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Chapter Author: Victor R. Fuchs, Elizabeth Rand, Bonnie Garrett

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The Distribution of Earnings in Health and Other Industries

Victor R. Fuchs
Elizabeth Rand
Bonnie Garrett

The growing interest in the size distribution of earnings has been manifest in studies of labor income for the total work force or for large subaggregates, such as all nonfarm wage and salary workers.[1] The purpose of this note is to suggest that the size distribution of earnings within detailed industries may also merit attention. Such data can provide insights concerning the distribution of human capital within industries and the variation of these distributions across industries. In addition, the analysis of intraindustry distributions may help us to understand better certain problems in industrial organization and labor market behavior.

We compare the distribution of earnings of full-time year-round employed persons in twenty large industries. The health industry is

NOTE: This study has appeared in *The Journal of Human Resources,* 4, Summer 1970, pp. 382–89. A previously unpublished appendix, "A Note on the Distribution of Earnings in Health Under Alternative Forms of Organization," has been added here.

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Certain data used in this note were derived from punch cards furnished under a joint project sponsored by the U.S. Bureau of the Census and Population Council, and containing selected 1960 Census information for a 0.1 per cent sample of the population of the United States. Neither the Census Bureau nor the Population Council assumes any responsibility for the validity of any of the figures or interpretations of them published herein based on this material.

[1] This literature is reviewed by Jacob Mincer in "The Distribution of Labor Incomes: A Survey with Special Reference to the Human Capital Approach," *Journal of Economic Literature,* 8, March 1970.

found to have an extraordinary bimodal distribution. Possible explanations for this marked discontinuity are discussed and some questions for further research are raised.

EARNINGS DISTRIBUTIONS

The basic data source is the 1/1,000 sample of the 1960 Census of Population and Housing.[2] Because the relative importance of part-time work varies considerably across industries, the study is limited to persons who worked at least forty weeks in 1959 and at least thirty hours per week in the Census sample week in April 1960.[3] Employed persons, including self-employed but excluding unpaid family workers, are classified by industry, and all industries, except agriculture and mining, with at least 600 observations (i.e., 600,000 persons) are included in the study.

Frequency distributions of annual earnings in 1959 are constructed for each industry, and summary statistics on these distributions are presented in Table 7-1. Mean earnings in the health industry are very much like those of other industries. The standard deviation of earnings in health, however, is very high—almost double that of the median industry. The coefficient of variation, which measures the relative variance or inequality in earnings, is higher for health than for any other industry.[4] Because the distribution of earnings in many industries more closely approximates the log normal than the normal, the coefficients of variation of the logarithms of earnings are also shown. The health industry again shows the greatest relative variation—almost double that of the median industry.

In Table 7-2 the frequency distributions for each industry are allocated across earnings classes based on ratios to the industry means rather than across specific dollar classes. This method allows us to compare distributions among industries irrespective of differing means. Several features of the health distribution stand out. First, we notice a much higher percentage of health workers at the very low end of the

[2] For a full description, see U.S. Department of Commerce, Bureau of the Census, *U.S. Censuses of Population and Housing: 1960, 1/1,000, 1/10,000—Two National Samples of the Population of the United States, Description and Technical Documentation,* Washington, D.C.

[3] Data on hours per week in 1959 are not available.

[4] Some of the inequality is the result of positive correlation between annual earnings and annual hours, but several rough calculations indicate that adjustment for hours of work would not alter the basic picture. The coefficient of variation for health earnings roughly adjusted for annual hours is 1.07.

