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SUPPLEMENT

STUDIES OF THE STRUCTURE OF ECONOMISTS' SALARIES AND INCOME

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STUDY III

CHANGES IN THE STRUCTURE OF ECONOMISTS' SALARIES AND EMPLOYMENT 1964–1966

Study II of this series has presented an *external* comparison of economists' salaries—i.e. a comparison of basic salaries in the economics profession as a whole with those in each of the twelve other professions represented by the National Register of 1966. The present study deals with the internal structure of economists' salaries and related employment. The results of two methods of analysis are presented herein. Part A of the following report uses a regression method to reveal the gross and net influence of six leading factors on variation of economists' salaries around their national geometric mean. Part B uses the method of distributing median salaries by intervals of each of the salary-related factors presented in Part A.

In both Part A and Part B, comparisons are made between salaries received in 1966 with those in 1964, the first year in which economists were included in the National Register. In Part A, the comparison takes the form of the regression values of the salary-related factors in each of the two years. In Part B, the 1964–66 per cent changes in median salaries are shown for each of the analysed categories of economists.

Employment changes between 1964 and 1966 are involved in the data presented in both parts of the report. In Part A, the employment changes alter the number of individual observations found in any given class of each independent variable in each of the two years. In Part B, the 1964–66 per cent changes in the numbers reporting salary in each category are shown, as well as the absolute numbers reporting for the end-year, 1966. Numbers reporting salary, rather than total numbers of registered economists, are shown. However, the salary—reporting numbers may generally be taken as quite representative of the corresponding relative total numbers, inasmuch as about nine-tenths of all registered economists did report their salaries. Exceptions to this rule are noted in the course of the Part B analysis.

PART A—FACTORS AFFECTING ECONOMISTS' SALARIES[1]

Using the 1966 National Register data, a regression model of economists' salaries was developed and estimated. In the main, this work updates the 1964 model reported to the profession in December, 1965.[2]

[1] By Emanuel Melichar.

[2] "The Structure of Economists' Employment and Salaries, 1964," *op.cit.*, pp. 63–70.

However, the model was expanded in three ways. First, the effect of experience on salaries was estimated separately for three employer groups: educational institutions, governments, and all other (primarily business and industry). In the 1964 model, governments had been grouped with educational institutions. Second, a more detailed classification was employed for primary work activity, with basic research separated from applied research, and management of research and development separated from other management. Third, agricultural economics was set up as an economic specialty separate from land economics, with which it had been combined in 1964.

In addition to updating the 1964 estimates, there was interest in examining how the net influences had changed during the two years between the surveys. Thus the new model was also estimated using the 1964 data, and 1964–66 changes in the net relationships are reported herein.[3]

The regression model employed here is basically similar to the all-profession model reported in the preceding study (II). Thus the discussion of the development and limitations of that model applies equally here.

Overall Influences on Salaries

Seven major characteristics were represented among the explanatory variables in the model, and together explained 49 per cent of the total variation among logarithms of salaries in 1966, somewhat below the 55 per cent explained using 1964 data. There was, however, somewhat greater variation among salaries in 1966 than in 1964.[4] The relative net contribution made by each characteristic in 1966 is shown in the first column of Table III-A-1.

The employer-experience variables were important in explaining salary variation in 1966, but less so than in 1964. Consequently, the level of academic degree was shown to be the most important single factor in 1966 salary variation, somewhat more important than experience alone.[5] However, the combination of employer and experience contin-

[3] Only in two minor ways is there lack of strict comparability between the 1964 and 1966 estimates. The 1966 data included economists who were not professionally-employed at the time of the survey, whereas these were excluded for 1964. The category of agricultural economics included forestry and fishery economics for 1964, whereas for 1966 the latter group was grouped with land economics. For both dates, the data included only civilian economists who reported their basic salaries and were employed full time, and excluded members of religious orders and persons employed by the Public Health Service.

[4] One standard deviation ranged to 31.9 per cent below the geometric mean in 1966 compared to 33.7 per cent in 1964, and to 53.7 per cent above the mean in 1966 compared to 50.9 per cent in 1964.

