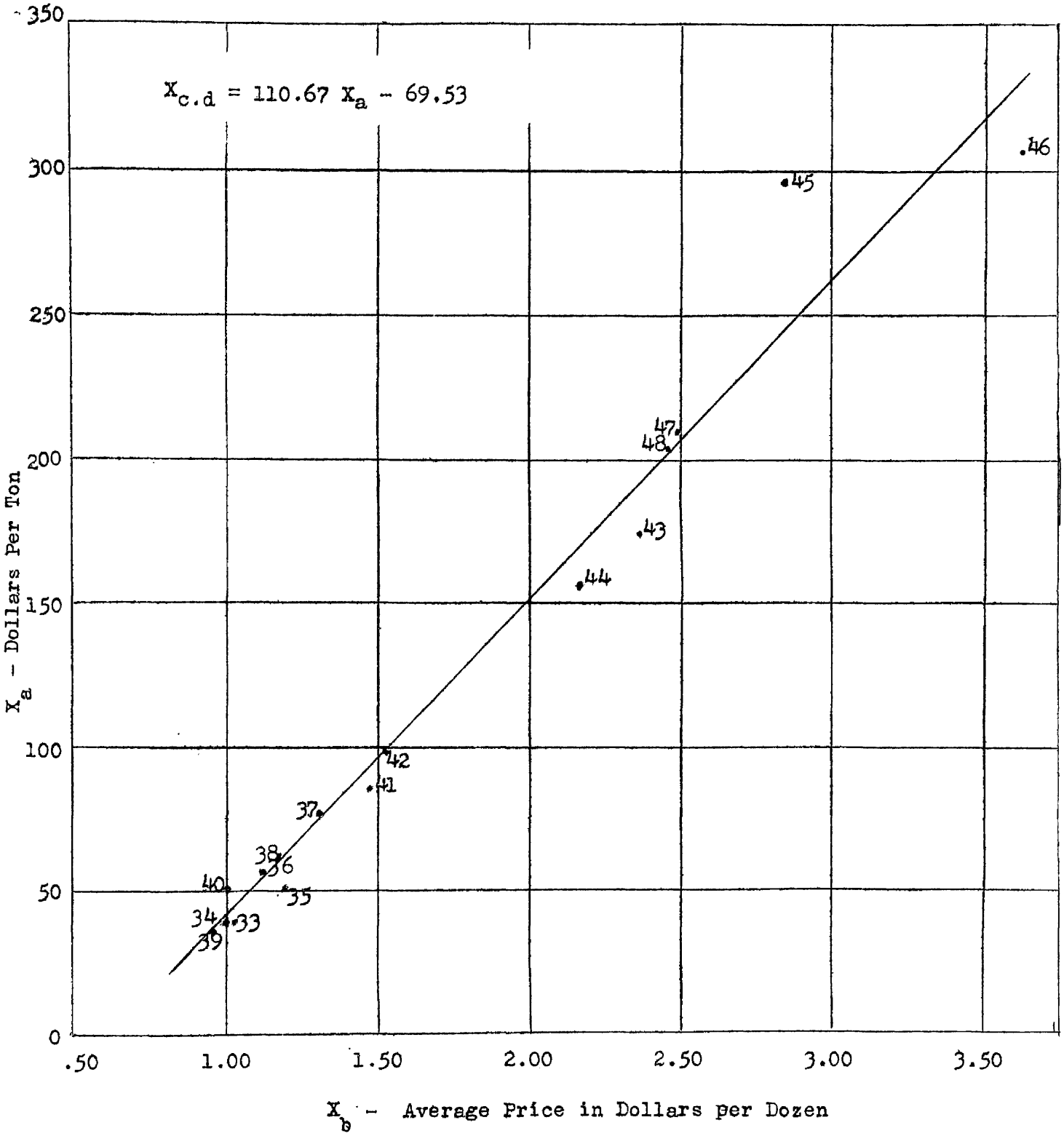


Figure 38. Average Relationship Between Michigan Farm Prices and f.o.b. Plant Prices in Number 2 Cans of Red Cherries with United States Marketing Charges Held Constant, Michigan, 1933-1948.

ton in the farmprice. The net relationship between the index of marketing charges and farm prices was negative to the extent that an increase of ten points in the index of marketing charges was associated with a decrease of 4.60 dollars per ton (Figure 39).

Farm prices estimated from these independent variables were very close to the actual prices[17] (Figure 40). The greatest deviation was a minus 52 dollars in 1945, but the estimates for 10 of the 16 years were within 10 dollars of the actual prices. This means that the estimates were within one-half cent per pound of the actual prices, of about equal to the average error.

A comparison of the two methods for estimating the Michigan farm price of red cherries disclosed fairly close results (Figure 41). The standard error of estimate was only slightly higher for the estimation from prices for number 2's and the index of marketing charges than from the estimations based upon the original data.[18] This comparison was based upon the exclusion of the war years in order that they could be compared on the same basis.

Summary. These latter procedures suggest that there is little difference in accuracy between the two alternatives for estimating red cherry prices in Michigan, either at the farm or at the packer levels. In most cases the standard errors of the estimates were slightly higher when the f.o.b. price of number 2's was used as one of the indicators, but the in-

---

17/ The coefficient of multiple linear correlation, $r_{a.b.c.}$, was 0.981 and the standard error, $S_{a.b.c.}$, was equal to 15.9 dollars per ton.

18/ 13.0 dollars per ton as compared with 12.9.

