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## **Interviewer influences on the ratings given "values" questions by farmers**

Gordon S. Nicks

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To the Graduate Council:

I am submitting herewith a thesis written by Gordon S. Nicks entitled "Interviewer influences on the ratings given "values" questions by farmers." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

Charles Cleland, Major Professor

We have read this thesis and recommend its acceptance:

Irving Dubov, Ted Jones

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

March 11, 1963

To the Graduate Council:

I am submitting herewith a thesis written by Gordon S. Nicks entitled "Interviewer Influence on the Ratings Given 'Values' Questions by Farmers." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

Charles L. Chiland  
Major Professor

We have read this thesis  
and recommend its acceptance:

Irving Klubov

Ted L. Jones

Accepted for the Council:

Hilton A. Smith  
Dean of the Graduate School

INTERVIEWER INFLUENCE ON THE RATINGS GIVEN "VALUES"

QUESTIONS BY FARMERS

---

A Thesis

Presented to

the Graduate Council of

The University of Tennessee

---

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

---

by

Gordon S. Nicks

March 1963

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This study was under the direction of Dr. Charles Cleland, Professor of Rural Sociology at the University of Tennessee, Knoxville. The writer shall remain indebted to him for his competent advice and constructive criticism.

My sincere thanks and appreciation is extended to my advisors, Dr. Irving Dubov and Dr. Ted Jones, who have offered suggestions for the improvement of this writing.

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## CHAPTER I

### INTRODUCTION

#### I. PREFACE

This thesis is an investigation of interviewer bias. The data upon which this thesis is based were collected from two surveys which were conducted in Bradley and White Counties, Tennessee. A survey was conducted at the beginning and one at the termination of the "Trial-Acre Fertilizer Demonstration and Education Experiment." The terminal survey, it was anticipated, would measure the change that had taken place since the experiment was initiated. A brief background of the "Trial-Acre" program is given before the problem of interviewer bias is approached.

#### II. BACKGROUND

The "Trial-Acre Fertilizer Demonstration and Education Experiment" was a cooperative project conducted by the University of Tennessee through the Tennessee Agricultural Experiment Station and the Tennessee Agricultural Extension Service in cooperation with the Tennessee Valley Authority. The "Trial-Acre" program was begun in 1960 in Bradley County, Tennessee and was an experimental, educational program in corn production. White County, Tennessee was the control county. A "Trial-Acre" was defined as an area of approximately one acre on which a crop

was grown following recommended practices and adjacent to the balance of a field on which the crop was grown using practices normally followed by the farmer.

The "Trial-Acre" program yielded information which was strictly applicable to the farms in a particular county and it is anticipated that a package program will be developed which can be carried out by any County Extension Staff. The farmers who cooperated in the program were primarily those who might be called "non-users" because they were among those who regularly used less than one-half the minimal fertilizer recommendations based on soil test.

Figure 1 shows the location of the experimental and control counties. The experimental county is located in the East Tennessee Valley. The control county is located in the Eastern Highland Rim area. The counties are effectively separated by the Highland Plateau. These counties were selected because they were most nearly comparable in many characteristics. An effort was made to select counties which were non-adjacent and which have similar soils, climate, types of farming, per cent urban, per cent non-white operators and roughly the same distance from major cities.

The interview schedule of questions contained three major areas of concern. The first dealt with corn production practices and knowledge related to selected farming practices. Data from this phase of the study were incorporated in a thesis written by Robert Palmer.<sup>1</sup> The

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<sup>1</sup>Robert Gerald Palmer, "Corn Yields as a Function of Several Management Factors Expressed as Variables in Quadratic Prediction Equations" (unpublished Master's thesis, The University of Tennessee, Knoxville, 1962).

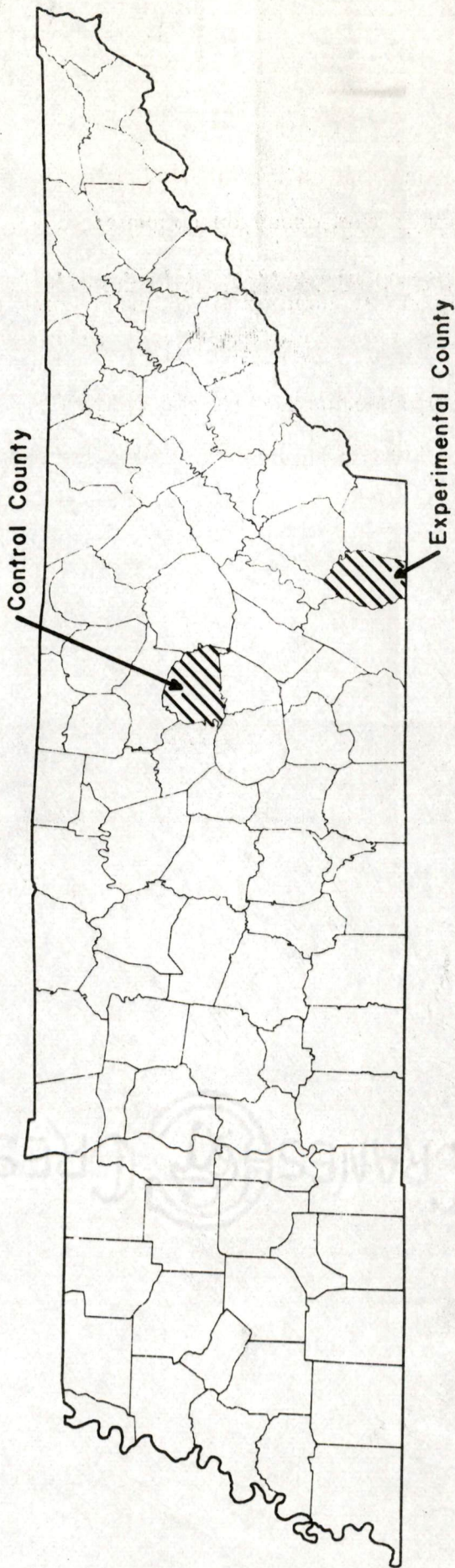


Figure 1. Location of the control county and the experimental county for the Trial-Acre program. Respondents in White County, Tennessee comprised the control group. Respondents in Bradley County, Tennessee comprised the experimental group.

second dealt with the bases for certain decisions which must be made in connection with corn production and fertilization. The data from the second area were further analyzed and included in a thesis written by Norman Huddleston.<sup>2</sup> The third dealt with socio-economic characteristics.

This thesis is based upon data derived from the second section of the interview schedule, namely, that section which dealt with the bases for certain decision in corn production. This section was comprised of 40 questions which were designed to measure the "value" orientation of the farmers interviewed with respect to certain decisions made in corn production. The farmers were asked to rank the importance of these 40 questions and how greatly they influence making three broader and major decisions of: (1) how many acres of ear corn to grow, (2) how many bushels of corn per acre to try to get, and (3) what kind of fertilizer (brand) to buy.

### III. THE PROBLEM

The interviewers who were involved in the survey from which the data for this thesis came experienced some difficulty in eliciting responses to the 40 "values" questions. Some interviewers reported it was often necessary to re-word the questions in order for farmers to fully understand the question. It is entirely possible that the manner

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<sup>2</sup>Norman Huddleston, "Decision-Making Patterns of Farmers Who Grow Corn in Two Tennessee Counties" (unpublished Master's thesis, The University of Tennessee, Knoxville, 1960).

in which the questions were re-worded could have been responsible for some biasing on the part of the interviewers. The problem is, "Did the individual interviewers significantly bias the ratings to the 40 'values' questions?"

#### IV. DELIMITATIONS

It would be possible to examine the changes in the ratings to the 40 "values" questions in the gross sense and center the investigation around the actual changes in farmers value orientations on the basis of these gross data. The forerunner of this type of investigation, however, should be some study of the error in the data, if any. It is not often that surveys are repeated in such a way that error can be examined as thoroughly as it has been in this study. Since the survey techniques were such that interviewer error could be examined, it was felt that the methods for measuring farmers' "value" orientations could be strengthened by examining how much interviewer bias the technique employed in this survey contained.

#### V. JUSTIFICATION OF STUDY

Agricultural research in the United States has made a tremendous contribution to our present abundance of food and fiber. Many research projects are under way at the various Land-Grant Institutions across the nation, resulting in an endless stream of research discoveries which are made available to the public. The public does not often challenge the findings of the Agricultural Researcher. As is true of



any profession, one of the most effective methods of insuring a high standard of research work in the various professions engaged in this type of activity is for the members of these professions to police their own ranks so to speak. The agricultural researcher might omit elements from a research study with the oft-mistaken notion that this omission will not significantly alter the findings of the study. Frequently funds and time do not permit the degree of refinement in research procedure which many researchers are both capable of and would like to have.

A great deal of research is being done in the area of public opinion and attitudinal surveys. In many of these surveys the respondent is asked to rate the importance of a certain event, thing or idea. Involved in these surveys are a great number of interviewers with all degrees of training in research procedure. The data upon which this thesis is based were derived from a survey such as that just mentioned.

Interviewers are human and hence are subject to error. Researchers who use the survey method should be concerned about interviewer error and try to keep it to a minimum. When there is any indication in the research findings that interviewer error or bias might be present, the first thing to do before trying to conclude anything further from the gross data is to find out how much error is present. The second thing to do would be to make some estimate of the impact of this error on the conclusions drawn from these gross data. If the error is great enough to significantly bias any conclusions drawn from the data, the reliability of the conclusions may be questionable.

There was some indication that the data upon which this thesis is based contain some interviewer bias. If the measurement of social values is to be developed to a point where standardized techniques may be employed, the present techniques must be improved so that a greater correspondence exists between methods of measurement and social concepts.

## VI. REVIEW OF RELATED LITERATURE

A great deal of work has already been done in the investigation of interviewer bias. In fact, some rather refined procedures have been developed for detecting such bias. Shapiro and Eberhart conducted a survey of veterans which was designed to find out the nature of veteran's on-the-job training, and among other things, his attitudes on certain questions related to wage ceilings. Shapiro separated from the general area of interviewer bias three areas of deviation from "good" interviewer performance which contribute to bias:

1. Reliance on initial response.
2. Incomplete reporting of respondents answers.
3. Independent decisions by an interviewer concerning the necessity for asking questions included in the schedule.<sup>3</sup>

Although the questions in the Shapiro study were unlike those from which the data for this thesis came, the techniques Shapiro employed were concerned with variability between the responses received by each interviewer.

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<sup>3</sup>Sam Shapiro and John C. Eberhart, "Interviewer Differences in an Intensive Interview Survey," International Journal of Opinion and Attitude Research, 1:1-17, 1947.

Shapiro concluded that their study contained apparent interviewer bias on attitude questions. His observation was that these variations between the interviewers were primarily due to interviewing methods employed. It was suggested that a useful procedure to control such differences would be by a comparison of early results of a survey. Any variations between interviewers could thus be found and ways to correct it developed.

Shapiro felt two factors were especially important in securing uniform interviewer performance. These were:

1. Careful design of the interview schedule to provide the most useful answer categories.
2. Skillful and persistent indoctrination of interviewers to acquaint them with the kind of information wanted on each question, and with the methods it is permissible for them to use.<sup>4</sup>

Ramsey and others, in a study of 188 New York dairy farmers, were concerned with value orientations and how they may serve as criteria in deciding among various alternative decisions.<sup>5</sup> There were 120 items in the schedule of items on value orientations, with only 6 failing to scale.<sup>6</sup> Ramsey and associates concluded that the scale analysis technique was valid in the study of values, i.e., it measured what it was designed to measure. The scales were worked out through three pre-

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<sup>4</sup>Ibid., p. 17.

<sup>5</sup>Charles E. Ramsey, Robert A. Polsen, and George E. Spencer, "Values and the Adoption of Practices," Rural Sociology, 24:35-47, March, 1959.

<sup>6</sup>Louis Guttman, "An Outline of Some New Methodology for Social Research," Public Opinion Quarterly, 18:395-405, 1954.

tests of the interview schedule. The questions were of a forced choice type.

Ramsey did not mention the existence of interviewer influence in his study. He does state that, "with acceptable methods and low correlations, not much hope can be held out for future research in this area unless more fundamental research is conducted on the nature and methodology of measuring values."<sup>7</sup>

Although many investigations have been made of interviewer bias, Cahalan and others conducted the first investigation of the relative degree of interviewer bias found in various types of questions.<sup>8</sup> Their study was done with an eye toward methods of selection and training of interviewers to keep specific types of bias to a minimum.

Cahalan was of the opinion that personal interviews are subject to three types of bias:<sup>9</sup>

1. Bias through selection of respondents.
2. Bias in eliciting the response.
3. Bias in recording the response.

No direct attempt was made to find out what proportion of observed bias can be attributed to each of these basic causes. Cahalan found that of twelve general types of question structures, there were examples

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<sup>7</sup>Ramsey, op. cit., p. 47.

<sup>8</sup>Don Cahalan, Valerie Tamulonis and Helen W. Verner, "Interview Bias Involved in Certain Types of Opinion Survey Questions," International Journal of Opinion and Attitude Research, 1:63-77, 1947.

<sup>9</sup>Ibid., p. 63.

sufficient to establish marked interviewer bias on four types.<sup>10</sup> One of the four types of questions with marked interviewer bias was the card question. In these questions the respondent is handed a card on which the alternatives are listed such as was done in the questions in the appendix.

Suspicion of systematic interviewer bias was cast upon three types of the 12 questions in the Cahalan study. One of these three was a type of question involving a five-point self-rating of intensity.

With reference to card questioning, Cahalan recommended that when a card was used, the respondent should be required to read the question. If the respondent is illiterate and must have the card read to him, that fact should be reported. Cahalan and his associates wonder whether valid answers can be expected from an illiterate if a question is so complicated that it requires a card.

These are a few of the studies which have been concerned with the removal of error in interviewing and primarily with the express purpose of making data more reliable.

## VII. SOURCES OF DATA

This thesis is based upon data which were obtained by surveys in Bradley and White Counties, Tennessee. These data were assembled from field work done in 1960 and 1962. The most important raw data have been included in the text. The results from the entire survey will not be

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<sup>10</sup>Ibid., p. 70.

used in this study. The entire thesis is based upon the ratings given to 40 "values" questions which were located in the middle portion of the interview schedule. A complete copy of the interview schedule used in the "Trial-Acre" study may be found in an unpublished M.S. thesis at the University of Tennessee.<sup>11</sup> The appendix contains the 40 questions with which this thesis was concerned. These 40 questions were worded exactly alike in both the 1960 and 1962 surveys.

#### VIII. METHODOLOGY

The collection of the data upon which this thesis is based was carried out in two time periods. The first survey was in June, 1960. A team of five interviewers conducted this survey. The second survey was in June, 1962. A different team composed of four interviewers was involved in the resurvey. The same respondents were involved in both the 1960 and 1962 surveys. In cases where a respondent had moved since the initial survey, every effort was made to find him and interview him at his new residence. Only the data from respondents who were interviewed in both time periods are the basis for this thesis. One-hundred and eighty-nine respondents were contacted in the 1960 survey. One-hundred and sixty-two of these were re-interviewed in the 1962 survey.

The rating scale in the 1960 survey was divided into five major degrees of importance. In the 1960 study, zero meant "not important"

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<sup>11</sup>Norman R. Huddleston, "Decision Making Patterns of Farmers Who Grow Corn in Two Tennessee Counties" (unpublished Master's thesis, The University of Tennessee, Knoxville, 1960), p. 77.

and four meant "crucially important." The rating scale allowed farmers to check half-values. As a result a range of nine degrees of rating was, in effect, possible if the respondent chose to check half-values. It was doubted after an examination of the 1960 responses that farmers could actually distinguish their convictions on "value" questions that closely.

