

A STUDY OF THE RELATIONSHIP BETWEEN PROFIT
RATES AND ECONOMIC CONCENTRATION IN A
SAMPLE OF CANADIAN INDUSTRY

by

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B.Sc. (Hons.) University of British Columbia, 1965

A Thesis Submitted in Partial Fulfilment of
the Requirements for the Degree of
Master of Business Administration

in the Department

of

Commerce and Business Administration

We accept this thesis as conforming to the
required standard.

The University of British Columbia

April, 1967.

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ABSTRACT OF THESIS

The purpose of this thesis is to test the hypothesis, derived from neo-classical micro-economic theory, that other things being equal the more concentrated an industry becomes, the more likely it is that firms in that industry can pursue monopolistic practices and thereby earn greater profits than would otherwise be possible if there were more firms in that industry. The method of study employed is the application of regression and correlation analysis to a cross-sectional sample of Canadian industry. The results of this study lead one to the conclusion that concentration and profits are positively correlated, thus supporting the hypothesis. However, concentration explains only about 10 per cent of the variation in industry profit rates in the cross-section.

TABLE OF CONTENTS

	Page
LIST OF TABLES	iv
LIST OF ILLUSTRATIONS	v
ACKNOWLEDGMENTS	vi
Chapter	
I. INTRODUCTION	1
Purpose	
Importance	
Method of Study	
Organization of Paper	
PART I. THE HYPOTHESIS	
II. THE CONCENTRATION PROFITS HYPOTHESIS	5
III. A REVIEW OF EMPIRICAL WORK	10
PART II. CONCENTRATION	
IV. CONCENTRATION	15
What is concentration?	
Measures of concentration.	
Choice of Concentration Index.	
PART III. THE STUDY	
V. THE DATA	27
Source of the Data	
Source of Information on the Tapes	
Selection of Tape Sample	
Classification of Industries on the Tapes	
Selection of Sample Industries for the Study	

Deficiencies in the Data
 Advantage of the Data
 Summary

VI.	MEASURES	35
	Introduction	
	Measure of Concentration	
	Measure of Profitability	
	Measure of Relative Profitability	
	Measure of Leverage	
	Measure of Profit Potential	
VII.	METHODS AND RESULTS	45
	Profitability of Dominant Groups	
	Cross Sectional Analysis	
	The Simple Relationship between	
	Concentration and Profitability	
	The Simple Relationship between	
	Relative Profitability and Con-	
	centration	
	Multiple Regression and Partial	
	Correlation Analysis	
	The Simple Relationship Between	
	Concentration and Profit Potential	
VIII.	SUMMARY AND CONCLUSIONS	63
	APPENDIX A	66
	APPENDIX B	71
	APPENDIX C	73
	APPENDIX D	86
	BIBLIOGRAPHY	93

LIST OF TABLES

Table		Page
1.	Spearman Rank Correlation Indices, Taxable Canadian Companies, 1962	24
2.	The Frequency Dominant Groups, Selected on a Sales Base, Are More Profitable than Non-dominant Groups	46
3.	The Frequency Non-dominant Groups, Selected on a Sales Base, Are More Profitable than Dominant Groups	47
4.	The Frequency Dominant Groups Selected on an Asset Base, Are More Profitable than Non-dominant Groups	48
5.	The Frequency Non-dominant Groups Selected on an Asset Base are More Profitable than Dominant Groups	49
6.	Simple Correlation and Regression Statistics: Independent Variable - Concentration, Dependent Variable - Profitability	51,52
7.	Simple Correlation and Regression Statistics: Independent Variable - Concentration, Dependent Variable - Relative Profitability	55
8.	Multiple Regression Statistics: Independent Variables- Concentration, Profitability Potential and Leverage, Dependent Variable - Profitability	57,58
9.	Partial Correlation Statistics: Independent Variables - Concentration, Profitability Potential and Leverage, Dependent Variable - Profitability	59
10.	Simple Correlation and Regression Statistics: Independent Variable - Concentration, Dependent Variable - Profit Potential	62

LIST OF ILLUSTRATIONS

Figure	Page
1. Derivation of the Profit Potential Measure	44

ACKNOWLEDGMENTS

The author would like to extend his appreciation to all those who assisted in the preparation of this thesis. In particular to Professor Mitchell and the Department of National Revenue, Taxation Division, for making the necessary data available. To Professors Mitchell, Bray and Burke for their advice and guidance. To the Staff of the University Computing Centre for their assistance in aid of programming. Finally, to my wife, Shannon for her assistance in preparation of the manuscript.

CHAPTER I

INTRODUCTION

Purpose

The purpose of this thesis is to test an hypothesis derived from microeconomic theory. This hypothesis may be stated as, "Other things being equal, firms in highly concentrated industries are more likely to be able to pursue monopolistic policies, which involve higher prices and profits and lower output than would prevail if a larger number of firms competed in the market".¹ More specifically, the hypothesis is to be tested in the Canadian context.

Importance

The author feels that this study is important for two diverse reasons. First, from an academic viewpoint, the study will test a well-known microeconomic theory. As Canadian business concerns grow larger this theory has increasing relevance to the Canadian scene as a frame of reference for judging how

¹ G. Rosenbluth, "The Structure of Canadian Manufacturing" Problems and Policies in Canadian Manufacturing : A Symposium. National Industrial Conference Board. Canadian Studies, No. 7, p. 19.

rational profit maximizing concerns will react to specific market stimuli. Further, as governments grow larger and become more influential in the economic sphere the theory may have to be modified. Therefore, it would be useful to know how well the theory predicts the actions of Canadian firms as represented by outcomes such as profits.

A second, and possibly more important reason for the study is social in nature. Do oligopolists, whether they are operating in a pure or partial oligopoly,² make significantly more profit than more competitive sectors of the economy? Of course when one considers profits, then factors such as distribution of income, allocation of resources, restriction of output and firm efficiency are considered by implication. Profit figures will not provide all the answers to questions relating to the previously mentioned factors, however, if the hypothesis is supported by data from the economy then one more bit of information is available to those concerned with such matters.

Method of Study

The method of study to be employed is essentially cross-sectional in nature. Such an approach permits the analysis of different groups from the cross-section and a comparison of these

²For a description of partial oligopoly power see W. Fellner, Competition Among the Few, New York: Reprint of Economic Classics, Angus M. Kelley, (copyright 1949) 1960, pp.136-141.

groups. Further, the method permits one to hold some of the factors implied in the statement "other things being equal" constant by the use of multiple regression and partial correlation analysis.

Organization of the Paper

The author has felt it best to organize the thesis, following the introduction, in the following manner. The first section consists of two chapters. Chapter II is a brief review of the economic hypothesis upon which this study is based. Chapter III is a review of the only published statistical work directly related to this study. It is hoped that these two chapters will provide a useful survey of background material and a base from which to progress.

The second section consists of only one chapter. Chapter IV is a discussion and review of what concentration measures are, and are purported to measure, as well as a review of the various concentration measures proposed to date.

The third section consists of the study itself. Chapter V describes the data used, its source, problems and limitations and how the cross-sectional sample was selected. Chapter VI is a description of the various measures of profitability, profit potential, relative profitability and leverage that have been generated from the source data. Chapter VII des-

cribes the methods employed in the study and an analysis of the results. Finally, Chapter VIII consists of a summary of findings and a note on further research in this area of study should the data become available.

PART I: THE HYPOTHESIS

CHAPTER II

THE CONCENTRATION - PROFITS HYPOTHESIS

The hypothesis to be tested is derived from neo-classical microeconomic theory, and may be briefly stated as, " ... the profit rate of firms in oligopolistic industries of a high concentration will tend to be significantly larger than that of firms in less concentrated oligopolies or in industries of atomistic structure".¹ Thus, the hypothesis rests upon the distinction of industries according to the degree of seller concentration. The spectrum of concentration ranges from highly concentrated, oligopolistic industries where a few sellers control a significant proportion of the industry output down to lowly concentrated, atomistic industries where no seller or small group of sellers controls a significant proportion of the industry output.

The derivation of this hypothesis is readily apparent when one considers the two extremes of industry market structure. A single firm with a monopoly (or oligopolists operating

¹ J.S. Bain. "Relation of Profit Rate to Industry", Quarterly Journal of Economics, Vol.XLV, No.3, Aug. 1951, p.293.

with effective collusion) should approach a long run profit maximizing solution as envisioned in price theory. Provided that the demand faced by the industry, its costs of production and sale, and that entry conditions are suitable, the long run profit maximizing solution will permit economic profit to be made. On the other hand, sellers in atomistic industries (or oligopolies that cannot attain effective collusion) given the previously mentioned industry demand and cost of production conditions will tend to sell at a lower price and therefore receive a lower profit.

However, as Fellner² points out, maximization of joint industry profits for oligopolies may not be feasible. The reasons why this maximization may not be feasible need not concern us here, it is sufficient to note that maximization may be impossible. To test this possibility a second hypothesis is put forward. The dominant group or leaders in an industry are hypothesized to earn higher profits relative to profits the balance or non-dominant group may make. Further it is hypothesized that the difference in profit rates between the dominant and non-dominant groups will increase with increasing concentration.

As was implied in the previous paragraph, each industry will be studied as if it were composed of two distinct groups.

² W. Fellner. Competition among the Few, New York : Reprint of Economic Classics, Angus M. Kelley (copyright 1949) 1960, Chapter IV.

One group is composed of the largest and presumably most economically powerful firms. The method for determining such dominant groups will be discussed and defined in Chapter IV. The balance of each industry will be defined as a non-dominant group.

The association of high concentration with high profits should hold only on the average, in the long run and not necessarily in each case. One could not expect demand and cost conditions to be identical or even similar in each industry. One could only expect such variation in these profit determinants to average out across industries. The same argument may be applied to other determinants of profits not considered here. Considering the association of high profits and high concentration from a dynamic point of view, one would expect the relationship to hold through time only on average. Profit rates for individual firms and industries would be expected to fluctuate as market conditions change. It is not unlikely that an industry with low concentration will enjoy a higher profit rate than an industry with high concentration given appropriate differences in market conditions between the industries. However, the assumption is made that these variations will average out across industries and it is expected that the concentration-profit rate hypothesis will hold.

In the previous paragraph the profit rate referred to has been the profit rate on sales. What about the profit rate

on equity? As Bain³ points out, in individual industries there is no reason to expect that the same relationship exists between rates of return on shareholder's equity and rates of return on sales. Nevertheless if one falls back on the argument that variations will average out across industries, then one may conclude that the same relationship exists between concentration and rates of return on shareholder's equity and concentration and rates of returns on sales. One may extend the hypothesis to say that it is expected that concentration and return on shareholder's equity are directly and positively related.

Bain⁴ has tested this assumption on relation of profit on sales and profit on equity. He concludes that the two measures of profit are so similar that for "statistical purposes these measures are effectively interchangeable". Therefore, in this study, profit rates on equity will be used as a measure of profitability.

Since microeconomic theory makes no distinction as to how productive assets are financed it was felt that the profits concentration hypothesis should be tested ignoring the method of financing employed by firms. Therefore, it is hypothesized that a direct and positive relationship exists between operating income⁵ and concentration.

³Bain, op.cit., p.297.

⁴Bain, loc.cit.

⁵Operating income is defined in Chapter VI, pp.37-38, of this study.

The foregoing discussion rests upon the assumption that is made in microeconomic theory to the effect that entrepreneurs are rational profit maximizers. How realistic is such an assumption? No definitive answer is forthcoming, however, a brief review of some thinking in this area is illuminating. Fellner⁶ lists several reasons for limitation of profit maximization: safety margins, long run objectives, objectives of controlling groups, desire to avoid cutthroat competition, and non-price competition. Cyert and March⁷ note four goals other than profit maximization that an organization may pursue. These may be listed as: the production goal, the inventory goal, the sales goal, and the market share goal. These goals may well be important enough in some firms to seriously limit profit maximization as a goal. Therefore, there are two sets of reasons, one economic, the other behavioral, that may prevent profit maximization.

Here again one may argue that such non profit maximizing behavior is likely to average out across industries. Therefore, the basic hypothesis remains intact to be tested empirically.

⁶W. Fellner, Competition Among the Few, New York: Reprint of Economic Classics, Angus M. Kelley, (copyright 1949) 1960, Chapters V and VI.

⁷R. Cyert and J. March, A Behavioral Theory of the Firm, Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1963, Chapter III.

CHAPTER III

A REVIEW OF EMPIRICAL WORK

A search of the literature revealed few empirical studies using concentration measures to test economic hypotheses. Most statistical work on concentration has been done to study concentration per se. Only two empirical studies that test hypotheses were found and of these only one relates to the topic at hand.¹ The relevant study by J.S. Bain² uses American prewar data and is therefore, very much out of date.

Bain's hypothesis is identical and is the source of the first hypothesis to be tested in this study. He states "the hypothesis in brief is that the average profit rate (on shareholder's equity) of firms in oligopolistic industries of a high concentration will tend to be significantly larger than that of firms in less concentrated oligopolies or in industries of atomistic structure".³ The concentration referred to seller concentration.

Bain selected 42 industries from about 340 manufacturing

¹The other work is a study of price inflexibility by A.C. Neal, Industrial Concentration and Price Inflexibility, Washington D.C.: American Council on Public Affairs, 1942.

²Bain, op.cit., pp.293-324. ³Ibid. p.294.

industries identified by the Census of Manufacturers for the year 1935.⁴ Subsequent data on the same basis was available for the following four years, making a five year period in total. The 42 industries selected survived screening tests based on the concept of an industry defined in terms of cross elasticity of demand. An industry is defined as a group of producers whose products are close substitutes and have high cross elasticities of demand. The products of an industry have low cross elasticities of demand with products of other industries. Further, the data was screened to eliminate those industries characterized by geographical market segmentation. Next, the data was screened to eliminate industries which produced more than one specialized product but were still classified by the census as an industry. The final screening involved the adequacy of Security Exchange Commission profit data coverage.

The concentration measure employed, (see Chapter IV for a discussion of concentration measures) was the percentage of value product (sales) supplied by the first eight firms for the year 1935.

Bain examined the accounting profit data from the Security Exchange Commission's Survey of American Corporations, 1936-1940. This source was chosen since it was in Bain's estimation

⁴ This classification is based on three and four digit classifications similar to those described in the Standard Industrial Classification Manual, Ottawa: Queen's Printer and Controller of Stationary, 1960.

the most "reliable, comprehensive, and uniform source of income information available ... "5

Bain, in his conclusion, writes as follows:

In summary, how accurate a representation of the theoretical long-run tendency of profit ratio of firm and industry is given by S.E.C. accounting data? Although such data should give a rough guide to the comparative long-run average profitability of various sizable groups of firms and industry, there are numerous sources of deviation of individual accounting profit rates from their theoretical long-run tendency. These are of sufficient weight that we should judge it quite improbable that the main hypothesis, even if true, would be verified by every pair of individual firms or industries.⁶

Bain employed two types of profit measures. The firm annual profit rate which is the simple unweighted 5 year arithmetic average of net profit after taxes to net worth at year beginning.⁷ A second profit figure for the industry was calculated as the simple unweighted 5 year average of the yearly weighted average profit rate (sum of firms profit divided by sum of firms' net worth). The second measure was employed as the primary measure in testing the hypothesis.

Bain's results are summarized as follows:

First there is no conclusive indication of any closely observed linear relationship of industry concentration to profit rates ... A regression line fitted to the data (concentration and in-

⁵Bain, op.cit., p.305.

⁶Bain, op.cit., p.309.

⁷Profit and net worth as defined by the S.E.C.

dustry average profit rates after taxes) shows a decided downward slope for profit as concentration decreases, but correlation is poor ($r = 0.33$) and the fit to any such line is obviously so poor that the inference of a rectilinear or other simple relationship of concentration to profits is not warranted ... Second, the positive conclusion which does emerge is that there is a rather distinct break in average profit rate showing at the 70% concentration line, and that there is a significant difference of industry average profit rates above and below this line.⁸

Thus, can Bain's result be improved upon in any way?

Of course, several factors to be discussed later, such as character of the data and different time period, preclude the present study from being exactly parallel. Nevertheless, might not Bain's type of study be improved by the use of multiple regression analysis, where factors other than concentration that affect profit may be held constant?

⁸Bain, op.cit., pp.313-314.

PART II: CONCENTRATION

CHAPTER IV

CONCENTRATION

What is Concentration?

The concept of concentration is associated with two phenomena, (a) the number of sellers and (b) the dominance of a few of these sellers. In statistical terms this might well be restated as "the number of units in the universe (industry) and the skewness of the distribution".¹ From the point of view of economic analysis the latter consideration, skewness or dominance of the few is most important. Thus, total number of enterprises is far less important than skewness unless a reduction in the number of firms is carried to the point where it produces dominance by a few.

Concentration may be measured at three levels: (1) the plant level, (2) the corporation level and (3) the interest group level. Plant concentration may be thought of as a measure of the technological state of an industry and need not concern us here. Concentration at the interest group level may

¹J.M. Blair, "Statistical Measures of Concentration in Business". Bulletin Oxford University Institute of Statistics, Vol. XVIII, No. 4, Nov. 1956, p.351.

be thought of as a measure of the economic power of the group, this does not concern us here. Concentration at the corporation level (be it a single or multiplant corporation) is the relevant concentration measure for the purpose of testing the economic hypothesis put forward in Chapter II, since we are concerned with concentration within one market or industry. However, corporations that are diversified across several industries do present a problem as will be seen in Chapter V.

What do concentration indices purport to measure? A concentration index indicates the likelihood that monopolistic or oligopolistic practices and behavior will become observable in an industry. As Rosenbluth points out "The degree of concentration is not by any means the only determinant of market behavior. In the absence of collusion or government regulation, high concentration is a necessary condition for monopolistic practices, while low concentration is a necessary condition for the type of competition that tends to equate price and marginal cost".² Thus, concentration indices are ex ante measures of the likelihood of certain types of market behavior. Concentration indices on the other hand, may not be viewed as ex poste indicators of monopoly or oligopoly, since these indices ignore

²G. Rosenbluth, "Industrial Concentration in Canada and the United States", Canadian Journal of Economics and Political Science. Vol. XX, No. 3, August, 1954, p.332.

many aspects of market structure.³ Measures of monopoly "relate to some property of monopoly (or oligopoly), usually conceived as an effect of this market condition".⁴

Measures of Concentration

Before proceeding to a description of various measures of concentration the problem of determining a base of measurement must be settled. Many bases have been used, such as: sales, assets, value added, and number of employees, to name only a few. Scitovsky⁵ has come out strongly in favour of the value added base and the sales base. While the value added base is often considered superior, especially where vertical integration is present, value added data are rarely available. Therefore, this thesis will adopt the sales base as the prime base for measuring concentration. As a supporting base the net asset at book value base has also been included in the study.