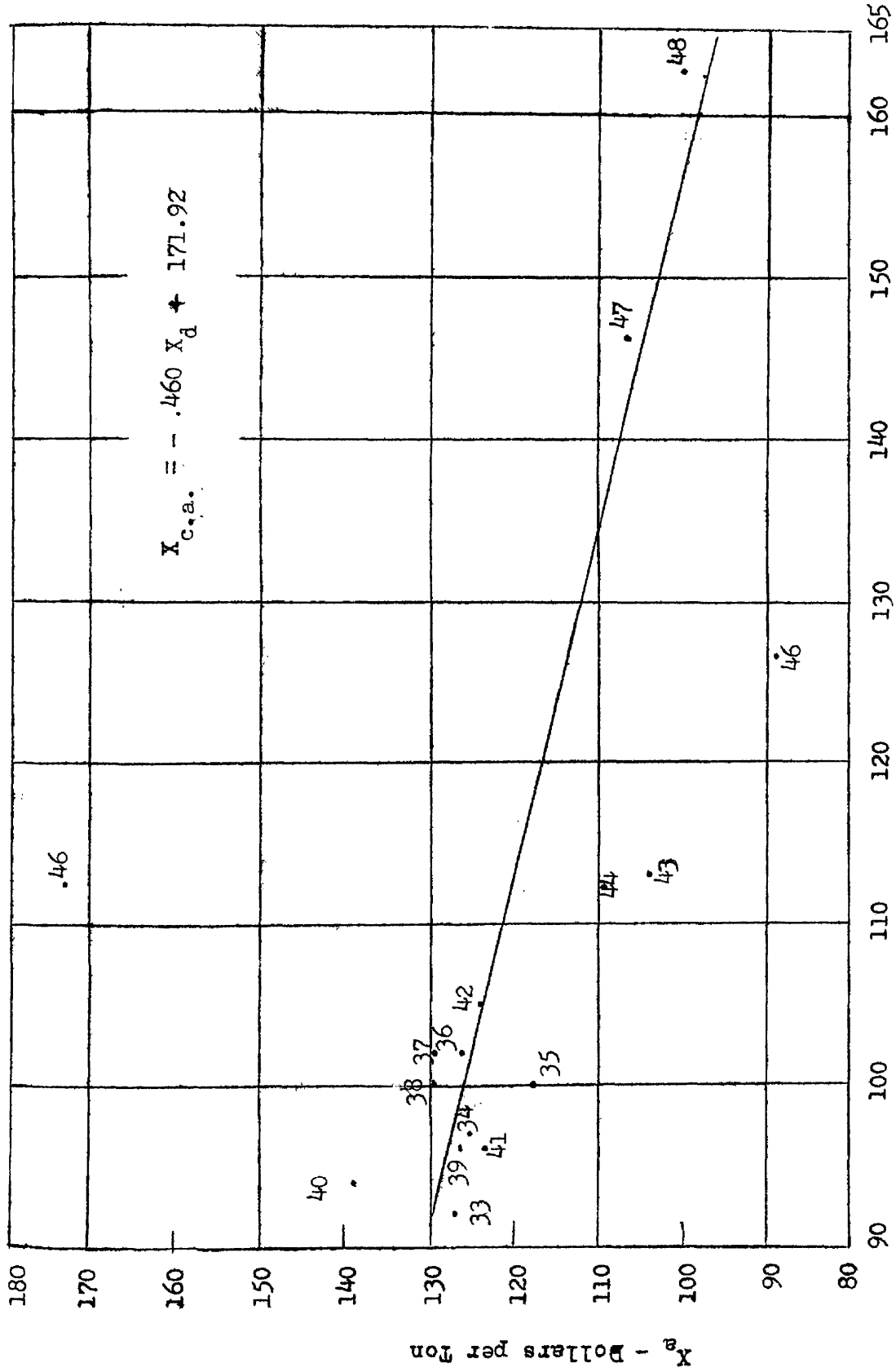


Figure 39. Average Relationship Between Michigan Farm Prices of Red Cherries and United States Marketing Charges with f.o.b. Plant Prices of Number 2 Cans Per Dozen Held Constant, 1933-1948.

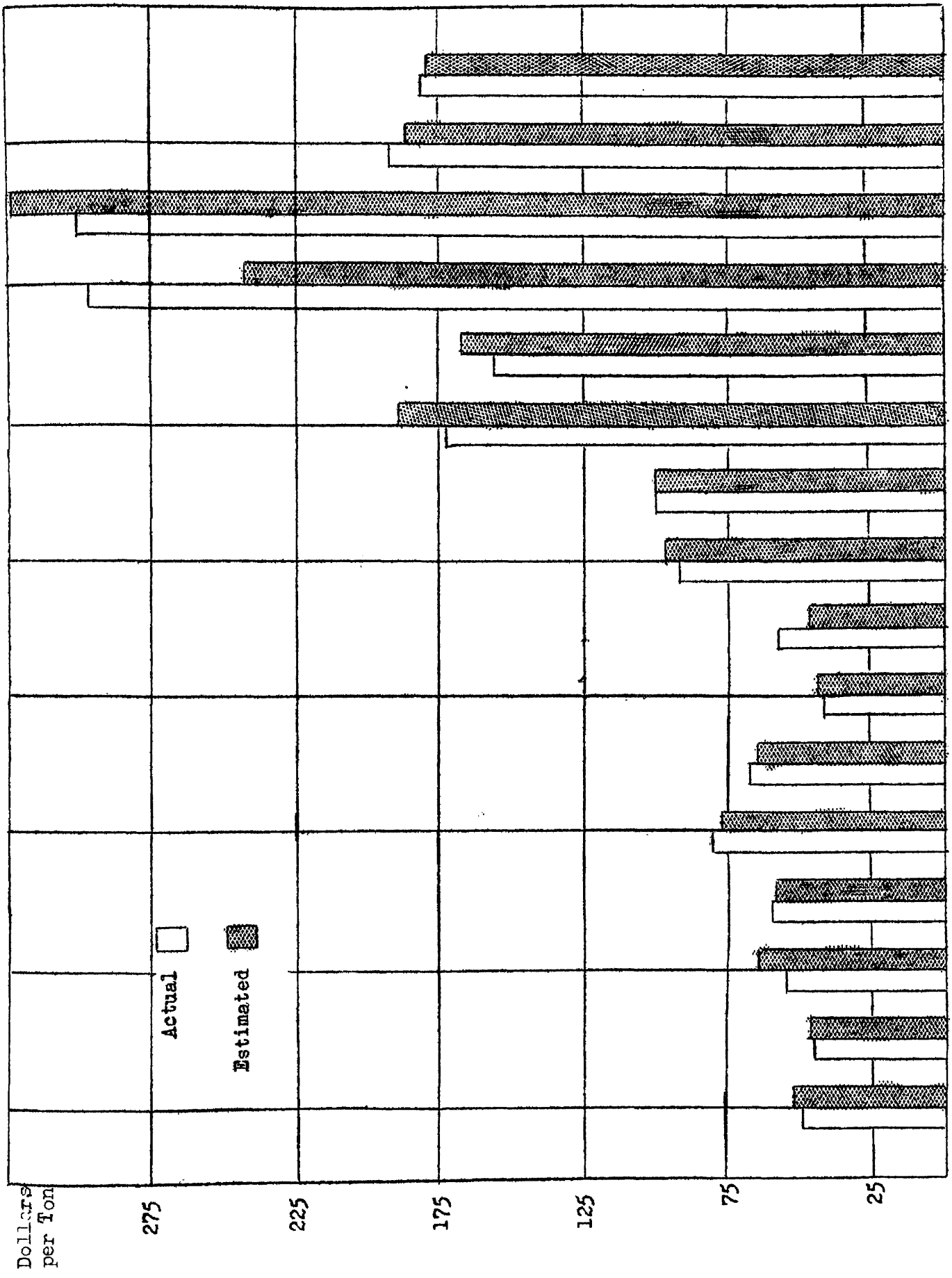


Figure 40. Actual and Estimated Michigan Farm Prices of Red Cherries, Michigan, 1933-1948.

