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CHAPTER 1

Changes in Income Level, 1929–1933

1 *Changes in 33 Cities*

During the Great Depression, the level of family income declined markedly in the 33 cities covered by the Survey. The drop in the mean income, ranging from 24 (Richmond) to 51 per cent (Racine), among the 33 identical samples, suggests the extent of impoverishment caused by the depression (see Table 2). The corresponding figure for the aggregate of the usable samples is 37 per cent. As a consequence of the sampling bias discussed in Appendix A 3, these percentage declines are likely to understate somewhat the drop in the mean income of the family populations. Aggregate income payments to individuals, including entrepreneurial savings, in the nation as a whole declined 45 per cent.[1] The substantial increase in the number of families with an income of less than $1,000 and the equally impressive decline in the income groups above $1,500, shown in Chart 1, reflect the general curtailment of incomes.

In most cities the mean incomes of tenants and owners decline in similar proportions; but there is a definite tendency for owner incomes to drop at a slightly higher rate. In 24 cities the mean income of owners shows a greater percentage decline, in 4, a smaller decline, than that of tenants; in 5 cities the rates of decline are the same.[2] The income of the average owner family invariably exceeds that of the average tenant family,[3] in both 1929 and 1933, although in 1933 the relative difference between the income levels of the two tenure groups is reduced in most (24) cities because of the greater decline in owner incomes.

Within each tenure group the two types of canvass as a rule corroborate each other with respect to changes in income level. Among owners the mail return schedules show slightly greater relative declines in 15, smaller declines in 11, and the same declines in 7 cities. Among tenants the situation is reversed, mail returns showing

[1] Kuznets, *op. cit.*, I, Table 1.

[2] If carried to more digits, the computations show 26 cities with a greater decline in owner incomes, 7 with a greater decline in tenant incomes.

Studying the aggregate of the usable samples in 52 cities covered by the Financial Survey, Wickens found that the mean income of owners declined 36 per cent, 1929–33, that of tenants 32 per cent (*Residential Real Estate*, p. 7).

[3] The maximum difference is in Atlanta: 91 and 94 per cent of tenants' mean income for 1929 and 1933 respectively.

TABLE 2: Declines in Income Level, 1929 to 1933

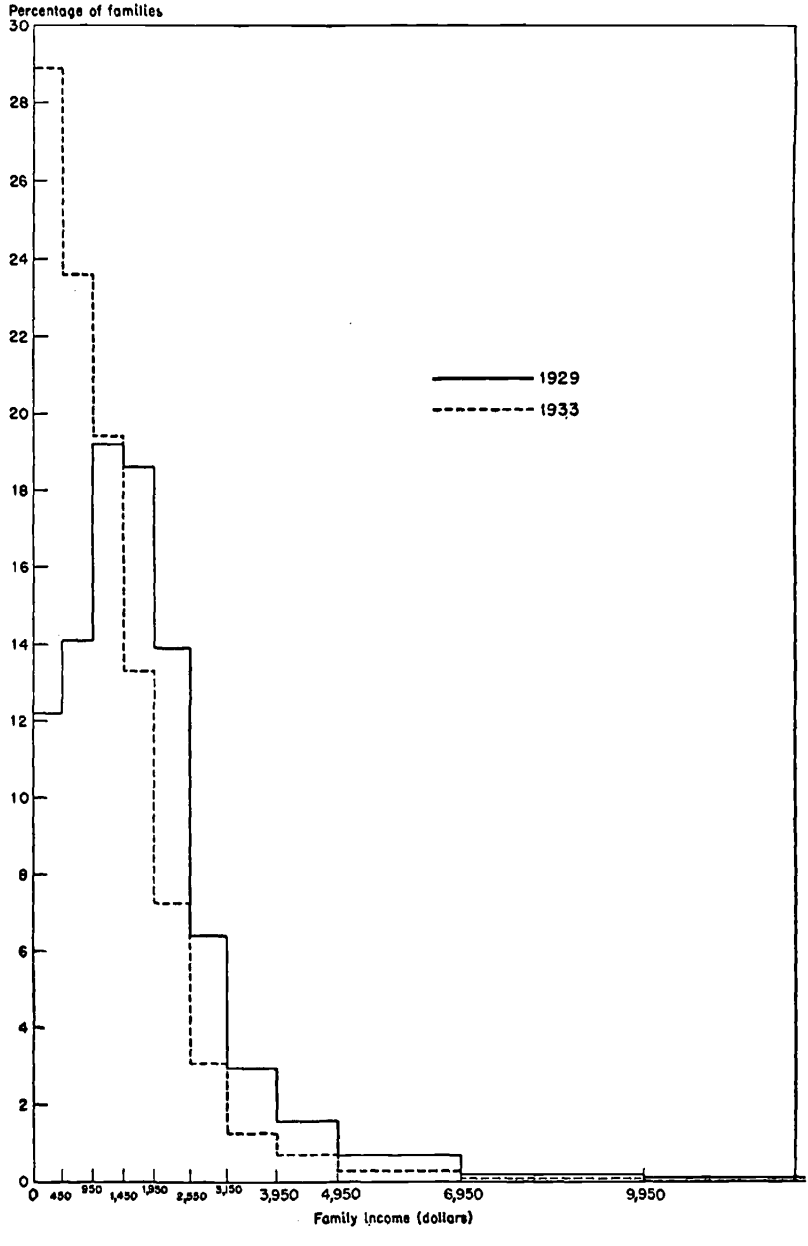
Identical Samples: Entire-city, Tenant, Owner-occupant