There are three major classes of concentration indices, none of which has gained universal acceptance.

³M.M. Massel, Competition and Monopoly, Washington, D.C.: The Brookings Institution, 1962, p.194.

⁴W. Fellner, "Comment", Business Concentration and Price Policy, Princeton, N.J.: Princeton University Press, 1955, p.113.

⁵T. Scitovsky, "Economic Theory and the Measurement of Concentration", Business Concentration and Price Policy, Princeton, N.J.: Princeton University Press, 1955, p.111.

The first group measures the extent to which a small number of firms control a large portion of the industry output, if a sales base is used. This "percentage partial"⁶ measure is usually computed using the largest three, four or eight firms in each industry, although any other small number of firms would be appropriate. Thus, one calculates the index on a sales base in the following manner:

let L.T.C. = the concentration index, largest
three companies,

A = the total output of the largest
three companies,

B = the total output for the industry.

then,

$$L.T.C. = \frac{A}{B}$$

A brief examination of the foregoing equation reveals that as the largest three firms in the industry become larger relative to the total industry, the index approaches unity, while, on the other hand, as the number of firms increases and as the largest three firms become smaller relative to the total industry, the index approaches zero.

A second class of indices closely related to the first class, measures the number of firms required to account for some percentage of total industry output. The level of output chosen

⁶C.L. Mitchell, Industrial Concentration in Canada. Unpublished Paper, The University of British Columbia, 1966, p.3.

is usually 80 percent. This is an inverse measure of concentration, increasing in numerical value as concentration decreases. A major disadvantage of this index is that it does not consider the total number of firms in the industry.

These two classes of indices are most often criticized because they consider only one point on a cumulative concentration curve which relates percentage of industry output to the number of firms producing that output.⁷

Nevertheless, they are useful measures "in determining the monopolistic potential in a particular industry".⁸

The third class of indices considers all the firms in an industry and is not subject to the criticism of the previously mentioned two classes. The best known index of this class is Herfindahl's summary index.⁹ This measure is the sum of the firm sizes, measured as a percentage of total industry size or output depending upon the base. The index is defined as

⁷G. Rosenbluth, "Measures of Concentration" Business Concentration and Price Policy, Princeton, N.J.: Princeton University Press, 1955, p.59.

⁸Mitchell, op.cit., p.2.

⁹G. Rosenbluth, "Measures of Concentration", Business Concentration and Price Policy, Princeton, N.J.: Princeton University Press, 1955, p.60.

follows:

let S.S.Q. = The concentration index, the sum
of the squares,

A_i = The proportion of industry output
controlled by the ith firm,

then

$$S.S.Q. = (A_i)^2 \text{ summed over all } i.$$

"This index is equal to the reciprocal of the number of firms if all firms are the same size, and reaches its maximum value of unity when there is only one firm in the industry".¹⁰ In an attempt to isolate the importance of these two variables, dispersion of firm size and number of firms, a further index based on the sum of the square of the variation in firm size from the mean size may be computed, however, this does not concern us here.

The Herfindahl class of indices considers all the firms in each industry, but on the other hand, it is not as specific as the other classes of indices in measuring the monopolistic potential of an industry.

A new index belonging to the first class of indices has been defined by C.L. Mitchell.¹¹ This index, dubbed the monopolistic potential or MP index, considers the total percentage of the output accounted for by each industry's dominant group

¹⁰ Ibid., p.60

¹¹ Mitchell, op.cit.

and the number of members constituting such a group. As the name implies this index was devised to measure monopoly potential. The index is defined as follows:

let MP = the concentration index,
monopolistic potential,

S = the proportion of output controlled
by the dominant group

$$\text{then } MP = \frac{S^2}{(n(n-1)/2)^{\frac{1}{2}}} .$$

The number of firms in the dominant group is defined when the equation reaches a maximum value as firms are included in the group sequentially from a rank ordered list. The dominant group may not be less than two nor more than fifteen. The maximum number of firms is set arbitrarily. The index tends toward unity as the industry becomes more monopolistic, although it is not defined in the case of monopoly, and tends toward zero as the industry becomes more atomistic.

This index is based on the assumption that the cohesiveness of the dominant group is a function of the number of possible interpersonal relationships in the group rather than a function of the absolute size of the group.¹² In other words, the index attempts to measure the potential effectiveness of group action and is, therefore, a measure of monopoly potential.

¹²Mitchell, op.cit., p.7.

Choice of a Concentration Index

There are two tests that an index must pass before it may be selected for use in this study. First, will the results of the study be biased by the selection of a particular index? If the answer is yes, then the index must be rejected. Second, will the index permit the selection of a dominant group in each industry? If the answer is no, then the index must be rejected. These tests will be dealt with in turn.

It is obvious that there is no theoretical ground for choosing one index over another. The answer must come from an analysis of the indices themselves.

Rosenbluth examined the relationship between concentration indices of the percentage partial type of an employment base using different numbers of firms. Rank correlations between the largest two, three, four and eight firms in 1947 exceeded 0.90 in all cases.¹³ Therefore it would seem that if a percentage partial index were selected the number of firms included in the index would not be crucial.

In comparing the three main classes of indices for 1947 on an employment base, Rosenbluth found a rank correlation in

¹³G. Rosenbluth, "Measures of Concentration", Business Concentration and Price Policy, Princeton, N.J.: Princeton University Press, 1955, p.64.

excess of 0.97 in all cases.¹⁴ He concludes,

These three comparisons suggest that in the analysis of cross-section data, the use of any one of the indexes considered here will result in substantially the same ordering of observations as any of the others. Analytical results that rest on the ordering of observations will not be greatly affected by the index used.¹⁵

Thus, the choice of index would not affect the analytical results.

Table 1 shows the relationships between various indices for 1962 on data compiled by the Department of National Revenue, Taxation Division,¹⁶ employing sales and assets as the size bases. These results are in complete agreement with those of Rosenbluth. Therefore, there is no statistical basis for selecting one index over the other.

The choice of an index, for the purpose of this study, rests entirely upon its ability to select dominant groups. This is necessary to test the partial oligopoly hypothesis. Further it is felt that profit rates calculated for industries as a whole are likely to be misleading where high profit rates of a few firms are marked by low profit rates of many firms.

The very nature of Herfindahl's summary index eliminates it from contention since it considers all the firms in an industry. However, the other indices are not so easily accepted or

¹⁴Ibid. p.69.

¹⁵Ibid. p.69.

¹⁶See Chapter V for a brief description of the data and its source.

TABLE 1
SPEARMAN RANK CORRELATION INDICES,
TAXABLE CANADIAN COMPANIES, 1962¹⁷

<u>Similar Bases</u>					
		L.T.C.	S.S.Q.	S.S.Q.V.	M.P.
	L.T.C.		.991	.989	.987
Asset	S.S.Q.	.993		.993	.986
					Sales
Base	S.S.Q.V.	.993	.995		.981
					Base
	M.P.	.987	.988	.984	

<u>Dissimilar Bases</u>				
	L.T.C.	S.S.Q.	S.S.Q.V.	M.P.
L.T.C.	.937	.930	.919	.937
S.S.Q.	.936	.935	.920	.941
S.S.Q.V.	.932	.927	.920	.939
M.P.	.937	.933	.920	.950

L.T.C. = Largest Three Company Index

S.S.Q. = Herfindahl's Summary Index

S.S.Q.V. = Sum of Square of Variance of Firms
Size Index

M.P. = Monopolistic Potential Index

¹⁷ adopted from Mitchell, op.cit., p.26.

or rejected. A percentage partial index will select dominant groups, arbitrarily composed of the firms included in the concentration index. The index based upon the number of firms required to account for some percentage of industry output or assets will select a dominant group arbitrarily composed of the firms that meet the required percentage of industry output. The monopolistic potential index is by definition able to select dominant groups. As before this selection is somewhat arbitrary.

The author feels that the dominant groups selected by the monopolistic potential index are likely to be more meaningful since the index considers both the amount of output controlled (economic power) by the groups and the number of corporations (likelihood of effective collusion) in the groups. Of course no arbitrary statistical measure can guarantee the selection of groups that are effectively colluding, however, it seems that groups selected by the monopolistic potential are likely to be more meaningful.

PART III: THE STUDY

CHAPTER V

THE DATA

Source of the Data

All data for this study was made available to the author, by the Taxation Division of the Department of National Revenue through Mr. C.L. Mitchell, associate professor at the University of British Columbia. The data is in the form of computer tapes containing the financial statement data summarized in the annual publication Taxation Statistics.¹ Those interested in the exact nature and breakdown of the data are referred to this publication. This financial data is in much the same groupings as would be found in a set of financial statements.

Source of Information on the Tapes

All information in the tapes was extracted from T2 income tax returns and attached financial statements. This compilation was done by a statistical section at the head office of the Taxation Division in Ottawa. There, the data was transcribed

¹Department of National Revenue, Taxation Statistics, Part 2, Ottawa: Queen's Printer and Controller of Stationary, 1965.

onto standard cards, "in accordance with a manual of general rules and procedures".² This manual was not examined in detail by the author, but has been reviewed by others and found to be acceptable.³ It is assumed that the data has been transcribed correctly.

Selection of the Tape Sample

The total population for all such data are of course, all companies that filed a Canadian corporation income tax return. However, all companies are not included on the tape. Approximately 22% of the firms were excluded (i.e. not tabulated) due to the following reasons: they were inactive, they were banks or insurance companies, they had incomplete returns, or they were cooperatives or crown corporations.⁴ Companies exempt from taxation under the income tax act, such as personal corporations, exempt cooperatives and other exempt corporations, naturally are not considered.

From the balance of the companies so far not excluded, those that met at least one of the following criteria were included in the sample and are fully tabulated:

² Ibid, p.16.

³ Mitchell, op.cit., p.4.

⁴ Taxation Statistics, op.cit. p.26.

1. Total net assets at book value plus accumulated depreciation and depletion over \$1,000,000.
2. Taxable income over \$50,000.
3. Taxable loss over \$25,000.⁵

Returns for companies failing these tests were stratified by industry groupings and a 10% random sample was taken from all strata.⁶ To compensate for the sampling technique, each company that was sample tabulated, was treated as one company representing nine others of equal size and character. This assumes that the sample companies are representative.

For 1963 (tax year) 10,234 larger companies were fully tabulated while 12,655 smaller companies were sample tabulated. "In aggregate, approximately 19% of the corporation returns received in the normal filing period (for tax year 1963) were analyzed".⁷

Time Period Covered by the Data

Data for two tax years 1962 and 1963 were available for this study. It was hoped that the data for 1964 would also be available but for technical reasons this data was not available in time to be included in the study.

⁵Taxation Statistics, op.cit., p.16.

⁶Taxation Statistics, op.cit., p.16.

⁷Taxation Statistics, op.cit., p.16.

One of the more serious limitations and a valid criticism of this study is the relatively short time period involved. The author feels that data for two or even three years covers an insufficient time period to be truly long-run in nature. A five year time span such as was used in the study by J.S. Bain⁸ is far more appropriate and a ten year span would be even more desirable. However, data for only two years were available and will have to serve as an approximation to the long-run.

Despite the short period of time covered by the data it can be argued that the cross-sectional nature of the analysis permits its use. One could expect the short-run fluctuations to average out across all industries.

Classification of Industries on the Tapes

The firms on the tape are broken down into 136 industries for 1962 and 137 for 1963. Each industry classification corresponds to that of the Standard Industrial Classification Manual⁹ or as a condensation and combination of such. C.L. Mitchell examined the 1962 tape and found that 63 of the 3-digit classifications were directly parallel, while the balance were

⁸ Bain, op.cit., p.305.

⁹ Dominion Bureau of Statistics, Standard Industrial Classification Manual, Ottawa: Queen's Printer and Controller of Stationary, 1960.

some combination of the 3-digit classifications.¹⁰

Firms with diverse activities are classified as to the industry in which they "show the greatest volume of sales".¹¹

"Firms" or "companies" are legal entities. Consolidated tax returns are not permitted by the Department of National Revenue.¹² This classification system tends to understate concentration.¹³

Selection of Sample Industries for the Study

After a thorough examination of the classification manual and the definition of firms classified into each 3-digit classification employed by Taxation Statistics,¹⁴ 49 industries were selected for the sample. The reader is referred to appendix A for a set of lists of industries excluded and a list of industries included.

The cross-sectional sample group was selected by testing each industry against four criteria. Those industries that were not rejected on any one of these criteria were included. The

¹⁰Mitchell, op.cit., p.5.

¹¹Taxation Statistics, op.cit., p.17.

¹²Taxation Statistics, op.cit., p.16.

¹³G. Rosenbluth, "Concentration of Ownership and Control of the Canadian Economy", Economics, Canada, Walker, M., and Forester, D. eds. Toronto, Ont.: McGraw-Hill Co., 1963, p.68.

¹⁴Taxation Statistics, op.cit.

four criteria were: if the industry classification contained more than one industry by product it was rejected; if the industry was one where a large portion of sales were made outside Canada, it was rejected, (this test was not applied in reverse mainly because of Canada's fairly high tariff barriers); if the industry was subject to government regulations or other interference, it was rejected; if the industry appeared to consist of firms with significant geographic monopolies, it was rejected. The selection of industries was done by judgment of the descriptions as they appear in the classification manual.

This selection of the sample was probably the weakest link in this study. Another person selecting industries in this manner might well have chosen a completely different set. Nevertheless, it was felt that it was better to discriminate between what is or what is not an industry as required by the hypothesis on judgment rather than accept all industries, as classified.

Deficiencies in the Data

Another criticism that may be made of the data is the use of book value of equity. At best, book value is a mixture of dollar amounts of various values that should not be summed. Book value of the capital stock accounts is not likely to be representative of the stock's true value if it has been out-

standing for any period of time. Further, the surplus account contains many additions to equity over the years in dollars of varying value.

It is necessary to fall back on the "averaging out argument" once more. One would not expect the book value of equity to vary in a consistent manner so as to bias the results.

Another deficiency in the data is that "generally accepted accounting principles" permit much variation in accounting practice. One just has to think of the many possible variations in the treatment of depreciation to realize that the data are not directly comparable from one firm to the next. However, as before one would expect these variations to average out in cross-sectional analysis.

Advantage of the Data

The advantage of this data lies in its form. The fact that it is on computer tapes permits the data to be easily retrieved and manipulated. Thus virtually no time is spent screening and coding data, yet one is assured of a complete sample.

Summary

In summary the data are compiled from information on T2 income tax returns and accompanying financial statements. In part the data are a sample of the economy, industry by

industry. The data covers the time period of two years, 1962 and 1963. The 49 industries in the final sample chosen for study were selected by a process of elimination. It is recognized that there are deficiencies in the data but it is not felt that they are of sufficient magnitude to invalidate the study.

CHAPTER VI

MEASURES

Introduction

Before the various measures of profitability and leverage are introduced the matter of what type of average to be used must be settled. The median of profit rates was not considered since this measure of central tendency ignores the symmetry of distributions. The mode was not considered since no attempt was made to check for bimodal distributions. Should the average profit rate for an industry or group within an industry be calculated as an unweighted arithmetic average or as a weighted arithmetic average (sum of the numerators divided by the sum of the denominators)?

The author feels that the weighted basis is superior on the grounds that each firm, in the group for which the averages are calculated, is weighted in proportion to the firm's relative importance in that group. In this way it is hoped that the profitability of the larger members of groups, the dominant groups in particular, will not be masked by smaller, less important members of groups. Further, a weighted average will give a truer picture of profits earned by any group as a whole, since the total profits of the group will be considered in relation to

the total shareholder equity or total operating assets of the group. This argument applies to measures other than profitability, such as profitability potential and leverage.

Despite the belief that weighted averages are a more desirable measure from the point of view of the intended goal, simple unweighted average rates have been computed as well, (the simple average of the profit rate for each firm). This has been done in part as a control to see if the type of average employed will affect the result and in part as a cross check of the author's curiosity as to which type of average is preferable. The two year average for any measure of profitability, profit potential, relative profitability or leverage, is the simple unweighted arithmetic average of the two years whether or not the averages being averaged are weighted or not.

Measure of Concentration

As was noted in Chapter IV, the measure of concentration employed in this study is of the monopolistic potential type on a sales base and on an asset base. The concentration measure used in the regression analysis is the simple two year average of concentration values for 1962 and 1963. Dominant groups are selected and defined as those groups of companies that the monopolistic potential index selects in calculating this concentration index. For specific concentration values

for the sample industries selected, the reader is referred to Appendix B.

Measures of Profitability

Three classes of profitability measures have been calculated. With each calculated as unweighted and weighted averages, there are six measures of profitability in total. Further, each measure is calculated twice for each industry, once for the dominant group, and once for the non-dominant group.

The first class of profitability measure is net profit after corporate income taxes to shareholder's equity. Where net profit after tax is defined as,

$$\text{Total revenue}^1 - \text{total expenses} + \text{Canadian dividends received} - \text{total tax declared},$$

and shareholder's equity is defined as,

$$\text{Preferred stock} + \text{common stock} + \text{surplus} - \text{deficit} + \text{due to shareholders} - \text{due from shareholders} - \text{intangible assets}$$

The second class of profitability measure is net profit, before corporate income taxes to shareholder's equity. This is identical to the previous measure except that "Total Tax Declared" is deleted from the numerator.

The third class of profit measure is operating income before income tax to operating assets. Where operating income

¹ For a complete description of these terms the reader is referred to Taxation Statistics, op.cit., pp.16-22.

is defined as,

Sales + rents received - total expenses + bond interest paid + mortgage interest paid + other interest paid,

and where operating assets (at cost) are defined as

(Accounts payable + tax liabilities)/3 + accounts receivable + inventories + land + buildings and equipment + other assets - depreciation and depletion reserves.