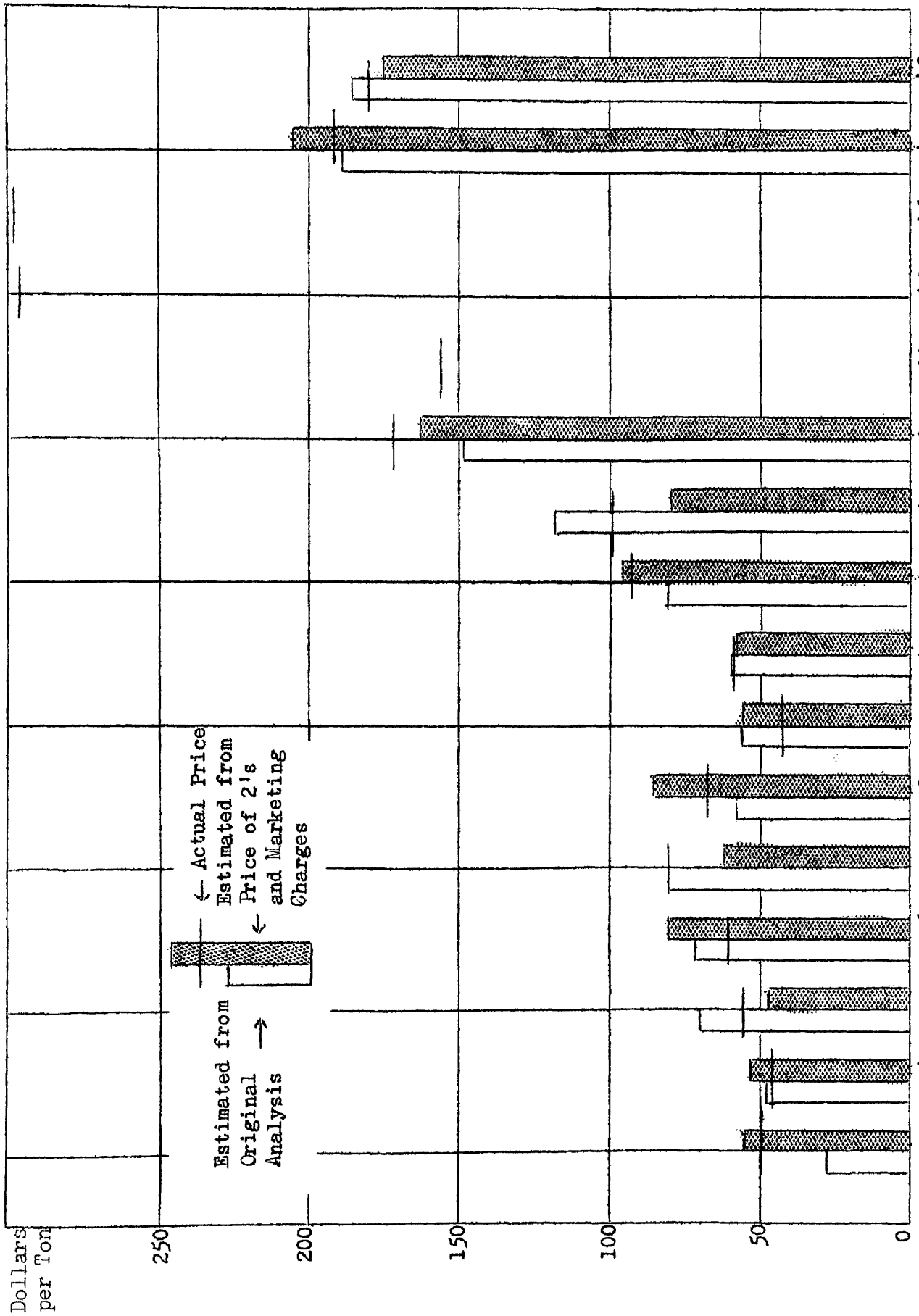


Figure 41. A Comparison of Estimated Farm Prices of Red Cherries from Original Analysis and from the Price of Number 2 Cans and Marketing Charges with Actual Farm Prices, Michigan, 1933-48.

creases were of small proportions. For purposes of expediency in the forecasting of prices, it is much easier to predict from the latter procedure rather than from the original analysis each time. But the original analysis is highly useful for observing net relationships among the various independent variables.

CHAPTER IX

PROBABLE FUTURE TRENDS IN THE RED CHERRY INDUSTRY

The economic system functions in the presence of a large number of interrelationships. These interrelationships serve to guide the course of each intricate part of the system, as well as to provide general direction to the entire system. The red cherry industry in Michigan or, for that matter, even in the entire United States, is relatively small compared with any criteria of total economic size. Hence the future of the red cherry industry to a large extent depends upon the general course that the entire economic system follows. Yet changes in the interrelationships of certain factors may change the course of some of the internal phases of the system without perceptably altering the aggregate movement of the system. The analysis of the future of the red cherry industry must consider both aspects, that is, the general movements of economic activity as well as the effects of internal variations in the economic data pertaining to the industry. In both cases the discussion will be limited to the economic factors of production, income, and prices, or forces pertaining thereto. It is impossible here to develop all of the arguments necessary to justify certain beliefs as to the future course of an industry. An attempt will be made to isolate some of the more important forces for attention. In effect, this means concentrating the analysis on the factors affecting cherry prices and the function of prices as guideposts to the future -- the future being the next two or three years.[1/]

1/ The assumptions here involve a cold war peace. Any deviation from this position barring shortages of materials and effective economic controls would add optimism rather than pessimism to the remarks to follow.

National income and consumption expenditures. The future movements and the anticipated level of national income is a very difficult question. The gross national product of the United States has increased tremendously since the pre-war years.[2] A slight downward readjustment occurred in 1945 as a result of decreases in government purchases of goods and services. Another post-war drop precipitated in the last quarter of 1948 because of the decline in private domestic and foreign investment. This latter decline has tended to level off beginning in the third quarter of 1949. The only decline in personal consumption expenditures[3] occurred from the fourth quarter of 1948 and the first quarter of 1949 but has risen slightly since. The rise in personal consumption expenditures since the first quarter of 1949 has been due to the greater increase in expenditures for durable goods and services relative to the decrease in expenditures for non-durable goods.[4] Private domestic investment has been bolstered by the increases in investments in producers' durable equipment and in new construction. Changes in business inventories has been a highly fluctuating item but have been rising since the third quarter of 1949.[5] Net personal savings usually vary directly with personal income which causes changes in personal consumption expenditures to lag either personal income or disposable personal income.[6] Savings turned upward with the upturn in personal income in the third quarter of 1949 which eventually caused a slight increase in personal consumption expenditures.

2/ Anonymous, Federal Reserve Chart Book, Historical Supplement, Board of Governors Federal Reserve System, Washington, D. C., March, 1950, p. 74.

3/ Anonymous, Federal Reserve Chart Book, loc. cit.

4/ Ibid. p. 75

5/ Ibid. p. 76

6/ Ibid. p. 77

Wage and salary receipts have risen steadily since 1946 except for a slight decline of short duration from the last quarter of 1948 to the first quarter of 1949.7/ This is a reflection of the high level of employment at good wage and salary rates in the United States.8/

These data indicate that most of the component factors of either gross national product or national income were favorable in 1949. The direction of movement of some of the more unfavorable factors was upward which would indicate that the outlook for these factors is fairly optimistic. Summing up the forces, it appears that incomes will remain high along with output. The large government debt on which service charges must be met, and the unlikelihood that tax rates will be increased to cover increased defense costs means that a positive effort will be made at the high policy levels to insure good incomes in the future. This conclusion appears to be sound since the United States Treasury is currently running a deficit as it did in 1949 in spite of the high level of national income. High national income means high disposable income with present tax rates. Savings tend to vary with disposable incomes but tends to lag somewhat so that the net effect is a more stable personal consumption expenditures figure. Thus, for the next two or three years it appears that personal consumption expenditures will remain very close to (perhaps slightly higher than) the present high levels.

Marketing charges. A hint as to what may happen to marketing charges may be gotten from the trend in consumer expenditures for services. As was mentioned, the trend in services has been steadily upward. Where-

---

7/ Ibid. p. 78.

8/ Ibid. pp. 79-81.

as slightly more than 20 billions of dollars were spent for services in 1944, there were almost 60 billions spent in 1949.9/ Marketing charges represent mainly charges for service functions performed on the raw products between the time of production and the time of final sale. An upward trend in the amount spent for services is consistent with either an upward trend in income or even a high and stable level of income. Consumers are demanding more services and unless retail prices rise relatively faster than marketing costs, the share of the retail price going for marketing costs will also rise. Thus, marketing charges are likely to rise in the future.

