OCCUPATIONAL EARNINGS BEHAVIOR AND THE INEQUALITY OF EARNINGS BY SEX AND RACE IN THE UNITED STATES*

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This paper examines differences in earnings by occupations, and within occupations by sex and by race, on the basis of the 1/100 Public Use Samples of the 1960 and 1970 U.S. Population Censuses. It employs interval analysis to establish 32 categories of occupations with similar characteristics. Little relation was found between mean earnings of occupational groups and the degree of earnings inequality within them. When the figures are examined by sex, it was found that men, on average, earned over twice as much as women in both years, but women's earnings were more unequally distributed (as measured by the Gini coefficient). Women are concentrated in the traditional "female" occupations, which tend to be those at the bottom of the earnings scale, and men have a monopoly of the higher paid occupations. But mean earnings for men exceeded those for women in all occupational groups except one, even in the primarily female occupations. Standardizing first for occupational distribution and then for earnings by occupation, it was found that earnings differences between males and females within occupation had a greater impact on the overall male–female earnings ratio than did differences in occupational distribution by sex. In contrast, when the figures are examined by race, the change in occupational distribution (primarily the movement of blacks out of farming and of blacks and Spanish speakers out of personal services) was the major factor. There was also a considerable degree of earnings inequality within demographic groups. The degree of inequality was in the main reduced when the demographic groups were subdivided into occupations, but it was still substantial. Additional factors like time worked, schooling, and experience must be taken into consideration in understanding this phenomenon.

I. INTRODUCTION

Attention has recently focused on occupational selection and exclusion and differences in occupational compensation as a major determinant of differentials in earnings between social groups in the United States. In 1958, F. G. Adams, using the 1950–53 University of Michigan Survey of Consumer Finances, found that a five category breakdown of occupation into managerial and professional, clerical and sales, skilled, semi-skilled, and unskilled and service resulted in significant coefficients for each of the categories in explaining individual earnings [1]. In 1960 Lee Soltow looked at changes in the coefficients of concentration brought about by shifts in the occupational distribution and shifts in the educational distribution between 1900 and 1956 for employed male civilians and discovered that the former effect was of greater importance than the latter [10].

More recently, Harriet Zellner found that 50 percent of employed women in 1960 were concentrated in occupations where they represented 80 percent or more of total employment [14]. Francine Blau Weisskoff discovered a similar concentration of women by occupation in 1969 and argued that an abundance of supply relative to demand in female occupations tended to bring down female earnings [11]. Malkiel and Malkiel found that among 272 professional employees of a single corporation women received less pay than men with similar credentials [8]. Fuchs showed that the ratio in hourly earnings between white males and females, adjusted for differences in age and schooling, increased slightly between 1959 and 1969 [4]. Moreover, constructing a segregation index, Fuchs calculated that the level of sex segregation in professional occupations declined somewhat between 1950 and 1970 and that about half of this decline was due to decreasing segregation within occupations and about half from the relatively faster growth of the less segregated occupations.[1]

Using 1960 Census data, Jack Gibbs found significant differences in the occupational distribution of whites and blacks in every state in the country [6]. Barbara Bergman argued that discrimination concentrates blacks into certain occupations and excludes them from others, resulting in lower pay for blacks because of their large supply relative to demand in those occupations [2]. Richard Freeman found that the percentage of non-whites working as managers rose from 7 to 13 between 1960 and 1970, while the percentage of whites employed in a managerial capacity rose from 19 to only 22 [3]. Finis Welch discovered a significant narrowing of the earnings differential between whites and blacks between 1959 and 1966 and attributed it to a tightening of the labor market [12]. Haworth, Gwartney and Haworth calculated that about half the rise in the non-white to white median earnings ratio between 1959 and 1969 was due to the exiting from the labor force of lower paid older blacks and the entrance of higher paid younger blacks, and about half was due to an improvement in black productivity factors [7].

Two main factors have been cited in the literature in analyzing the differential in earnings between males and females and between whites and blacks. The first, which we shall call "occupational differentiation", attributes part of the differential to differences in the occupational distributions of the respective groups, and the second, which we shall call "occupational earnings inequality", ascribes the rest to differences in mean earnings between the respective groups within occupations. Using data from the 1960 and 1970 Census Public Use Sample, we shall quantify the importance of each of these two factors in the determination of the overall earnings differential by sex and race, and consider this in relation to the degree of earnings inequality by demographic and occupational group.[2]

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[1]See [5]. Fuchs included nurses and elementary school teachers among professionals. Though the Census Bureau classified them as such, nurses and elementary school teachers both rank low in the ordering of occupations by mean earnings, casting some doubt on the wisdom of their inclusion in this class and the meaningfulness of Fuch's results. See Section 3 below.

[2]Though respondents recorded earnings for years 1959 and 1969 respectively, occupations were recorded for years 1960 and 1970, and we shall consistently refer to years 1960 and 1970 in the results.