The system of rating was changed in the 1962 survey. The rating scale was divided into five parts, but the farmer was not asked to give a half-value. The farmers were asked to rate the importance of the 40 decision-making questions on the new scale. A rating of zero signified "not important," rating of one meant "not very important," a rating of two means "important," a rating of three means "very important," and a rating of four meant "crucially important."

In order to compare the data gathered in the 1960 survey with that in the 1962 survey, a combining process was used for the 1960 data in which the one-half and zero ratings, the one and a half and two ratings, the two and a half and three ratings, the three and a half and four ratings were combined.

In conducting the survey, each respondent was given instruction by the interviewers in how these 40 questions would be rated. The respondent was handed a card which had each degree of rating from zero to four on it and also the meaning of each. The number the respondent selected from this card as the appropriate response for a given question was recorded in the space provided. These numbers were punched directly

into the I.B.M. cards. Two different sets of cards were made from the coded information. The two decks were then compared to detect errors in punching. Errors were corrected when found. I.B.M. equipment at the University of Tennessee computing center was used in compiling the data.

The five 1960 interviewers were identified by the letters A, B, C, D and E. The four 1962 interviewers were identified by the numbers 1, 2, 3 and 4.

An understanding of the rating variation scale is essential in understanding the methods employed in this study. The 40 "values" questions in the survey schedule were rated by the same respondents in both 1960 and 1962. A five point rating scale was used ranging from zero (no importance) to four (crucially important). The actual variation in the rating of a particular question was obtained by subtracting the 1962 rating from the 1960 rating, yielding a value for the Rating Variation. If the 1960 rating of the importance of a question was four (crucially important) and the 1962 rating was also four, the net change in rating from one time period to the second time period would have been zero. Figure 2 shows the differences which could occur between ratings of a question in two time periods.



Figure 2. Scale of variations in farmers' ratings of 40 "values" questions at two points in time.

If the rating to a question was zero (no importance) in 1960 and four (crucially important) in 1962 by the same respondent, the net change



would be four points of variation higher in 1962. In Figure 2 it may be seen that the ratings which were lower in 1960 have a negative sign. The negative sign was obtained because the 1962 value rating was subtracted from the 1960 value rating.<sup>12</sup> The right hand portion of the scale in Figure 2 shows deviations which were lower in 1960 (this implies that the 1962 ratings were higher).

#### IX. ORGANIZATION OF STUDY

The point of focus for this study was the interviewer. It was not the intention to place emphasis on the content of the 40 "values" questions. It was assumed that any interviewer who was thoroughly briefed and had a thorough understanding of the question intent and the proper interviewing procedure would record the same rating to a given "values" question from a given respondent as any other interviewer who had received the same training. Since the sampling procedure used to select the respondents was only slightly modified (the random cluster sampling procedure was changed to include farms with at least 5 acres of corn or more), we would expect the rating variations of individual respondents to be distributed randomly among all interviewers. No association of rating variation with a particular interviewer would be expected.

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<sup>12</sup>The base year was 1960. In the example given, zero minus four gives minus four as the variation in the rating from 1960. By convention, the 1962 ratings should have served as the base so that the negative values would have appeared on the left hand side of Figure 2 instead of the right.

The first area to be investigated was the distribution of the means of the rating variations to the 40 "values" questions. It was anticipated that this distribution would be normal. The normality of the distribution of the means of the rating variations is an indication that the 40 "values" questions were not misunderstood to a significant degree.

In the investigation of possible differences between the individual interviewers, the first evidence of differences is a series of graphs for 10 of the "values" questions. Each graph is in two parts which represent the cumulative distribution of rating variations recorded by the interviewers in 1960 and 1962, respectively.

The second evidence to be presented regarding possible interviewer differences is in the form of two tables of chi-square values for the rating variations to the 40 "values" questions recorded by the interviewers in 1960 and 1962, respectively. A calculated chi-square value beyond the critical value for the rating variations to a particular question indicates that there was a significant difference between the rating variations recorded by each interviewer in that time period.

The third and final evidence to be presented regarding possible interviewer differences is in the form of a tabular presentation of the rating variations received by each individual interviewer in one time period while controlling on the rating variations received by a different set of interviewers in another time period. In this manner the bias associated with a given interviewer could be determined. Five of the 40 "values" questions were examined in this manner.

## CHAPTER II

### RESULTS OF STUDY

It was anticipated that the means of the variations in ratings between 1960 and 1962 to the 40 "values" questions would be normally distributed. The chi-square "goodness of fit" test was used to see if the observed distribution of the means of the variations in the ratings at the two points in time was normally distributed. This test utilized a comparison between the actual distribution of the means of the variations in ratings and the theoretical frequency distribution which could have been expected by chance.

Table I shows the theoretical and observed frequency distributions for the means of the variations in the ratings for the 40 "values" questions. It may be seen that the actual and theoretical frequency distributions were very nearly the same. The calculated chi-square value of 1.774 is well below the critical chi-square value of 7.810 and we therefore accept, at the 5 per cent level of significance, the alternative hypothesis that the distribution of the means of the variations in ratings between the two periods of time is normal.

Table II shows the means of the variations of the 1962 ratings from the ratings given the same 40 "values" questions in 1960. The mean of the means of the variations of the 1962 ratings from the 1960 ratings was  $-.161$ . The sample variance is an estimate of the variance of the

TABLE I

THEORETICAL AND OBSERVED FREQUENCY DISTRIBUTIONS OF THE  
MEANS OF THE RATING VARIATIONS TO  
40 "VALUES" QUESTIONS

Standard deviation from mean	Interval	Theoretical frequency	Observed frequency	$\frac{(f_i - F_i)^2}{F_i}$
Beyond -1	Above .203	6.4	4.0	.900
0 to -1	-.161 to .203	13.6	16.0	.424
0 to 1	-.161 to -.525	13.6	15.0	.144
Beyond 1	Below -.525	6.4	5.0	.306
		40.0	40.0	1.774

$$\bar{X} = -.161 \quad s = .364 \quad \chi^2 = 1.774 \quad d.f. = 3 \quad p = .05$$

Source: Wilfrid J. Dixon and Frank J. Massey, Jr., Introduction to Statistical Analysis (second edition; New York: McGraw-Hill Book Company, Inc., 1957), p. 227.

TABLE II

MEANS OF THE DIFFERENCES OF THE RATINGS TO 40 "VALUES"  
QUESTIONS IN 1962 AS COMPARED TO 1960

Question number	Mean of differences	Question number	Mean of differences
1	-.115	21	-.253
2	.051	22	-.181
3	-.356	23	-.233
4	-.038	24	-.350
5	-.006	25	-.370
6	-1.224	26	-.435
7	-.865	27	-.194
8	.032	28	.220
9	.258	29	.098
10	-.225	30	-.383
11	.077	31	.097
12	-.483	32	1.012
13	.064	33	-.444
14	.090	34	.065
15	-.577	35	-.581
16	-.086	36	-.181
17	-.032	37	-.474
18	.071	38	.116
19	-.253	39	.311
20	-.610	40	-.077

$$\bar{X} = -.161 \quad s = .364$$

universe.<sup>1</sup> The sample standard deviation was used in arriving at an estimate of the critical limits for the means of the variations to each question. The estimated critical limits, using the 95 per cent confidence level, were  $-.874$  and  $.552$ .

The means of the variations in the ratings of two of the 40 questions fell outside the critical limits. These questions were number 6 and number 32.<sup>2</sup> However, at the 95 per cent confidence level we could have expected two of the 40 means to have fallen outside the critical limits by chance. This is further evidence of the normality of the distribution.

I. CUMULATIVE PER CENT OF VARIATION IN RESPONDENT RATINGS,  
1960 RELATIVE TO 1962 BY INTERVIEWERS, 1960 and 1962

Figures 3-12, pages 20-29, are the focal points of this section. Each of the figures represents the cumulative distribution in rating variations (in per cent) to a selected "values" question. The cumulative per cent distributions of the rating variations have been used to facilitate comparison of the individual interviewers since the interviewers did not interview the same number of respondents.

The left side of each figure shows the cumulative distribution of the rating variations received by the individual interviewer in 1960 to

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<sup>1</sup>M. J. Moroney, Facts From Figures (Harmondsworth, Middlesex, England: Penguin Books, Ltd., 1951), p. 226.

<sup>2</sup>See appendix for question content.

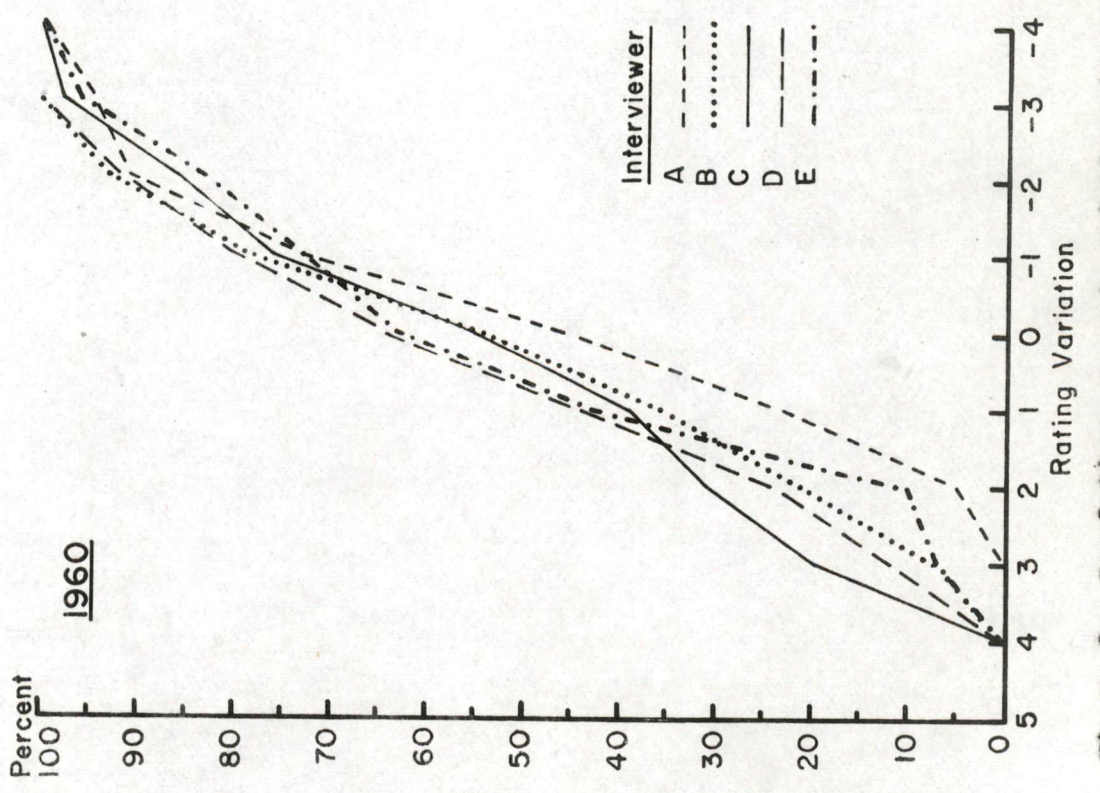
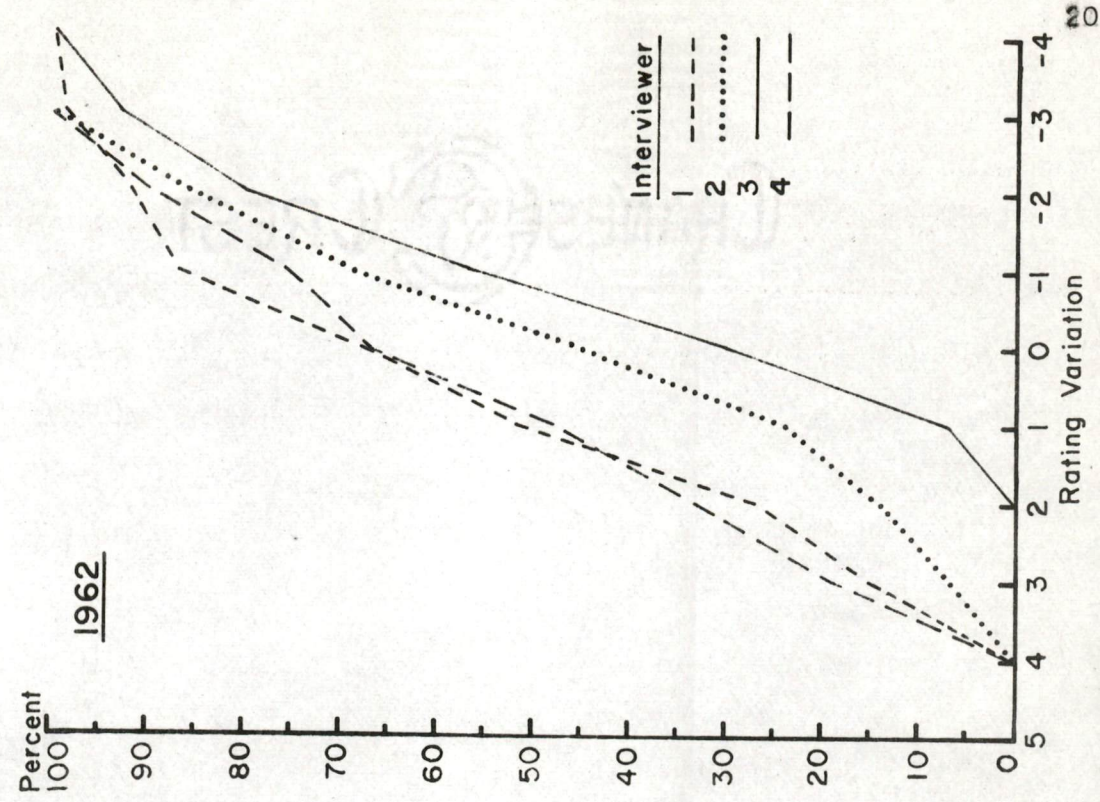


Figure 3. Cumulative per cent variations in respondent ratings of Question 1, 1960 relative to 1962, by interviewer, 1960 and 1962.

