Communism, Conformity, Cohorts, and Categories: American Tolerance in 1954 and 1972–73[1]

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Samuel A. Stouffer's 1954 survey is compared with replication data in the National Opinion Research Center's 1972–73 General Social Surveys to check his predictions regarding the effects of generation, age, and education on tolerance of Communists and atheists. A flow graph model for difference equations involving categorical variables is used to organize the findings. Major conclusions are these: (1) there has been an average increase of about 23% in tolerant responses; (2) about 4% of this increase is due to cohort effects on educational attainment, as Stouffer predicted; (3) about 5% is due to cohort replacement per se; (4) about 13% is due to increasing tolerance among all cohort and education groups, the opposite of what Stouffer predicted; and (5) about 1% is due to increased college attainment not accounted for by cohort.

In 1954, Samuel A. Stouffer studied tolerance of Communists, atheists, and socialists in a 4,933-case national sample. His classic monograph, *Communism, Conformity, and Civil Liberties,* ventured this forecast:

> The data showed that [*A*] the older generation was less tolerant of nonconformists than the younger generation; also, that [*B*] within each group the less educated were less tolerant than the better educated.
>
> The fact also was brought out that [*C*] the older generation tended to have much less education than the younger—reflecting the big change in American school attendance in the past thirty years.
>
> Can we then forecast, we asked, that if external conditions are unchanged the younger people will be more tolerant when they grow older than their elders are now?
>
> . . . Much evidence points in this direction . . . [*C*] more of the people who are moving from youth to middle age [are] better educated than their elders. . . .

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> On the other hand, [*D*] even if the people who are now 30 may still be more tolerant when they reach 60 than their elders, they may on the average be somewhat less tolerant than they are now. This is suggested by the tendency, among people at the *same* educational level, for the older ones to be . . . less tolerant. . . . [Stouffer 1955, p. 107]

THE ARGUMENT IN GRAPH TERMS

Stouffer is talking about three variables—cohort ("generation"), educational attainment, and tolerance—and three static propositions: (*A*) the older the cohort, the less the tolerance; (*B*) the greater the education, the greater the tolerance; (*C*) the older the cohort, the less the education.

Following Stinchcombe (1968, pp. 130–48), the three propositions can be represented by the linear flow graph in figure 1. As is conventional in

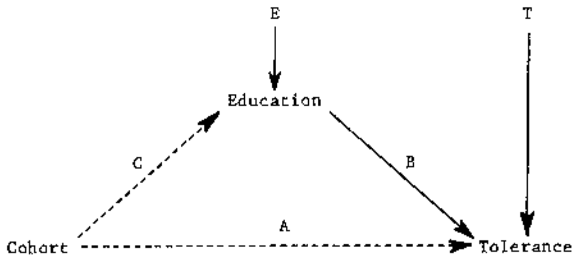

FIG. 1.—Flow graph for propositions *A*, *B*, and *C*. For cohort, older is the positive end, younger the negative. Solid lines indicate positive coefficients; dashed lines indicate negative coefficients. *E* and *T* are constants or "intercept" values.

flow graphs, we have added two residuals: *E* for education and *T* for tolerance. Technically, they represent the constants in equations for the system ("intercepts" for the slopes associated with the coefficients). Substantively, they may be viewed as the contribution of all variables excluded from the model.

Stouffer also adds a dynamic proposition: (*D*) net of all other variables, tolerance will decline with time.[2] Nothing is said about two other matters that turn out to be relevant. Taking his silence as deliberate, we add two other propositions: (*E*) cohort change completely accounts for change in education, and (*F*) the coefficients *A*, *B*, and *C* do not change over time. As will be explained later, propositions *A*–*F* imply the "change graph" in figure 2. (The symbol, delta [Δ], may be read as the difference in value between a later and an earlier time.)

If the six propositions are correct, Stouffer's implicit dynamic argument may be read off figure 2.

[2] Stouffer does not distinguish between "period" and "age" effects in proposition *D*, although my impression is he is talking about age. Since the two are confounded in our analysis, we will call the time effect "period-age."

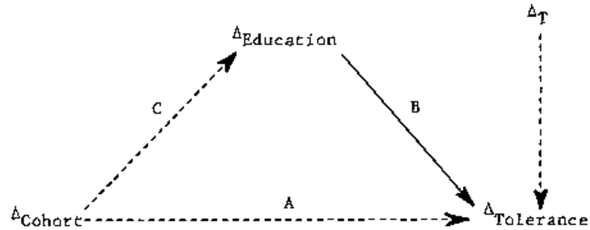

FIG. 2.—Change graph for Stouffer's argument

1. Δ_{Cohort} will be negative (the mean "oldness" of the population will decline over time).
2. $\Delta_{Education}$ will be positive, since it equals Δ_{Cohort} C and both have negative signs. (The departure of less well-educated, older cohorts will raise education.)
3. $\Delta_{Tolerance}$ will have one negative and two positive components:

$$\Delta_{Tolerance} = (\Delta_{Cohort} \cdot A) + (\Delta_{Cohort} \cdot C \cdot B) + (\Delta_T).$$

That is:

a) Δ_T will be negative (from proposition D).
b) $\Delta_{Cohort} \cdot A$ will be positive, since both terms are negative. (The declining proportion of less tolerant oldsters will raise tolerance.)
c) $\Delta_{Cohort} \cdot C \cdot B$ will be positive, since B is positive and the other two terms are negative. (The declining proportion of less well-educated oldsters will raise tolerance.)

In brief, Stouffer's prophecy boils down to two points: (1) cohort replacement will tend to increase tolerance directly and also via an increase in education levels, and (2) period-age will tend to decrease tolerance. Since the components have opposite signs, it is impossible to predict whether the net change in tolerance will be positive or negative. We will now proceed to check these propositions with national survey data.

DATA

The original Stouffer study was an area probability sample of the American population 21 years of age and older living in private households, with a completion rate of 84% (see Stouffer 1955, appendix A). In 1972 and 1973, the National Opinion Research Center (NORC) repeated nine of the original Stouffer tolerance items in its General Social Survey (GSS).[3] The GSS is a "modified probability" sample of the same uni-

[3] The General Social Survey (GSS) is an annual national sampling supported by the National Science Foundation that replicates a wide variety of sociological variables. Data from the study are disseminated to any interested person, at cost, immediately upon completion of the coding and keypunching, through the cooperation of the Roper Public Opinion Research Center, Williams College, Williamstown, Mass. The

verse, except that age is expanded to include persons 18–20 years old. By pooling the two GSS files and excluding 93 persons under 21 years of age and 18 cases lacking information on all three variables, we have 3,006 cases for comparison with Stouffer's 4,904 (4,933 minus 29 cases lacking information on all three variables). We will use these two data sets to check Stouffer's forecast over an 18–19-year interval.