II. CATEGORY CONSTRUCTION

In order to analyze earnings behavior by social and occupational group, it was first necessary to construct the groups. For a naturally dichotomous variable like sex, no problem arose, but for multi-category variables like race and occupation it was necessary to solve the problem of how to combine the categories to simplify the analysis without distorting the results by introducing an "aggregation bias". The technique we employed is called "interval analysis" and was originally developed by Nancy and Richard Ruggles for matching micro data sets [9]. The procedure is to combine those categories of a variable which have conditional distributions of other variables that are similar. Since the variable of interest in this study was earnings, groups were formed by combining categories of a variable with similar distributions of earnings. A correlation coefficient was used to measure the closeness of the distributions, and categories were merged into a group if and only if the correlation between the earnings distributions of each pair of categories exceeded a pre-specified correlation level.[3]

In the case of race, different correlation levels were tried until the categories of the variable bifurcated into two groups.[4] The resulting groups consisted of (non-Spanish) whites, Japanese, and Chinese on the one hand, and blacks, Spanish-Americans (Puerto Ricans and Mexican-Americans), Filipinos and others, on the other hand.[5] In the case of occupation, the technique was modified, because the variable has 296 raw categories in the 1960 Public Use Sample, making the computer cost of forming all possible groupings prohibitive. An iterative procedure was thus adopted, with only what appeared to be, *prima facie*, similar occupations compared, like engineers and physics professors. Three passes were made at correlation level 0.80, and the 296 occupations "collapsed", successively, into 113, 64 and 32 groups.[6] The final groupings are shown in Appendix 1.[7]

III. RESULTS

A. *Occupational Statistics*

Table 1 presents statistics on the distribution of earnings by occupation for

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[3]See [13], section 2, for a fuller discussion of this technique.

[4]The 1960 Census 1/100 Public Use Sample stratified on race was used, with wage earnings divided into 26 size classes in intervals of $1,000 up to $24,999 and $25,000 and above.

[5]The variable "race" as used in the Census Public Use Sample seems to refer more to cultural differences than to ethnological differences. For this reason, Spanish-Americans were included in the list of racial categories.

[6]The 1960 Census 1/100 Public Use Sample, stratified on occupation with approximately 200 observations for each occupation, was used for this classification procedure.

[7]New occupational categories were added in the 1970 Public Use Sample, and each of these (indicated by an asterisk in Appendix 1) was placed in the occupational group whose aggregated earnings distribution was most highly correlated with its earnings distribution.

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TABLE 1

EARNINGS STATISTICS BY OCCUPATION

	1960				1970		
	Percent Distribution	Mean Income	Gini Coefficient	Rank	Percent Distribution	Mean Income	Gini Coefficient
1 Medical Doctors	0.25	$10,383	0.5349	2	0.24	$17,659	0.4744
2 Air Pilots	0.04	10,255	0.3614	1	0.05	18,735	0.3179
3 Deans, Lawyers, Judges	0.13	9,326	0.4570	3	0.17	15,396	0.3983
4 Professors, Engineers	1.49	7,952	0.2622	6	2.64	11,894	0.2855
5 Brokers, Advertising men	0.09	7,540	0.3939	5	0.21	12,583	0.4562
6 Government officials	5.43	7,222	0.3672	7	6.99	11,385	0.3794
7 Architects	0.12	6,985	0.3014	4	0.46	13,400	0.3047
8 Railway conductors	0.19	6,962	0.1453	8	0.04	10,009	0.2020
9 Engravers, Toolmakers	2.65	6,366	0.2256	9	2.47	9,554	0.2296
10 Writers, Accountants	1.32	5,877	0.2871	10	3.12	9,505	0.3530
11 Agents, Telegraphers	1.87	5,300	0.2915	15	1.70	7,675	0.3297
12 High school teachers	1.92	5,279	0.3007	16	2.80	7,222	0.3555
13 Millers	0.29	5,227	0.2198	11	0.26	8,327	0.2355
14 Plumbers, Skilled labor	4.09	5,108	0.2295	13	0.84	7,944	0.2667
15 Motormen, Welders	1.45	4,896	0.2267	17	1.81	6,876	0.2767
16 Police, Firemen	0.94	4,763	0.2151	14	0.87	7,937	0.2604
17 Mechanics, Craftsmen	4.95	4,226	0.2654	18	5.20	6,771	0.3026
18 Technicians	1.29	4,173	0.3773	19	1.80	6,663	0.3796
19 Farmers	0.61	3,847	0.6691	12	0.82	7,955	0.5048
20 Elementary teachers	2.26	3,780	0.3425	20	2.26	5,514	0.4030
21 Apprentices, Operatives	11.58	3,638	0.3421	24	8.08	5,003	0.3525
22 Tailors, Painters	0.93	3,466	0.3592	23	0.84	4,998	0.4279
23 Barbers, Bartenders	0.79	3,371	0.3374	26	1.31	4,386	0.4160
24 Apprentices, Drivers	6.16	3,249	0.4001	22	5.27	5,228	0.3795
25 Clerks, Secretaries	8.31	3,234	0.2946	25	8.91	4,563	0.3385
26 Textile workers	0.22	3,079	0.2410	28	0.59	3,992	0.2880
27 Typists, Cashiers, Newsboys	18.83	2,831	0.5045	30	13.29	3,615	0.5162
28 Entertainers	0.49	2,740	0.5714	29	0.50	3,712	0.6272
29 Nurses	1.03	2,610	0.3882	21	1.37	5,278	0.3699
30 Armed forces	0.07	2,089	0.4458	27	0.14	4,203	0.4200
31 Milliners	1.20	1,988	0.3245	31	1.34	2,976	0.3276
32 Personal services	19.12	1,641	0.5212	32	19.72	2,668	0.5227
All	100.00	3,628	0.4504	—	100.00	5,649	0.4573

1960 and 1970.[8] The occupational groups are ordered by 1960 mean earnings, with the 1970 rank shown in column four. Generally, professionals and government officials ranked highest, followed by skilled labor and police and firemen, farmers and semi-skilled operatives, clerical workers, armed forces personnel, and personal service workers and unskilled labor. The "earnings ladder" was stable between the two periods, with a rank correlation of 0.96 between the 1960 and 1970 orderings.