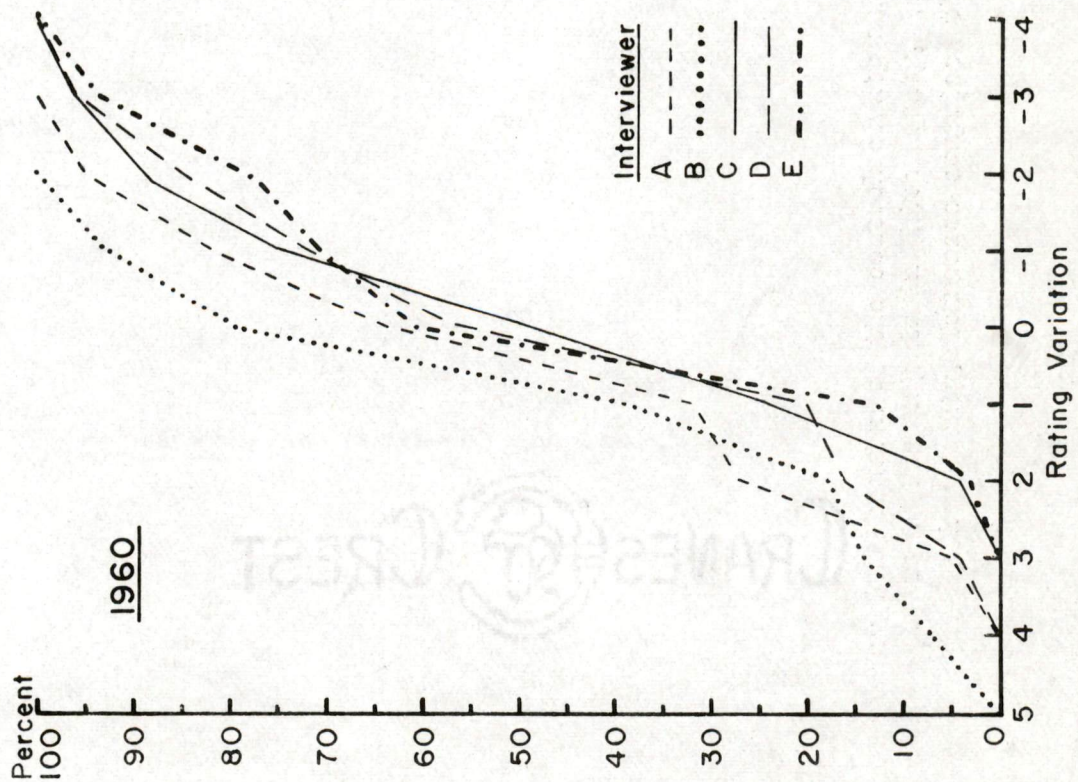
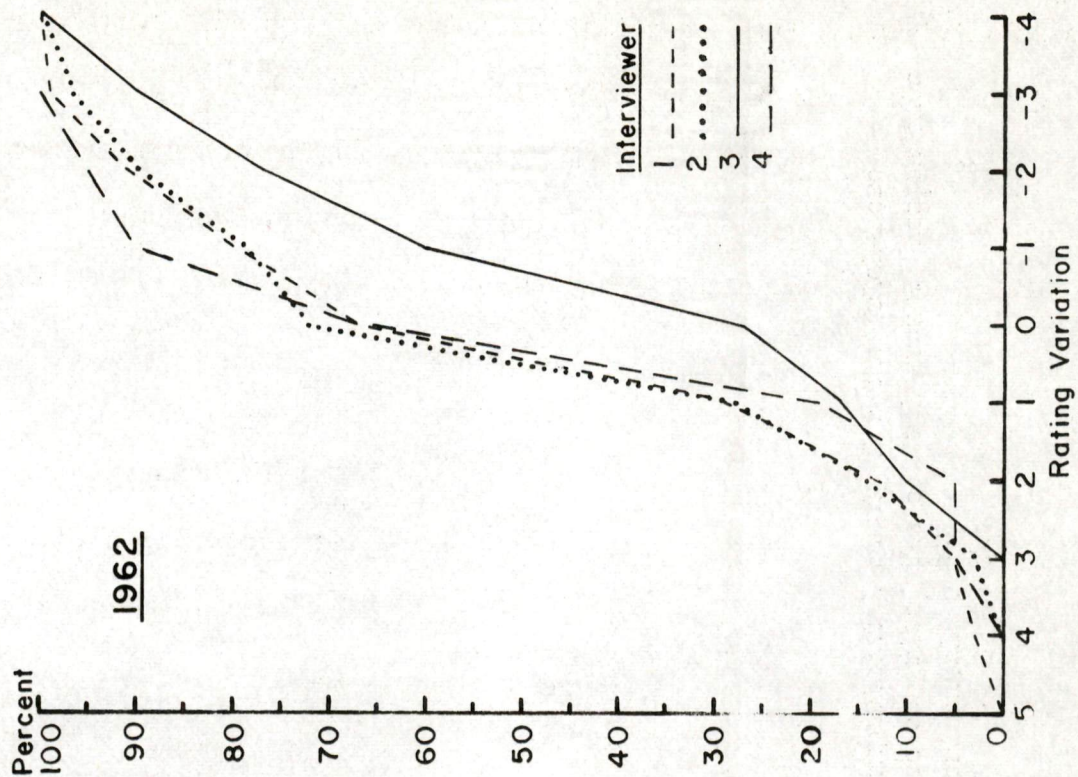


Figure 4. Cumulative per cent variations in respondent ratings of Question 3, 1960 relative to 1962, by interviewer, 1960 and 1962.



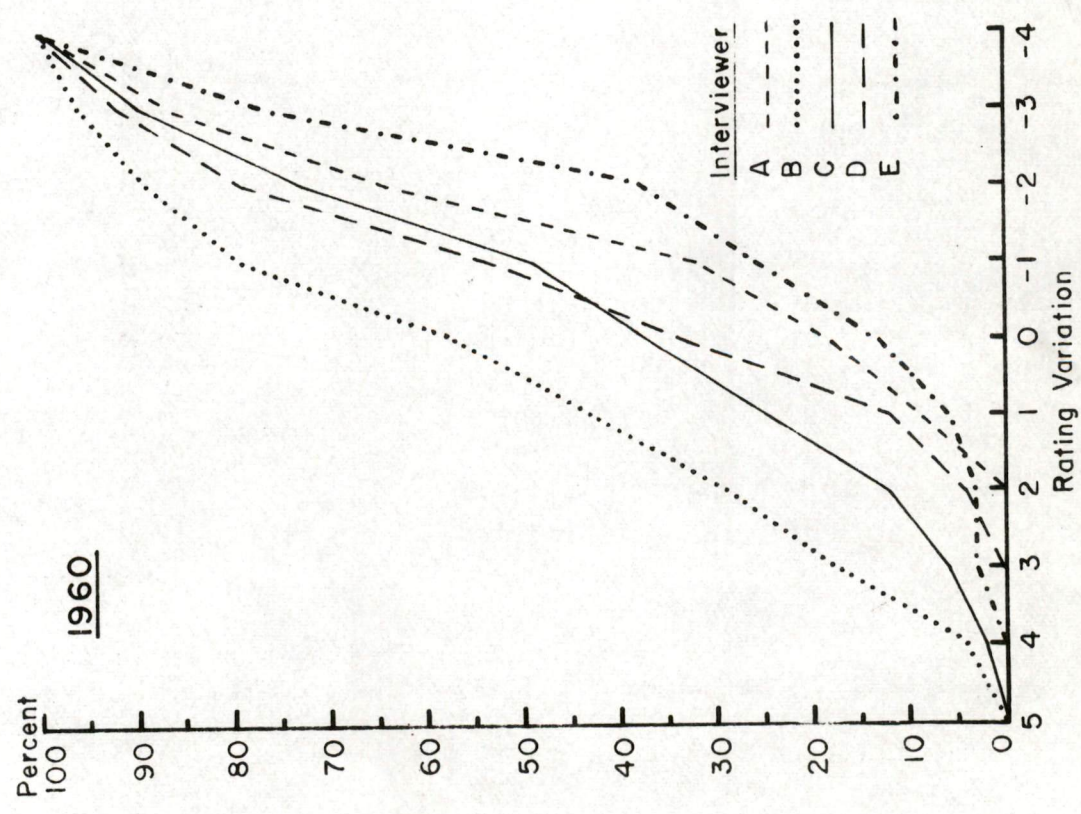
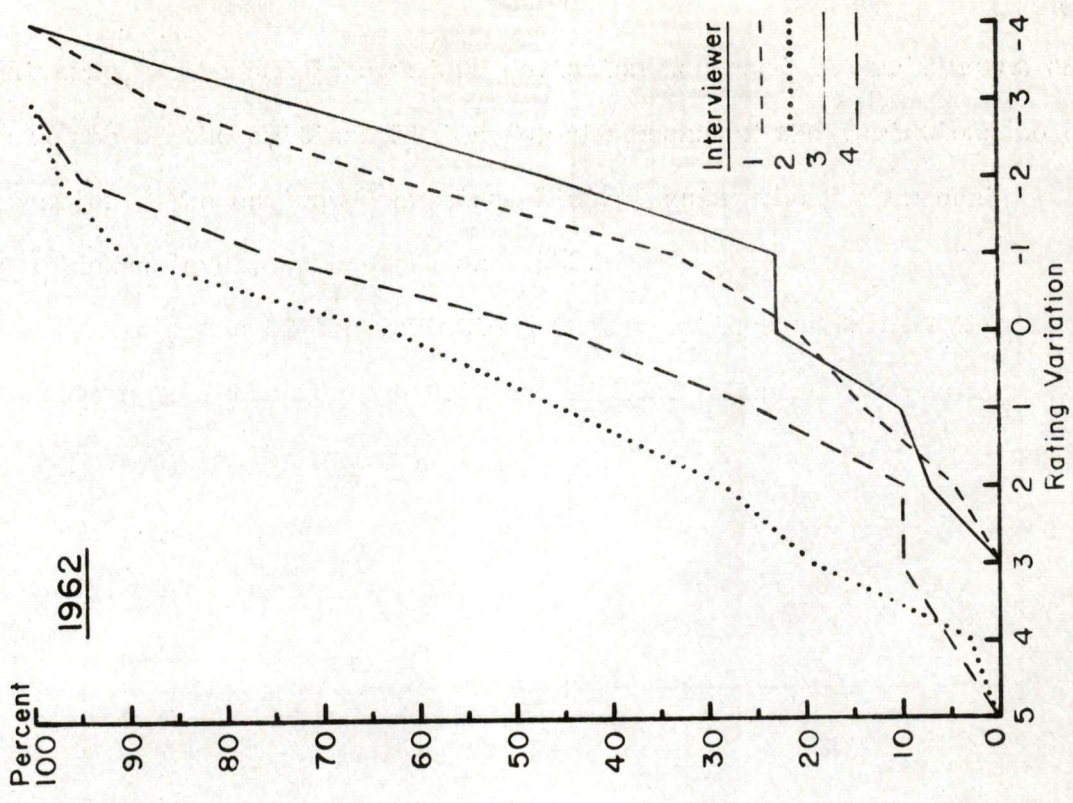


Figure 5. Cumulative percent variations in respondent ratings of Question 6, 1960 relative to 1962, by interviewer, 1960 and 1962.

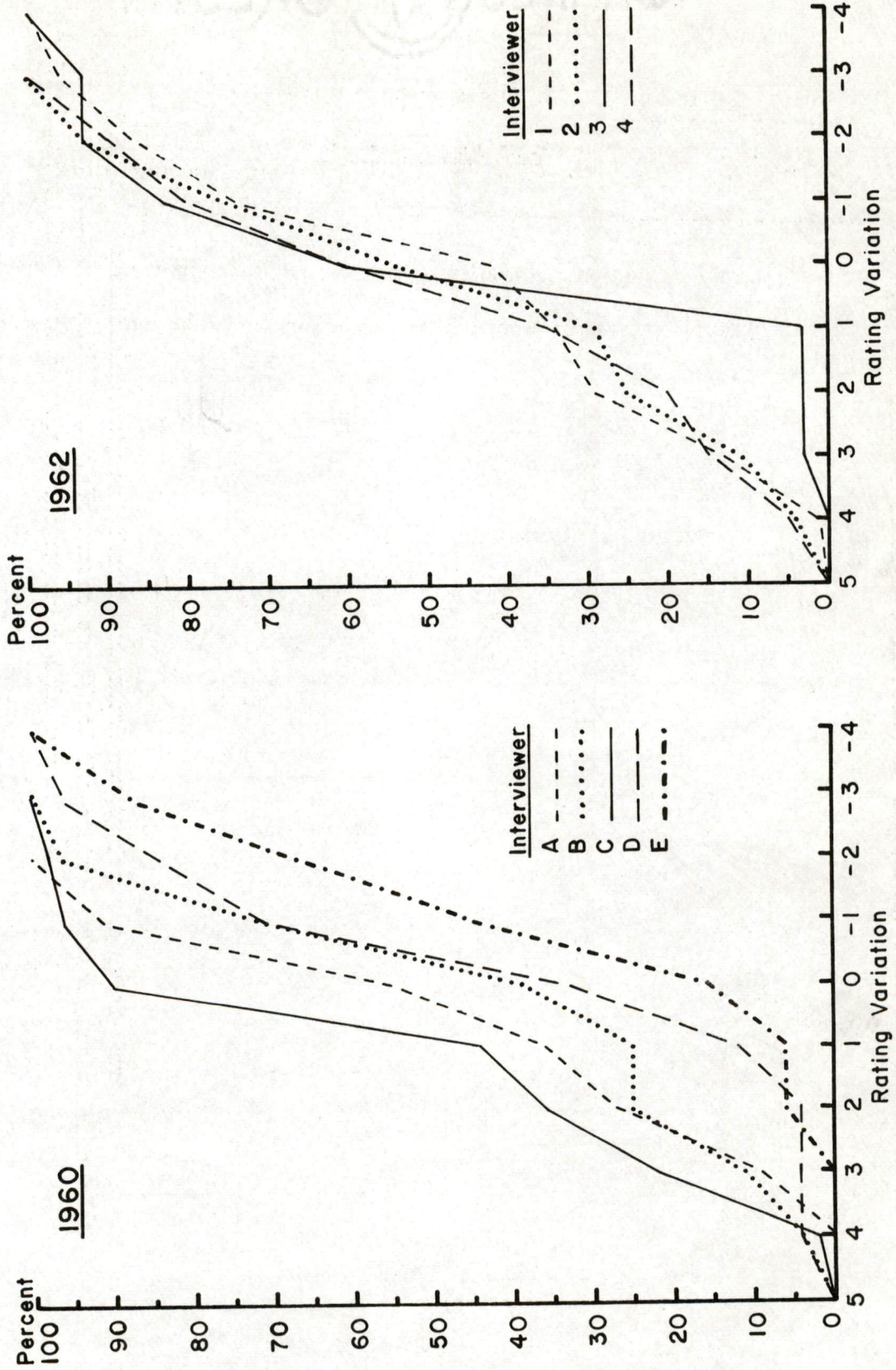


Figure 6. Cumulative per cent variations in respondent ratings of Question 10, 1960 relative to 1962, by interviewer, 1960 and 1962.