[5] For 21 variables representing years of experience separately for each of three major employer groups, the coefficient of partial determination (partial R^2) was .068 in 1966

TABLE III-A-1—IMPORTANCE OF SELECTED CHARACTERISTICS IN EXPLAINING ECONOMISTS' SALARY VARIATION, 1966

Characteristic	Net relationship			Gross relationship 1966		Number of variables used
	Partial R^2		F-ratio 1966			
	1966	1964		R^2	F-ratio	
Years of experience and type of employer	.130	.174	57	.390	246	29
Highest academic degree	.076	.081	305	.032	122	3
Primary work activity	.051	.065	100	.204	478	6
Sex of economist	.016	.015	177	.014	153	1
Age of economist	.011	.017	18	.225	463	7
Economic specialty	.008	.009	7	.038	37	12

Note: All relationships are significant at the .01 probability level.

ued to explain substantially more of the variation than either the academic degree or the other fairly important factor, the primary work activity. Sex also exerted a highly significant influence, but was not very important in explaining total variation because of the very small proportion of women among the registrants. Age had an even lesser net effect and the economic specialty was again a minor influence in 1966.

Employer-Experience Influence on Salaries

The net relationships between length of experience and salary are shown separately for each employer group in Table III-A-2, and are charted for the major employer groups in Figure III-A-1.

Type of employer. If net salary differences among employers are to be quantified and discussed, it must be done with reference to specific levels of experience, as a glance at Figure III-A-1 clearly indicates. At the beginning of a career, salary is little affected by the type of employer, but the percentage differences become increasingly large for economists with more experience. Overall salary progression attributable to added experience is greatest in industry, considerably less in government, and least at educational institutions.

For persons with 1 year or less of professional experience, industry tended to pay 15 per cent more than the Federal government and 5 per cent more than educational institutions paid for a full year. At 10 to 14 years of experience the industry salary advantage over the Federal government was still 14 per cent, but that over educational institutions had widened to 28 per cent. At the most advanced experience level studied,

compared to .086 in 1964. As shown in Table III-A-1, the partial R^2 for academic degree was above the coefficient for experience in 1966, but not in 1964. For eight other variables representing only employer types plus the academic year—calendar year dichotomy at educational institutions, the partial R^2 was .020 in 1966 and .011 in 1964.

TABLE III-A-2—NET RELATIONSHIP BETWEEN ECONOMISTS' SALARIES AND EMPLOYER-EXPERIENCE CHARACTERISTICS, 1966

Type of employer	Years of experience						
	1 or less	2 to 4	5 to 9	10 to 14	15 to 19	20 to 29	30 and over
	Percentage difference from national geometric mean						
Educational institution:							
Academic year base....	−28.4	−28.7	−24.9	−21.7	−15.5	−8.9	−4.0
Calendar year base....	−19.4	−19.7	−15.5	−11.8	− 4.8	2.7	8.2
Government:							
Federal.....	−26.3	−18.7	− 6.3	− 1.4	8.1	20.5	27.2
Other.....	−29.2	−21.9	−10.0	− 5.2	3.9	15.8	22.2
Other employer:							
Nonprofit organization.	−19.2	−19.6	− 5.4	7.4	18.3	34.0	54.1
Industry or business...	−15.4	−15.8	− .9	12.5	23.9	40.4	61.5
Self-employed.....	−14.6	−15.0	0	13.5	25.0	41.6	62.9

30 years and over, the gap had increased to 27 per cent over the Federal government and 49 per cent over educational institutions.

For persons with no previous experience, working for the Federal government tended to depress salaries by 9 per cent below the calendar-year pay at educational institutions. But by the next experience level there was no difference, and thereafter work for the Federal government tended to be progressively more highly rewarded. In the group with 10 to 14 years of experience, the government advantage was 12 per cent; for those with 30 or more years, it was 18 per cent.