Employment was distributed unevenly over the earnings ladder, reflecting both the technique by which the occupational groups were created and the distribution of the labor force over the raw occupational categories. Personal service workers accounted for almost 20 percent of the labor force; typists, cashiers, and newsboys almost another 20 percent; apprentices and operatives approximately 12 percent; and clerks, tellers, and secretaries over 8 percent. Together these groups made up 58 percent of the 1960 and 50 percent of the 1970 work force. Between 1960 and 1970 the occupational distribution shifted towards occupational groups with higher mean earnings. Occupations 4, 6, 10, 12 and 18 all rose as a percent of the labor force while occupations 21 and 27 declined. In 1960, 21 occupations had mean earnings exceeding the national average of $3,628, and in 1970, 20 occupations exceeded the national average of $5,649. The distribution was thus generally thinner on the portion of the occupational ladder above the mean than on the part below it.

Inequality in earnings by occupational group was generally less than the overall level of earnings inequality, reflecting in part the technique of category construction, where low-earnings occupations were kept separate from high-earnings ones. In 1960 Gini coefficients ranged from 0.1453 to 0.6691, the median coefficient was 0.3509, and only 6 occupational groups had a Gini coefficient exceeding the national figure of 0.4504. In 1970, the range was 0.2020 to 0.6272, the median was 0.3542, and only 5 occupations exceeded the national figure of 0.4573. A slight upward shift was evident in occupational inequality between 1960 and 1970, with Gini coefficients rising in 25 occupations and falling in 7, though the net changes were, in the main, small. The rank correlation between mean earnings and the Gini coefficient by occupational group was 0.24 in 1960 and 0.34 in 1970, indicating little systematic relation between level of earnings and the degree of earnings inequality.[9]

[8] 1960 computations were made using the 1960 1/100 Public Use Sample stratified on occupation, with a sample size of 41,349, and 1970 computations were made using the 1970 1/100 Public Use Sample stratified on occupation, with a sample size of 63,661.
"Earnings" refer to wages, salaries, commissions, bonuses and tips. In 1960 earnings were recorded in $100 intervals up to $9,999; $1,000 intervals up to $24,999; $25,000 or more. The midpoint of each wage class except the last was used to compute the mean. For the last interval, the Pareto equation

$$\text{Log } N = K - A \log x$$

was estimated for income recipients above the median, where x is the size of the individual's income and N the number of income recipients above income x. $\hat{K} = 13.5141$, $\hat{A} = -2.7836$, $R^2 = .9916$, and the estimated average income of the last income class was $38,807. In 1970, there were 501 intervals: $100 intervals up to $49,999; $50,000 and above. The Pareto equation was estimated for 1970, with the result that $\hat{K} = 14.7710$, $\hat{A} = -2.9393$, $R^2 = 0.9944$, and the estimated average income of the last income class was $71,376.

[9] A strong correlation did, however, exist between annual earnings and hours worked per year by occupation. Adjusting for this, average hourly "wage rates" showed a much smaller dispersion than annual earnings. See [13] for more detail.

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B. Sex and Race Statistics

Table 2 gives statistics on earnings by sex and race.[10] Though slightly outnumbered in the population, 1.74 times as many men as women were employed in 1960 and 1.43 times as many in 1970. Men earned on average over twice as much annual income as women in the two periods, and accounted for 80 percent of total earnings in 1960 and 75 percent in 1970. Measured by the Gini coefficient, earnings were more unequally distributed among women than among men, though the gap narrowed somewhat between the two periods.

The number of blacks and Hispanic–Americans rose from 12 to 15 percent of the population between 1960 and 1970, mainly due to the large migration of Puerto Ricans to the mainland. The percent of black and Spanish wage recipients was almost exactly equal to their population share in both years. The ratio of annual earnings of whites to blacks and Spanish was quite high in 1960, at 1.75, but declined substantially by 1970, to 1.41. For blacks alone the ratio fell from 1.85 to 1.45, and for Hispanic–Americans alone it declined from 1.30 to 1.25. Moreover, in 1960 the degree of earnings inequality was almost exactly the same for the two groups, but by 1970 blacks and Spanish had less inequality than did whites.[11]

C. Occupational and Demographic Statistics

Statistics on the distribution of male and female employment and their relative earnings and the distribution of white and black and Spanish employment and their relative earnings were computed for each occupation in 1960 and 1970 (see Appendices 2 and 3). Though 64 percent of those unemployed in 1960 were males and 36 percent females, men made up at least 80 percent of 16 of the 17 highest-paying occupational groups and women at least 45 percent of 7 of the 8 lowest-paying occupational groups. In fact, of the traditional "female occupations", 83 percent of elementary school teachers and librarians, 77 percent of clerks and secretaries, 62 percent of typists and cashiers, 98 percent of nurses, and 94 percent of milliners were women. Between 1960 and 1970, the percentage of women in the labor force rose to 41, and this increase was spread, in general, proportionately over the occupational earnings ladder.

