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Tests of Bivariate Hypotheses Relating Characteristics of International Organizations to Interorganizational Relations

by

L. Julian Efird*

The World Food Conference of 1974 established almost universal agreement that global problems do exist in reference to hunger and malnutrition (UN-ECOSOC, 1974). Some proposals for action were adopted by the conference and later approved by the United Nations General Assembly in an effort to combat these problems. The program of action was summarized in a "Universal Declaration on the Eradication of Hunger and Malnutrition" proclaiming that "Every man, woman and child has the inalienable right to be free from hunger and malnutrition in order to develop fully and maintain their physical and mental faculties" (UN-ECOSOC, 1974: 55).

Three categories of action emerged from the World Food Conference: agricultural development, food security, and coordination. Although much research was directed by the Conference Secretariat toward documenting problems associated with agricultural development and food security, comparatively little effort was made to consider the organizational dimension of world food problems (FAO, 1974a; 1974b; 1974c). Documentation dealt with design of new international bodies rather than an analysis of existing ones. The apparent neglect of the organizational domain by those responsible for research on world food problems served as one reason for undertaking the present study.

Earlier research revealed international food organizations included a wide range of organizational entities; some large, but most small in terms of staff and money; some egalitarian, but many restrictive in terms of participating countries; some representing exclusively poor and developing countries, but many other associations available for organizing rich countries (Efird, 1976).

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This study involves a degree of methodological thoroughness that requires a more extensive publication than many journals can provide. It represents a multi-method, multi-statistical analysis of a particular problem — the relationship between organizational characteristics and interaction with other associations. In many ways it is like a dectective story requiring the sometimes tedious tracing of leads in order to reach a valid conclusion based on the available data (evidence). Normal science takes place within established theoretical frameworks and is largely concerned with explanations, rather than descriptions or predictions. Such is the focus of this study — to probe the realm of interorganizational relations and seek explanations as to why certain classes of associations engage in more interaction than other classes.

Keohane and Nye (1972) as well as Rosenau (1966) suggested that research should focus on distinct problem areas. Other academic research, in addition to the United Nations efforts, has produced many detailed and varied analyses of world food problems. Unfortunately, this writer is aware of no comprehensive studies of international organizations in the food problem area. In other problem areas, such as environment and population, several studies have been compiled which focus on organizations. They vary in comprehensiveness, usually concentrating most attention on the United Nations family of organizations. One report which purported to examine the role of international organizations in the problem area of food and energy in fact was concerned with only one international organization – the proposed World Food Authority (Gardner, 1974). Much attention following the World Food Conference has been devoted to the analysis of that meeting and, to a lesser extent, with the new international organizations created in its aftermath (U.S. Senate, 1975; GAO, 1976).

THE ANALYTIC FRAMEWORK AND REVIEW OF LITERATURE

When one hears about global food problems, what is implied? Who can solve the problems? In the past, individuals concerned with research, production, distribution, and consumption, together with various governmental agencies, have usually dealt with the problems. International concern has been demonstrated by organizations such as the Food and Agriculture Organization (FAO) of the United Nations.

Two classes of international organizations will be studied. International governmental organizations (IGOs), sometimes called intergovernmental organizations, are comprised of representatives from various foreign governments or agencies of governments. International Non-Governmental Organizations (INGOs) draw membership from individuals, associations, or other bodies which are not direct agents of government.

The complex of issues associated with food problems cannot be covered in a piecemeal approach. Organizations spanning a number of countries are necessary to cope with the international implications of the situation. The tremendous growth in such associations accents the perceived need for international coordination of effort. Nevertheless, to date, international organizations, as individuals and governments, have proved incapable of effectively treating these problems. Concern about the inability of previous efforts to prevent a food crisis in 1972 led to a World Food Conference in 1974 and to the formation of a new, coordinating agency, the World Food Council, in 1975, to direct new programs.

Reviewing ten years of research on international organizations, Alger (1970a: 414) proposed "to see where our collective activity is leading." Among his findings for 1960-1969 are the following (Alger, 1970a: 442-443):

1. There has been no discernable increase in the research published on international organizations.

2. There has been no increase in published works which use quantitative and field research techniques.
3. Eighty percent study only one organization.
4. None of the studies focused on relations between organizations
5. Seventy percent studied the United Nations.
6. Only four studies revealed comparative work.
7. Sixty percent of the studies used descriptive statistics, twenty-one percent used bivariate statistics, and eleven percent used multivariate statistics. Seven percent used no statistics.

In the same study, Alger (1970a: 421) observed that "those familiar with the global complex of United Nations activities realize that relations between organizations is a matter of increasing concern. . . ." Yet, Alger found that none of the 61 studies under review focused on interorganizational relations (#4 above). A subsequent follow-up review of the literature for 1970-1974 noted only one study that examined how international organizations are interrelated (Dixon, 1975: 20).

Judge (1971) observed that the number of organizations active in any given field or geographical area is increasing. From 1950 to 1970, the number of international bodies increased from 718 to 2538, including 28 United Nations, 214 inter-governmental, and 2296 international non-governmental organizations. This projects 10,455 international bodies in 2000, assuming a specified rate of growth, Judge estimated.

Angell (1965: 185-195) earlier had noted the same growth trends in international organizations when he studied the changes in the number, type and membership of international organizations between 1956 and 1963. He found that the total number of organizations increased 64% over the six-year period. Regional organizations increased 167%; controlling for European Economic Community (ECE)-related organizations, there was a 76% increase.

Skjelsbaek (1971) examined the growth of international non-governmental organizations for the period 1954-1968. The average increase per year between 1954 and 1968 was 4.7%, while the average growth annually for 1962-1968 was 6.2%. During the period, NGOs increased in number from 1,012 to 1,899.

Galtung (1975: 161) surveyed the longer term trends in international organization by reporting on research perfomed by Feld (1972) and Alger (1973). Table 1 portrays the growth of international organizations over the past century.

TABLE 1: NUMBER OF IGOs AND INGOs, 1860-1970

	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970
IGOs	1	2	5	10	11	13	9	31	38	81	142	242
INGOs	5	9	21	37	69	135	214	375	477	795	1321	2296

Source: Feld, 1972: 177

Judge's observation (1971) that "the number of organizations active in any given field or geographical area is increasing" has been confirmed by the above-mentioned studies of international organizations. In addition, Judge (1971) hypothesized that there has been "an increase in the inter-connectedness of organizations . . . which also contribute to the complexity." The subject of interorganizational relations has been ignored by the academic community for the most part. This study will lay the groundwork for such research to proceed in the issue area of food by examining organizational characteristics which might help explain why associations contact other international organizations.

Data for this study are taken from the *Yearbook of International Organizations* (1972) compiled by the Union of International Associations for the United Nations. It is the most systematic and extensive data source available on international organizations.

This study will investigate two general research questions. First, is there association between organizational characteristics and amount of interaction with other international organizations? Second, do findings related to associations linked to FAO differ significantly from the larger data set of organizations?

The first question examines how well the dependent variable — interaction — can be predicted, given the values for the independent variables and assuming that the form of relationship between independent and dependent variables is linear and first order. In testing for relationships between the variables, bivariate analysis will be employed in the form of two graphic techniques — scattergrams and contingency tables — as well as several statistical measures of correlation, including Pearson's product moment correlation, Kendall's and Spearman's rank order correlations, and Phi. Each will be employed when appropriate. The graphic techniques will aid in inspecting the form of relationships and degree of dispersion, while the statistics allow for summarizing the strength of the association. Most tests of data will employ Pearson's r and scatterplots since interval level measurements are assumed. In six tests where the independent variable *identity* is dichtomized, Phi and contingency tables will be used in measuring association. *Interaction* will be recoded into two categories also. Three other tests involve the FAO sample and the dependent variable *status* which is an ordinal level measurement. Rank order correlations will be used and no visual display will be employed. The regression coefficient (r^2) will be reported where appropriate for the reader's benefit, but no interpretations will be offered.

The second question has broader implications. By focusing on a subset of data — namely, the international food organizations which are linked to FAO — it is assumed that they might manifest patterns differing from the larger universe of associations. Thus, the implied hypothesis, the null hypothesis, is that no significant difference exists between the larger data set and the subset of data.

Five independent variables which measure organizational characteristics are hypothesized to be associated with the dependent variable which measures interaction. A number of tests will be made for bivariate relationships between the independent variables – size of bureaucracy, budget, identity, membership, and agency age – and the dependent variable which is measured by the total number of other international organizations contacted. Single indicators given below will be employed: (1) size of bureaucracy: total staff (paid + voluntary); (2) budget: annual expenditures in thousands of US dollars; (3) identity: location of headquarters (Center or Periphery); (4) membership: number of member countries; (5) agency age: age of organization in years; (6) interaction: total international organizations (IGOs + INGOs) for which contact is reported.

All variables will be treated as interval level measurements except *identity*. It may be assumed nominal. However, it will not be possible to construct meaningful scatterplots using *identity*. Instead, 2x2 tables will be used as visual displays. Phi, a statistic which is equivalent to Pearson's r in a 2x2 table, will be calculated. The dependent variable *interaction* may be dichotomized into two categories – high and low – to facilitate handling it.

Five hypotheses will be tested using a variety of data samples. For each hypothesis applied to the primary data set, three different subsets of data will be used, thus accounting for a total of 15 tests or three for each hypothesis. The same 15 tests will be applied to the FAO sample. The hypotheses are:

1. As the staff size of international food organizations increases, those associations tend to contact more international organizations.
2. As the budget of international food organizations increases, those associations tend to contact more international organizations.
3. If international food organizations have headquarters in Center countries, then they tend to contact with more international organizations than those with headquarters in Periphery countries.
4. As the membership of international food organizations increases, those associations tend to contact more international organizations.
5. As the age of international food organizations increases, those associations tend to contact more international organizations.

As mentioned earlier, tests for association between independent and dependent variables will be conducted with two samples – the primary data set and FAO network. Each sample will be decomposed into three subsets: the first eliminating those cases which reported no interaction and the last two subsets eliminating some outlying cases which distort results due to extreme scores. The three subsets will focus on cases which contact other international organizations (Test 1) *and* which are typical in both organizational characteristics and number of contacts (Tests 2 and 3). Typical is defined as those attributes that do not represent extreme deviations from the mean.

Test 1 includes all cases with joint scores ranging from the minimum positive value to the maximum. Test 2 incorporates a subset of cases which do not include the extreme scores noted in Test 1. Test 3 analyzes another subset of cases which do not include deviant outlying cases from Test 2. (See Appendix A).

Scatterplots reveal the "spread" of cases around the least-squares line of the data plot. In order to test hypotheses, the least-squares line is calculated. If the relationship between independent and dependent variable is perfect, then a straight line will be plotted through *all* data points, thus indicating a perfect linear relationship. When the relationship is not perfect, then the least-squares line is the one which fits the data points with the greatest average accuracy. The least-squares equation *minimizes* the squared differences between the predicted values and observed values.

Outlying cases may distort the slope of the least-squares line. By physically removing the extreme cases from analysis, a more representative least-squares line may be plotted which better fits the remaining data points and minimizes the squared differences between the predicted values and observed values.

Each sample (the primary data set and FAO network) will be subjected to three tests of the hypotheses. In each test, only cases reporting contact with other international organizations will be included. If an international food organization failed to report contact with other international organizations, this project treated it as missing data rather than no contact. Therefore, no reported interaction is coded as missing data. Many cases from the primary data set and the FAO network will be excluded because of pairwise deletion of missing data. When interpreting results, care must be taken *not* to generalize to the FAO network unless 75% or 116 of 154 of the cases are included in analysis. Otherwise, results may be safely applied *only* to the subset of cases for which tests were conducted, especially in reference to the primary data set.

The problem of systematic bias may be raised, given this project's procedure of excluding those cases which reported no contacts. Many cases therefore will be excluded because of pairwise deletion of missing data. Since this project is primarily concerned with associations which engage on interaction, the decision to exclude those failing to report contacts was based on the desire to portray the association between organizational characteristics and contacts with other international organizations. As previously noted, in many cases the failure of associations to report does not indicate a lack of interaction, but rather missing data. It was believed that by treating no report of contact as missing data, certain cases would be systematically excluded.

Less than 20 of the EEC associations reported contact with other international organizations, so over 100 are excluded from analysis. International food organizations not linked to FAO and not reporting contact with other associations had no crosscheck performed by scanning the United Nations consultative lists, so an undetermined number of INGOs might be excluded from analysis. However, to have included cases coded "0" in testing would have grouped a large number of observations at the origin of scatterplots and distorted the measurement of association, as well as the plot of least-squares line.

The method to be used for eliminating extreme cases or those international food organizations with high values on certain variables will involve excluding those cases from the plotting of scatterplots and computation of correlation coefficients. The computer program allows preselection by the researcher of maximum and minimum values in order to include a specified range of scores. By resetting maximum values, cases with extreme scores may be excluded.

The figures in Appendix A summarize high scores and low scores selected by the researcher for computing scatterplots and correlation statistics. The numbers represent the range of scores for each variable. For instance, in the case of staff, Test 1 includes the range of scores which all international food organizations reported: the smallest staff had one member, while the largest staff had 3,643. In Test 2, cases with more than 200 staff members were excluded from analysis. In Test 3, cases with more than 40 staff members were excluded. The complete listing of values is indicated in Appendix A.

The maximum values of Test 1 are equal to the highest sample scores on that particular variable. The lowest positive score is included as the initial point on the scale. Maximum values in Test 2 and Test 3 were determined after inspecting scatterplots produced in Test 1.

Such maximum values were assigned by the researcher. No calculations were performed to determine cutoff points. Instead, simple visual inspection was used to locate the extreme cases or those data points which deviated from the least-squares lines. Values were estimated which would exclude such cases from later analysis and those scores became the new maximum values in Appendix A.

The scatterplots produced by Test 1 show the "spread" of data points. Deviant or extreme cases may be observed because they depart from the general pattern of plotted cases. The utility of scatterplots is in providing a visual display in order to discover outlying cases which might disproportionately skew the results. Since only a few cases usually are deviant, subsequent analysis may examine the majority of clustered cases if outlying ones are eliminated.

Two decision rules guided selection of scale values for Test 2 and Test 3. First, analysis should focus on the clustered cases. By clustered, it is meant the occurrence of many cases in a small area on the scatterplot. For international food organizations, this generally means those cases located near the origin and along the horizontal axis. This study does not use "cluster analysis" as a research technique.

In addition to treating the clustered cases, analyis will also focus on the deviant or outlying cases as revealed in the scattergraphs. This analysis will be applied to the FAO subset of cases rather than the primary data set. Such a decision relates to the applicability of making policy recommendations in reference to those international organizations which contact FAO. In the case of the larger data set, there is no target or agency which could utilize a recommendation. Administrators at FAO might be influenced by data about interorganizational relations, hence they are a potential target for recommendations.

