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# City Size and Income, 1949

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## Introduction

In recent years, considerable interest has focused on the relationship between city size and income.<sup>1</sup> The publication of the 1950 census of population makes possible a further study of this relationship. My paper is an attempt to answer a variety of pertinent questions involving the relationship of the level of the 1949 median incomes of city consumer units<sup>2</sup> provided by the census to three variables, specifically:

1. City size. Are the median incomes of consumer units higher, on the average, in large cities than in small? Does the relationship

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<sup>1</sup> Herbert E. Klarman, "A Statistical Study of Income Differences Among Communities," *Studies in Income and Wealth, Volume Six*, National Bureau of Economic Research, 1943, pp. 206-235; D. Gale Johnson, "Some Effects of Region, Community Size, Color and Occupation on Family and Individual Income," *Studies in Income and Wealth, Volume Fifteen*, 1952, pp. 50-74; Milton Friedman and Simon Kuznets, *Income from Independent Professional Practice*, National Bureau of Economic Research, 1945, pp. 173-235; Henry M. Oliver, "Income, Region, Community-Size and Color," *Quarterly Journal of Economics*, August 1946, pp. 588-599; John L. Fulmer, "Factors Influencing State per Capita Income Differentials," *Southern Economic Journal*, January 1950, pp. 259-278; William Weinfield, "Income of Physicians, 1929-49," July 1951, pp. 9-26; "Income of Dentists," January 1950, pp. 8-16; "Income of Lawyers, 1929-48," August 1949, pp. 18-24; all in the *Survey of Current Business*, Dept. of Commerce; Jacob Perlman, "Extent and Causes of Differences in Hourly Earnings," *Journal of the American Statistical Association*, March 1940, pp. 1-12; Morris A. Copeland, "The Social and Economic Determinants of the Distribution of Income in the United States," *American Economic Review*, March 1947, pp. 56-75; Sidney Sufrin, Alfred Swinyard, and Francis Stephenson, "The North-South Differential—a Different View," *Southern Economic Journal*, October 1948, pp. 184-190; George J. Stigler, *Domestic Servants in the United States, 1900-1940*, National Bureau of Economic Research, Occasional Paper 24, 1946.

<sup>2</sup> The definition of the term used here is the one of Selma Goldsmith, George Jaszi, Hyman Kaitz, and Maurice Liebenburg, "Size Distribution of Income since the Mid-Thirties," *Review of Economics and Statistics*, February 1954, pp. 1-32. A consumer unit is a family or unrelated individual. A family is a group of two or more persons who reside together and are related by blood, marriage, or adoption; an unrelated individual is a member of the noninstitutional population who is not living with relatives.

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between income and city size persist in each of the nine census regions and in each of the forty-eight states?

2. Regional location. When the levels of median income in cities in different census regions are compared, do regional income differences persist among cities of the same size?

3. Proximity to other cities. How do the median incomes in "isolated" cities (more than five miles from the nearest "urban place" or "standard metropolitan area" in the same state) compare with those in "neighboring" cities (within five miles) of the same size?

Considerable emphasis is placed upon the variation in the level of median income among cities of the same size. Although earlier work in this area has established that income tends to rise with community size, no effort has been made to compare the differences in income among cities of different size with the dispersion of income among cities of comparable size. For example, the average median income in cities of 100,000 to 249,999 inhabitants may be \$100 higher than that in cities of 25,000 to 49,999 inhabitants, but the median incomes of the larger cities and of the smaller cities may vary so widely that the difference between the averages may have little or no significance. Much of the present analysis centers on the comparison of interclass differences in income with intraclass variability of city median incomes.

Some writers have given the impression that regional income differences can largely be explained by differences among regions in community-size composition.<sup>3</sup> According to this view, income is significantly higher in large communities than in small, so income in one region is higher than in another because the former has a larger proportion of the population concentrated in larger communities.<sup>4</sup> Some attention will be devoted here to the association between regional differences in income and regional differences in community-size composition.

### *Definition of the City*<sup>5</sup>

The 1950 census of population provides the 1949 median income of consumer units in each standard metropolitan area, ur-

<sup>3</sup> Klarman, *op. cit.*

<sup>4</sup> In the most recent study (Johnson, *op. cit.*), community-size composition was used together with racial composition. In the present study, community-size composition alone is considered.

<sup>5</sup> For discussions of the concept and definition of the city, see Walter Willcox, "A Redefinition of City in Terms of Density of Population," *The Urban Community*, University of Chicago Press, 1926, pp. 115-121; Robert Park, "A Spacial Pattern and a Moral Order," *ibid.*, pp. 3-20; Louis Wirth, "Urbanism as a Way

banized area, and urban place in the United States.<sup>6</sup> I have considered urban places, or legal cities, within a large metropolitan center as component parts of a city rather than as independent cities.<sup>7</sup> Both the standard metropolitan area and the urbanized area have the advantage of including most component cities, but I chose the standard metropolitan area because it permitted certain clerical simplifications.<sup>8</sup>

For areas outside standard metropolitan areas, each urban place must be considered a city. However, when such places are located

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of Life," *American Journal of Sociology*, July 1938, pp. 1-24; Noel P. Gist and L. A. Halbert, *Urban Society*, Crowell, 1933; Howard Woolston, *Metropolis*, Appleton-Century, 1938; Chauncy D. Harris and Edward L. Ullman, "The Nature of Cities," in *Reader in Urban Sociology*, Free Press, 1951, pp. 222-232 (in which the urban community, not the metropolitan community treated by Bogue and McKenzie, is the primary subject of study); D. J. Bogue, *The Structure of the Metropolitan Community*, University of Michigan Press, 1950; R. D. McKenzie, *The Metropolitan Community*, McGraw-Hill, 1933.

<sup>6</sup> Incorporated places of 2,500 or more inhabitants and unincorporated places of this size outside urban fringes are designated as urban places. A standard metropolitan area is a county, or group of contiguous counties, that contains at least one city of 50,000 or more inhabitants and that is essentially metropolitan in character. An urbanized area is designed to include the thickly settled urban core of the standard metropolitan areas. *Census of Population, 1950*, Bureau of the Census, Vol. II, Part 1, pp. 21-31; Robert Klove, "The Definition of Standard Metropolitan Areas," *Economic Geography*, April 1952, pp. 95-104; Robert L. Wrigley, Jr., "Urbanized Areas and the 1950 Decennial Census," *American Institute of Planners Journal*, Spring 1950, pp. 66-70.

There are a few cities for which no median incomes are listed in the census: Dannemora, New York; Polk, Pennsylvania; North Quincy, Illinois; Orr Mills, South Carolina; Jackson, Louisiana; Zuni Pueblo, New Mexico. These cities are excluded from the present analysis. Only slight attention is accorded the rural population. The income data are based on a 20 per cent sample of the population. Although they are affected by underreporting, etc., there is no evidence that among the urban population this bias is associated with city size. Thus, it appears that in general these data, which are more extensive than any previously available, are suitable for a study of this type. However, the exclusion of in-kind receipts probably causes an underestimate of rural incomes relative to urban incomes. This accounts in part for the limited attention devoted to the rural population. For a discussion of the income data, see Herman Miller, "An Appraisal of the 1950 Census Income Data," *Journal of the American Statistical Association*, March 1953, pp. 28-43.

<sup>7</sup> Certainly, it would be misleading to consider the level of income in a metropolis to be that of only the people who inhabit its most densely settled core. The level of income in the suburbs, which often act as dormitories for higher income segments of the labor force in the metropolis, would be omitted.

<sup>8</sup> State maps were used to identify urban places located outside the counties designated as standard metropolitan areas. County lines could not have been used in this work if urbanized areas had been chosen. Although the use of metropolitan areas has the disadvantage that some of the included population is essentially rural, these areas serve here almost as well as would urbanized areas. Then, too, in view of the relatively small average difference (about \$80) between the median income in a standard metropolitan area and that in the corresponding urbanized area, it does not appear that the major conclusions of this paper would be altered if urbanized areas had been chosen.

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close to one another and so probably form an interdependent network or galaxy, they are classified as neighboring cities and are accorded some separate treatment.<sup>9</sup>

This classification system is not ideal. Standard metropolitan areas and urban places rely on political or legal boundaries and so only approximate the "city" that would be appropriate here. But the use of the standard metropolitan area and the grouping of neighboring urban places remove important errors.

### *City Size and Income*

#### NATIONAL, REGIONAL, AND STATE LEVELS

If all cities, as defined above, are grouped into eight size classes,<sup>10</sup> and if the unweighted mean of the median incomes in the cities in each class is computed, these means or averages generally rise with city size (Table 1). Although the direct relation between city size and income is not perfect, the level of median income is about \$600 higher in the largest standard metropolitan areas than in the smallest urban places, about \$300 higher in smaller standard metropolitan areas than in the smallest urban places, and about \$150 higher in larger urban places than in the smallest urban places. The level of median income is lower among the rural population than in the smallest urban places.

If, for greater homogeneity by city size, seven of the eight size classes are each broken into two, the direct relationship between city size and income tends to persist (Table 2). Although the multiplication of city-size classes shows that small increases in city size are often accompanied by decreases rather than increases in income,<sup>11</sup>

<sup>9</sup> A city was classified as neighboring if its limits are within five miles of an urban place or standard metropolitan area *in the same state*. In classifying cities as isolated or neighboring, state maps with varying mileage scales had to be used.

No attempt is made to justify the choice of precisely five miles as the criterion by which to differentiate neighboring from isolated cities. The purpose of the isolated city-neighboring city classification is to separate cities that may form an economically and socially integrated cluster from those that are isolated entities. Four, six, or ten miles may be a better criterion. The clerical job involved in classifying almost 2,800 cities into the neighboring and isolated categories prevented experimentation with alternative criteria. The five-mile criterion, although arbitrary, seems to be reasonable on a priori grounds, and it may be justified to some extent by the fact that significant differences in income exist between the two classes of cities based upon that criterion.

It was discovered after completing the computations that Ottawa, Illinois, was classified mistakenly as a neighboring city, but this error was judged not to affect the findings materially.

<sup>10</sup> Unless stated to the contrary, the city-size classes set forth in Table 1 are used consistently throughout this paper.

<sup>11</sup> In six out of fourteen cases, the level of income in a city-size class is higher than that in the next largest city-size class.

TABLE 1

Means and Standard Deviations of 1949 City Median Incomes,  
by 1950 City Size, Eight Classes

City Size	Number of Cities	Mean Median Income <sup>a</sup>	Standard Deviation
Urban places: <sup>b</sup>			
2,500- 4,999	1,351	\$2,409	\$691
5,000- 9,999	779	2,372	611
10,000- 24,999	500	2,546	594
25,000- 49,999	156	2,558	593
Standard metropolitan areas:			
50,000- 99,999	17	2,798	511
100,000-249,999	74	2,683	485
250,000-499,999	44	2,860	370
500,000 and over	33	3,027	327

<sup>a</sup> The unweighted mean of the median incomes reported for the cities in the class. The median incomes of consumer units in rural areas are: rural farm, \$1,567; and rural nonfarm, \$2,186.

<sup>b</sup> Outside standard metropolitan areas.

Source: *Census of Population, 1950*, Bureau of the Census.

TABLE 2

Means and Standard Deviations of 1949 City Median Incomes,  
by 1950 City Size, Fifteen Classes

City Size	Number of Cities	Mean Median Income <sup>a</sup>	Standard Deviation
Urban places: <sup>b</sup>			
2,500- 3,749	873	\$2,402	\$694
3,750- 4,999	478	2,420	685
5,000- 7,499	534	2,366	606
7,500- 9,999	245	2,386	623
10,000- 17,499	362	2,537	588
17,500- 24,999	138	2,504	840
25,000- 37,499	107	2,531	629
37,500- 49,999	49	2,616	508
Standard metropolitan areas:			
50,000- 74,999	4	2,532	822
75,000- 99,999	13	2,880	386
100,000-174,999	53	2,600	475
175,000-249,999	21	2,891	455
250,000-374,999	33	2,871	314
375,000-499,999	11	2,826	520
500,000 and over	33	3,027	327

<sup>a</sup> The unweighted mean of the median incomes reported for the cities in the class.

<sup>b</sup> Outside standard metropolitan areas.

Source: *Census of Population, 1950*, Bureau of the Census.

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a general upward drift in the level of the median incomes is shown to occur as city size increases.

When the relationship between city size and income is examined in each census region,<sup>12</sup> the results do not contradict the hypothesis that income and city size are directly related (Table 3). In each census region, the level of median income tends to increase as city size increases, and it tends to be lower among the rural population than in the smallest cities. The magnitude of the income differential associated with size of city varies from one census region to another. Measured in percentage terms, the largest income differential between the largest and the smallest cities is found in the southern regions and the smallest differential is found in the far western.

When the income-city-size relationship is examined on a state-by-state basis, many states show a fairly weak tendency for median income to rise with city size. Rank correlation techniques indicate that in 39 of the 48 states, city size and median income are related directly, but in only 15 of the states does the rank correlation coefficient depart significantly from zero.<sup>13</sup> The observed weakness on the state level of the income-city-size relationship may be attributed in part to the nature of the correlation techniques,<sup>14</sup> but despite these difficulties the results seem to indicate that the relationship in many states is not strong.