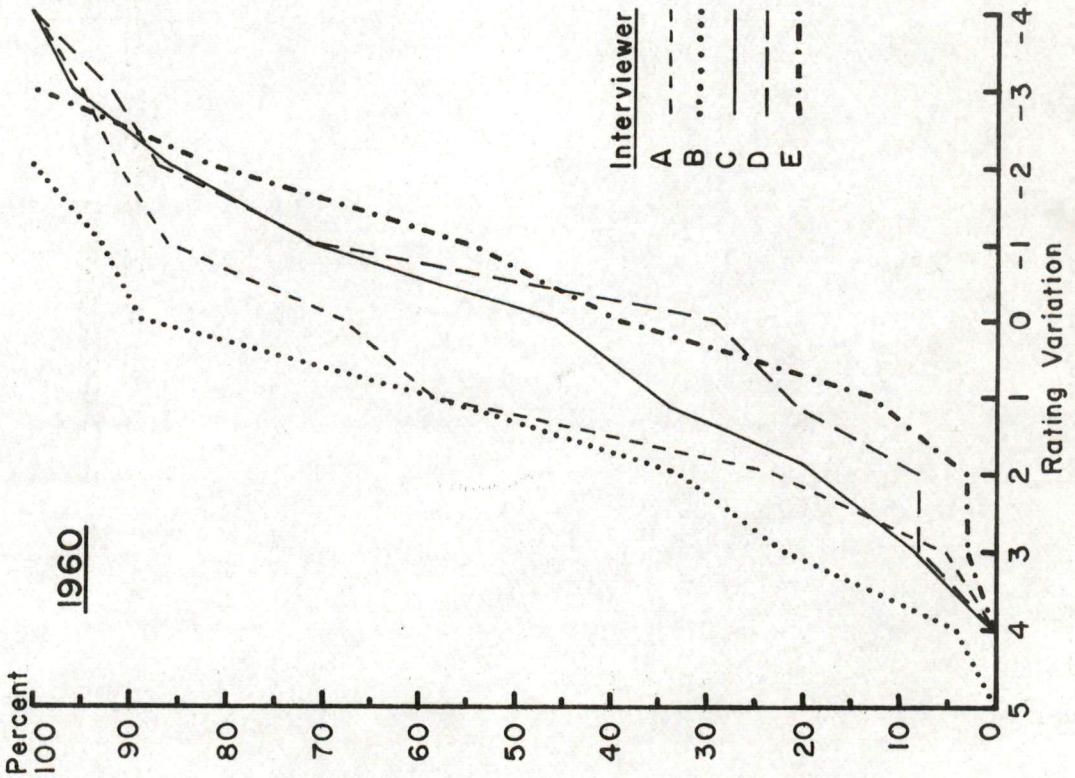
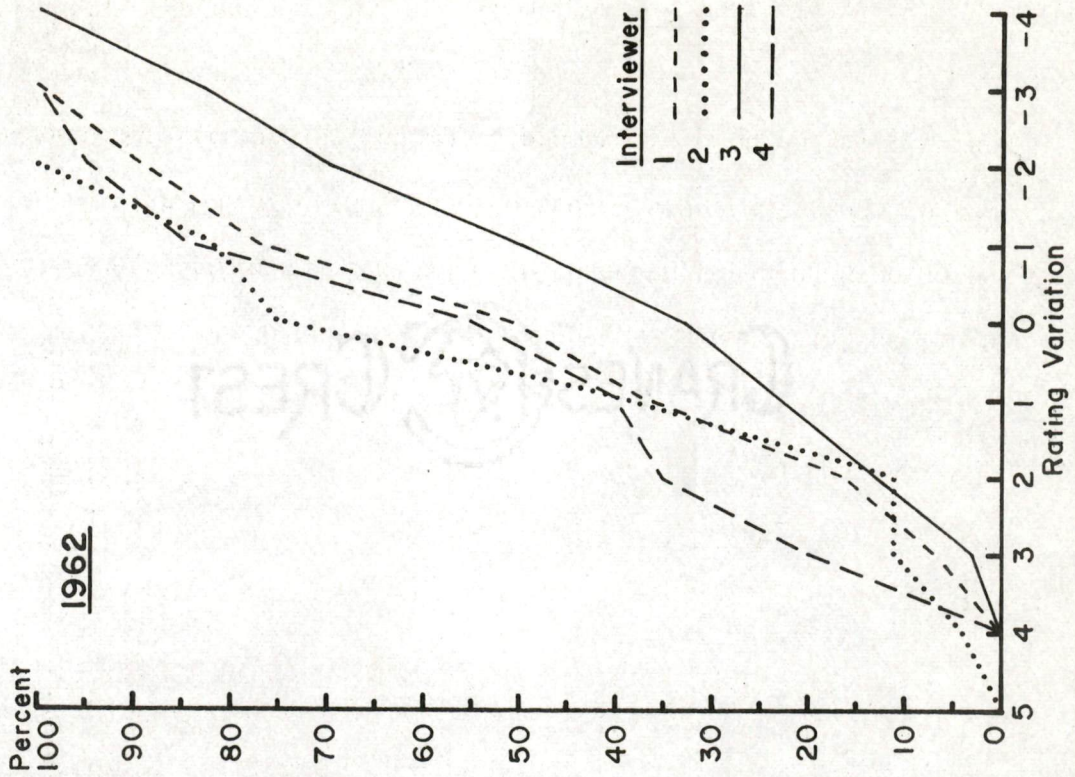


Figure 7. Cumulative per cent variations in respondent ratings of Question 19, 1960 relative to 1962, by interviewer, 1960 and 1962.

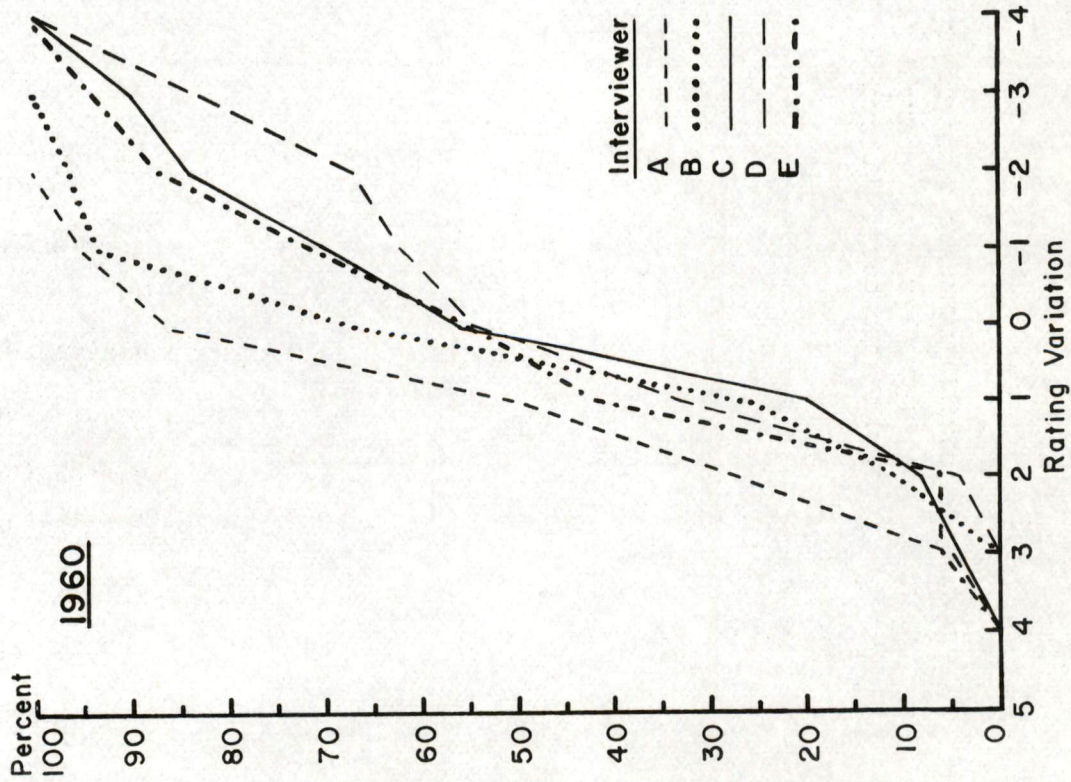
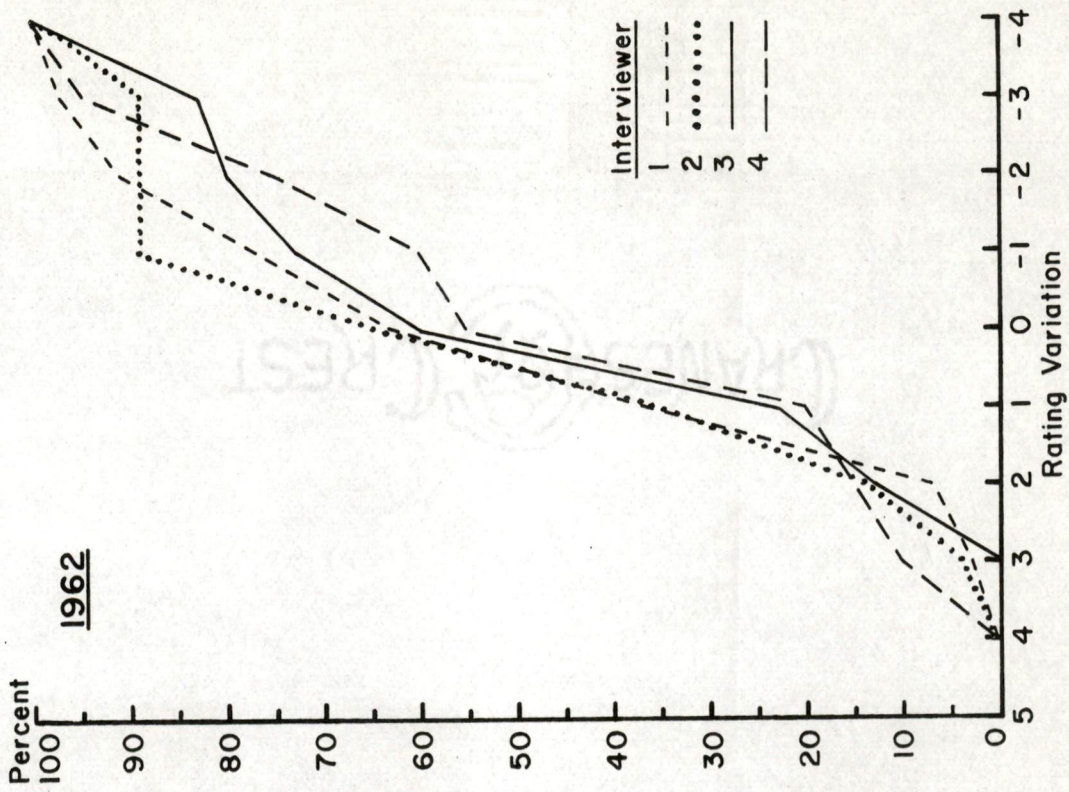


Figure 8. Cumulative per cent variations in respondent ratings of Question 25, 1960 relative to 1962, by interviewer, 1960 and 1962.

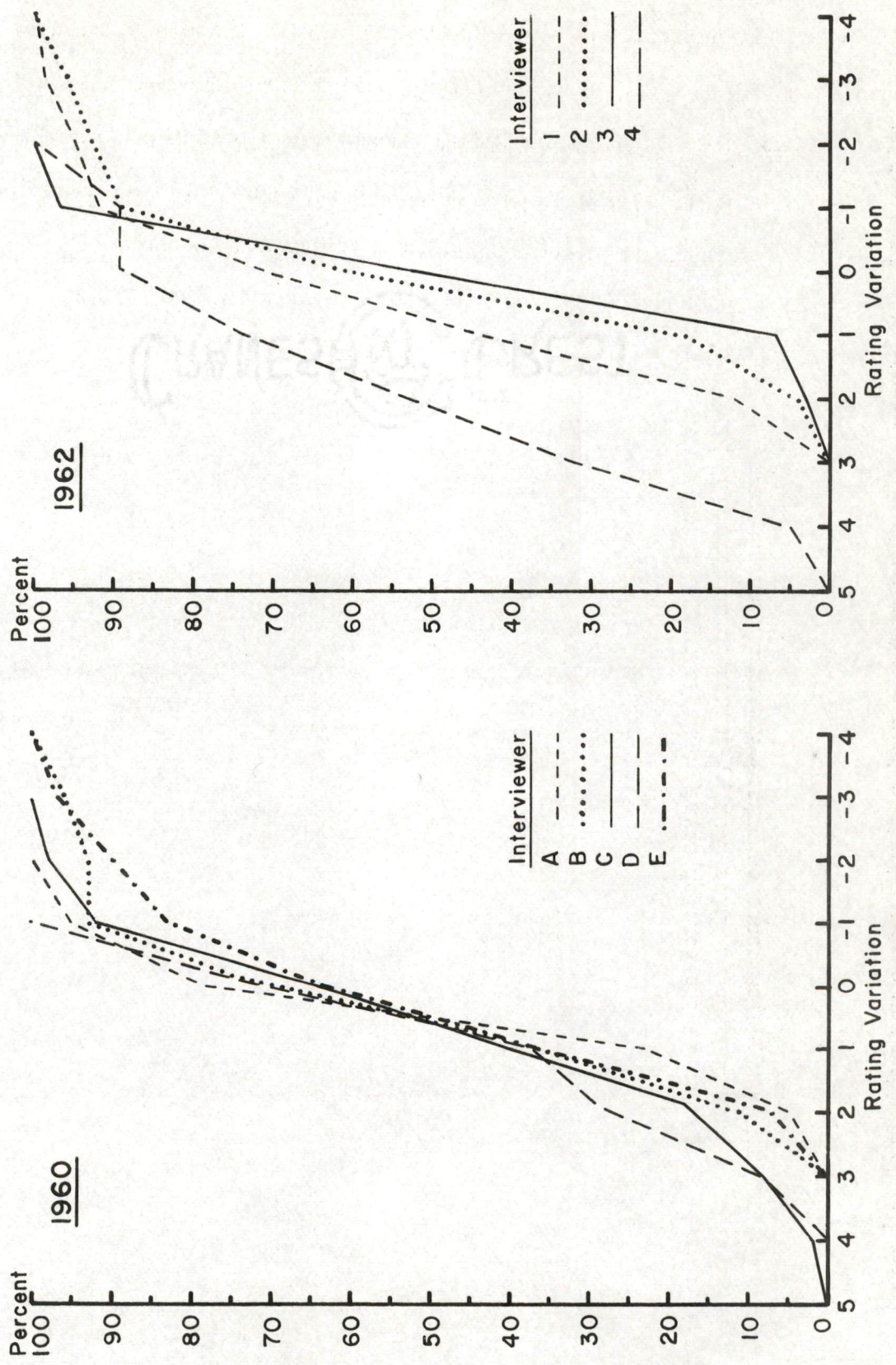


Figure 9. Cumulative per cent variations in respondent ratings of Question 29, 1960 relative to 1962, by interviewer, 1960 and 1962.