TABLE 7-1

Summary Measures of Annual Earnings of Full-Time Year-Round Employed Persons, Twenty Large Industries, 1959

Industry	Number of Observations	Mean	Standard Deviation	Coefficient of Variation	Coefficient of Variation of Logs
Health	1,724	$5,709	$7,522	1.318	.121
Apparel	698	4,247	5,190	1.222	.096
Finance and insurance	1,902	6,200	5,853	.944	.078
Retail trade	5,866	4,772	4,277	.896	.106
Wholesale trade	1,691	6,602	5,710	.865	.082
Food	1,364	5,534	4,241	.766	.075
Textiles	692	3,837	2,841	.740	.067
Construction	2,637	5,953	4,201	.706	.077
Machinery (except electrical)	1,117	6,534	4,455	.682	.064
Printing and publishing	715	6,114	4,148	.678	.081
Electrical machinery	1,168	5,918	3,951	.668	.066
Chemicals	697	6,496	4,308	.663	.064
Transportation	2,245	5,848	3,646	.623	.068
Fabricated metals	1,372	5,680	3,425	.603	.061
Education	1,692	5,160	3,004	.582	.087
Primary metals	807	6,198	3,601	.581	.060
Communication	681	5,477	2,989	.546	.059
Utilities	803	5,525	2,615	.473	.057
Public administration (except postal)	2,118	5,459	2,550	.467	.062
Transportation equipment	1,530	6,191	2,824	.456	.049
Median	1,368	5,778	4,050	.673	.068

Note: Industry means and standard deviations are calculated using the midpoints of each class and $40,000 for the open-ended class $25,000 and over.

distribution. Second, we note that there are very few persons in the health industry with earnings between the mean and twice the mean. Finally, we note that the percentage earning more than twice the mean is much higher than in any other industry.

By selecting the median percentage distribution among the twenty industries in each relative earnings class, we have created a "typical" industry distribution. Comparison of the health distribution with this "typical" distribution indicates that the greatest discrepancy is in the range from the mean to 50 per cent above the mean; in the median

TABLE 7-2

Percentage Frequency Distributions of Earnings Relative to the Mean and Cumulative Deviations from the Median, Twenty Large Industries, 1959

Industry	Ratios to the Mean[a]									Cumulative Absolute Deviation (% Point)
	0–.25	.26–.50	.51–.75	.76–1.00	1.01–1.25	1.26–1.50	1.51–1.75	1.76–2.00	Over 2.00	
Health	9.4%	25.8%	27.7%	15.4%	5.2%	2.5%	1.7%	1.0%	11.6%	71.0
Apparel	2.2	20.7	35.1	17.4	7.3	3.8	2.9	2.1	8.4	54.9
Finance and insurance	2.6	18.0	30.0	19.2	11.1	6.5	3.7	1.5	7.4	38.0
Retail trade	6.1	17.0	21.5	18.2	13.9	8.1	4.4	2.6	8.1	33.3
Wholesale trade	3.0	15.6	25.9	23.3	12.3	5.8	4.7	3.0	6.5	26.1
Transportation equipment	0.9	4.3	19.6	35.2	22.0	9.4	4.0	2.3	2.3	24.4
Communication	0.8	6.9	29.2	24.6	14.4	11.8	5.6	2.5	4.0	19.8
Utilities	1.7	6.8	19.6	26.4	24.6	12.8	4.1	2.2	1.8	19.6
Education	4.9	9.9	18.1	23.2	19.2	11.6	5.9	2.4	4.9	19.1

(continued)

TABLE 7-2 (concluded)

Textiles	0.8	5.5	33.0	26.2	14.7	8.4	4.1	2.5	4.7	18.5
Transportation	2.1	7.0	19.6	33.0	19.2	10.0	4.3	1.8	3.1	16.3
Primary metals	1.0	6.1	22.1	34.2	19.0	7.8	4.7	1.1	4.0	15.8
Printing and publishing	1.7	12.2	23.2	20.6	20.1	10.2	5.3	1.6	5.0	15.3
Construction	3.1	11.5	22.1	24.0	16.4	11.6	4.5	2.0	4.7	15.4
Public administration (except postal)	1.0	6.2	21.5	30.4	20.4	9.3	4.7	2.3	4.1	12.3
Machinery (except electrical)	1.2	7.8	25.8	30.4	16.9	7.8	3.9	1.8	4.5	11.7
Food	2.8	11.3	20.2	27.7	19.8	8.4	3.6	1.9	4.2	11.5
Fabricated metals	1.2	6.1	24.2	29.8	20.2	8.4	4.3	2.4	3.4	10.8
Chemicals	0.9	8.5	23.1	30.5	19.0	7.8	4.0	2.6	3.6	8.2
Electrical machinery	1.5	7.9	26.8	25.7	17.6	9.6	3.9	2.1	4.8	7.5
Median[b]	1.7	8.5	24.0	26.8	18.9	8.7	4.3	2.3	4.8	17.4

[a] The classes for the frequency distributions are expressed in terms of ratios to the mean earnings for each industry. Thus, the dollar values of each class vary among industries.