The first term in operating assets is an approximation of operating cash and is used to separate operating cash requirements from financial cash activities.

Each measure has been included in the study for specific reasons. The after tax income to shareholder's equity is included as a measure of income to the shareholders, considering taxes. The before tax figure is included since it relates more closely to the hypothesis which says nothing about corporate income tax. The operating income figure has been included to test profits generated on assets regardless of how those assets are financed.

Measures of Relative Profitability

The relative profitability measures are designed to indicate any change in relative profitability between the dominant and non-dominant groups as concentration increases. In other words, they are designed to test for partial oligopoly powers

and profits if and when oligopolies exist in conjunction with competitive segments of the same industry.²

These measures are simply the ratio of the profit ratio of the dominant group to the profit ratio of the non-dominant group. Thus,

$$\begin{aligned} & \text{Relative profitability on shareholder's equity after taxes} \\ = & \frac{\text{Net profit after taxes to shareholder's equity dominant group}}{\text{Net profit after taxes to shareholder's equity non-dominant group}} \end{aligned}$$

and

$$\begin{aligned} & \text{Relative profitability on shareholder's equity before taxes} \\ = & \frac{\text{Net profit before taxes to shareholder's equity dominant group}}{\text{Net profit before taxes to shareholder's equity non-dominant group}} \end{aligned}$$

and

$$\begin{aligned} & \text{Relative profitability on operating assets} \\ = & \frac{\text{Operating income to operating assets dominant group}}{\text{Operating income to operating assets non-dominant group.}} \end{aligned}$$

In total there are six such ratios, three weighted and three un-weighted.

Provision was made to take care of cases where one or both of the groups in a relative profitability ratio was less

²W. Fellner, Competition Among the Few, New York; Reprint of Economic Classics, Angus M. Kelley, (copyright 1949) 1960, Chapter IV.

than zero. Let,

A = profitability of the dominant group,

B = profitability of the non-dominant group,

R = ratio of the two,

$||$ = absolute value of the enclosed expression,

r = the absolute range between A and B,

y = the smaller of $|A|$ or $|B|$,

lt. = less than,

gt. = greater than.

The following three equations permit a calculation of a positive ratio even when one value is negative. Thus if,

A lt. 0, and, B lt. 0, then,

$$R = B/A$$

or if,

A lt. 0, and B gt. 0,

then,

$$R = \left| \frac{y}{r + y} \right|$$

or if,

A gt. 0, and B lt. 0,

then

$$R = \left| \frac{r + y}{y} \right|$$

The first two of these equations were used only a very few times. However, the last was used more frequently.

Measure of Leverage

It was decided that an important variable in determining profits that could be used in the regression analysis and held constant was leverage. Leverage was defined as follows,

$$\text{leverage} = 1 - \frac{\text{shareholder's equity}}{\text{total net assets} - \text{depreciation and depletion reserves} - \text{intangible assets}}$$

where shareholder's equity is defined as before. Four such ratios have been generated, two for each dominant group and two for each non-dominant group. Of the two for each group, one is on a weighted basis, (sum of the numerators divided by the sum of the denominators), and one is on a simple unweighted basis.

Not only can the inclusion of the above variable permit it to be held constant, but it can be checked to see how this factor changes with concentration, although Potter indicates that a negative relationship is likely to exist, when he states that "smaller firms tend to be over leveraged".³

Measure of Profit Potential

For the derivation of the measure of profit potential the reader is referred to figure 1. Profit potential is de-

³C.C. Potter, Finance and Business Administration in Canada. Scarborough, Ontario: Prentice-Hall Canada Ltd., 1966, p.451.

defined as,

$$\text{Profit potential} = \frac{A}{B} = \frac{\frac{TR}{U}}{\frac{TC}{U}} = \frac{TR}{TC},$$

and where, TR = Total revenue + Canadian dividends received,

and where, TC = Total expenses + an imputed return on equity,

as previously defined, 10% before taxes, 12% after taxes.⁴

For pure competition in long run equilibrium the profit potential should equal unity. However, in imperfect markets the profit potential, in long run equilibrium, should be greater than unity. Thus one reason for creating this measure is to see if it is positively correlated with concentration.

In the statement of the hypothesis the rider, "other things being equal" was inserted. Two of the most important "other things" that are determinants of profit are demand faced by the firm and industry and the cost of satisfying this demand. One would expect that these factors would vary from firm to firm, and from industry to industry. Obviously, even a monopolist cannot make any excess profit if the cost of satisfying demand (where marginal cost equals marginal revenue) is equal to the revenue obtained. Should costs exceed revenues in the long

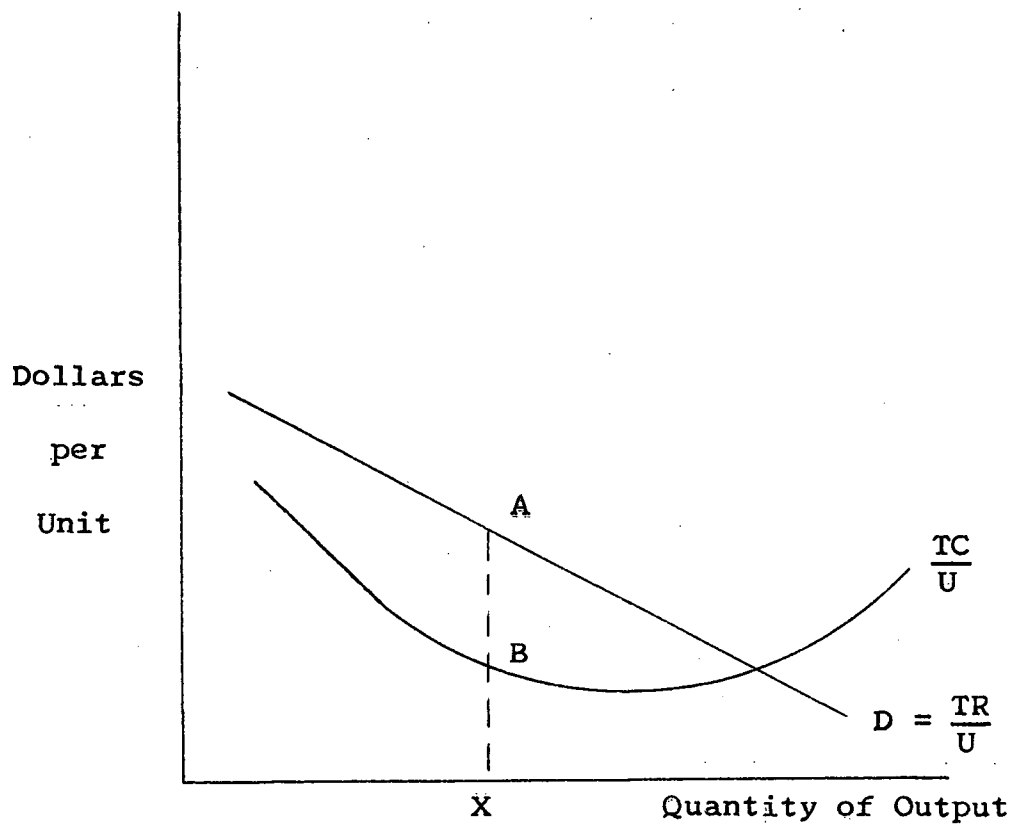
⁴ These two percentages were chosen because they were found to be average return on equity, after tax and before tax, based on research done for C.L. Mitchell during the summer of 1965 at U.B.C. using the same source data.

run the monopolist will have to go out of business. Thus, one might expect profit rates in lowly concentrated industries to occasionally equal profit rates in highly concentrated industries. The profit potential measure is a measure of the quantity of output demanded (total revenue) and a measure of the cost of production (total cost). Thus, these factors may be held constant and the relationship between profit rates and concentration examined.

Profit potential is a measure of margin on sales and if the total revenue and total cost figures employed are over time, then the effect of turnover is included in the measure. It is expected that profit potential and profit rates on equity will be highly correlated.

Viewed from an ex post point of view, this measure is also a measure of entry conditions in the more concentrated industries since the entry of a new firm would likely drive up the prices of input factors and drive down the market price of the industry's product for each firm in the oligopoly. Of course, this measure in no way gives any information about ex ante conditions, such as firms in the oligopoly holding down prices for fear of attracting new competition in the future. As with other measures, profit potential is calculated on a weighted and unweighted basis for both the dominant and non-dominant groups.

Figure 1 - Derivation of the Profit Potential Measure



D = Demand or Total Revenue per Unit (TR/U)

$\frac{TC}{U}$ = Total Cost per Unit

X = Some Level of Output

A = Total Revenue per Unit at Output X

B = Total Cost per Unit at Output X

CHAPTER VII

METHODS AND RESULTS

Profitability of Dominant Groups

Does the concentration index select dominant groups that are more profitable than non-dominant groups? Does the base used (sales or assets) affect the outcome? As can be seen from Tables 2, 3, 4 and 5 the dominant groups selected on the sales base have a far higher frequency of being more profitable than dominant groups selected on the asset base. Obviously the dominant groups selected by the two bases are composed of different firms. The author felt that an analysis of the differences between groups was outside the area of the thesis and can only suggest that the method of asset valuation may be the source of the difference. Since the asset base cannot select dominant groups that are more profitable than corresponding non-dominant groups this base will not be considered further. All subsequent figures are based on sales.

On the sales base, weighted profitability ratios for the dominant groups exceed weighted profitability ratios for the non-dominant groups about three out of four times. On the other hand, for the unweighted profitability ratios this excess does not exist. The non-dominant groups are more profitable

TABLE 2

THE FREQUENCY DOMINANT GROUPS, SELECTED ON A SALES BASE
ARE MORE PROFITABLE THAN NON-DOMINANT GROUPS
(1962, 1963 Averages, 49 Observations)

<u>Profitability Measure</u>	Profitability of Dominant Groups Greater Than Non-dominant Groups							
	<u>Total</u>		<u>Concentration</u>					
	#	%	<u>(0.0-0.1)</u>		<u>(0.1-0.2)</u>		<u>(0.2 +)</u>	
Weighted After Tax Profit to Share Equity	35	71.43	23	46.94	7	14.29	5	10.20
Unweighted After Tax Profit to Share Equity	26	53.01	18	36.75	5	10.20	3	6.12
Weighted Before Tax Profit to Share Equity	38	77.55	26	53.01	7	14.29	5	10.20
Unweighted Before tax Profit to Share Equity	33	67.35	25	51.02	5	10.20	3	6.12
Weighted Operative Profit	38	77.55	24	48.98	8	16.33	6	12.24
Unweighted Operative Profit	25	51.02	18	36.75	5	10.20	2	4.08

TABLE 3

THE FREQUENCY NON-DOMINANT GROUPS, SELECTED ON A SALES BASE,
ARE MORE PROFITABLE THAN DOMINANT GROUPS
(1962, 1963 Average, 49 Observations)

<u>Profitability Measure</u>	Profitability of Non-Dominant Groups Greater than Dominant Groups							
	<u>Total</u>		<u>Concentration</u>					
	#	%	(0.0-0.1)		(0.1-0.2)		(0.2 +)	
	#	%	#	%	#	%	#	%
Weighted After Tax Profit to Share Equity	14	28.57	11	22.45	2	4.08	1	2.04
Unweighted After Tax Profit to Share Equity	23	46.94	16	32.65	4	8.16	3	6.12
Weighted Before Tax Profit to Share Equity	11	22.45	8	16.33	2	4.08	1	2.04
Unweighted Before Tax Profit to Share Equity	16	32.65	9	18.37	4	8.16	3	6.12
Weighted Operating Profit	11	22.45	10	20.41	1	2.04	0	0
Unweighted Operating Profit	24	48.98	16	32.65	4	8.16	4	8.16

TABLE 4

THE FREQUENCY DOMINANT GROUPS SELECTED ON AN ASSET BASE,
ARE MORE PROFITABLE THAN NON-DOMINANT GROUPS
(1962, 1963 Average, 49 Observations)

<u>Profitability Measure</u>	Profitability of Dominant Groups Greater Than Non-dominant Groups							
	<u>Total</u>		<u>Concentration</u>					
			<u>(0.0-0.1)</u>		<u>(0.1-0.2)</u>		<u>(0.2 +)</u>	
	#	%	#	%	#	%	#	%
Weighted After Tax Profit to Share Equity	19	38.78	11	22.45	4	8.16	4	8.16
Unweighted After Tax Profit to Share Equity	21	42.86	16	32.65	3	6.12	2	4.08
Weighted Before Tax Profit to Share Equity	22	44.90	14	28.59	4	8.16	4	8.16
Unweighted Before Tax Profit to Share Equity	26	53.01	18	36.75	6	12.24	2	4.08
Weighted Operating Profit	28	57.14	17	34.69	5	10.20	6	12.24
Unweighted Operating Profit	21	42.86	13	26.53	6	12.24	2	4.08

TABLE 5

THE FREQUENCY NON-DOMINANT GROUPS SELECTED ON AN ASSET BASE
ARE MORE PROFITABLE THAN DOMINANT GROUPS
(1962, 1963 Average, 49 Observations)

<u>Profitability Measure</u>	Profitability of Non-dominant Groups Greater than Dominant Groups							
	<u>Total</u>		<u>Concentration</u>					
	#	%	(0.0-0.1)	%	(0.1-0.2)	%	(0.2+)	%
Weighted After Tax Profit to Share Equity	30	61.22	21	42.86	6	12.24	3	6.12
Unweighted After Tax Profit to Share Equity	28	57.14	16	32.63	7	14.29	5	10.20
Weighted Before Tax Profit to Share Equity	27	55.10	18	36.75	6	12.24	3	6.12
Unweighted Before Tax Profit to Share Equity	23	46.94	14	28.59	4	8.16	5	10.20
Weighted Operating Profit	21	42.86	15	30.61	5	10.20	1	2.04
Unweighted Operating Profit	28	57.14	19	38.78	4	8.16	5	10.20

with equal frequency. This difference is felt to lie in the way the ratios are calculated. The weighted ratios are weighted by the size of the firms and the larger firms are more likely to be found in the dominant groups. This may indicate that the absolute size of firms (measured by volume of sales) is correlated with profitability.

Cross-Sectional Analysis.

The correlations and regressions for this study were done by a library programme on an I.B.M. 7040 at the University of British Columbia's Computing Center. The interested reader is referred to UBC Trip and Mathematical Methods for Digital Computers edited by Ralston and Wilf for the specific techniques employed.

The cross-section of Canadian industry to be analyzed consists of forty-nine industries as listed in Appendix B. For each industry, data for two years are available. Profit rates and other figures to be used in the analysis are simple averages of figures for both years. Thus, for each regression and correlation there are forty-nine sets of observations.

The Simple Relationship between Concentration and Profitability

The hypothesis to be tested by simple correlation and regression analysis has been formulated as follows:

$$\text{Profitability} = a + b \text{ Concentration.}$$

TABLE 6

SIMPLE CORRELATION AND REGRESSION STATISTICS: INDEPENDENT VARIABLE - CONCENTRATION,
DEPENDENT VARIABLE - PROFITABILITY SALES BASE (1962, 1963
AVERAGE) 49 OBSERVATIONS.

Profitability Measure	Correlation Statistics		Regression Statistics				
	r^1	r^2	Value ²	a	b	Standard Error of b	Standard Error of Estimate
Weighted After Tax Profit to Share Equity Dominant Group	.301	.090	4.67	.09	.24	.11	.09
Weighted After Tax Profit to Share Equity Non-dominant Group	.099	.009	.46	.07	.03	.05	.04
Unweighted After Tax Profit to Share Equity Dominant Group	-.027	.001	.03	.30	-.21	1.13	.92
Unweighted After Tax Profit to Share Equity Non-dominant group	.052	.002	.12	.08	.07	.18	.14
Weighted Before Tax Profit to Share Equity Dominant group	.293	.085	4.40	.15	.38	.18	.14
Weighted Before Tax Profit to Share Equity Non-dominant group	.180	.032	1.57	.10	.09	.07	.06
Unweighted Before Tax Profit to Share Equity Dominant group	-.029	.001	.41	.51	-.39	1.94	1.58
Unweighted Before Tax Profit to Share Equity Non-dominant group	.103	.010	.50	.10	.14	.20	.16

¹ $r_{.10}$ (48df) = .2405
 $r_{.05}$ (48df) = .2789
 $r_{.01}$ (48df) = .3613

² $F_{.20}$ (1,48)df = 1.69
 $F_{.10}$ (1,48)df = 2.83
 $F_{.05}$ (1,48)df = 4.04
 $F_{.01}$ (1,48)df = 7.19

Table 6, cont.

<u>Profitability Measure</u>	<u>Correlation Statistics</u>		<u>Regression Statistics</u>				
	<u>r</u>	<u>r²</u>	<u>Evalue</u>	<u>a</u>	<u>b</u>	<u>Standard Error of b</u>	<u>Standard Error of Estimate</u>
Weighted Operating Profit Dominant group	.336	.114	5.95	.08	.29	.12	.09
Weighted Operating Profit Non-dominant group	.193	.037	1.82	.06	.07	.05	.04
Unweighted Operating Profit Dominant group	.257	.066	3.32	.15	.24	.24	.19
Unweighted Operating Profit Non-dominant group	.121	.015	.69	.27	2.56	3.07	2.49

In other words the various measures of profitability for each dominant and non-dominant group are assumed to be dependent upon concentration. The reader is referred to Table 6 for a summary of specific statistics.

Table 6 reveals that only three profitability measures are significantly correlated with concentration at the 0.05 significance level. The measures are, weighted profit to shareholder's equity before and after taxes, dominant group, and weighted operating profit, dominant group. At the 0.10 level of significance the unweighted operating profit of the dominant group is correlated with concentration. Except for the weighted operating profit of the non-dominant group the remainder of the measures are not significantly correlated with concentration even at the 0.20 level.

While these measures are significant they explain only a very small percentage of the observed variation in profitability. This percentage may be read directly from the column in Table 6 headed " r^2 ". The significant measures explain between 8.5 per cent and 11.4 per cent of the variation in profitability.

The negative slope of the relation between concentration and unweighted profit to share equity, dominant group may be attributed to two low concentration, high profit industries. The reader may verify this by reference to Appendix C.