Thus, it appears at the national and regional levels that the means

<sup>12</sup> For the states included in each census region, see, for example, *Census of Population, 1950*, Bureau of the Census, Vol. II, Part 1, p. xi. The District of Columbia is in the South Atlantic division. The census regions are usually termed "divisions." Where a standard metropolitan area is in two or more census regions, it is classified in the census region containing the largest proportion of its population.

<sup>13</sup> A frequency distribution of the forty-eight states by the degree of correlation between median income and city size follows:

Rank Correlation Coefficient	Number of States	Number Significant
0.00 and below	9	0
0.01-0.09	6	0
0.10-0.19	11	1
0.20-0.29	6	2
0.30-0.39	10	7
0.40-0.49	3	3
0.50 and over	3	2

In Washington and Rhode Island, the coefficient of rank correlation is 0.00. In New Jersey, Maryland, North Carolina, South Carolina, Alabama, Arizona, and Oregon, the coefficient of rank correlation is negative. These negative coefficients range from -0.06 to -0.27.

<sup>14</sup> The J-shaped distribution of cities by size is responsible for the choice of rank methods here. However, such methods may understate the strength of the relationship between city size and income. A hypothetical case in which rank correlation

TABLE 3

Means and Standard Deviations of 1949 City Median Incomes, by  
1950 City Size and Census Region

CITY SIZE	CENSUS REGION								
	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Moun- tain	Pacific
	<i>Mean Median Income <sup>a</sup></i> (dollars)								
Urban places: <sup>b</sup>									
2,500- 4,999	2,496	2,744	2,694	2,398	2,179	1,893	1,984	2,773	2,944
5,000- 9,999	2,596	2,564	2,632	2,409	2,121	1,883	2,032	2,828	2,860
10,000- 24,999	2,835	2,655	2,712	2,521	2,224	1,988	2,221	2,731	3,117
25,000- 49,999	2,660	2,782	2,844	2,626	2,227	1,817	2,268	2,898	2,981
Standard metropoli- tan areas:									
50,000- 99,999	2,980		3,096	2,750		2,296	2,279	3,060	
100,000-249,999	2,924	2,854	3,131	2,857	2,212	2,072	2,498	2,794	2,877
250,000-499,999	3,075	2,845	3,258	2,888	2,529	2,314	2,862	2,838	2,823
500,000 and over	2,902	3,134	3,319	3,042	2,908	2,631	2,649	2,877	3,058
Rural: <sup>c</sup>									
Farm	1,985	2,114	2,217	2,024	1,165	934	1,308	2,116	2,340
Nonfarm	2,542	2,643	2,589	2,036	1,887	1,503	1,689	2,364	2,548
	<i>Standard Deviation</i> (dollars)								
Urban places: <sup>b</sup>									
2,500- 4,999	614	597	538	512	680	527	675	600	642
5,000- 9,999	536	551	468	565	521	388	595	598	485
10,000- 24,999	300	417	556	479	472	435	599	603	566
25,000- 49,999	390	548	529	583	465	406	600	444	383
Standard metropoli- tan areas: <sup>d</sup>									
50,000-249,999	346	382	267	337	319	168	493	{ 305 }	<sup>e</sup>
250,000 and over	184	251	236	141	410	230	340		
	<i>Number of Cities</i>								
Urban places: <sup>b</sup>									
2,500- 4,999	68	132	220	180	236	117	201	97	100
5,000- 9,999	40	70	149	96	120	76	129	54	45
10,000- 24,999	35	52	104	64	66	33	72	27	47
25,000- 49,999	14	12	33	18	29	12	16	12	10
Standard metropoli- tan areas:									
50,000- 99,999	2	0	6	2	0	1	4	2	0
100,000-249,999	9	7	16	8	16	5	10	1	2

(continued on next page)

TABLE 3 (continued)

CITY SIZE	CENSUS REGION								
	New England	Middle Atlantic	East	West	South Atlantic	East	West	Moun- tain	Pacific
			North Central	North Central		South Central	South Central		
	<i>Number of Cities (continued)</i>								
250,000-499,999	5	9	8	2	7	3	3	2	5
500,000 and over	2	5	8	3	3	2	4	1	5

. . . = not available.

<sup>a</sup> The unweighted mean of the median incomes reported for the cities in the class.

<sup>b</sup> Outside standard metropolitan areas.

<sup>c</sup> The weighted average of the state rural median incomes. The weights are the number of rural consumer units in each state.

<sup>d</sup> Because of the small number of cities, two rather than the customary four size classes are used.

<sup>e</sup> Only two cities in this cell.

Source: *Census of Population, 1950*, Bureau of the Census.

of the city median incomes tend to rise with city size.<sup>15</sup> However, it is a commonplace in statistics that a mean only describes one aspect of any distribution, and that a comparison of two distributions which relies wholly upon a comparison of means may conceal as much as it reveals. If the variation about each of the means is great enough, the difference between the two may have little meaning. Account should be taken of the variation among the median incomes in each size class,<sup>16</sup> and the reliability of the difference

appears too stringent a test is as follows. A state has six cities with these populations and median incomes:

City	Population	Income
A	2,500	\$1,910
B	2,501	1,908
C	2,505	1,907
D	2,510	1,900
E	10,000	2,100
F	100,000	2,900

The coefficient of rank correlation between income and city size in this state is 0.43. Certainly, this correlation coefficient underestimates the true relationship. Cities A, B, C, and D have almost identical populations and incomes; the fact that the small population differences between them are inversely correlated with the small income differences causes the coefficient to be quite low.

<sup>15</sup> At the state level, the relatively small number of cities in many states prevented the grouping of cities into city-size classes and the derivation of the mean of the median incomes in each such class.

<sup>16</sup> Median incomes in small cities vary to a greater extent than do those in large cities. The coefficient of variation of the median incomes decreases as city size increases (Table 1). The standard deviations used throughout this paper are based on  $n - 1$  where  $n$  is the number of cities. In cases where it is desirable to obtain

between the means should be judged in the light of such intraclass variation.<sup>17</sup>

How shall one decide whether the intraclass variation is large enough to impair the reliability of the difference between the means? One possible technique is to treat the median incomes in the two classes as if they were samples and to conduct *t*-tests to ascertain the statistical significance of the difference between the means. Non-significance (0.05 probability level) of the difference may be used to indicate roughly that it may not have reliability or meaning.<sup>18</sup>

If the median incomes in each city-size class are treated as samples, *t*-tests indicate that at the national level most of the differences between the mean median incomes in two of the city-size classes used in Table 1 are statistically significant (Table 4). Moreover, a pattern of significant differences emerges:

1. The levels of median income in cities of 2,500 to 9,999 inhabitants appear to be significantly lower than in other size classes, but the levels of median income in the former two size classes do not depart significantly from one another.

2. The levels of median income in the 10,000 to 249,999 classes do not depart significantly from one another, but in general they are significantly higher than those in the 2,500 to 10,000 classes and significantly lower than those in the classes of 250,000 and over. However, the level of median income in cities of 50,000 to 99,999 does not depart significantly from that in cities of 250,000 and over.

3. The level of median income is significantly higher in cities of 250,000 to 499,999 inhabitants than in the under 250,000 classes, and it is significantly lower than in the over 500,000 class.

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standard deviations based on *n*, it is necessary only to multiply the standard deviations shown here by  $\sqrt{n - 1/n}$ .

<sup>17</sup> When the reliability of a difference between the means is judged here, this should not be interpreted as a test to determine whether the difference is fortuitous. The question raised here concerns the extent to which the difference between the means is a reliable summary measure of the differences between the median incomes in the two classes.

<sup>18</sup> Two assumptions in particular are implicit in the use of the *t*-test: (1) normality, and (2) equal standard deviations in each of the classes. In each city-size class where there exists a large number of observations, the distribution of city median incomes is in general fairly close to normal. But as shown in Table 1, for example, the assumption concerning equal standard deviations is not met. In order to validate our results in cases where there were appreciable differences in the size of the standard deviations, a technique recommended by Alice A. Aspin in "Tables for use in comparisons whose accuracy involves two variances, separately estimated," *Biometrika*, December 1949, pp. 290-293, which does not assume equality of the standard deviations, was employed. In but six cases did this technique produce results contradictory to the *t*-test, and in those cases the results of the Aspin test were used.

TABLE 4

Statistical Significance of Observed Differences in 1949 Mean Median Income between Pairs of 1950 City Size Classes

(significance level) <sup>a</sup>

CITY SIZE	CITY SIZE						
	Urban Places <sup>b</sup>			Standard Metropolitan Areas			
	5,000- 9,999	10,000- 24,999	25,000- 49,999	50,000- 99,999	100,000- 249,999	250,000- 499,999	500,000 and Over
Urban places: <sup>b</sup>							
2,500- 4,999	o	x	x	x	x	x	x
5,000- 9,999		x	x	x	x	x	x
10,000- 24,999			o	o	o	x	x
25,000- 49,999				o	o	x	x
Standard metropolitan areas:							
50,000- 99,999					o	o	o
100,000-249,999						x	x
250,000-499,999							x

<sup>a</sup> An x signifies that the mean of the size class in the caption differs significantly (at the 0.05 probability level) from the mean of the size class in the stub. An o signifies that this difference is nonsignificant.

<sup>b</sup> Outside standard metropolitan areas.

Source: *Census of Population, 1950*, Bureau of the Census.

4. The level of median income in cities of 500,000 or more inhabitants is significantly higher than in the other size classes.

Thus, it appears, on the basis of the present classification and techniques, that the city-size classes can be best grouped together on the basis of statistically significant income differences into four groups: 2,500-9,999; 10,000-249,999; 250,000-499,999; and 500,000 and over.<sup>19</sup>

At the regional level, the differences between size classes in the means of the median incomes are less often statistically significant than they are when the nation is considered as a whole.<sup>20</sup> The pat-

<sup>19</sup> Somewhat different points of demarcation between groups of city-size classes may arise if different city-size classes are used. If, for example, the city-size classes in Table 2 are used, 175,000 rather than 250,000 appears to be a point of demarcation, and incomes in cities of 500,000 and over do not appear to be significantly different from those in somewhat smaller cities.

<sup>20</sup> At the national level, 32 per cent of the income differences between pairs of city-size classes are nonsignificant. By census region, the percentage of such differences that are nonsignificant is:

Census Region	Percentage	Census Region	Percentage
New England	60	East South Central	60
Middle Atlantic	71	West South Central	53
East North Central	39	Mountain	100
West North Central	60	Pacific	93
South Atlantic	67		

The larger percentage in each of the regions may be due in part to the smaller

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tern of significant differences varies from one division to another. In the Middle Atlantic states, the level of median income is significantly higher among cities of 500,000 and over than in other size classes; in the South Atlantic and East South Central states, it is significantly higher in the 250,000 and over classes. In the West North Central states, there is some indication that median incomes are significantly higher in the 50,000 and over classes than in the classes of smaller cities. In the New England and West South Central states, no clear pattern of significant differences emerges. In the Mountain and Pacific states, there are virtually no significant differences between size classes in the level of city median incomes. In the East North Central states, significant income differences appear to exist between three groups of size classes (2,500–24,999; 25,000–99,999; and 100,000 and over), the level of median income rising with city size.

Thus, when two size classes differ greatly in size, the *t*-tests indicate that the income difference between the classes is large compared with the variation within them. But if, at the national level, the cities in one class are only twice the size of those in the other, the income difference between the classes is likely to be nonsignificant. Even when one class includes cities with ten times as many inhabitants as those in the other, the income difference between the classes may be nonsignificant.<sup>21</sup> At the regional level, one size class must often contain cities ten times as large as those in another size class if the income difference between the classes is to be significant. In some regions, the income difference between the two size classes is nonsignificant regardless of the difference in size between the cities included in the classes.

A second and less obvious technique than the *t*-tests may be employed to compare the interclass income differences with the intraclass variation in income. The probability may be estimated that the 1949 median income in a city chosen at random from a class of large cities is higher than that in a city chosen at random from a class of small cities.<sup>22</sup> Suppose that the names of all cities of 100,000

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number of observations (Table 3). In some regions, city-size classes were combined because of an insufficient number of observations in a class. The 50,000–99,999 and 100,000–249,999 classes were sometimes combined, as were the 250,000–499,999 and 500,000 and over classes.

<sup>21</sup> The level of income in cities of 100,000 to 249,999 is not significantly higher than in cities of 10,000 to 24,999.

<sup>22</sup> Consider the city median incomes in each city-size class to be independent, normally distributed random variables. The population parameters are known, since the city median incomes are considered the universe. Let *x* represent the median incomes of the large cities and *y* represent the median incomes of the small cities. *x* is distributed normally with expected value  $E_x$  and standard deviation  $\sigma_x$ ; *y*

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to 249,999 inhabitants are included in one list and that the names of all cities of 2,500 to 4,999 inhabitants are in another. A person is asked to choose at random a city from each list and to estimate which of these two randomly chosen cities had in 1949 the higher median income. Assume that he knows that median income generally rises with city size and that he estimates that income is higher in the larger city. If the chances are only slightly better than 50-50 that he is correct, the intraclass variation in income appears sufficient to rob the interclass difference in income of much of its significance. That is, if the probability is only slightly higher than 0.5 that the median income in the randomly chosen large city was higher, it would appear that the interclass difference in income is a rather unreliable summary measure.