Second, analysis should include the maximum number of cases, therefore excluding as few cases as possible after complying with Rule 1. After running data for Test 2, the same decision rules were applied to scatterplots produced in those tests. New maximum values were set and Test 3 was performed. The actual values used for Test 2 and Test 3 are noted in Appendix A.

Scatterplots and correlation coefficients will be used to interpret the preceding tests. One quadrant scatterplots will be constructed in order to portray the form of relationship between variables. These visual displays have vertical and horizontal axes which originate at the "0" intercept. Only positive values are represented along both axes which form a right angle.

Independent variables will be plotted along the horizontal axis and dependent variables along the vertical axis. Since scatterplots are a graphic method of displaying the form of relationship, they are useful in determining if the joint distribution of values follows a linear pattern. Correlation coefficients indicate the strength of relationship or association between variables. Since a few cases of extreme values can influence correation scores to overestimate the strength of association, scatterplots help identify those outlying cases so they may be taken into account when interpreting results. As mentioned in the introduction to this study, given knowledge of the form of relationship between independent and dependent variables and given values on the independent variable, correlation is a measurement of how well scores on the dependent variable can be predicted or how well they conform to a hypothesized linear relationship. Since values for the dependent variables are recorded, this project is more interested in testing the hypothesized relationships. Scattergraphs aid in confirmation of hypotheses by demonstrating that the form is linear, if that be the case. The correlation coefficient is a measurement of how well a linear least-squares line fits the data points in a two-dimensional space. The more the dispersion of values around the least-squares line, the less the score of the correlation, and consequently, the less evidence that the linear hypothesis being is confirmed. By taking deviant or outlying cases into account, an attempt is made to improve the fit of the least-squares line and hence improve the correlation score, thus providing stronger confirmation of the hypotheses, but for a smaller subset of cases.

The first set of figures reveals patterns of association and form of relationships when size of staff and total international organizations contacted are plotted. Pairwise data deletion was employed. The range of values was specified to include the highest and lowest score on variable for the initial test: International food organizations with staff sizes from 1 to 3,643 were included. The N-size of both the primary data set and the FAO network was substantially reduced by excluding cases with data missing on one or both variables.

When interpreting these tests, as well as subsequent ones, caution should be exercised in generalizing from the results to the primary data set or FAO network. In each instance, findings will apply *only* to the subset of cases in the primary data set or FAO network which provide complete data, not to the entire samples. Subset refers to the sample of cases left after pairwise deletion of missing data has been implemented. Only cases having scores on both measurements will be included in analysis. These cases represent subsets of either the primary data set or FAO organization set as the case may be.

Descriptive adjectives about degree of association and amount of variance explained are somewhat arbitrary. This study will use, distinctive adjectives to describe ranges of correlation scores (and amount of variance explained): weak – less than .447 (less than .200); moderately weak – .447 to .547 (.200 to .300); moderate – .548 to .706 (.300 to .499); moderately strong – .707 to .774 (5.00 to .599); strong – .775 or higher (.600 or higher).

HYPOTHESIS 1: *As the staff size of international food organizations increases, those associations tend to contact more international organizations.*

Figures 1 to 6 portray all tests for relationship between total staff size and total number of international organizations contacted by international food organizations in the primary data set and FAO network. The strength of association between variables in Figure 1 (which portrays Test 1 of the primary data set) was measured by Pearson's r as .720 (r^2 = .519), thus indicating moderately strong association between size of staff and total international organizations contacted. How-

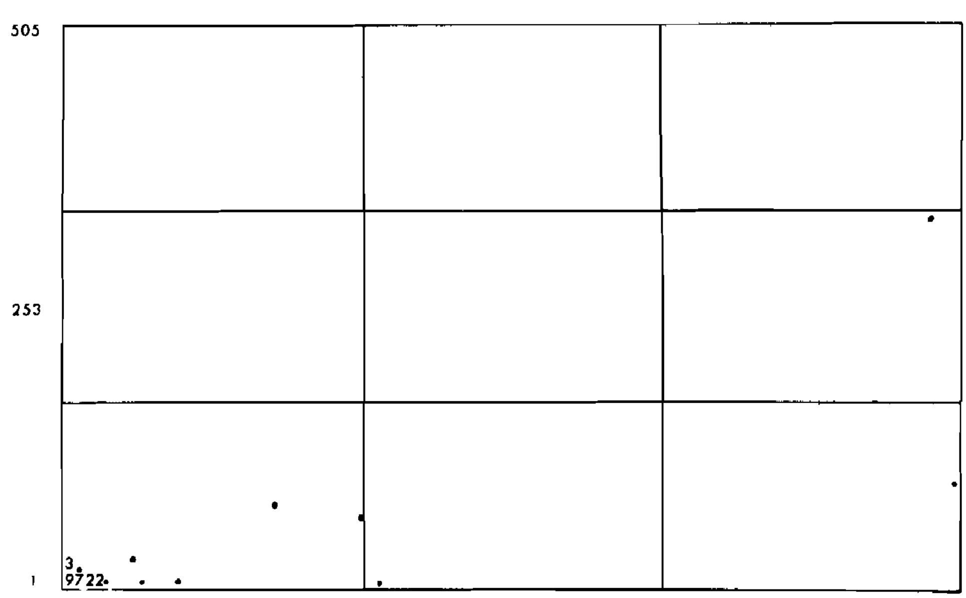

FIGURE 1: SCATTERGRAM OF STAFF SIZE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (Test 1)

ever, caution in interpreting this coefficient should be excercised. The form of relationship as revealed in Figure 1 appears to be linear, but there are many cases grouped at the lower end of both scales. This cluster comprises the majority of cases and no pattern may be discerned. The effect of the extreme cases (representing a minority of the subset) disproportionately influences both the form and strength of relationship.

Nevertheless, *the strength of the correlation coefficient (.720) lends moderately strong support to Hypothesis 1 as applied to the primary data set and the 78 cases for which data on both variables were available.* It is suspected that the coefficient may be inflated as a result of extreme cases. A more reliable estimate of the strength of association may be calculated if extreme cases are eliminated. An extreme observation represents a case which has scored higher than the majority of other cases on either one or both measurements. Associations which have extremely large staffs (e.g., over 1000) and large organization sets (e.g., over 50 contacts) would be outlying cases in Figure 1: five cases have these characteristics. Most are United Nations agencies or European IGOs. Similar observations may be applied to initial tests of other hypotheses as well.

Next, the maximum values of both variables were adjusted in order to filter out extreme cases on both measures (see Appendix A for values of Test 2). Slightly more than ten percent of the cases (or nine) were excluded by setting new maximum values for the scales in Figure 2. This recoding allows narrowing in on the cluster of cases

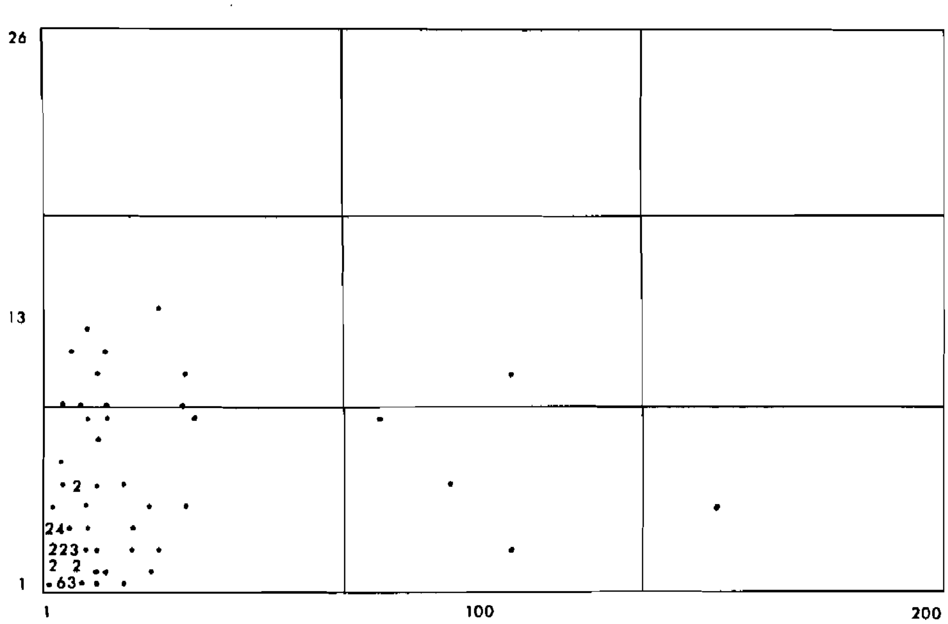

FIGURE 2: SCATTERGRAM OF STAFF SIZE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (Test 2)

in the lower left corner of Figure 1. The new coding limits produced a subset of 69 cases. Correlation coefficients in the present test and subsequent ones are calculated on the adjusted N-size.

For Figure 2, Pearson's r is calculated at .232 in Test 2, which indicates extremely weak association between the variables (r^2 = .054). The form of relationship appears to be linear. Outlying cases represented by international food organizations with staffs over 70 influence the form and measurement of association in the relationship. *This test weakly confirms Hypothesis 1 as applied to the primary data set and 69 cases since a correlation of .232 was noted.* Further controls to exclude these five outlying cases would allow examination of four-fifths the original subset or 64 out of 78 cases.

The correlation coefficient is weaker in Test 2 because the influence of extreme cases has been removed. In Test 1, the contribution to correlation by a few cases overestimated r for many other cases which Test 2 examined. Similar observations may be applied to tests of other hypotheses.

Test 3 narrows attention to clustered cases by adjusting the maximum scores. Figure 3 incorporates a third set of scale values in order

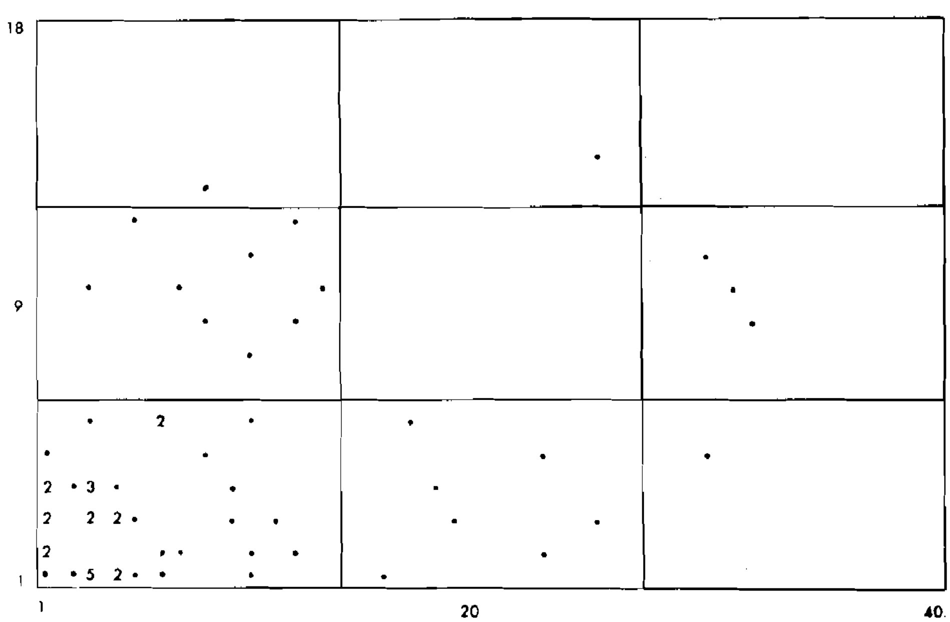

FIGURE 3: SCATTERGRAM OF STAFF SIZE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (Test 3)

to focus on the majority of clustered cases. (See Appendix A for values in Test 3.) The strength of association is calculated at .385 for these 64 cases (r^2 = .148). A linear relationship is indicated by the pattern of data points in the scattergraph. There is a great deal of dispersion in the scatterplot which accounts for the weak measure of association. However, *the correlation coefficient of .385 weakly confirms Hypothesis 1 as applied to 64 cases in the primary data set.* It seems a more reliable estimate of the strength of association between independent and dependent variables since outlying cases are excluded, but not to the detriment of the N-size.

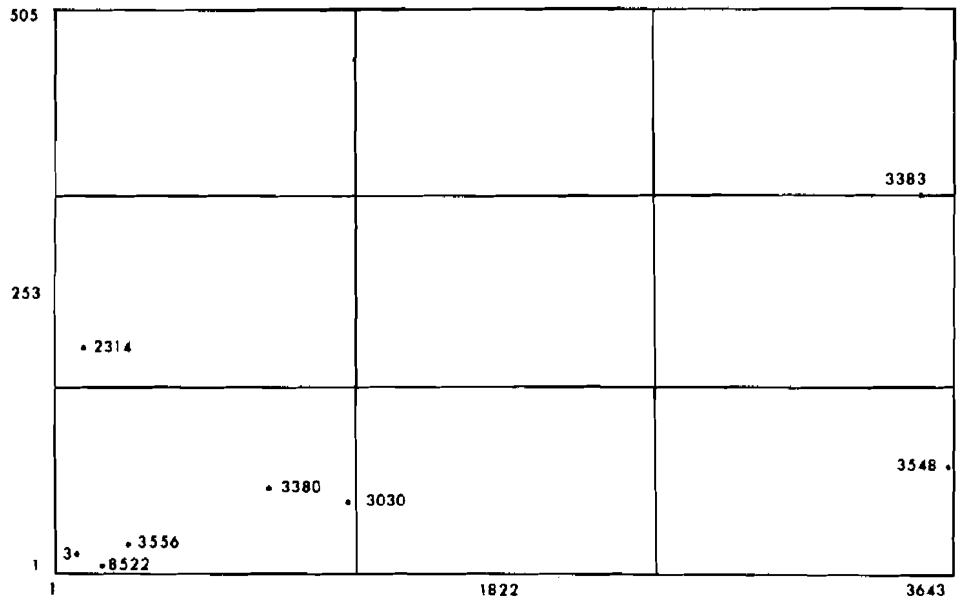

FIGURE 4: SCATTERGRAM OF STAFF SIZE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (FAO Test 1)

In Figure 4, data from the FAO network is subjected to Test 1 as was applied in Figure 1 to the primary data set. A moderately strong measure of association (.748) is calculated (r^2 = .560). The number of cases in this subset is 63, so the influence of extreme cases may be greater, hence the higher coefficient score. Many cases are grouped in the lower left corner of the scattergraph. The few extreme cases determine the form of relationship which appears linear. *Hypothesis 1 is given moderately strong confirmation by the correlation coefficient of .748 as applied to the 63 cases in the FAO network* for which data was available. The same qualifications apply to this test: extreme cases exerted a disproportionate influence in the calculation of the coefficient; a more reliable estimate of the association may be produced by eliminating extreme cases.