	ENTIRE-CITY			TENANT			OWNER-OCCUPANT		
	Mean income (dollars)		%	Mean income (dollars)		%	Mean income (dollars)		%
	1929	*1933*	decline	*1929*	*1933*	decline	*1929*	*1933*	decline
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Atlanta	1,778	1,223	31	1,413	966	32	2,704	1,876	31
Birmingham	1,655	869	47	1,431	748	48	2,267	1,200	47
Boise	1,680	1,221	27	1,580	1,191	25	1,812	1,266	30
Butte	2,026	1,062	48	1,882	1,003	47	2,257	1,155	49
Cleveland	2,086	1,237	41	1,851	1,140	38	2,464	1,393	43
Dallas	2,107	1,427	32	1,841	1,259	32	2,565	1,716	33
Des Moines	1,893	1,313	31	1,706	1,196	30	2,138	1,466	31
Erie	1,756	969	45	1,613	911	44	1,951	1,047	46
Indianapolis	2,295	1,481	35	1,981	1,292	35	2,898	1,843	36
Lansing	1,898	1,068	44	1,710	964	44	2,146	1,205	44
Lincoln	1,958	1,285	34	1,679	1,175	30	2,282	1,411	38
Little Rock	1,882	1,140	39	1,488	935	37	2,591	1,506	42
Minneapolis	1,993	1,350	32	1,778	1,226	31	2,304	1,529	34
Oklahoma City	2,056	1,274	38	1,763	1,091	38	2,580	1,601	38
Peoria	1,941	1,301	33	1,692	1,154	32	2,214	1,462	34
Portland, Me.	2,087	1,460	30	1,789	1,294	28	2,773	1,841	34
Portland, Ore.	1,714	1,047	39	1,485	904	39	1,994	1,222	39
Providence	1,910	1,315	31	1,661	1,140	31	2,339	1,615	31
Racine	1,789	874	51	1,653	829	50	1,939	924	52
Richmond	1,908	1,458	24	1,544	1,212	22	2,737	2,017	26
Sacramento	2,097	1,495	29	1,869	1,358	27	2,465	1,715	30
St. Joseph	1,786	1,313	26	1,581	1,205	24	2,109	1,483	30
St. Paul	1,763	1,248	29	1,500	1,048	30	2,060	1,474	28
Salt Lake City	1,955	1,238	37	1,701	1,105	35	2,270	1,404	38
San Diego	1,852	1,277	31	1,728	1,216	30	2,047	1,374	33
Seattle	1,943	1,184	39	1,803	1,112	38	2,120	1,274	40
Springfield, Mo.	1,545	1,048	32	1,363	924	32	1,759	1,192	32
Syracuse	1,974	1,267	36	1,663	1,092	34	2,448	1,533	37
Topeka	1,766	1,226	31	1,565	1,071	32	1,981	1,391	30
Trenton	1,580	1,030	35	1,347	893	33	1,835	1,181	36
Wheeling	1,491	991	34	1,419	948	33	1,594	1,052	34
Wichita	1,852	1,139	38	1,696	1,060	38	2,099	1,264	40
Worcester	2,053	1,456	29	1,716	1,234	28	2,786	1,937	30

larger declines in 4 cities only, smaller in 25, and the same in 4 cities. There is no obvious explanation in either case.