This technique has the advantage that it is less influenced than the first by the number of observations<sup>23</sup> and that it does not rely upon one's viewing the median incomes as if they were sample observations. However, it has the disadvantage that, though the reliability of the difference between the means decreases as this probability approaches 0.5, no particular value of the probability near 0.5 is a "natural" demarcation point between those cases in which the difference between the means is to be considered reliable and those cases in which this reliability is to be questioned.<sup>24</sup> If the probability is not much greater than 0.6, we shall consider that the reliability of the difference may be questioned. This value seems reasonable, but it is arbitrary.<sup>25</sup>

is distributed normally with expected value  $E_2$  and standard deviation  $\sigma_2$ . It follows that  $x - y$  is distributed normally with expected value  $E_1 - E_2$  and standard deviation  $\sqrt{\sigma_1^2 + \sigma_2^2}$ . By standardization, the following is a unit normal variable:

$$\frac{x - y - (E_1 - E_2)}{\sqrt{\sigma_1^2 + \sigma_2^2}}$$

When  $x$  exceeds  $y$ , this variable takes on a value exceeding

$$\frac{E_2 - E_1}{\sqrt{\sigma_1^2 + \sigma_2^2}}$$

Since  $E_1$ ,  $E_2$ ,  $\sigma_1$ , and  $\sigma_2$  are known, this value can be computed. Tables of the unit normal distribution show the probability of that value being exceeded. Harald Cramér, *Mathematical Methods of Statistics*. Princeton University Press, 1946, p. 213.

<sup>23</sup> In the  $t$ -test, with an increase in the number of observations, greater significance is attached to a given difference between the means.

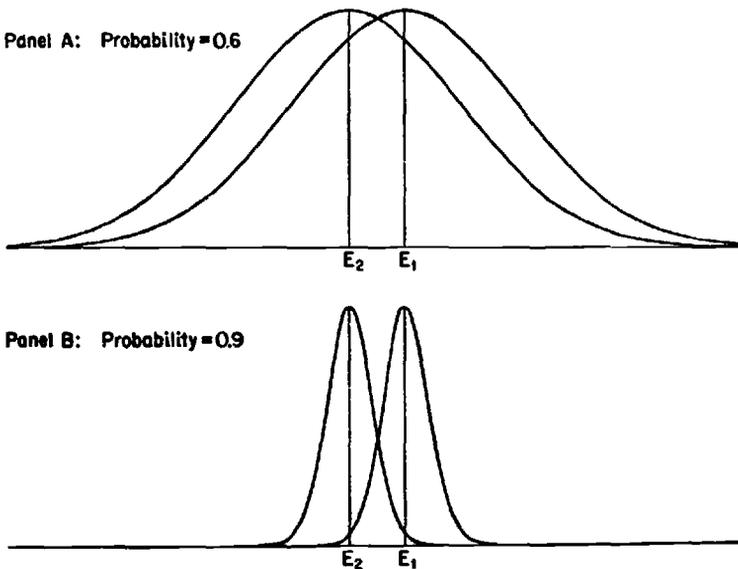
<sup>24</sup> So long as the mean in one class exceeds that in the other class, the probability exceeds 0.5. However, as the intraclass variation increases (decreases) relative to the difference between the means, the probability approaches 0.5 (unity). Thus, the question here is not whether the probability exceeds 0.5, but the extent to which it does.

<sup>25</sup> The results of the  $t$ -test also rely upon arbitrary underpinnings. The 0.05 significance level was chosen arbitrarily.

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Figure 1 may be helpful in clarifying this technique. Two pairs of distributions are shown, the difference between the means being the same in each case. The variation within the upper pair of distributions is substantially greater than that within the lower pair. In panel B, the probability is 0.9 that the value of an observation chosen from the distribution at the right will exceed that of one chosen from the distribution at the left. There can be little doubt that the difference between the means is a reliable summary measure. In panel A, this probability is only 0.6. The two distributions overlap to such an extent that the difference between the means by itself may be considered rather unreliable as a summary measure.

FIGURE 1



The probability that one can estimate correctly, on the basis of their relative size, which of two randomly chosen cities had the higher median income, decreases as the difference in size between the two cities becomes smaller (Table 5).<sup>26</sup> About 8 times in 10, one will be correct in estimating that median income in a city of 500,000 and over was higher than in a city of 2,500 to 4,999. One

<sup>26</sup> The probabilities shown in Table 5 (and in similar tables below) are only approximations. The assumption of normality is not strictly met. There may be only one-digit accuracy in these tables.

TABLE 5

Probability of a Higher 1949 Median Income in a Larger City than in a Smaller,  
Both Randomly Chosen, by 1950 City Size  
(probabilities) <sup>a</sup>

SIZE OF SMALLER CITY	SIZE OF LARGER CITY						
	Standard Metropolitan Areas				Urban Places <sup>b</sup>		
	500,000 and Over	250,000- 499,999	100,000- 249,999	50,000- 99,999	25,000- 49,999	10,000- 24,999	5,000- 9,999
Standard metropolitan areas:							
250,000-499,999	0.63						
100,000-249,999	0.72	0.61					
50,000- 99,999	0.65	0.54	0.44 <sup>c</sup>				
Urban places: [outside standard metropolitan areas]							
25,000- 49,999	0.75	0.67	0.56	0.62			
10,000- 24,999	0.76	0.67	0.57	0.63	0.51		
5,000- 9,999	0.83	0.75	0.66	0.70	0.59	0.58	
2,500- 4,999	0.79	0.72	0.63	0.67	0.56	0.56	0.48

<sup>a</sup> Outside standard metropolitan areas.

<sup>b</sup> The following are examples of the manner in which this table is to be interpreted: The changes are roughly 48 in 100 that the 1949 median income in a randomly selected city of 5,000 to 9,999 exceeded that in a randomly selected city of 2,500 to 4,999. The chances are roughly 72 in 100 that the median income in a randomly selected city of 250,000 to 499,999 exceeded in 1949 that in a randomly selected city of 2,500 to 4,999.

<sup>c</sup> The probability that the larger city has the higher income is less than 0.5. This is because the mean of the median incomes is higher in the class of smaller cities than in the class of larger cities.

Source: *Census of Population, 1950*, Bureau of the Census.

will be correct only about 2 times in 3 in estimating that the median income in a city of 100,000 to 249,999 was higher than in a city of 2,500 to 4,999 although it is forty times larger. Although the mean of the median incomes in cities of 25,000 to 49,999 is significantly higher than that in cities of 2,500 to 4,999, one will be correct less than 6 times in 10 in estimating that income in a city chosen at random from the former size class exceeds that in a city chosen at random from the latter size class.

To repeat, the chances are only 2 in 3 that income in a randomly chosen city of 100,000 to 249,999 is higher than in a randomly chosen city under 5,000. Although the cities included in the former size class have about forty times as many inhabitants as those in the latter size class, the chances are 1 in 3 that median income in the randomly chosen small city will exceed that in the randomly

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chosen large city. Similarly, the chances seem better than 4 in 10 that median income in a randomly chosen city under 5,000 is higher than that in a randomly chosen city ten times its size.

This appears to indicate clearly the considerable variation in median income among cities of the same size and the extent to which a comparison, without reference to this intraclass variation, of the means in two size classes may be misleading. When the cities in one size class are twice the size of those in another class, the intraclass variation in income is often so great relative to the difference between the means that the latter seems a rather unreliable measure. Even when the cities in one size class are ten times or more the size of those in another class, this is sometimes the case. There is a definite tendency for median income to rise with city size, but if the cities which are compared do not differ markedly with regard to their size, this tendency is often blurred by intraclass variation in income; and even if the cities do differ markedly in size, there is no assurance that this tendency may not still be blurred appreciably.

### ISOLATED, NEIGHBORING, AND COMPONENT CITIES

When isolated cities only are considered, median income is found to increase with city size (Table 6). Since isolated cities all have fewer than 50,000 inhabitants, the income differences associated with differences in city size are in a sense bounded. The level of median income in cities of 25,000 to 49,999 is about \$200 or 7 per cent higher than in cities of 2,500 to 4,999.

Among neighboring cities, there is apparently no correlation between the level of median income and the size of the city. As city size increases, there is neither a consistent upward nor downward drift in income. This is the first case encountered in which no direct relationship between income and city size is observed. This apparent departure from the previously found pattern can perhaps be explained if neighboring cities are parts of closely integrated, interdependent galaxies of cities. Each such galaxy or chain should probably be considered one large city rather than a group of separate cities. When neighboring cities are considered in this light and when each neighboring city is classified not on the basis of its own population but on the basis of the combined population of the cities in the galaxy, a direct relationship generally emerges between city size and income (Table 6).

An entire standard metropolitan area is generally considered an individual city here, but within each standard metropolitan area there are numerous urban places recognized in the census as separate cities. Among these component cities, median income generally

TABLE 6

Means and Standard Deviations of 1949 City Median Incomes, Isolated Cities, Neighboring Cities, and Component Cities, by 1950 City Size

City Size	Number of Cities	Mean		Number of Cities	Mean		
		Median Income	Standard Deviation		Median Income	Standard Deviation	
		<i>Isolated Cities</i>			<i>Neighboring Cities</i>		
2,500- 4,999	952	\$2,290	\$642	399	\$2,690	\$722	
5,000- 9,999	582	2,316	589	197	2,537	646	
10,000- 24,999	318	2,459	580	182	2,699	587	
25,000- 49,999	72	2,480	658	84	2,625	527	
		<i>Neighboring Cities by Combined Size<sup>a</sup></i>			<i>Component Cities</i>		
2,500- 4,999	0	0	0	489	\$3,363	\$995	
5,000- 9,999	108	\$2,533	\$777	396	3,534	942	
10,000- 24,999	270	2,636	640	278	3,644	975	
25,000- 49,999	249	2,738	575	96	3,430	640	
50,000- 99,999	150	2,525	717	126	2,993	630	
100,000-249,999	67	2,854	648	65	2,826	441	
250,000-499,999	0	0	0	23	2,915	325	
500,000 and over	0	0	0	18	2,954	289	

<sup>a</sup> Urban places located within five miles of a standard metropolitan area but not within five miles of another urban place are not included here. Such cities could only be combined with a standard metropolitan area, and the latter are not considered neighboring cities. Source: *Census of Population, 1950*, Bureau of the Census.

decreases as city size increases; the level of median income in the smallest component cities is about 15 per cent higher than in the largest component cities.

This inverse income-city-size relationship among component cities should not be deemed a refutation of the hypothesis that income and city size are directly correlated. Component cities, though politically independent, are economic subdivisions of larger urban areas, and there is no apparent justification for classifying them by their own size in a study of this kind. When an entire standard metropolitan area is considered a single city, the direct relation between income and city size is observed. Moreover, the inverse correlation among component cities of income and city size is not surprising; the level of median income in the smaller component cities, which often are the dormitory areas for managerial and professional personnel, would be expected to exceed that in the hub of the standard metropolitan area.<sup>27</sup>

<sup>27</sup> The level of median income in component cities of a given size increases with the size of the largest component city in the standard metropolitan area. Moreover, income in component cities of comparable size varies to a greater extent with the

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Thus, mean median incomes in isolated cities, and in neighboring cities classified by their combined size, increase with city size. When *t*-tests are conducted to compare the differences between these means with the intra-size-class variation in income, a large number of the former are statistically significant. Among isolated cities, the mean median incomes in the 10,000-49,999 classes are significantly higher than those in the 2,500-9,999 classes. Among neighboring cities classified by their combined size, almost all of the interclass income differences are statistically significant.<sup>28</sup>

Apparently, however, the results of the *t*-test should be discounted on the grounds that they are unduly affected by the large numbers of observations. The probability that the median income in a randomly chosen larger isolated city is higher than that in a randomly chosen smaller isolated city is consistently less than 0.6; and among neighboring cities classified by their combined populations, the corresponding probability is never appreciably greater than 0.6.<sup>29</sup> The

size of the largest component city than does income in component cities of differing size when the size of the largest component cities is held constant. These findings are in accord with the present treatment of component cities, since they suggest that income in component cities varies more with the size of the standard metropolitan area than with the size of the individual component cities. The average median incomes of component cities by their size, and the size of the largest component city in the standard metropolitan area, are:

Size of Largest Component City	Size of Component City				
	2,500- 4,999	5,000- 9,999	10,000- 24,999	25,000- 49,999	50,000- 99,999
50,000- 99,999	\$2,902	\$2,970	\$2,774	\$3,250	\$3,386
100,000-249,999	3,052	3,025	2,950	3,036	2,741
250,000-499,999	3,213	3,577	3,483	3,087	—
500,000 and over	3,702	3,825	3,900	3,584	3,552

<sup>28</sup> Only the income differences between the 5,000-9,999 and the 10,000-24,999 classes, between the 5,000-9,999 and the 50,000-99,999 classes, and between the 25,000-49,999 and the 100,000-249,999 classes are nonsignificant at the 0.05 probability level.