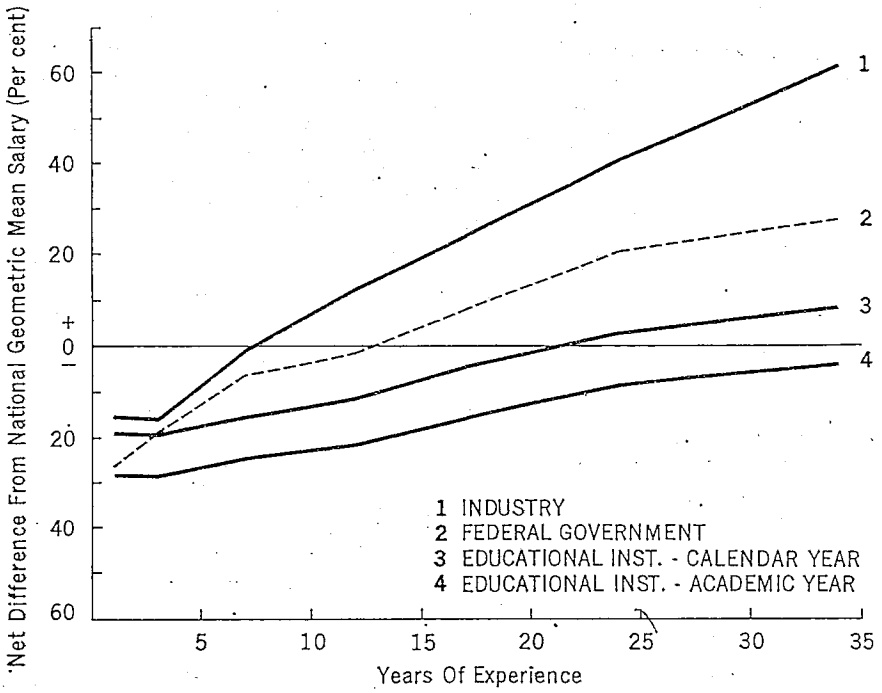
Minor salary influences were found for employer subgroups within each of the three major groupings. The largest of these influences was based on the distinction between academic and calendar year employment at educational institutions. Work on a calendar year basis tended to bring a salary 13 per cent higher than for an academic year. Of course, many of the academic-year group may have received additional salary income during the free months, but such income was not included in the analysis.

Within the government grouping, Federal government employment carried a 4 per cent salary advantage over work for state and local governments. And within the last major group, industry and business tended to pay 5 per cent more than nonprofit organizations.

Experience. As Figure III-A-1 illustrates, salary progression attributed to additional experience differed markedly among the three major employer groupings. Between the class with one year or less of experience and that with 30 or more years, the total net salary gain attrib-

FIGURE III-A-1

NET RELATIONSHIP BETWEEN ECONOMISTS' SALARIES AND YEARS OF EXPERIENCE, BY SELECTED EMPLOYER GROUPS



uted to added experience was 34 per cent at educational institutions, 73 per cent in government, and 91 per cent in industry. Assuming this period to cover 33 years, the net average annual rate of such progression was 0.9 per cent at educational institutions, 1.7 per cent in government, and 2.0 per cent in industry.

During the first six years of this period, the average progression in government was a sharp 4.1 per cent annually, with business and industry not far behind at 2.7 per cent. At educational institutions, however, the annual rate was only 0.8 per cent.

Over the following ten years, progression in government fell off to an annual rate of 1.4 per cent, while in business it was 2.3 per cent and at educational institutions it rose to 1.2 per cent. Then during the last 17 years of the 33-year period, the annual rate of progression was reduced at all employers, falling to 1.6 per cent in industry, 1.0 per cent in government, and 0.7 per cent at educational institutions.

Table III-A-3 shows the change in the net coefficients between 1964 and 1966, for employer-experience classes. A positive change indicates that the class gained in salary relative to the overall geometric mean, whereas a negative value indicates that it lost ground relative to that

mean. There are two striking findings: (1) the relatively sharp gain for persons with one year or less of experience, which occurred at all major employers except the Federal government; and (2) the overall gain at educational institutions and governments at the expense of business and nonprofit organizations (if some groups gain relative to the overall mean, others must necessarily lose relative to the same mean). Both of these changes, by reducing the net differences between the extremes of employer and experience ranges, operated to reduce the proportion of the total salary variation that could be explained by these characteristics.

Other Net Relationships

Net relationships between salaries and five other characteristics are presented in the first column of Table III-A-4 and are charted in Figure III-A-2.