Among the associations considered as extreme cases are UNESCO (3383), WHO (3548), Organization of America States (3030), UNICEF (3380), International Organization for Standardization (2314), and WMO (3556). The first two have large staffs (over 3000) while the last ones have staffs between 200 and 1200. All except WHO have organization sets larger than 50. These associations confirm the hypothesis, with the exception of International Organization for Standardization which has a relatively small staff given its number of contacts with international organizations. It deviates from the linear relationship revealed by the other IGOs. It is an INGO.

Using the same scale values as employed in Figure 2 (see Appendix A), replotting of FAO data for Test 2 produced Figure 5 which included 57 cases. Pearson's r equaled .187, a coefficient indicating extremely weak association (r^2 = .035). Outlying cases are a problem,

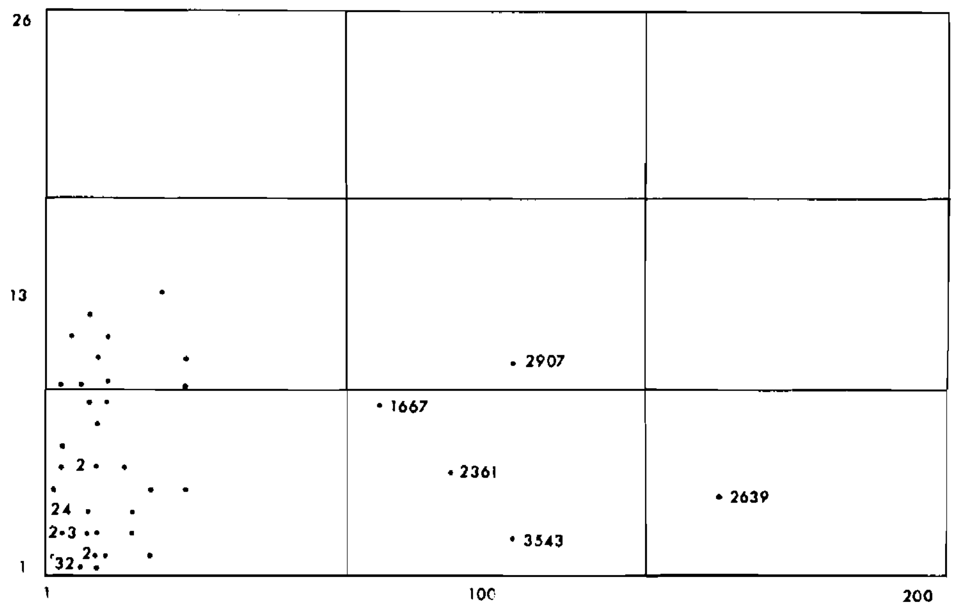

FIGURE 5: SCATTERGRAM OF STAFF SIZE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (FAO Test 2)

as the scatterplot demonstrates, so the maximum values of both variables were reduced to focus on the main cluster of data points. *Hypothesis 1 is weakly confirmed by a .187 coefficient for the FAO data.* The five outlying cases are International Trade Centre (2639), League of Red Cross Societies (2907), World Food Programme (3543), International Planned Parenthood Federation (2361), and International

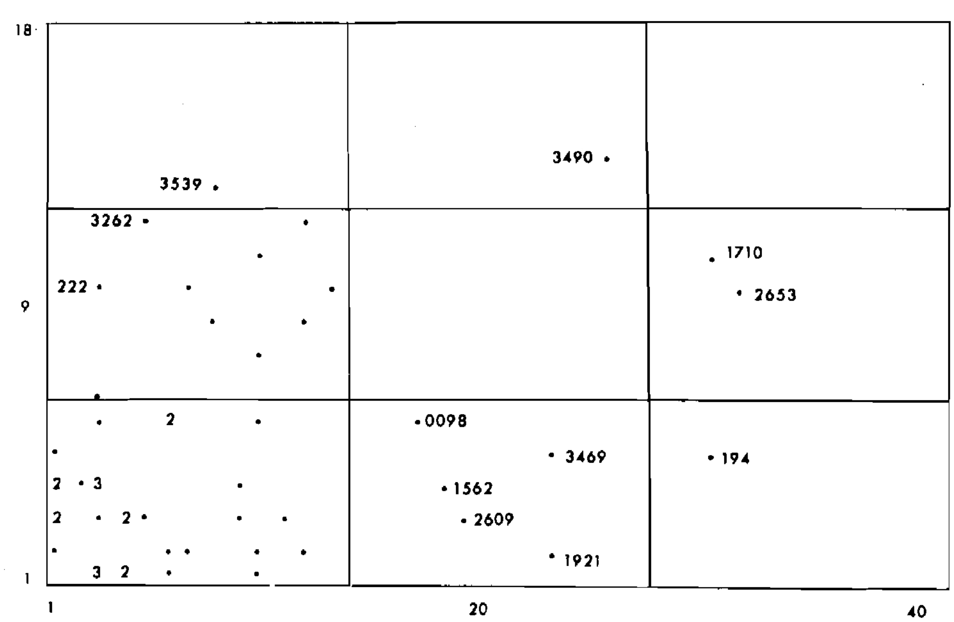

FIGURE 6: SCATTERGRAM OF STAFF SIZE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (FAO Test 3)

Confederation of Free Trade Unions (1667). All have staffs considerably larger than other associations in Figure 5, although number of contacts does not deviate from other associations.

Figure 6 adjusted the scale values for Test 3 to those used in Figure 3 (see Appendix A). For 52 cases, a correlation coefficient of .359 is calculated, thus showing weak association between variables for the FAO data ($r^2 = .129$). Dispersion of data points is evident in the scattergraph, but the form of relationship appears to be linear.

Two groups of international food organizations appear to deviate from the predicted relationships. The first group of associations tends to have small staffs (less then 15 personnel) but contact 8 or more international organizations: World Confederation of United Nations Associations (3539), World Confederation of Organizations for the Teaching Profession (3491), Special Committee for the International Biological Programme (3262), World Young Women's Christian Association (3609), Catholic International Union for Social Science (222), International Council for Social Welfare (1771), International Council of Scientific Unions (1752), International Federation of Agricultural Producers (1850), European Confederation of Agriculture (686), and World University Service (3604). The second group tends to have larger staffs (between 17 and 30) but relatively fewer contacts (less than 6) with other international organizations: Boy Scouts World Bureau (194), International Federation of Fruit Juice Producers (1921), World Association of Girl Guides and Girls Scouts (3469), International Superphosphate Manufacturers' Association (2609), and International Commission on Irrigation and Drainage (1562).

This test weakly confirms Hypothesis 1 for 52 cases in the FAO network. It represents what may be a more reliable estimate of the association between independent and dependent variables.

Although the initial tests of Hypothesis 1 for the primary data set and FAO network revealed moderately strong association with more than half the variance explained, subsequent tests did not produce such strong results. In fact, Test 3 for both data sets yielded weak measures of association and showed a small amount of variance explained. Figures 3 and 6 which covered these tests revealed great dispersion of data points, even after eliminating extreme and/or outlying cases. This dispersion around the least-squares line contributed to the weak correlation and regression coefficients. There is certainly no pattern which follows closely the least-squares line in either Figure 3 or 6. No one case or even groups of cases mask the relationship since there is so much dispersion. It might be concluded that while there is association, neither its strength nor the amount of variance explained warrants making too much out of this finding. Its explanatory power is therefore quite weak.

HYPOTHESIS 2: *As the budget of international food organizations increases, those associations tend to contact more international organizations.*

By examining the relationships between budget and total number of international organizations contacted, tests of this hypothesis may be undertaken. Figures 7 to 12 display the results of various tests to the primary data set and FAO data. Pairwise deletion of missing values will be used. The range of values on each scale in Figure 7 and 10 corresponds to the highest and lowest positive score for any case.

Figure 7 presents the scatterplot for the primary data set. There are only 46 cases in Test 1, so caution is urged when interpreting results

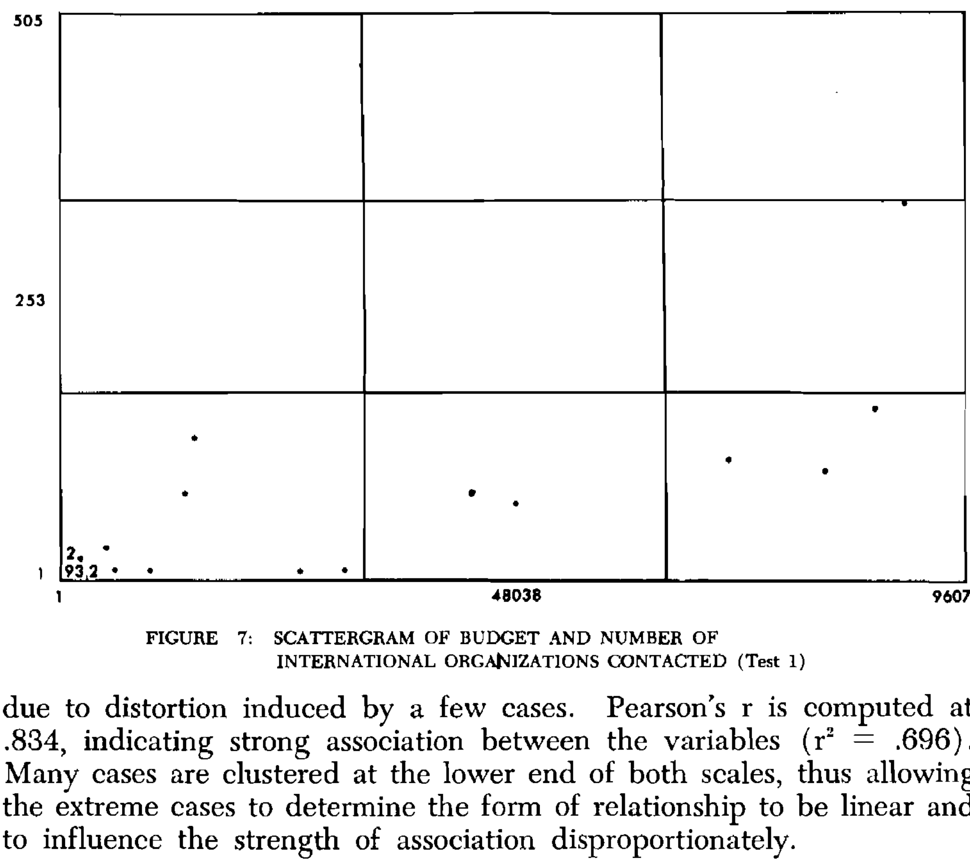

FIGURE 7: SCATTERGRAM OF BUDGET AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (Test 1)

due to distortion induced by a few cases. Pearson's r is computed at .834, indicating strong association between the variables ($r^2 = .696$). Many cases are clustered at the lower end of both scales, thus allowing the extreme cases to determine the form of relationship to be linear and to influence the strength of association disproportionately.

The strength of the correlation coefficient (.834) strongly confirms Hypothesis 2 as applied to the 46 cases in the primary data set. It is suspected that the coefficient may be inflated as a result of the small N-size and few extreme cases. Outlying cases will be eliminated.

The maximum values of both independent and dependent variables were adjusted for Test 2 in order to filter out extreme cases on both measures. (See Appendix A for values in Test 2.) One-fifth of the cases (11) were eliminated by adjusting maximum values. This procedure allows an examination of 35 cases which clustered in the lower left corner of Figure 7.

Recalculating the correlation coefficient for the primary data set and 35 cases produced a score of .350 ($r^2 = .122$). Figure 8 portrays the relationship. Several extreme cases appear in this sample and influence results. The form of relationship appears linear.

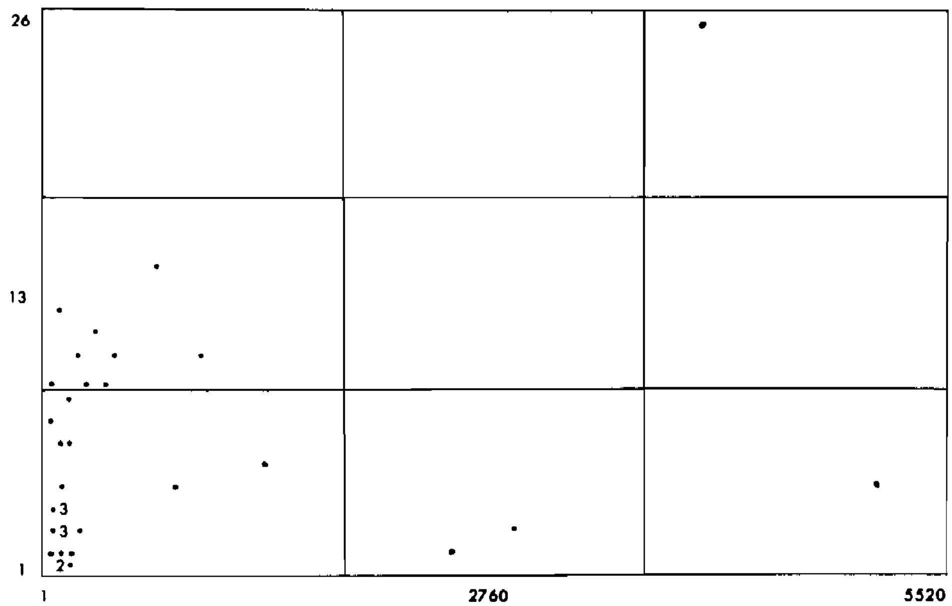

FIGURE 8: SCATTERGRAM OF BUDGET AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (Test 2)

The small N-size in these subsets allows each case to have a greater impact on the value of the correlation coefficient than if the subset had, for instance, twice as many cases. Such r values must be treated with caution since they are extremely sensitive to individual measurements. Those cases which are included in analysis also may be atypical in that they provided data about budgets *and* number of international organiza-

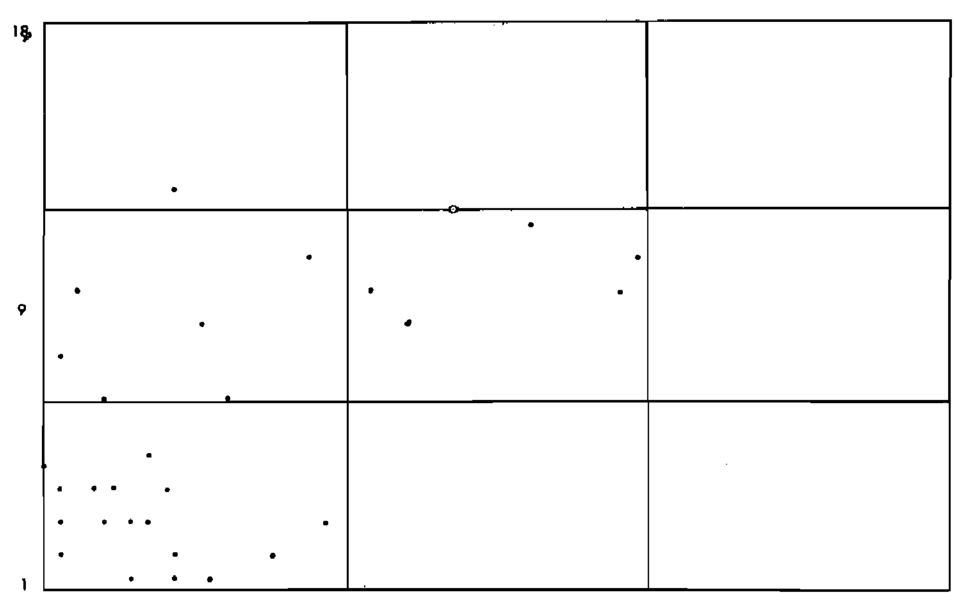

FIGURE 9: SCATTERGRAM OF BUDGET AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (Test 3)

tions contacted. The same observation applies to outlying cases previously dropped. Whatever conclusions are drawn will apply only to cases being analyzed.