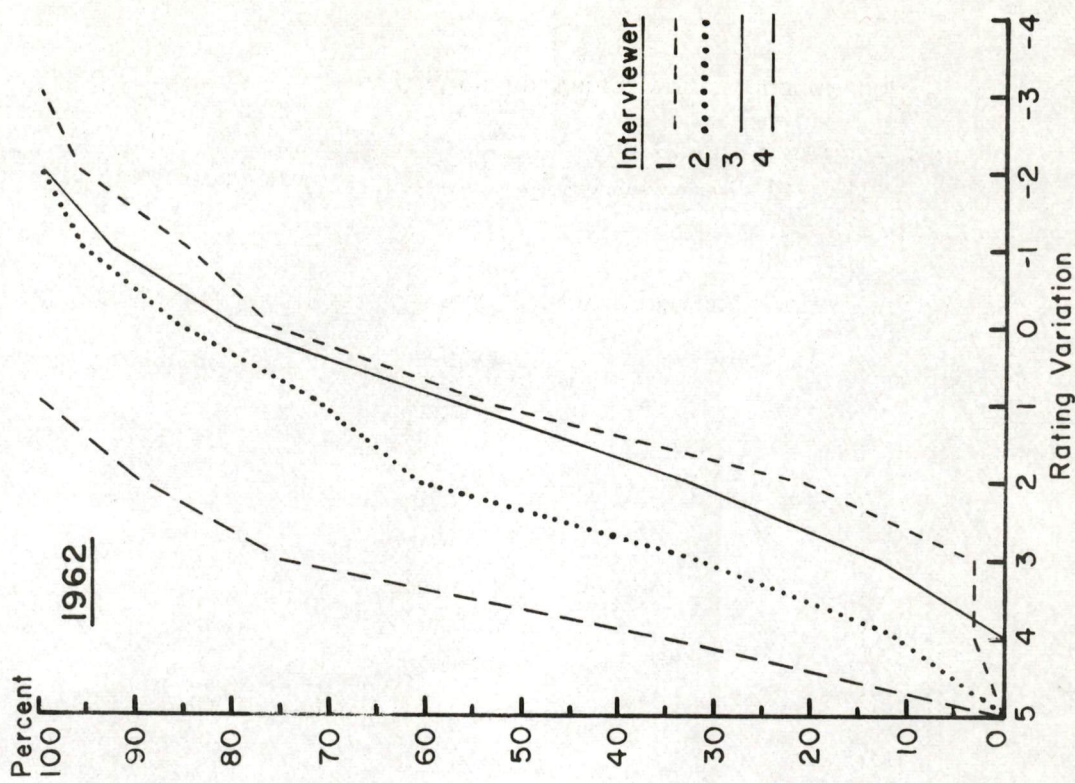
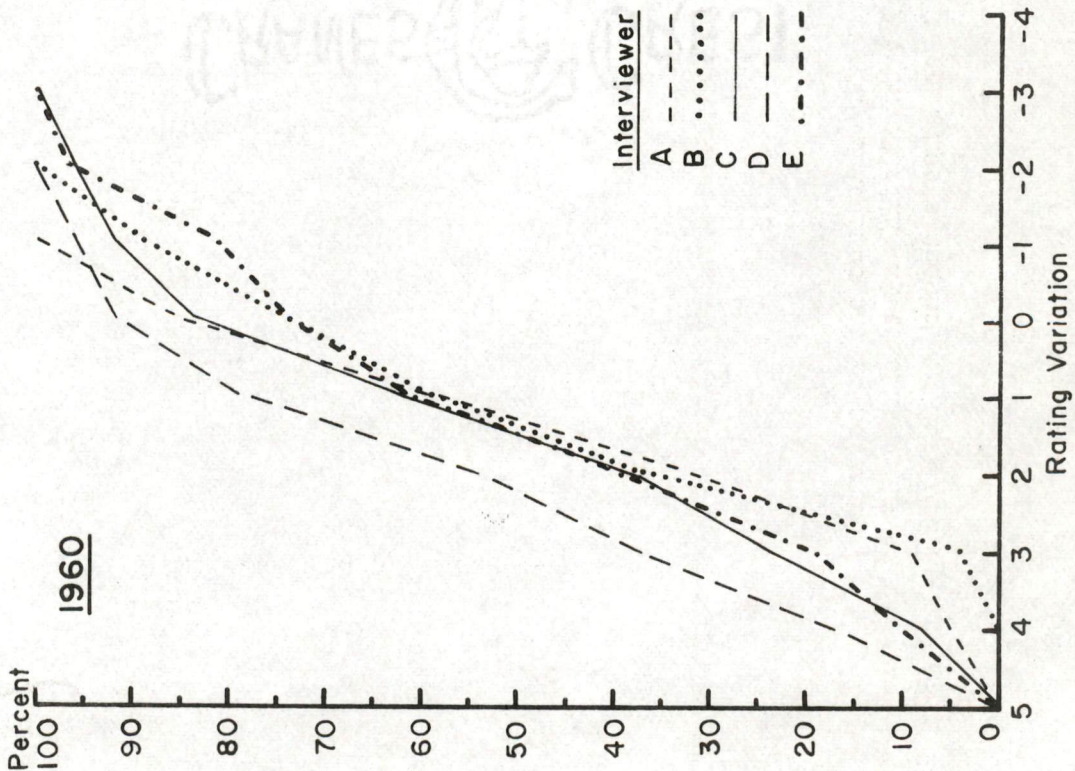


Figure 10. Cumulative per cent variations in respondent ratings of Question 32, 1960 relative to 1962, by interviewer, 1960 and 1962.

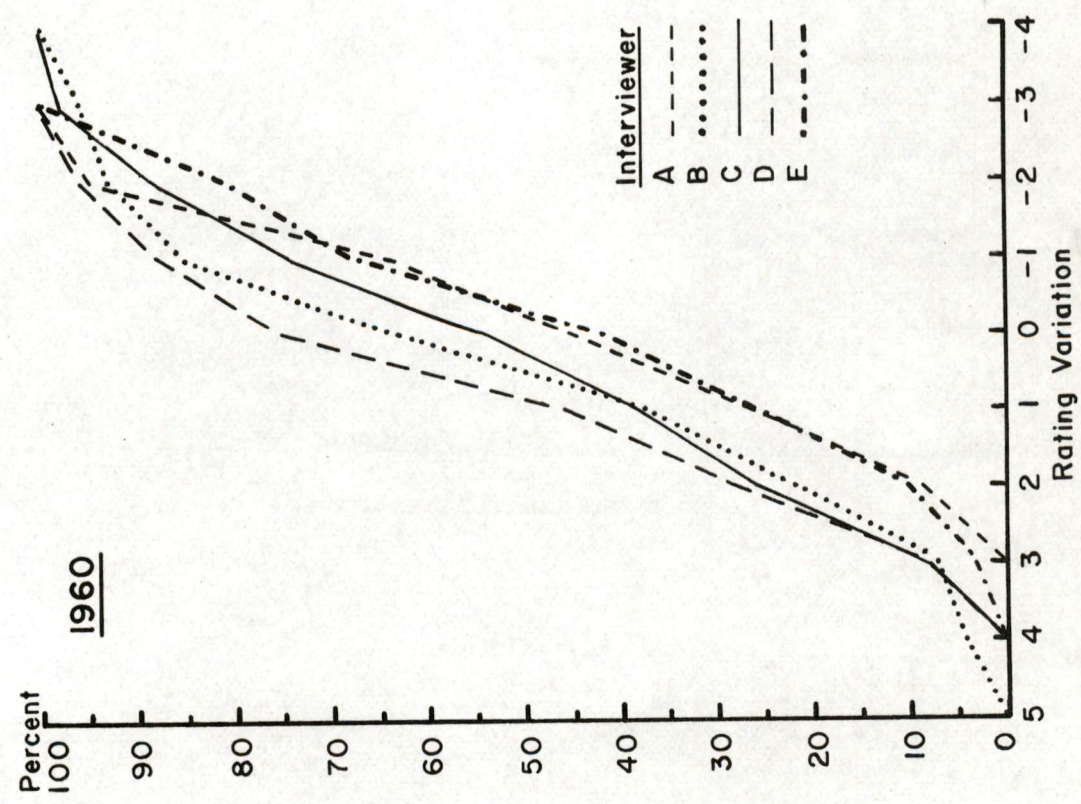
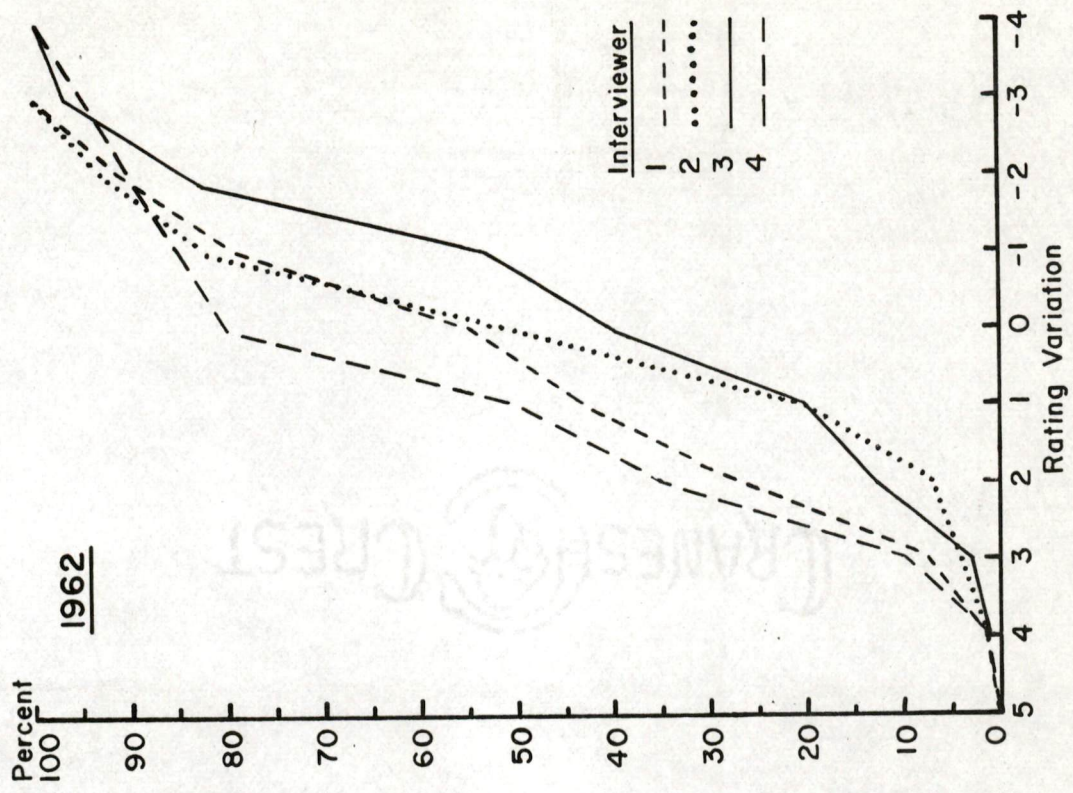


Figure 11. Cumulative per cent variations in respondent ratings of Question 36, 1960 relative to 1962, by interviewer, 1960 and 1962.

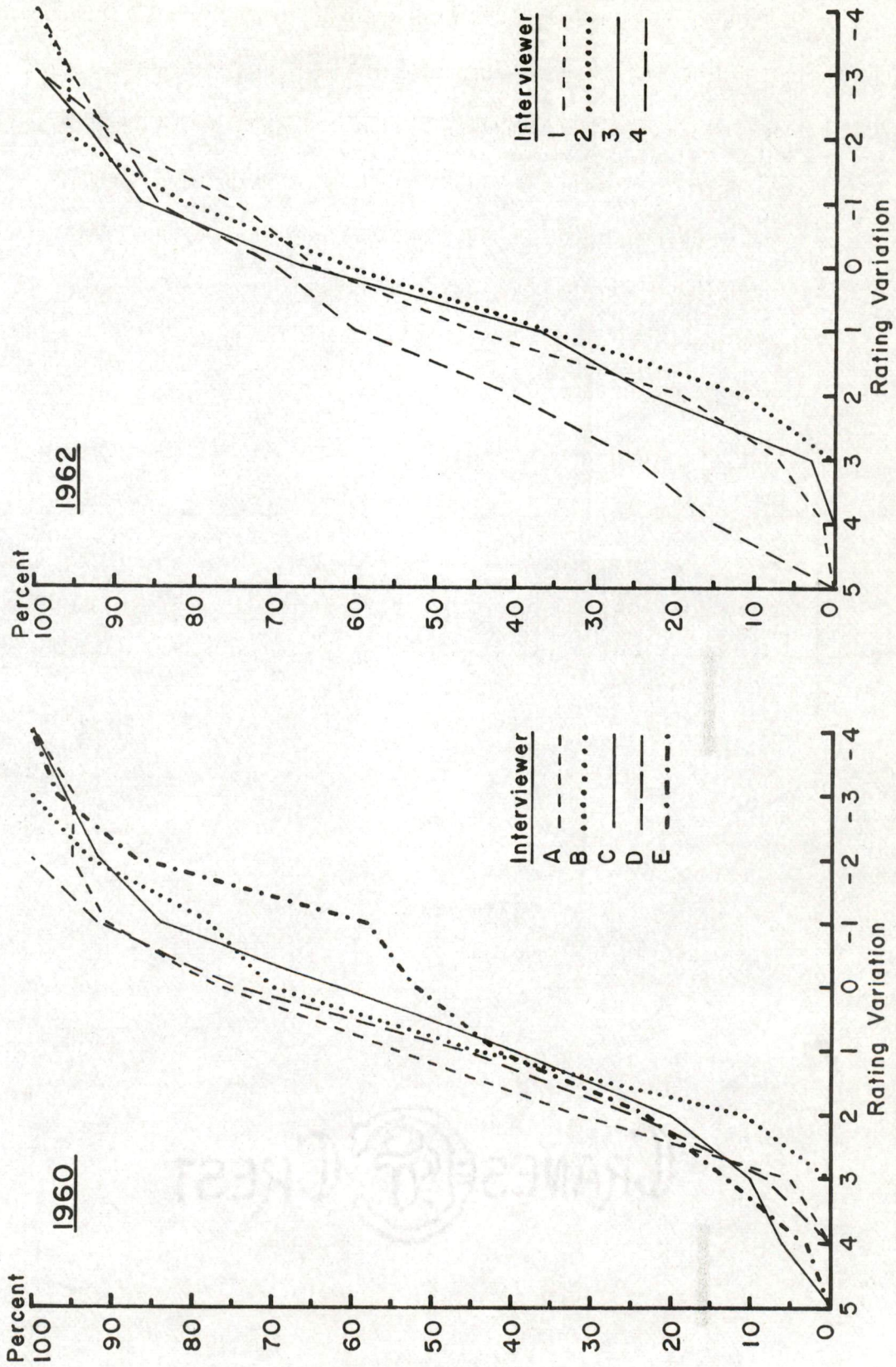


Figure 12. Cumulative per cent variations in respondent ratings of Question 38, 1960 relative to 1962, by interviewer, 1960 and 1962.



a particular question. It should be kept in mind that in 1962 an entirely different group of interviewers was employed. The same 40 "values" questions and the same respondents were included in both the 1960 and 1962 survey.

The right side of each figure shows the cumulative distribution of the rating variations received by each individual interviewer in 1962 to a particular question from the ratings respondents gave that question in 1960.

Ten of the 40 "values" questions were selected for the graphic presentation in Figures 3-12. Four of these ten questions were deliberately chosen because of certain characteristics they possessed. The means of the variations in ratings to questions 6 and 32 were beyond the critical limits. The means of the variations in ratings to questions 1 and 36 were the nearest to the mean of the means of the variations in ratings to all 40 "values" questions. The first two questions were most extreme and the last two were least extreme with reference to their means of rating variations. The distributions of the rating variations to the 10 questions selected show some distinct differences between the interviewers. The cumulative distribution in rating variations received by the 1960 interviewers will be examined first.

#### The 1960 Interviewers

It may be seen that the line representing the rating variations received by Interviewer A tended to be to the left of similar lines

for the other 1960 interviewers. This tendency is most marked in Figures 4, 6, 7, 8 and 12.

The line representing the rating variations received by Interviewer B tended to be to the left of similar lines for the other 1960 interviewers.

The distributions of the rating variations received by Interviewer C did not deviate greatly from those of the other interviewers. This is evident by the tendency for the cumulative distribution in rating variations received by Interviewer C to be centrally located with respect to the variations received by the other 1960 interviewers.

The distributions of the rating variations received by Interviewer D were either centrally located or to the left in seven out of the 10 questions represented in Figures 3-12. The rating variations received by the four other 1960 interviewers were further to the right on the rating variation scale in most instances, compared to Interviewer D. A notable exception to this may be seen in Figure 7, page 24.

Interviewer E received ratings to the ten questions which were generally to the right of the ratings received by Interviewers A, B, C and D.

#### The 1962 Interviewers

The cumulative distribution of rating variations received by the 1962 interviewers will now be examined. It should be remembered from Figure 2, page 13, that the negative rating variations represent higher ratings in 1962 to that particular question than it received in 1960 by the same respondent.