Production trends. Some attention should be given to probable future trends in production. Production in the United States, 5-states and Michigan has trended upwards since 1931. The most common estimation of production for a few years hence has been the census classification of bearing and non-bearing trees. The census, however, does not distinguish between sweet and red cherry trees so that some estimation of the ratio of sweet to red cherry trees must be made. Further, the census does not show the number of trees by age groups which is essential for an accurate projection of production. In spite of these limitations it is assumed that for maintenance of production, one non-bearing tree is needed for three bearing trees. When the ratio exceeds this limit (e. g. 1:4), production declines, and when the ratio is smaller (e. g. 1:2), the trend in production is usually upward. An examination of the trends in these ratios shows a great deal of variability.10/ The variability is apparent

---

9/ Ibid. p. 75

10/ Thomas F. Carroll, Cherries, Background Information and Statistics for Fruit Marketing I, Cornell University Agricultural Experiment Station, A. E. 662, Ithaca, New York, March 1948, p. 7.

both by census years and by states within census years. For example, in 1940, Montana had a low ratio of 0.94 bearing trees to one non-bearing tree while Colorado had 9.53 bearing trees for each non-bearing tree. An example of the variability between years was the ratio of 1.75 in 1930 as compared with 4.77 in 1940. This year-to-year variability is considerably less than the variability exhibited within years. Since aggregate production is of more concern than individual state output the above fact affords more stability. The primary point of interest in these data is that the ratio of bearing to non-bearing trees has been increasing since 1930 yet production has also been increasing. These data are contrary to what is expected. The Michigan Cooperative Crop Reporting Service surveyed Michigan in order to determine the age distribution of the cherry trees in the state as well as to determine the location of the producing areas within the state.[11/] Their conclusion was that 25 percent of all the trees in Michigan were of non-bearing age.[12/] In analyzing the possible future trends in production they concluded that potential cherry production in Michigan can be expected to increase during the next few years, especially in the middle and late 'fifties.[13/] This expansion can be attributed to the expansion of tree numbers due to longer lived trees. It was also thought that increasing yields could be expected in the future. Taking into account only the potential number of bearing trees, production in Michigan is expected to increase about 16 percent by 1955.

11/ Anonymous, Michigan Cherry Survey, Michigan Cooperative Crop Reporting Service, Mimeographed Report, Lansing, Mich.

12/ Ibid. p. 2.

13/ Ibid. p. 3.

In estimating red cherry production for the future, it seems safe to assume that potential production will increase. Michigan produces a large proportion of the total in the 5-eastern states, and since prices have been relatively favorable, production in the 5-state area will probably also increase. It is difficult to tell exactly how much production will actually increase because of the impact of uncertain forces, principally weather.

Aside from the variable time, this completes the consideration of the variables used in the analysis of red cherry prices. Resolving the likely magnitudes of these variables is no mean task. Personal consumption expenditures as a measure of demand of course carried the greatest weight in the equations, and an upward trend in these expenditures will be necessary to counteract the upward movement in each of the other variables if prices are to remain at approximately present levels. However if personal consumption expenditures fail to rise, marketing costs may be expected to rise as well as production, and prices of red cherries may be expected to fall. Another possible combination of forces may be that even though total personal consumption expenditures may rise, marketing charges could fall slightly if there is a relative decline in the amount spent for services as compared with durable and non-durable goods, in which case changes in production would be the most important factor in determining future prices. These latter two possibilities seem most plausible. That is, red cherry prices can be expected to remain either at, or slightly below present levels with a gradual widening of the spread between f.o.b. pack prices and farm prices.

Other trends. There are some other trends that are likely in the industry, based in part on the trends included either directly or indirectly

in the above analysis, but also on some outside forces. The development of new uses for the product as well as new types of pack offer possibilities for expanding the market and increasing the aggregate demand for the product. The development of new uses sometimes involves the development of a new recipe. Bakeries, flour manufacturers, candy makers, ice cream factories, and many others associated with the institutional trade, have research constantly under way to supplement that of the industry in the quest for new uses for their products. Red cherries for brining have increased in volume since the 'thirties, and some have also been glaced and used as a confection. Jams, preserves, and juices also represent special uses that expand the quantity that can be sold. A concerted effort is being made to pack red cherries in extra heavy syrup so that they may be consumed directly from the can as dessert. Technical problems of maintaining and handling such heavy syrup have been encountered, and consumer resistance is still present. Yet a product that is desirable and that will compete favorably with other canned fruits as a dessert holds great potentialities for appeal in the mass consumer market.

New types of pack also offer possibilities. Initially, the frozen pack was designed exclusively for the institutional trade. Gradually a few red cherries were packed in smaller and smaller containers until the 1 pound consumer package became fairly popular. The most common type of 1 pound frozen package has been the waxed cardboard container with metal ends. On the packing line, these containers have not yet been adapted for the speed and accuracy of sealing that is typical of a number 2 can hot pack line. A poorly sealed container that leaks causes a great deal of damage. Consequently, the industry is now introducing a metal package similar to the number 2 can which will overcome the difficulties encount-

ered with the cardboard containers. But the problem still to be overcome is that of educating the consumer to keep the package frozen. Otherwise there is the danger of over-expansion of the contents causing a minor explosion.

Advertising program. A strengthening factor for future prices in view of the potential increase in production is the advertising program now under way for red cherries. At the national level, the National Red Cherry Institute is the organization whose primary function is to promote the red cherry. In Michigan, the Michigan Cherry Commission performs this function. By act of the state legislature in Michigan in 1947, a commission composed of representatives of growers and packers was formed for the sole purpose of promoting the red cherry industry. The Commission is appointed by the Governor and approved by the state legislature. The activities of the Commission are financed by a subscription of .001 dollars per pound of raw product sold, levied on each grower and collected by the packers at the time of sale. The subscription is not compulsory. Growers may claim exemption from the tax by filing exemption forms with the proper authorities if they so desire. Compliance has been high. The provisions of the act have only been in effect for two years and each year the rate of compliance has exceeded 90 percent of the product marketed. Thus, the Commission's operating funds have exceeded 100 thousand dollars in each of the years 1948 and 1949. Actually the amount of funds was almost equal for the two years since the rate of compliance was enough higher in 1949 to offset the effects of the smaller crop as compared with 1948. The Commission's policy has been not to advertise Michigan cherries as such, but to promote the product. Consequently, the Commission has cooperated with the National Red Cherry Institute to promote the product

nationally with no concerted effort to differentiate cherries grown in Michigan from cherries grown in other states. Judged from the standpoint of efficient marketing and wise policy this procedure seems sound. How successful the advertising program has been, of course, would be difficult to measure. As compared with 1948, red cherry prices were practically the same in 1949, averaging about .09 dollars per pound in each year. All farm prices dropped from their all time high in 1948 to lower levels in 1949. The index of all fruit prices, heavily weighted by apple prices, fell considerably from 1948 to 1949 also. Whether advertising had much effect upon maintaining the relative favorability of red cherry prices is very difficult to say, but it probably has been a contributor. It has been estimated that for each dollar spent for advertising directly by the industry it has received the equivalent of 10 dollars worth of advertising space since related industries tie in their advertising programs with that of the cherry industry.[14/] This would mean that cherries have been promoted by the equivalent of more than 1 million dollars worth of advertising per year.

Use of results of price analysis. The use of price analysis in the formulation of expectations affords an opportunity for the reduction of price uncertainty facing both growers and packers. The reduction of price uncertainty could do two things. First, it could reduce the range of price expectations by individuals in the market to the extent that income through time is more stable.[15/] Secondly, it could add to the completeness as well

---

14/ By A. J. Rogers, Mgr., Cherry Growers, Inc., before a marketing class at Michigan State College in March, 1950.