<sup>29</sup> For isolated cities and neighboring cities classified by their combined size, the probability that the median income in a randomly chosen larger city exceeds that in a randomly chosen smaller city is shown below. The size of the larger city is in the caption, the size of the smaller city is in the stub:

	Isolated Cities			Neighboring Cities			
	5,000- 9,999	10,000- 24,999	25,000- 49,999	10,000- 24,999	25,000- 49,999	50,000- 99,999	100,000- 249,999
2,500- 4,999	0.51	0.58	0.58	—	—	—	—
5,000- 9,999	—	0.57	0.58	0.54	0.58	0.50	0.63
10,000-24,999	—	—	0.51	—	0.55	0.45	0.59
25,000-49,999	—	—	—	—	—	0.41	0.55
50,000-99,999	—	—	—	—	—	—	0.65

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probability statements indicate quite clearly that, though a tendency exists for median income to rise with size of city, the variation in median income among cities of comparable size is in most cases sufficient to rob the differences between the means of much of their significance or reliability.<sup>30</sup>

### REGION AND NEIGHBORING-ISOLATED CITY COMPOSITION

When the relation at the national level between city size and income was studied above, the regional location and neighboring-isolated city composition of the city-size classes were not held constant. In subsequent sections of this paper, it is shown that the level of city median income is related to regional location and proximity to other cities even when city size is held constant. Thus, the differences in income that appeared to be associated with differences in city size may actually have partly reflected concealed variation in the regional location and neighboring-isolated city composition of the size classes.

Smaller cities are concentrated to a greater extent than are larger in regions where median income is relatively low even among cities of the same size.<sup>31</sup> Neighboring cities have higher median incomes than do isolated cities of the same size, and the ratio of the number of neighboring cities to the number of isolated cities is higher among large than among small cities.<sup>32</sup>

To determine the relation between city size and the level of median income when the differences between size classes in regional and neighboring-isolated city composition are eliminated, hypothetical mean median incomes are constructed. These hypothetical means indicate roughly the level of median income in

<sup>30</sup> Among isolated cities, for example, the maximum difference between the means in two size classes is less than \$200 and the standard deviation of the median incomes in each class is about \$600. It seems reasonable to conclude that the differences between the means have but limited reliability.

<sup>31</sup> In almost all size classes, median incomes in the South are lower than in the non-South. The percentage of the cities in each size class which are in the South is:

<i>Size Class</i>	<i>Percentage</i>	<i>Size Class</i>	<i>Percentage</i>
2,500- 4,999	41	50,000- 99,999	29
5,000- 9,999	42	100,000-249,999	42
10,000-24,999	34	250,000-499,999	29
25,000-49,999	36	500,000 and over	27

<sup>32</sup> The ratio of number of neighboring cities to number of isolated cities, by size class, is shown below:

<i>City Size</i>	<i>Ratio</i>
2,500- 4,999	0.42
5,000- 9,999	0.34
10,000-24,999	0.57
25,000-49,999	1.17

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each of the size classes that might result if, in each size class, the proportion of the cities located in a particular region were the same and the proportion of the neighboring or isolated cities were the same. This standardization procedure results in a reduction of the income differences between city-size classes (Table 7). Although

TABLE 7

1949 Mean Median Incomes, Observed and Standardized for Differences in Regional Location and Isolated-Neighboring City Composition, by 1950 City Size

CITY SIZE	MEAN MEDIAN INCOME <sup>a</sup>				RATIO OF	
	<i>Observed</i>		<i>Standardized</i> <sup>b</sup>		STANDARDIZED DIFFERENCE TO OB- SERVED DIFFERENCE	
	<i>Amount</i>	<i>Difference from Previ- ous Class</i> <sup>c</sup>	<i>Amount</i>	<i>Difference from Previ- ous Class</i> <sup>d</sup>		
	(1)	(2)	(3)	(4)	(5)	
2,500- 4,999	\$2,409	n.a.	\$2,417	n.a.	n.a.	
5,000- 9,999	2,372	-\$37	2,395	-\$22	0.59	
10,000- 24,999	2,546	+174	2,502	+107	0.61	
25,000- 49,999	2,558	+12	2,522	+20	1.67	
50,000- 99,999	2,798	+240	2,734	+212	0.88	
100,000-249,999	2,683	-115	2,685	-49	0.43	
250,000-499,999	2,860	+177	2,845	+160	0.90	
500,000 and over	3,027	+167	2,969	+124	0.74	

n.a. = not applicable.

<sup>a</sup> The unweighted mean of the 1949 median incomes of the cities in each size class.

<sup>b</sup> Standardized for regional location and neighboring-isolated city composition. Based on the assumptions that (1) each census region has the same percentage of cities in each size class as its total number of cities 2,500 and over is of the total number of United States cities 2,500 and over, and (2) each census region has the same percentage of isolated and neighboring cities in each size class as it has in all size classes (2,500-49,999) combined.

<sup>c</sup> Corresponding figure in column 1 minus the figure immediately above in column 1.

<sup>d</sup> Corresponding figure in column 3 minus the figure immediately above in column 3.

Source: *Census of Population, 1950*, Bureau of the Census.

the income differences between particular city-size classes are often reduced by more than 10 per cent, it is probably best to conclude only that disguised variation among city-size classes in regional and in neighboring-isolated city composition may be associated with about 10 per cent of the observed income differences between city-size classes.<sup>33</sup>

<sup>33</sup> In two of the cases in Table 7, a decrease in income associated with an increase in city size is reduced. In the remaining cases, the unweighted mean of the ratios of the differences is 0.96. This figure probably gives too much weight to the extreme value, 1.67. Thus, 0.90 may be a reasonable summary figure.

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### *Regional Location and Income*

#### ALL CITIES

There has been some controversy over the existence of regional income differences among the inhabitants of cities of comparable size. Some have suggested that the observed differences are statistically nonsignificant; others have argued (particularly in reference to the South versus the non-South) that such differences persist.<sup>34</sup> When comparably sized cities are classified by census region and when the median incomes in one region are compared with those in another, the results indicate substantial differences between the median income levels in the various regions (Table 3). Indeed, such differences are larger than the differences in income level between the largest standard metropolitan areas and the smallest urban places. The level of median income in the largest standard metropolitan area is about \$600 or 25 per cent higher than that in the smallest urban places, but the level of median income in the highest-income census region is about \$700 or 40 per cent higher than that in the lowest-income census region among standard metropolitan areas, and among urban places outside standard metropolitan areas, the level of median income in the highest-income region exceeds that in the lowest-income one by about \$1,100 or 60 per cent.

The pattern and size of regional income differences vary with city size. Among urban places outside standard metropolitan areas, the level of median income is substantially higher in the Far West and substantially lower in the South than in other regions. Among standard metropolitan areas, the level of median income in the East North Central region rather than the Far West appears to be highest, but the level of income in the South again is lowest.<sup>35</sup> In both absolute and relative terms, the size of the regional income differences does not vary greatly among size classes including cities of fewer than 250,000 inhabitants. However, among cities of over 250,000, regional income differences are appreciably smaller than among cities of fewer than 250,000.<sup>36</sup>

<sup>34</sup> Klarman, *op. cit.*, and Oliver, *op. cit.*

<sup>35</sup> Among the rural farm population, income appears to be highest in the Pacific and East North Central regions and lowest in the South. Among the rural nonfarm population, income is again lower in the South than in the non-South.

<sup>36</sup> The variation among census regions as measured by the standard deviation and coefficient of variation (per cent), by city size, is:

City Size	Standard Deviation	Coefficient of Variation
2,500- 4,999	\$371	15.1
5,000- 9,999	351	14.4
10,000- 24,999	354	13.9

## CITY SIZE AND INCOME, 1949

Just as it seemed necessary to take account of the variation in median income among comparably sized cities when the city-size-income relationship was treated, so now it seems necessary to take account of intraregional variation in median income.<sup>87</sup> Most of the income differences in Table 3 between pairs of census regions are statistically significant.<sup>88</sup>

Among the small cities (under 25,000), the difference in the level of median income between a census region in the Far West and one in the South is always significant, and between a census region in the Northeast or North Central regions and one in the South or Far West, this is nearly always so. However, the income differential between one in the Northeast and one in the North Central region is usually nonsignificant. Among large cities (over 25,000), the income differential between a census region in the South and one in the non-South is significant in most cases. However, the difference in income between two in the South or two in the non-South is frequently nonsignificant.

Estimates can also be made of the probability that the median income in a city of given size chosen at random from a high-income census region is higher than that in a city of the same size chosen

<i>City Size</i>	<i>Standard Deviation</i>	<i>Coefficient of Variation</i>
25,000- 49,999	385	15.0
50,000- 99,999	373	13.6
100,000-249,999	353	13.1
250,000-499,999	275	9.7
500,000 and over	221	7.5

<sup>87</sup> In most city-size classes the relative dispersion of city median incomes is higher in the southern regions than in others. Relative dispersion is generally highest in the West South Central region, and the South Atlantic and East South Central regions often rank close behind. The relatively great dispersion of median incomes in the South may indicate that labor mobility among southern cities is relatively low or that southern cities vary more with regard to occupational structure than do non-southern cities.

<sup>88</sup> The *t*-tests indicate that the following percentages of the income differences among pairs of census regions are nonsignificant:

<i>City Size</i>	<i>Percentage</i>
2,500- 4,999	17
5,000- 9,999	22
10,000- 24,999	22
25,000- 49,999	47
100,000-249,999	48
250,000-499,999	60
500,000 and over	63

In some cases it was necessary to combine two or more census regions because there were so few observations. The southern regions were combined twice; the North Central twice; the Middle Atlantic, once with New England; and the Mountain and Pacific, twice. There were too few cities in the 50,000-99,999 class to permit the use of *t*-tests.

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at random from a low-income region.<sup>39</sup> These probability statements can be interpreted within the following framework: a person chooses at random a city from each of two lists, one list including all cities of given size in a low-income census region, the other list including all cities of the same size in a high-income one. He estimates that the median income in the randomly chosen city in the high-income region exceeds that in the randomly chosen city in the low-income region. The probabilities shown in Tables 8, 9, and 10 indicate the chances of being correct for each pair of census regions. Probabilities are estimated for but three city-size classes: 2,500-4,999; 10,000-24,999; and 100,000-249,999.

About 8 times in 10, one will be correct in estimating that income in a randomly chosen small city in the Far West is higher than in a randomly chosen small city in the South (Table 8). About 3 times in 4, one will be correct in estimating that income in a small city

TABLE 8

Probability of a Higher 1949 Median Income in a Small City in One Region (in Heading) than in One in Another (in Stub), Both Randomly Chosen <sup>a</sup> (probabilities) <sup>b</sup>

CENSUS REGIONS, ARRAYED FROM HIGHEST INCOME	CENSUS REGIONS, ARRAYED FROM HIGHEST INCOME							
	<i>Pa- cific</i>	<i>Moun- tain</i>	<i>Middle Atlantic</i>	<i>East North Central</i>	<i>New Eng- land</i>	<i>West North Central</i>	<i>South Atlantic</i>	<i>West South Central</i>
Mountain	0.58							
Middle Atlantic	0.59	0.51						
East North Central	0.62	0.54	0.52					
New England	0.69	0.63	0.61	0.59				
West North Central	0.75	0.68	0.67	0.66	0.55			
South Atlantic	0.79	0.74	0.73	0.72	0.64	0.60		
West South Central	0.85	0.81	0.80	0.79	0.71	0.69	0.58	
East South Central	0.90	0.86	0.86	0.86	0.77	0.75	0.63	0.54

<sup>a</sup> Cities of 2,500 to 4,999 inhabitants in 1950.

<sup>b</sup> The following are examples of the manner in which this table is to be interpreted: The chances are roughly 64 in 100 that the median income in a randomly chosen city in New England exceeded that in a randomly chosen city in the South Atlantic states. The chances are roughly 59 in 100 that the median income in a randomly chosen city in the East North Central states exceeded that in a randomly chosen city in the New England states.

Source: *Census of Population, 1950*, Bureau of the Census.

<sup>39</sup> Consider the median incomes in cities of a given size in each region to be independent, normally distributed, random variables. Let  $x$  represent the median incomes of the cities in the high-income region and  $y$  the median incomes in the cities in the low-income region. Proceeding as in note 22 above, the probability can be estimated that  $x - y > 0$ . Again, these are only approximations.

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in one of the northeastern or north central regions is higher than in a small southern city. Among medium-sized cities, one will be correct about 8 times in 10 in estimating that income in a city in the far western or northeastern-north central regions is higher than in a southern city (Table 9). Although among small-sized and medium-sized cities, median incomes in the Far West are higher than else-

TABLE 9

Probability of a Higher 1949 Median Income in a Medium-Sized City in One Region (in Heading) than in One in Another (in Stub), Both Randomly Chosen <sup>a</sup> (probabilities) <sup>b</sup>

CENSUS REGIONS, ARRAYED FROM HIGHEST INCOME	CENSUS REGIONS, ARRAYED FROM HIGHEST INCOME							
	<i>New Pa- cific</i>	<i>Eng- land</i>	<i>Moun- tain</i>	<i>North Central</i>	<i>Middle Atlantic</i>	<i>West North Central</i>	<i>South Atlantic</i>	<i>West South Central</i>
New England	0.67							
Mountain	0.68	0.56						
East North Central	0.69	0.58	0.51					
Middle Atlantic	0.75	0.64	0.54	0.53				
West North Central	0.79	0.71	0.61	0.60	0.58			
South Atlantic	0.89	0.86	0.75	0.75	0.75	0.67		
West South Central	0.86	0.82	0.73	0.73	0.72	0.65	0.50	
East South Central	0.94	0.95	0.84	0.85	0.87	0.79	0.64	0.62

<sup>a</sup> Cities of 10,000 to 24,999 inhabitants in 1950.