Interviewer 1 in 1962 had the distinction of interviewing the greatest number of respondents (76). Because of the large number of respondents interviewed by Interviewer 1, the cumulative per cent of rating variation line for Interviewer 1 was smoother than the lines for some of the others. The cumulative distribution of rating variations received by Interviewer 1 tended to be centrally located with respect to the three other 1962 interviewers.

The cumulative distribution of rating variations received by Interviewer 2 tended to be to the left throughout the 10 questions (Figures 3-12).

The cumulative distribution of rating variations received by Interviewer 3 were to the right in all ten questions with the possible exception of Question 10 (Figure 6) which shall be mentioned later in an examination of special instances.

The cumulative distribution of rating variations received by Interviewer 4 were in most instances to the left in comparison to the ratings received by Interviewers 1, 2, and 3.

In Figure 5, Question 6, it may be seen that the cumulative distribution of rating variations are widely separated in the case of both the 1960 and 1962 interviewers. There is cause to suspect that Question 6 was not clearly understood by the respondents due to the wide fluctuation in the ratings given it.

Figure 6, Question 10, shows an unusual cumulative distribution of rating variations with respect to Interviewer 3 in 1962. Approximately 3 per cent of the respondents who were asked Question 10 by Interviewer

3 rated Question 10 lower than they did in 1960. Since Interviewer 3 interviewed 30 respondents, only one of these respondents rated Question 10 lower in 1962 than in 1960. Except for Interviewer 3, the cumulative distribution of rating variations to Question 10 received by the other 1962 interviewers were clustered together rather closely. The cumulative distribution of rating variations received by the 1960 interviewers to Question 10 were widely separated.

It may be seen from Figures 3-12 that the lines representing the cumulative distributions of the rating variations (in per cent) are more widely separated in some cases than in others. While such differences are apparently great, there may be some question as to whether there were significant differences between the rating variations received by the interviewers in a particular year (either 1960 or 1962). This question cannot be answered with any degree of confidence simply by a visual inspection of Figures 3-12. A statistical test is needed to determine when significant differences occur between the cumulative distribution of the rating variations received by the interviewer in a given year. The next section is devoted to such a test. For the sake of brevity only ten of the 40 "values" questions were included in the section just concluded. The statistical methods employed in the following section will be applied to all 40 of the "values" questions.

## II. THE CHI-SQUARE TEST OF SIGNIFICANT DIFFERENCE BETWEEN INTERVIEWERS IN TIME PERIODS ONE AND TWO

The chi-square test of significant difference was used to find which questions received rating variations which were significantly different with respect to the interviewers in a given time period. This test was used to determine whether the frequency distribution of the rating variations received by the interviewers differed significantly from the frequencies which might have been expected by chance in a table of critical chi-square values. The .05 level was the level of significance accepted.

The 1960 interviewers are examined first. Table I shows the calculated chi-square values for the rating variations received by the 1960 interviewers to each of the 40 "values" questions. It may be seen in Table III, Question 1, that 11 per cent of the positive (higher) rating variations were received by Interviewer A. Interviewer A was also responsible for collecting 18 per cent of the negative rating variations to Question 1.

There is one point that should be clarified concerning the data in Tables III and IV. It may be seen in Tables III and IV that in some cases the category of "no chance" (zero) in the rating variations was included in the higher category and in some cases in the lower category. Since nine columns of numbers cannot be divided directly in the center, the zero grouping was included on the side where it was needed to insure that the theoretical frequency in each cell would be greater than five. Thus, the higher or lower categories are not in

TABLE III

FARMERS' RATINGS OF 40 "VALUES" QUESTIONS IN 1960 RELATIVE TO THEIR RATINGS OF THE SAME QUESTIONS IN 1962, BY 1960 INTERVIEWERS

Question	1960 rating relative to 1962	1960 interviewers					Total per cent	N	Chi square	d.f.	p
		Per cent									
		A	B	C	D	E					
1	Higher* Lower	11 18	17 19	32 34	18 13	22 16	100 100	(88) (68)	2.466	4	> .05
2	Higher Lower*	18 12	27 12	34 31	10 20	11 25	100 100	(62) (95)	13.040	4	< .05
3	Higher* Lower	15 13	23 10	27 41	15 17	20 19	100 100	(94) (63)	7.182	4	> .05
4	Higher* Lower	13 15	22 11	23 40	19 11	18 23	100 100	(100) (57)	6.878	4	> .05
5	Higher* Lower	17 10	23 10	39 22	9 26	12 32	100 100	(97) (59)	21.776	4	< .05
6	Higher* Lower	9 19	30 7	33 32	17 14	11 28	100 100	(75) (81)	20.031	4	< .05
7	Higher* Lower	12 15	25 14	42 27	16 15	5 29	100 100	(57) (99)	15.012	4	< .05
8	Higher* Lower	17 10	23 10	29 38	14 18	17 24	100 100	(94) (61)	7.793	4	> .05

TABLE III (continued)

Question	1960 rating relative to 1962	1960 interviewers						Total per cent	N	Chi square	d.f.	p
		Per cent										
		A	B	C	D	E	F					
9	Higher Lower*	19 11	12 21	25 37	19 13	25 18	100 100	(53) (102)	5.381	4	> .05	
10	Higher* Lower	15 14	14 22	56 7	9 22	6 35	100 100	(81) (74)	52.074	4	< .05	
11	Higher* Lower	17 7	16 22	30 37	13 20	24 14	100 100	(104) (51)	5.780	4	> .05	
12	Higher* Lower	9 20	21 14	30 36	15 16	25 14	100 100	(85) (70)	6.850	4	> .05	
13	Higher* Lower	13 16	17 19	47 11	6 30	17 24	100 100	(92) (62)	30.393	4	< .05	
14	Higher* Lower	15 14	29 10	26 37	18 13	12 26	100 100	(66) (89)	13.491	4	< .05	
15	Higher Lower*	6 21	21 16	43 23	13 18	17 22	100 100	(68) (86)	12.142	4	< .05	
16	Higher* Lower	15 13	20 14	28 39	12 21	25 13	100 100	(88) (62)	7.076	4	> .05	
17	Higher* Lower	18 8	23 8	39 20	12 23	8 41	100 100	(95) (59)	34.900	4	< .05	

TABLE III (continued)

Question	1960 rating		1962							Total per cent	N	Chi square	d.f.	p
	Higher*	Lower	A	B	C	D	E	F						
18	Higher*	Lower	14	19	39	9	19	100	(99)	11.049	4	< .05		
			15	15	22	27	21	100	(55)					
19	Higher*	Lower	18	30	28	9	15	100	(81)	24.954	4	< .05		
			10	4	37	23	26	100	(73)					
20	Higher*	Lower	22	26	36	9	7	100	(74)	27.541	4	< .05		
			7	10	29	21	33	100	(80)					
21	Higher*	Lower	16	22	34	17	11	100	(98)	14.902	4	< .05		
			11	11	30	12	36	100	(56)					
22	Higher*	Lower	12	21	31	19	17	100	(97)	4.816	4	> .05		
			18	12	35	11	24	100	(57)					
23	Higher*	Lower	15	16	31	21	17	100	(85)	5.737	4	> .05		
			13	19	35	9	24	100	(69)					
24	Higher*	Lower	13	21	30	20	16	100	(76)	4.652	4	> .05		
			15	14	35	12	24	100	(78)					
25	Higher	Lower*	23	14	20	16	27	100	(49)	8.769	4	> .05		
			10	19	39	15	17	100	(105)					
26	Higher*	Lower	17	21	34	15	13	100	(77)	5.845	4	> .05		
			12	14	31	16	27	100	(77)					



TABLE III (continued)

Question	1960 rating relative to 1962		A	B	C	D	E	Total per cent	N	Chi square	d.f.	P
	Higher	Lower*										
27	Higher	Lower*	21	36	20	10	13	100	(56)	28.069	4	< .05
			10	7	10	18	25	100	(98)			
28	Higher	Lower*	8	20	22	18	32	100	(65)	16.826	4	< .05
			20	16	10	13	11	100	(89)			
29	Higher*	Lower	16	18	32	16	18	100	(104)	1.690	4	> .05
			10	16	37	14	23	100	(49)			
30	Higher*	Lower	19	17	28	19	17	100	(77)	6.528	4	> .05
			9	18	38	12	23	100	(77)			
31	Higher	Lower*	16	33	30	13	8	100	(70)	26.739	4	< .05
			13	5	34	18	30	100	(84)			
32	Higher	Lower*	13	16	32	20	19	100	(98)	3.046	4	> .05
			16	20	34	9	21	100	(56)			
33	Higher	Lower*	16	18	27	14	25	100	(51)	1.805	4	> .05
			13	18	35	16	18	100	(102)			
34	Higher	Lower*	15	25	19	17	24	100	(53)	7.865	4	> .05
			14	14	10	14	18	100	(100)			
35	Higher	Lower*	17	27	19	22	15	100	(41)	8.583	4	> .05
			13	14	38	13	22	100	(112)			

TABLE III (continued)

Question	1960 rating relative to 1962	Total						Chi square	d.f.	p
		A	B	C	D	E	per cent			
36	Higher*	12	20	32	21	15	100	7.536	4	> .05
	Lower	17	15	33	?	26	100			
37	Higher*	10	24	32	16	18	100	6.471	4	> .05
	Lower	19	11	33	15	22	100			
38	Higher	18	18	29	16	19	100	1.399	4	> .05
	Lower*	12	17	35	15	21	100			
39	Higher	15	21	24	21	19	100	5.038	4	> .05
	Lower*	13	16	38	12	21	100			
40	Higher*	15	18	29	20	18	100	4.957	4	> .05
	Lower	13	17	38	8	24	100			

\*Includes no difference.

TABLE IV

FARMERS' RATINGS OF 40 "VALUES" QUESTIONS IN 1962 RELATIVE TO THEIR RATINGS OF THE SAME QUESTIONS IN 1960, BY 1962 INTERVIEWERS

Question	1962 rating relative to 1960	1962 interviewers				Total per cent	N	Chi square	d.f.	p
		Per cent								
		1	2	3	4					
1	Higher* Lower	59 35	15 24	10 31	16 10	100 100	(87) (68)	16.277	3	< .05
2	Higher* Lower	51 43	20 16	17 25	12 16	100 100	(112) (44)	1.955	3	> .05
3	Higher* Lower	54 40	22 13	9 36	15 11	100 100	(94) (62)	17.773	3	< .05
4	Higher* Lower	53 43	22 12	11 33	14 12	100 100	(99) (57)	12.110	3	< .05
5	Higher* Lower	54 39	20 17	14 29	12 15	100 100	(96) (59)	6.931	3	> .05
6	Higher* Lower	35 62	35 4	10 28	20 6	100 100	(74) (81)	25.691	3	< .05
7	Higher* Lower	43 53	27 14	12 23	18 10	100 100	(56) (99)	7.533	3	> .05
8	Higher Lower*	48 50	22 16	13 24	17 10	100 100	(64) (90)	5.068	3	> .05

TABLE IV (continued)

Question	1962 rating relative to 1960	1962 interviewers				Total per cent	N	Chi square	d.f.	p
		Per cent								
		1	2	3	4					
9	Higher Lower*	44 53	17 19	33 12	6 16	100 100	(52) (102)	10.636	3	< .05
10	Higher Lower*	44 55	19 18	22 16	15 11	100 100	(81) (73)	1.940	3	> .05
11	Higher Lower*	52 47	14 21	19 20	15 12	100 100	(59) (95)	1.735	3	> .05
12	Higher** Lower	52 46	23 13	4 38	21 3	100 100	(84) (70)	36.491	3	< .05
13	Higher** Lower	53 43	15 21	19 20	13 13	100 100	(92) (61)	1.064	3	> .05
14	Higher** Lower	51 46	24 6	14 30	11 18	100 100	(104) (50)	11.849	3	< .05
15	Higher** Lower	49 51	29 9	13 25	9 15	100 100	(68) (85)	12.097	3	< .05
16	Higher Lower*	58 43	19 20	8 27	15 10	100 100	(59) (90)	8.395	3	< .05
17	Higher** Lower	48 51	19 17	18 22	15 10	100 100	(94) (59)	1.068	3	> .05

TABLE IV (continued)

Question	1962 rating relative to 1960	1962 interviewers				Total per cent	N	Chi square	d.f.	p
		Per cent								
		1	2	3	4					
18	Higher Lower*	53 40	19 16	14 31	14 13	100 100	(98) (55)	7.201	3	> .05
19	Higher Lower*	52 47	20 17	13 23	15 13	100 100	(54) (99)	2.404	3	> .05
20	Higher** Lower	48 50	22 15	14 25	16 10	100 100	(73) (80)	4.725	3	> .05
21	Higher** Lower	50 46	23 11	17 25	10 18	100 100	(97) (56)	5.753	3	> .05
22	Higher Lower*	44 52	26 14	13 23	17 11	100 100	(53) (100)	6.081	3	> .05
23	Higher Lower*	43 52	26 15	14 22	17 11	100 100	(47) (106)	4.092	3	> .05
24	Higher** Lower	47 51	27 10	10 29	16 10	100 100	(75) (78)	12.751	3	< .05
25	Higher** Lower	50 47	19 17	19 20	12 16	100 100	(94) (59)	.519	3	> .05
26	Higher** Lower	44 55	18 18	16 23	22 4	100 100	(76) (77)	12.076	3	< .05

TABLE IV (continued)

Question	1962 rating relative to 1960	1962 interviewers				Total per cent	N	Chi square	d.f.	p
		Per cent								
		1	2	3	4					
27	Higher* Lower	48 50	27 9	7 34	18 7	(83) (70)	24.343	3	< .05	
28	Higher* Lower	61 27	16 24	10 36	13 13	(98) (55)	21.919	3	< .05	
29	Higher* Lower	53 45	16 22	15 29	16 4	(103) (49)	7.877	3	> .05	
30	Higher* Lower	44 55	22 14	21 18	13 13	(76) (77)	2.492	3	> .05	
31	Higher Lower*	41 56	33 6	9 29	17 9	(69) (84)	26.764	3	< .05	
32	Higher Lower*	26 64	28 12	16 22	30 2	(61) (92)	37.318	3	< .05	
33	Higher* Lower	54 43	19 18	15 25	12 14	(84) (68)	2.904	3	> .05	
34	Higher* Lower	53 38	19 13	17 30	11 19	(115) (37)	5.510	3	> .05	
35	Higher* Lower	42 60	27 5	19 21	12 14	(90) (62)	12.337	3	< .05	

TABLE IV (continued)

Question	1962 rating relative to 1960	1962 interviewers				Total per cent	N	Chi square	d.f.	p
		Per cent								
		1	2	3	4					
36	Higher*	50	17	14	19	100	(84)	8.395	3	< .05
	Lower	48	20	26	6	100				
37	Higher*	51	26	4	19	100	(78)	30.756	3	< .05
	Lower	47	10	36	7	100				
38	Higher*	49	17	20	14	100	(100)	.493	3	> .05
	Lower	49	21	19	11	100				
39	Higher	36	29	14	21	100	(63)	16.409	3	< .05
	Lower*	58	11	23	8	100				
40	Higher*	49	25	9	17	100	(93)	23.953	3	< .05
	Lower	48	8	37	7	100				

\*Includes no difference.

the strictest sense higher or lower, depending on which side the "no change" group was included. For purposes of the discussion at this point, the distinction of where the zero point lies for each question will not be mentioned.

