

## MEASURING WAGE AND EMPLOYMENT CHANGES AS WORKERS AGE BY USE OF COHORT DATA

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The unavailability of wage statistics for worker cohorts has generally resulted in the use of cross-sectional data to measure changes in wages. Many years ago, Woytinsky cautioned against such comparisons, warning that they

are likely to be misleading in comparisons over time because of a change in the composition of the labor force; they may show, for instance, a rise of wages in depression because of a reduction in the number of less skilled and low-paid workers, whom it is customary to lay off first ... 1/

Cross-sectional comparisons of average wages from one year to the next, which are based on the wages of employed workers are misleading because they

do not make allowance for the fact and extent of unemployment ... Based on payrolls, as such an average is, it necessarily measures only the earnings of those who continue to be attached to a job and ignores those who do not have a position and whose names consequently do not appear on the records of any employer. Yet unemployment of course affects the relative well being of those who labor, and its omission results in an overstatement of the actual average amounts received by those who seek work and is an imperfect portrayal of the relative changes from year to year of this larger class ... There is need, therefore, for measuring the average annual earnings of the active members of the working class by thus taking account of the losses of income resulting from the failure to find employment.

The theoretically best method of accomplishing this would be to obtain reports on total annual earnings or income from a large number of identical workmen over a period of years. At present, however, such material is unavailable ... 2/

1/ Encyclopedia of Social Sciences, p. 303. See also Staff Report on Employment, Growth, and Price Levels, Joint Economic Committee, U.S. Congress, December 24, 1959, which at page 142, on the basis of cross-sectional comparisons concludes that from 1947 to 1958 wages tended "to continue to move upward, even during periods of substantial unemployment."

2/ Paul H. Douglas, Real Wages in the United States, Houghton, Mifflin Company, New York, 1930, pp. 11 and 12.

The Cohort and its Selection (Tables 1 and 2)

While Douglas' goal still cannot be fully achieved, it is now possible to trace and analyze the employment and wage histories of a cohort of identical workers as they aged from 1937 to 1957. Neither the employment nor the wage histories of these workers are complete, and they may not be completely representative of the history of the "typical" wage earner. From the wage records maintained by the Bureau of Old-Age and Survivors Insurance, however, it is possible to examine the history of a cohort of 61,202 wage workers--39,018 men and 22,184 women--with respect to that part of their employment covered by the BOASI program and to the wage credits they received as a result of such employment. This paper reports a few of the highlights from a forthcoming study of this cohort which was selected from the Continuous Work History Sample maintained by the Bureau of Old-Age and Survivors Insurance. The cohort represents a 0.1 percent sampling of wage earners working in covered employment in 1957. 3/ Workers were included in the cohort on the basis of two criteria: (1) In 1957, they were working in employment covered by the OASI program; and (2) when working in covered employment in any of the years in the 1951-57 period, they received wage credits 4/ solely from work as wage earners. Selection of the cohort on this retrospective basis guaranteed that the cohort members were alive in the period preceding 1957, and obviated the need for adjusting the wage data to take into account the incidence of mortality. The method of cohort selection, therefore, differs from the more usual method, and conceivably could affect the findings of this study. Our findings with respect to wage differentials and sex differentials, however, are consistent with the findings of other studies of wage problems, and suggest that use of this method of cohort selection does not result in findings which would be appreciably different if a different method of selection had been used.

Employment and wage credits of the cohort are analyzed for the 1937-57 period, which is divided into two time spans--1937-50 and 1951-57. Wage histories of workers included in this study

3/ For a description of the sample, see The Continuous Work History Sample Under Old-Age and Survivors Insurance in the United States of America, by B. J. Mandel, First International Conference of Social Security Actuaries and Statisticians, Brussels, November 1956. Also see Jacob Perlman and Benjamin Mandel, "Sampling the Federal OASI Records," Journal of the American Statistical Association, September 1953.

4/ Wages credited to a worker for work in covered employment in a given year for purposes of benefit computations--up to \$3,000 for 1937-50, \$3,600 for 1951-54, and \$4,200 for 1955-57.