A third look at the clustered cases will be carried out by reducing the maximum values in Test 3. Figure 9 shows this result. Pearson's r is .526, representing moderately weak association (r^2 = .277). The form of the relationship appears linear, although there is considerable dispersion of data points. Number of cases equals 27.

Both Test 2 and Test 3 give moderately weak confirmation to Hypothesis 2 for their respective subsets of data from the primary data set.

Figure 10 reveals the linear form of the relationship in the FAO network for 39 cases in Test 1. A strong measure of association (.847)

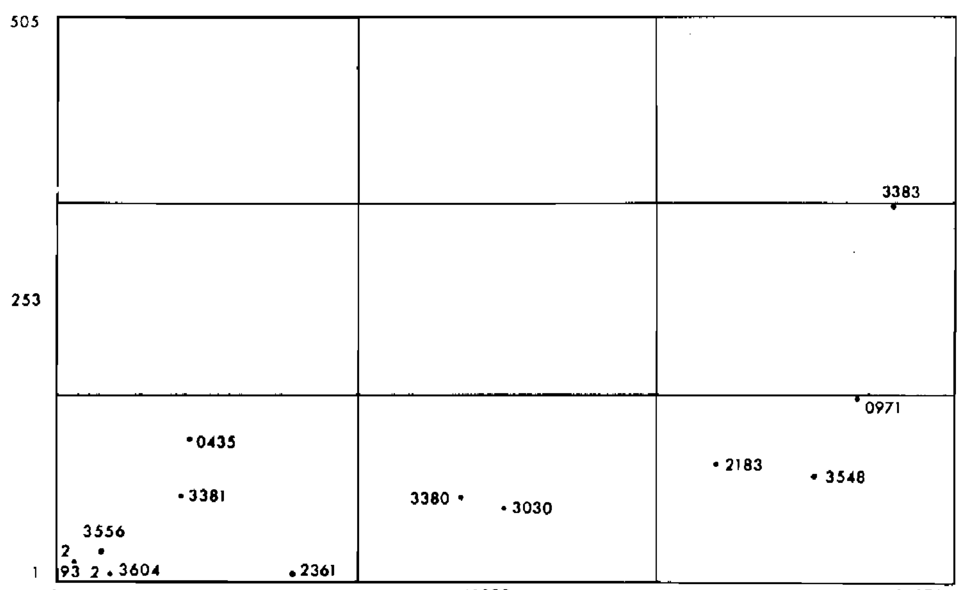

FIGURE 10: SCATTERGRAM OF BUDGET AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (FAO Test 1)

is calculated, although with so few cases, the influence of extreme cases may have inflated the score (r^2 = .717). Once again, many cases are clustered at the lower end of both scales, thus allowing the extreme cases to disproportionately influence the strength of association and form of relationship. Those extreme cases are: UNESCO (3383), FAO (971), WHO (3548), ILO (2183), OAS (3030), UNICEF (3380), International Planned Parenthood Federation (2361), UNCTAD (3381), and Council of Europe (2135). Only UNESCO has an organization set larger than 175. Along with FAO, WHO, and ILO, UNESCO spends over 70 million dollars. OAS and UNICEF spend around 50 million and IPPF, UNCTAD and Council of Europe spend under 30 million dollars. There is little variation in number of contacts as these associations spend more money, except for UNESCO. It might be concluded that past a certain threshold, increasing the amount of money spent does not correlate very highly with having larger organization sets.

The strength of the correlation coefficient (.847) strongly confirms Hypothesis 2 as applied to the FAO network of 39 cases, for which data was available. Two additional tests were conducted using new maximum values for independent and dependent variables in an effort to determine to what degree extreme cases had distorted results.

Figure 11 portrays Test 2 which included 30 cases and produced a correlation coefficient of .334 (r^2 = .112). Lack of discrimination

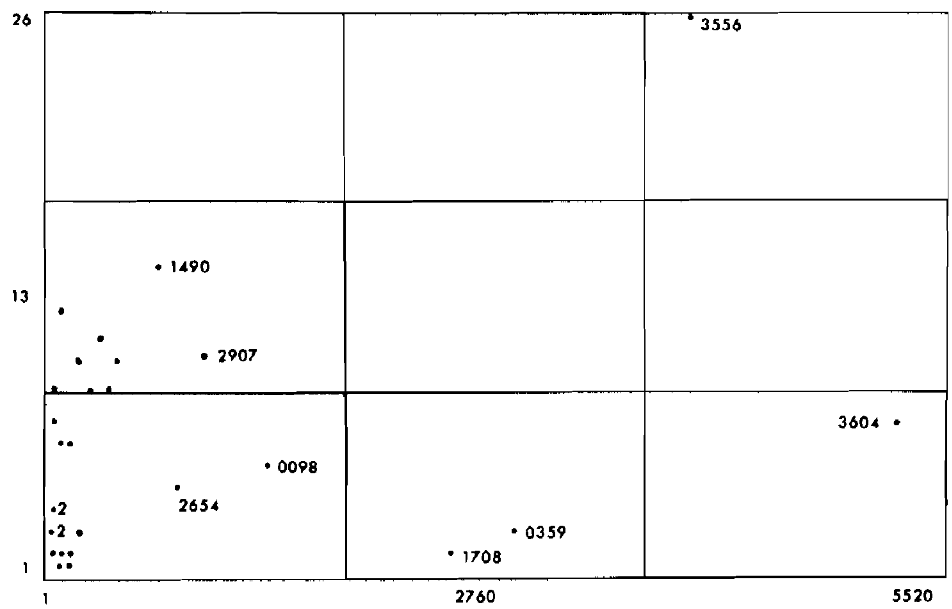

FIGURE 11: SCATTERGRAM OF BUDGET AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (FAO Test 2)

remained a problem in the scatterplot as the grouping along the vertical axis demonstrates. Four outlying cases also may be interferring with computation of statistics. They are World University Service (3604), WMO (3556), Commonwealth Agriculture Bureau (359), and International Co-operation for Socio-Economic Development (1708). World University Service spends almost 5 million dollars but contacts only seven other international organizations, while WMO spends about 4 million dollars and contacts 26 international organizations. The other two outlying cases spend relatively more money but have only one or two contacts. Such variation does not aid in computing strong correlations.

Figure 12 focuses on the cluster of cases located in the left-hand corner of Figure 11. For 22 cases in Test 3, Pearson's r equals .522 and the form of the relationship appears (r^2 = .272). There are no truly deviant cases in this scatterplot, although two groups appear to have marked differences. One group has four or fewer contacts and spends less than 180 thousand dollars. The other group has seven or more contacts, but expenditures vary from almost nothing to over 350

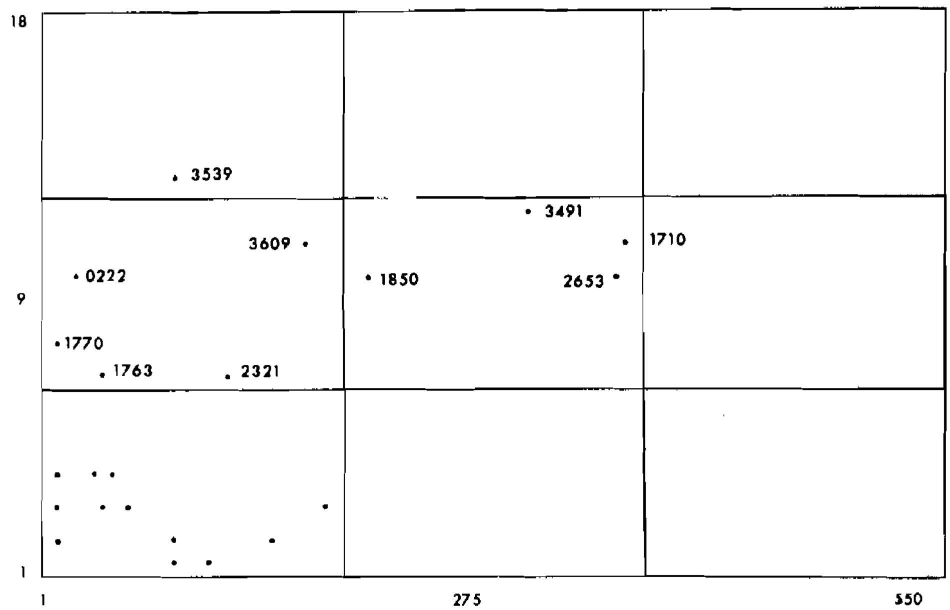

FIGURE 12: SCATTERGRAM OF BUDGET AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (FAO Test 3)

thousand dollars. Taken together, they all contribute to the correlation value for Figure 12. A great deal of dispersion is evident. Cases like Catholic International Union for Social Service (222), International Council of Jewish Social Welfare Services (1770), and International Council of Women (1763) have many contacts but small budgets, while others like Dairy Society International, International Commission for Food and Agricultural Industries, and European and Mediterranean Plant Protection Organization have larger budgets yet relatively few contacts.

Both of the preceding tests provide weak or moderately weak support for Hypothesis 2 as applied to the subset of cases from the FAO sample which were examined.

Neither testing of the primary data set nor FAO's network revealed consistent evidence to support Hypothesis 2. After the strong correlation coefficients and large amount of variance explained in Test 1 of both data sets, subsequent tests with extreme and/or outlying cases removed gave only weak or moderately weak confirmation. Neither correlation values nor regression coefficients in Test 3 lend enough support to the hypothesis to warrant its acceptance. Dispersion of data points in Figures 9 and 12 diminish both statistics. No clear pattern along the least-squares line is revealed in either figure. The explanatory utility of this hypothesis is restricted although some association does occur.

> HYPOTHESIS 3: *If international food organizations have headquarters in a Center region, then they tend to contact more international organizations than those with headquarters in Periphery countries.*

Because identity is a dichotomized variable, no meaningful scatterplot may be used to visually display relationships. By dichtomizing the dependent variable – total number of international organizations contacted – into high and low, the hypothesis may be tested in a 2 x 2 table. Since data reviewed earlier indicated that the most common pattern of interaction was linkage with only one other international organization, the high category will be equal to two or more links. In this case, Pearson's r is equal to Phi calculated from the 2 x 2 tables, so Phi may be treated as a correlation coefficient equivalent to Pearson's product moment correlation.

The primary data set and FAO network samples each will be tested three ways. In each test, the maximum value of the dependent variable – total international organizations contacted – will be varied, corresponding to changes used in the scatterplots. This procedure will serve as a means of controlling for extreme cases. No attempt to manipulate the independent variable will be made since only one of two values were coded for each case.

Figures 13, 14, and 15 apply to the primary data set. In order for the hypothesis to be confirmed, most cases must fall into the positive diagonal in the visual display and a high Phi score should be recorded. *None of the tests confirms Hypothesis 3.* Too many cases which deviate from the prediction fall into the negative diagonals. The correlation coefficients are all less than .100.

FIGURES 13 to 18: BIVARIATE RELATIONSHIPS BETWEEN IDENTITY AND INTERACTION FOR INTERNATIONAL ORGANIZATIONS CONCERNED WITH FOOD

Figure 13: Primary Data Set

Headquarters Location	*Number of Contacts* Low	High
Periphery	6 (3.2%)	5 (2.7%)
Center	69 (36.7%)	108 (57.4%)
Phi = .075		

Figure 14: Primary Data Set

Headquarters Location	*Number of Contacts* Low	High
Periphery	6 (3.4%)	5 (2.8%)
Center	69 (38.8%)	98 (55.1%)
Phi = .065		

Figure 15: Primary Data Set

Headquarters Location	*Number of Contacts* Low	High
Periphery	6 (3.4%)	5 (2.8%)
Center	69 (39.2%)	96 (54.5%)
Phi = .062		

Figure 16: FAO Network

Headquarters Location	*Number of Contacts* Low	High
Periphery	2 (1.6%)	3 (2.4%)
Center	25 (20.2%)	94 (75.8%)
Phi = .090		

Figure 17: FAO Network

Headquarters Location	*Number of Contacts* Low	High
Periphery	2 (1.8%)	3 (2.6%)
Center	25 (21.9%)	84 (73.7%)
Phi = .082		

Figure: 18 FAO Network

Headquarters Location	*Number of Contacts* Low	High
Periphery	2 (1.8%)	3 (2.7%)
Center	25 (22.3%)	82 (73.2%)
Phi = .080		

Source: *Yearbook of International Organizations,* Volume 14 (1972-1973)

Figures 16, 17, and 18 apply to the FAO network. The same results occur: too many cases fall into the negative diagonals and all correlation coefficients are less than .100. *None of the tests confirm Hypothesis 3.*

Hypothesis 3 is disconformed for subsets of data from both samples, according to these tests. However, the preceding operationalization may have failed to measure relationships which exist. An alternative procedure will consider headquarters location as an ordinal level measurement and use rank-order correlation as an approximation to r. (See Garson, 1971: 182-184.) The statistics recommended by Garson are Spearman's rho and Kendall's tau. It will not be necesary to control for outlying or extreme cases since neither the form nor fit of a least-squares line influences the correlation score. Two tests will be conducted — one for the primary data set and the other for the FAO network.

For the primary data set, rho is equal to .167 and tau equal .153. For the FAO network, rho equals .305 and tau equals .261. Rho tends to overestimate correlation, while tau underestimates it, according to Garson. All scores indicate extremely weak or weak confirmation of the predicted relationship.