In the discussion that follows for each characteristic, the salient features of the 1966 net relationship are emphasized. Differences between the 1966 and 1964 coefficients are also presented in Table III-A-4, but in no instance did they appear large enough to be of material significance or to warrant comment.

In the preceding chapter treating the all-profession model, there was mention when warranted of how the net relationship for one characteristic was affected by the introduction of certain other characteristics into the model. The findings of this nature discussed there also apply in general to the relationships for economists, and are not repeated here.

Highest academic degree. As previously noted, the level of academic degree attained by the economist exerted the greatest single influence

TABLE III-A-3—CHANGE IN NET COEFFICIENTS FROM 1964 TO 1966, BY TYPE OF EMPLOYER AND YEARS OF EXPERIENCE

Type of employer	Years of experience						
	1 or less	2 to 4	5 to 9	10 to 14	15 to 19	20 to 29	30 and over
Educational institution:							
Academic year base	+4.8	+ 2.5	+ 2.1	− .4	+ 1.3	+ .8	− 3.9
Calendar year base	+5.6	+ 3.1	+ 2.6	− .1	+ 1.9	+ 1.3	− 3.9
Government:							
Federal	+ .8	− 1.0	+ 2.8	− 1.7	+ 3.5	+ 4.5	+ 3.8
Other	+3.4	+ 2.0	+ 6.0	+ 2.1	+ 7.1	+ 8.5	+ 8.1
Other employer:							
Nonprofit organization	+4.0	− 3.3	− 4.2	− 2.0	− 4.3	− 6.2	− 5.8
Industry or business	+4.9	− 2.7	− 4.0	− 1.1	− 3.2	− 5.1	− 4.5
Self-employed	−1.8	−10.0	−13.7	−11.8	−15.2	−18.8	−20.1

TABLE-III-A-4—RELATIONSHIPS BETWEEN ECONOMISTS' SALARIES AND SPECIFIED CHARACTERISTICS

Characteristic	Percentage difference from national geometric mean, 1966		Change in net coefficient 1964–66	Percentage of respondents in class
	Net	Gross		
Primary work activiy:				
Management of—				
Other than r & d	12.7	29.2	− .9	20.3
R & d	11.7	28.7	− .1	10.9
Basic research	.9	− 8.4	−1.4	4.8
Applied research	− 1.5	− 6.3	+ .6	13.0
Production & inspection	− 8.4	− 4.4	+ .5	9.4
Teaching	− 9.1	−20.5	−1.1	30.4
Other or not reported	1.8	6.1	+1.2	11.3
Highest academic degree:				
Ph.D.	12.5	2.7	+ .7	45.6
Master's	− 9.3	− 9.9	−1.2	32.1
Bachelor's	−10.0	9.3	+ .1	20.6
Other or not reported	− 6.4	16.7	+5.0	1.7
Age:				
Under 30	−11.9	−33.3	+1.2	9.6
30–34	− 6.5	−21.6	− .4	15.6
35–39	− .1	− 6.6	+ .7	17.5
40–44	3.2	7.6	+ .1	17.0
45–54	4.8	19.3	−1.3	26.7
55–64	4.1	26.1	+1.7	11.2
65 and over	− 1.8	13.6	+1.1	2.2
Not reported	2.8	1.2	+2.7	.2
Sex:				
Male	.7	.9	+ .1	96.4
Female	−18.7	−22.9	−1.1	3.6
Economic specialty:				
Monetary and fiscal theory	3.7	− 5.3	+2.0	8.5
International	3.7	− 1.9	+1.8	4.6
Statistics	3.3	− 6.4	+2.7	3.2
Industrial organization	2.1	5.7	−1.9	6.0
Population and welfare	1.8	2.5	+6.2	1.9
Business	.9	9.5	− .3	37.9
Systems	− .3	− 5.0	− .9	6.9
Labor economics	− .8	− 6.9	+1.1	5.9
General theory	− 1.4	−11.8	− .5	9.4
History	− 5.3	−19.2	+ .4	2.2
Agricultural economics	− 5.7	− 4.4	+ .8	9.2
Land economics	− 6.8	− 6.7	− .4	3.8
Other	− 1.6	− .7	−4.1	.5

on salaries. The positive effect of the Ph.D. now proves to account for almost all of this effect. The Ph.D. degree tended to yield a 24 per cent

salary advantage over the Master's and a 25 per cent advantage over the Bachelor's. As this indicates, the difference in the salary effect of the latter degrees was not significant.