[b] This distribution is referred to as the "typical" industry. The median for each class is adjusted so that the sum across classes equals 100.0.

industry about 27.6 per cent of workers fall in that range, but in health only 7.7 per cent do so. The mean earnings in health are now about $10,000, and it is not likely that any drastic change in distribution occurred during the past decade. Therefore, the current shortage is of workers whose education, experience, etc., justifies earnings of from $10,000 to $15,000 per year. These are the persons who in other industries take on middle professional and supervisory functions, freeing the more skilled so that they can concentrate on the more important and demanding tasks.[5] The data also suggest that a smaller, but significant, shortage exists in the range from one and one-half times the mean to twice the mean, i.e., in current terms, from $15,000 to $20,000 per annum. This shortage is shown graphically in Chart 7-1, where the health industry distribution is compared with that of the median or "typical" industry.

The last column in Table 7-2 presents a measure of the extent to

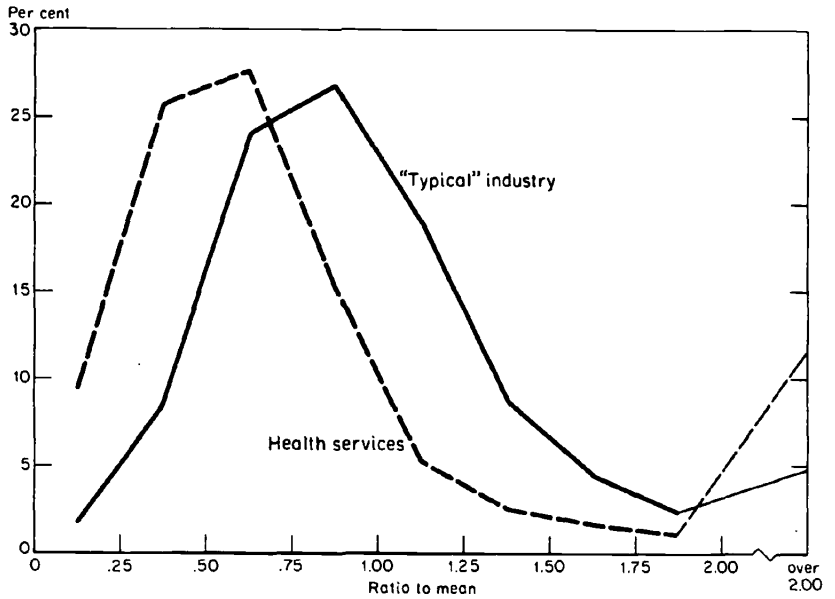

CHART 7-1
Percentage Frequency Distributions of Earnings Relative to the Mean, Health Services, and the "Typical" Industry, 1959

[5] In most industries many of these middle level workers started at lower levels and worked their way up. In the health industry, the occupational "ladders" are very limited.