The calculated chi-square value for Question 1, Table III, is 2.466. This value is well within the critical chi-square value and is strong grounds for asserting that Question 1 was free from significant bias from the 1960 interviewer.

It may be seen in Table III that significant chi-square values were obtained to 16 of the 40 "values" questions for the 1960 interviewers. The critical value was 9.49. This means that the rating variations given these 16 questions by the respondents in 1960 differed significantly with respect to the individual interviewers in 1960. The 16 questions may be easily located in Table III as those with calculated chi-square values exceeding the critical value of 9.49.

In the preceding section it was pointed out that the rating variations received by a particular interviewer in 1960 tended to occur in the same relative position with respect to the rating variations received by the other 1960 interviewers. It was mentioned in the previous section that the rating variations tended to be toward the extreme right with respect to Interviewer E for the 10 questions examined. This same trend may be seen in Table III. In 30 of the 40 questions, a greater percentage of the rating variations received by Interviewer E were toward the right side of the rating scale.



It was stated in the previous section that the rating variations received by Interviewer B were generally toward the left side of the rating variation scale. Table III shows the same trend continuing throughout the 40 "values" questions. In 30 of the 40 questions, a greater percentage of the rating variations received by Interviewer B were toward the left side than to the right.

In Table IV, the rating variations to the 40 "values" questions received by the 1962 interviewers may be seen. Twenty-one of the forty questions showed significant differences between the ratings received by the 1962 interviewers. The critical chi-square value in Table IV was 7.81.

In the previous section it was pointed out that the rating variations received by Interviewer 1 to the ten selected "values" questions tended to be centrally located with respect to the rating variations received by the other 1962 interviewers. In Table IV it may be seen that in 21 of the 40 questions the rating variations received by Interviewer 1 were higher than the ratings to Question 1 received by the 1960 interviewers. In 18 of the 40 questions the ratings were lower for interviewers in 1962. This is consistent with the central tendency observed for Interviewer 1 in Figures 3-12.

In Table IV, it may be seen that in 30 of the 40 questions the rating variations received by Interviewer 2 were to the left on the rating scale in comparison to the other 1962 interviewers.

In 36 of the 40 questions, the rating variations received by Interviewer 3 were to the right compared to the rating variations received by the rest of the 1962 interviewers.

In Table IV, it may be seen that in 27 of the 40 questions the rating variations received by Interviewer 4 were higher than the ratings these 27 questions received in 1960. This is consistent with the trend in Figures 3-12 in which it may be seen that the cumulative rating variation lines for Interviewer 4 were higher in most instances.

In 1960 the respondents were assigned randomly to all the interviewers who conducted the initial survey. In 1962 the counties were divided into segments and each individual interviewer conducted most of his work within that segment. There were some instances where an interviewer did conduct interviews in all parts of the control and experimental counties. The rating variations show the differences in ratings given to two different interviewers. The result of this was a situation where the rating variations associated with a given interviewer, in the foregoing discussion, may be slightly misleading. For example, in 1962, Interviewer 4 contacted 22 farmers in the southwest corner of White County, Tennessee. In 1960 Interviewers C, D and E were each involved in the survey of this area. Before consistently high or low ratings can be conclusively associated with a particular interviewer, the ratings received by the interviewers of the other time period must be controlled. The next section is devoted to an examination of five of the 40 "values" questions for which such a control technique has been employed.

III. DISTRIBUTION OF THE RATING VARIATIONS OF SELECTED  
"VALUES" QUESTIONS BY 1960 INTERVIEWERS

Tables V through VIII contain the data upon which this discussion is based. The five interviewers of 1960 are examined first. Table V contains the distribution of rating variations received by the 1960 interviewers to five selected "values" questions while controlling upon the ratings received by Interviewer 1 in 1962. Up to this point it was not possible to talk about ratings on the basis of the data presented. The rating variation is defined as the difference in the rating given a particular question by one respondent in one time period and the rating given a question by the same respondent in another time period. By controlling on the interviewer in one time period, the rating variations can be used to show the relative differences in the ratings (as distinct from the rating variations) recorded by the various interviewers in the other time period. In the example above, the differences in the ratings received may be determined for Interviewers A, B, C, D and E.

The rating variations in the tables were divided into "high" and "low" groupings with the cutting point being determined by the specific statistical test to be used. Each interviewer was then taken singly while the others were grouped together. The resulting 2 by 2 table was then tested for significance using either the chi-square test or Fisher's exact test of probability.<sup>3</sup> In cases where the theoretical cell

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<sup>3</sup>Allen L. Edwards, Experimental Design in Psychological Research (New York: Rinehart and Company, Inc., 1950), pp. 84-85.

TABLE V

DISTRIBUTION OF THE RATING VARIATIONS BY 1960  
INTERVIEWERS AND 1962 INTERVIEWER 1

Question	1960 interviewer	Total	Rating variation									
			4	3	2	1	0	-1	-2	-3	-4	
1	A	9				4	2	3				
	B	15		2	4	2	2	3	2			
	C	20		6	3	2	3	5		1		
	D	9		1	1	3	2		1	1		
	E	22		2	1	8	3	3	1	3	1	
	Totals	75		11	9	19	12	14	4	5	1	
3	A	9		1	3	1	1	1	1	1		
	B	15	2	1		1	7	2	2			
	C	20			1	6	4	5	4			
	D	9			2	1	4				2	
	E	23				3	13	2	1	3	1	
	Totals	76	2	2	6	12	29	10	8	6	1	
6	A	9				1	1	1	4	2		
	B	15			2	2	2	4	3	2		
	C	20			2	2	1	2	8	3	2	
	D	9				1	1	1	2	2	2	
	E	23				1		2	5	9	6	
	Totals	76			4	7	5	10	22	18	10	
10	A	9		2	3	1		2	1			
	B	15	1	1	2		2	6	3			
	C	20		6	5	2	6	1				
	D	9				1	1	3	1	2	1	
	E	23			2		1	8	5	5	2	
	Totals	76	1	9	12	4	10	20	10	7	3	
19	A	9		1	3	4		1				
	B	14		2	3	3	5	1				
	C	20		1	1	4	1	9	2	2		
	D	9				2		5	1	1		
	E	23		1		3	4	4	6	5		
	Totals	75		5	7	16	10	20	9	8		

TABLE VI

DISTRIBUTION OF THE RATING VARIATIONS BY 1960  
INTERVIEWERS AND 1962 INTERVIEWER 2

Question	1960 interviewer	Total	Rating variation									
			4	3	2	1	0	-1	-2	-3	-4	
1	A	4			1		1			1	1	
	B	11				1	3	4	1		2	
	C	5		1	1			2	1			
	D	5		1		1	1	1			1	
	E	4				1	1		2			
	Totals	29		2	2	3	6	7	5		4	
3	A	4					4					
	B	11		1	1	4	4	1				
	C	5					2	1	1	1		
	D	5			1		3		1			
	E	4			1				1	1	1	1
	Totals	29		1	3	4	13	2	3	2	2	1
6	A	4				1	1	2				
	B	11	1	4		2	2	2				
	C	5		1		1	1	2			1	
	D	5			1	1	1	1	1			
	E	4		1			1	1	1			
	Totals	29	1	6	1	5	5	8	2		1	
10	A	4			1	1	1	1				
	B	11			2		2	3	3		1	
	C	4	1	2	1							
	D	5					2	2	1			
	E	4					2	2	1		1	
	Totals	28	1	2	4	1	7	6	5		2	
19	A	4				2	1			1		
	B	11	1	2		4	2			2		
	C	4				1	2	1				
	D	5				1	2	1	1			
	E	4					3			1		
	Totals	28	1	2		8	10	2	5			

TABLE VII

DISTRIBUTION OF THE RATING VARIATIONS BY 1960  
INTERVIEWERS AND 1962 INTERVIEWER 3

Question	1960 interviewer	Total	Rating variation								
			4	3	2	1	0	-1	-2	-3	-4
1	A	9					2	3	3		1
	B	2				1			1		
	C	14				1	3	4	2	3	1
	D	3					1	1	1		
	E	2					1			1	
	Totals	30				2	7	8	7	4	2
3	A	9			2		2	3	2		
	B	2				1		1			
	C	14			1	1	1	5	2	2	2
	D	3							1	1	1
	E	2						1		1	
	Totals	30			3	2	3	10	5	4	3
6	A	9							3	3	3
	B	2			1						1
	C	14			1	1	3		2	4	3
	D	3					1		1	1	
	E	2							1		1
	Totals	30			2	1	4		7	8	8
10	A	9					3	5	1		
	B	2		1					1		
	C	14					12	1	1		
	D	3					2	1			
	E	2									2
	Totals	30		1			17	7	3		2
19	A	9			1	2	1	3		1	1
	B	2		1			1				
	C	14			2	1	1	2	4	2	2
	D	3							1		2
	E	2							1	1	
	Totals	30		1	3	3	3	5	6	4	5

TABLE VIII

DISTRIBUTION OF THE RATING VARIATIONS BY 1960  
INTERVIEWERS AND 1962 INTERVIEWER 4

Question	1960 interviewer	Total	Rating variation								
			4	3	2	1	0	-1	-2	-3	-4
1	C	12		3	2	1	2		2	2	
	D	7		1	1	1	1	2	1		
	E	2				1	1				
	Totals	21		4	3	3	4	2	3	2	
3	C	12				3	6	2		1	
	D	7		1			2	3	1		
	E	2					2				
	Totals	21		1		3	10	5	1	1	
6	C	12	1	1		3	2	2	2	1	
	D	6				1	3	2			
	E	2				1	1				
	Totals	20	1	1		3	4	6	4	1	
10	C	12		2	1	2	5	1		1	
	D	6	1			1		2	1	1	
	E	2						1	1		
	Totals	20	1	2	1	3	5	4	2	2	
19	C	12		3	3	1	2	1	1	1	
	D	6		1				4	1		
	E	2					1	1			
	Totals	20		4	3	1	3	6	2	1	

frequencies were less than five but the marginal totals were six or greater, Fisher's test was used. In cases where the theoretical cell frequency was five or greater, the chi-square test was used.

Chi-square values greater than 3.841 were considered significant. Probabilities computed by Fisher's test which were .05 or less were considered significant. In Tables V through VIII it may be seen that certain of the marginal totals are smaller than six. Numbers this low were not tested.

In the case of Interviewer A, there were ten instances in which either the chi-square or Fisher's tests were applied. None were significant at the .05 level. Based on these results, Interviewer A clearly did not differ greatly from the other 1960 interviewers with respect to the ratings received to the five questions in Tables V through VIII.

In two instances the rating variations received by Interviewer A were approaching the .05 level. In Table VII, while controlling on the ratings received by Interviewer 3 in 1962, the ratings received by A were subjected to Fisher's test of probability. With this test we may determine the exact probability that a given distribution or a distribution more extreme will occur. In the instance in Table VII, the exact probability of the occurrence of ratings received by Interviewer A to Question 3 (control on Interviewer 3) was .057. If this value had been .050 or smaller, it would have been considered significant.

The other instance where the ratings received by Interviewer A were approaching a significant difference is also seen in Table VII.



While controlling on the ratings received by Interviewer 3 in 1962, the ratings received by A to Question 6 yielded an exact probability value of .057. This was the same value as in the case just mentioned. However, it may be seen that the ratings were in opposite directions from each other in these two cases.

Where a number of tests of significance can be made, the question arises as to just how many significant distributions might be expected by chance. In these ten instances we would have expected one-half of one case to be significantly different by chance at the .05 level. Since it is impossible to examine half a case, the conclusion is that if in one instance out of the ten a significant difference was noted between Interviewer A and the other 1960 interviewers, Interviewer A would be considered significantly different from the other 1960 interviewers.

In the case of Interviewer B, there were ten instances in which the statistical tests were applied and in three of these instances the ratings received by Interviewer B were significantly different from the ratings received by the other 1960 interviewers. In all three cases the ratings received by B were further to the left on the rating variation scale than the ratings received by the other 1960 interviewers. Interviewer B clearly did differ significantly from the other 1960 interviewers with respect to the ratings received to the five questions in Tables V through VIII. The conclusion is that Interviewer B did in fact have some influence upon the ratings recorded.

Question 10 in Tables V, VII and VIII shows that the ratings received by Interviewer C were significantly different from the other 1960 interviewers. In these three instances the ratings were toward the left. In Table VI, where Interviewer 2 is controlled upon, the ratings received by Interviewer C were toward the left but not significantly so. In the case of Interviewer C there were 15 instances in which the statistical tests were applied. In four of these instances the ratings recorded by Interviewer C differed significantly from the ratings recorded by the other 1960 interviewers. Interviewer C clearly differed significantly from the other 1960 interviewers with respect to the ratings given the five questions being examined. The conclusion is that Interviewer C had a significant influence upon the ratings recorded.

In the case of Interviewer D there were ten instances in which the statistical test was applied and in none of these instances did the ratings recorded by Interviewer D differ significantly from the ratings received by the other 1960 interviewers. The conclusion is that Interviewer D did not have a significant influence upon the ratings given.

In the case of Interviewer E there were five instances in which the statistical tests were applied. In two of these instances the ratings received by Interviewer E were significantly different from the ratings the other 1960 interviewers received. In these two cases the ratings were toward the right on the rating variation scale. Interviewer E clearly differed significantly from the other 1960 interviewers with respect to the ratings received to the five questions in Tables V

through VIII. The conclusion is that Interviewer E had a significant influence upon the ratings he recorded.

#### IV. DISTRIBUTION OF THE RATING VARIATIONS OF SELECTED "VALUES" QUESTIONS BY 1962 INTERVIEWERS

The previous section was concerned with the influence, if any, the 1960 interviewers had on the ratings farmers gave five selected "values" questions from the 40 questions presented in the appendix. This section is concerned with the 1962 interviewers and the influence, if any, they had on the ratings the same farmers gave to the same question in 1960. There were five interviewers for the 1960 survey whereas in the 1962 survey four were employed.

Tables IX through XIII contain the data upon which this discussion is based. These tables contain the distributions of ratings received by the 1962 interviewers to the same five questions examined in the previous section except that in this section the ratings received by the 1960 interviewers are controlled upon. In this manner it was possible to find out if the 1962 interviewers had any influence upon the ratings received.