Table 1.--Number of Wage Earners in the Cohorts, by Sex, Age, and Average Wage Credits Per Year in Covered Employment <sup>a/</sup>

Age in 1957	Male					Female				
	Average Wage Credits PYE, 1951-57					Average Wage Credits PYE, 1951-57				
	Total	Under \$1,200	\$1,200-\$2,399	\$2,400-\$3,599	\$3,600 and over	Total	Under \$1,200	\$1,200-\$2,399	\$2,400-\$3,599	\$3,600 and over
Total ....	39,018	8,989	7,497	9,811	12,721	22,184	10,481	7,215	3,542	946
1-15 .....	324	320	3	1	---	150	148	2	---	---
16-19 .....	3,243	2,812	374	55	2	2,290	1,991	289	10	---
20-24 .....	5,096	2,472	1,882	716	26	3,040	1,658	1,194	188	---
25-29 .....	4,829	870	1,495	1,861	503	2,371	984	902	455	30
30-34 .....	4,775	461	769	1,634	1,911	2,397	1,090	751	472	84
35-39 .....	4,599	419	614	1,267	2,299	2,500	1,064	805	512	119
40-44 .....	3,957	339	486	1,017	2,115	2,390	953	829	463	145
45-49 .....	3,542	324	493	844	1,881	2,326	834	824	502	166
50-54 .....	2,887	275	358	694	1,560	1,788	630	622	382	154
55-59 .....	2,318	216	332	651	1,119	1,365	457	471	296	141
60-64 .....	1,731	148	280	465	838	848	325	293	158	72
65-69 .....	1,064	154	231	334	345	479	216	157	79	27
70 and over .	629	174	168	169	118	234	128	73	25	8

<sup>a/</sup> 0.1 percent sample of workers with credits solely from work as wage earners in 1957 and when employed any time in the 1951-57 period.

Table 2.--Percentage Distribution of Male and Female Age Cohorts by Average Wage Credits Per Year in Covered Employment

Age in 1957	Male				Female			
	Average Wage Credits PYE, 1951-57				Average Wage Credits PYE, 1951-57			
	Under \$1,200	Under \$2,400	Under \$3,600	\$3,600 and over	Under \$1,200	Under \$2,400	Under \$3,600	\$3,600 and over
Total ....	23.0	42.2	67.3	32.6	47.2	79.7	95.7	4.3
1-15 .....	98.8	99.7	100.0	---	98.7	100.0	100.0	---
16-19 .....	86.7	98.2	99.9	0.1	86.9	99.5	99.9	---
20-24 .....	48.5	85.4	99.5	0.5	54.5	93.8	100.0	---
25-29 .....	18.0	49.0	89.6	10.4	41.5	79.5	98.7	1.3
30-34 .....	9.7	25.8	60.0	40.0	45.5	76.8	96.5	3.5
35-39 .....	9.1	22.5	50.0	50.0	42.6	74.8	95.3	4.8
40-44 .....	8.6	20.9	46.6	53.4	39.9	76.6	94.0	6.1
45-49 .....	9.1	23.0	46.8	53.1	35.9	71.3	92.9	7.1
50-54 .....	9.5	21.9	45.9	54.0	35.2	70.0	91.4	8.6
55-59 .....	9.3	23.6	51.7	48.3	33.5	68.0	89.7	10.3
60-64 .....	8.5	24.7	51.6	48.4	38.3	72.9	91.5	8.5
65-69 .....	14.5	36.2	67.6	32.4	45.1	77.9	94.4	5.6
70 and over .	27.7	54.4	81.3	18.8	54.7	85.9	96.6	3.4

are classified by age in 1957, and by sex. In addition, they are grouped into four subcohorts. Those whose average wage credits per year employed, 1951-57, were: (1) less than \$1,200 constitute the low-paid cohort; (2) \$1,200-\$2,399 constitute the intermediate low-paid cohort; (3) \$2,400-\$3,599 constitute the intermediate high-paid cohort; (4) \$3,600 or more constitute the high-paid cohort.