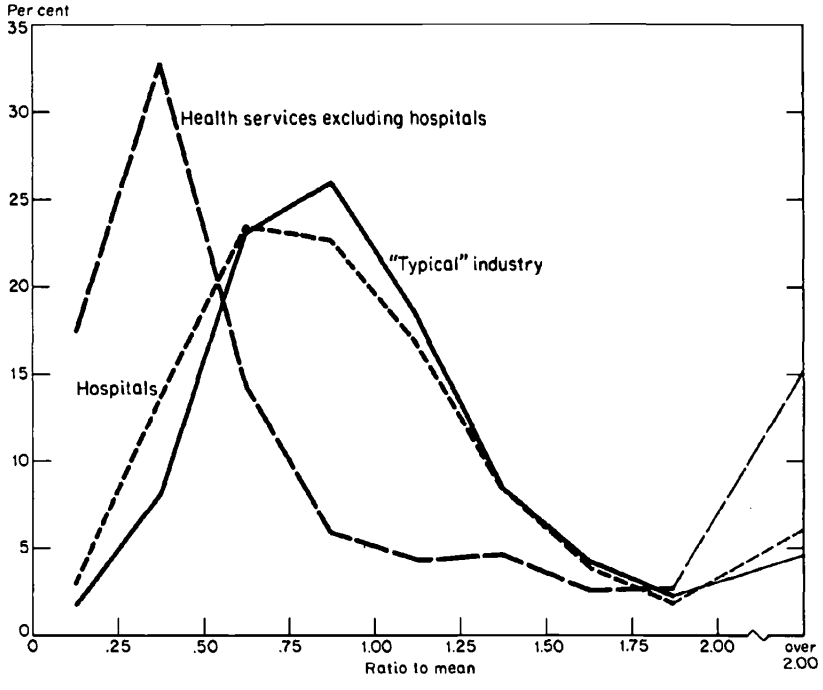

CHART 7-2
Percentage Frequency Distributions of Earnings Relative to the Mean, Hospitals, Health Services Excluding Hospitals, and the "Typical" Industry, 1959

which each industry's distribution departs from that of the "typical" industry. It is the sum across the nine relative earnings classes of the absolute deviation, in percentage points, of the given industry's frequencies from the "typical" industry's frequencies. The health industry distribution departs most from that of the "typical" industry, with a cumulative deviation of 71.0 percentage points. The electrical machinery industry has roughly one-tenth as much cumulative deviation, and all industries except two have less than half as much deviation as does health. Further calculations for the health industry show that its unusual distribution of earnings is found in the four regions of the country and in smaller cities and rural areas as well as in the large Standard Metropolitan Statistical Areas (see Table 7-3).

When the health industry is disaggregated into "hospital" and "medical and other health services except hospitals," we find that the distribution of earnings in the former closely resembles that of the

TABLE 7-3

Summary Measures of Earnings Distributions in Health, by Region and City Size, 1959

	Number of Observations	Mean	Standard Deviation	Coefficient of Variation	Coefficient of Variation of Logs	Cumulative Absolute Deviation[a]
Health total	1724	$5709	$7522	1.318	.121	70.4
Region						
Northeast	501	6333	8505	1.343	.102	84.7
North Central	487	5486	7223	1.316	.102	66.8
South	464	4767	6861	1.439	.113	63.7
West	272	6566	8205	1.250	.100	74.3
City size						
SMSA's $\geq$ 1 million	682	6734	8669	1.287	.103	79.3
SMSA's $<$ 1 million	521	5213	7026	1.348	.103	62.0
Outside SMSA's	521	4865	6847	1.408	.107	68.2

[a] Percentage point deviations measured from "typical" industry as defined in Table 7-2.

TABLE 7-4

Summary Measures of Earnings Distributions, Health and Other Professional Service Industries, 1959

	Number of Observations	Mean	Standard Deviation	Coefficient of Variation	Coefficient of Variation of Logs	Cumulative Absolute Deviation[a]
Hospitals	1,103	$ 3,816	$ 3,877	1.016	.085	15.5
Health, excluding hospitals	621	9,072	10,956	1.208	.121	101.5
Legal services	202	10,853	10,998	1.013	.102	73.8
Accounting services	130	7,735	7,055	.912	.082	35.4
Engineering services	148	8,079	6,588	.815	.076	26.1

[a] Percentage point deviations measured from "typical" industry as defined in Table 7-2.