Primary work activity. The primary work activity in which an economist was engaged exerted considerable influence on salary. Management tended to pay 13 per cent more than research and 23 per cent more than teaching. Research enjoyed an advantage of about 8 per cent over both teaching and production and inspection.

It made little difference whether the management effort involved supervison of research and development or of other activities. Similarly, there was no significant difference between the impact of basic as opposed to applied research.

Sex. Being a woman tended to reduce salary by 19 per cent, a significant effect both statistically and for the economists affected.[6] The pronounced difference was relatively unimportant in explaining total variation, however, because only 3.6 per cent of the registrants were women.

Age. The net influence of age on salaries was not large with the length of experience already represented in the model. Over the younger age groups and up to about age 50, however, net salary progression totaling 19 per cent was considered an effect of advancing age. Thereafter, further advance in age exerted a depressing effect, very slight at first but apparently accelerating after age 65.

Economic specialty. The economic specialties tending to produce a salary advantage were monetary and fiscal theory, international studies, and statistics, whereas salary disadvantage was associated with land economics, agricultural economics, and history. The net salary difference between these extremes was on the order of 10 to 11 per cent. On the whole, however, salary differences among economic specialties accounted for little of the total salary variation.

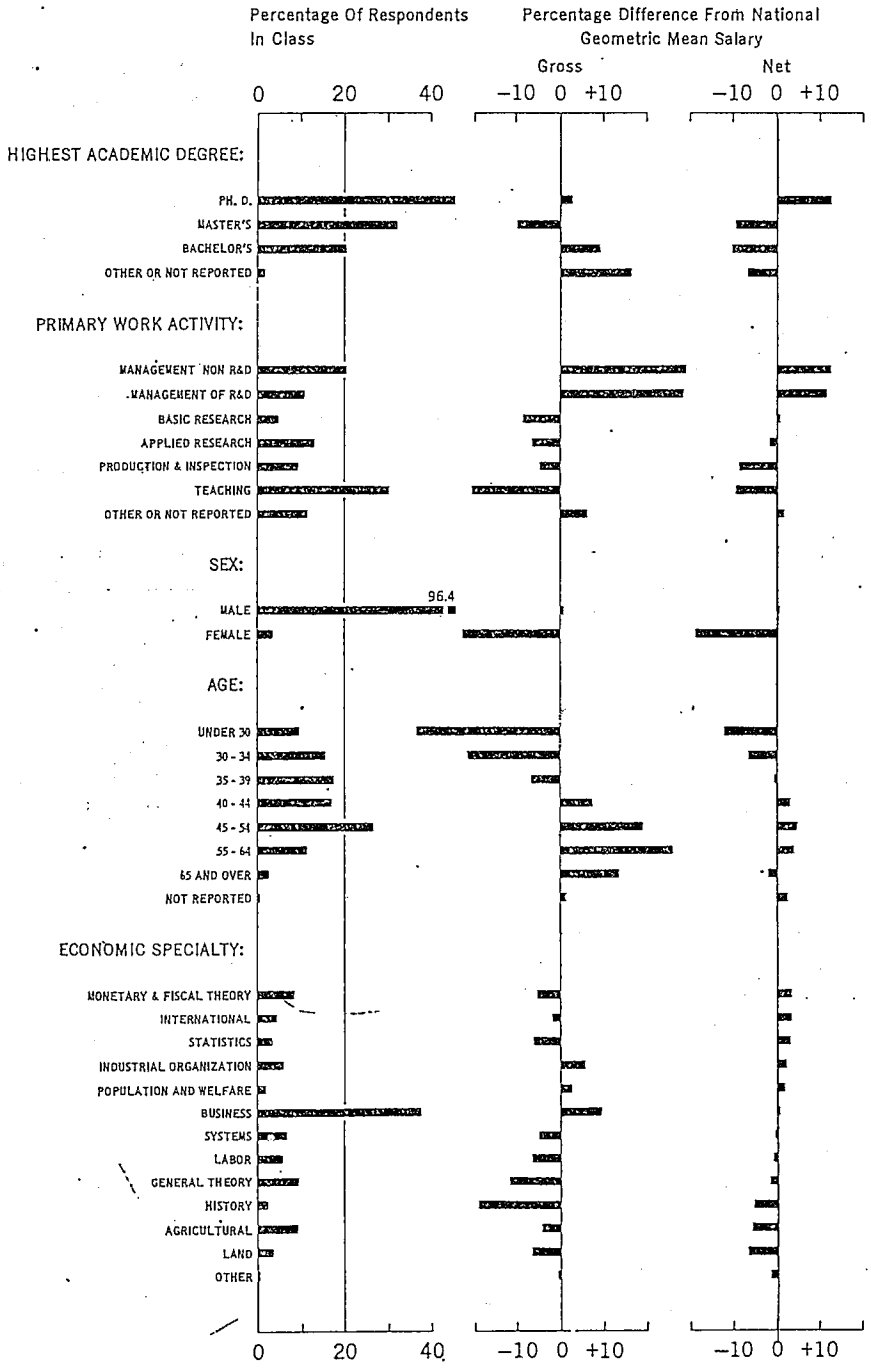
Estimating Individual Salaries

The model can be used to estimate salaries for individuals with specific characteristics, in the manner described in the previous study. For instance, the salary of the economist for which an estimate of $10,127 was obtained from the all-profession model can alternatively be estimated with this model. The subject was a male (+0.7) economist, 34 years old (—6.5), holder of a Ph.D. (+12.5), with eight years of experience and currently engaged in teaching (−9.1) general theory (−1.4) at an educational institution on an academic year basis (−24.9).