About two-thirds of the male cohort, and more than nine-tenths of the female cohort, had average wage credits of less than \$3,600 per year employed during the 1951-57 period. While this proportion varied with age, among male workers 40 years of age or older, the proportion of lower-paid workers was surprisingly high. For men aged 50-54, 46 percent had average wage credits per year in covered employment (PYE), 1951-57, of less than \$3,600, and for those aged 60-64, a little more than one-half the male cohort had average wage credits of less than \$3,600 PYE, 1951-57. For only one group in the female cohort--age 55-59--was the proportion of workers with credits of \$3,600 or more PYE, 1951-57, as high as 10 percent. Among women 25 to 69 years of age, the proportion with average credits of less than \$1,200 PYE, 1951-57, varied from 35 percent to 45 percent. About 80 percent of all the women are to be found in the two lowest-paid cohorts--i.e., those with average credits of less than \$2,400 PYE, 1951-57.

#### Analytical Concepts

Because the two time periods are of unequal duration, it was necessary to derive a common denominator by which employment and wage credits in each period could be compared. The Employment Ratio (ER) enables us to make such a comparison. It measures average intensity or continuity of employment of a cohort by relating the average number of years of work in employment covered by the Social Security Act to a given span of years. If a cohort, for example, was employed for an average of 7 years in covered employment during 1937-50, its ER was  $.50 \left[ \frac{7 \text{ years employed}}{14 \text{ elapsed years}} \right]$ .

If the same cohort was also in covered employment an average of 7 years during 1951-57, its ER was  $1.00 \left[ \frac{7 \text{ years employed}}{7 \text{ elapsed years}} \right]$ .<sup>5/</sup> Thus, although the

average number of years in covered employment of the hypothetical cohort was the same for both 1937-50 and 1951-57, the intensity of employment in the 1951-57 period was twice as great as in the 1937-50 period.

Average wage credits per year employed (PYE) indicate the average wage credits per year in covered employment during a given number of years. Average wage credits per elapsed year (PEY), on the other hand, are derived by dividing

the average credits cumulated by the cohort by the number of elapsed years in a given time span. Average wage credits per elapsed year (PEY) thus reflect the joint effects of nonemployment<sup>6/</sup>--as indicated by the ER--and by the level of wages PYE. As a welfare indicator, therefore, average wage credits PEY are a more significant measure than average credits PYE. Mathematically, the relationship between these three concepts may be expressed succinctly: Average wage credits PYE x ER = Average wage credits PEY.

#### 1. Employment Intensity and Average Wage Credits, 1937-50, 1951-57

One of the principal uses of cohort analyses of wages is illustrated by the remainder of this paper. For wage earners in employment covered by the Social Security Act, we ask this question: To what degree was the increase in average earnings credits of the cohort due to increasing intensity or continuity of employment, and to what degree was this increase due to changes in the level of annual wage credits PYE? In the first part of this discussion, we examine employment changes from 1937-50 to 1951-57 as well as changes in the average wage credits per year employed and per elapsed year during these two periods. In the latter part, we examine the joint effects of changes in these two factors on average credits per elapsed year.

#### Male ER's (Table 3)

A comparison of the ER's for men for 1937-50 and 1951-57 indicates that as the male cohorts aged, intensity of employment (ER's) and the level of average annual wage credits PYE, 1951-57, on the whole were closely associated throughout the 1937-57 period. For those 50-54 years old in 1957, the ER's of the lowest-paid males were .407 in 1937-50; .671 in 1951-57; and .495 for 1937-57. For the intermediate low-paid males of this age, the ER's were correspondingly higher--.600 in 1937-50; .886 in 1951-57; and .695 for 1937-57. For the intermediate high-paid males in this age group the ER's for these three periods were still higher, .714, .943, and .790, respectively. For the highest-paid males of this age the ER's were highest--.864, .971, and .900, respectively. With the exception of the highest-paid males younger than 25 years of age, whose ER's probably reflect their more extensive schooling, ER's for 1937-50, 1951-57, and 1937-57 are closely associated with the level of average annual wage credits PYE, 1951-57.

#### Females--ER's (Table 4)

Among the female cohorts, the same general relationship between ER's and annual wage credits PYE, 1951-57, prevailed. With the exception of the small number of women in the highest-paid cohort--

<sup>5/</sup> For workers aged 20 or younger in 1957 the ER was computed on the basis of years elapsing since 1937 or the year of birth, whichever was later.