CHART 1

Frequency Histogram of Family Income, 1929 and 1933
Residential Real Estate, 33 Entire-city Samples



The mean income calculated from mail returns exceeds that from personal enumeration in all except 8 and 9 cities for the owner samples in 1929 and 1933 respectively, and 5 and 4 for tenants (Tables 3 and 4),[4] probably because of the varying response of the different income groups to the two forms of canvass (see App. A 2).

The information contained in the identical samples, to which the above remarks refer, is substantially the same as that afforded by the larger *usable* samples. The rates of decline in the mean incomes of the usable samples are very similar, city by city, to those in the identical samples (Table 5).[5] In level of income there is very little difference between the broader and the narrower samples, especially in 1929, for the simple reason that nearly all usable schedules containing information on 1929 income furnished data also on 1933 income and thus were eligible for inclusion in the identical sample. For 1933 the usable samples of owners (tenants) show slightly higher mean incomes than the identical samples in 9 (13) cities, lower incomes in 22 (20), and the same incomes in 2 (0) cities.

2 *Relation between Income Level and Its Rate of Change*

The rates at which mean incomes decline, 1929–33, i.e., the differences between the 1929 and 1933 means divided by the 1929 means, vary greatly from city to city. To account for some of this variation we analyze the correlation between the mean incomes in 1929 and the rate of decline for the 33 (identical) entire-city samples. Do high-income cities show larger relative income losses than low-income cities? Or is the reverse true? Or is the rate of income decline independent of the city's income level?

[4] Twenty-three or more similar contingencies—larger as against smaller declines, excesses as against deficiencies—will occur by chance in random samples of 33 observations, with a probability of less than 5 per cent. It is assumed that there are only two possible, mutually exclusive contingencies, each having equal chance of occurring, and that the 33 cities are a random sample of cities of their general type.

Consequently, statistical significance—on the 5 per cent probability level—can be attributed to the following observations made above.

1) Among tenants, mail return schedules show smaller income drops than schedules from personal enumeration. (In order to reduce the contingencies to two, percentage changes were calculated to 3 digits, eliminating the cases of equal change.)
2) The mean income from mail returns exceeds that from personal enumeration, for tenants in both years, owners in 1929.

[5] The mean incomes for the usable samples, 1929 and 1933, are given for both tenure groups and each city in *Residential Real Estate*, p. 183. The figures for tenants in that source are, however, inconsistent with the data in the *Financial Survey of Urban Housing* and the special tabulations used in this study. In Table 5 they are replaced by the correct figures.

In line with these questions, one may well ask: What happens to the relative dispersion of mean incomes among the 33 cities? Does it increase during the depression, decline, or remain constant? This problem would be automatically solved by the answer to the first set of questions if the 1929 and 1933 mean incomes of the various cities were in perfect linear correlation. As will soon be apparent, however, such a correlation does not exist.

To answer these questions we correlate the 1929 and 1933 mean incomes and estimate the slope of the regression line linking 1933 to 1929 incomes. If its slope exceeds the ratio of the mean 1933 and