15/ D. Gale Johnson, Forward Prices for Agriculture, University of Chicago Press, Chicago, Illinois, 1947. Cf. especially Chapter XIII.

as the perfectness of knowledge about the market. This would mean that the market is more nearly perfect and would operate more nearly in conformance with the principles of perfect competition. To the extent that price analysis contributes to the reduction of price uncertainty in these two ways, it should prove to be beneficial to the industry.

A further industry trend that would tend to make the market more perfect is the trend away from concentration. As the industry has expanded, more and more firms have entered, thus reducing the relative importance of the larger firms. With the probable future increases in production, it is likely that more firms will continue to enter the industry rather than there being any major tendency for the present firms to become larger. There will probably always be some consolidation of smaller firms who do not enjoy some of the economies of scale of the larger firms and encounter financial difficulties. This, of course, is healthy for the industry since more economic efficiency is attained by so doing.

The future of the red cherry industry in Michigan appears bright. Industry policies and trends are such that they tend to promote soundness and efficiency. Following such policies, prices and incomes to growers should remain relatively favorable in the years ahead as compared with other alternative opportunities for either grower or packers.

CHAPTER X

SUMMARY AND CONCLUSIONS

1. The red cherry industry has become a highly specialized business and has been of commercial importance in only a few counties of a relatively small number of states. In many of these counties the welfare of agriculture and industry depends upon the income derived from the cherry crop. Once the crop is determined for a particular year, prices hold the key to income and welfare for these areas so that establishing the "right" price is of major importance.

2. The farm value of the production of red cherries has constituted from about 1/2 percent to slightly more than 2 3/4 percent of the value of all farm production in Michigan since 1931. Incomewise, red cherries have produced as much as 18 million dollars in 1946 in the localized commercial areas of the state.

3. The production of red cherries has been highly variable from year to year in Michigan as well as in the United States, and in recent years the magnitude of this variation has markedly increased. This phenomenon is mainly due to the intensification of production making the total output more susceptible to the exogenous natural and economic forces affecting the industry.

4. The pricing problem at the farm level has always been acute in view of the fact that prices must be established on the basis of anticipated as well as present supply and demand conditions. But, there are no current quotations upon which to base estimates of these conditions. Therefore information or general knowledge that would reduce the range of uncertainty confronting producers and processors in the industry should increase the overall economic efficiency of the industry.

5. Production and farm prices of red cherries have trended upward whether Michigan, the five eastern states, or the United States was considered as the area. The expected inverse year to year relationship between prices and production did not consistently occur in any of these areas for the years beginning with 1933 and extending through 1948 primarily because of overall inflation of all prices for these years. Production thus bore little relationship to prices.

6. The most important factors affecting the farm price of cherries were those indicating or reflecting levels of aggregate demand. The net relationship between Michigan prices and 5-state production was zero, while the net relationship between the index of all farm prices and red cherry farm prices in Michigan was highly positive. Personal consumption expenditures, as an indicator of aggregate demand, bore a high positive relationship with farm prices.

7. Using the four independent variables, 5-state production, personal consumption expenditures in the United States, the index of United States farm prices, and time, the Michigan farm price of cherries was estimated with an error that exceeded 0.01 dollars per pound in only 2 of the 15 years included in the analysis. The standard error of the estimate was 0.0065 dollars per pound.

8. The factors selected for the analysis of red cherry pack prices included total production in 5-states, personal consumption expenditures in the United States, an index of marketing charges in the United States, and time. Of these independent variables, the net effect of personal consumption expenditures was highly positive while the net effect of each of the other variables was negative. Personal consumption expenditures carried the greatest weight in the regression equations for the canned

pack followed by production, time, and marketing charges in that order. The coefficient of multiple correlation was slightly more than 0.96 for the two different types of canned pack. The analysis of the frozen pack included fewer years but the relationships were similar.

10. As was true with farm prices of red cherries, there was little gross relationship between Michigan prices and either the amount packed or produced. However, the upward trend in the volume packed was slightly more than the upward trend in production.

11. The rise in prices through time for the institutional sized containers was relatively greater than the rise for consumer sized packages. This is probably a reflection of the differences in the elasticity of demand. As the quantity packed increases, more should be packed in those containers for which the demand is most elastic.

12. Changes in the type of pack processed by Michigan packers reflect changes in demands. The frozen pack increased five times as much as the canned pack between the early 'thirties and 1948. The relative size of the frozen pack to the canned pack also increased though there was considerable year-to-year variability.

13. In years of large crops, more of the pack was processed into consumer sized rather than institutional sized containers. In those years, more effort was thus expended on effecting direct consumer sales which constituted the greatest potential market for the product.

14. Favorable red cherry prices in the face of increases in the per capita consumption of the product was conducive to industry expansion. In Michigan, the number of processing firms in the industry increased from 19 in 1931 to 44 by 1948. This growth in the number of firms has just about kept pace with the increase in production, thus not

materially altering the average size of firm in the industry.

15. The relative size of the five largest firms in the industry decreased from about 70 percent of the total pack in 1931 to 44 percent in 1948. There has therefore been a trend away from economic concentration in the industry as indicated by relative physical volumes.

16. Cherries alone accounted for one-half or more of the average total dollar volume of business done by 54 percent of the plants in Michigan in 1948. This means that these firms are highly vulnerable to price and production instability in the cherry industry in the short-run.

17. Some of the requisites for imperfect competition as they pertain to prices and price policy have been present in the industry. In practice, though, these forces were not considered to be strong enough to exert any major influence upon prices.

18. Year-to-year storage has been frowned upon by the industry. If this policy has been theoritically sound, the price elasticity of total demand as quantity decreased must have been less provided the demand curve itself did not shift. Increases in demand undoubtedly have occurred which would tend to counteract the adverse effects of storage due to the relative elasticities of demand.

19. Inventory policies by marketing agencies at higher levels in the trade channel than the packer cause pseudo-reactions on prices and rates of sale at the packer level. More data on stocks are needed in these higher levels of the trade channels so that processors may pursue sounder sales policies on the basis of the more complete knowledge.

20. The future of the red cherry industry for the next two or three years will be conditioned by economic events. National income will probably be maintained at or near present levels and red cherry prices are largely affected by movements in aggregate demand. The industry is promoting the product through advertising in an effort to further stimulate demand. Research is also constantly under way in an effort to develop new uses for the products as well as to develop new types of pack for a broader market. New firms will probably continue to enter into this expanding industry.

APPENDIX A

QUESTIONNAIRE USED FOR COLLECTION OF MISCELLANEOUS INFORMATION.

QUESTIONNAIRE FOR MICHIGAN CHERRY PACKERS

Packer Number _____

Date _____

Filled in By _____

L. L. BOGER
AGRICULTURAL ECONOMICS
MICHIGAN STATE COLLEGE
EAST LANSING, MICHIGAN

A. RELATIONSHIP OF CHERRIES TO TOTAL VOLUME OF BUSINESS

1. What percent of your total sales are made up of cherries? (a) By years or (b) Average.

1931 _____	1936 _____	1941 _____	1945 _____
1932 _____	1937 _____	1942 _____	1946 _____
1933 _____	1938 _____	1943 _____	1947 _____
1934 _____	1939 _____	1944 _____	1948 _____
1935 _____	1940 _____		

(If estimate of average for all years, list here.)

(b) Average _____.