Hypothesis 3 does not receive strong confirmation from any test performed. Therefore, its utility as an explanatory statement does not appear to be very great.

HYPOTHESIS 4: *As the membership of international food organizations increases, those associations tend to contact more international organizations.*

Figures 19 to 24 depict the relationship between membership and total international organizations contacted. Pairwise deletion of missing values will be used. Only cases in the primary data set and FAO network having one or more links will be included.

For Figure 19 the range of values on each scale for Test 1 includes the highest and lowest score for any case (see Appendix A). The

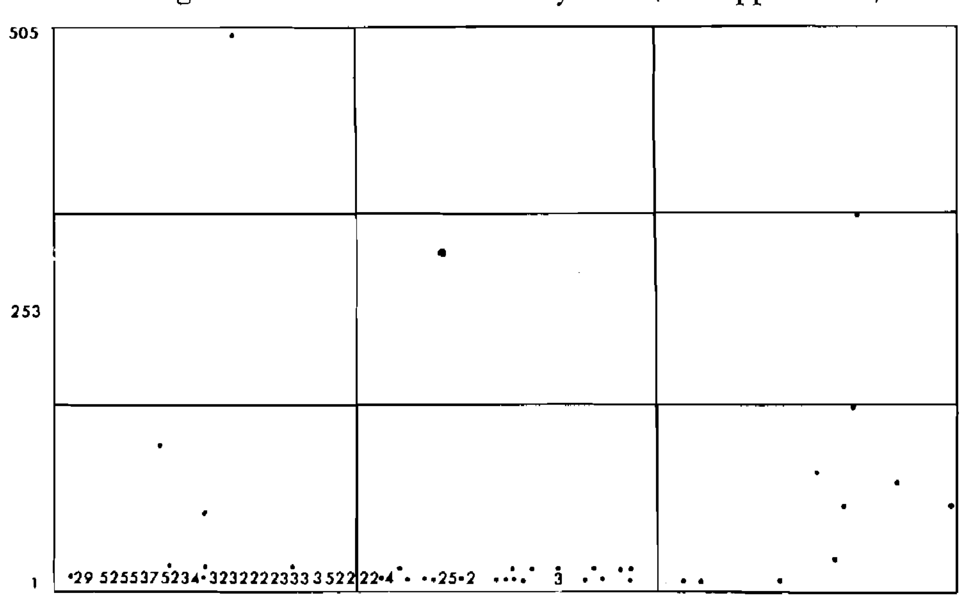

FIGURE 19: SCATTERGRAM OF MEMBERSHIP SIZE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (Test 1)

correlation coefficient equals .299 for the 172 cases having joint values (r^2 = .089). Inspecting Figure 19 reveals clustering of most cases along the horizontal axis, with a few extreme cases.

Hypothesis 4 is weakly confirmed by the correlation coefficient of .299 as applied to the 172 cases in the primary data set. There is only weak association between size of membership in international food organizations and number of international organizations contacted. The least-squares line does not represent the best statement of the form nor should Pearson's r be considered a reliable measure of association. Eliminating outlying cases and adjusting both scales should improve ability to examine clustered cases.

Figure 20 shows the scatterplot derived in Test 2 for 162 cases, controlling for extreme cases. Pearson's r of .602 was calculated, in-

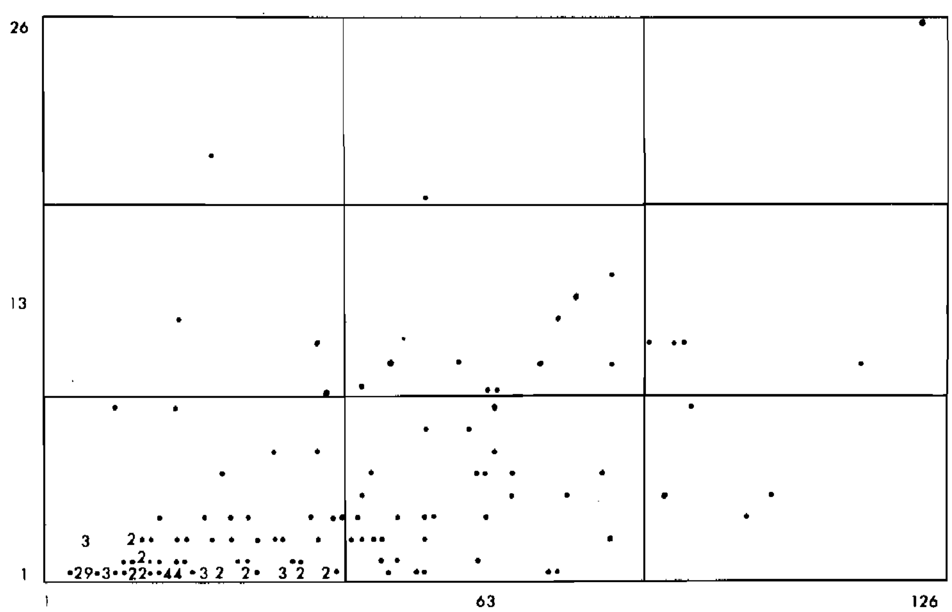

FIGURE 20: SCATTERGRAM OF MEMBERSHIP SIZE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (Test 2)

dicating moderate correlation between size of membership and total international organizations contacted when focusing on this subset of the primary data set (r^2 = .363). Only ten cases – the extreme ones – have been eliminated in Test 2 from the data used in Test 1. Moderate association between variables is indicated by the coefficient and the scatterplot shows that the form of the relationship is linear. There are still some outlying cases which influence the form and score.

Another run of data was made in Test 3 by adjusting both variables' maximum values in order to focus on the 153 cases grouped along the least-squares line. Figure 21 portrays that display which has a correlation coefficient of .577 (r^2 = .333). The form of the relationship appears linear and the effect of extreme cases has been eliminated. *The last two tests give moderate evidence that Hypothsis 4 is confirmed as applied to the subsets of data from the primary data set,* given the

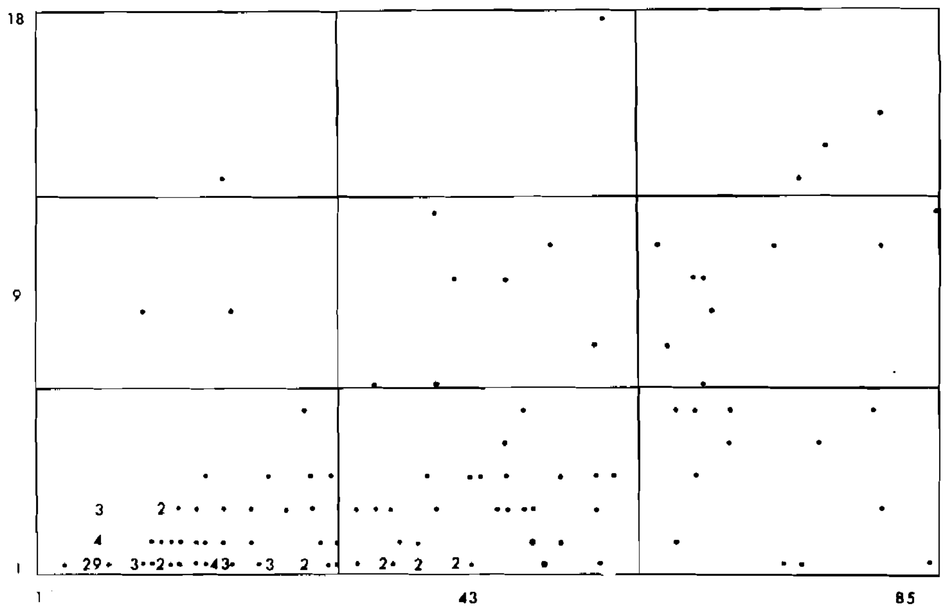

FIGURE 21: SCATTERGRAM OF MEMBERSHIP SIZE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (Test 3)

strength of the correlation coefficients (.602; .577) and subject to the qualification that some extreme cases were eliminated prior to obtaining these results.

For the FAO network, Figure 22 reveals in Test 1 a lack of discrimination, given the maximum values as well as a clustering along the horizontal axis. The extreme cases disproportionately determine the correlation coefficient of .258 ($r^2 = .067$).

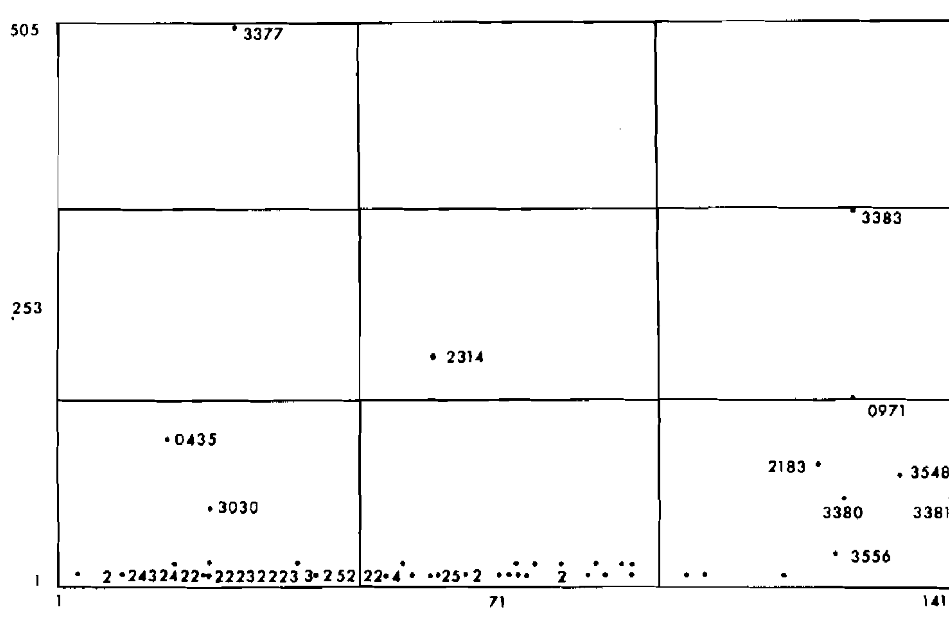

FIGURE 22: SCATTERGRAM OF MEMBERSHIP SIZE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (FAO Test 1)

Two groups of extreme cases are noted. First, there are those associations which have relatively small memberships (under 60) and large organization sets (over 50): UN-ECOSOC (3377), International Organization for Standardization (2314), Organization of American States (3030), and Council of Europe (435). Second, there are other associations with large memberships (over 125) and large organization sets (over 50): UNESCO (3383), FAO (971), ILO (2183), WHO (3548), UNICEF (3380, UNCTAD 3381, and WMO (3556).

However, in Test 2, by controlling for the extreme cases, a moderately weak correlation coefficient of .520 is calculated (r^2 = .270). In Figure 23, the form of the relationship appears to be linear. A few

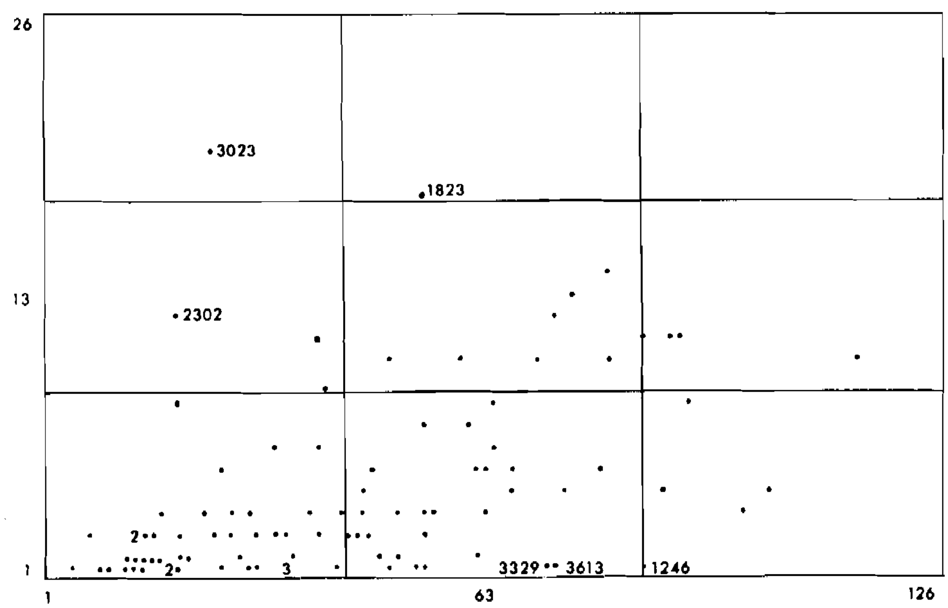

FIGURE 23: SCATTERGRAM OF MEMBERSHIP SIZE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (FAO Test 2)

associations have small memberships and relatively large organization sets: Organization for Economic Cooperation and Development (3023), International Olive Oil Council (2302). A number of other associations which do not conform to the predicated relationship between size of membership and number of associations contacted tend to cluster along the horizontal axis, indicating that increases in number of members does not affect the size of organization sets: International Association of Agricultural Economists (1246), World's Poultry Science Association (3613), and Trade Unions International (3329), exemplify this characteristic of having large memberships (over 70) and contact with only one other international organization.

Figure 24 shows the scatterplot using Test 3 maximum values (see Appendix A). Pearson's r equals .497 (r^2 = .247). The form of relationship appears to be linear, although there is considerable dispersion of data points. *All three tests confirm Hypothesis 4 as applied to the FAO subsets of data,* given the correlation coefficients. However,

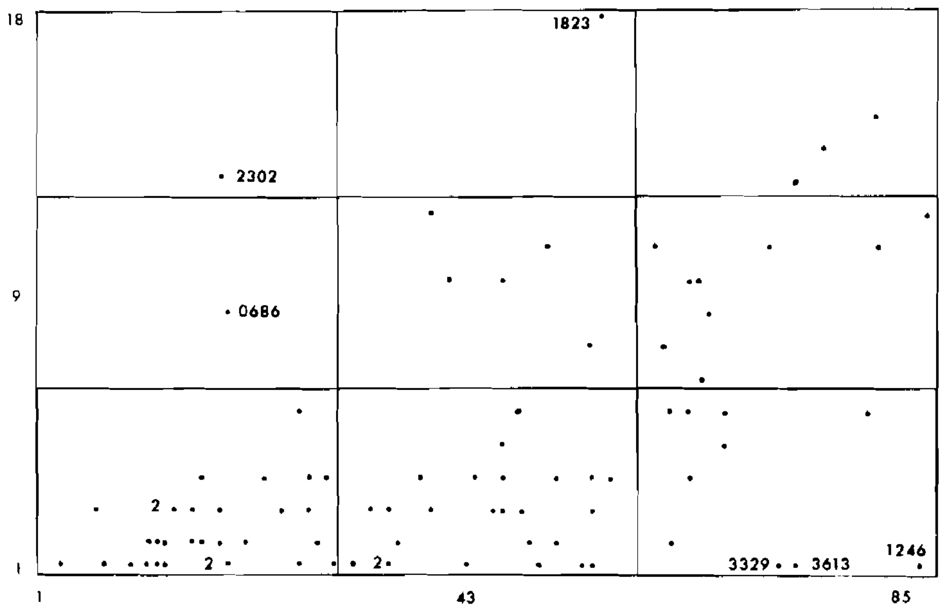

FIGURE 24: SCATTERGRAM OF MEMBERSHIP SIZE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (FAO Test 3)

Test 3 may be the most reliable exercise and it reveals moderately weak correlation for the majority of cases which have small organization sets. Among those organizations there is association between size of membership and number of international organizations contacted.