TABLE 3

Declines in Income Level, 1929 to 1933

Identical Samples: Tenant, by Type of Canvass

	MAIL RETURNS			PERSONAL ENUMERATION		
	Mean income (dollars)		% decline	Mean income (dollars)		% decline
	1929	*1933*		*1929*	*1933*	
	(1)	(2)	(3)	(4)	(5)	(6)
Atlanta	1,356	961	29	1,456	970	33
Birmingham	1,536	837	46	1,399	721	48
Boise	1,615	1,235	24	1,543	1,144	26
Butte	1,843	996	46	1,971	1,021	48
Cleveland	1,977	1,269	36	1,737	1,024	41
Dallas	1,948	1,350	31	1,747	1,186	32
Des Moines	1,695	1,214	28	1,719	1,176	32
Erie	1,676	954	43	1,519	848	44
Indianapolis	2,086	1,398	33	1,845	1,155	37
Lansing	1,712	972	43	1,708	957	44
Lincoln	1,749	1,239	29	1,590	1,093	31
Little Rock	1,494	946	37	1,483	926	38
Minneapolis	1,892	1,309	31	1,711	1,177	31
Oklahoma City	1,843	1,169	37	1,729	1,058	39
Peoria	1,718	1,197	30	1,664	1,109	33
Portland, Me.	1,882	1,368	27	1,670	1,199	28
Portland, Ore.	1,654	1,032	38	1,417	853	40
Providence	1,807	1,277	29	1,580	1,064	33
Racine	1,757	875	50	1,533	776	49
Richmond	2,001	1,525	24	1,324	1,062	20
Sacramento	2,034	1,519	25	1,818	1,308	28
St. Joseph	1,622	1,234	24	1,528	1,167	24
St. Paul	1,800	1,285	29	1,392	962	31
Salt Lake City	1,836	1,213	34	1,595	1,020	36
San Diego	1,766	1,231	30	1,694	1,203	29
Seattle	1,830	1,130	38	1,782	1,099	38
Springfield, Mo.	1,416	954	33	1,308	893	32
Syracuse	1,873	1,274	32	1,490	942	37
Topeka	1,505	1,054	30	1,631	1,090	33
Trenton	1,402	959	32	1,318	857	35
Wheeling	1,447	1,004	31	1,397	903	35
Wichita	1,701	1,087	36	1,691	1,034	39
Worcester	1,645	1,181	28	2,138	1,549	28

1929 incomes,[6] cities with relatively high 1929 incomes will tend to show smaller relative losses than cities with low 1929 incomes; and conversely, if the slope is less than the ratio of the means.

This is illustrated by a diagram for two imaginary cities i and j. Calling the 1929 incomes x, the 1933 incomes y, the means for the 33 cities $\bar{x}$ and $\bar{y}$, respectively, we see that the mean income will change at the same rate in both cities if i tends to have a 1933 income of y_i and j a 1933 income of y_j, i.e., if the income points tend to fol-

[6] I.e., the mean of the 33 city means for 1933 divided by the corresponding mean for 1929.

TABLE 4

Declines in Income Level, 1929 to 1933

Identical Samples: Owner-occupant, by Type of Canvass

	MAIL RETURNS			PERSONAL ENUMERATION		
	Mean income (dollars)		% decline	Mean income (dollars)		% decline
	1929	*1933*		*1929*	*1933*	
	(1)	(2)	(3)	(4)	(5)	(6)
Atlanta	2,808	1,949	31	2,599	1,812	30
Birmingham	2,385	1,283	46	2,211	1,160	48
Boise	1,743	1,229	29	1,916	1,320	31
Butte	2,253	1,157	49	2,266	1,150	49
Cleveland	2,704	1,522	44	2,199	1,250	43
Dallas	2,656	1,775	33	2,462	1,650	33
Des Moines	2,202	1,536	30	2,053	1,374	33
Erie	2,066	1,115	46	1,766	939	47
Indianapolis	2,741	1,702	38	3,115	2,038	35
Lansing	2,158	1,161	46	2,136	1,244	42
Lincoln	2,508	1,524	39	2,010	1,275	37
Little Rock	2,567	1,486	42	2,645	1,550	41
Minneapolis	2,354	1,576	33	2,257	1,484	34
Oklahoma City	2,936	1,867	36	2,348	1,428	39
Peoria	2,195	1,442	34	2,236	1,485	34
Portland, Me.	2,995	1,947	35	2,459	1,693	31
Portland, Ore.	2,139	1,335	38	1,888	1,138	40
Providence	2,442	1,621	34	2,271	1,611	29
Racine	2,044	980	52	1,776	838	53
Richmond	3,253	2,332	28	2,312	1,758	24
Sacramento	2,588	1,818	30	2,413	1,672	31
St. Joseph	2,158	1,519	30	2,038	1,432	30
St. Paul	2,322	1,589	32	1,940	1,421	27
Salt Lake City	2,612	1,557	40	1,973	1,274	35
San Diego	2,185	1,468	33	1,900	1,274	33
Seattle	2,046	1,228	40	2,172	1,307	40
Springfield, Mo.	1,836	1,248	32	1,652	1,115	33
Syracuse	2,849	1,755	38	2,009	1,291	36
Topeka	1,895	1,363	28	2,085	1,424	32
Trenton	2,050	1,306	36	1,718	1,113	35
Wheeling	1,694	1,118	34	1,518	1,002	34
Wichita	2,062	1,188	42	2,142	1,350	37
Worcester	2,665	1,847	31	3,384	2,384	30

low the line with the slope $\bar{y} / \bar{x}$; for the 1933 incomes will, in this case, tend to be proportional to the 1929 incomes.