2. What other fruits or vegetables did you pack or distribute in 1948? (Check those that apply.)

	Frozen	Canned		Frozen	Canned
Asparagus	____	____	Apricots	____	____
Snapbeans	____	____	Apples	____	____
Cabbage	____	____	Peaches	____	____
Carrots	____	____	Pears	____	____
Cauliflower	____	____	Plums	____	____
Cucumbers	____	____	Sweet Cherries	____	____
Tomatoes	____	____	Other_____	____	____
Lima Beans	____	____	_____	____	____
Navy Beans	____	____	_____	____	____
Other_____	____	____	_____	____	____
_____	____	____	_____	____	____
_____	____	____	_____	____	____

3. What percent of your cherries do you ____ pack and/or ____ distribute under your own brand names? _____% (Check and fill in %)

What are your brand names, and what grade do they represent?

(List each)	Brand	Grade
	_____	_____
	_____	_____
	_____	_____

B. COSTS OF STORAGE FOR CHERRIES

1. What does it cost you to store cherries per month? (List by type of pack.)

Canned _____

_____

_____

Frozen _____

_____

_____

2. (If costs have been calculated by years, list them below by the years. Also note items of cost included.)

C. COSTS OF PROCESSING CHERRIES

1. What does it cost you per pound to pack frozen cherries?

   Estimate _____

   Actual _____

2. What does it cost you per pound to pack canned cherries?

   Estimate _____

   Actual _____

3. (If processing costs have been calculated by years, list them by years, then enumerate items of cost included.)

	Canned	Frozen		Canned	Frozen
1931	_____	_____	1940	_____	_____
1932	_____	_____	1941	_____	_____
1933	_____	_____	1942	_____	_____
1934	_____	_____	1943	_____	_____
1935	_____	_____	1944	_____	_____
1936	_____	_____	1945	_____	_____
1937	_____	_____	1946	_____	_____
1938	_____	_____	1947	_____	_____
1939	_____	_____	1948	_____	_____

4. What percent of your receipts was pick?

1931	_____	1940	_____
1932	_____	1941	_____
1933	_____	1942	_____
1934	_____	1943	_____
1935	_____	1944	_____
1936	_____	1945	_____
1937	_____	1946	_____
1938	_____	1947	_____
1939	_____	1948	_____

APPENDIX B

SUPPLEMENTARY DATA

APPENDIX B

SUPPLEMENTARY DATA

Table I b. - Aggregate Values of Selected Measures of Aggregate Demand, United States, 1929-48.

Year	Personal Consumption Expenditures[a]	Food and Tobacco Expenditures[a]	Income of Industrial Workers[b]	Prices Received by Farmers[b]	Wholesale Prices of Non-farm Products[b]
	Billion Dollars	Billion Dollars	Index	Index	Index
1910-14	---	---	---	100	100
1935-39	---	---	100	---	---
1929	78.8	21.4	134	149	136
1930	70.8	19.5	110	128	126
1931	61.2	16.3	84	90	111
1932	49.2	12.7	58	68	104
1933	46.3	12.8	61	72	106
1934	51.9	15.6	76	90	116
1935	56.2	17.7	86	109	115
1936	62.5	20.0	100	114	118
1937	67.1	21.6	117	122	126
1938	64.5	20.7	91	97	121
1939	67.5	21.1	105	95	120
1940	72.1	22.6	119	100	123
1941	82.3	26.5	169	124	132
1942	90.8	32.8	241	159	141
1943	101.6	38.1	322	192	144
1944	110.4	41.6	336	195	146
1945	121.7	46.7	291	202	148
1946	143.7	55.1	275	233	162
1947	164.4	64.3	332	278	200
1948	177.7	67.1	360	287	222

a/ Survey of Current Business, National Income Supplement, U. S. Dept. of Commerce, July, 1947 and Current Issues.

b/ Agricultural Outlook Charts, U. S. Dept. of Agriculture, B. A. E., 1949.

Table II b. - Estimated and Observed Average Farm Prices of Red Cherries, Michigan, 1933-48.

Year	Estimated[a/]	Observed	Estimated Minus Observed
	Dollars per ton	Dollars per ton	Dollars per ton
1933	27.6	50	-22.4
1934	47.4	45	2.4
1935	70.2	55	15.2
1936	72.4	60	12.4
1937	80.8	81	- .2
1938	57.5	67	- 9.5
1939	55.6	42	13.6
1940	60.2	58	2.2
1941	80.9	92	-11.1
1942	118.0	100	18.0
1943	149.4	172	-22.6
1944	--	--	--
1945	--	--	--
1946	--	--	--
1947	188.4	192	- 3.6
1948	185.6	180	5.6

a/ Estimated from $\hat{X}_1 = 0.000000000X_2 - 0.0143X_3 + 1.272X_4 + 4.81X_5 - 12.22$ where X_1 = Average farm price in dollars per ton, X_2 = 5-state production in tons, X_3 = Personal Consumption Expenditures in 10 billion dollars, X_4 = Index of U. S. Farm Prices, and X_5 = Time in years since 1930.

Table III b. - Number of Plants that Reported Packing Red Cherries, Michigan, 1931 - 48.

Year	Number	Year	Number	Year	Number
1931	19	1937	24	1943	25
1932	19	1938	22	1944	28
1933	19	1939	23	1945	26
1934	19	1940	21	1946	37
1935	21	1941	23	1947	38
1936	22	1942	25	1948	44

Table IV b. - Percent of Total Pack of Red Cherries Processed by the Five Largest Packers, Michigan, 1931 - 48.[a/]

Year	Percent	Year	Percent	Year	Percent
1931	72.95	1937	51.80	1943	45.05
1932	71.54	1938	49.57	1944	49.64
1933	71.19	1939	49.01	1945	47.01
1934	57.25	1940	44.90	1946	47.55
1935	64.99	1941	48.73	1947	51.58
1936	54.04	1942	50.43	1948	43.67

Table V b. - Total Pack of Red Cherries, Michigan, 1931 - 48.[a/]

Year	Total Pack	Year	Total Pack	Year	Total Pack
	tons		tons		tons
1931	16,159	1937	29,288	1943	6,746
1932	16,032	1938	14,072	1944	45,292
1933	25,539	1939	32,471	1945	11,514
1934	20,179	1940	38,931	1946	56,699
1935	27,498	1941	22,783	1947	44,246
1936	23,658	1942	41,928	1948	62,073

a/ Reported as confidential information to Roy E. Marshall, Michigan State College.

Table VI b. - Sizes of the Canned, Frozen, and Brined Packs of Red Cherries, Michigan 1931 - 48.[a/]

Year	Canned	Frozen	Brined	Year	Canned	Frozen	Brined
	Million Pounds				Million Pounds		
1931	30.2	2.5	--	1940	65.4	12.5	5.9
1932	31.2	1.5	--	1941	34.8	11.9	.9
1933	40.9	3.1	--	1942	75.5	8.3	1.3
1934	38.8	1.6	--	1943	9.4	4.1	.2
1935	50.1	5.4	2.5	1944	70.9	18.7	1.0
1936	41.3	6.0	8.8	1945	20.2	2.8	--
1937	49.5	9.1	11.3	1946	85.0	28.0	.4
1938	25.7	2.4	2.8	1947	61.3	25.3	1.9
1939	59.9	5.0	3.3	1948	93.1	29.0	3.4

a/ Reported as confidential information to Roy E. Marshall, Michigan State College.

Table VII b. - Average Importance of Red Cherry Pack to Total Volume of Business for 28 Plants, Michigan, 1948.

Percent of Total Volume of Business	Number of Plants.
0-9	3
10-19	2
20-29	7
30-39	1
40-49	1
50-59	5
60-69	2
70-79	2
80-89	1
90-100	4

Table VIII b. - Number of Red Cherry Packing Plants Packing Other Fruit and Vegetable Products, Michigan, 1948.