From these data one may conclude that, for the dominant group profits are directly and positively related to concentration although there is much less than a one-to-one relationship. However, for the non-dominant group no such relationship is evident.

The Simple Relationship between Relative Profitability and Concentration

In the previous discussion the conclusion drawn was that profitability was positively correlated with concentration for the dominant group but not for the non-dominant group. Is there a systematic increase in relative profitability as concentration increases? The relationship was formulated as follows:

$$\text{Relative Profitability} = a + b \text{ Concentration.}$$

For specific statistics relating to this equation the reader is referred to Table 7 and Appendix D.

As can be seen from Table 7 none of the relationships are statistically significant at the .05 level. Paradoxically relative operating profit is significant at the .10 level on a weighted basis and at the .20 level on an unweighted basis. However, this relationship is not apparent in the relative profitability ratios calculated on an equity basis. The author can offer no explanation to resolve this paradox.

Thus, one may conclude that there is no systematic increase of relative profitability as concentration increases.

TABLE 7

SIMPLE CORRELATION AND REGRESSION STATISTICS: INDEPENDENT VARIABLE - CONCENTRATION,
DEPENDENT VARIABLE - RELATIVE PROFITABILITY SALES BASE (1962, 1963 AVERAGE)
49 OBSERVATIONS

Relative Profitability Measure	Correlation Statistics		Regression Statistics				
	³ r	² r	⁴ F value	a	b	Standard Error of b	Standard Error of Estimate
Relative Weighted After Tax Profitability Ratio	.081	.007	.031	2.42	4.67	8.36	6.78
Relative Unweighted After Tax Profitability Ratio	-.111	.013	.594	11.06	-20.83	27.01	21.92
Relative Weighted Before Tax Profitability Ratio	.068	.005	.217	2.57	3.96	8.50	6.90
Relative Unweighted Before Tax Profitability Ratio	-.021	.004	.019	46.81	-42.57	302.22	245.19
Relative Weighted Operating Income Ratio	.240	.058	2.86	1.87	5.40	3.19	2.59
Relative Unweighted Operating Income Ratio	.218	.048	2.35	4.47	47.99	31.31	24.40

³r.10 (48df) = .2405

r.05 (48df) = .2789

r.01 (48df) = .3613

⁴F.20 (1,48)df = 1.69

F.10 (1,48)df = 2.83

F.05 (1,48)df = 4.04

F.01 (1,48)df = 7.19

Multiple Regression and Partial Correlation Analysis

The previous analysis has ignored the "other things being equal" aspect of the hypothesis. Therefore in an attempt to overcome this deficiency two more independent variables have been included in the analysis. It is not expected that these two variables will account for all the variation in profitability, however, there should be an improvement. The two new variables are profitability potential and leverage. The multiple relationship has been formulated as follows:

$$\text{Profitability} = a + b \text{ Concentration} + c \text{ Profit Potential} + d \text{ Leverage,}$$

or,

$$X_1 = a + b X_2 + c X_3 + d X_4 .$$

Partial correlation coefficient subscripts will be as assigned above. The reader is referred to Tables 8 and 9 for specific statistics. In these tables the statistics are identified by the appropriate dependent variable.

As can be seen from Table 8 the variables that explain profitability in order of importance are, profitability potential, leverage and concentration. Only once is concentration a significant determinant of profit at the .05 level of significance. The profit measure is weighted after tax profit to shareholder's equity, dominant group. Also, on a before tax basis the weighted profitability ratios for both dominant and non-dominant groups are both significantly correlated with con-

TABLE 8

MULTIPLE REGRESSION STATISTICS: INDEPENDENT VARIABLES - CONCENTRATION,
 PROFITABILITY POTENTIAL, AND LEVERAGE, DEPENDENT VARIABLE -
 PROFITABILITY SALES BASE (1962, 1963 AVERAGE) 49
 OBSERVATIONS

Profitability Measure	R^2	Standard Error of Estimate	Regression Statistics						Standard Error of c	d	Standard Error of d
			a	b	Stand- ard Error of b	c					
Weighted After Tax Profit to Share Equity Dominant Group	.455	.072	-1.788	.184 (4.05) ⁵	.091	1.739 (27.39)		.332	.236 (11.38)		.069
Weighted After Tax Profit to Share Equity Non- dominant Group	.586	.028	- .748	.026 (.60)	.034	.854 (62.26)		.108	-.060 (3.28)		.033
Unweighted After Tax Profit to Share Equity Dominant group	.087	.899	-7.100	.034 (.00)	1.156	6.528 (2.57)		4.106	1.56 (2.84)		.926
Unweighted After Tax Profit to Share Equity Non- dominant Group	.050	.148	- .022	.041 (.06)	.184	.055 (1.78)		.041	.087 (.25)		.173

⁵F values are in brackets
 F.20 (1,45)df = 1.69
 F.10 (1,45)df = 2.83
 F.05 (1,45)df = 4.05
 F.01 (1,45)df = 7.22

Table 8, cont.

Profitability Measure	Regression Statistics							
	R^2	Standard Error of Estimate	a	b	Standard Error of b	c	Standard Error of c	d
Weighted Before Tax Profit to Share Equity' Dominant group	.459	.115	-2.700	.029 (3.96)	.146 (25.95)	2.667 (25.95)	.524	.338 (10.05)
Weighted Before Tax Profit to Share Equity Non-dominant group	.591	.039	-.937	.086 (3.09)	.049 (61.37)	1.102 (61.37)	.141	-.098 (4.11)
Unweighted Before Tax Profit to Share Equity Dominant Group	.078	1.550	-10.415	.025 (.00)	1.999 (1.89)	9.688 (1.89)	7.054	2.358 (2.30)
Unweighted Before Tax Profit to Share Equity Non-dominant Group	.124	.159	-.045	.117 (.05)	.196 (5.58)	.124 (5.58)	.053	.043 (.36)
								.186

TABLE 9

PARTIAL CORRELATION STATISTICS: INDEPENDENT VARIABLES - CONCENTRATION,
 PROFITABILITY POTENTIAL, AND LEVERAGE, DEPENDENT
 VARIABLE - PROFITABILITY SALES BASE (1962,
 1963 AVERAGE) 49 OBSERVATIONS.

<u>Profitability Measure</u>	<u>Partial Correlation Statistics</u> ⁶					
	<u>r_{12.34}</u>	<u>r_{13.24}</u>	<u>r_{14.23}</u>	<u>r_{23.14}</u>	<u>r_{24.13}</u>	<u>r_{34.12}</u>
Weighted After Tax Profit to Share						
Equity Dominant Group	.287	.615	.449	.173	-.087	-.346
Weighted After Tax Profit to Share						
Equity Non-dominant Group	.115	.762	-.261	.025	.095	.157
Unweighted After Tax Profit to						
Share Equity Dominant Group	.004	.231	.244	.093	-.238	-.256
Unweighted After Tax Profit to						
Share Equity Non-dominant Group	.033	.196	.075	.088	.019	.110
Weighted Before Tax Profit to Share						
Equity Dominant Group	.284	.605	.427	.187	-.118	.188
Weighted Before Tax Profit to Share						
Equity Non-dominant Group	.253	.760	-.289	.013	-.094	.228
Unweighted Before Tax Profit to						
Share Equity Dominant Group	.002	.201	.221	.116	-.255	.114
Unweighted Before Tax Profit to						
Share Equity Non-dominant Group	.088	.332	.035	.054	.023	.115

⁶r_{.10} (45 df) = .243

r_{.05} (45 df) = .287

r_{.01} (45 df) = .372

centration.

It is interesting to note that profitability of non-dominant groups is significantly correlated with concentration on a before tax basis but not on an after tax basis. This is somewhat paradoxical since firms taxed at the lower rate of twenty-one per cent would be expected to make up a significant proportion of the non-dominant groups. On the other hand, the introduction of taxes makes little difference to the correlation between concentration and profitability for the dominant groups. One would expect that the majority of dominant groups would be taxed at the fifty percent rate. This observation leads one to question the equity of corporate taxation.

Further, upon examining the partial correlation coefficient in Table 9 it can be seen that the concentration variable is not significantly correlated with the other two more significant determinants of profit. No colinearity exists between concentration and the other independent variables.

The method of calculating measures of profitability, profitability potential and leverage is a crucial factor in this study. On an unweighted basis only five per cent to thirteen per cent of the variation in profit is explained. On the other hand, when weighted measures are used from forty-five per cent to sixty per cent of the variation is explained.

At best, concentration explains seven per cent to eight

per cent of the variation in weighted profitability. It would appear that variables unrelated to concentration are far more significant in explaining profitability than is concentration.

The Simple Relationship between Concentration and Profit Potential

The question to be tested here is, does profit potential increase with increasing concentration? For firms in pure competition and in long run equilibrium the profit potential should equal unity. For firms in imperfect competition and in long run equilibrium profit potential values greater than unity would be expected. The relationship is postulated as follows:

$$\text{Profit Potential} = a + b \text{ Concentration}$$

The reader is referred to Table 10 for specific statistics.

As can be seen from Table 10 profit potential is a function of concentration at the 0.20 level of significance (F Ratio), for the dominant groups on a weighted basis. This relationship does not hold for the non-dominant groups.

Thus, it would appear that as concentration increases dominant firms can improve on the difference between total cost of production, and the resultant total revenue.

TABLE 10

SIMPLE CORRELATION AND REGRESSION STATISTICS; INDEPENDENT VARIABLE - CONCENTRATION,
DEPENDENT VARIABLE - PROFIT POTENTIAL SALES BASE (1962, 1963 AVERAGE)
49 OBSERVATIONS

<u>Profit Potential</u>	<u>Correlation Statistics</u>		<u>F Value</u> ²	<u>Regression Statistics.</u>			
	<u>r¹</u>	<u>r²</u>		<u>a</u>	<u>b</u>	<u>Standard Error of b</u>	<u>Standard Error of Estimate</u>
Weighted After Tax Profit							
Potential Dominant Group	.217	.042	2.330	1.018	1.063	.042	.034
Weighted After Tax Profit							
Potential Non-dominant Group	.009	.000	.005	.998	.003	.047	.038
Unweighted After Tax Profit							
Potential Dominant Group	.164	.027	1.295	1.018	.046	.041	.033
Unweighted After Tax Profit							
Potential Non-dominant Group	.091	.008	.393	1.029	.407	.650	.527
Weighted Before Tax Profit							
Potential Dominant Group	.214	.046	2.250	1.009	.061	.040	.033
Weighted Before Tax Profit							
Potential Non-dominant Group	-.009	.000	.004	.990	-.003	.052	.042
Unweighted Before Tax Profit							
Potential Dominant Group	.151	.023	1.102	1.011	.042	.040	.032
Unweighted Before Tax Profit							
Potential Non-dominant Group	.057	.003	.154	1.019	.215	.547	.444

¹r.10 (48df) = .2405
r.05 (48df) = .2789
r.01 (48df) = .3613

²F.20 (1,48)df = 1.69
F.10 (1,48)df = 2.83
F.05 (1,48)df = 4.04
F.01 (1, 48)df = 7.19

CHAPTER VIII

SUMMARY AND CONCLUSIONS

The purpose of this study has been to examine statistically a microeconomic hypothesis. The main hypothesis is that other things being equal, firms in more concentrated industries are likely to earn higher profits than if a larger number of firms competed in the market. A secondary hypothesis is that the dominant groups in each industry will earn more profits than non-dominant firms in the industry.

The technique employed to test the hypothesis was a correlation and regression analysis of a sample cross section of the Canadian economy. The data for the study was obtained from computer tapes compiled by the Department of National Revenue, Taxation Division. Despite several rather serious limitations in the data, it was felt that the data was sufficiently accurate to justify analysis.

The study has pointed out a need for more meaningful classification of industries and firms, if further statistical studies, testing economic hypotheses are to bear fruit. Hopefully the situation will improve now that the Dominion Bureau of Statistics has assumed the job of compiling data of the type employed herein.

The author sees opportunity for further research in this area, if the required data becomes available in suitable form. Factors such as market entry conditions, patent positions, trade barriers, the nature of regional markets, independence of rivals, vertical integration and degree of product differentiation, to name only a few, are obviously relevant to the study of market behavior and might well be included in further studies.

It was found that the sales base was superior to the asset base in selecting dominant groups with higher profitability than the corresponding non-dominant groups on the average. Any base that cannot select dominant groups that are more profitable than non-dominant groups cannot be used to test the partial oligopoly hypothesis. Due to the superiority of the sales base it was used exclusively in further analysis.

The disparate results between profitability average calculated on a weighted and unweighted basis, leads one to postulate that profitability is correlated with absolute size as measured by volume of sales. However, no attempt was made to test this postulation.

It was found on a weighted basis that profitability is significantly correlated with concentration for the dominant group. The corresponding non-dominant group profits were not significantly correlated with concentration. None of the unweighted profitability figures were significantly correlated with

concentration. This again suggests the correlation of firm size and profitability. However, the hypothesis that the entire industry will make higher profits as concentration increases appears untenable. At best concentration explains in the order of ten per cent of the variation in profitability in the cross-section.

When other factors were introduced and held constant in the regressions, profitability on a weighted, after tax basis is significantly correlated with a concentration at the 0.05 level of significance for the dominant group. At the 0.10 level of significance, the weighted, before tax profitabilities for both dominant and non-dominant groups are significantly correlated with concentration.

It is not clear whether the partial oligopoly hypothesis is supported or not supported. The simple regression and correlation analysis on profit rates and concentration tend to support the hypothesis. The slope of least squares regression lines is much steeper for dominant than for non-dominant groups. However, the analysis based on the relative profitability measures does not support the hypothesis.

Thus one may conclude that concentration is a significant determinant of profit but that other factors not related to concentration are far more significant determinants of profit.

APPENDIX A

Appendix A consists of six lists of industries based on Taxation Statistics groupings. The first five are lists of industries excluded for the reasons shown at the head of each list. The sixth list contains industries accepted for this study. Although many industries can be rejected on several grounds, each industry appears in one list only.

1. The following have been rejected primarily because dissimilar industries have been grouped together. That is the products of the "industry" have a low cross elasticity.

<u>Industry code</u>	<u>Industry</u>
11	Agriculture
31	Forestry
53	Other metal mining
79	Other non-metal mining
83	Quarries
89	Mining unclassified
94	Prospecting and contract drilling
105	Dairy products
123	Grain mill products
139	Miscellaneous foods
161	Rubber products
179	Other leather products
229	Miscellaneous textile products
249	Miscellaneous clothing
259	Miscellaneous wood products
274	Miscellaneous paper products
295	Metal smelting and refining
301	Boilers and fabricated structural metal
304	Metal stamping, pressing and coating
308	Machine shop
309	Miscellaneous metal fabricating
315	Machine tools and miscellaneous machinery
318	Office and store machinery
325	Motor vehicle parts and accessories

<u>Industry Code</u>	<u>Industry</u>
329	Miscellaneous transportation equipment
331	Household electrical appliances
336	Industrial, electrical and communications equipment
339	Miscellaneous electrical products
341	Cement, clay and stone products
359	Glass and non-metallic minerals
369	Other petroleum and coal products
371	Fertilizers and industrial chemicals
379	Miscellaneous chemical products
399	Miscellaneous manufacturing industries
409	Other construction
421	Special trade contractors
501	Air transport
504	Water transport
506	Railways
519	Urban transportation and taxicabs
527	Storage and warehouse
602	Livestock and grains
606	Coal and petroleum products
621	Electrical and farm machinery
623	Other machinery and equipment
629	Other wholesale trade
652	Auto accessories, tires and service stations
658	Motor vehicle repairs
673	Hardware retail
676	Clothing and dry goods
694	Jewelery stores
699	Other retail stores
801	Community or public services
859	Other recreation services
864	Other business services
869	Laundries, cleaners and pressers
875	Restaurants and taverns
876	Hotels and Lodging houses
879	Other personal and miscellaneous services
<hr/>	
59	TOTAL

2. The following were rejected because they are largely part of international industries.

<u>Industry Code</u>	<u>Industry</u>
41	Fishing
111	Fish products
251	Sawmills
252	Plywood and planing mills
271	Pulp and paper mills
311	Agricultural implements (mfg.)
321	Aircraft and parts
<hr/>	
8	TOTAL

3. The following were rejected because they are largely Government regulated and/or subsidized.

61	Coal mines
508	Bus transport
515	Pipelines
543	Radio and television broadcasting
544	Telephones
572	Electric power
574	Gas distribution
579	Other utilities
<hr/>	
7	TOTAL

4. The following have a geographic monopoly not measured by concentration figures.

524	Grains elevators
649	Other general merchandise
693	Fuel dealers
<hr/>	
3	TOTAL

5. The following are Finance, Real Estate, and Investment firms of various sorts, and have been rejected because of poor classification and because they are financial in nature, or are government regulated (banks) or may have regional monopolies.

<u>Industry code</u>	<u>Industry</u>
702	Banks and insurance carriers
710	Trust and mortgage companies
711	Investment and holding companies
712	Non resident owned investment companies
713	Stock, bond and commodity dealers
714	Loan companies and other finance
725	Insurance agencies
726	Real estate except rental
727	Real estate rental operations
<hr/>	
9	TOTAL

6. The following have been accepted.

51	Gold mining
63	Oil and natural gas
101-	Slaughtering and meat packing
112	Canned fruit and vegetables
129	Bakery products
131	Confectionary
141	Soft drinks
143	Distilleries and wineries *
145	Breweries *
153	Tobacco products
174	Boots and shoes
183	Cotton goods
193	Woollen goods
231	Hosiery and knit goods
243	Clothing
246	Fur goods
261	Furniture
273	Paper boxes and bags
286	Commercial printing
287	Engraving, stereotyping
289	Publishing and printing

<u>Industry Code</u>	<u>Industry</u>
291	Iron and steel mills
294	Iron foundries
305	Wire and wire products
306	Hardware and tools
307	Heating equipment manufacturers
323	Motor vehicles
327	Shipbuilding
365	Petroleum refineries
374	Pharmaceutical preparations
375	Paints and varnishes
376	Soap and toilet preparations
404	Building construction
406	Highway, bridge and street construction
507	Truck transport
614	Food products
616	Drugs and toilet preparations
617	Clothing and dry goods
619	Motor vehicles and accessories
624	Hardware, plumbing and heating
626	Lumber and building materials
631	Food stores
642	Department stores
656	Motor vehicle dealers
663	Shoe stores
669	Clothing and dry goods
681	Drug stores
851	Motion picture theaters
862	Advertising
874	Laundries, cleaners and pressers
877	Funeral directors
<hr/>	
51	TOTAL

* These industries are acceptable, however, they are not classified in the same manner for 1962 and 1963, therefore they have been excluded from the sample.