If, however, y_i' tends to be associated with x_i, and y_j' with x_j, i.e., if the income points follow the line of steeper slope, 1933 incomes will form a larger proportion of 1929 incomes the higher the latter. Consequently, the rate of income decline will fall as we pass from low- to high-income cities.

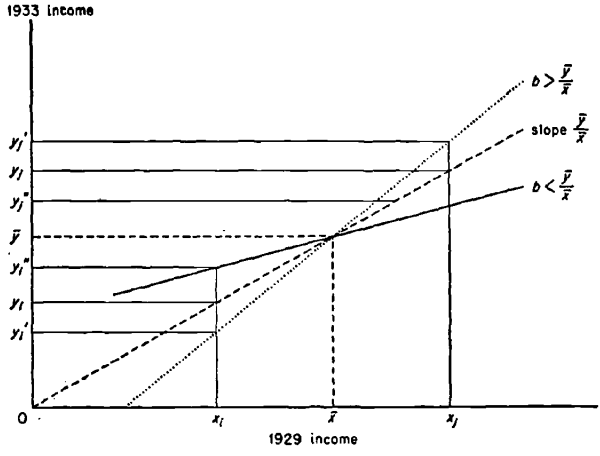
If, finally, y_i'' and y_j'' tend to be associated with x_i and x_j respectively, i.e., if the points follow the line of flatter slope, 1933 incomes will form a smaller proportion of 1929 incomes the higher the lat-

TABLE 5

Declines in Income Level, 1929 to 1933

Usable Samples: Tenant and Owner-occupant

	TENANT			OWNER-OCCUPANT		
	Mean income (dollars)		% decline	Mean income (dollars)		% decline
	1929	*1933*		*1929*	*1933*	
	(1)	(2)	(3)	(4)	(5)	(6)
Atlanta	1,411	979	31	2,701	1,906	29
Birmingham	1,431	764	47	2,267	1,211	47
Boise	1,580	1,190	25	1,812	1,266	30
Butte	1,880	991	47	2,257	1,155	49
Cleveland	1,847	1,143	38	2,463	1,391	44
Dallas	1,840	1,236	33	2,564	1,712	33
Des Moines	1,703	1,179	31	2,138	1,455	32
Erie	1,611	917	43	1,943	1,080	44
Indianapolis	1,977	1,293	35	2,899	1,821	37
Lansing	1,709	969	43	2,146	1,204	44
Lincoln	1,679	1,157	31	2,294	1,404	39
Little Rock	1,486	924	38	2,591	1,502	42
Minneapolis	1,778	1,222	31	2,304	1,530	34
Oklahoma City	1,760	1,093	38	2,580	1,617	37
Peoria	1,691	1,133	33	2,203	1,454	34
Portland, Me.	1,788	1,293	28	2,773	1,842	34
Portland, Ore.	1,484	909	39	1,994	1,218	39
Providence	1,660	1,134	32	2,339	1,606	31
Racine	1,650	834	49	1,939	918	53
Richmond	1,548	1,243	20	2,715	1,999	26
Sacramento	1,867	1,347	28	2,465	1,712	31
St. Joseph	1,581	1,167	26	2,196	1,473	33
St. Paul	1,499	1,062	29	2,060	1,469	29
Salt Lake City	1,698	1,089	36	2,270	1,417	38
San Diego	1,728	1,194	31	2,047	1,371	33
Seattle	1,802	1,109	38	2,122	1,278	40
Springfield, Mo.	1,363	898	34	1,753	1,162	34
Syracuse	1,666	1,083	35	2,450	1,507	38
Topeka	1,564	1,072	31	1,981	1,373	31
Trenton	1,347	902	33	1,917	1,174	39
Wheeling	1,418	925	35	1,594	1,023	36
Wichita	1,694	1,033	39	2,112	1,271	40
Worcester	1,715	1,224	29	2,784	1,907	32



ter. Consequently, the rate of income decline will rise as we pass from low- to high-income cities.