In the original Stouffer questionnaire, age is coded 21–29, 30–39, 40–49, 50–59, and 60 years and older. For simplicity we used three groups, 21–39, 40–59, and 60 plus years, and termed them Young, Middle-aged, and Older. We can find the same cohorts in the 1972 and 1973 surveys by adding 18- or 19-year-olds[4] to these numbers, which also include a "new generation" of adults who reached age 21 in 1955 and after. This classification gives four cohort groups for analysis:

1. The Older Cohort—persons age 60 or older in 1954 and 79 or older in 1973. They were born in 1894 or before and reached age 16 in 1910 or earlier.
2. The Middle-aged Cohort—persons age 40–59 in 1954 and 59–78 in 1973. They were born between 1895 and 1914 and reached age 16 between 1911 and 1930.
3. The Younger Cohort—Persons age 21–39 in 1954 and 40–58 in 1973. They were born between 1915 and 1933 and reached age 16 between 1931 and 1949.
4. The New Generation—persons under age 21 in 1954 and 21–39 in 1973 (21–38 in 1972). They were born in 1933 or later and reached age 16 in 1949 and after. Persons in the New Generation were too young for the Stouffer study but appear in the 1972–73 data.

The second variable, educational attainment, was assessed by these questions: Stouffer: "What is the last grade you finished in school?" (seven precoded answers from "None" to "College graduate"). General Social Survey: "(*a*) What is the highest grade in elementary or high school that you finished and got credit for? (*b*) Did you ever get a high school diploma? (*c*) Did you complete one or more years of college for credit?" We assume that persons saying "yes" to question *c* match Stouffer's "College, not graduate" and "College graduate" categories; persons answering "yes" to *b* but not *c* match Stouffer's "High School (12)" category; and all others match Stouffer's "None," "Grammar School (1–6)," "Grammar School (7–8)," and "High School (9–11)" categories. The three groups will be termed "College," "High School," and "Grade School" (or "Grade").

Stouffer data were obtained through the courtesy of the Inter-University Consortium for Public Opinion Research.

[4] In fact, the tape used for 1972 had age coded in 10-year units. Thus, cohort definitions for 1972, but not for 1973, are off from one to two years. The discrepancy has little or no practical effect but should be borne in mind by anyone seeking to continue or extend this analysis in his own use of the GSS data.

TABLE 1

WORDING OF COMMUNIST AND ATHEIST ITEMS

Question	Response Categories
There are always some people whose ideas are considered bad or dangerous by other people. For instance, somebody who is against all churches and religion . . .	
A. If such a person wanted to make a speech in your city (town, community) against churches and religion, should he be allowed to speak, or not?	Yes, allowed to speak Not allowed Don't know No answer
B. Should such a person be allowed to teach in a college or university, or not?	Yes, allowed to teach Not allowed Don't know No answer
C. If some people in your community suggested that a book he wrote against churches and religion should be taken out of your public library, would you favor removing this book, or not?	Favor Not favor Don't know No answer
Now, I should like to ask you some questions about a man who admits he is a Communist.	
A. Suppose this admitted Communist wanted to make a speech in your community. Should he be allowed to speak, or not?	Yes, allowed to speak Not allowed Don't know No answer
B. Suppose he is teaching in a college. Should he be fired, or not?	Yes, fired Not fired Don't know No answer
C. Suppose he wrote a book which is in your public library. Somebody in your community suggests that the book should be removed from the library. Would you favor removing it, or not?	Favor Not favor Don't know No answer

The tolerance items, taken verbatim from Stouffer, appear in table 1. A similar trio of Stouffer-GSS items dealing with "a person who favored government ownership of all the railroads and all big industries" are not included in this report because preliminary inspection of the data showed their pattern to be about the same as that for atheists and Communists.

ANALYSIS

Flow graph models such as figures 1 and 2 can be estimated using regression techniques (for such an analysis of these data, see Stinchcombe [1974]). Nevertheless, we shall use a different, but closely related, technique for handling categorical data with flow graphs (*a*) because no level of measurement assumptions is required, (*b*) because the technique gives us interesting information about interactions and differential category effects that would be swept under the rug in regression analysis, and (*c*) because of arbitrary personal preference.

The method is simple enough; we will develop it by example as we proceed. The Appendix reviews the key concepts; for a more detailed explanation, see Davis (1976). Before proceeding, it is necessary to discuss alternative models for change data.

Change Models

Consider a prior categorical variable, K—for example, cohort—and a dependent dichotomy—for example, the proportion Grade on education—with measures of K and Y in independent samples of the same universe at Time I and Time II—for example, 1954 and 1972–73. (We do *not* assume a panel design with repeated measures on the same subject.)

To pick a change model, the relevant data are the proportions Y for each category of K at each time. Table 2 gives a schematic layout. Reading across the top row of table 2, we see: (*a*) p_{aI} and p_{aII}, the proportions Y for cases in the a category of k at Time I and Time II; (*b*) d_a, the percentage difference between p_{aI} and P_{aII}; (*c*) v_{aI}, the variance of p_{aI}, following the usual textbook formula for estimating the variance of a proportion; (*d*) v_{aII}, the variance for p_{aII}; and (*e*) $v_{aI} + v_{aII}$, the variance for d_a, following the usual textbook formula.

TABLE 2

Framework for Analyzing Change in a Categorical System

Category of K	Proportion Y Time I	Proportion Y Time II	d_k	v_{I}	v_{II}	v
K_a	$p_{a\mathrm{I}}$	$p_{a\mathrm{II}}$	$p_{a\mathrm{II}} - p_{a\mathrm{I}}$	$\frac{(p_{a\mathrm{I}})(1 - p_{a\mathrm{I}})}{N}$	$\frac{(p_{a\mathrm{II}})(1 - p_{a\mathrm{II}})}{N}$	$v_{a\mathrm{I}} + v_{a\mathrm{II}}$
K_b	$p_{b\mathrm{I}}$	$p_{b\mathrm{II}}$	$p_{b\mathrm{II}} - p_{b\mathrm{I}}$	Etc.	Etc.	Etc.
K_c	$p_{c\mathrm{I}}$	$p_{c\mathrm{II}}$	$p_{c\mathrm{II}} - p_{c\mathrm{I}}$	Etc.	Etc.	Etc.
Etc.	Etc.		Etc.	Etc.	Etc.	Etc.