Two outlying cases may be distorting the plot of the least-squares line: International Olive Oil Council (2302) and European Confederation of Agriculture (686). Most associations tend to contact less than seven other international organizations, but for those which do contact more than seven, all except the previously mentioned two cases have memberships of 35 or more countries.

Although the amount of variance explained and correlation coefficients were improved in subsequent tests, those values do not indicate that Hypothesis 4 is a particulary powerful explanatory statement. Part of the problem appeared in Figures 21 and 24 where many cases are clustered along the horizontal axis. These cases tend to skew results for both the primary data set and FAO network. These cases have varying membership sizes but only one or two reported contacts with other international organizations. The possibility of inaccurate reporting has been pointed out previously. Such inaccuracies in number of associations contacted could be affecting the test results, especially if the number reported underestimates the actual total of contacts. This is only one possibility. It is also possible that the scores are correct and, consequently, that the utility of the hypothesis is restricted.

HYPOTHESIS 5: *As the age of international food organizations increases, those associations tend to contact more international organizations.*

In order to test for relationships between age of agency and number of international organizations contacted, the primary data set and FAO network were used. Pairwise deletion of missing values reduced the N-size of each sample: 185 out of 445 cases were included in Test 1 applied to the primary data set and 124 cases out of 154 in the FAO network. Only cases having one or more links were included.

No association of significance to support Hypothesis 5 for the primary data set is found in the pattern revealed by Figure 25 since Pear-

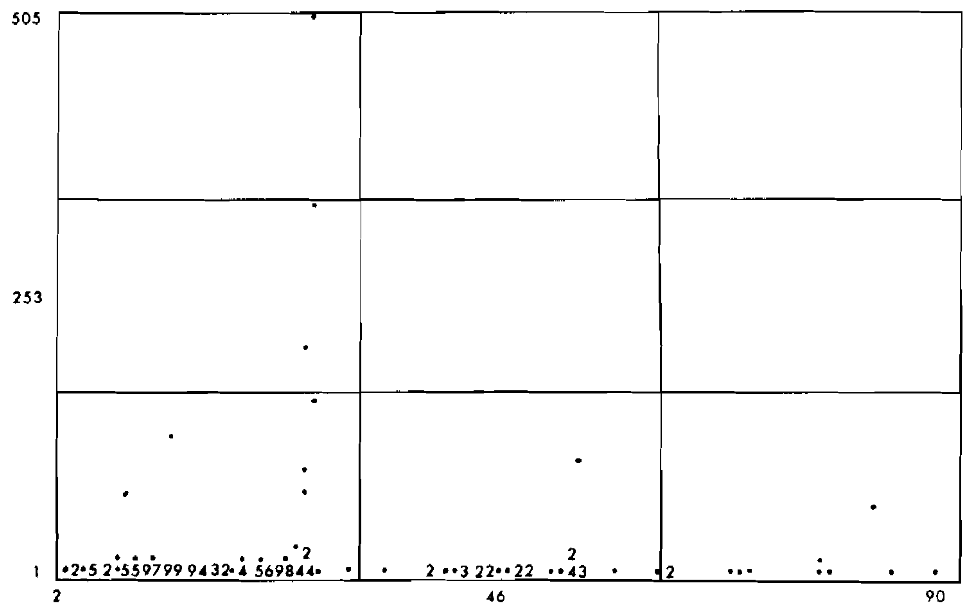

FIGURE 25: SCATTERGRAM OF AGE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (Test 1)

son's r equals .063 (r^2 = .004). The extreme cases force the least-squares line to be a poor estimate. Most cases are grouped along the horizontal axis. By adjusting the maximum values of both scales in Tests 2 and 3, it will be possible to focus on the clustering (see Appendix A for values). This finding of .063 correlation does not disconfirm Hypothesis 5 in the opinion of the researcher. However, it does suggest that the influences of extreme cases may mask any relationship between independent and dependent variables in this test. Subsequent tests will investigate Hypothesis 5 without including such outlying cases.

Figure 26 retains 175 of 185 cases for which data on both variables were coded, but eliminates extreme cases from the scattergram. The correlation coefficient is .305, representing weak association for Test 2 (r^2 = .093). The fit of the least-squares line to the data has been improved by dropping ten outlying cases. The form of the relationship appears to be linear. *The strength of Pearson's r (.305) weakly confirms Hypothesis 5 as applied to the primary data set of 175 cases.*

Data points in Figure 26 seem clustered in two distinct patterns. The left cluster of international food organizations was formed after 1945, while the right cluster was established before 1936. Test 3 will

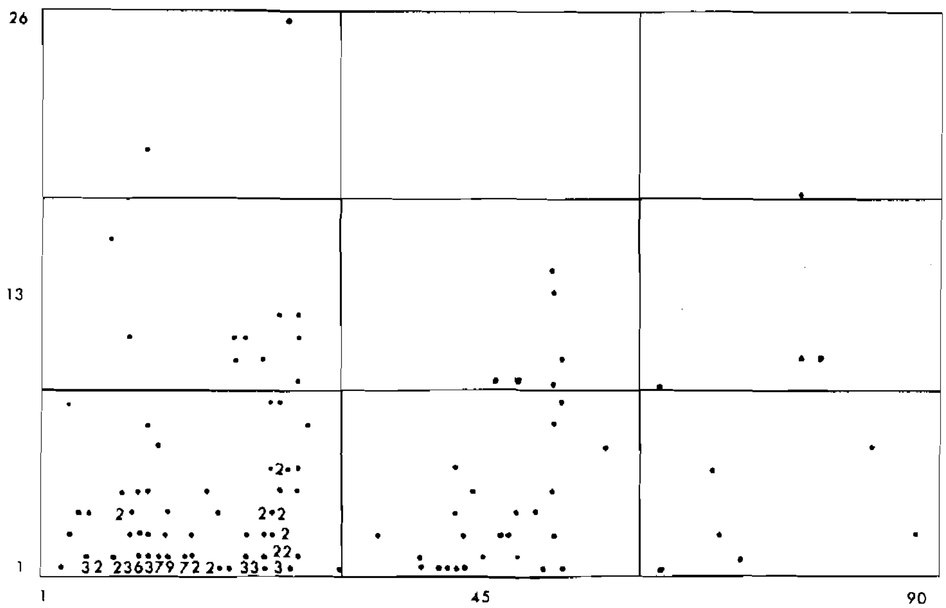

FIGURE 26: SCATTERGRAM OF AGE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (Test 2)

examine international food organizations founded after 1918 (see Appendix A for values).

Figure 27 reveals more clearly the two clusters. In each pattern *those international food organizations founded after wars (1918 and 1945) tend to interact with more international organizations than those founded later.* This interpretation implies that a single least-squares

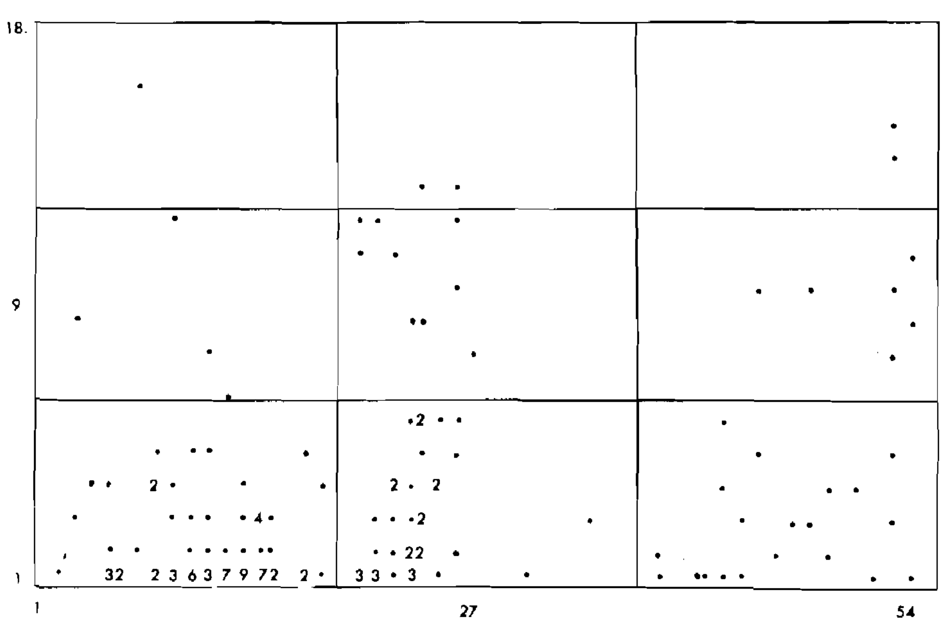

FIGURE 27: SCATTERGRAM OF AGE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (Test 3)

line may not be the best statement of the relationships, although the strength of the correlation coefficient (.315) measures weak asociation (r^2 = .099). The form of relationship appears bimodal, hence further analysis of each cluster separately will be undertaken. *Hypothesis 5 is weakly confirmed by Test 3 of the 161 cases from the primary data set.* There is a relationship between age and number of international organizations contacted, although there appears to be stronger

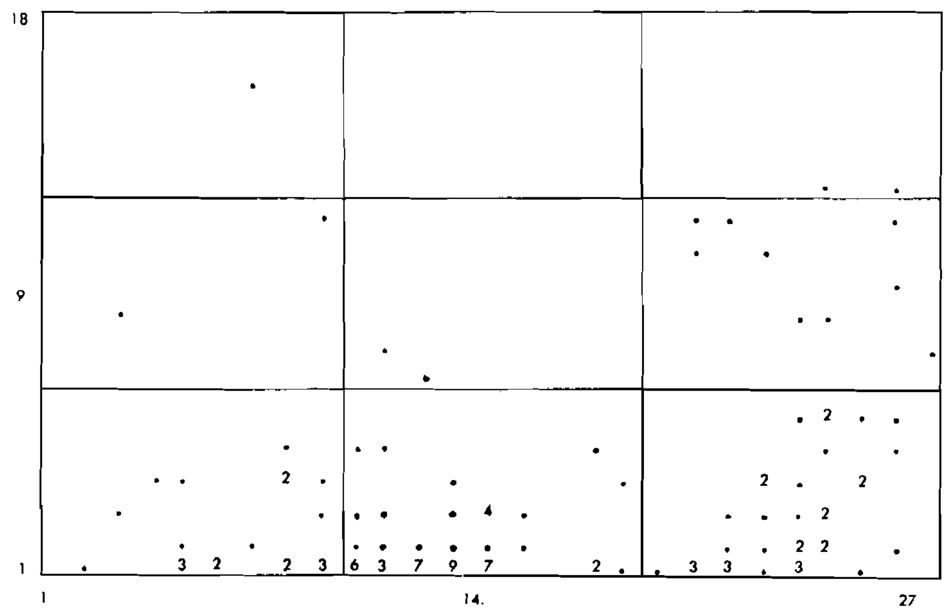

FIGURE 28: SCATTERGRAM OF POST 1945 SAMPLE

FIGURE 29: SCATTERGRAM OF POST 1918 SAMPLE

association between when an international food organization was established and size of its organization set.

Analysis of each cluster revealed by Figure 27 was undertaken next in order to test the latter observation. Figure 28 focused on those 131 international organizations which were founded after 1945, while Figure 29 examined 30 international organizations founded between 1918 and 1945.

The coefficient of correlation for Figure 28 is .286, which indicates weak association (r^2 = .082). There are several outlying cases in the quadrants nearest the vertical axis which diminish the strength of relationship. Form appears to be linear. *For international food organizations established after 1945, this evidence weakly confirms Hypothesis 5 for 131 cases in the primary data set.*

In Figure 29, Pearson's r is computed at .516 for 30 cases (r^2 = .266). *The strength of this correlation coefficient gives moderately weak confirmation for Hypothesis 5 as applied to the subset of international food organizations established between 1918 and 1945.* The form of relationship appears to be linear.

Substantively, the two clusters portrayed in Figures 28 and 29 follow the same pattern: *international food organizations in the primary data set which were founded soon after world wars tend to interact with more international organizations than those established later.* This is not to imply that a cause and effect relationship exists. There is a pronounced pattern for the post-1945 cluster in Figure 28, in part due to the large N-size. More organizations were established in this period and more of them engage in contacting a large number of international organizations. Relative to the post-1918 sample, only the absolute difference seems important.

There are also more deviant cases as indicated by the outlying data points in Figure 28. In Figure 29, the pattern is more consistent since there are relatively few outlying cases and no truly deviant ones. In general, most cases in both figures conform to the generalization that there is a relationship between numbers of years after a world war and number of international organizations contacted.

Testing of this relationship between number of years after a world war and number of international organizations contacted was conducted by creating a dummy variable which combined the cases from the post-1918 data set and post-1945 data set. More specifically, those cases in the 1918-1938 period were recoded in a manner which integrated them chronologically into the 1945-1970 data set. Since the variable *age* was calculated by subtracting the date of founding from 1972, the base year of sampling, it was possible to add a factor to each score on the 1918-1938 scale in order to make 1918-1945 (or 27 years old), 1919-1946 (or 26 years old), etc. in the 1918-1938 data set. Following this procedure, each score was converted to the 1945-1970 scale.