Mean earnings for men exceeded those for women in all occupational groups except one in 1960 and 1970. Even in the primarily female occupations, men averaged substantially more income than women. Though the overall difference

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[10]The 1960 and 1970 1/10,000 Public Use Sample, with sample sizes of 6,762 and 8,555 respectively, were used to compute the results in this section.

[11]The ratio of average hourly wage rates (computed by dividing annual earnings by hours worked per year) was considerably less than the ratio of mean annual earnings between men and women and slightly less than that between whites and blacks and Spanish.

Ratio of Average Hourly Earnings

	1960	1970
Males/Females	1.604	1.532
Whites/Blacks and Spanish	1.607	1.349

See [13] for greater detail.

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TABLE 2

EARNINGS STATISTICS BY SOCIAL GROUP

	1960				1970			
Variable	Percent of Wage Earners	Mean Earnings	Gini Coefficient	Ratio of Mean Earnings	Percent of Wage Earners	Mean Earnings	Gini Coefficient	Ratio of Mean Earnings
A. *Sex*								
(1) Females	36.50	$2,009	0.4515	—	41.20	$3,382	0.4430	—
(2) Males	63.50	4,565	0.3954	2.2726	58.80	7,236	0.4059	2.1391
B. *Race*								
(1) Blacks, Spanish	12.05	2,193	0.4403	—	15.06	4,200	0.4369	—
(2) Whites	87.95	3,830	0.4427	1.7462	84.94	5,905	0.4554	1.4059
All	100.00	3,628	0.4504	—	100.00	5,649	0.4573	—

in earnings between men and women fell slightly between 1960 and 1970, the ratio of mean earnings rose in almost two thirds of the occupational groups. Despite this, the ratio in mean earnings between males and females fell short of the overall ratio in all but four occupational groups in 1960 and six in 1970. Thus, the concentration of women in the lower-paying occupations and the higher earnings of men in almost all occupations both contributed to the overall male-female ratio of earnings, in the two periods. To assess the relative impact of each factor, we calculated ratios standardized for each factor in turn. First, standardizing for occupational distribution, we calculated the aggregate ratio of mean earnings that would result if the occupational distribution of both sexes were the same and equal to the overall occupational distribution (row 1 of Tables 3A and 3B); the remaining difference is attributable to male–female differences within occupation. Second, standardizing for differences within occupation, we calculated the aggregate ratio of mean earnings that would result if mean earnings by occupation were the same for both sexes and equal to the overall occupational means (column 1 of Tables 3A and 3B). This gives the difference attributable to differences in occupational distribution. Standardized for occupational distribution, the overall ratio of mean earnings was 1.87 in 1960, or 69 percent (0.87/1.27) of the actual level, and 1.86 in 1970, or 75 percent of the actual level. Standardized for earnings by occupation, the overall ratio was 1.36 in 1960, or 28 percent of the actual level. Thus, earnings differences between males and females within occupation had a more sizable impact on the overall male-female earnings ratio than differences in occupational distribution by sex.

TABLE 3

ACTUAL AND STANDARDIZED RATIO OF MEAN
EARNINGS BETWEEN MALES AND FEMALES

| | Mean Earnings by Occupation | |
	Overall	Actual
A. 1960		
Occupational	Overall	1.00	1.87
Distribution	Actual	1.36	2.27
B. 1970		
Occupational	Overall	1.00	1.86
Distribution	Actual	1.45	2.14

Almost half of all blacks and Spanish–Americans employed in 1960 were personal service workers. The only other occupational groups more than 10 percent black and Spanish were police and firemen, farmers, tailors and painters, bus and truck drivers, and the armed forces; and of the ten highest-paying occupations, none was more than 3.8 percent black and Spanish. Between 1960 and 1970, as the percentage of blacks and Spanish in the labor force rose from 12 to 15, the percentage of service workers that were black or Spanish declined from 31 to 24. The percentage of blacks and Spanish increased in most other occupa-

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tions, with the notable exception of farmers, and in 11 of the top 15 occupations the rate of increase surpassed the overall rate of increase.

Mean annual earnings for whites exceeded those for blacks and Spanish in all but 3 occupations in 1960 and 5 in 1970. However, in only 2 occupations in 1960 and 7 in 1970 was the ratio of mean earnings greater than the overall ratio of earnings between whites and blacks and Spanish of 1.75 in 1960 and 1.41 in 1970. In order to assess the relative impact of difference in mean earnings by occupation and differences in occupational distribution on the overall white to black and Spanish earnings ratio, standardized averages were computed, as in the case of sex (Tables 4A and 4B). Differences in racial composition by occupation accounted for about 56 percent (0.42/0.75) of the actual overall ratio of mean earnings in 1960 and about 49 percent (0.20/0.41) in 1970.