Goodman (1963, pp. 97–98) gives simple methods for testing the following hypotheses in contingency tables with conditional d's: (1) the d_k's differ among each other, or (2) each d_k estimates a common universe value, d—(*a*) which is zero or (*b*) which is not zero.

Let us now consider how to interpret such tests when Goodman's techniques are applied to change data. A test has been made for significant changes in the marginal proportions of K. Figure 3 gives a typology of possibilities.

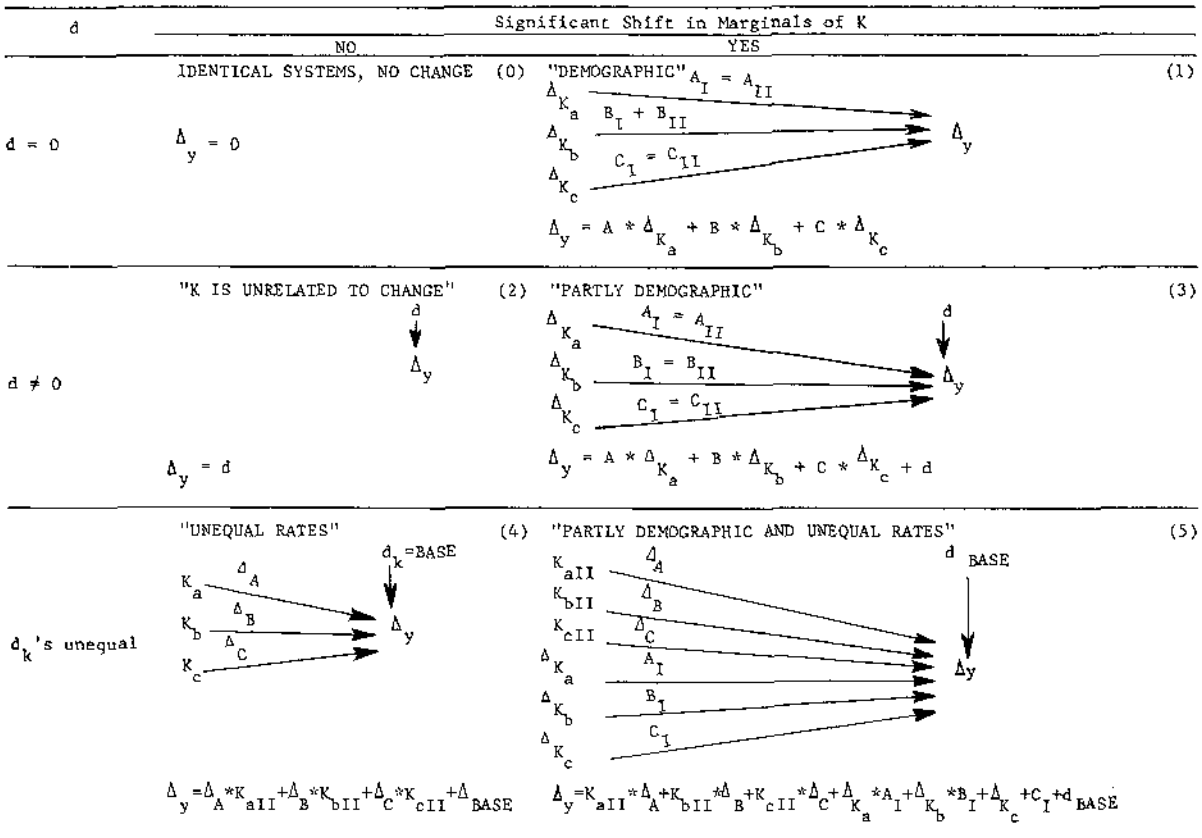

FIG. 3.—A typology of change models

Case 0: identical systems, no change.—If there is no change in the marginals for K and $d = 0$, we infer no change in y ($\Delta_y = 0$), no change in K ($\Delta_k = 0$), and no change in the K-Y coefficients. (To see the reason for inferring stable coefficients, we remember that each coefficient is a difference in proportion Y for two categories of K. If these proportions do not change, the differences between them also do not change.) Thus, we infer the K-by-Y tables at Times I and II are identical, save for N and random error.

Case 0 serves as a benchmark by defining "stability" and is useful for deciding when data sets are sufficiently similar to justify pooling them into a common file.

Case 1: "demographic" change.—Here we have a change in the level of the prior variable, K, but $d = 0$; there are no changes in Y *within* categories of K. Necessarily, the K-Y coefficients do not change. In such models, the total change in Y is given by multiplying each change in K_i by its K_i-Y coefficient and summing. (Of course, if the coefficients are all zero, changes in the level of K will not produce changes in Y.)

When we interpret a linear equation by saying "a unit increase in X will be followed by a (value of coefficient) change in Y," we are using model 1. Following Stinchcombe (1968, chap. 3), we call this a "demographic" model because it accounts for change in a dependent variable by changes in the population composition for a prior variable.

Case 2: K unrelated.—In case 2 there is an identical change in Y within each category of K and no change in the marginals for K. Since the K-Y coefficients are constant and K does not shift in level, the change in Y, estimated by the value of d, has nothing to do with variable K. K may or may not be associated with Y, but it has nothing to do with the observed *change* in Y.

Case 3: partly demographic.—Case 3 combines cases 1 and 2. Since the level of K changes and there is no variation in the d's, demographic change occurs. Since d is other than zero, there are also changes in Y within categories of K that cannot be accounted for by differences between K's categories. In this model, demographic change accounts for part, but not all, of the change in Y.

Case 4: unequal rates.—Here we have a situation where the d's are unequal; the changes in Y have different magnitudes in different categories of K. Table 3 gives a hypothetical example.

In the base category of K (see the Appendix for a discussion of base categories), d equals $+.200$, while in K_a it is $+.040$, and in K_b it is $-.300$. Inevitably, the coefficients (the difference in proportion Y between K_a and the base and between K_b and the base) change from Time I to Time II. The right-hand column in table 3 shows the differences between the Time I and Time II d's for K_b and K_a. The same numbers

TABLE 3

HYPOTHETICAL EXAMPLE OF A TYPE 4 MODEL

CATEGORY OF K	CONSTANT PROPORTION	PROPORTION V		d_k	COEFFICIENT		CHANGE IN COEFFICIENT
		Time I	Time II		Time I	Time II	
K_b	.400	.500	.200	−.300	+.400	−.100	−.500
K_a	.350	.200	.240	+.040	+.100	−.060	−.160
K_{Base}	.250	.100	.300	+.200	...	...	...
Total	1.000	.295	.239	−.056	...	...	...