<sup>6/</sup> Nonemployment includes not only years of unemployment, but also periods which may involve withdrawal from the labor force or work in employment not covered under the Social Security Act.

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Table 3.--Employment Ratios (ER's) for 1937-50, 1951-57, and 1937-57,  
by Age in 1957 and Average Wage Credits Per Year Employed, 1951-57

Age in 1957	1937-50				1951-57				1937-57			
	Under \$1,200	\$1,200- \$2,399	\$2,400- \$3,599	\$3,600 and over	Under \$1,200	\$1,200- \$2,399	\$2,400- \$3,599	\$3,600 and over	Under \$1,200	\$1,200- \$2,399	\$2,400- \$3,599	\$3,600 and over
Total .	.129	.307	.493	.736	.529	.757	.886	.957	.262	.457	.624	.810
1-15 ....	---	---	.643	---	.200	.329	.714	---	---	---	---	---
16-19 ....	---	---	---	---	.329	.386	.357	.286	.131	.154	.143	.114
20-24 ....	.014	.029	.043	.086	.614	.700	.771	.657	.214	.252	.286	.276
25-29 ....	.157	.207	.271	.343	.614	.714	.814	.857	.310	.376	.452	.514
30-34 ....	.300	.371	.407	.486	.643	.814	.871	.957	.414	.519	.562	.643
35-39 ....	.364	.457	.514	.650	.686	.829	.886	.957	.471	.581	.638	.752
40-44 ....	.414	.521	.643	.800	.671	.843	.914	.957	.500	.629	.733	.852
45-49 ....	.400	.600	.693	.843	.671	.857	.929	.971	.490	.686	.771	.886
50-54 ....	.407	.600	.714	.864	.671	.886	.943	.971	.495	.695	.790	.900
55-59 ....	.450	.600	.750	.879	.657	.886	.943	.971	.519	.695	.814	.910
60-64 ....	.429	.607	.757	.857	.671	.900	.957	.957	.510	.705	.824	.890
65-69 ....	.386	.579	.779	.871	.714	.886	.957	.971	.495	.681	.838	.905
70 and ... over	.471	.614	.757	.814	.700	.871	.943	.929	.548	.700	.819	.852

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Table 4.--Employment Ratios (ER's) for 1937-50, 1951-57, and 1937-57,  
by Age in 1957 and Average Wage Credits Per Year Employed, 1951-57

Age in 1957	1937-50				1951-57				1937-57			
	Under \$1,200	\$1,200- \$2,399	\$2,400- \$3,599	\$3,600 and over	Under \$1,200	\$1,200- \$2,399	\$2,400- \$3,599	\$3,600 and over	Under \$1,200	\$1,200- \$2,399	\$2,400- \$3,599	\$3,600 and over
Total .	.186	.336	.507	.607	.543	.800	.914	.857	.305	.490	.643	.690
1-15 ....	---	---	---	---	.186	.500	---	---	---	---	---	---
16-19 ....	---	---	.050	---	.300	.357	.414	---	.120	.143	.206	---
20-24 ....	.014	.014	.036	---	.600	.729	.786	---	.210	.252	.286	---
25-29 ....	.164	.207	.250	.300	.629	.843	.929	.800	.319	.419	.476	.467
30-34 ....	.307	.379	.464	.507	.600	.814	.929	.943	.405	.524	.619	.652
35-39 ....	.336	.450	.586	.636	.571	.800	.914	.886	.414	.567	.695	.719
40-44 ....	.314	.464	.600	.679	.600	.829	.914	.886	.410	.586	.705	.748
45-49 ....	.300	.443	.600	.607	.614	.857	.914	.857	.405	.581	.705	.690
50-54 ....	.271	.464	.607	.650	.629	.857	.914	.857	.390	.595	.710	.719
55-59 ....	.279	.493	.614	.614	.629	.886	.929	.843	.395	.624	.719	.690
60-64 ....	.257	.521	.650	.614	.643	.900	.929	.829	.386	.648	.743	.686
65-69 ....	.257	.493	.629	.371	.686	.900	.857	.686	.400	.629	.705	.476
70 and ... over	.336	.486	.493	.779	.771	.929	.900	.843	.481	.633	.629	.800