APPENDIX B

The following list contains the three digit classification number, name and two year average concentration value on the sales base and the asset base. The number of members in the dominant group is not revealed since, on occasion, only two firms are included in this group and to reveal such information would destroy the confidential nature of the information.

Industry Number	Industry Name	Monopolistic Potential Index	
		Sales Base	Asset Base
51	Gold mining	0.0488	0.0973
63	Oil and natural gas	0.1030	0.0325
101	Slaughtering and meat packing	0.2352	0.2406
112	Canned fruit and vegetables	0.1509	0.2152
129	Bakery products	0.0376	0.1570
131	Confectionary	0.0687	0.0903
141	Soft drinks	0.1387	0.1578
153	Tobacco products	0.1674	0.2807
174	Boots and shoes	0.0234	0.0314
183	Cotton goods	0.3186	0.4030
193	Woollen goods	0.0514	0.0448
231	Hosiery and knit goods	0.0133	0.0260
243	Clothing	0.0017	0.0026
246	Fur goods	0.0089	0.0043
261	Furniture	0.0063	0.0086
273	Paper boxes and bags	0.0605	0.1181
286	Commercial printing	0.0111	0.0104
287	Engraving, stereotyping	0.1632	0.1187
289	Publishing and printing	0.0275	0.0332
291	Iron and steel mills	0.2781	0.3043
294	Iron foundries	0.1611	0.1777
305	Wire and wire products	0.0414	0.0403
306	Hardware and tools	0.0158	0.0180
307	Heating equipment	0.0495	0.0646
323	Motor vehicles	0.5193	0.4678
327	Shipbuilding	0.1014	0.1016
365	Petroleum refiners	0.4162	0.2934
374	Pharmaceutical preparations	0.0259	0.0282

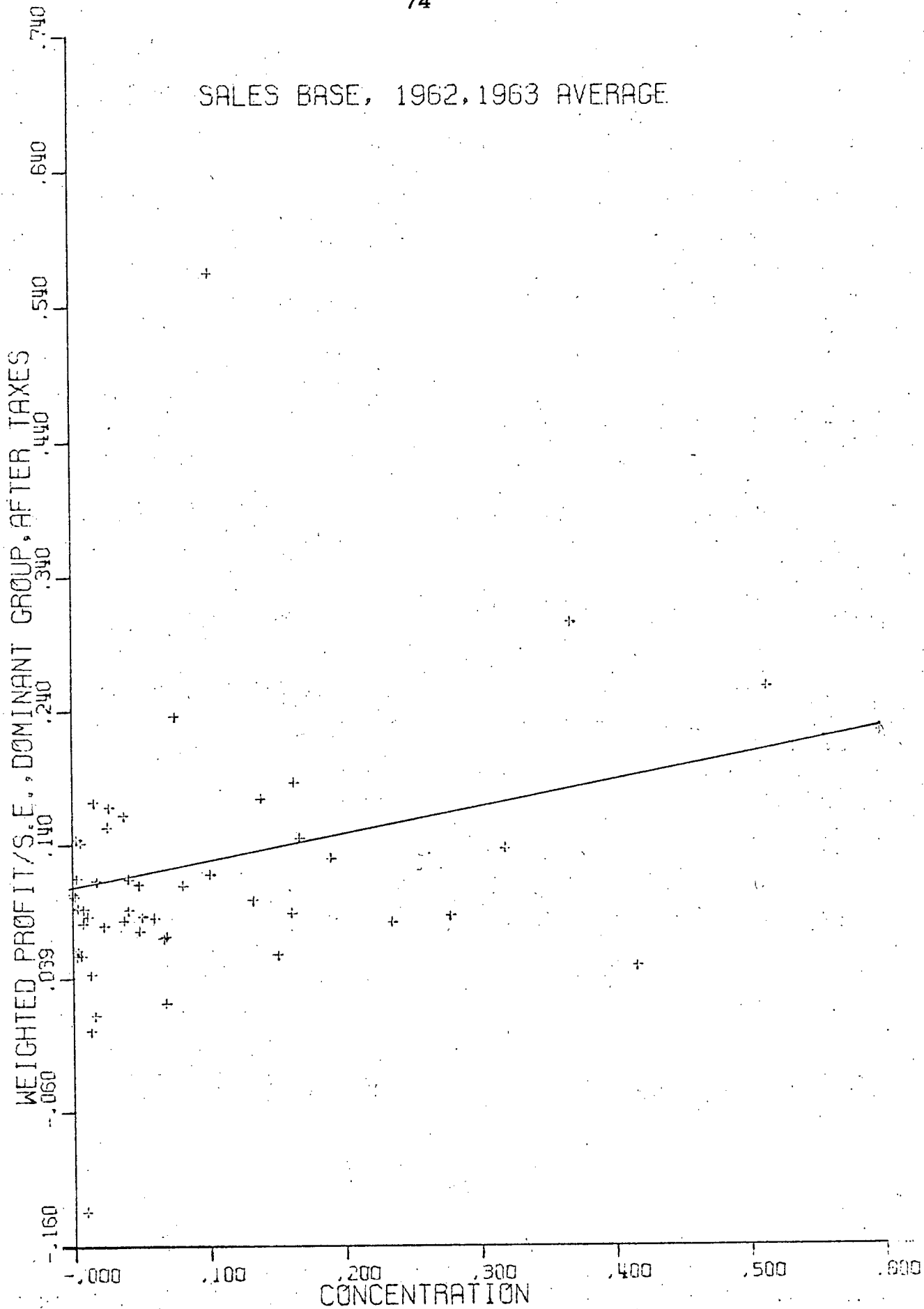
Industry Number	Industry Name	Monopolistic Potential Index	
		Sales Base	Asset Base
375	Paints and varnishes	0.0067	0.0660
376	Soap and toilet preparations	0.1905	0.1722
404	Building construction	0.0040	0.0020
406	Highway and bridge construction	0.0164	0.0211
507	Truck transport	0.0033	0.0056
614	Food products	0.0177	0.0138
616	Drugs and toilet preparations	0.0681	0.0441
617	Clothing and dry goods	0.0083	0.0088
619	Motor vehicle accessories	0.3685	0.1253
624	Hardware, plumbing and heating	0.0130	0.0163
626	Lumber and building materials	0.0035	0.0041
631	Food stores	0.1328	0.1821
642	Department stores	0.0812	0.0929
656	Motor vehicle dealers	0.0004	0.0011
663	Shoe stores	0.0412	0.0276
669	Clothing and dry goods	0.0039	0.0023
681	Drug stores	0.0080	0.0110
851	Motion picture theatres	0.0376	0.1058
862	Advertising	0.0757	0.0315
874	Launderers, cleaners, pressers	0.0065	0.0106
877	Funeral directors	0.0031	0.0055

Industries numbered between 101 and 376 are manufacturing, between 614 and 626 are wholesale trade, between 631 and 669 are retail trade and between 851 and 877 are service.

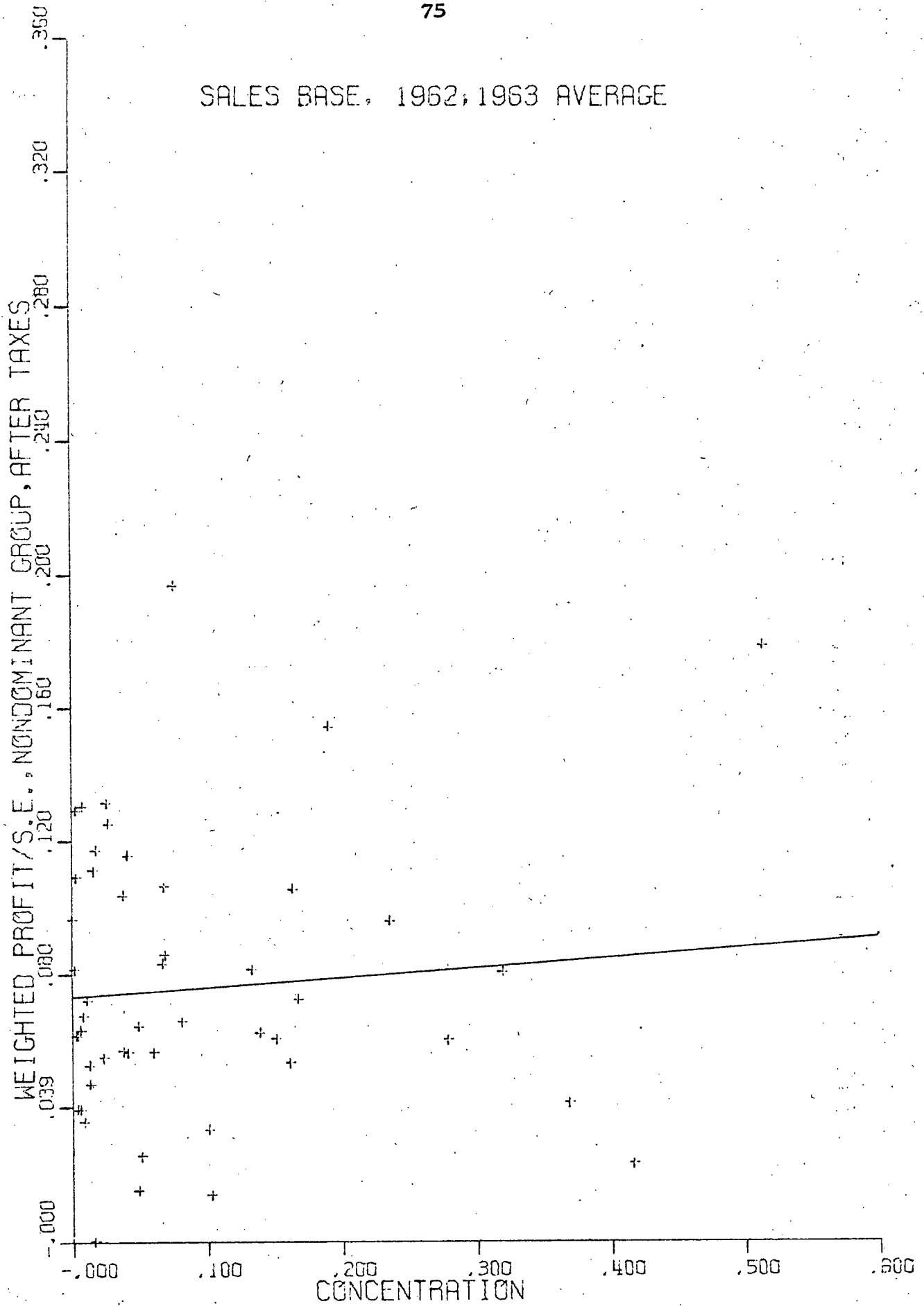
APPENDIX C

Appendix C contains twelve computer generated graphs showing the relationship between the various measures of profit and concentration. To each plot the appropriate least squares line has been fitted. For statistics relating to these graphs the reader is referred to Table 6. Each graph is identified by the label on the ordinate axis, the axis is scaled to best suit the data plotted and, therefore, the ordinate scales are not identical. The ordinate values are profitability ratios. The abscissa values are concentration ratios.