Number of Fruits and Vegetables	Number of Plants	
	Fruit Products	Vegetable Products
1	4	2
2	4	2
3	3	0
4	2	2
5	2	1
6	4	1
7	3	0
8	1	0
9	1	0
10	1	0
11	0	0
12	0	0
13	0	0
14	1	0

Table IX b. - Percentage of Red Cherries Packed and/or Distributed Under Own Brand Names by Plants, Michigan, 1948.

Percentage	Number of Plants	
	Packed	Distributed
Less than 50	2	2
50-59	6	5
60-69	3	3
70-79	2	1
80-89	2	2
90 and over	3	2

Table X b. - Opening Pack Prices by Type of Pack for Red Cherries f.o.b. Packing Plant, Michigan, 1931 - 1948.

Year	Number 2 Cans per Dozen	Number 10 Cans per ¼ Dozen.	Frozen per pound in 30 pound tins
	Dollars	Dollars	Dollars
1931	1.32	1.56	---
1932	.99	1.00	---
1933	1.07	1.28	---
1934	.93	1.11	---
1935	1.15	1.34	---
1936	1.20	1.41	---
1937	1.46	1.77	.080
1938	1.11	1.28	.078
1939	1.00	1.35	.078
1940	.99	1.17	.070
1941	1.45	1.70	.075
1942	1.48	1.86	.090
1943	2.35	2.84	.160
1944	2.20	2.88	.135
1945	2.80	4.11	.202
1946	3.60	4.50	.219
1947	2.45	2.95	.152
1948	2.46	3.00	.152

Table XI b. - Estimated and Observed Average f.o.b. Prices of Red Cherries in Number 2 Cans, Michigan, 1931 - 48.

Year	Estimated[a/]	Observed	Estimated minus Observed
	Dollars per Dozen	Dollars per Dozen	Dollars per Dozen
1931	1.39	1.53	-.14
1932	1.08	.99	.09
1933	1.05	1.03	.02
1934	1.05	1.00	.05
1935	1.01	1.17	-.16
1936	1.33	1.13	.20
1937	1.15	1.30	-.15
1938	1.36	1.17	.19
1939	1.07	.97	.10
1940	1.08	.99	.09
1941	1.44	1.45	-.01
1942	1.32	1.51	-.19
1943	2.11	2.35	-.24
1944	—	2.15	—
1945	—	2.83	—
1946	—	3.62	—
1947	2.65	2.47	.18
1948	2.43	2.46	-.03

a/ Estimated from $\hat{X}_1 = 1.094 - .00000942X_2 + .000205X_3 - .00327X_4 - .033845$ where X_2 = 5-State Production in tons, X_3 = Personal Consumption Expenditures in 10 Billion dollars, X_4 = Index of U. S. Marketing Charges, and X_5 = Time in years since 1930. The years 1944, 1945, and 1946 were omitted.

Table XII b. - Estimated and Observed Average f.o.b. Prices of Red Cherries in Number 10 Cans, Michigan, 1931 - 48.

Year	Estimated[a/]	Observed	Estimated minus Observed
	Dollars per ¼ Dozen.	Dollars per ¼ Dozen.	Dollars per ¼ Dozen.
1931	1.53	1.79	-.26
1932	1.19	.96	.23
1933	1.18	1.10	.08
1934	1.19	1.16	.03
1935	1.17	1.35	-.18
1936	1.55	1.40	.15
1937	1.35	1.55	-.20
1938	1.62	1.33	.29
1939	1.29	1.14	.15
1940	1.31	1.21	.10
1941	1.73	1.77	-.04
1942	1.62	1.90	-.28
1943	2.56	2.84	-.28
1944	—	2.88	—
1945	—	4.11	—
1946	—	4.50	—
1947	3.21	2.98	.23
1948	2.99	3.01	-.02

a/ Estimated from $\hat{X}_1 = 1.059 - .0000110X_2 + .00219X_3 - .001716X_4 - .0183X_5$ where the units of the independent variables are identical with those of Table XI b.

Table XIII b. - Estimated and Observed Average f.o.b. Prices of Red Cherries in 30 Pound Tins, Michigan, 1937 - 48.

Year	Estimated[a/]	Observed	Estimated minus Observed
	Dollars per pound	Dollars per pound	Dollars per pound
1937	.070	.080	-.010
1938	.066	.078	-.012
1939	.069	.065	.004
1940	.080	.070	.010
1941	.119	.075	.044
1942	.092	.090	.002
1943	.121	.143	-.022
1944	.125	.138	-.013
1945	.188	.190	-.002
1946	.184	.219	-.035
1947	.185	.152	.033
1948	.154	.153	.001

a/ Estimated from $\hat{X}_1 = .332 - .000000636X_2 + .0000496X_3 - .004496X_4 - .0153X_5$ where the units of the independent variables are identical with those of Table XI b.

Table XIV b. - Estimated Farm and f.o.b. Pack Prices for Number 10 Cans and 30 pound Tins, Michigan, 1931 - 48.

Year	Farm[a/]	Number 10 Cans[b/]	30 Pound Tins[c/]
	Dollars per ton	Dollars per $\frac{1}{4}$ Dozen	Dollars per Pound
1931	---	1.67	---
1932	---	1.25	---
1933	55.0	1.22	---
1934	52.6	1.22	---
1935	46.8	1.16	---
1936	81.3	1.59	---
1937	61.8	1.35	.072
1938	85.6	1.63	.085
1939	55.3	1.27	.067
1940	57.4	1.25	.068
1941	96.3	1.73	.090
1942	78.8	1.57	.082
1943	162.6	2.61	.131
1944	---	---	---
1945	---	---	---
1946	---	---	---
1947	206.3	3.33	.164
1948	175.0	3.04	.150

a/ Estimated from $\hat{X}_a = -18.98 + 110.67X_b - .460X_c$ where X_b = the f.o.b. price of number 2 cans per dozen and X_c = Index of U. S. Marketing Charges.

b/ Estimated from $Y = 1.32X - .17$ where X = f.o.b. price of number 2 cans per dozen.

c/ Estimated from $Y = .061X + .002$ where X = f.o.b. price of number 2 cans per dozen.

Table XV b. - Miscellaneous Ranges in Costs for Red Cherry Pack, Michigan, 1948.

Item	Range	Median
	Dollars	Dollars
Freezing and Storing 30 pound tins per pound		
First month	0.015 -0.0281	0.015
Additional month	0.0007-0.00583	0.0015
Processing Costs		
Number 2 cans per pound	0.0566-0.0844	--
Number 10 cans per pound	0.0343-0.057	--
30 pound tins per pound	0.0433-0.0805	--

BIBLIOGRAPHY

Alcorn, George. "Using Price Research," Journal of Farm Economics, XXXI (1949), 4, pp. 1096-8.

Anonymous, Federal Reserve Chart Book, Historical Supplement, Washington, D. C.: Board of Governors Federal Reserve System, March, 1950, p. 74.

Anonymous, Fruits and Nuts, Bearing Acreage 1919-1946. United States Department of Agriculture, Washington 25, D. C.: Bureau of Agricultural Economics, CS-32, January, 1949.

Anonymous, Fruits (13 non-citrus) Production and Utilization 1934-36. Washington 25, D. C.: United States Dept. of Agriculture, Bureau of Agricultural Economics, July, 1947.

Anonymous, The Marketing of Red Cherries, An Analysis of Problems That Are of Mutual Interest to Canner and Grower. Washington, D. C.: Division of Statistics, National Canners Association, January, 1940.