Between 1960 and 1970, the overall white to black and Spanish earnings ratio fell from 1.75 to 1.41, reflecting both a drop in the mean earnings ratio in about two thirds of the occupational groups and a shift of black and Spanish employment out of lower-paying occupations, particularly services and farming, toward the higher-paying ones, including many professions. In order to quantify these two effects, the overall mean earnings ratio was computed that would result if 1960 occupational mean earnings by race had remained constant but the occupational distributions had shifted to their 1970 composition (row 2 and column 1 of Table 4C), and if the 1960 occupational distributions had remained constant but occupational mean earnings by race had shifted to their 1970 levels (row 1 and column 2 of Table 4C). A shift in the occupational distributions alone would have reduced the aggregate mean earnings ratio by 0.28 or by 82 percent (0.28/(1.77–1.41)) of the actual decline in the ratio of mean earnings. This would be primarily due to the movement of blacks out of farming, where black earnings were very low in 1960, and of blacks and Spanish out of personal services, where

TABLE 4

ACTUAL AND STANDARDIZED RATIOS OF MEAN
EARNINGS BETWEEN WHITES AND BLACKS AND SPANISH

		Mean Earnings by Occupation	
		Overall	Actual
A. 1960			
Occupational	Overall	1.00	1.36
Distribution	Actual	1.42	1.75
B. 1970			
Occupational	Overall	1.00	1.20
Distribution	Actual	1.26	1.41
		1960 Actual	1970 Actual
C. 1960-70			
Occupational	1960 Actual	1.75	1.59
Distribution	1970 Actual	1.47	1.41

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the overall level of earnings was low. A change in mean earnings by occupation would alone have caused a reduction of 0.16, or of 47 percent of the total differential. This would be mainly attributed to the decline of the white to black and Spanish earnings ratio in personal services from 1.17 to 0.97. The change in the occupational distributions was, in comparison, the major factor in the fall in the overall earnings ratio.

Table 5 shows the distribution of occupational Gini coefficients for males, females, whites, and blacks and Spanish. The distributions were all relatively similar to the overall distribution of occupational Gini coefficients in the two periods, reflecting that the inequality of earnings by occupational and demographic group was close to that of the occupational group. However, the distribution of occupational Gini coefficients for females peaked at a higher level in both years than that for men, reflecting the higher overall level of earnings inequality among women than among men. In fact, Gini coefficients were higher for females than for males in all occupational groups except 7 in 1960 and 6 in 1970. The distributions of Gini coefficients were very similar for whites and blacks and Spanish, corresponding to the closeness of the overall level of earnings inequality for the two groups. In general, the Gini coefficients by occupational and demographic group deviated in the same direction and to the same extent from the occupational level as the degree of inequality by demographic group deviated from that of the whole work force.

TABLE 5

FREQUENCY DISTRIBUTIONS OF OCCUPATIONAL GINI COEFFICIENTS
BY SEX AND RACE

Gini Coefficients	All	Sex		Race	
		Males	Females	Whites	Blacks & Spanish
A. 1960					
0.100–0.199	1	2	1	1	4
0.200–0.299	11	13	6	13	15
0.300–0.399	12	9	13	11	5
0.400–0.499	3	5	8	2	5
0.500–0.599	4	2	3	4	0
0.600–0.699	1	1	0	1	1
Overall Level	0.4504	0.3954	0.4515	0.4427	0.4403
B. 1970					
0.100–0.199	0	0	0	0	2
0.200–0.299	7	12	4	9	6
0.300–0.399	14	12	13	13	12
0.400–0.499	7	6	12	6	10
0.500–0.599	3	2	2	3	1
0.600–0.699	1	0	1	1	0
Overall Level	0.4573	0.4059	0.4430	0.4554	0.4369

Note: The distributions do not necessarily total to 32, since some occupational cells are empty for females and/or for blacks and Spanish.

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IV. Summary and Conclusion

Both occupational differentiation and within-occupation earnings inequality contributed to the overall difference in mean earnings between males and females and between whites and blacks and Spanish. As Zellner and Weisskoff found, women were heavily concentrated in a few occupational groups in both years and these tended to be in the lower portion of the occupational earnings ladder. Men, on the other hand, comprised the vast majority of the occupational groups on the top portion of the ladder. Moreover, as Malkiel and Malkiel and Fuchs discovered, men tended to receive higher earnings than women in a given occupation. In fact, men out-earned women in every occupational group except one in the two periods. Both differences in mean earnings by occupational group and differences in occupational distribution by sex played a role in the formation of an overall male–female earnings ratio of over 2.0 in both years, but within-occupation earnings inequality was, on net, the dominant factor.

As Gibbs and Bergman found, significant differences existed in the occupational distributions of whites and blacks and Spanish. In fact, almost half the employed black and Spanish labor force worked in personal services in 1960, though this percentage fell to 32 by 1970. On the other hand, the percentage of blacks and Spanish in most professional occupations was very small, though it increased somewhat, as Freeman observed for managerial personnel, between 1960 and 1970. Mean earnings for whites exceeded those for blacks and Spanish in almost all occupational groups in both years. On net, occupational differentiation was the more dominant effect of the two in the determination of the overall mean earnings ratio between the races. Moreover, as Welch and Haworth, Gwartney, and Haworth observed, the mean earnings ratio fell substantially between 1960 and 1970. Both shifts in the occupational distribution of whites and blacks and Spanish and declines in the mean earnings ratios by occupation contributed to the fall, but the former was the stronger factor.

Even though considerable differences in mean earnings between demographic groups existed, there was also a considerable degree of earnings inequality within demographic groups. The degree of inequality was in the main reduced when the demographic groups were subdivided into occupations, but the degree of earnings inequality was still substantial for most demographic by occupational groups. Thus, any explanation of earnings inequality between social groups must be counterbalanced by an examination of earnings inequality within social groups, and additional factors like time worked, schooling, and experience must be taken into consideration in understanding these two relations.

APPENDIX 1
Occupational Groupings

Occupation 1

Chiropractors
Dentists
Physicians, surgeons
Optometrists
Osteopaths
*1970 only.