NOTE.—$\Delta_y = (-.500 \cdot .400) + (-.160 \cdot .350) + .200 = -.056$.

would emerge if we compared the base d with the d's for the other categories. Thus,

$$\Delta_{\text{Coefficient } C} = (C_{\text{II}} - C_{\text{I}}) = d_c - d_{\text{Base}}.$$

The expression $\Delta_{\text{Coefficient}}$ may be viewed as a measure of relative degree of change. If it is positive, the category has increased more (decreased less) in proportion V than the base; if negative, the opposite; if zero, the category and the base show identical values of d. It is easy to show (when the K marginals are constant) that the total change in V is given by multiplying each K marginal by its value of $\Delta_{\text{Coefficient}}$ and summing.

Substantively, we may view a case 4 model as one in which change in V is accounted for by differential rates of change among categories whose marginal proportions remain constant. Sociological theories of "massification and differentiation" (Glenn 1967) employ this kind of model.

Case 5: partly demographic and unequal rates.—The final model might better be called the "kitchen sink," since it includes aspects of models 1–4. With changing marginals for K and unequal values of d_k, the total change in V is decomposed into three parts: (1) the Time II marginals for K times their change in coefficient; (2) the marginal change in K times the original Time I coefficients; and (3) the value of d in the base category of K. The first may be viewed as a contribution from unequal rates; the second, as the contribution from "demographic change"; and the third, as a frame of reference. Case 5, in fact, is the general model. The other cases occur when particular parameters are set to zero. Figure 4 gives the general flow graph for K and V.

Calculations necessary to choose a model will be explained as we analyze the actual data. For now, we merely note that Stouffer's implicit change model (fig. 2) implies case 1 data for change in educational attainment and case 3 for change in tolerance.

We now turn to an analysis of the Stouffer data in 1954 and 1972–73.

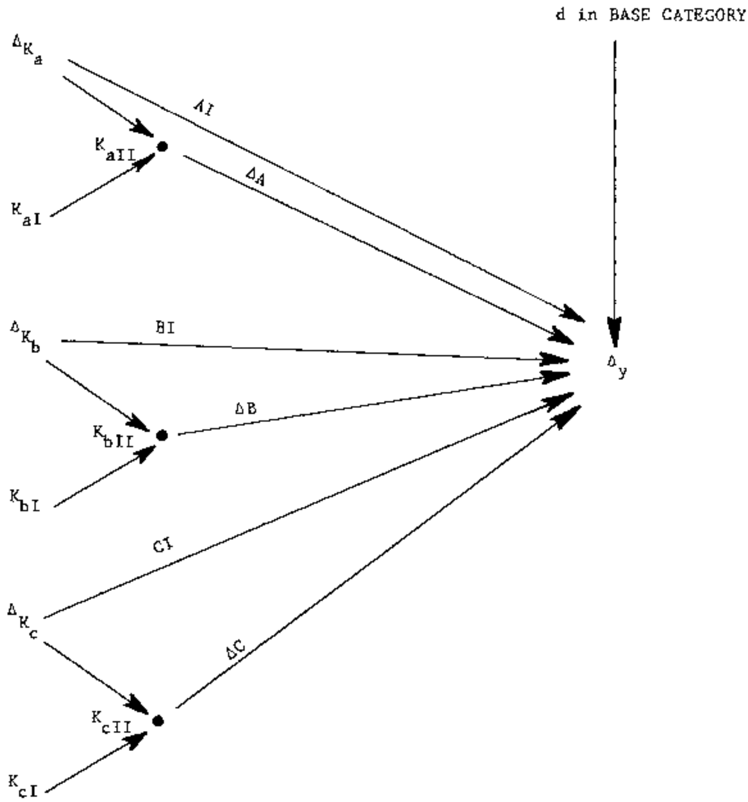

FIG. 4.—General flow graph for change in proportion Y as a function of a prior categorical variable, K.

CHANGE IN COHORT AND EDUCATION

Table 4 gives the distribution of cases into the four cohort groups for 1954 and 1972–73. To test the significance of the Δ_k parameters, we first calculated the variance for each difference, as in table 2, and took its square root to get the standard deviation. These formulas assume simple random sampling (SRS). It is well known that multistage samples of the sort analyzed here tend to have higher variances. Since a number of studies have shown that multistage variances are typically twice as large as SRS variances (Moser and Kalton 1972), we shall routinely multiply the v's by two and the standard deviations by 1.5 (a conservative approximation of $\sqrt{2} = 1.414$). The adjusted σ's are next multiplied by two to give conventional .95 confidence levels. Since the changes for the Older and Younger Cohorts are well outside the two σ confidence bands, the Δ's are significant. The $+0.419$ increase for the New Cohort is inherently significant and was not tested.

TABLE 4

COHORT DISTRIBUTIONS, 1954 AND 1972–73

Cohort*	1954 Proportion	1972–73 Proportion	$\Delta_k 2\sigma_d$*
Older	.202	.017	−.185 (.018)
Younger	.423	.346	−.077 (.033)
New Generation	.000	.419	+.419
Middle-aged	.375	.218	−.157
Total	1.000	1.000	.000
Total cases	4,904	3,006	...
Total no answer	29	111†	...
Total N	4,933	3,117	...

* Definitions given in text.
† Includes 93 cases of respondents age 18–20.

Table 4 confirms the facts of life. The Older Cohort's shares of the adult population have declined appreciably. While the Older and Middle-aged groups made up 58% of Stouffer's sample, they are only 24% of the 1972–73 cases. The New Generation, too young for Stouffer's study, now makes up about 42% of the population 21 and older.

Table 5 gives educational attainment by cohort for 1954 and 1972–73. To model the first two variables, cohort and education, we must choose

TABLE 5

EDUCATIONAL ATTAINMENT BY COHORT, 1954 AND 1972–73 (PROPORTIONS)

	Education				
YEAR AND COHORT	Grade	High	College	TOTAL	N
1954:					
Older	.762	.138	.100	1.000	930
Middle-aged	.652	.177	.171	1.000	1,761
Younger	.428	.366	.206	1.000	1,976
New	...	...	...	...	...
Total	.579	.249	.172	1.000	4,667*
1972–73:					
Older	.646	.125	.229	1.000	48
Middle-aged	.603	.209	.188	1.000	627
Younger	.412	.320	.269	1.001	1,001
New	.223	.376	.401	1.000	1,218
Total	.378	.316	.306	1.000	2,894*

* N's differ from table 4 because of "no answer" cases on education: 237 in 1954, 112 in 1972–73.