It will be seen from the scatter diagram in Chart 2 that the mean incomes for the two years are not at all closely related. The correlation coefficient is .70. Nevertheless, the 33 points can be approximated by a straight line. Chart 3 shows the elementary regression of 1933 (y) on the 1929 (x) mean income (dotted line); and that of 1929 on 1933 income (dark line). The slope of the first line with respect to the x-axis is .670; that of the second, 1.362. The ratio of the means (heavy line) is \$1,221/\$1,881 = .649, that is, little less than the slope of the first regression line and a great deal less than that of the second. The difference between .670 and .649 is statistically insignificant, while that between 1.362 and .649 is highly significant.[7] From the viewpoint of this analysis there is no justification for selecting one of these lines and rejecting the other; [8] but since

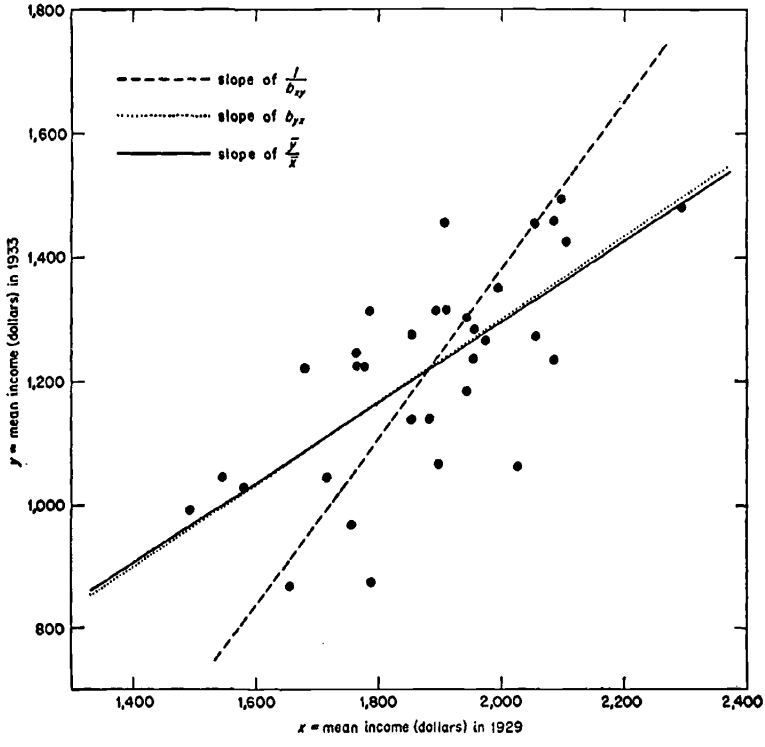
[7] Fisher's t test indicates that the first difference might be exceeded in more than 80 out of 100 random samples ($t = .18$) while the second difference might be exceeded in less than 1 out of 100 random samples only ($t = 6$).

[8] If the 'true' values of y and x are assumed to be in perfect linear correlation, the choice between the first and second elementary regressions might be made on the basis of a further assumption, viz., that errors of observation, which cause the observed values of the variables to deviate from their 'true' ones, are all concentrated on x or on y. Or, a line between the two elementary regressions might be chosen as the 'true regression' if a certain distribution of the errors of observation over the two variables were assumed. In the present case there does not seem to be any ground for either assumption.

For the methodological aspects of this problem see Ragnar Frisch, *Statistical Confluence Analysis by Means of Complete Regression Systems* (Oslo, 1934), in particular pp. 57 ff.; and T. Koopmans, *Linear Regression Analysis of Economic Time Series* (Haarlem, 1937).