Veterinarians
Podiatrists*
Health practitioners*

Occupation 2

Airline pilots

Occupation 3

University presidents and deans
Lawyers, judges

Occupation 4

Agriculture professors

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Biology professors
Medical science professors
Chemistry professors
Geology professors
Physics professors
Natural science professors
Engineering professors
Economists
Geologists
Physicists
Economics professors
Sociology professors
Social science professors
Mathematics professors
Statistics professors
Humanities professors
Professors n.e.c.
Psychologists
Misc. social scientists
Mathematicians
Misc. natural scientists
Aeronautical engineers
Chemical engineers
Mining engineers
Sales engineers
Civil engineers
Electrical engineers
Industrial engineers
Mechanical engineers
Metallurgical engineers
Engineers n.e.c.†
Systems analysts*
Computer specialists*
Petroleum engineers*
Environmental scientists*
Marine scientists*
Environmental professors*
Air traffic controllers*
University administrators*
School administrators*

Occupation 5

Advertising agents
Auctioneers
Stock brokers
Real estate appraisers*

Occupation 6

Public administration inspectors
Public administration officials
Postmasters
Farm buyers
Credit men
Union officials
Store buyers
Misc. buyers
Misc. managers
Ship pilots
Public administration controllers*
Bank officers*

Construction inspectors
Office managers*
Manufacturing sales representatives*
Wholesale sales representatives*
Clerical supervisors*

Occupation 7

Designers
Architects
Sales managers*

Occupation 8

Railroad conductors

Occupation 9

Locomotive engineers
Photoengravers
Foremen n.e.c.
Electrotypers
Engravers
Stationery engineers
Toolmakers
Pattern makers

Occupation 10

Authors
Draftsmen
Photographers
Accountants
Farm and home management advisors
Personnel workers
Publicity writers
Programmers*
Tool programmers*
Educational counselors*
Health administrators*
Misc. administrators*

Occupation 11

Vehicle dispatchers
Insurance adjusters
Misc. agents
Baggagemen
Ticket agents
Mail carriers
Railway mail clerks
Postal clerks
Telegraph messengers
Telegraph operators
Insurance agents

Occupation 12

High school teachers
Agricultural scientists
Biological scientists
Statisticians
Pharmacists
Undertakers

Technicians n.e.c.
Radio operators
Electrical technicians
Physical science technicians

Occupation 13

Millers
Millwrights
Inspectors n.e.c.

Occupation 14

Airplane mechanics
Office machine mechanics
Machinists
Plumbers
Electricians
Blacksmiths
Cranemen
Excavating machine operators
Metal rollers
Sheet metal workers
Boilermakers
Printers
Structural metal workers
Heat treaters
Metal molders
Stonemasons
Cement finishers
Forgemen and hammermen
Telephone servicemen
Locomotive firemen
Metal job setters
Production controllers*
Bulldozer operators*
Earth drillers*
Dry wall installers*
Grinding machine operators*

Occupation 15

Railroad brakemen
Boatmen and canalmen
Bus conductors
Streetcar motormen
Railroad switchmen
Asbestos workers
Powdermen
Metal heaters
Power station operators
Furnacemen
Factory motormen
Welders
Metal grinders
Greasers
Stationary firemen
Shipfitters*
Lathe operators*
Mixing operators*
Fork lift operators*

*1970 only.   † n.e.c.: not elsewhere classified.

Occupation 16

Firemen
Marshals
Policemen
Sheriffs
Longshoremen and stevedores
Warehousemen

Occupation 17

Appliance mechanics
Radio and TV mechanics
Misc. mechanics
Auto mechanics
Railroad mechanics
Glaziers
Opticians
Plasterers
Cabinetmakers
Carpenters
Misc. craftsmen
Roofers and slaters
Loom fixers
Bakers
Lumber inspectors
Meter readers*
Farm implement mechanics*
Heavy equipment mechanics*
Carpet installers*
Stamping press operators*
Metal platers*
Precision machine operations*

Occupation 18

Therapists
Medical dental technicians
Foresters
Surveyors
Misc. technicians
Artists, art teachers
Editors, reporters
Clergymen
Social workers

Occupation 19

Farmers (owner and tenant)
Farm managers
Store floor managers
Building managers
Researchers, n.e.c.*

Occupation 20

Librarians
Elementary teachers
Curators*

Occupation 21

Apprentice electricians
Apprentice machinists

*1970 only.

Apprentice plumbers
Painters
Sawyers
Cab drivers
Miners
Misc. operatives
Assemblers
Manufacturing inspectors
Dyers
Textile knitters
Riveters*
Cutting operations*
Furniture finishers*
Winding operators*

Occupation 22

Furriers
Jewellers
Stonecutters
Upholsterers
Tailors
Shoemakers
Bookbinders
Decorators
Painters
Paper hangers
Movie projectionists
Canning operators*
Sign painters*

Occupation 23

Barbers
Bartenders
Farm foremen
Garbage collectors*
Freight handlers*

Occupation 24

Apprentice printers
Auto apprentices
Apprentice masons
Apprentice carpenters
Apprentice mechanics
Apprentice builders
Apprentice metal workers
Other apprentices
Meat cutters
Photographic processing workers
Bus drivers
Sailors
Truck drivers
Deliverymen
Parking attendants
Surveying assistants
Manufacturing graders
Laundry operators
Packers n.e.c.
Vegetable packers
Auto installers*