TABLE 6

Statistical Tests for Educational Changes within Cohort

Category and Calculation	Older	Middle-aged	Younger	Total
Grade:				
1) p_{I}	.762	.652	.428	...
2) p_{II}	.646	.603	.412	...
3) d_k	−.116	−.049	−.016	...
4) v_k	.004959	.000511	.000366	...
5) w_k	.041	.400	.559	...
6) $w_k \cdot d_k$	−.00476	−.01960	−.00894	$-.033 = d$
7) $\frac{(d_k - d)^2}{v_k}$	1.389	0.501	0.790	2.68
8) $\frac{d_k^2}{v_k}$	2.713	4.699	0.699	8.111
College:				
1) p_{I}	.100	.171	.206	...
2) p_{II}	.229	.188	.269	...
3) d_k	+.129	+.017	+.063	...
4) v_k	.003775	.000324	.000279	...
5) w_k	.038	.445	.517	...
6) $w_k \cdot d_k$	+.00490	.00757	.03257	$+.045 = d$
7) $\frac{(d_k - d)^2}{v_k}$	1.869	2.420	1.161	5.450
8) $\frac{d_k^2}{v_k}$	4.408	0.892	14.226	19.526

among cases 1, 3, and 5, since there are changes in our K variable. The calculations suggested by Goodman (1963) are simple, but as they may be relatively unfamiliar, we will review them step by step. (Table 6 gives the figures.) In row 1 of table 6 we see the 1954 proportions for the three cohort groups (the New Generation is excluded, since there are no 1954 data for it); in row 2, the 1972–73 proportions; in row 3, the within-cohort changes, d_k; and in row 4, the estimated variances for the differences, with no correction (as yet) for multistage sampling.

The next step is to estimate d, the pooled change. Goodman tells us that d is the weighted average of the d_k's where the weights are inverse to the v's. Row 5 gives the weights, obtained by finding the reciprocal of each variance, summing, and dividing each by the sum. To find d, we multiply each d_k by its weight, as shown in row 6. The row sum is −.033, our estimate of the common within-cohort change in proportion Grade assuming no interactions.

Row 7 gives Goodman's test for differences among the d_k's, the interaction effects. We subtract each d_k from d, square the difference, divide by v_k, and sum. The sum, 2.68, is distributed as χ^2 with degrees of freedom equal to $K - 1$. To correct for multistage sampling, we divide the sum by two (which is tantamount to multiplying each v_k by two), obtaining 1.34. (For two degrees of freedom, $P > .50$.)

Having inferred homogeneity among the d_k's, we may test the significance of d, the pooled estimate, by squaring each d_k, dividing it by v_k, and summing. The sum is distributed as χ^2 with K degrees of freedom. (For the sum $8.111/2 = 4.056$, $P > .20$.) We infer $d = .000$. There is no reliable within-cohort change in the proportion Grade from 1954 to 1972–73.

The bottom panel in table 6 gives similar steps for analyzing within-category change in the proportion College. The adjusted χ^2 for interaction, 2.725, is not significant ($P > .20$), but the adjusted χ^2 for d, 9.763, is significant ($.05 > P > .02$). We infer a significant increase, +.045, in the proportion College within each cohort. Technically, the result is simple: for College we must add a residual change of +.045 to our model; substantively, however, this result is a bit of a mystery.

Could the result be produced by nonrandom sampling biases? It could if the GSS were biased toward higher education or the Stouffer study were biased toward lower education. Indirect evidence suggests, however, that this is not the case. In a separate analysis, we tabulated Grade–High School–College in the well-known University of Michigan Election Studies (for 1952, 1956, 1958, 1960, 1962, 1964, 1966, 1968, 1970, 1972) and ran the least-squares trend lines for the marginal proportions. We got a good fit ($R^2 = .931$, standard error of the estimate = .0189, for Grade School; $R^2 = .904$, standard error of the estimate = .0138, for College). Although there were no election studies in 1954 or 1973, we can use the regression equations to estimate what SRC (Survey Research Center, University of Michigan) would have obtained for these years. These results appear in table 7.

The Stouffer-GSS figures are very close to the Michigan estimates. Since the Michigan sample is technically excellent and carried out in essentially the same way for both study periods, the bias explanation is not sufficient. Whether the result can be explained—by adult education, differential mortality, immigration, some sort of changing bias in many survey organizations or Type I error—is unknown.

We now know we must use a case 3 model for change in cohort and education. The parameters required are the Δ_k's from table 4; the College residual, +.045; and the K-V coefficients. Since the model assumes constant coefficients, we pool the estimates from 1954 and 1972–73. The technique is exactly the same as that for estimating the pooled d's.

The Middle-aged Cohort was chosen as the base category for cohort and High School as the base for education; table 8 gives the results. The

TABLE 7

MARGINAL PROPORTIONS FOR EDUCATION IN MICHIGAN ELECTION SERIES, STOUFFER, AND GENERAL SOCIAL SURVEY

	Grade	High School	College	Total
1954:				
Stouffer	.579	.249	.172	1.000
Michigan*	.559	.269	.172	1.000
Difference	+.020	—.020	.000	...
1972–73:				
General Social Survey	.378	.316	.306	1.000
Michigan*	.368	.344	.288	1.000
Difference	+.010	—.028	+.018	...

* See text for explanation of regression estimates.

pooled differences (1954 only for the New Cohort) confirm Stouffer's (*C*) proposition, that the older generation tends to have much less education. Compared to the Middle-aged Cohort, the Older are higher in proportion Grade (+.106) and lower in proportion College (—.066), while the Younger and Middle-aged Cohorts are lower in Grade (—.215 and —.380) and higher in College (+.047 and +.213). Figure 5 arranges all of these parameters as a flow graph model for cohort and education, as in case 3 in figure 3.