<sup>b</sup> The following are examples of the manner in which this table is to be interpreted: The chances are roughly 56 in 100 that the median income in a randomly chosen city in New England exceeded that in a randomly chosen city in the Mountain states. The chances are roughly 53 in 100 that the median income in a randomly chosen city in the East North Central states exceeded that in a randomly chosen city in the Middle Atlantic states.

Source: *Census of Population, 1950*, Bureau of the Census.

where, one will be correct only about 6 or 7 times in 10 in estimating that income in a randomly chosen far western city of those sizes is higher than in a randomly chosen city of similar size in the northeastern or north central regions. Among large cities, the chances of being right in estimating that income in a city in the non-South exceeds that in a city in the South are better than 9 in 10 (Table 10).

These probability statements show that, though regional income differences of \$200 to \$300 may be small when considered in the light of the intraregional income variation, the differences in income between the highest-income and lowest-income regions are usually quite large when considered in this light. This is revealed quite strikingly by the fact that the chances are often about 8

TABLE 10

Probability of a Higher 1949 Median Income in a Large City in One Region (in Heading) than in One in Another (in Stub), Both Randomly Chosen <sup>a</sup>  
(probabilities) <sup>b</sup>

CENSUS REGIONS, ARRAYED FROM HIGHEST INCOME	CENSUS REGIONS, <sup>c</sup> ARRAYED FROM HIGHEST INCOME					
	<i>East North Central</i>	<i>New England</i>	<i>West North Central</i>	<i>Middle Atlantic</i>	<i>West South Central</i>	<i>South Atlantic</i>
New England	0.67					
West North Central	0.73	0.55				
Middle Atlantic	0.72	0.55	0.50			
West South Central	0.90	0.79	0.75	0.74		
South Atlantic	0.98	0.93	0.92	0.90	0.72	
East South Central	0.999	0.98	0.98	0.97	0.84	0.65

<sup>a</sup> Cities of 100,000 to 249,999 inhabitants in 1950.

<sup>b</sup> The following are examples of the manner in which this table is to be interpreted: The chances are roughly 55 in 100 that the median income in a randomly chosen city in New England exceeded that in a randomly chosen city in the Middle Atlantic states. The chances are roughly 98 in 100 that the median income in a randomly chosen city in the West North Central states exceeded that in a randomly chosen city in the East South Central states.

<sup>c</sup> The Mountain and Pacific divisions are not included among cities of 100,000 to 249,999 because only one city of 100,000 to 249,999 exists in the former division and only two such cities exist in the latter division.

Source: *Census of Population, 1950*, Bureau of the Census.

in 10 that the median income in a city in one census region is higher than that in a city of comparable size in another. It will be recalled that the probability that one of the largest metropolitan areas has a higher median income than one of the smallest urban places is no greater than this.

#### ISOLATED, NEIGHBORING, AND COMPONENT CITIES

Among isolated cities of comparable size, there are income differences among regions, and their size and pattern are much the same as those found among all small cities (Table 11). The difference in median income level between the highest-income and lowest-income census regions is ordinarily about \$1,100 or 60 per cent. The level of median income is highest in the Far West and lowest in the South, the Northeast and North Central regions ranking in the middle.

Among neighboring cities of comparable size, regional income differences persist, and the magnitude in both absolute and relative terms of these differences is generally about the same as that among isolated cities. Only among cities smaller than 5,000 is there any appreciable difference; among such cities, regional income differ-

TABLE 11

1949 Mean Median Incomes of Isolated and Neighboring Cities,<sup>a</sup> by Census Region and by 1950 City Size

(dollars)

Census Region	City Size			
	2,500-4,999	5,000-9,999	10,000-24,999	25,000-49,999
<i>Isolated Cities</i>				
New England	2,317	2,632	2,645	1,942
Middle Atlantic	2,575	2,478	2,574	2,645
East North Central	2,597	2,604	2,684	2,843
West North Central	2,374	2,383	2,516	2,654
South Atlantic	1,970	2,029	2,068	2,206
East South Central	1,759	1,812	1,900	1,829
West South Central	1,971	2,071	2,245	2,252
Mountain	2,716	2,835	2,779	3,055
Pacific	3,014	2,802	2,977	2,541
<i>Neighboring Cities</i>				
New England	2,630	2,569	2,874	2,715
Middle Atlantic	2,853	2,628	2,701	2,918
East North Central	2,909	2,749	2,779	2,845
West North Central	2,704	2,740	2,586	2,399
South Atlantic	2,530	2,297	2,497	2,247
East South Central	2,340	2,302	2,191	1,806
West South Central	2,084	1,683	2,152	2,304
Mountain	2,970	2,812	2,561	2,787
Pacific	2,834	2,955	3,221	3,091

<sup>a</sup> The unweighted mean of the 1949 median incomes reported for the cities included in the size class.

Source: *Census of Population, 1950*, Bureau of the Census.

ences are larger in the case of isolated cities.<sup>40</sup> The pattern of regional income differences among neighboring cities is similar to

<sup>40</sup> For isolated, neighboring, and component cities under 50,000, the variation among census regions as measured by the standard deviation and the coefficient of variation (per cent), is:

City Size	Isolated	Neighboring (standard deviation)	Component
2,500- 4,999	\$407	\$291	\$329
5,000- 9,999	361	385	411
10,000-24,999	349	332	447
25,000-49,999	411	407	526
(coefficient of variation)			
2,500- 4,999	17.2	11.0	10.1
5,000- 9,999	15.0	15.2	12.6
10,000-24,999	14.0	12.7	13.0
25,000-49,999	16.8	15.9	16.9

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that among isolated cities: incomes in the Far West tend to be highest, incomes in the South are lowest, incomes in the Northeast and North Central regions rank in the middle. However, among neighboring cities, the tendency for incomes in the Far West to exceed those in other regions seems somewhat weaker than among isolated cities.

Regional differences in the level of median income also persist among the component cities of standard metropolitan areas (Table 12). In absolute terms, these differences are generally somewhat

TABLE 12  
1949 Mean Median Incomes of Component Cities of Standard Metropolitan Areas,<sup>a</sup> by Census Region and by 1950 City Size  
(dollars)

Census Region	Size of Cities within Standard Metropolitan Areas							
	2,500- 4,999	5,000- 9,999	10,000- 24,999	25,000- 49,999	50,000- 99,999	100,000- 249,999	250,000- 499,999	500,000 and Over
New England	2,921	2,888	2,948	3,094	3,066	2,815	n.a.	2,643
Middle Atlantic	3,321	3,481	3,593	3,394	3,064	3,048	3,074	2,970
East North Central	3,760	4,071	4,072	3,692	3,440	3,273	3,234	3,192
West North Central	3,478	3,440	3,693	3,549	2,907	3,016	2,999	2,898
South Atlantic	2,873	3,131	3,055	2,440	2,322	2,335	2,191	2,896
East South Central	3,446	3,376	2,964	2,972	2,296	2,136	2,499	n.a.
West South Central	3,569	2,920	4,013	2,281	2,524	2,636	2,748	2,602
Mountain	2,856	2,690	3,052	n.a.	3,085	2,918	2,846	n.a.
Pacific	3,178	3,330	3,564	3,519	3,315	3,010	3,023	2,944

n.a. = not available.

<sup>a</sup> The unweighted mean of the 1949 median incomes reported for the cities included in the size class.

Source: *Census of Population, 1950*, Bureau of the Census.

greater, but in relative terms, they are smaller than those among isolated and neighboring cities.<sup>41</sup>

It was noted that income in standard metropolitan areas is generally highest in the East North Central region and lowest in the South. Is this pattern due purely to the fact that income in the largest component cities of standard metropolitan areas is highest in the East North Central region and lowest in the South? Or does it persist among component cities of varying size? It appears that in every city-size class, component cities in the East North Central region have higher median incomes than in other regions. On the other hand, the relatively low incomes of southern metropolitan areas are confined chiefly to the larger component cities. In the smaller

<sup>41</sup> See note 40 above.

## CITY SIZE AND INCOME, 1949

component cities in the South, the level of income often compares favorably with that in the rest of the nation.

Most of the regional income differences observed among isolated cities are statistically significant, but the proportion of nonsignificant differences increases with city size. Less of the differences among census regions in the level of median income is significant among neighboring cities than among isolated cities. The difference in income between a census region in the South and one in the non-South usually is significant, but the income difference between two census regions, both of which are in the South or in the non-South, often is nonsignificant. Among component cities, about one-half of the regional differences between the means of the median incomes are significant.<sup>42</sup> Though regional income differences of only \$200 to \$300 may be quite small relative to intraregional income variation, this variation appears insufficient to impair the reliability of the income differences among the highest-income and lowest-income regions.

### *Proximity to Other Cities*

#### NEIGHBORING AND ISOLATED CITIES

So far as I know, the relation between the level of income in a city and the nearness of the city to other cities, has been neglected in national income literature. The present study indicates that in general, income is higher in neighboring cities than in isolated ones. At the national level, the mean median income in neighboring cities is about \$250 higher than in isolated cities of the same size (Table 6). When the analysis is conducted at the regional level, it is found again that the level of median income is generally higher in neighboring cities than in isolated cities (Table 13). However, the size of the income differential varies both by region and by city size.

At the national level, the differences between the mean median

<sup>42</sup> Based on *t*-tests using the 0.05 significance level, for isolated, neighboring, and component cities, the percentage of the income differences among pairs of census regions which is nonsignificant, by city size, is:

City Size	Isolated	Neighboring	Component
	(percentages)		
2,500- 4,999	14	58	69
5,000- 9,999	25	56	68
10,000- 24,999	42	46	57
25,000- 49,999	62	43	50
50,000- 99,999	—	—	38
100,000-249,999	—	—	38
250,000-499,999	—	—	33
500,000 and over	—	—	100

**TABLE 13**  
**1949 Mean Median Incomes of Isolated and Neighboring Cities,<sup>a</sup> by Census Region and by 1950 City Size**  
*(dollars)*

<i>Census Region and Type of City</i>	<i>City Size</i>			
	<i>2,500- 4,999</i>	<i>5,000- 9,999</i>	<i>10,000- 24,999</i>	<i>25,000- 49,999</i>
<b>New England:</b>				
Isolated	2,317	2,632	2,645	1,942
Neighboring	2,630	2,569	2,874	2,715
<b>Middle Atlantic:</b>				
Isolated	2,575	2,478	2,574	2,645
Neighboring	2,853	2,628	2,701	2,918
<b>East North Central:</b>				
Isolated	2,597	2,604	2,684	2,843
Neighboring	2,909	2,749	2,779	2,845
<b>West North Central:</b>				
Isolated	2,374	2,383	2,516	2,654
Neighboring	2,704	2,740	2,586	2,399
<b>South Atlantic:</b>				
Isolated	1,970	2,029	2,068	2,206
Neighboring	2,530	2,297	2,497	2,247
<b>East South Central:</b>				
Isolated	1,759	1,812	1,900	1,829
Neighboring	2,340	2,302	2,191	1,806
<b>West South Central:</b>				
Isolated	1,971	2,071	2,245	2,252
Neighboring	2,084	1,683	2,152	2,304
<b>Mountain:</b>				
Isolated	2,716	2,835	2,779	3,055
Neighboring	2,970	2,812	2,561	2,787
<b>Pacific:</b>				
Isolated	3,014	2,802	2,977	2,541
Neighboring	2,834	2,955	3,221	3,091

<sup>a</sup> The unweighted mean of the 1949 median incomes reported for the cities included in the size class.

Source: *Census of Population, 1950*, Bureau of the Census.

incomes in neighboring cities and in isolated cities are highly significant.<sup>43</sup> However, the probability techniques<sup>44</sup> indicate that the chances are generally only 6 in 10 that one will be correct in estimating that a randomly chosen neighboring city has a higher

<sup>43</sup> Based on the *t*-test, all but one of these income differences are significant at the 0.001 probability level. In the remaining case, i.e. among cities of 25,000 to 49,999, the income difference is nonsignificant at the 0.05 level.

<sup>44</sup> The approximation used to estimate these probabilities is precisely the same as that outlined in note 22 above. In the notation used there, *x* represents the median incomes of neighboring cities of a given size, and *y* represents the median incomes of isolated cities of the same size.

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1949 median income than a randomly chosen isolated city.<sup>45</sup> Thus, it appears that the variation in median income among neighboring and isolated cities is often great enough to call into question the reliability of the income difference between them. There is a consistent tendency for the level of median income to be higher among neighboring cities than among isolated cities, but this tendency is often blurred appreciably by the variation in income among neighboring cities and among isolated cities.