Figure 30 displays the results of plotting the scattergram for the cases occurring after world wars. Pearson's r equals .352 (r^2 = .124). The correlation coefficient indicates weak association between the vari-

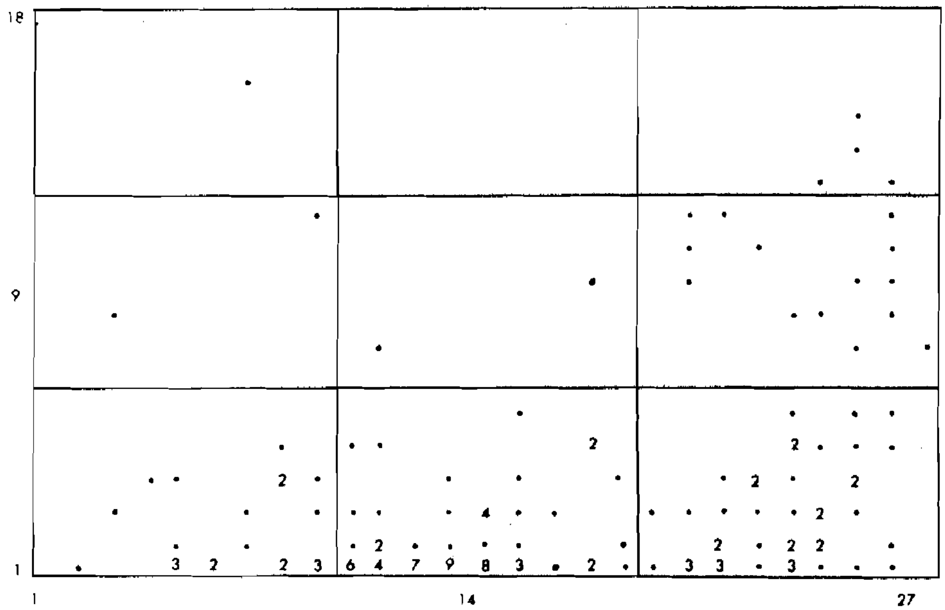

FIGURE 30: SCATTERGRAM OF POST WAR SAMPLE

ables, while the regression coefficient shows that the proportion of variation being explained is slight since the value is less than .200. A few outlying cases cause r to overestimate the association. However, there does appear to be a constant relationship between number of years after a world war and number of organizations contacted, as was pointed out earlier: *international food organizations founded soon after wars*

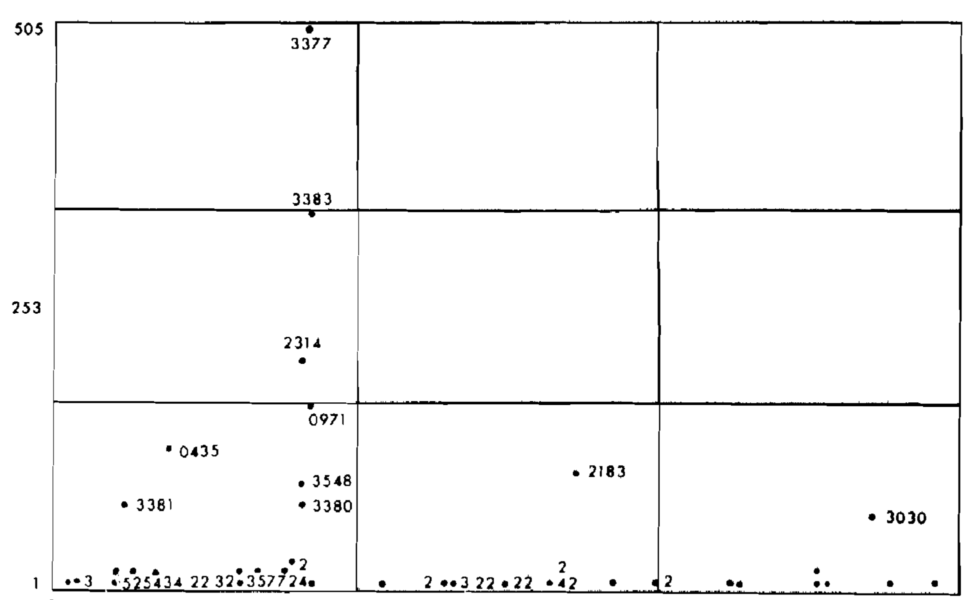

FIGURE 31: SCATTERGRAM OF AGE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (FAO Test 1)

tend to interact with more international organizations than those established later.

Circumstances following world wars may be such that cooperation among newly formed international organizations is a necessity. It would be interesting to examine the number of contacts over the years since founding of organizations to determine if time were a factor or if initially they formed a number of linkages as was speculated. Regardless of whether conditions after a war or time itself conditioned such activity, those associations display a greater tendency to contact other organizations than more recently established ones.

Next, examination of the relationship between age of agency and interaction will focus on the FAO network. Figure 31 reveals that for Test 1 a subset of 124 cases have complete data, but almost no correlation is recorded. Pearson's r equals .013. A few extreme cases forced the least-squares line away from the majority of cases. These include UN-ECOSOC (3377), UNESCO (3383), International Organization for Standardization (2314), FAO (971), Council of Europe (435), UNCTAD (3381), WHO (3548), UNICEF (3380), ILO (2183), and OAS (3030). All have organization sets of more than 50 associations. Only two, however, were founded prior to World War II: ILO and OAS. UNCTAD and Council of Europe are the most recently formed ones, while all others were established immediately after World War II. By adjusting both scales in Test 2 and 3, it will be possible to concentrate attention on the cases along the horizontal axis. With so many cases clustered along it, the form of relationship is not evident in Figure 28.

Figure 32 portrays the relationship in Test 2 after scale values for agency age and interaction have been adjusted (see Appendix A for

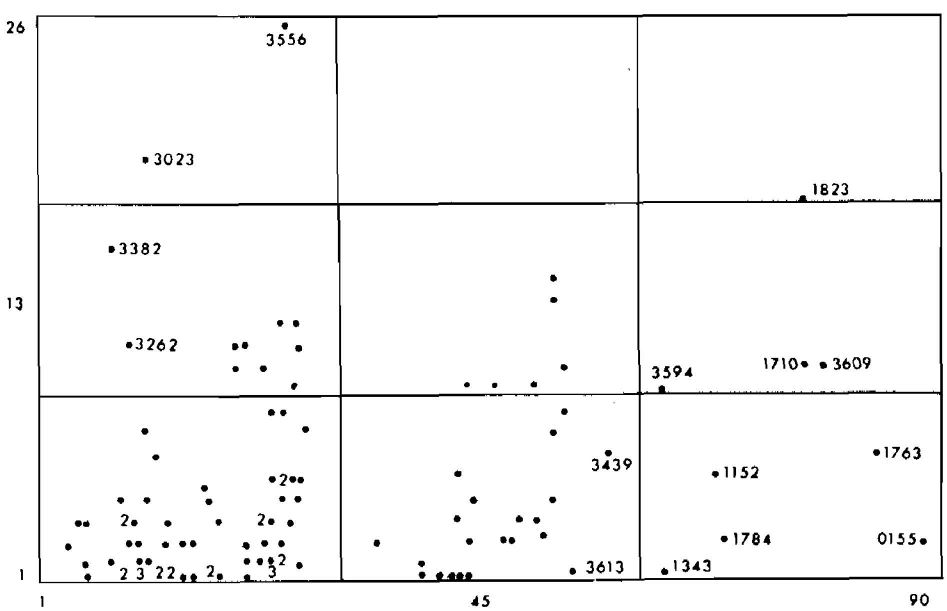

FIGURE 32: SCATTERGRAM OF AGE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (FAO Test 2)

values). Some 114 cases are included, while ten extreme cases have been eliminated. Pearson's r is computed at .226 for this subset, which represents an improvement over the initial correlation (r^2 = .051). The present coefficient is weak, but does indicate association exists. The form of relationship appears linear. *Strength of association at .226 weakly confirms Hypothesis 5 as applied to this FAO subset* of 114 cases. As in Figure 26, data points seem clustered in two patterns. Further examination of these clusters will be undertaken in Figure 33, when maximum values of Test 3 are adjusted to exclude outlying cases.

Those outlying cases in Figure 32 include associations which were established after World War II. They include WMO (3556), Organization for Economic Cooperation and Development (3023), UNDP (3382), and Special Committee for the International Biological Programme (3262). The first three have exceptionally large organization sets compared to other associations in Figure 32 which were formed after World War II. Another group of outlying cases which will be eliminated for Test 3 is associations established prior to World War I. Most have seven or fewer contacts with other international associations. These are the deviant cases. Others which will be eliminated because of age, but which have more than seven contacts are not deviant cases, it would appear: World Union of Catholic Women's Organizations (3594), International Co-operative Alliance (1710), World's Young Women's Christian Association (3609), and International Federation of Documentation (1823). All four cases approximate the least-squares line in Figure 32 but are eliminated in order that analysis may focus on the relationship between world wars and contact with international organizations in subsequent scatterplots.

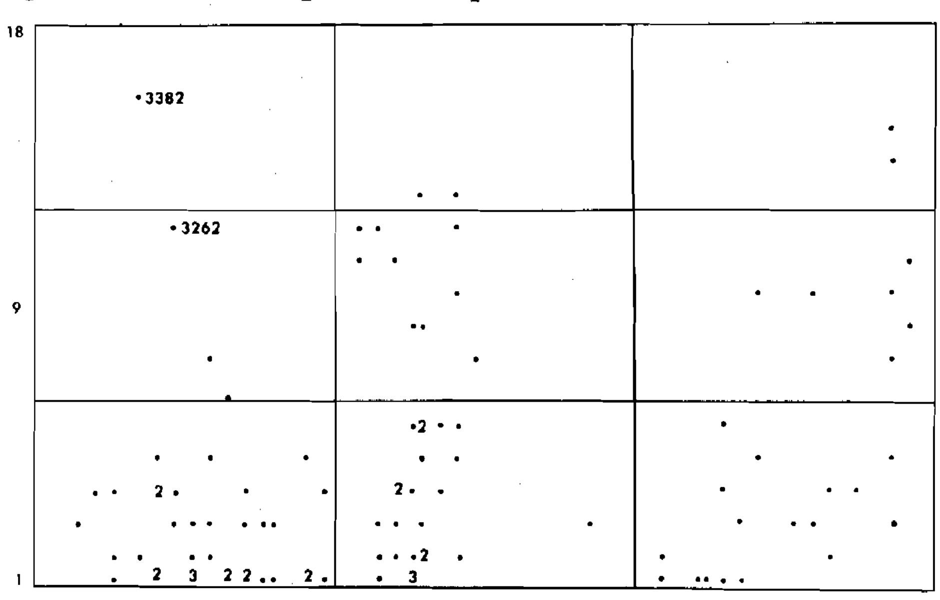

FIGURE 33: SCATTERGRAM OF AGE AND NUMBER OF INTERNATIONAL ORGANIZATIONS CONTACTED (FAO Test 3)

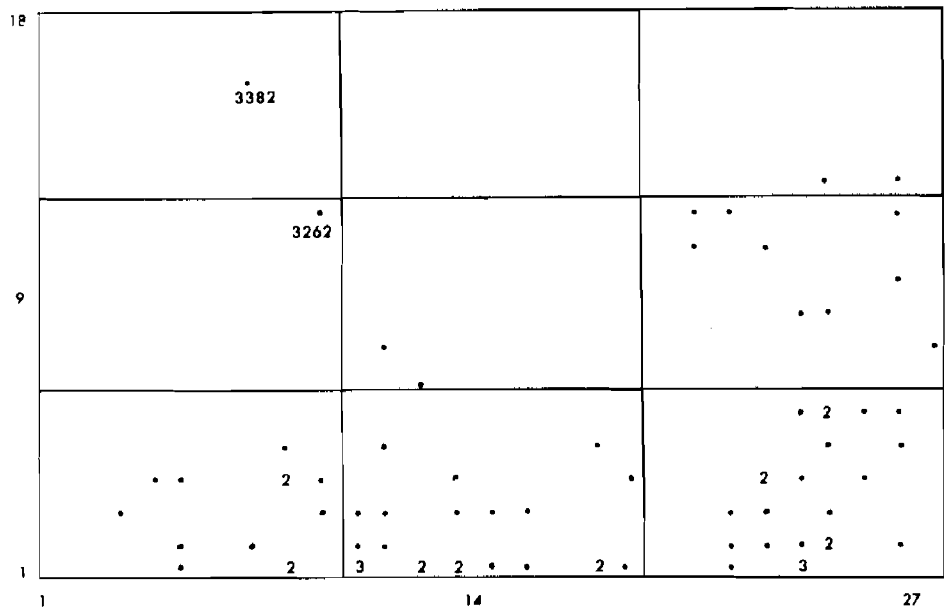

FIGURE 34: SCATTERGRAM OF POST 1945 SAMPLE (FAO)

Two distinct clusters appear in Figure 33. The larger cluster on the left includes international food organizations founded after 1945, while the right cluster has cases which were established between 1918 and 1945. Pearson's r equals .254 and indicates weak association between variables (r^2 = .064). *Hypothesis 5 is weakly confirmed, given the correlation coefficient of .254 for this subset of FAO.* However, the form of relationship appears bimodal and further decomposition will take place in an effort to analyze each cluster separately.

Pearson's r for Figure 34 equals .270 for 75 international organizations established after 1945 (r^2 = .073). The form of relationship appears linear. Two outlying cases are noted which may influence results: UNDP (3382), and Special Committee for the International Biological Programme (3262). Both associations are rather recent creations, but both have 12 or more contacts with other international organizations, a relatively large number for newer organizations. However, both associations are coordinating-type agencies. UNDP supplies funds for projects to be carried out by other agencies, while the Biological Programme is composed of representatives from seven international scientific unions, and in turn, acts as their contact mechanism with UNESCO, FAO, WHO, and WMO (UIA, 1972: 593; 570).