By multiplying source values by coefficients and summing, we can account for the marginal shift in education between 1954 and 1972–73, as shown in table 9. The numbers may be interpreted as follows. First, we apply the residual (.000 or +.045) to the base category, since this is our estimate of the increase within the base group. Then, we see how other categories raise or lower the total because of their change in marginal

TABLE 8

COEFFICIENTS FOR COHORT AND EDUCATION

Education Category and Cohort Comparison	Difference in Proportions		Pooled	Adjusted χ^2	P	df
	1954	1972–73				
Grade:						
Older vs. Middle-aged	+.110	+.043	+.106	19.05	<.001	2
Younger vs. Middle-aged	—.224	—.191	—.215	128.85	<.001	2
New vs. Middle-aged	...	—.380	(—.380)	130.66	<.001	1
College:						
Older vs. Middle-aged	—.071	+.041	—.066	14.40	<.001	2
Younger vs. Middle-aged	+.035	+.081	+.047	11.15	<.01	2
New vs. Middle-aged	...	+.213	(+.213)	42.36	<.001	1

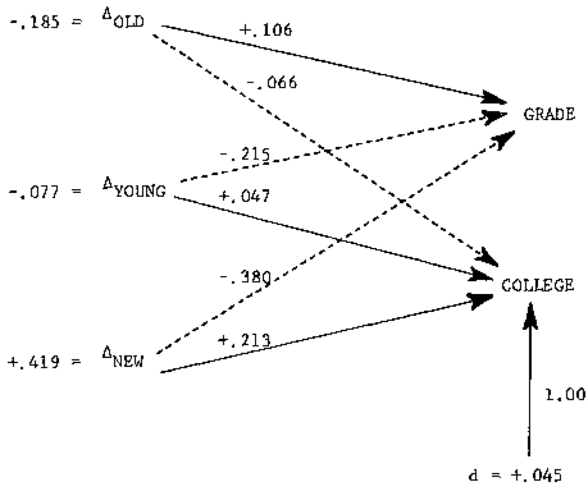

FIG. 5.—Flow graph model for cohort and education, 1954 and 1972–73

TABLE 9

MARGINAL SHIFT IN EDUCATION BETWEEN 1954 AND 1972–73

Change in Grade:		
Prior: Older Cohort	—.185 · +.106	—.0196
Base category: Middle-aged Cohort		.0000 (—.033)
Later:		
Younger Cohort	—.077 · —.215 = +.0166	—.1426
New Generation	+.419 · —.380 = —.1592	
Total		—.1622 (—.1952)
Raw data		—.201
Change in College:		
Prior: Older Cohort	—.185 · —.066	+.0122
Base category: Middle-aged Cohort		+.045
Later:		
Younger Cohort	—.077 · +.047 = —.0036	+.0852
New Generation	+.419 · +.213 = +.0888	
Total		+.1424
Raw data		+.134

proportions and greater or lesser education. The Older Cohort raises College +.0122 and lowers Grade —.0196 because it is less well educated and declining in size. The two newer cohorts have the opposite effect; they raise College and lower Grade.[5]

[5] The Younger Cohort actually shows miniscule effects in the opposite direction. They are better educated than the Middle-aged Cohort, but their "share of the market" is declining. The strong contributions coming from New Cohort more than offset these effects.

TABLE 10

Marginal Distributions for Tolerance Items, 1954 and 1972–73 (Proportion More Tolerant)

Item	1954 Proportion	1954 N	1972–73 Proportion	1972–73 N	Δ
Atheist:					
Speech	.382	4,800	.662	3,069	+.280
Book	.373	4,664	.710	3,013	+.337
Teacher	.124	4,740	.419	2,990	+.295
Communist:					
Speech	.282	4,701	.573	3,024	+.291
Book	.289	4,566	.577	2,995	+.288
Teacher	.064	4,701	.380	2,905	+.316
Average	.252	...	.554	...	+.301

The modeled changes in College are quite close to the raw data, but less so for Grade because we decided to treat the residual value (—.033) as unreliable.[6] To a considerable degree the results confirm Stouffer's prediction. Cohort changes of the sort he predicted—the replacement of older, less well-educated Americans by younger, better educated ones—account for most, but not all, of the increased educational attainment between 1954 and 1972–73.

COHORT, EDUCATION, AND TOLERANCE

We come now to the dependent variable, change in levels of tolerance. After eliminating the generally small number of "no answers" and "don't knows," we dichotomized each item to make the "more tolerant" response positive. The original codebook marginals allow us to see the general trend, as shown in table 10.

Each of the items shows a distinct increase in tolerance. Although the marginals differ, each shows a net increase rather close to the average change of +.301. In 1954, these six items show an average of .252 choosing the more tolerant alternative, while in 1972–73 the proportions rose to an average of .554. The Δ's for the atheist items are about the same as those for Communists, suggesting that the decline in the Cold War spirit cannot provide a simple explanation for the changes. Whether cohort and educational changes can give an explanation, as Stouffer predicted, is the question we now address.

[6] This illustrates an interesting difference between this method and regression analysis. In regression models, the means must come out correctly, but the calculated coefficients may differ from the data because of interaction effects. In the categorical approach, however, the coefficients are estimated from the data and the fitted means may differ from the modeled figures.

We tabulated cohort by education by each of the six tolerance items within the 1954 and 1972–73 studies. Since each of the six items gave about the same pattern of proportions, the results are pooled in table 11. Thus, each proportion in table 11 is the average of six tolerance proportions, and each base N is the average of the six bases.

TABLE 11

Cohort by Education by Tolerance, 1954 and 1972–73
(Mean Proportion Giving More Tolerant Response
Averaged over Six Items)

	Less than High School		High School Graduate		College	
Cohort	1954	1972–73	1954	1972–73	1954	1972–73
Older	.142 (709)	.185 (31)	.228 (128)	.361 (6)	.208 (93)	.426 (11)
Middle-aged ...	.176 (1,148)	.248 (378)	.308 (312)	.426 (131)	.408 (301)	.510 (118)
Younger	.204 (845)	.361 (412)	.317 (724)	.510 (320)	.503 (407)	.695 (269)
New Generation ..		.454 (272)		.668 (458)		.821 (488)

In table 11, if we read up each column, the proportions increase; in each year and each educational level, the older cohorts are less tolerant. If we read across each row, the proportions increase (save for Older-College in 1954); within cohort and year, the better educated are more tolerant. Finally, if we examine the diagonals in each "box," the upper right percentage is always greater than the lower left; each cohort and educational group was more tolerant 18.5 years later. Thus, Stouffer's cohort and education differences still hold, but he was incorrect in part of his prediction. As each group aged, it became *more* tolerant, not *less* tolerant.

The techniques of categorical modeling, as in tables 2, 6, and 8, allow us to state these conclusions more precisely. Table 12 summarizes the results.

Table 12 has no significant interaction effects, but each coefficient is significant, thus confirming Stouffer's propositions *A* and *B*, that "the older generation was less tolerant" and "the less educated were less tolerant." But, as Stouffer did *not* say, there is a significant within-category increase of +.131, an across-the-board increase in tolerance within cohort and education groupings.