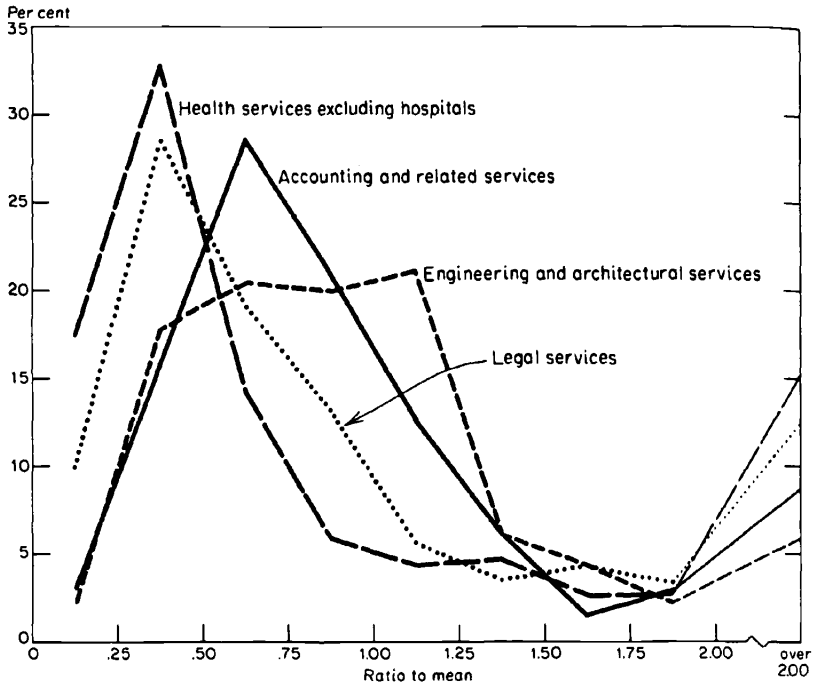

CHART 7-3
Percentage Frequency Distributions of Earnings Relative to the Mean, Four Professional Service Industries, 1959

"typical" industry, but that the latter distribution departs even more markedly from the "typical" than the one for health as a whole (see Table 7-4 and Chart 7-2). This table also shows that "health excluding hospitals" departs more markedly than do the distributions for the three other major professional service industries: legal, accounting, and engineering (see Chart 7-3).

DISCUSSION

Several questions arise concerning the methodology and data reported above. Are earnings a good proxy for human capital? Would distributions based on education, age, occupation, or other characteristics reveal similar patterns? What explains the variation across industries in the distribution of human capital? Is the distribution in health the result of physicians' desire to prevent the emergence of any close substitutes for their services, or is it dictated by the technology of medical care?

Is the more normal distribution observed for accounting and engineering attributable to the use of certification in those professions rather than the more restrictive licensure that prevails in law and medicine? Would the emergence of a more normal distribution of manpower in the health industry help relieve the "doctor shortage"?[6] It is hoped that this note may stimulate further research on these and related questions.

APPENDIX A:

A NOTE ON THE DISTRIBUTION OF EARNINGS IN HEALTH UNDER ALTERNATIVE FORMS OF ORGANIZATION

This note reports on a comparison between the distribution of earnings in the health industry as a whole and a single, large, prepaid group practice plan that provides comprehensive in-hospital and am-