Dental laboratory technicians*
Apprentice pressmen*
Clothing pressers*
Drill press operators*
Transport equipment operators*

Occupation 25

Bill collectors
Bank tellers
Bookkeepers
Payroll clerks
Shipping clerks
Storekeepers
Secretaries
Stenographers
Officemachine operators
Billing clerks*
Social welfare assistants*
Proofreaders*
Statistical clerks*
Weighers*

Occupation 26

Textile spinners
Textile weavers
Solderers*
Carding operators*
Textile operators n.e.c.*

Occupation 27

Cashiers
File clerks
Office boys
Misc. clerks
Library assistants
Doctor's attendants
Receptionists
Typists
Telephone operators
Demonstrators
Peddlers
Newsboys
Real estate agents
Misc. sales clerks
Retail sales clerks*
Retail salesmen*
Misc. sales workers*
Counter clerks*
Teacher aides*

Occupation 28

Actors
Dancers, dance teachers
Musicians, music teachers
Group workers
Athletes
Misc. entertainers
Religious workers

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Radio, TV announcers*
Interviewers*

Occupation 29

Dietitians
Nurses
Student nurses
Restaurant, bar managers*

Occupation 30

Armed forces

Occupation 31

Dressmakers
Milliners
Manufacturing sewers
Shoe machine operators*

Occupation 32

Household baby sitters
Housekeepers
Household laundresses
Other household workers
Personal service workers
Recreation attendants
Recreation ushers
Waiters
Cooks
Hairdressers
Watchmen
Maids
Bootblacks
Charwomen
Fountain workers
Kitchen workers
Misc. service workers
Hospital attendants

Midwives
Practical nurses
Elevator operators
Janitors and sextons
Porters
Farm laborers
Carpenters' helpers
Garage laborers
Gardeners
Lumbermen
Teamsters
Truck drivers' helpers
Fishermen
Laborers n.e.c.
Animal caretakers*
Construction workers*
Dental assistants*
Childcare workers*
Personal service apprentices*
School monitors*

*1970 only.

REFERENCES

[1] Adams, F. G., "The Size of Individual Incomes: Socio-Economic Variables and Chance Variation", *Review of Economics and Statistics*, Vol. XL, No. 4, November, 1958.
[2] Bergman, Barbara, "The Effect on White Incomes of Discrimination in Employment", *Journal of Political Economy*, Vol. 79, No. 2, March–April, 1971.
[3] Freeman, Richard, "Decline of Labor Market Discrimination and Economic Analysis", *American Economic Review*, Vol. 63, No. 2, May, 1973.
[4] Fuchs, Victor, "Recent Trends and Long-Run Prospects for Female Earnings", *American Economic Review*, Vol. 64, No. 2, May, 1974.
[5] ————, "A Note on Sex Segregation in Professional Occupations", *Explorations in Economic Research*, Vol. 2, No. 1, Winter, 1975.
[6] Gibbs, Jack, "Occupational Differentiation of Negroes and Whites in the United States", *Social Forces*, Vol. 44, No. 2, December, 1965.
[7] Haworth, J. G., Gwartney, J., and Haworth, C., "Earnings, Productivity, and Change in Employment Discrimination During the 1960's", *American Economic Review*, Vol. 65, No. 1, March, 1975.
[8] Malkiel, B., and Malkiel, J., "Male–Female Pay Differentials in Professional Employment", *American Economic Review*, Vol. 63, No. 4, September, 1973.
[9] Ruggles, Nancy, and Ruggles, Richard, "A Strategy for Merging and Matching Microdata Sets", *Annals of Economic and Social Measurement*, Vol. 3, No. 2, April, 1974.
[10] Soltow, Lee, "The Distribution of Income Related to Changes in the Distribution of Education, Age, and Occupation", *Review of Economics and Statistics*, Vol. XLII, No. 4, November, 1960.
[11] Weisskoff, Francine Blau, "Women's Place in the Labor Market", *American Economic Review*, Vol. 63, No. 2, May, 1973.
[12] Welch, Finis, "Black–White Differences in Returns to Schooling", *American Economic Review*, Vol. 63, No. 5, December, 1973.
[13] Wolff, Edward, "Social Determinants of Occupational Wage Behavior", New York University Center for Applied Economics Discussion Papers No. 75–27, February, 1975.
[14] Zellner, Harriet, "Discrimination Against Women, Occupational Segregation, and the Relative Wage", *American Economic Review*, Vol. 62, No. 2, May, 1972.