TABLE 12

PARAMETER ESTIMATES FOR TOLERANCE IN TABLE 11

Difference in Tolerance	Pooled d	Interaction χ^{2*}	Interaction df	Interaction P	Significance of d χ^{2*}	Significance of d df	Significance of d P
Year:							
1972–73 vs. 1954	+.131	7.05	8	>.50	55.3	9	<.001
Cohort:							
Older vs. Middle-aged	−.055	5.35	5	>.30	12.1	6	.10>P>.05
Younger vs. Middle-aged ..	+.055	7.00	5	>.20	16.8	6	<.02
New vs. Middle-aged	+.116	1.15	2	>.50	12.4	3	<.01
Education:							
College vs. High School ...	+.141	7.1	6	>.30	49.45	7	<.001
Grade School vs. High School	−.137	4.2	6	>.50	59.25	7	<.001

* Divided by two to adjust for multistage sampling, as explained in text.

Figure 6 presents these results, along with those in figure 5, as a flow graph model of change in tolerance. By multiplying source and residual values by their appropriate arrow coefficients and summing, we can decompose the modeled change, as shown in table 13.

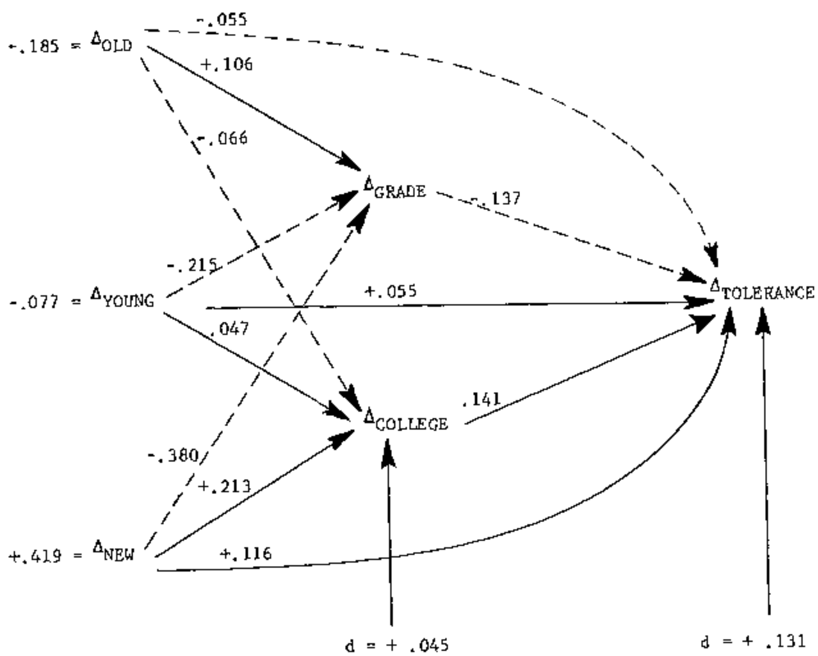

FIG. 6.—Flow graph model for change in cohort, education, and tolerance, 1954 and 1972–73.

TABLE 13

DECOMPOSITION OF CHANGE IN TOLERANCE FROM FIGURE 6

Source		Change
Prior (Older Cohort):		
Direct	−.185 · −.055	+.01018
Via education:		
Grade	−.185 · +.106 · −.137	= +.00269
College	−.185 · −.066 · +.141	= +.00172
Within Middle-aged Cohort		+.131
Later:		
Direct		
Younger Cohort	−.077 · +.055 = −.00424	+.04436
New Generation	+.419 · +.116 = +.0486	
Via education:		
Grade	−.077 · −.215 · −.137 = −.00227	+.01954
	.419 · −.380 · −.137 = +.02181	
College	−.077 · +.047 · +.141 = −.00051	+.01207
	.419 · +.213 · +.141 = +.01258	
College change not accounted for by cohort	+.045 · +.141	+.00635
Total		+.22791
Raw data		+.2827

The table decomposes change in tolerance into (*a*) direct effects of changes in cohort composition, summing to +.05454; (*b*) indirect effects of cohort changes operating through their impact on education, summing to +.03602; (*c*) a contribution from the increase in College not accounted for by cohort changes, +.00635; and (*d*) the residual within-cohort-and-educational-group increase, +.131. These changes sum to +.22791, which differs from the raw data change of +.2827 because of interaction effects that were shown to be nonsignificant.

How do Stouffer's predictions stand up? He was correct in predicting the +.03602 increase coming from cohort effects on educational levels. He was wrong, however, in predicting the "period-age" effect to be negative. It is positive and of nontrivial magnitude, +.131. He did not foresee the direct effect of cohort replacement, net of education, of +.05454, or the mysterious residual increase in College and its contribution of +.00635; but neither contradicts his line of reasoning. In sum, the implicit Stouffer model accounts for about 10 of the 23 units of increase, while the remaining +.13 represent a false prediction. Rather than becoming more conservative as they moved through the 1950s, 1960s, and early 1970s, Americans became more tolerant, regardless of their cohort or education group.

This residual increase is perhaps the most interesting finding in the analysis, but it is difficult to interpret. Because age and period are necessarily confounded in the design, we cannot say the data refute the hypothesis that aging induces conservativism. But we can argue that if a "natural" negative effect for age has been offset by a positive period effect, the period effect is really extraordinary!

Could the residual occur because our categories were too coarse? I doubt it. Without going into detail, it is easy to show that collapsing categories produces spurious residual *d*'s only when the subcategory proportions change considerably. Aside from the Older Cohort, I doubt that mortality has been sufficient to change age proportions and years-of-school proportions much *within* the broad categories we used.

Why, then, have Americans become much more tolerant than can be accounted for by changes in cohort and education? It is hard to find noncircular hypotheses, save for our previous negative observation that decline in Cold War tensions seems implausible because the change for atheists is about the same as the change for Communists. To invoke "the climate of the times," the "effect of media," "shifts in values," and so forth, is to say nothing concrete. Alas, as best we know, there are no national data for the Stouffer items between 1954 and 1972–73, so it is impossible to tell whether specific events are related to change. To dig into the problem, it seems that our only choice is to examine trends in other attitude and opinion items to see whether the same patterns turn up in race relations, sex, family matters, and similar GSS items where baseline data are available.