Hypothesis 5 is weakly confirmed for the FAO subset founded after 1945, given the correlation of .270. A moderate measure of association is computed for 26 cases in Figure 35. Pearson's r equals .630, although with so few cases, the included ones have a disproportionate effect on the coefficient (r^2 = .397). The form appears linear. *Hypothesis 5 is moderately confirmed for the FAO subset of international food organizations established between 1918 and 1945.*

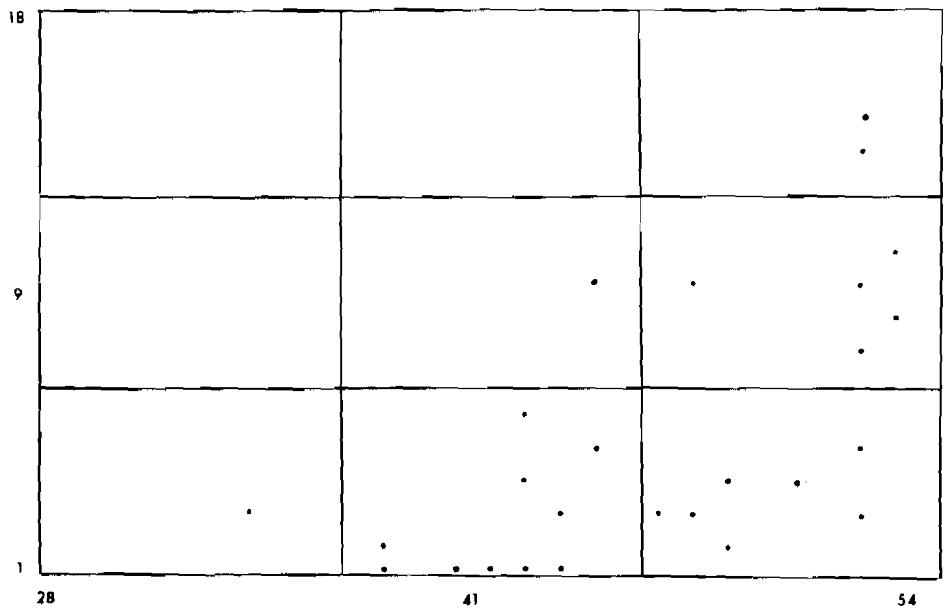

FIGURE 35: SCATTERGRAM OF POST 1918 SAMPLE (FAO)

Both clusters follow the pattern noted in the primary data set (Figures 28 and 29): *international food organizations in the FAO network which were founded soon after world wars tend to interact with more international organizations than those founded later.* Several deviant cases are located in the post-1945 cluster (Figure 34). A few

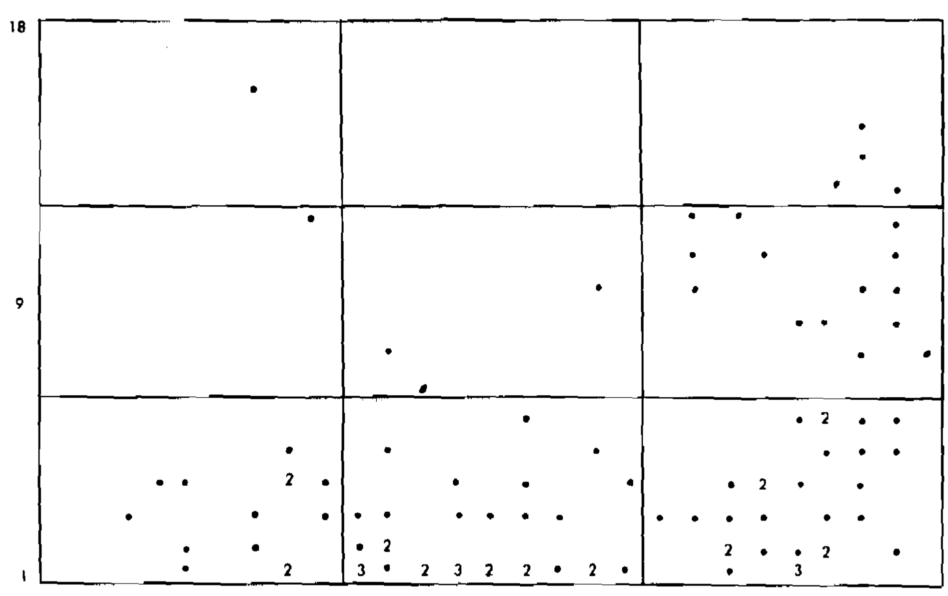

FIGURE 36: SCATTERGRAM OF POST WAR SAMPLE (FAO)

outlying cases in Figure 35 are also noted, but the generalization holds for both clusters.

Additional testing of the relationship between number of years after a world war and number of international organizations contacted was undertaken for the FAO network by creating a dummy variable as in Figure 30. Those cases falling in the 1918-1938 scale were recoded to the 1945-1970 scale in the following manner: 1918-1945 (27 years), 1919-1946 (26 years), etc.

Figure 36 is the scattergram of the relationship between the dummy variable and number of international organizations contacted. Pearson's r equals .360 and the regression coefficient was .130. A few deviant cases may cause the correlation coefficient to overestimate the strength of association, while r^2 indicates a small proportion of variation being explained. Nevertheless, there does appear to be a constant relationship between age and number of international organizations contacted for the FAO subset: *those associations founded soon after world wars tend to interact with more international organizations than those established later.* As was mentioned earlier, time or maturation may be the key factor in leading associations to have large organization sets. The alternative interpretation, given present evidence, is that conditions after world wars may stimulate interorganizational cooperation and hence contact is necessary. Such initial experience could reinforce later tendencies to expand organization sets. Further research would have to investigate both alternative explanations.

The various exclusions and rearrangements of data sets helped to improve the amount of variance explained and correlation coefficients, but none of the tests strongly supported Hypothesis 5. Therefore, its utility as an explanatory statement is marginal at best. Even when the post-world war clusters were examined separately and jointly, while the results did confirm weak association, no powerful explanatory proposition was revealed.

SUMMARY AND CONCLUSIONS

Five hypotheses about the relationship between attributes of international food organizations and the number of other international organizations contacted were tested for two samples – the primary data set and FAO organization set. Subsets of each sample were tested as well in an effort to remove effects of outlying or extreme cases from calculation of correlation coefficients. The procedure of subset analysis was followed since inspection of initial scatterplots revealed several atypical cases might be distorting results in all tests of hypotheses.

> HYPOTHESIS 1: *As the staff size of international food organizations increases, those associations tend to contact more international organizations.*

Both samples – the primary data set and FAO network – tended to confirm this hypothesized relationship. Tests for both samples and two subsets of each yielded positive correlations ranging from .187 to .748 (r^2 = .035 to .560) indicating weak to moderately strong association between staff size and number of international organizations contacted for the respective groups of cases examined. The strongest correlations (.748 and .720) resulted from tests of FAO's organization set and the primary data set without eliminating extreme cases.

Examination of two subsets of each sample produced weaker correlation coefficients. Removing the most extreme cases from calculation of statistics, values of .232 and .187 (r^2 = .054 and .035) were calculated for the primary data set and FAO network. The next step removed a few deviant cases and focused on the clustered cases, producing correlations of .385 and .359 (.148 and .129 for r^2) for the primary subset and FAO subset respectively. Both scores indicate weak association between staff size and number of international organizations contacted. They represent a more accurate measure of relationship for the majority of cases – 64 of 78 in the primary data set and 52 of 63 in FAO's organization set.

It might be concluded that among international food organizations, there is a relationship between bureaucracy and interaction. As associations increase the number of staff, they generally increase the size of organization sets. Hypothesis 1 is weakly confirmed.

Given the weak correlation coefficients and small amount of variance explained for the last test, however, this evidence does not warrant treating the hypothesis as a powerful explanatory statement. Too much dispersion of cases was noted in Test 3 of both data sets after eliminating extreme and/or outlying cases. What this means is that some international food organizations had many contacts with international organizations and smaller staffs than other associations which had large staffs and small organization sets.

> HYPOTHESIS 2: *As the budget of international food organizations increases, those associations tend to contact more international organizations.*

Both samples – the primary data set and FAO network – confirmed relationship. Tests for both samples and two subsets of each yielded positive correlations ranging from .334 to .847 (r^2 = .112 to .717), indicating weak to strong association between staff size and number of international organizations contacted. Strongest correlations (.834 and 47) came from tests of the primary data set and FAO network samples without eliminating extreme cases.

Subset analysis yielded weaker correlation coefficients after extreme cases were removed. Values of .350 and .334 (r^2 = .122 and .112) were calculated for 35 cases in the primary data set and 30 cases in FAO's organization set of 46 and 39 cases originally. These statistics may be better estimates of association than the third test results due to the larger N-size. Only 27 and 22 cases were retained by focusing on the clustered patterns, although moderately weak correlations of .526

and .522 (r^2 = .277 and .272) resulted for the primary subset and FAO subset.

Given the above correlations measuring the relationship between budget and number of international organizations contacted, it may be concluded that as size of budget increases, so do the number of international organizations contacted. Some association is found to weakly confirm the hypothesis.

Given the moderately weak correlation coefficients and small amount of variance explained for the last test, however, this evidence does not warrant treating the hypothesis as a powerful explanatory statement. Dispersion of data points in the last test after eliminating extreme and/or outlying cases indicates that many cases fail to conform to the predicted pattern. Some international food organizations with small budgets had many contacts and others with large budgets had few contacts.

HYPOTHESIS 3: *If international food organizations have headquarters in Center regions, then they tend to contact more international organizations than those with headquarters in Periphery regions.*

Two different methods of testing the relationship between location of headquarters and interaction were employed. No proof to confirm the relationship was provided by the first method and only weak evidence was generated by the second.

Phi, a statistic comparable to a correlation coefficient, was computed for dichotomized data. Three tests of both samples – the primary data set and FAO network – were conducted. No measure of association exceeded .100, indicating no relationship or an extremely weak one.

Two nonparametric statistics – Spearman's rho and Kendall's tau – were computed on the assumption that data was ordinal level. Only one test was made for each sample. For the primary data set, rho equaled .167 and tau .153. Weak association between variables is present. For FAO's organization set, rho equaled .305 and tau .261. Both values indicate weak association in the FAO cases.

In conclusion, it must be pointed out that while testing variables as dichotomized measurements, no proof supporting Hypothesis 3 was found. Rank order correlations (rho and tau) indicate weak association between variables. Evidence does not warrant drawing implications, although Hypothesis 3 is weakly confirmed by the rank order correlations.

HYPOTHESIS 4: *As the membership of international food organizations increases, those associations tend to contact more international organizations.*

Both samples – the primary data set and FAO's organization set – confirm this relationship. Tests for both samples and two subsets of each yielded correlations ranging from .258 to .602, indicating weak to moderate association between number of members and number of international organizations contacted.

The weaker correlations were found in the analysis of each sample without eliminating extreme cases: .299 (r^2 = .089) for the primary data set and .258 (r^2 = .067) for FAO's organization set. Subset analysis produced stronger coefficients after extreme cases were removed. For those cases in the subset analysis, the hypothesis served as a moderately accurate predictive statement. In the primary data set, two moderate correlations were derived by focusing on 162 and 153 out of 172 cases. Both subsets represented clustered cases with outlying cases removed from calculations. Correlations of .602 and .577 were found (r^2 = .363 and .333). Coefficients of .520 and .497 (r^2 = .270 and .247) were calculated for two subsets of FAO data, indicating moderately weak association. All tests confirmed Hypothesis 4.

It might be concluded that among international food organizations, there is a relationship between size of membership and number of international organizations contacted. After a particular breakpoint, however, the strength of that relationship decreases, indicating that past a threshold, increasing the number of members does not increase the number of contacts as rapidly as below the breakpoint. This project used an arbitrary cutoff value of 126 members for the second test and 85 members for the third, both based on inspection of previous scatterplots. Further research might established a more precise value. However, Hypothesis 4 is confirmed: as associations increase the number of members, they generally increase the size of organization sets.

However, the strength of correlation coefficients and amount of variance explained does not provide evidence that a powerful explanatory statement has been discovered. The hypothesis does appear to have more value for explanation than previous ones, especially for the primary data set where one-third or more of the variance was explained. Nevertheless, its utility does not appear sufficient to warrant applying it in making recommendations about enlarging memberships in order to expand contacts with other international organizations. Other factors would have to be considered and since this study tested bivariate relationships, it would be inappropriate to make recommendations based on multivariate considerations.

> HYPOTHESIS 5: *As the age of international food organizations increases, those associations tend to contact more international organizations.*

Initial tests of both samples – the primary data set (185 cases) and FAO network (124 cases) – yielded low correlations: .063 and .013. However, tests of two subsets from each sample gave improved values when controlling for outlying cases: association was found for two subsets of cases in the primary data set (correlations equaled .305 and .315; r^2 = .092 and .099), while weak association for subsets of cases within the FAO network (values equaled .226 and .254; r^2 = .051 and .073). All demonstrated relationship between age of international food organizations and number of international organizations contacted, thus confirming Hypothesis 5. It might be concluded that the older international food organizations have larger organization sets than the younger ones.

Further investigation of cases in the primary data set and FAO network was suggested by scattergraphs in Test 2 and Test 3. Both revealed bimodal patterns in which cases cluster in periods after World War I and World War II. By analyzing each cluster separately, additional tests of Hypothesis 5 were performed. For the post-1918 cluster in the primary data set, a correlation of .516 was computed (r^2 = .266). A value of .286 was found for the post-1945 cluster (r^2 = .082). In the FAO network, coefficients of .360 and .270 (r^2 = .397 and .073) were computed for the post-1918 and post-1945 clusters. Weak association for both post-1945 clusters is indicated, but moderately weak relationships are noted in the post-1918 clusters. Organizations founded soon after wars tend to have larger organization sets than those established in later years.

Another test was derived in which a dummy variable (years after world wars) was created and run against number of contacts. For the primary data set, correlation of .352 and r^2 of .124 were computed. For FAO's organization set, values of .360 and .130 were computed. Neither test yielded correlations or amount of variance explained that deviated from previous values.

Testing of Hypothesis 5 produced some evidence to confirm it. However, neither the strength of correlation coefficients nor amount of variance explained would justify treating the hypothesis as a powerful explanatory statement.

Prior to testing these relationships, it had been hoped that strong confirmation for Hypotheses 1, 2, 3, and 4 would be given. These hypotheses included independent variables which the researcher thought might be manipulative, that is, they could be altered or changed in order to increase contact among international organizations. However, when each variable is considered by itself, its explanatory power does not warrant treating it as manipulative. They do serve as descriptive variables. Hypothesis 5 was a test designed to determine if maturation were important as an independent variable. It appears to serve better as an intervening variable, since it is not manipulative and should be included in multivariate analysis.

Future research should focus on multivariate analysis of these variables. Findings in this study indicate that the variables included may in combination have increased explanatory power, while by themselves they leave something to be desired.

APPENDIX A: VALUES SELECTED FOR SETTING HIGH AND LOW SCORES TO TEST FOR BIVARIATE RELATIONSHIPS BETWEEN INDEPENDENT VARIABLES AND INTERACTION *

	Test 1: Minimum, Maximum Values for All Cases with Joint Scores	Test 2: Minimum, Maximum Values for Subset of Cases Excluding Extreme Scores	Test 3: Minimum, Maximum Values for Subset of Cases Excluding Additional Deviant Scores
Staff	1,3643	1,200	1,40
Budget	1,96075	1,5520	1,550
Membership	1,141	1,126	1,85
Agency Age	1,90	1,90	1,54
International Organizations Contacted	1,505	1,26	1,18

*NOTE: Staff figures refer to number of total employees; budget refers to expenditures in thousands of US dollars; membership refers to the total number of countries participating in an association; agency age refers to the age of an association in years; and International Organizations contacted refers to the number of international organizations with which an association has contacts which are reported in the *Yearbook*.
Source: *Yearbook of International Organizations*, Volume 14 (1972-1973)

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