### MISCLASSIFICATION BY SIZE AND DIFFERENCES IN REGIONAL LOCATION

A direct income-city-size relation was shown to obtain for neighboring cities only when they were classified by their combined size. Although it might seem that income differences between isolated and neighboring cities would decrease considerably if the latter were again classified on the basis of their combined populations, such apparently is not the case. When neighboring cities are classified by their combined size, the income difference between neighboring and isolated cities remains about constant among cities of 5,000 to 9,999, decreases by about 25 per cent among cities of 10,000 to 24,999, and increases by about 75 per cent among cities of 25,000 to 49,999 (Table 6). Apparently, only a fairly minor portion of the income differential between neighboring and isolated cities can be explained by the former's being misclassified by size.

When the differences at the national level between income in neighboring and isolated cities were studied, the regional location of neighboring and isolated cities was not held constant. Since the proportion of isolated cities located in low-income regions is generally larger than that of neighboring cities, the observed income difference may have partly reflected differences in regional location.<sup>46</sup> To separate the effects of regional location from "pure" income differences between neighboring and isolated cities, hypothetical mean median

<sup>45</sup> The probability that the 1949 median income in a randomly chosen neighboring city exceeded that in a randomly chosen isolated city of comparable size, by city size, is: 2,500-4,999, 0.66; 5,000-9,999, 0.60; 10,000-24,999, 0.61; and 25,000-49,999, 0.57. The significance of the differences between the means indicated by the *t*-test may be due principally to the large number of observations.

<sup>46</sup> The percentage of all neighboring and isolated cities in each size class located in the South (the low-income region) is:

<i>City Size</i>	<i>Neighboring</i>	<i>Isolated</i>
2,500-4,999	35	44
5,000-9,999	33	45
10,000-24,999	29	37
25,000-49,999	31	43

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incomes, in which each region is weighted the same for both neighboring and isolated cities, are presented. Ostensibly, these hypothetical means are adjusted for differences in regional location. The adjusted differences in income between neighboring and isolated cities are in general about 25 per cent smaller than the unadjusted differences. The adjustment causes the income difference to decrease by about 25 per cent among cities of 2,500 to 4,999, to decrease by about 40 per cent among cities of 5,000 to 9,999 and 10,000 to 24,999, and to remain roughly constant among cities of 25,000 to 49,999 (Table 14).

TABLE 14

1949 Mean Median Incomes of Neighboring and Isolated Cities, Observed and Standardized for Regional Location, by 1950 City Size

	City Size			
	2,500- 4,999	5,000- 9,999	10,000- 24,999	25,000- 49,999
	<i>Mean Median Income</i>			
Observed: <sup>a</sup>				
Neighboring cities	\$2,690	\$2,537	\$2,699	\$2,625
Isolated cities	2,290	2,316	2,459	2,480
Difference: neighboring less isolated cities	400	221	240	145
Standardized: <sup>b</sup>				
Neighboring cities	2,663	2,510	2,668	2,651
Isolated cities	2,364	2,384	2,530	2,502
Difference: neighboring less isolated cities	299	126	138	149
	<i>Ratio</i>			
Ratio of standardized difference to observed difference	0.75	0.57	0.58	1.03

<sup>a</sup> The unweighted mean of the 1949 median incomes of the cities in each size class.

<sup>b</sup> Based on the assumption that in each size class each census region contains the same percentage of neighboring cities as isolated cities, this percentage being the percentage of all urban places in the size class which is included in the census region.

Source: *Census of Population, 1950*, Bureau of the Census.

*Community-Size Composition and Regional Income Differences*

I have already referred to the theory that regional income differences are largely reflections of city-size-associated income differences. This explanation of regional income differences is not, of course, complete. If the level of income in comparably-sized cities were the same in each region, the causes of regional income differ-

## CITY SIZE AND INCOME, 1949

ences would then have to be sought among (1) those factors that cause community-size composition to differ among regions, and (2) those factors that cause income to differ with size of place. The result would be to shift the areas in which the basic causes of regional income differences might be sought.

Moreover, an observed relationship between community-size composition and income in a region does not establish a line of causation. It is possible that certain factors, e.g. distribution of natural resources and locational advantages, are responsible for regional differences in both community-size composition and income level. It may even be possible that the community-size composition in a region is affected somewhat by the regional income level.

Because so much interest has centered on the relationship between community-size composition and regional income differences, an attempt is made here to estimate very roughly the extent to which regional income differences are associated with differences in community-size composition. However, in interpreting the results the above remarks should be borne in mind. The following technique is used. In each census region, the percentage distribution of consumer units among community-size classes is used to weight the regional mean median incomes in the community-size classes. Two such percentage distributions are used: (1) the observed distribution in the region, and (2) the United States distribution. Thus, two series of regional incomes result, the one reflecting regional differences in community-size composition, the other adjusted for such differences. A comparison of the income differences between the two series of regional incomes indicates roughly the extent to which regional differences in community-size composition may be associated with regional income differences. Several difficulties limit the usefulness of this technique:

1. The mean of a number of city or state median incomes, not the mean income of the consumer units in each community-size class, is used. The result of averaging medians defies precise interpretation. The resulting regional incomes do not represent two series of regional mean consumer unit incomes arrived at by alternative weighting devices. Instead they are rough approximations to the relative levels of regional income that might arise as the result of such weighting devices.

2. As in most standardization procedures of this sort, the results are hypothetical, and the regional incomes that actually would result after standardization of community-size composition would not necessarily be those shown below.

CITY SIZE AND INCOME, 1949

3. There is some duplication of consumer units in the community-size classification. Some located in standard metropolitan areas are also included in the rural farm or rural nonfarm population.

The results indicate that differences in community-size composition are associated with a substantial portion of the differences among regional incomes. The coefficient of variation of the adjusted regional incomes is 36 per cent smaller than that of the regional incomes reflecting differences in community-size composition (Table 15).<sup>47</sup> The percentage income difference between the highest-income

TABLE 15

Hypothetical 1949 Mean Median Incomes, Reflecting and Standardized for Regional Differences in 1950 Community-Size Composition, by Census Region

CENSUS REGION	MEAN MEDIAN INCOME				RATIO OF STANDARDIZED DIFFERENCE TO REFLECTING DIFFERENCE
	Reflecting Differences in Community-Size Composition <sup>a</sup> Difference from East		Standardized for Differences in Community-Size Composition <sup>b</sup> Difference from East		
	Income	South Central	Amount	South Central	
	(1)	(2)	(3)	(4)	(5)
East South Central	\$1,670	n.a.	\$2,047	n.a.	n.a.
West South Central	2,085	\$415	2,249	\$202	.49
South Atlantic	2,129	459	2,321	274	.60
West North Central	2,492	822	2,629	582	.71
Mountain	2,619	949	2,677	630	.66
New England	2,802	1,132	2,715	668	.59
Pacific	2,909	1,239	2,836	789	.64
Middle Atlantic	2,967	1,297	2,808	761	.59
East North Central	2,988	1,318	2,948	901	.68

n.a. = not applicable.

<sup>a</sup> The sum of the mean median incomes in each city size and rural category weighted by the percentage of the consumer units in the region which are located in the category. These figures rather than the actual median consumer unit incomes were used because they seem more comparable with the standardized figures.

<sup>b</sup> The sum of the mean median incomes in each city size and rural category weighted by the percentage of the consumer units in the United States which are located in the category.

Source: *Census of Population, 1950*, Bureau of the Census.

and lowest-income regions is also reduced by about one-third. The roughness of this estimate should again be emphasized. In the neighborhood of 40 per cent of regional income differences may be associated with regional differences in community-size composition. Cer-

<sup>47</sup> If the actual median incomes in the census regions rather than the figures in Table 15, column 1, are used, the coefficient of variation is reduced by 44 per cent.

tainly, the data and techniques do not justify any more precise conclusion than this.<sup>48</sup>

### *Limitations of the Results*

Before summarizing the results, a discussion of their limitations is in order. Although several of these have already been noted, a restatement of them should be of value:<sup>49</sup>

#### BASIC DATA

1. The 1950 census data are subject to errors of response, errors of nonreporting, and errors due to editing assumptions.<sup>50</sup> So long as these biases are not associated with city size or region, they do not constitute an important problem. Although the estimates of rural incomes may be biased downward more than other community-size categories, there is no evidence that city size and these biases are associated among the urban population. Moreover, the effects of these biases may be mitigated by the use of the median, which is relatively insensitive to changes in the extremes of the distribution.

2. The median incomes reported in the census are subject to sampling errors. Among large cities, such errors are so small that they constitute no problem. Among the smallest cities, though such errors may amount to over \$100 in the case of an individual median, the mean of groups of medians is used, and it is subject to much smaller errors.<sup>51</sup>

#### DEFINITIONS

1. The income concept employed in the census excludes non-monetary receipts.<sup>52</sup> This exclusion may cause an appreciable under-

<sup>48</sup> The underestimate of rural incomes due to the exclusion of nonmonetary receipts may also hamper the present results.

<sup>49</sup> In addition to the limitations presented below, there are obvious limitations of time and space. The income data, and hence the results of this study, pertain to the United States in 1949. The results of other studies suggest, however, that the direct relation between city size and income held at other times (see the works cited in note 1). It appears too that in the United Kingdom, income is somewhat lower in small than in large cities. H. F. Lydall, "National Survey of Personal Incomes and Savings," *Bulletin of the Oxford University Institute of Statistics*, February-March 1953, pp. 35-85.

<sup>50</sup> For a discussion of the editing assumptions, see Miller, *op. cit.*

<sup>51</sup> Two other probably less important limitations are: (1) the income data pertain to 1949, whereas the city-size data pertain to 1950, (2) the income data pertain to consumer units, whereas for some purposes it would be desirable to have data concerning individual personal income. Census data concerning personal income in urbanized areas, urban places outside urbanized areas, and among rural populations, are available. However, the regional breakdown is very broad, and it is impossible to determine the variation in income level among cities of the same size. *Census of Population, 1950*, Bureau of the Census, Vol. IV, Part 5, Chap. A.

<sup>52</sup> For the census definition of income, see *Census of Population, 1950*, Bureau of the Census, Vol. II, Part 1, pp. 63-65.

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estimate of income, particularly in rural areas relative to urban areas.

2. The concept of the city used probably relies too heavily upon political boundaries.<sup>53</sup>

### TECHNIQUES

1. The level of income in a community-size class is measured by the unweighted mean of the median incomes in the cities included in the size class or the weighted mean of the state median incomes in the case of the rural population. These measures represent neither the mean nor the median income of consumer units in the community-size category. They are merely a rough approximation of the level of income in such a category. Although these measures are awkward in some circumstances, they seem proper when interclass income differences are compared with intraclass variation in income. Within that framework, income in each city, not in each consumer unit, is regarded as an observation, and the mean of the median incomes may be regarded simply as the mean of the observations.

2. In measuring regional income differences among cities of comparable size, the community-size variable is not strictly held constant. Although the cities compared are of the same size, the total urbanization and community-size composition of the regions may vary. The level of income in a city may be associated with the total community-size composition in the surrounding region as well as with its own size.

3. The classification by community size is not entirely satisfactory. Some of the consumer units located in standard metropolitan areas are also included in the rural farm or rural nonfarm population.<sup>54</sup>

<sup>53</sup> If each urbanized area (rather than each standard metropolitan area) were considered a city, the effect would be to increase the income differences associated with city size. The median incomes in urbanized areas are, on the average, \$50 to \$100 higher than in corresponding standard metropolitan areas. Moreover, median incomes in urbanized areas appear higher relative to those in standard metropolitan areas in the South and in the Pacific states than in the rest of the nation.

If each urban place in the United States were considered a city, the effect would be to decrease city-size-associated income differences. Mean median incomes, by size of city, would be:

<i>City Size</i>	<i>Income</i>	<i>City Size</i>	<i>Income</i>
2,500- 4,999	\$2,662	50,000- 99,999	\$2,993
5,000- 9,999	2,764	100,000-249,999	2,826
10,000-24,999	2,939	250,000-499,999	2,915
25,000-49,999	2,890	500,000 and over	2,954

<sup>54</sup> About 3 million consumer units, i.e. about 7 per cent of the consumer units in the United States, are included both in the rural population and in standard metropolitan areas.

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### SCOPE

1. An attempt is made here to estimate the extent to which regional income differences are associated with regional differences in community-size composition alone. No attempt is made to estimate the extent to which regional income differences are associated with community-size composition together with other variables, such as racial, occupational, or age composition.

2. The relations between city size, regional location, and proximity to other cities, on the one hand, and the level of median income, on the other, do not establish lines of causation. The observed relation between city size and income cannot be interpreted as evidence that variations in city size cause incomes to vary. The causes of these observed income differences must be sought among such factors as differences among cities in supply-and-demand conditions in the factor markets due to factor immobility, differences in occupational composition, differences in the size of inflowing property incomes, and differences in nonpecuniary rewards and in the price level. Although no attempt is made here to formulate a theory explaining the observed income difference between city-size classes, some additional clues regarding the explanation may be presented. (a) The number of persons in the labor force per consumer unit appears to be higher in standard metropolitan areas than in urban places outside standard metropolitan areas.<sup>55</sup> (b) The proportion of the labor force included in relatively high-paid occupations is larger in large cities than in small cities.<sup>56</sup> (c) The age and educational distribution of the population appears to be more favorable in large cities.<sup>57</sup>

<sup>55</sup> See Edwin Mansfield, "Community Size, Region, Labor Force, and Income, 1950," *Review of Economics and Statistics*, November 1955.