To summarize, I take the liberty of quoting the anonymous referee's comments on the first draft of this paper:

> I would say that there is solid empirical ground for suspecting that the changes observed here were not isolated changes in these particular attitudes, but part of a general movement including all sorts of (issues) of the liberalism-dogmatism variety (not economic liberalism), including civil liberty, racial prejudice, women's rights, tolerance of nudity and sexual experimentation. . . . The attitude institutionalized very strongly in sociology in particular and in the humanities and social sciences generally, has been gaining ground. . . . I would like to see some overall speculation about what is going on in society that might produce such a pattern of several indicators moving in the same direction and in the same pattern. But that goes beyond the available data and might offend much of the profession. Besides, I'll be damned if I know what I think about it myself. But I'm sure glad about it.

APPENDIX

Flow Graphs for Categories: A Brief Introduction

Consider table A1, a hypothetical fourfold table presented in percentage form. The familiar percentage difference, $d_{yx} = 75 - 50 = 25$, indicates

TABLE A1

HYPOTHETICAL FOURFOLD TABLE

	% Y	Case Base
X_1	75	800
X_0	50	500
Total	65.38	1,300

that the percentage Y among the X_1's is 25 units higher than the percentage among the X_0's. It is well known that the percentage difference in a fourfold table is analogous to the "slope" in a linear system. If we think of X and Y as variables with only two possible values, 0.0000 and 1.000, the mean on Y when X is zero equals .50, the mean on Y when X is 1.000 equals .75, and the increase in mean Y for a one-unit increase in X is .25.

Pursuing the analogy, we can write a set of equations for the data, shifting from percentages to proportions.

$$X_1 = .615; \quad \text{(A1)}$$

$$Y = (.250 \cdot X_1) + .500. \quad \text{(A2)}$$

Equation (A1) says that the mean on $X_1 = .615$, which, in a zero-one system, turns out to be the marginal proportion X_1. Equation (A2) says that the mean on Y (its marginal proportion) equals the coefficient (d_{yx}) times the value of X_1, plus the constant or intercept value (i.e., the mean Y when $X = 0$).

Substituting (A1) into (A2):

$$.6538 = (.250 \cdot .615) + .500 \quad \text{(A3)}$$

In sum, there are three strict analogies between fourfold tables and recursive systems of linear equations: (1) variable means = marginal proportions, (2) coefficients = percentage differences = slopes, and (3) constants = (percentage in dependent category for category scored zero on prior variable) = intercept.

Any set of equations can be translated into a linear graph according to the following rules: (1) variables = points, (2) coefficients = values associated with one-way arrows connecting points, and (3) constants = dummy sources whose arrows have implicit values of one. Figure A1 presents the graph for our hypothetical system.

The graph has no information not available in equation (A3), but with more complicated systems, one can use simple rules to find visual solutions for results that would be tedious with algebra. Examples appear in the substantive text.

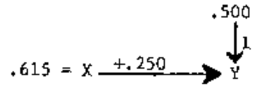

FIG. A1.—Graph of equation (A3)

To extend the approach beyond dichotomies, let us add a third category to X; table A2 presents the results. The "zero-one" analogy breaks down

TABLE A2

HYPOTHETICAL TABLE WITH ONE POLYTOMOUS VARIABLE

	% Y	Case Base	d		Case Bases as Proportions
X_2	25	400		−25	0.235
X_1	75	800	+25		0.471
X_0	50	500			0.294
Total	55.88	1,700			1.000

because X has three values, but if we keep X_0 as the "intercept" or "base" category, the following equation is perfectly correct:

$$Y = (d_{y,x_2x_0} \cdot X_2) + (d_{y,x_1x_0} \cdot X_1) + \text{Proportion } Y \text{ in intercept category of } X. \quad \text{(A4)}$$

Thus,

$$.5588 = (-.250 \cdot .235) + (.250 \cdot .471) + .500. \quad \text{(A5)}$$

Equation (A4) can be graphed, as in figure A2. This approach can be extended to systems with any number of categories in the independent or dependent variable, as illustrated in the substantive text.

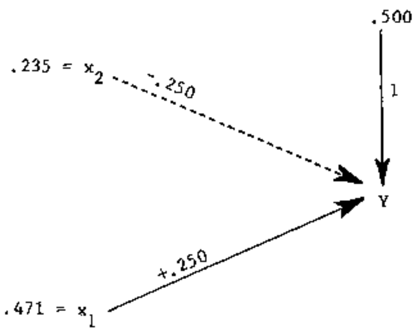

FIG. A2.—Graph of equations (A4) and (A5)

One may also extend the technique to systems with more than two variables, using "partial *d*'s," provided that (*a*) the variables have a strict causal order, and (*b*) there are no interactions such that the value of a conditional *d* varies with the category of a control (test) variable. (Examples of the procedures used appear in the substantive text.) Data with interactions or ambiguous causal directions may be handled by "block recursive models," as explained in Davis (1976). At first glance, the system may appear identical with dummy variable regression, but it is not. The method of dichotomizing the prior variable is different, and dummy variables cannot be used in flow graphs, since they have inevitable, artificial, negative correlations with each other.

The major drawback of the system is the arbitrary character of the intercept or base category. One could model the data in table A2 using X_0, X_1, or X_2 as the base. Each choice would "add up" perfectly, although the values might be quite different. Unfortunately, the necessity to suppress one category seems fundamental in analyzing categorical data (Fennessey 1968; Cohen 1968). Without it, one or more of the parameters estimated would be redundant; that is, there would be more parameters than degrees of freedom.

REFERENCES

Cohen, Jacob. 1968. "Multiple Regression as a General Data-analytic System." *Psychological Bulletin* 70 (December): 426–43.

Davis, James A. 1976. "Analyzing Contingency Tables with Linear Flow Graphs." In *Sociological Methodology*, edited by David R. Heise. San Francisco: Jossey-Bass.

Fennessey, James. 1968. "The General Linear Model: A New Perspective on Some Familiar Topics." *American Journal of Sociology* 74 (July): 1–27.

Glenn, Norval D. 1967. "Massification versus Differentiation: Some Trend Data from National Surveys." *Social Forces* 46 (December): 172–80.

Goodman, Leo A. 1963. "On Methods for Comparing Contingency Tables." *Journal of the Royal Statistical Society*, ser. A, pt. 1, 126:94–108.

Moser, C. A., and G. Kalton. 1972. *Survey Methods in Social Investigation*. New York: Basic.

Stinchcombe, Arthur L. 1968. *Constructing Social Theories*. New York: Harcourt, Brace & World.

———. 1974. "An Example of Identification Problems in Cohort Analysis: Attitudes toward Atheists and Communists." Mimeographed. Berkeley: University of California.

Stouffer, Samuel A. 1955. *Communism, Conformity, and Civil Liberties*. New York: Doubleday.