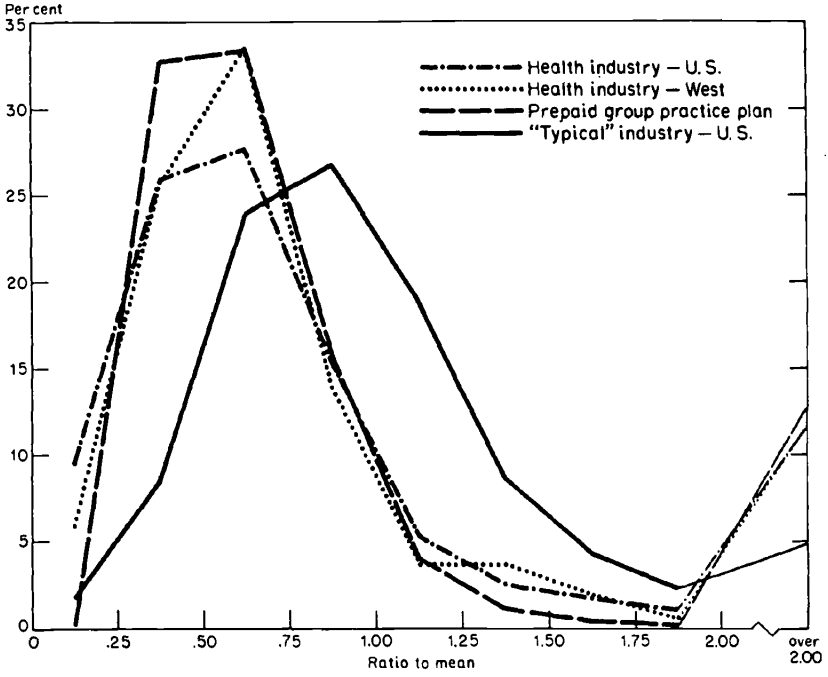

CHART 7-A-1

Percentage Frequency Distributions of Earnings Relative to the Mean, the Health Industry, the "Typical" Industry, and Prepaid Group Practice

[6] See Rashi Fein, *The Doctor Shortage: An Economic Diagnosis,* Washington, D.C., The Brookings Institution, 1967.

TABLE 7-A-1

Earnings Distributions in Prepaid Group Practice, the Health Industry, and the "Typical" Industry

	Prepaid Group Practice Plan 1968	Health Industry U.S. 1959	Health Industry West 1959	"Typical" Industry U.S. 1959
Mean ($)	9,535	5,709	6,566	5,778
Standard deviation ($)	10,093	7,522	8,205	4,050
Coefficient of variation (%)	105.8	131.8	125.0	67.3
Frequency distributions (%) (ratios to the mean)				
0–0.25	0.1	9.4	5.8	1.7
0.26–0.50	33.7	25.8	25.7	8.5
0.51–0.75	32.9	27.7	33.4	24.0
0.76–1.00	15.2	15.1	13.8	26.8
1.01–1.25	3.8	5.2	3.7	18.9
1.26–1.50	1.0	2.5	3.7	8.7
1.51–1.75	.4	1.7	1.9	4.3
1.76–2.00	.1	1.0	0.5	2.3
Over 2.00	12.8	11.6	11.6	4.8

bulatory care. Many advocates of prepaid group practice have suggested that one of the advantages of this type of organization is the opportunity it affords for restructuring the inputs of personnel at different levels of skill and responsibility.[7] In particular, it is thought that a prepaid plan offering comprehensive outpatient as well as hospital care could economize in the use of physicians and make more use of technicians and other middle-level personnel.

Table 7–A-1 compares the prepaid group practice plan with the U.S. health industry and the "typical" U.S. industry.[8] A comparison with the health industry in the West, the region in which the prepaid group practice plan under discussion is located, is also presented. Chart 7–A-1 shows the percentage frequency distributions in graphical form.

We see that the distribution of earnings in the prepaid group practice plan is similar to that for the health industry in the United States

[7] Fein, *The Doctor Shortage*, 1967; also, A. A. Boan, *Group Practice*, Ottawa, Royal Commission on Health Service, Queen's Printer, 1966.

[8] The "typical" industry is based on the median of twenty large industries in the United States.

as a whole and in the West. The coefficient of variation, which measures the relative inequality of earnings, is slightly smaller for the plan, but the shortage of workers earning more than the mean but less than twice the mean is even more pronounced than in the health industry as a whole.

There are, to be sure, significant differences in the series being compared. The three general series refer to 1959 and are based on unverified responses to household interviews, and the mean and standard deviations are calculated using frequency distribution midpoints. The plan data refer to 1968 and use the mean (since it is known) rather than the estimated midpoint of the open-ended class.

These differences may bias the distributions, but it seems unlikely that they could account for the striking similarity in all the health series and the sharp differences between the health series and other industries. The introduction of a different form of financing and delivery of health care has apparently not resulted in a significantly different mix of personnel. To the extent that the prepaid group practice plan is more efficient, it probably takes the form of a saving in all types of personnel, not in the substitution of middle-level professionals for the more expensive physicians.