Anonymous, Michigan Cherry Survey, Lansing, Michigan; Michigan Co-operative Crop Reporting Service, 1949.

Anonymous, National Income Supplement to Survey of Current Business. Washington, D. C.: United States Dept. of Commerce, Bureau of Foreign and Domestic Commerce, July, 1947.

Anonymous, Sour Cherry Production in 5 Eastern States. United States Dept. of Agriculture. Washington 25, D. C.: Bureau of Agricultural Economics, 1 p. mimeo. annually, June 15.

Boulding, Kenneth E. Economic Analysis, New York: Harper & Brothers, 1941.

Bruner, Nancy and Leavens, Dickson H. "Notes on the Doolittle Solution," Econometrica, XV (1947), 1.

Carroll, Thomas F. Cherries, Background Information and Statistics for Fruit Marketing I. A. E. 662. Ithaca, New York: Cornell University Agricultural Experiment Station, March, 1948.

Cavin, J. P. "Forecasting the Demand for Agricultural Products," Address, joint meeting, American Statistical Association, and American Farm Economic Association.

Ely, Richard and Wehrwein, George S. Land Economics. New York: The Macmillan Co., 1940.

Foote, Richard J. and Ives, J. Russell. The Relationship of the Method of Graphic Correlation to Least Squares. Washington 25, D. C.: United States Dept. of Agriculture, Bureau of Agricultural Economics, Statistics and Agriculture No. 1, April, 1941.

Gessner, Anne L. Handbook of Cooperatives Processing Horticultural Products, 1945-46 and 1946-47. Miscellaneous Report 120, Farm Credit Administration, Washington, D. C.: United States Dept. of Agriculture.

Gessner, Anne L. Marketing Practices of Cooperatives Processing Canned and Frozen Fruits and Vegetables. Miscellaneous Report 130, Farm Credit Administration. Washington, D. C.: United States Department of Agriculture.

Girshick, M. A. and Haavelmo, Trygve. "Statistical Analysis of the Demand for Food: Examples of Simultaneous Estimation of Structural Equations," Econometrica, XV (1947), 2.

Hoos, Sidney and Phelps, H. Fisk. California Clingstone Peaches Economic Status, California Agricultural Experiment Station, Circular 385. Berkeley, California: University of California, May, 1948.

Hoos, Sidney and Shear, S. W. "Relation Between Auction Prices and Supplies of California Fresh Bartlett Pears," Hilgardia, Berkeley, California: University of California Printing Office, Vol.14, Number 5, January, 1942.

Hoos, Sidney. Statistical Analysis of the Annual Average f.o.b. Prices of Canned Apricots, 1926-27 to 1948-49. Mimeo. Report No. 97, Berkeley, California: University of California, Agricultural Experiment Station, June, 1949.

Hoos, Sidney. Statistical Analysis of the Annual f.o.b. Prices of Clingstone Peaches, 1924-25 to 1948-49. Mimeo. Rep. No. 96. Berkeley, California: University of California, Agricultural Experiment Station, June, 1949.

Hoos, Sidney. Statistical Analysis of the Annual Average f.o.b. Prices of Pacific Coast Canned Bartlett Pears, 1926-27 to 1948-49. Mimeo. Report No. 98. Berkeley, California: University of California, Agricultural Experiment Station, June, 1949.

Johnson, D. Gale. Forward Prices for Agriculture. Chicago, Illinois: University of Chicago Press, 1947.

Kenney, John F. Mathematics of Statistics. New York: D. Van Nostrand Company, 1939.

Mallory, L. D. Smith, S. R. and Shear, S. W. "Factors Affecting Annual Prices of California Fresh Grapes, 1921-1929", Hilgardia. Berkeley, California: University of California Printing Office, Vol. 6, No. 4, September, 1931.

Marshall, Roy E. Production and Price Trends in the Pitted Red Cherry Industry. East Lansing, Michigan: Michigan State Agricultural Experiment Station Special Bulletin 258, February, 1935.

Marshall, Roy E. "Some Trends in the Red Cherry Industry," The Canner, January 4, 1947.

Motts, G. N., Scholl, C. A. and Chapin, J. W. Trends in Cherry Production in Michigan. Special Bulletin 237. East Lansing, Michigan: Michigan Agricultural Experiment Station, June, 1933.

Nelson, Milton H. and Sulerud, George L. An Economic Study of the Cherry Industry with Special Reference to Oregon, Agricultural Experiment Station, Bulletin 310. Corvallis, Oregon: Oregon State College, February, 1933.

Nicholls, William H. Imperfect Competition Within Agricultural Industries. Ames, Iowa: Iowa State College Press, 1947.

Norton, L. J. "Differentiation in Marketing Farm Products," Journal of Farm Economics, XXI (1939), 3 (I), pp. 587-95.

Palmer, Cary D. and Schlotzhauer, E. O. "Methods of Forecasting Production of Fruit," Agricultural Economics Research, II (1950), 1, pp. 10-19.

Shear, S. W. and Howe, R. M. "Factors Affecting California Raisin Sales and Prices, 1922-1929," Hilgardia. Berkeley, California: University of California Printing Office, Vol. 6, No. 4, September, 1931.

Shepherd, Geoffrey. "Price Discrimination for Agricultural Products," Journal of Farm Economics, XX (1938), 4, pp. 792-807.

Steck, Leon J. "Effect of an Increase in Population on the Shape of the Demand Curve," Journal of Farm Economics, XVI (1934), 3, p. 535.

Stigler, George J. "Social Welfare and Differential Prices," Journal of Farm Economics, XX (1938), 3, pp. 573-90. (Including a rejoinder by Waugh.)

Stigler, George J. The Theory of Price. New York: The Macmillan Co., 1947.

Sturges, Alexander. "The Use of Correlation in Price Analysis," Journal of Farm Economics. XIX (1939), pp. 699-706.

Tintner, Gerhard. "The Theory and Measurement or Demand," Journal of FarmEconomics, XXI (1939), 3 (I), pp. 610.

Thomsen, F. L. "Measuring Changes in the Demand for Farm products," Journal of Farm Economics, XXI (1939), 1, pp. 132-141.

Waite, Warren C. "Place of and Limitations to the Method," and "Notes on the Discussion," Journal of Farm Economics, XXIII (1941), 1, pp. 317-23.

Waugh, Frederick V. "Market Prorates and Social Welfare," Journal of Farm Economics, XX (1938), 2, pp. 403-17.

Wellman, H. R. "Application and Uses of the Graphic Method of Multiple Correlation," Journal of Farm Economics, XXII (1941), 1, pp. 311-317.

Wellman, H. R. and Braun, E. W. Cherries. Agricultural Experiment Station, Bulletin 488. Berkeley, California: University of California College of Agriculture, February, 1930.

Wellman, H. R. Statistical Analysis of the Annual Average f.o.b. Prices of Canned Clingstone Peaches, 1924-25 to 1938-39. Mimeographed Report No. 67. Berkeley, California: University of California Agricultural Experiment Station, June, 1939.

Wellman, H. R. Supply, Demand, and Prices of California Peaches. Agricultural Experiment Station, Bulletin 547. Berkeley, California: University of California College of Agriculture, December, 1932.

Working, Elmer J. "Evaluation of Methods Used in Commodity Price Forecasting," Journal of Farm Economics, XII (1930) 1, pp. 119-39.

Working, Elmer J. "Graphic Method in Price Analysis," Journal of Farm Economics, XXI (1939), 1, pp. 337-45.