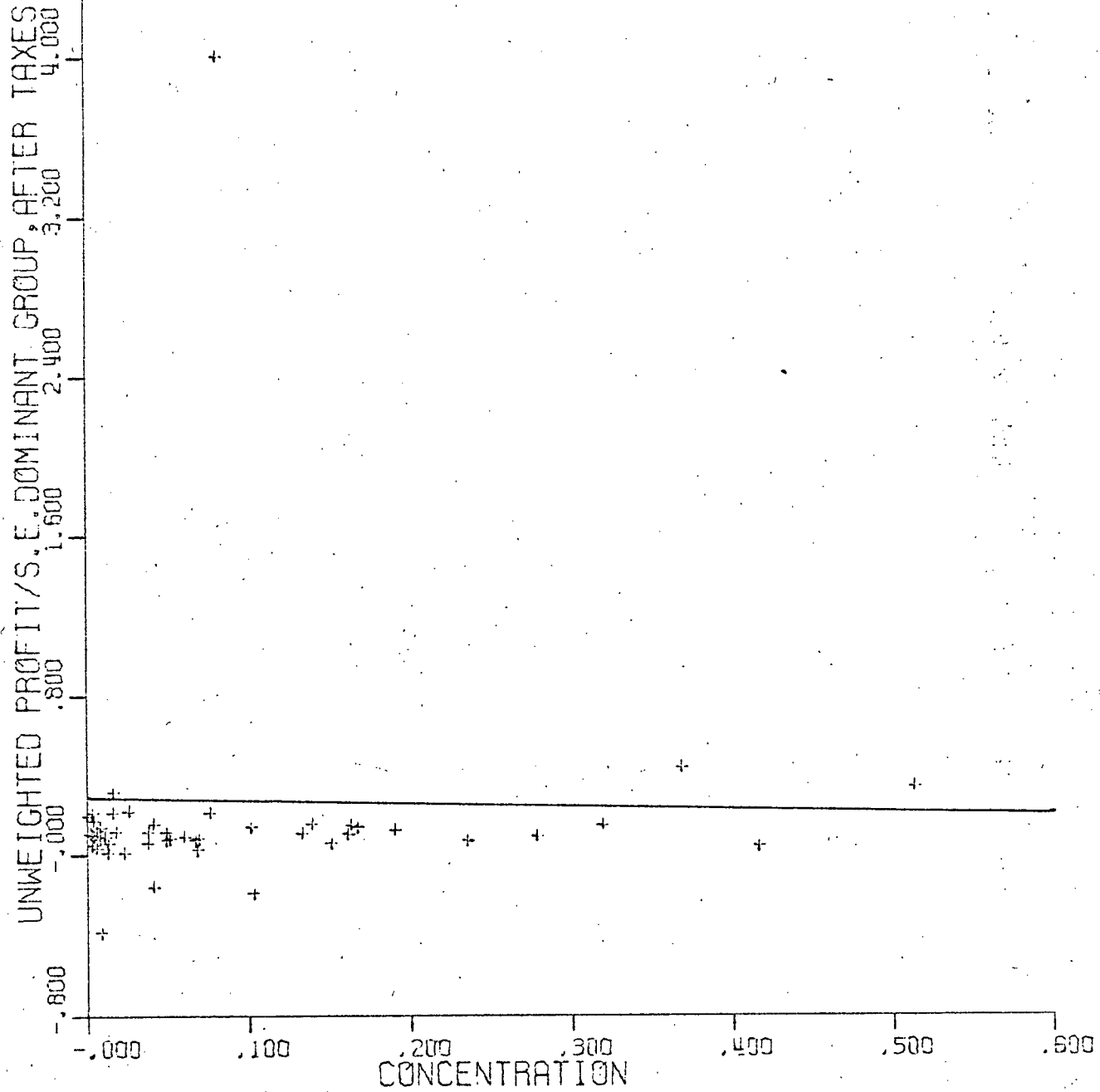
SALES BASE, 1962, 1963 AVERAGE

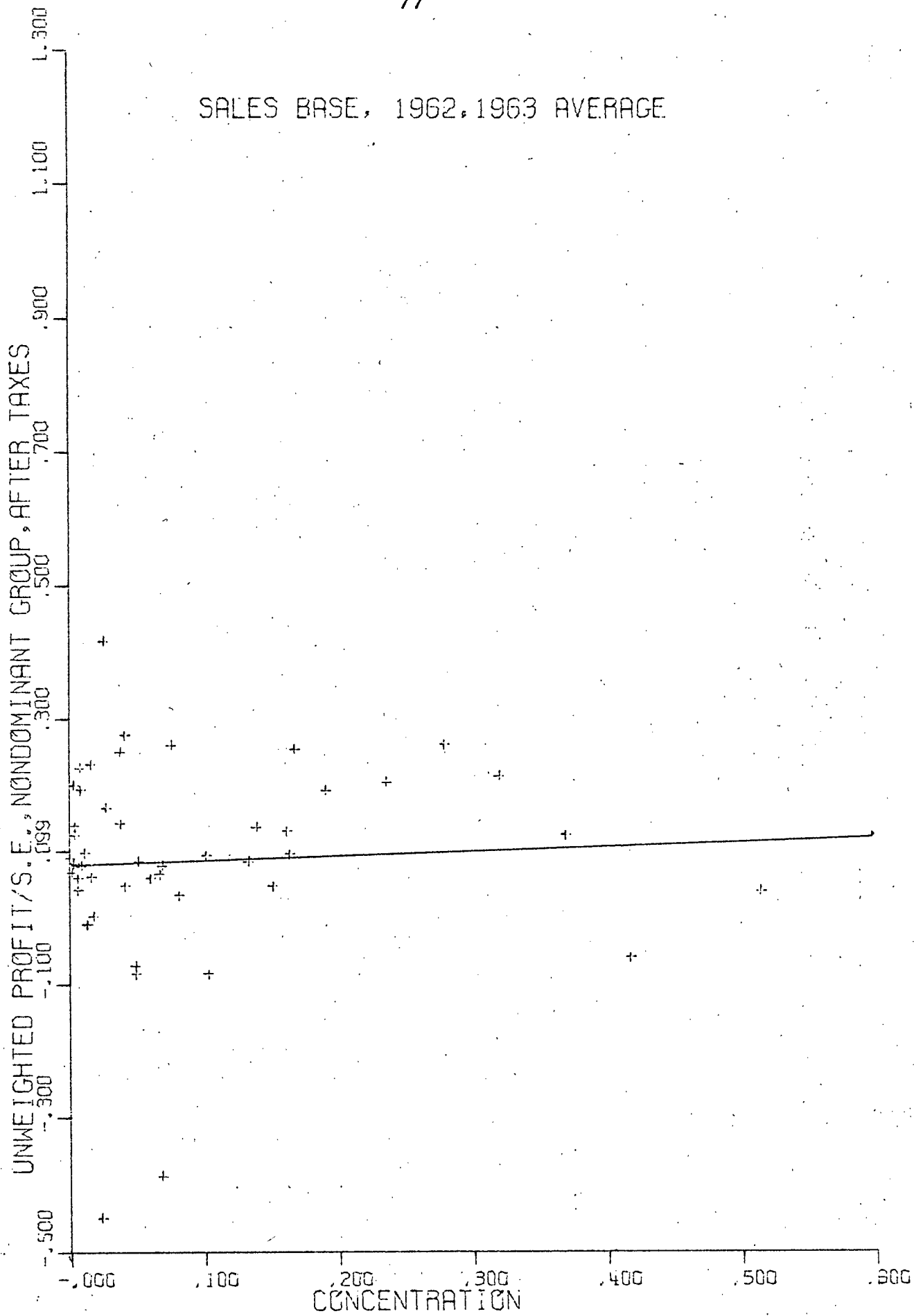


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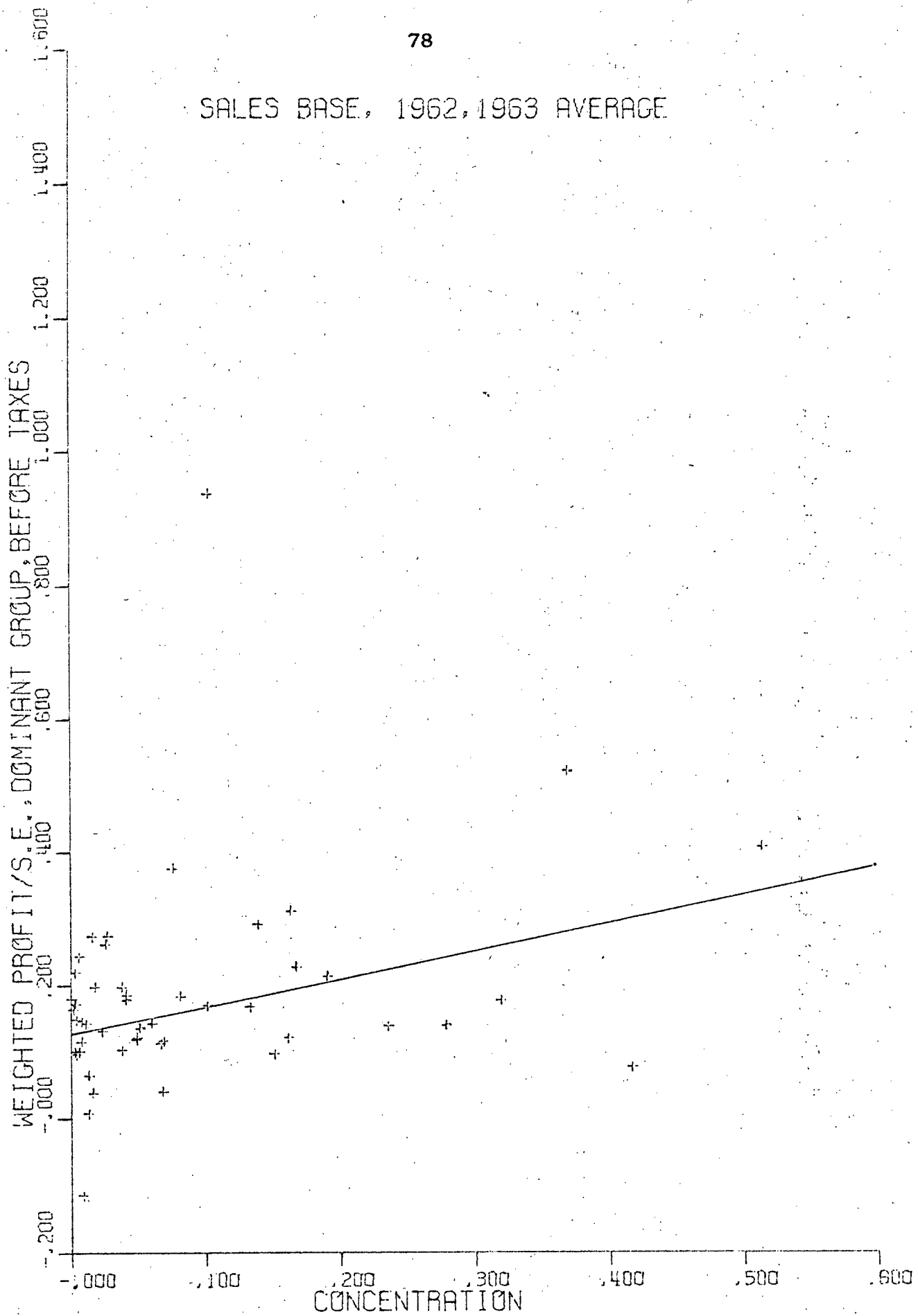


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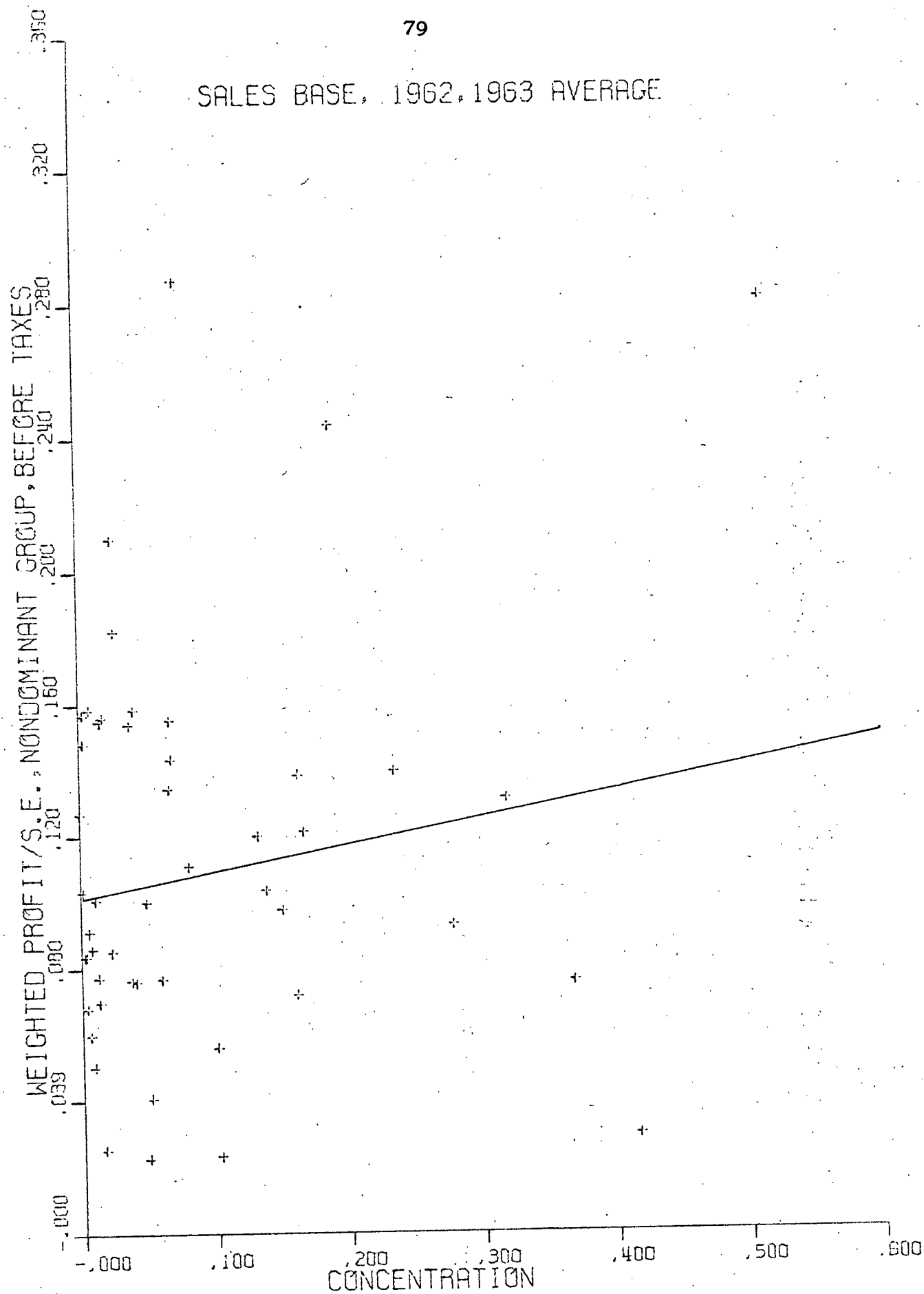




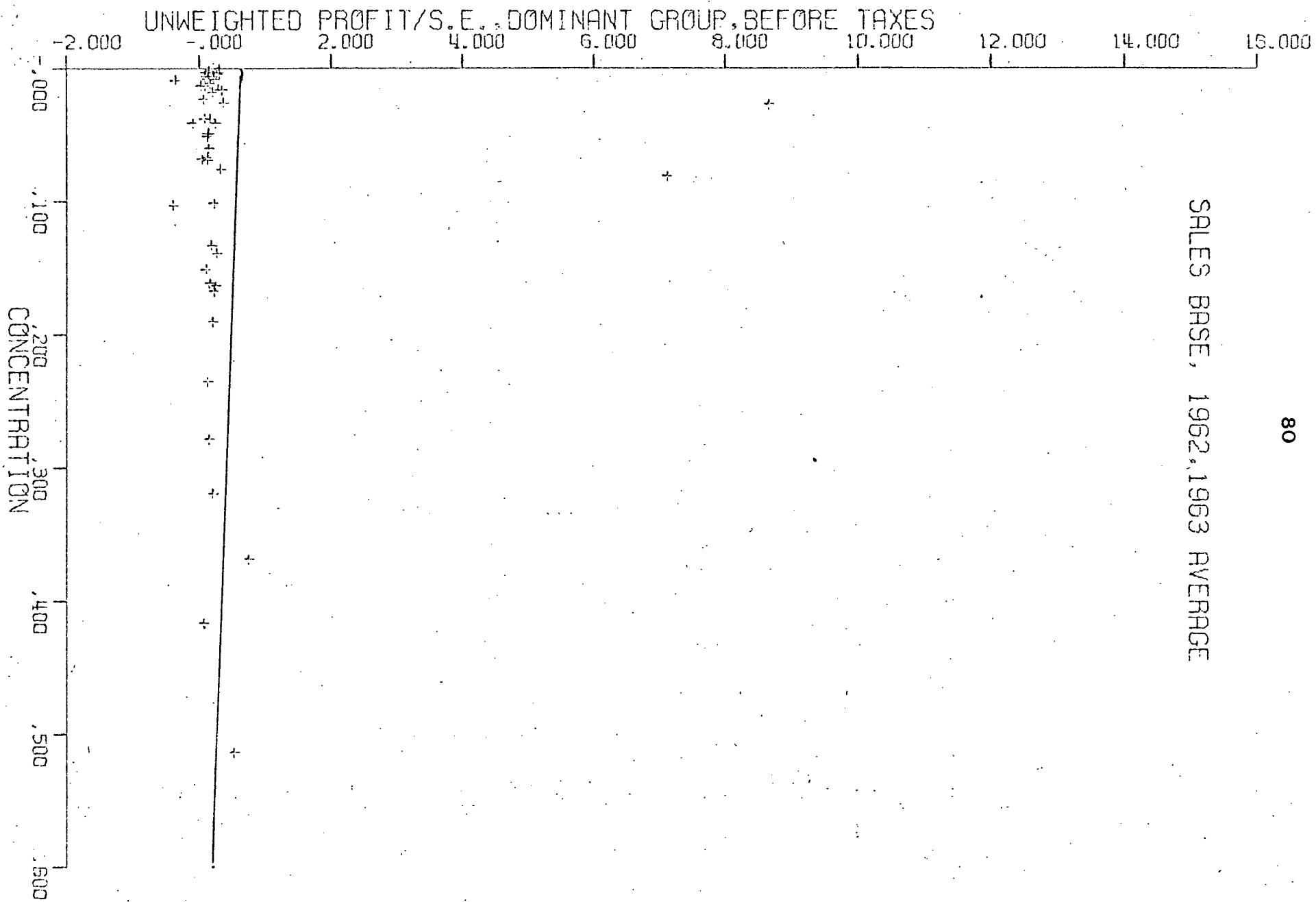
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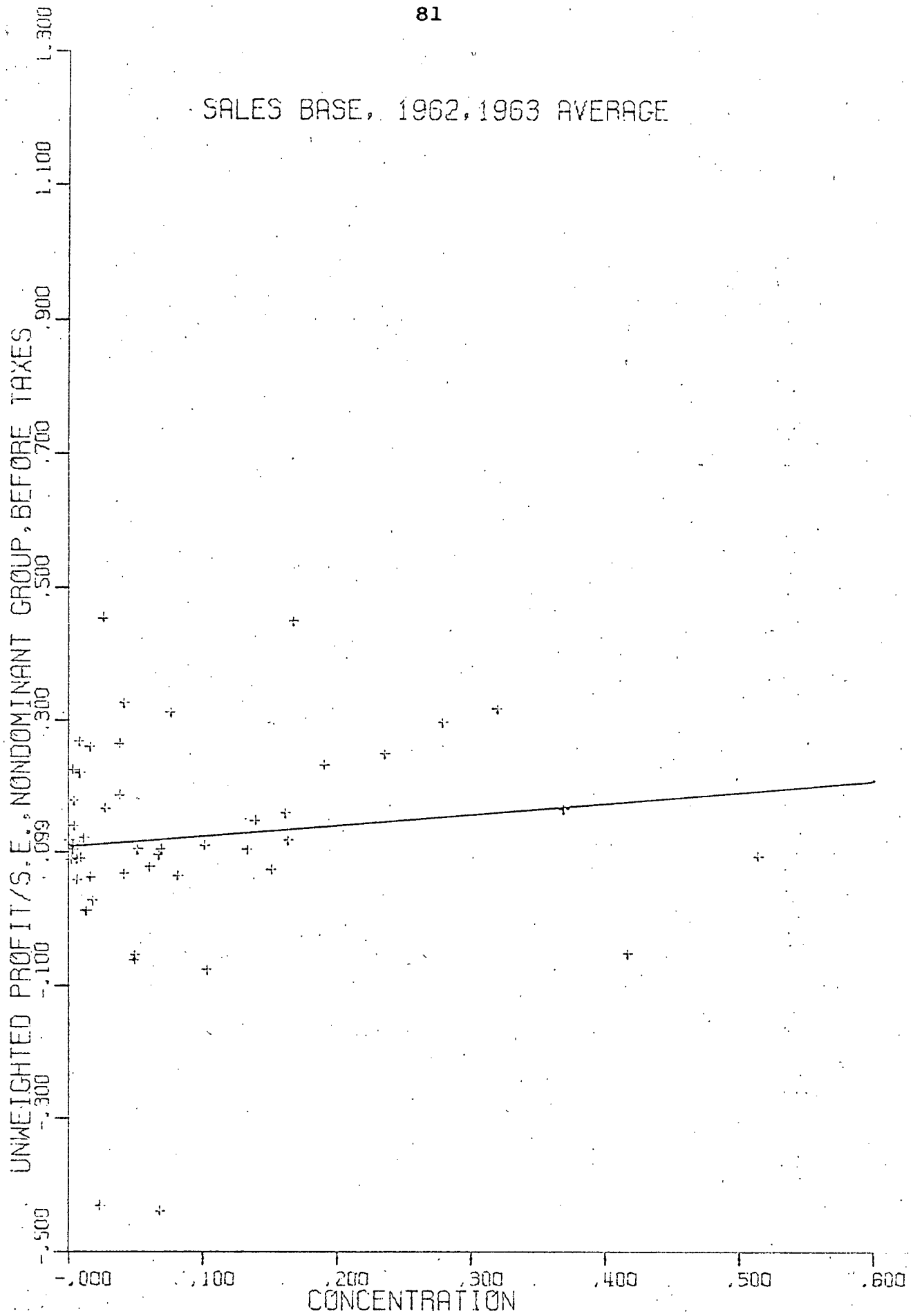


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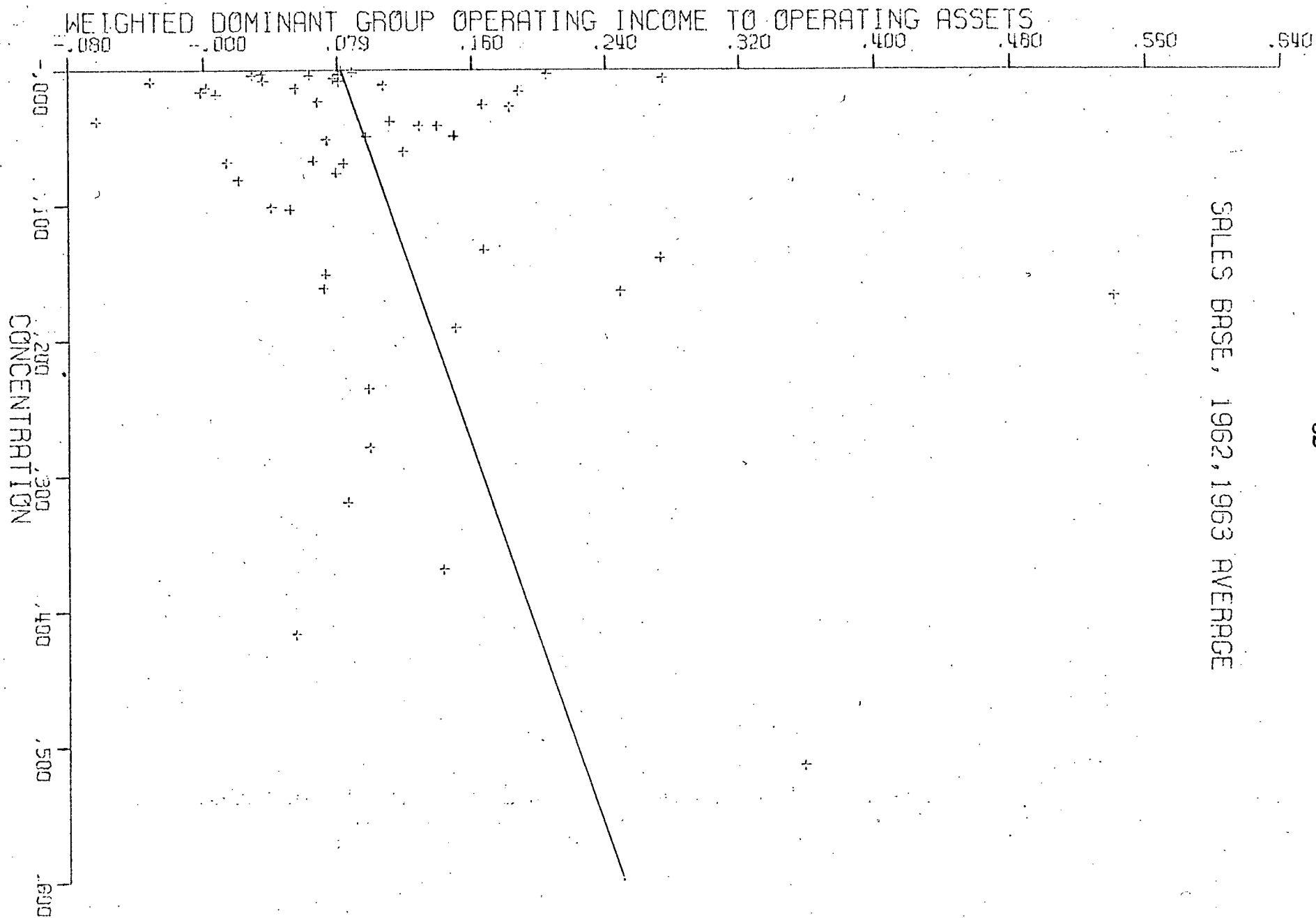