CHART 2

Mean Income, 1929 and 1933
33 Entire-city Samples



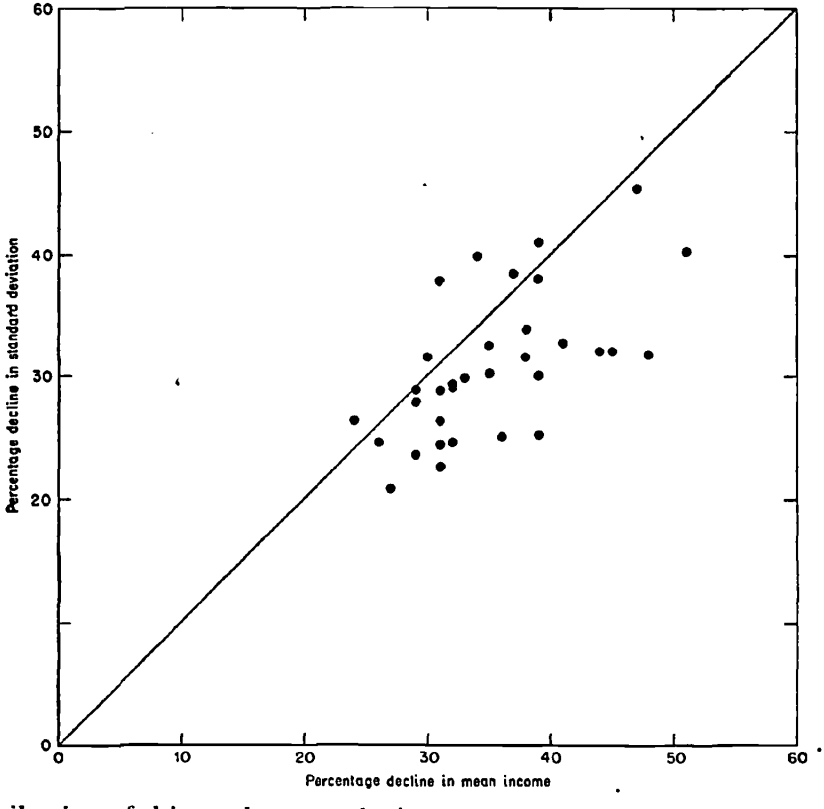
both are of steeper slope than the ratio of the means it may be concluded that the correlation between a city's income level and the rate of income decline tends to be negative, i.e., that the higher a city's income level in either 1929 or 1933, the lower its rate of income decline from 1929 to 1933 tends to be.

As the negative correlation between a city's income level and the rate of income decline indicates, the inequality of income levels of the various cities becomes more accentuated during the Great Depression. The coefficient of variation for the 33 city means rises from .09 in 1929 to .14 in 1933, that is, by 56 per cent, which is statistically significant.[9] The increase in income inequality among cities can be attributed, at least in part, to the tendency of low-income cities to show greater and of high-income cities to show smaller declines in mean income. It is impossible, however, to assess the con-

[9] In samples of 33 observations a difference of this size should occur by chance in fewer than 5 out of 100 cases. For the test applied, see Ch. 2, Sec. 1a.

CHART 3

Percentage Decline in Mean Income and Standard Deviation
33 Entire-city Samples



tribution of this tendency to the increase in intercity dispersion. It seems small (6 per cent of the observed increase in the coefficient of variation) if the relation between 1929 and 1933 income is expressed by the first elementary regression. It seems very large (196 per cent of the observed increase) if the relation is expressed by the second elementary regression.[10]

The tendency for the income levels of the cities to become more

[10] If the 1933 mean incomes (y) of the various cities were *perfectly* correlated with the corresponding 1929 incomes (x) instead of being scattered along the line $y = a + bx$, the differences between the income of each city i and the mean for 33 cities would be ruled by the relationship $y_i - \bar{y} = b\,(x_i - \bar{x})$. The resulting standard deviation of the 1933 incomes (σ_y^*) would be $\sigma_y^* = b\sigma_x$. The ratio of the coefficients of variation of the city means for 1929 and 1933 would be $\frac{v_y^*}{v_x} = \frac{\sigma_y^*}{\sigma_x}\frac{\bar{x}}{\bar{y}} = b\frac{\bar{x}}{\bar{y}}$.

In the present case (first elementary regression) $b = .67$, $\bar{x} = \$1{,}881$, $\bar{y} = \$1{,}221$; therefore $v_y^*/v_x = 1.03$. For the second elementary regression $b = 1.362$, and $v_y^*/v_x = 2.1$.

unequal during the Great Depression has an interesting parallel *within* cities, discussed in the next chapter.[11] The preceding analysis has, however, pointed to a decline in another aspect of income inequality: in most cities the two tenure groups drew closer together because of the larger proportional decline of the higher owner incomes.

[11] In connection with the analysis of sections of the income distribution (Ch. 2, Sec. 3a) it will be seen that there is also an increase in intercity inequality with respect to the mean incomes of lower and upper income groups. The coefficient of variation of the 33 mean incomes of the lower group rises from .07 in 1929 to .16 in 1933, that of the mean incomes of the upper group from .07 to .10 (see Ch. 2, Sec. 3, for definitions of the lower and upper groups).