STATISTICS FOR SEX BY OCCUPATION

		1960			1970		
		Females as Percent of Occupation	Males as Percent of Occupation	Male/Female Ratio of Mean Earnings	Females as Percent of Occupation	Males as Percent of Occupation	Male/Female Ratio of Mean Earnings
1	Medical doctors	0.073	0.927	2.203	0.148	0.852	1.623
2	Air pilots	0.0	1.000	0.0	0.012	0.987	2.049
3	Deans, Lawyers, Judges	0.052	0.948	0.864	0.065	0.935	2.498
4	Professors, Engineers	0.053	0.947	1.600	0.116	0.884	1.780
5	Brokers, Advertising men	0.107	0.893	1.848	0.163	0.837	2.077
6	Government officials	0.160	0.840	2.249	0.167	0.833	2.136
7	Architects	0.198	0.802	1.733	0.107	0.893	2.074
8	Railway conductors	0.012	0.988	1.024	0.014	0.986	1.400
9	Engravers, Toolmakers	0.034	0.966	1.781	0.059	0.941	1.590
10	Writers, Accountants	0.167	0.833	1.704	0.270	0.730	1.913
11	Agents, Telegraphers	0.112	0.888	1.922	0.229	0.771	1.945
12	High school teachers	0.280	0.719	1.456	0.435	0.565	1.620
13	Millers	0.045	0.955	2.932	0.041	0.959	2.452
14	Plumbers, Skilled labor	0.010	0.990	1.750	0.046	0.954	1.784
15	Motormen, Welders	0.035	0.965	2.219	0.071	0.929	1.934
16	Police, Firemen	0.031	0.969	1.419	0.027	0.973	1.279
17	Mechanics, Craftsmen	0.016	0.984	1.588	0.053	0.947	2.022
18	Technicians	0.351	0.649	1.575	0.452	0.547	1.680
19	Farmers	0.044	0.956	2.040	0.197	0.803	2.285
20	Elementary teachers	0.826	0.174	1.325	0.843	0.157	1.511
21	Apprentices, Operatives	0.269	0.731	1.885	0.388	0.612	1.897
22	Tailors, Painters	0.117	0.882	1.833	0.225	0.775	2.043
23	Barbers, Bartenders	0.052	0.948	3.009	0.132	0.868	1.598
24	Apprentices, Drivers	0.214	0.786	2.127	0.243	0.757	2.365
25	Clerks, Secretaries	0.766	0.234	1.339	0.789	0.211	1.600
26	Textile workers	0.577	0.423	1.431	0.562	0.438	1.390
27	Typists, Cashiers, Newsboys	0.616	0.384	2.533	0.749	0.251	2.220
28	Entertainers	0.494	0.506	2.158	0.501	0.499	2.549
29	Nurses	0.977	0.023	1.063	0.876	0.124	1.642
30	Armed forces	0.023	0.977	1.451	0.021	0.979	0.857
31	Milliners	0.942	0.058	1.521	0.912	0.088	1.473
32	Personal services	0.451	0.549	2.090	0.477	0.523	1.702
33	All	0.365	0.635	2.273	0.412	0.588	2.139

APPENDIX 3

STATISTICS FOR RACE BY OCCUPATION

	1960			1970		
	Blacks & Spanish as Percent of Occupation	Whites as Percent of Occupation	White/Black Ratio of Mean Earnings	Blacks & Spanish as Percent of Occupation	Whites as Percent of Occupation	White/Black Ratio of Mean Earnings
1 Medical doctors	0.032	0.968	1.625	0.115	0.885	1.206
2 Air pilots	0.0	1.000	0.0	0.0	1.000	0.0
3 Deans, Lawyers, Judges	0.027	0.973	1.333	0.020	0.979	2.011
4 Professors, Engineers	0.019	0.981	1.405	0.050	0.950	1.431
5 Brokers, Advertising men	0.0	1.000	0.0	0.023	0.977	3.909
6 Government officials	0.005	0.995	1.423	0.049	0.951	1.451
7 Architects	0.024	0.976	2.322	0.017	0.983	1.460
8 Railway conductors	0.012	0.988	1.024	0.021	0.979	1.144
9 Engravers, Toolmakers	0.038	0.962	1.560	0.073	0.927	1.147
10 Writers, Accountants	0.023	0.977	1.137	0.049	0.951	1.298
11 Agents, Telegraphers	0.063	0.937	1.307	0.116	0.884	1.384
12 High school teachers	0.035	0.965	1.537	0.068	0.932	1.301
13 Millers	0.043	0.957	1.125	0.046	0.954	1.696
14 Plumbers, Skilled labor	0.066	0.934	1.329	0.099	0.901	1.323
15 Motormen, Welders	0.092	0.908	1.261	0.157	0.843	1.162
16 Police, Firemen	0.119	0.881	1.206	0.106	0.894	1.179
17 Mechanics, Craftsmen	0.061	0.939	1.307	0.115	0.885	1.196
18 Technicians	0.064	0.936	1.232	0.077	0.923	1.381
19 Farmers	0.132	0.868	3.279	0.040	0.960	1.987
20 Elementary teachers	0.086	0.914	1.017	0.094	0.906	0.888
21 Apprentices, Operatives	0.098	0.902	1.496	0.194	0.806	1.134
22 Tailors, Painters	0.107	0.893	1.447	0.158	0.842	1.372
23 Barbers, Bartenders	0.088	0.911	1.268	0.209	0.791	1.051
24 Apprentices, Drivers	0.168	0.832	1.623	0.173	0.827	1.227
25 Clerks, Secretaries	0.038	0.962	1.017	0.064	0.936	0.930
26 Textile workers	0.006	0.994	0.863	0.125	0.875	1.253
27 Typists, Cashiers, Newsboys	0.047	0.953	1.623	0.098	0.902	1.071
28 Entertainers	0.060	0.940	0.956	0.090	0.910	0.957
29 Nurses	0.087	0.912	0.987	0.096	0.904	1.028
30 Armed forces	0.108	0.892	1.690	0.131	0.869	1.090
31 Milliners	0.082	0.918	1.127	0.165	0.835	0.964
32 Personal services	0.310	0.690	1.166	0.244	0.756	0.970
33 All	0.120	0.879	1.746	0.151	0.849	1.406