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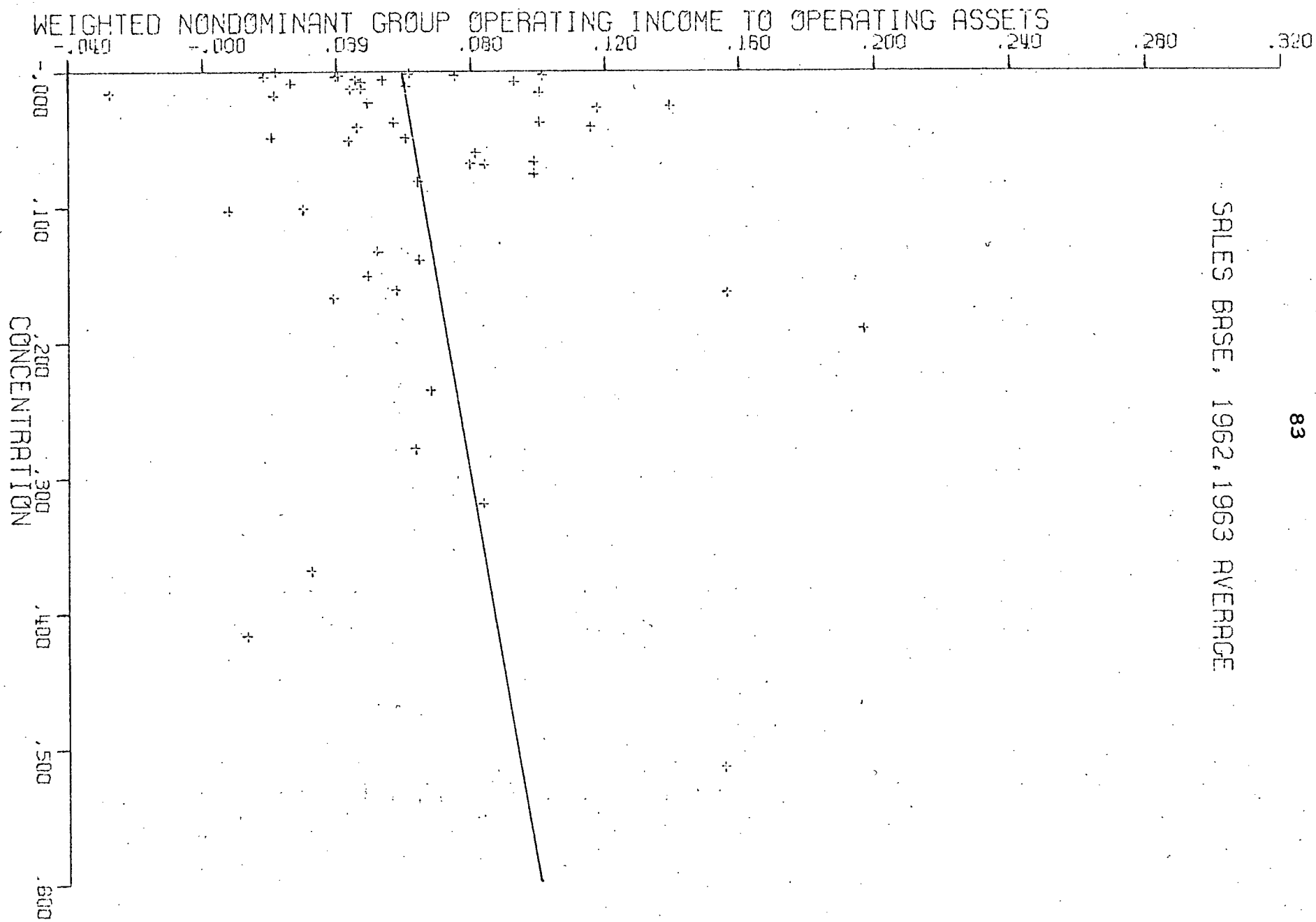




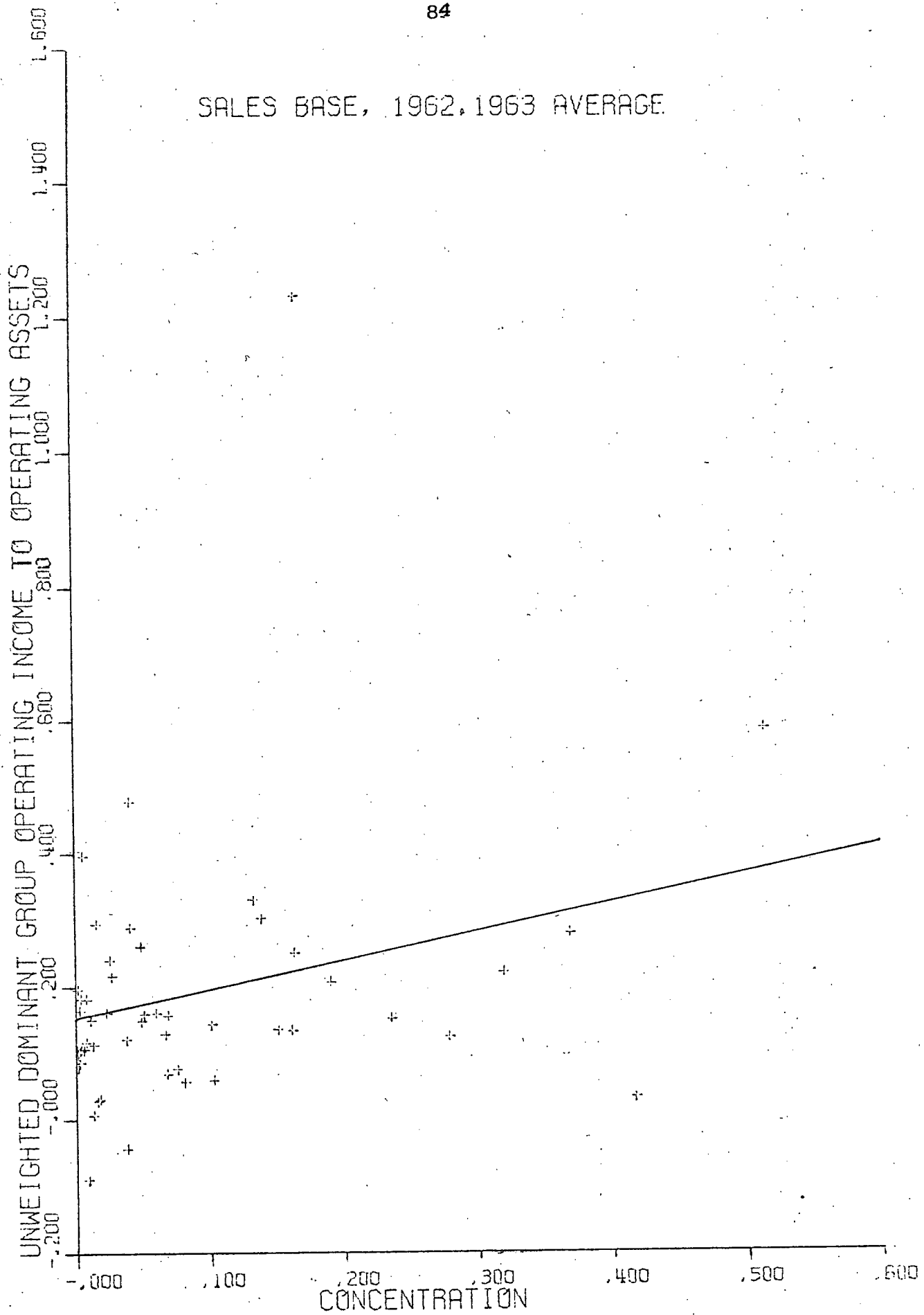
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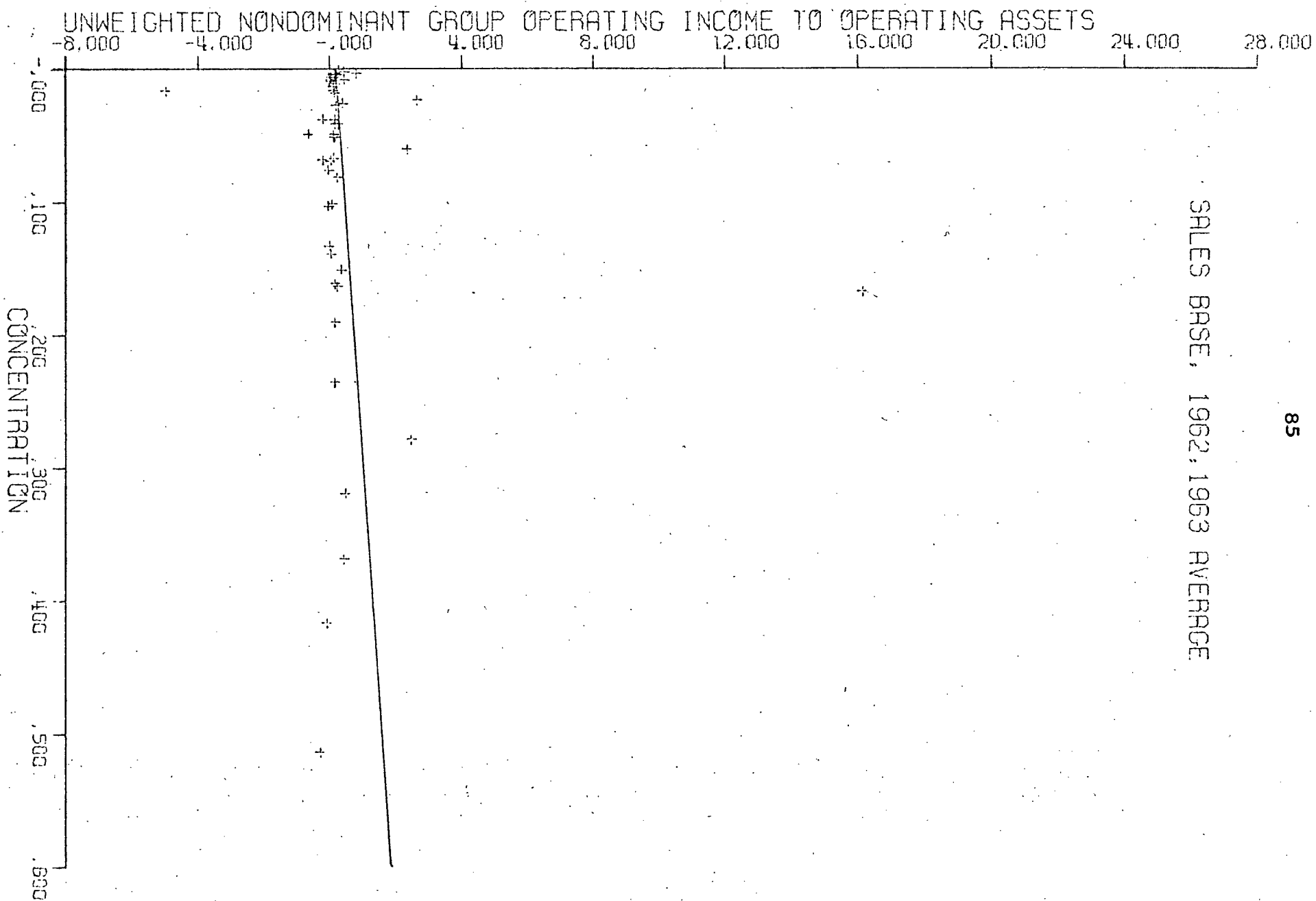
SALES BASE, 1962, 1963 AVERAGE