[6] It might be helpful to note that the percentage differences cited in the text do not apply to the converse relationship unless recomputed to take account of the change in base. For example, women tended to be paid 19 per cent less than men, while men tended to be paid 24 per cent more than women.

FIGURE III-A-2

GROSS AND NET RELATIONSHIPS BETWEEN ECONOMISTS' SALARIES AND SPECIFIED CHARACTERISTICS



The 1966 salary estimate is made by multiplying these coefficients in turn by the overall geometric mean salary of $13,614 as follows:

$$\bar{Y} = (\$13{,}614)\ (1.007)\ (.935)\ (1.125)\ (.909)\ (.986)\ (.751)$$
$$= \$9{,}706$$

The standard error of the estimate ranged from −27 per cent to +36 per cent. Using it as a guide, a 1966 salary range from $7,085 to $13,200 would be estimated to include about two-thirds of all economists with the set of values given in the example.

To illustrate further that actual salaries of particular individuals are likely to differ considerably from the estimate obtained by solving the equation presented herein, salary estimates using the model were made for all of the 1966 registrants in economics. Table III-A-5 shows the extent to which the estimated salaries differed from the actual. Thirty-five per cent of the estimates were within 10 per cent of the actual salary, 71 per cent were within 25 per cent, and 93 per cent were within 50 per cent.

But though the usefulness of the model in making individual estimates thus seems rather limited, the model was very successful in estimating geometric mean salaries for all individuals with a particular common characteristic—for instance, all women, all Ph.D.'s, or all agricultural economists. Such means were estimated for all 58 classes represented in the model, and in each case the estimate came within 0.1 per cent of the actual mean. This test tends to indicate success in the primary goal of this work, the quantification of the general influence of each characteristic.

TABLE III-A-5—DISTRIBUTION OF INDIVIDUAL SALARY ESTIMATES FROM THE REGRESSION MODEL, BY PERCENTAGE DIFFERENCE FROM THE ACTUAL SALARIES IN 1966

Deviation of estimate from actual salary (per cent)	Economists	
	Number	Per cent of total
All economists	11,210	100.0
+50 and over	590	5.3
+25 to +49	1,304	11.6
+10 to +24	1,898	16.9
0 to +9	1,903	17.0
0 to −9	1,996	17.8
−10 to −24	2,201	19.6
−25 to −49	1,149	10.2
−50 and over	169	1.5