It was mentioned previously that Interviewer 1 of 1962 had the distinction of interviewing the greatest number of farmers. For this reason the marginal totals were large enough to permit statistical examination and be relatively confident of the results obtained. There were twenty-five instances in Tables IX through XIII in which either Fisher's exact test of probability or the chi-square test could be

TABLE IX  
 DISTRIBUTION OF THE RATING VARIATIONS BY 1962  
 INTERVIEWERS AND 1960 INTERVIEWER A

Question	1962 interviewer	Total	Rating variation									
			4	3	2	1	0	-1	-2	-3	-4	
1	1	9				4	2	3				
	2	4			1		1		1	1		
	3	9					2	3	3		1	
	Totals	22			1	4	5	6	4	1	1	
3	1	9		1	3	1	1	1	1	1		
	2	4					4					
	3	9			2		2	3	2			
	Totals	22		1	5	1	7	4	3	1		
6	1	9				1	1	1	4	2		
	2	4				1	1	2				
	3	9							3	3	3	
	Totals	22				2	2	3	7	5	3	
10	1	9		2	3	1		2	1			
	2	4			1	1	1	1				
	3	9					3	5	1			
	Totals	22		2	4	2	4	8	2			
19	1	9		1	3	4		1				
	2	4				2	1		1			
	3	9			1	2	1	3		1	1	
	Totals	22		1	4	8	2	4	1	1	1	

TABLE X

DISTRIBUTION OF THE RATING VARIATIONS BY 1962  
INTERVIEWERS AND 1960 INTERVIEWER B

Question	1962 interviewer	Total	Rating variation								
			4	3	2	1	0	-1	-2	-3	-4
1	1	15		2	4	2	2	3	2		
	2	11				1	3	4	1	2	
	3	2				1			1		
	Totals	28		2	4	4	5	7	4	2	
3	1	15	2	1		1	7	2	2		
	2	11		1	1	4	4	1			
	3	2				1		1			
	Totals	28	2	2	1	6	11	4	2		
6	1	15			2	2	2	4	3	2	
	2	11	1	4		2	2	2			
	3	2			1						1
	Totals	28	1	4	3	4	4	6	3	2	1
10	1	15	1	1	2		2	6	3		
	2	11			2		2	3	3	1	
	3	2		1					1		
	Totals	28	1	2	4		4	9	7	1	
19	1	14		2	3	3	5	1			
	2	11	1	2		4	2		2		
	3	2		1			1				
	Totals	27	1	5	3	7	8	1	2		

TABLE XI  
 DISTRIBUTION OF THE RATING VARIATIONS BY 1962  
 INTERVIEWERS AND 1960 INTERVIEWER C

Question	1962 interviewer	Total	Rating variation								
			4	3	2	1	0	-1	-2	-3	-4
1	1	20		6	3	2	3	5		1	
	2	5		1	1			2	1		
	3	14				1	3	4	2	3	1
	4	12		3	2	1	2		2	2	
	Totals	51		10	6	4	8	11	5	6	1
3	1	20			1	6	4	5	4		
	2	5					2	1	1	1	
	3	14			1	1	1	5	2	2	2
	4	12				3	6	2		1	
	Totals	51			2	10	13	13	7	4	2
6	1	20			2	2	1	2	8	3	2
	2	5		1		1		2		1	
	3	14			1	1	3		2	4	3
	4	12	1	1		3	2	2	2	1	
	Totals	51	1	2	3	7	6	6	12	9	5
10	1	20		6	5	2	6	1			
	2	4	1	2	1						
	3	14					12	1	1		
	4	12		2	1	2	5	1		1	
	Totals	50	1	10	7	4	23	3	1	1	
19	1	20		1	1	4	1	9	2	2	
	2	4				1	2	1			
	3	14			2	1	1	2	4	2	2
	4	12		3	3	1	2	1	1	1	
	Totals	50		4	6	7	6	13	7	5	2

TABLE XII  
 DISTRIBUTION OF THE RATING VARIATIONS BY 1962  
 INTERVIEWERS AND 1960 INTERVIEWER D

Question	1962 interviewer	Total	Rating variation								
			4	3	2	1	0	-1	-2	-3	-4
1	1	9		1	1	3	2		1	1	
	2	5		1		1	1	1		1	
	3	3				1	1	1	1		
	4	7		1	1	1	1	2	1		
	Totals	24		3	2	5	5	4	3	2	
3	1	9			2	1	4			2	
	2	5			1		3		1		
	3	3							1	1	1
	4	7		1			2	3	1		
	Totals	24		1	3	1	9	3	3	3	1
6	1	9				1	1	1	2	2	2
	2	5			1	1	1	1	1		
	3	3					1		1	1	
	4	6					1	3	2		
	Totals	23			1	2	4	5	6	3	2
10	1	9				1	1	3	1	2	1
	2	5					2	2	1		
	3	3					2	1			
	4	6	1			1		2	1	1	
	Totals	23	1			2	5	8	3	3	1
19	1	9				2		5	1	1	
	2	5				1	2	1	1		
	3	3							1		2
	4	6		1				4	1		
	Totals	23		1		3	2	10	4	1	2

TABLE XIII

DISTRIBUTION OF THE RATING VARIATIONS BY 1962  
INTERVIEWERS AND 1960 INTERVIEWER E

Question	1962 interviewer	Total	Rating variation								
			4	3	2	1	0	-1	-2	-3	-4
1	1	22		2	1	8	3	3	1	3	1
	2	4				1	1		2		
	3	2					1			1	
	4	2				1	1				
	Totals	30		2	1	10	6	3	3	4	1
3	1	23				3	13	2	1	3	1
	2	4			1				1	1	1
	3	2						1		1	
	4	2					2				
	Totals	31			1	3	15	3	2	5	2
6	1	23				1		2	5	9	6
	2	4		1			1	1	1		
	3	2							1		1
	4	2					1	1			
	Totals	31		1		1	2	4	7	9	7
10	1	23			2		1	8	5	5	2
	2	4					2		1	1	
	3	2									2
	4	2						1	1		
	Totals	31			2		3	9	7	6	4
19	1	23		1		3	4	4	6	5	
	2	4					3		1		
	3	2							1	1	
	4	2					1	1			
	Totals	31		1		3	8	5	8	6	



applied. Six of the twenty-five instances were significantly different. Each of the five questions had one instance which was significantly different. In Table X there were two instances in which the ratings recorded by Interviewer 1 were significantly different. The ratings recorded by Interviewer 1 were toward the right in all the cases which were significantly different except in Question 6, Table XIII. In that instance the rating was toward the left. Based on these results, Interviewer 1 differed significantly from the other 1962 interviewers with respect to the ratings recorded. The conclusion is that Interviewer 1 did influence the ratings given these selected questions in 1962.

In the case of Interviewer 2, of the five instances in which the statistical tests were applied, Interviewer 2, Question 3, showed a significant difference to the left. The ratings received by Interviewer 2 were generally toward the left on the rating variation scale. This is consistent with the trend in Figures 3 through 12 (pages 20-29) regarding the cumulative per cent of rating variation lines for Interviewer 2. Interviewer 2 differed significantly from the other 1962 interviewers with respect to the ratings given the five questions being examined. The conclusion is that Interviewer 2 did, in fact, have a significant biasing influence on the ratings to the five questions being examined in Tables IX through XIII.

In the case of Interviewer 3, of the ten instances in which statistical tests of significance were made, six of these instances yielded a significant difference with respect to the ratings received by Interviewer 3. The ratings were to the right in every instance. This

is consistent with the trend in Figures 3-12 regarding the cumulative per cent of rating variation lines for Interviewer 3. Interviewer 3 differed significantly from the other 1962 interviewers with respect to the ratings received to the five questions in Tables IX through XIII. The conclusion is that Interviewer 3 exerted a significant biasing effect on the five questions being examined.

There were ten instances in which statistical tests were made in the case of Interviewer 4. Two of these instances yielded significant differences in the ratings. The ratings in both of these instances were toward the left and may be seen in Table XI, Questions 6 and 19. This is consistent with the trend in Figures 3-12 regarding the cumulative per cent of rating variation lines for Interviewer 4. Interviewer 4 differed significantly from the other 1962 interviewers in the ratings he received to the five questions. The conclusion is that Interviewer 4 did, in fact, have significant biasing influence upon the ratings to the five questions in Tables IX through XIII.

## CHAPTER III

### SUMMARY AND CONCLUSIONS

Interviewer bias is a concern of many researchers. This thesis has been concerned with an investigation of interviewer bias. Data used in this thesis were collected through interviews with 189 corn growers selected at random in Bradley and White Counties, Tennessee. The data upon which this thesis is based were obtained from one section of the interview schedule. The questions contained in this section are included in the appendix to this thesis. This section was comprised of 40 questions which were designed to measure the "value" orientations of the farmers interviewed with respect to certain major decisions in corn production. The 189 farmers were asked to rate the importance of these 40 "values" questions from zero to four, depending on the intensity of the farmers' feelings to the question. The differences between the ratings these same farmers gave these questions at two points in time were the basis for this study. These differences were called "rating variations."

The chi-square "goodness of fit" test was used to see if the observed distribution of the means of the variations in ratings to the 40 "values" questions at the two points in time was normal. It was found that the distribution of the means was normal. The mean of the means of the rating variations (-.161) was not very different from zero. This is an indication that the ratings the respondents gave the 40

"values" questions in the second time period were not, on the average, very different from the ratings given the questions in the first time period.

The graphic presentation of the cumulative per cent distribution of the rating variations to 10 of the 40 questions, given in Figures 3-12 (pages 20-29), showed each interviewer to be associated with the variations in a systematic way. By chance, assuming no interviewer bias, we would have expected no consistent repetition in the location of these lines.

The per cent distribution of the variations by 1960 interviewer were examined first. It was found that Interviewer E was associated with ratings more frequently toward the right while Interviewer A was associated with ratings toward the left on the rating variation scale. The cumulative per cent rating variation lines of Interviewer B, C and D tended to be more centrally located on the rating variation scale than either Interviewer A or E of 1960.

The cumulative per cent distribution of the rating variations by 1962 interviewer were also examined. It was found that the lines for Interviewers 2 and 4 were toward the left, the lines for Interviewer 1 were centrally located and the lines for Interviewer 3 were toward the right in most instances.

The graphic presentation merely showed the trends of the rating variations associated with each individual interviewer. In order to find if the rating variations were significantly different by interviewer the chi-square test was used. It was found that significant

chi-square values were obtained in 16 of the 40 "values" questions for the 1960 interviewers (at the .05 level of significance). In the case of the 1962 interviewers, 21 significant chi-square values were obtained.

Finally, the actual ratings received by the interviewers in one time period were controlled upon to show the relative differences in the ratings recorded by the various interviewers in the other time period. The rating variations for five of the 40 questions were arranged in tabular form. The rating variations in the tables were divided into "high" and "low" groupings. The resulting 2 by 2 tables were tested for significant difference, by interviewer, using either the chi-square test or Fisher's test. Using these tests it was found that Interviewer A did not differ significantly from the other 1960 interviewers. Interviewers B, C and E differed significantly from each other and the other 1960 interviewers.

An examination of the rating variations in the case of the four 1962 interviewers revealed significant differences for each with respect to the five questions examined. By employing the control technique it was possible to determine which interviewers were biasing the results and in which direction.

In conclusion, it is necessary to point out that, even though significant interviewer's bias does exist in many of the 40 "values" questions, it does not necessarily follow that this bias is large. However, the systematic occurrence of the interviewer bias is an indication that the interviewers were, in fact, influencing the ratings to the 40 "values" questions.

On the basis of the findings of this study, it is difficult to explain what was responsible for these "influences," what impact they might have on generalizations made from the data or how they might be eliminated in future research. On the basis of this study, it is only possible to suggest reasons for the bias and recommend ways in which such bias can be reduced in future studies.

Time did not permit the completion of a pre-testing of the schedule used in this survey. The use of a pre-test will allow the researcher to make comparisons of early findings of a survey and detect which interviewers appear to be biasing the results. In this manner the interviewers not only receive a good "practice run" at taking interviews but it is possible to find readily in a study where bias might be coming from and steps to correct it taken.

In some instances the interviewers reported the necessity to repeat a question to a farmer. This writer, who was also one of the interviewers, found that it was necessary to re-state a question quite often for the farmer to be sure it was understood. The re-stating process often was done with "in other words, Mr. Farmer" as a prefix to the re-stated question. It is entirely possible that interviewer bias could have been inserted at this point due to individual differences in the exact way the questions were restated.

The writer found that farmers were reluctant to rate the exact intensity of their feeling of the importance of each values question. Farmers would often prefer to give verbal responses rather than the exact rating value. It was necessary to make it clear to these farmers

that numbered ratings were desired and not verbal responses. A card with the meaning of each degree of rating was given each farmer to help him choose the response which most nearly represented the intensity of his feeling on a given question. Cahalan suggested that this type of question, "would tend to permit the interviewer to project his own feeling of intensity in helping the uncertain respondent to classify his emotional involvement."<sup>1</sup>

In future research in the methods of measuring farmers' value orientations it is possible that interviewer bias could be reduced by using a forced choice type of question similar to that used by Ramsey in the New York study. The necessity for shortening the number of values areas would become apparent with this type of question. However, it would seem that quality of research data is more valuable than quantity.

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<sup>1</sup>Don Cahalan, Valerie Tamulonis and Helen W. Verner, "Interview Bias Involved in Certain Types of Opinion Survey Questions," International Journal of Opinion and Attitude Research, 1:71, 1947.

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**APPENDIX**

Department of Agricultural Economics and Rural Sociology

University of Tennessee

Summer 1962

CORN PRODUCTION PRACTICES STUDY

(portion of schedule)

In your answer to one of the first questions I asked, you indicated that you plan to grow a certain number of acres of corn for ear corn next year. This represents a decision you have made. People differ in the things they consider in reaching a decision and I would like for you to indicate on this little column (SHOW HIM CARD) how important each of the following is when you are deciding how much ear corn to grow.

1. How important is the amount of labor (family and hired) that you expect to have available?
2. How important is the availability of a tractor?
3. How important is the availability of a corn picker?
4. How important a factor is the amount of time it's going to take to work and harvest the corn?
5. How important is the size of the cash outlay you would have to make for seed, fertilizer, and fuel or feed?
6. How important is the kind of weather you expect to have during the growing season (from almanac or other sources)?

7. How important is the market price for corn that you expect (anticipate) at harvest time?
8. How important is the amount of energy you would have to put out to make the crop?
9. How important are the feed requirements of your livestock?
10. How important is the amount of cash you may get for it?
11. How important is the number of acres of cropland available to you?
12. How important is the number of acres of corn your friends and neighbors grow?
13. How important is the amount of money you might have to borrow to grow the corn?
14. How important is the fertility (productivity) of the soil where you grow your corn?
15. How important is the extent to which the corn production will interfere with other things you like to do, such as go fishing, hunting, talking with friends at the store, etc.?

Now, using the same little scale, how important is each of the following when you are deciding how many bushels of corn per acre to try to get?

16. How important is the size of the yield you got last year?
17. How important is the extra cash you might make through a higher yield?
18. How important is the extra cash outlay you would have to make for seed and fertilizer to get a higher yield?

19. How important is the extra time and care it would take to get a higher yield?
20. How important is the availability of labor which you could count on to follow your instructions exactly?
21. How important is the natural fertility of the soil where you grow your corn?
22. How important is the kind of yield your friends and neighbors are getting?
23. How important is the kind of yield the most successful farmers in the county are getting?
24. How important is the seed and fertilizer salesman's talk about the yields obtained with the seed or fertilizer he sells?
25. How important is the need to get as much as you can from the limited acreage available to you?
26. How important is the yield obtained from corn demonstrations in this county?
27. How important is the extra effort that would be required on your part to get a higher yield?

Now, I would like to know how important each of the following is when you are deciding what kind of fertilizer (brand) to buy.

28. How important is the past experience you have had with a particular kind of fertilizer?
29. How important are the physical characteristics (drillability) of the fertilizer?

30. How important is the fertilizer dealer's or co-op manager's recommendation of a particular kind of fertilizer?
31. How important is the kind of equipment you have to spread the fertilizer?
32. How important is the weight of the bags it comes in?
33. How important is the cost per bag?
34. How important is the analysis of the fertilizer?
35. How important is the cost per unit of plant food?
36. How important is the brand of the fertilizer?
37. How important is the kind of fertilizer your friends and neighbors use?
38. How important is the kind of fertilizer the dealer happens to carry (or have on hand)?
39. How important is what you read in farm papers and magazines?
40. How important is what advertisements say about fertilizer?