<sup>56</sup> According to census data, professional and clerical workers constitute a larger proportion of the employed labor force in large cities than in small cities, while operatives, private household workers, and laborers (farm and nonfarm) constitute a smaller proportion of the employed labor force in large cities than in small cities. These census data use urbanized areas, rather than standard metropolitan areas, as individual large cities. *Census of Population, 1950*, Bureau of the Census, Vol. IV, Part 5, Chap. A.

<sup>57</sup> The proportion of the population fourteen and over which is under twenty-five years old and over sixty-five years old is 16 per cent smaller in urbanized areas of 250,000 and over than in urban places outside urbanized areas of 2,500 to 10,000. The proportion of the population fourteen and over which is twenty-five to forty-four years old is 7 per cent larger, and the proportion which is forty-five to sixty-four years old is 12 per cent larger in urbanized areas of 250,000 and over than in urban places of 2,500 to 10,000. It appears too that among persons twenty-five to forty-four years old, 50.5 per cent in urbanized areas of 250,000 and over finished high school, whereas in urban places of 2,500 to 10,000 only 46.5 per cent did so. Among persons forty-five to sixty-four years old, 30.0 per cent in urbanized places of 250,000 and over and 26.7 per cent in urban places of 2,500 to 10,000 finished high school. *Ibid.*

*Conclusions*

With the limitations outlined in the preceding section in mind, the findings may be summarized as follows:

1. In the United States as a whole, median income appears to rise with city size. The level of income is about 25 per cent higher in the largest standard metropolitan areas than in the smallest urban places outside standard metropolitan areas. Income in rural areas is lower than that in the smallest cities.

2. Although there is a definite tendency at the national level for income to rise with city size, two city-size classes must differ substantially with regard to the size of the cities included in each class if the interclass income differences are to be large relative to the intraclass variation in income. Indeed, the chances are often as great as 1 time in 3 that the 1949 median income in a large standard metropolitan area, chosen at random, would be no higher than in a randomly chosen small urban place outside standard metropolitan areas.

3. The relationships between city size and income seem stronger in the South and Middle West than in the Northeast and Far West. In the Far West, in particular, income differences between city-size classes seem very small relative to the intraclass income variation. In many states, the correlation between income and city size is quite weak.

4. The level of median income is directly related to city size among isolated cities and, when they are classified on the basis of their combined size, among neighboring cities. Income appears to be inversely related to city size among the component cities of standard metropolitan areas. Among neighboring cities classified by their individual size, income and city size seem to be uncorrelated.

5. Standardization for differences among city-size classes in regional and neighboring-isolated city composition seems to reduce the income differences between size classes at the national level by about 10 per cent.

6. Regional differences in the level of median income persist among cities of comparable size. These regional income differences are often larger in both dollar and percentage terms than the income differences between the largest and smallest cities. The income differences between the highest-income and lowest-income census regions are quite large relative to the intraregional income variation.

7. In urban places outside standard metropolitan areas, income is higher in the Far West than in other parts of the nation. In stand-

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ard metropolitan areas, income is higher in the East North Central states than in other parts of the nation. In cities of all sizes, income in the South is lower than in the rest of the country.

8. The level of median income is consistently higher in neighboring cities than in isolated cities of the same size, but this income difference is often quite small relative to the variation in median income among neighboring and isolated cities. The income difference between neighboring and isolated cities is not reduced materially by classifying neighboring cities on the basis of their combined population.

9. Standardization for differences in regional location between neighboring and isolated cities of comparable size apparently reduces the income difference between them by about 25 per cent.

10. Regional differences in community-size composition may be associated with about 40 per cent of the differences in regional income.

## C O M M E N T

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My comments on Edwin Mansfield's paper will be mainly of two sorts. First, I present some data that "go behind" the city-size differentials he found. What I should like to be able to say, but cannot really, is whether someone would have a higher expectation of either money or real income if he located in a city of one size rather than another. Second, I shall discuss again a statement I made at an earlier Conference on Income and Wealth, a finding that the incomes of white nonfarm families living in the South are approximately the same as the incomes of white nonfarm families living in the rest of the country.

Mansfield has given us data on the mean median incomes for families and unrelated individuals for various city-size groups. These data indicate that there is a quite consistent tendency for the level of income to rise as the city size increases. For example, his Table 7 reveals that the median income in cities of 500,000 and over was \$467 more than in cities of 10,000 to 24,999, after adjustment had been made for regional location and the isolated-neighboring city composition. Does this mean that persons with the same tastes and productive capacities would earn \$467 more in cities of 500,000 and over than in the smaller cities?

The available data allow a partial answer. In most of my material,

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I do not use exactly the same city-size classifications used by Mansfield. This somewhat unsatisfactory procedure has been adopted because some of the estimates were calculated a year or more ago, while others are based on *Characteristics by Size of Place*,<sup>1</sup> which uses a still different city-size grouping.

In the United States, a man's income depends in part on the color of his skin, and if he is white, on whether he was born in the United States.<sup>2</sup> Mansfield did not attempt to determine whether the various city-size groups differ in the proportion of white to nonwhite in

TABLE 1

Total Nonwhite and Foreign-Born White as Percentage of Total Population, by 1950 City Size, Seven Classes, and Census Region

CITY SIZE	UNITED STATES		SOUTH		NORTH EAST		NORTH CENTRAL		WEST	
	<i>Foreign</i>		<i>Foreign</i>		<i>Foreign</i>		<i>Foreign</i>		<i>Foreign</i>	
	<i>Non- white</i>	<i>Born white</i>								
Outside urbanized areas:										
2,500-10,000	8.5	3.9	19.6	1.3	1.6	8.4	1.3	3.7	0.8	5.6
10,000-25,000	8.8	4.5	20.8	1.6	2.5	9.5	2.6	3.4	1.5	6.2
25,000 and over	9.2	5.2	21.6	2.0	2.0	11.0	3.4	4.5	2.2	6.2
In urbanized areas:										
Under 250,000	10.0	6.6	22.6	2.5	2.9	12.3	4.3	5.1	2.7	7.7
250,000-1,000,000	11.4	6.2	21.4	2.7	2.8	12.6	7.8	5.9	2.8	7.8
1,000,000-3,000,000	12.4	10.7	22.2	4.8	9.1	12.1	12.8	11.4	6.8	11.1
3,000,000 and over	8.9	16.4	a	a	8.0	19.7	11.8	13.3	5.4	10.3

<sup>a</sup> No city of this size.

Source: *Census of Population, 1950*, Bureau of the Census, Special Report P-E, No. 5A.

their populations. My Table 1 shows what percentage of the total population is nonwhite or foreign-born white in the United States and in four regions by city size.

In the United States as a whole, the proportion of nonwhite in the population rises gradually as the city size increases up to the next to the largest city-size group. The proportion in the largest, and in the smallest, is about the same. However, the proportion of foreign-born increases as city size increases. In the South, the proportions of nonwhites and foreign-born whites differ little from one city size to another. But in the North Central states, larger cities have proportionately many more nonwhites and foreign-born whites

<sup>1</sup> *Census of Population, 1950*, Bureau of the Census, Special Report P-E, No. 5A.

<sup>2</sup> In 1935-1936 the median income of native white nonrelief families in cities over 1,500,000 in population was \$1,960; the median for foreign-born white non-relief families was \$1,535. The median for Negro families was \$1,150 (*Consumer Incomes in the United States*, National Resources Committee, 1938, Table 22B).

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than smaller cities. Thus, one would expect that the income differences by city size found by Mansfield for the North Central states would be smaller than the differences one could find for native-born whites, if such data were available.

The failure to take account of the small difference in the distribution of whites and nonwhites had little effect for the United States as a whole. As Table 2 shows, the differentials by city size for white males and for all males are approximately the same.

TABLE 2

1949 Median Incomes of Males, Total and White, by 1950 City Size, Four Classes

City Size	All Males		White Males	
	(index)		(index)	
Outside urbanized areas:				
2,500-10,000	\$2,354	100	\$2,480	100
10,000-25,000	2,484	106	2,610	105
25,000 and over	2,554	108	2,680	108
In urbanized areas:				
Under 250,000	2,692	114	2,830	114
250,000-1,000,000	2,779	118	2,950	119
1,000,000-3,000,000	3,026	128	3,170	128
3,000,000 and over	3,078	131	3,180	128

Source: *Census of Population, 1950*, Bureau of the Census, Special Report P-E, No. 5A, Table 4, and p. 5a-11.

Table 3 indicates another set of factors that influence the income and city-size pattern—the age factors. Two aspects of the age and income relationships are shown for four city sizes. These data indi-

TABLE 3

1949 Median Incomes of Persons Fourteen and Over with Income, by Age and 1950 City Size, Four Classes

AGE	CITY SIZE							
	Outside Urbanized Areas				In Urbanized Areas			
	2,500-10,000		10,000-25,000		Under 250,000		1,000,000-3,000,000	
	% of Median Persons	Income	% of Median Persons	Income	% of Median Persons	Income	% of Median Persons	Income
14-24	17.3	\$1,075	18.0	\$1,155	15.9	\$1,335	14.0	\$1,585
25-44	44.1	2,800	44.2	2,915	45.8	3,060	46.7	3,295
45-64	27.5	2,670	27.6	2,870	29.3	3,085	31.3	3,370
65 and over	11.1	1,080	10.1	1,280	9.0	1,450	10.6	1,830
14 and over	100.0	2,354	99.9	2,484	100.0	2,697	99.9	3,026

Source: *Census of Population, 1950*, Bureau of the Census, Special Report P-E, No. 5A, Table 4, and p. 5a-11.

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cate that part of the difference in median incomes by city size results from differences in the distribution of income receivers by age. The smaller cities have a larger concentration in the combined younger and older age groups, groups that have lower incomes. These cities also have relatively lower earnings in the age groups at the extremes of the age distributions, and have maximum income at an earlier age. There is much smaller differential in income at the twenty-five to forty-four year group than at any other age or for the cities as a whole.

In Table 4, I have attempted to measure the influence of the occupational distribution upon the level of income of all males by assum-

TABLE 4

Distribution of Males by 1950 City Size, Five Classes, and by Occupation, Money Value, 1949 Median Income, Color, and Schooling

	CITY SIZE				
	Outside Urbanized Areas		In Urbanized Areas		
	2,500- 10,000	15,000- 25,000	250,000- 1,000,000	1,000,000- 3,000,000	3,000,000 and Over
Occupation, per cent					
Professional	7.8	8.3	9.2	10.3	10.7
Farmers	1.6	0.8	0.2	0.1	0.2
Managers	12.9	12.9	12.6	11.5	14.2
Clerical	5.6	6.4	9.0	9.6	10.0
Sales	7.4	8.1	8.5	7.9	8.3
Craftsmen	21.2	21.1	21.8	21.9	20.2
Operatives	23.8	23.4	21.3	21.5	20.0
Household	0.2	0.2	0.2	0.2	0.2
Service	6.3	7.0	7.6	7.7	8.6
Farm laborers	2.3	1.4	0.3	0.2	0.2
Laborers	9.7	9.2	8.3	8.2	6.5
Not reported	1.1	1.0	1.0	0.9	0.8
Money value, dollars *	2,884	2,920	2,979	2,983	3,024
Median income, dollars	2,268	2,484	2,779	3,026	3,078
Nonwhite, per cent	8.9	7.5	10.3	12.0	7.8
Schooling, years	9.1	9.6	10.2	10.3	10.2

\* For explanation of money value of occupational distribution, see text.

Source: *Census of Population, 1950*, Bureau of the Census, Tables B, C, 4, and 4a; and *Detailed Characteristics, U.S. Summary*, Bull. P-C1, Table 129 (for median incomes by occupation).

ing that the median income for each occupational group is the same as the median for the United States as a whole. The "money value" of the occupational distribution of cities of 2,500 to 10,000 was \$2,884, while that of cities of 1,000,000 to 3,000,000 was \$2,983—a difference of \$99. If the same method is applied to the occupational

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distribution of males of twenty-five to forty-four years, the resulting differentials are approximately the same. The data are consistent with the much larger differences in median incomes, because either or both (1) earnings in each occupation are lower in smaller cities than in larger, or (2) because the occupational groups used are so broad that they cover up significant within group income variations.

It is unfortunate that Mansfield relied exclusively upon income data for families and unrelated individuals. Family data tend to be much more comparable from city to city, and it is probable that the standard deviation of median incomes would have been substantially lower for the family incomes than for those of families and individuals. For example, for sixty-eight cities of 10,000 to 15,000 in the East North Central states, the standard deviation of the city median incomes for families and unrelated individuals was \$624 and for families was \$412. The coefficients of variation were 23 and 13 per cent respectively.