SALES BASE, 1962, 1963 AVERAGE

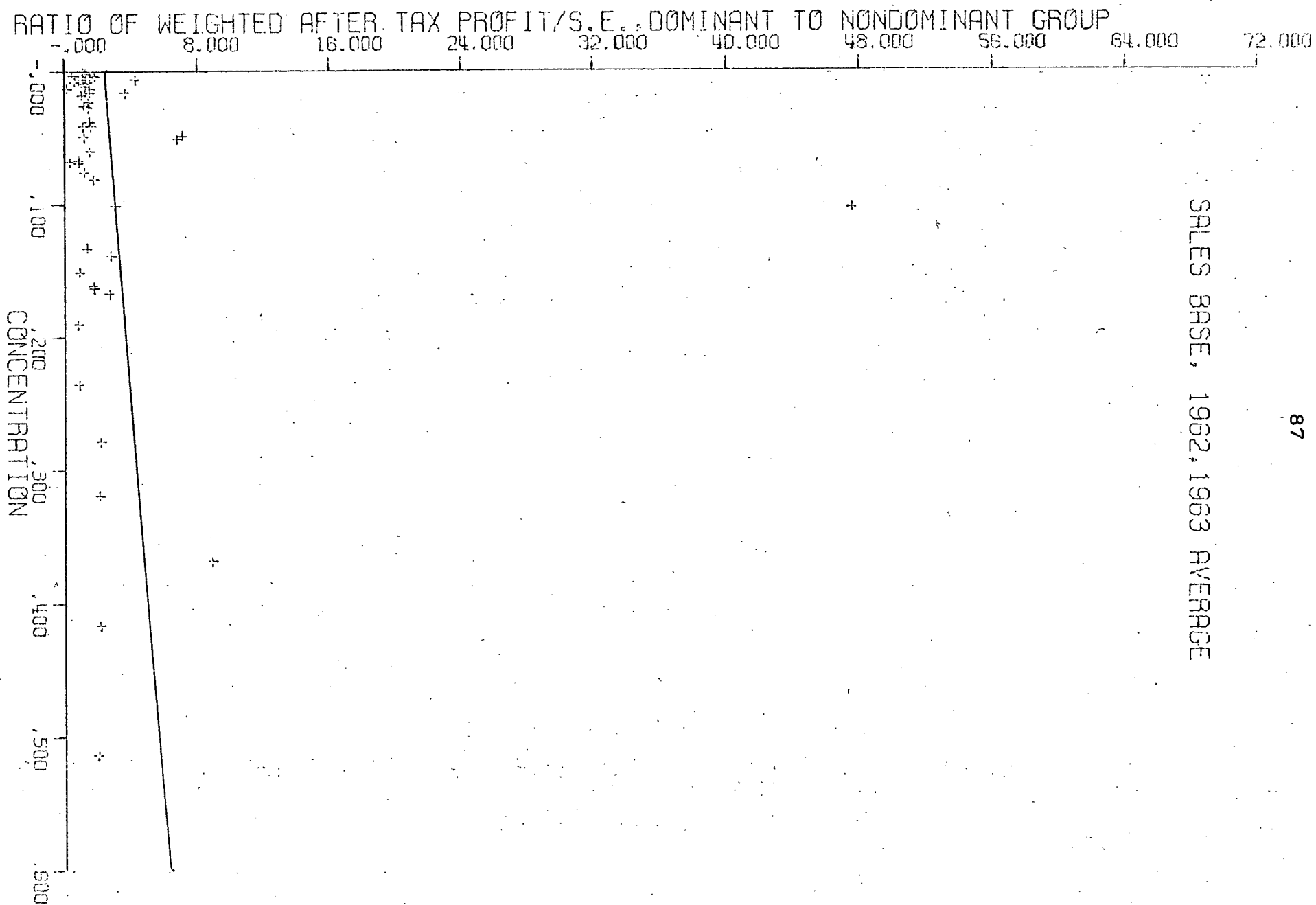


SALES BASE, 1962, 1963 AVERAGE

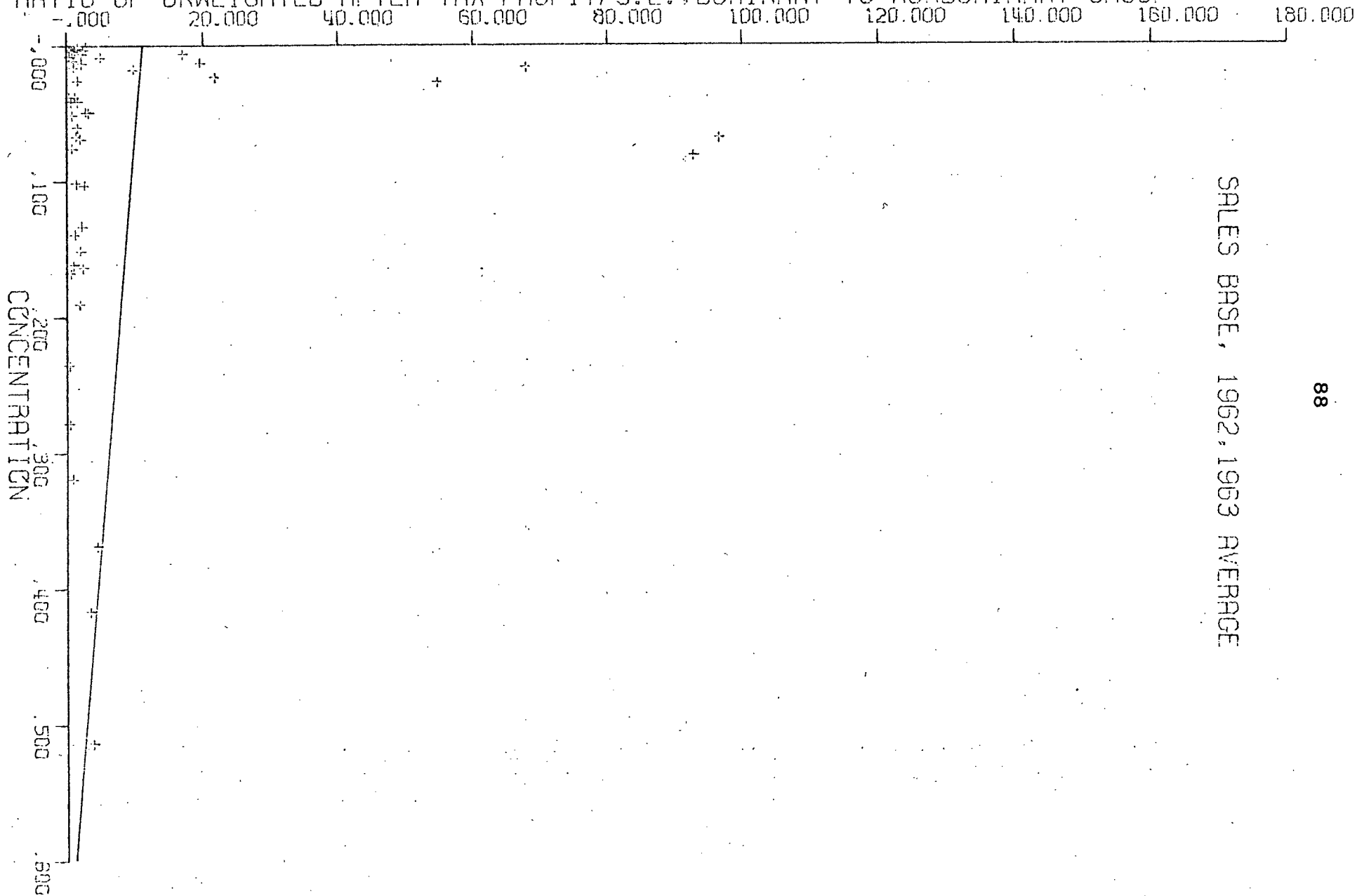


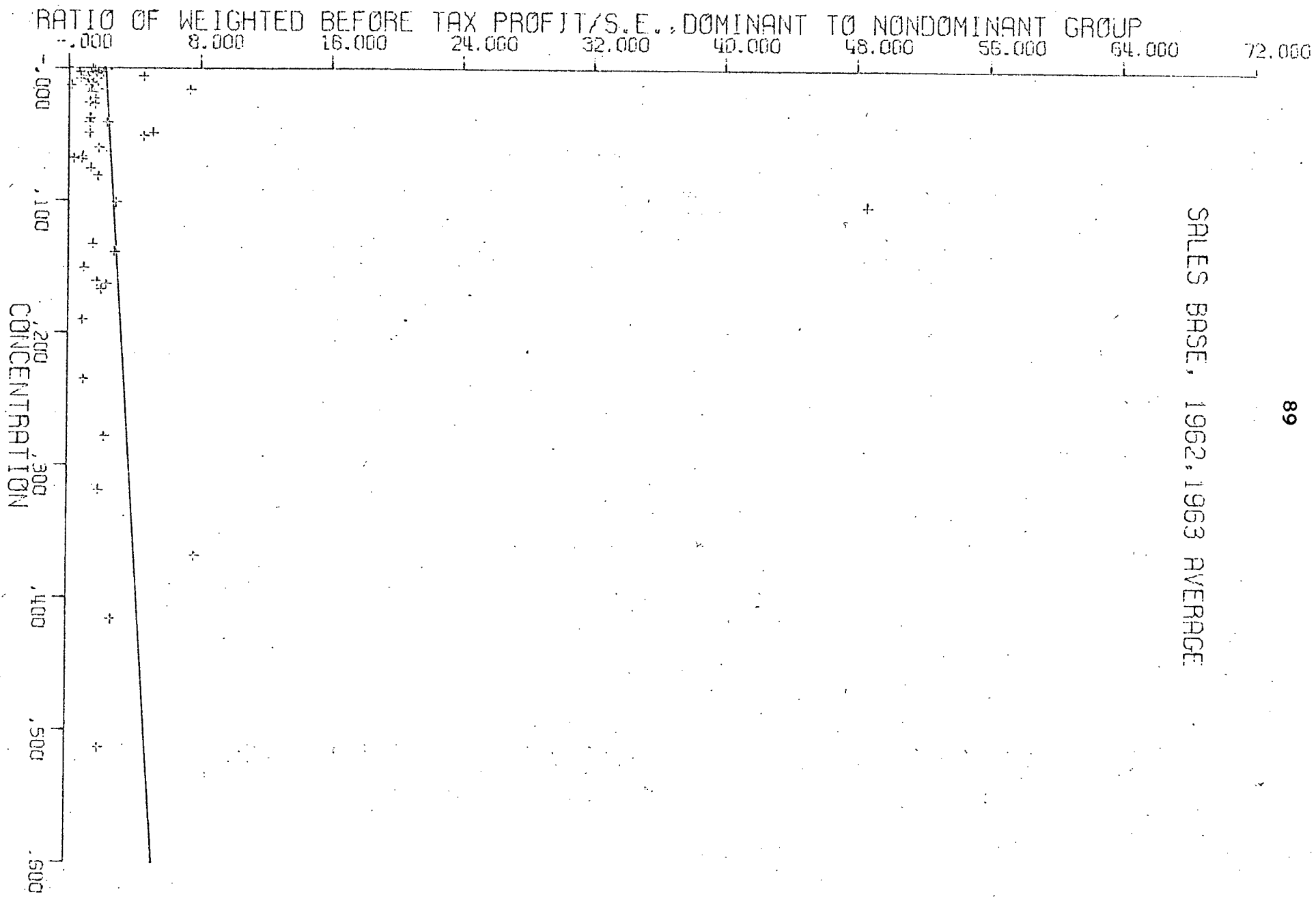
APPENDIX D

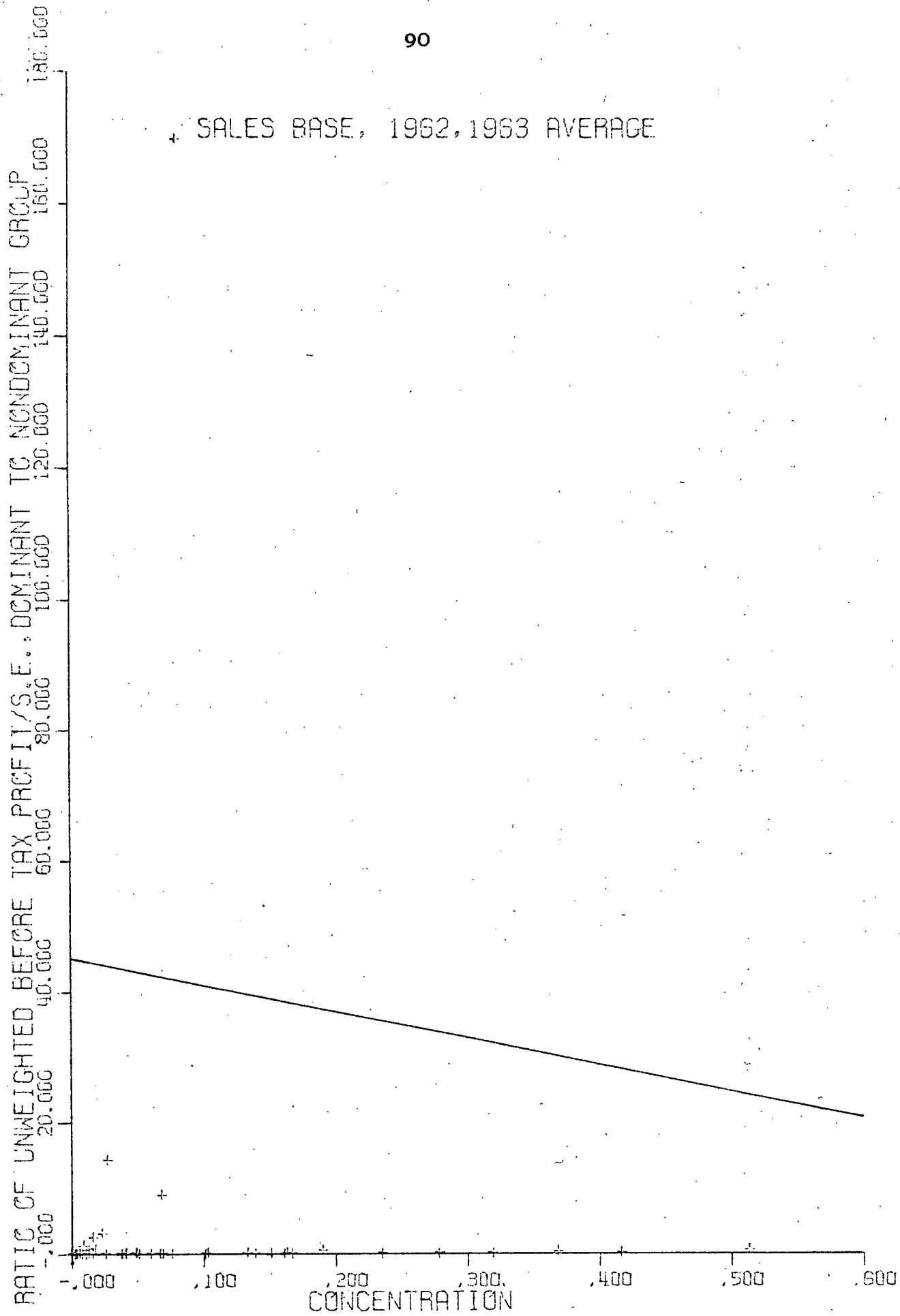
Appendix D contains six computer generated graphs showing the relationship between relative profitability and leverage. To each plot, the appropriate least squares line has been fitted. For statistics related to these graphs the reader is referred to Table 7. Each graph is identified by the label on the ordinate axis. This axis is scaled to best suit the data plotted and, therefore, the scales are not identical. The ordinate values are relative profitability ratios. The abscissa values are concentration ratios.



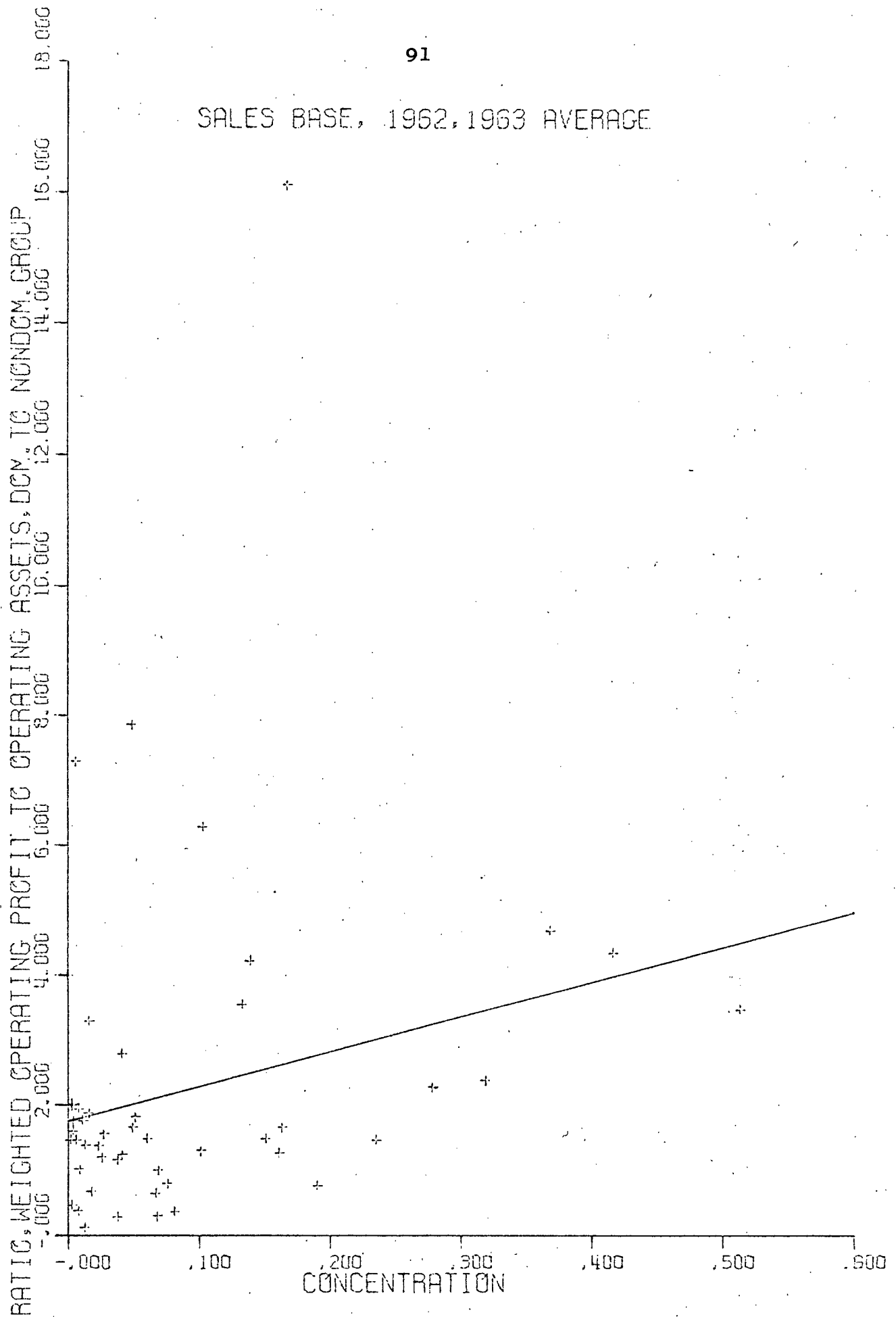
RATIO OF UNWEIGHTED AFTER TAX PROFIT/S.E., DOMINANT TO NONDOMINANT GROUP



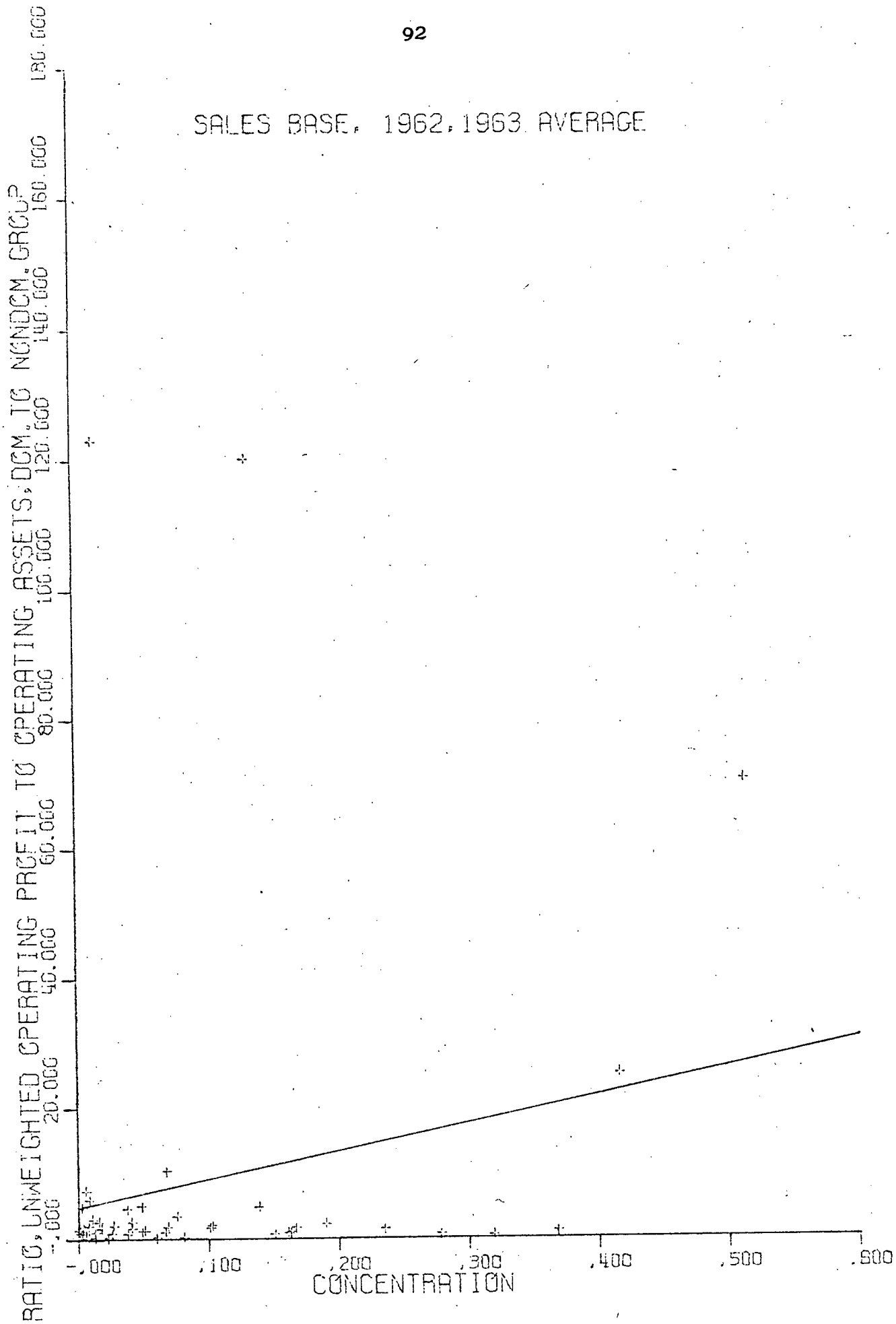




SALES BASE, 1962, 1963 AVERAGE



SALES BASE, 1962, 1963 AVERAGE



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