TABLE 5

1949 Median Incomes For Families and Unrelated Individuals, and for Families,  
Three Census Regions

(dollars)

CITY SIZE	MIDDLE ATLANTIC		EAST NORTH CENTRAL		PACIFIC	
	<i>Family and Unrelated Individuals</i>	<i>Family</i>	<i>Family and Unrelated Individuals</i>	<i>Family</i>	<i>Family and Unrelated Individuals</i>	<i>Family</i>
10,000- 15,000	2,817	3,292	2,693	3,250	3,071	3,558
15,000- 25,000	2,648	3,201	2,858	3,334	3,197	3,783
25,000- 50,000	2,836	3,331	2,929	3,476	2,977	3,555
50,000-150,000	2,965	3,382	3,175	3,615	2,933	3,447
150,000-300,000	2,988	3,401	3,354	3,744	3,191	3,750
300,000-500,000	3,244	3,745	3,348	3,796	2,805	3,565
500,000 and over	3,170	3,534	3,350	3,809	3,174	3,811

Note: For urban places of 25,000 to 50,000, Mansfield derived different estimates for families and unrelated individuals for the Middle Atlantic states (\$2,782) and East North Central (\$2,844). In my analysis I used the concept of urbanized areas for deciding if a given town or city was a satellite, while Mansfield used the standard metropolitan area for the same purpose.

Source: *Census of Population, 1950*, Bureau of the Census, P-B Series.

In defense of Mansfield's choice of a statistic, it should be pointed out that the Bureau of the Census did not publish family income data for cities under 10,000. Furthermore, the effect on income differences by city size was quite small (Table 5 presents data for the East North Central, Middle Atlantic, and Pacific states). Though it is true that the mean differences are quite comparable, the differences in the standard deviations would have affected his statements

on the statistical significance of differences in incomes by city size.

I would like now to turn to the question of regional differences in income, especially the question of North-South income comparisons. From his data, Mansfield concludes that there exists a substantial difference between incomes in the South and in other regions of the nation, based on differences between the highest-income and lowest-income regions equal to 40 to 60 per cent of the income level of the lowest-income region. Most of this difference is due to two factors—the larger proportion of nonwhites in the South than in the non-south and the higher earnings of nonwhites in the non-South than in the South.

I have argued elsewhere that the family incomes of White urban families in the South are approximately the same, for each city size, as in the rest of the country. My use of the word “approximately” or the phrase “nearly the same” were not so precise as they might have been. Since there is some net migration of whites out of the South, it is reasonable to expect that white incomes in the South would be somewhat below those in the areas gaining population, primarily the Pacific states and the East North Central region. What I meant to imply, but failed to say specifically, was that white nonfarm families living in the South were not more than 3 to 5 per cent below those of the rest of the country. Data were presented which indicated that in 1946 the white urban median family income for the United States, after adjustment for community size, was \$3,116; for the South, it was \$3,009, and for the Northeast, \$3,159.<sup>3</sup>

Table 6 presents estimates of white family incomes for the South and for all families in the rest of the country. The medians for white families in the non-South are less than 2 per cent greater than for all non-South families. This would probably be true also of the medians for white families, if such data were available, for cities of 10,000 to 300,000 in size. For the largest city size, the white family median would probably be 2 to 3 per cent above the median for all families; for the 300,000 to 500,000 cities, 1 to 2 per cent. Table 6 is almost, though not quite, consistent with the statement that southern white urban families have incomes only 3 to 5 per cent less than in the rest of the country. Of the seven instances, two would fall within this range, one would exhibit a smaller differential, while four reflect a larger differential.

Family income data have not been published for cities of 2,500 to 10,000, nor any data for white family and unrelated individuals.

<sup>3</sup> D. Gale Johnson, “Some Effects of Region, Community Size, Color and Occupation on Family and Individual Income,” in *Studies in Income and Wealth, Volume Fifteen*, National Bureau of Economic Research, 1952, p. 56.

**TABLE 6**  
**1949 Median Family Incomes by 1950 City Size, All in Non-South  
 and White in South**

<i>City Size</i>	<i>South</i> <sup>a</sup>	<i>Non-South</i>	<i>South as Percentage of Non-South</i>
10,000- 15,000	\$2,885	\$3,267	88.4
15,000- 25,000	3,172	3,319	94.8
25,000- 50,000	3,191	3,406	94.7
50,000-150,000	3,491	3,450	101.2
150,000-300,000	3,461	3,564	97.1
300,000-500,000	3,489	3,663	95.2
500,000 and over	3,719	3,663	101.5

<sup>a</sup> Published data do not allow estimates of white family incomes by cities. These estimates were made by subtracting median income of families and unrelated individuals from median income for families and adding the difference to the median incomes of white families and unrelated individuals. This procedure was used because unpublished data on twenty-one cities of over 10,000 population in seven southern states indicated that the difference between the median incomes of white families and white families and unrelated individuals was \$435, while the difference for all families and all families and unrelated individuals was \$428.

Source: Based on *Census of Population, 1950*, Bureau of the Census, *General Characteristics*, P-B Series.

On the basis of data from a sample of about twenty counties in each of seven southern states, data for white families, and white families and unrelated individuals, have been estimated. These medians are presented in Table 7, along with data on all family and unrelated individuals for other census regions and certain midwestern states that are about as rural as the South. Except for Arkansas, the incomes in the South compare very favorably with those in the West North Central states and New England.

The comparison with the West North Central states is quite valuable. Except for Missouri, the West North Central states include states with relatively prosperous farm areas. The median levels of incomes of white rural farm families and unrelated individuals in the West North Central states is 50 per cent higher, on the average, than in the southern states. Yet the level of urban incomes is as high or higher in the South than in the West North Central states. My final table compares the white family incomes in three southern regions with all family (but almost all white) incomes in the West North Central states and, in addition, the Mountain states. The Mountain states are about as dependent on agriculture as the southern states, and the distribution of population among cities of various sizes is quite similar to that in these two regions with relatively high farm incomes, whose incomes are quite similar to those in the South.

TABLE 7

1949 Median Incomes in Cities of 2,500 to 10,000 for White Families and White Families and Unrelated Individuals in the South and All Families and Unrelated Individuals in Other Areas

<i>Region or State</i>	<i>Number of Cities</i>	<i>Families</i>	<i>Families and Unrelated Individuals</i>
North Carolina	10	\$2,975	\$2,684
Mississippi	14	2,781	2,403
Kentucky	10	2,664	2,405
Tennessee	13	2,631	2,404
Georgia	8	2,842	2,592
South Carolina	24	3,023	2,784
Arkansas	12	2,140	1,879
New England	123		2,580
Middle Atlantic	347		2,826
East North Central	443		2,765
West North Central	278		2,415
Mountain	168		2,792
Pacific	195		2,946
Iowa	66		2,450
Nebraska	30		2,486
Minnesota	57		2,676
Wisconsin	71		2,731

Source: *Census of Population, 1950, General Characteristics* (state reports) Bureau of the Census, and unpublished data.

TABLE 8

1949 Median Family Incomes by 1950 City Size for Five Census Regions, White Families in the South and All Families in Other Regions

(dollars)

<i>City Size</i>	<i>South Atlantic</i>	<i>East South Central</i>	<i>West South Central</i>	<i>West North Central</i>	<i>Mountain</i>
10,000- 15,000	3,101	2,714	2,730	3,044	3,249
15,000- 25,000	3,281	3,039	3,130	3,105	3,472
25,000- 50,000	3,231	3,024	3,258	3,321	3,519
50,000-150,000	3,459	3,397	3,588	3,381	3,336
150,000-300,000	3,503	3,266	3,555	3,614	3,330
300,000-500,000	3,524	3,668	3,186	3,441	3,472
500,000 and over	3,732	n.a.	3,711	3,558	n.a.

n.a. = not applicable.

Note: For source and methods, see Table 6.

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D. Gale Johnson has emphasized the value of comparing family incomes rather than the incomes of families and unrelated individuals in different cities. I wish to repeat this emphasis. For some

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comparisons by city size, only the incomes of families and unrelated individuals combined are available, but these have serious limitations, and the smaller the city the more serious is likely to be the limitation. The shortcomings of such incomes are especially great when one compares the incomes of white and nonwhite consumer units. Data on family incomes by race would contribute to an understanding of the factors causing differences in income by city size within the South.

Some of Johnson's comparisons assumed relatively little difference between the incomes of white and nonwhite consumer units in northern cities—at least a difference appreciably less than that in the southern cities. Income data to test this supposition are very limited. It would be advisable to have data on the incomes of families, and of families and unrelated individuals, in at least a few of the standard metropolitan areas of the North, places like Chicago and Detroit that have a relatively large nonwhite population.

In examining the income structure of places differing in size, the region as well as the occupation should be controlled. Also, occupational incomes should be shown for the male labor force. Many factors, including the birth rate, affect the labor force participation of females. Comparisons also should not be limited to broad occupational groups if they are as heterogeneous as the professional group. The median incomes of the subgroups of professionals vary widely in the various cities. The subgroups may even represent quite different mixtures of occupations in the sense of skills priced differently in a perfectly functioning market.

Intensive use of the income data already reported in the 1950 census of population, if region and city size are controlled, should contribute to an understanding of the income structure of the country as a whole. Does the income difference by city size represent a difference in the cost of living or in the importance of various occupations that command different incomes? Or does it represent an economic opportunity to those who are willing to migrate? If the income difference can be explained by the occupational structure of the various places, then greater equality of income must come through mobility among occupations as well as among places.

### REPLY BY THE AUTHOR

Both D. Gale Johnson and Margaret G. Reid believe that it would have been preferable to use family income data rather than income data for families and unrelated individuals. However, they recognize that the latter data had to be used if cities under 10,000 were to be included. Of course, differences in the number of families per

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unrelated individual may result in differences between cities in the median income of families and unrelated individuals. But the use of family income data has the disadvantage that many income recipients are omitted.

For present purposes, the important question is whether or not the findings would have been greatly altered if family income data had been used. Johnson admits that the income differences by city size would be much the same. Data presented elsewhere suggest that regional income differences among cities of comparable size would be no smaller if family income data had been used.<sup>1</sup> Apparently, the most important question revolves about the dispersion of median incomes among cities of comparable size.

Johnson is quite right in believing that this dispersion would have been less if family income had been used. Within particular census regions, it may decrease substantially. For the nation as a whole, the decrease does not seem so great:

1950 CITY SIZE AND REGION	STANDARD DEVIATION OF 1949 MEDIAN INCOME		Ratio of (2) to (1) (3)
	<i>Families and Unrelated Individuals</i> (1)	<i>Families</i> (2)	
10,000-24,999			
New England	\$300	\$280	0.93
Middle Atlantic	417	281	0.67
West North Central	479	374	0.78
East South Central	435	352	0.81
Mountain	603	464	0.77
Pacific	566	395	0.70
25,000-49,999			
United States	593	492	0.83
250,000-499,999			
United States	370	355	0.96

Source: *Census of Population, 1950*, Bureau of the Census.

But despite this decrease, the dispersion of income among cities of comparable size is still quite large relative to the differences by city size. On the basis of the previous table, it seems reasonable to assume that the standard deviation of median family incomes is the following percentage of the standard deviation of median consumer unit incomes: cities of 50,000 and over, 95 per cent; cities of 10,000 to 49,999, 85 per cent; cities under 10,000, 75 per cent. Using this approximation and assuming that the income differences by city size

<sup>1</sup> See Edwin Mansfield, "Community Size, Region, Labor Force, and Income, 1950," *Review of Economics and Statistics*, November 1955, Table 2.

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would remain the same for family income as for consumer unit income, one can estimate probabilities such as those shown in my Table 5 above for family income.<sup>2</sup> The results indicate that the dispersion of median family income is still large relative to the differences by city size. For example, the chances still are about 1 in 3 that the 1949 median income in a randomly chosen city under 5,000 will be higher than in a standard metropolitan area of 100,000 to 250,000:<sup>3</sup>

1950 SIZE OF SMALLER CITY	1950 SIZE OF LARGER CITY							
	Standard Metropolitan Areas				Urban Places <sup>a</sup>			
	500,000 and Over	250,000- 499,999	100,000- 249,999	50,000- 99,999	25,000- 49,999	10,000- 24,999	5,000- 9,999	
Standard metropolitan areas:								
250,000-499,999	0.63							
100,000-249,999	0.73	0.62						
50,000- 99,999	0.66	0.54	0.43					
Urban places outside stand- ard metropolitan areas:								
25,000- 49,999	0.79	0.69	0.57	0.63				
10,000- 24,999	0.79	0.69	0.58	0.64	0.51			
5,000- 9,999	0.88	0.80	0.68	0.74	0.61	0.60		
2,500- 4,999	0.85	0.76	0.66	0.71	0.58	0.58	0.48	

<sup>a</sup> Outside standard metropolitan areas.

Source: *Census of Population, 1950*, Bureau of the Census.

<sup>2</sup> The approximation is again based on the assumption of normality.

<sup>3</sup> It should be noted that the analysis above pertains to the nation as a whole. For particular census regions, it is possible that the decrease in dispersion would have a greater effect upon the results.