less than 5 percent of the 21,000 women included in this study--ER's for 1937-50 and 1951-57 and average annual wage credits PYE, 1951-57, were also closely associated. For women 50-54 years old in 1957, ER's for the lowest-paid cohort were .271 in 1937-50; .629 in 1951-57; and .390 for 1937-57. For the intermediate low-paid women of this age, ER's were correspondingly higher--.464 in 1937-50; .857 in 1951-57, and .595 for 1937-57. For the intermediate high-paid women of this age, ER's were still higher--.607 for 1937-50; .914 for 1951-57; and .710 for 1937-57. For women with average credits of \$3,600 or more PYE, 1951-57, ER's in 1937-50 were higher than for the three lower-paid female cohorts but were lower than those of the intermediate high-paid women in 1951-57. This variation is probably explained by differences in the employment propensity of women in the higher socio-economic levels.

#### Changes in ER's, 1937-50 to 1951-57 (Table 5)

The ER's furnish a dramatic summary of the patterns of increased employment which characterize the post-World War II economy, and of the differences between the male and female patterns of continuity of employment during this period.

While the male ER was higher than the female ER in both 1937-50 and 1951-57, Table 5 indicates that among the three lowest-paid cohorts, for both these periods the female ER exceeded the male ER. Furthermore, from 1937-50 to 1951-57 the ER's of women rose by 133 percent, while those of the male cohort increased by only 78 percent--a vivid reflection of the substantial rise in female employment during the post-World War II period.

For 1937-57 as a whole, among the three lowest-paid cohorts the ER's of the females were somewhat higher than those of the male cohorts; only for the highest-paid cohort was the female ER lower than the male ER.

Table 5.--ER's of Four Male and Female Cohorts as They Aged, 1937-50, 1951-57, and 1937-57

Sex and Wage Cohort	1937-1957	1937-1950	1951-1957	1951-1957 as % of 1937-1950
	(1)	(2)	(3)	(4)
Male cohorts .....	.567	.450	.800	177.8
Low-paid .....	.262	.129	.529	410.1
Intermediate low-paid.	.457	.307	.757	246.6
Intermediate high-paid	.624	.493	.886	179.7
High-paid .....	.810	.736	.957	130.0
Female cohorts .....	.433	.300	.700	233.3
Low-paid .....	.305	.186	.543	291.9
Intermediate low-paid.	.490	.336	.800	238.1
Intermediate high-paid	.643	.507	.914	180.3
High-paid .....	.690	.607	.857	141.2

#### Males--Average Wage Credits PYE (Table 6)

Average wage credits per year employed refer only to average credits of workers employed in jobs covered by the OASI program. Because they are calculated on a year-in-covered-employment basis, average credits PYE tend to be far more stable than average credits per elapsed year, which reflect trends in both the ER's and the average PYE's.

Although the level of average credits PYE generally increased from 1937-50 to 1951-57 for the male cohorts, the relative levels of average credits PYE of the four respective male cohorts remained unchanged during both time periods. The lowest-paid cohort during 1951-57 had the lowest average wage credits PYE for 1937-50. For each successively higher-paid cohort in 1951-57, average credits PYE for 1937-50 were also successively higher. Average wage credits PYE, 1951-57, of the four successively higher-paid male cohorts were \$666, \$1,819, \$3,069, and \$3,822, respectively. Average credits PYE, 1937-50, of the identical workers in these four cohorts were \$684, \$1,020, \$1,422, and \$2,048, respectively. These data suggest that the relative positions of the average low-paid and high-paid workers in the wage structure tend to be established at an early age and remain relatively unchanged throughout the working lifetime. It should be noted, however, that these are data for averages, and that the relative positions of substantial numbers of individual workers may improve with increased training or education during their working lifetimes.

As the members of the lowest-paid male cohort aged, the absolute level of the average wage credits per year employed of the older members--those aged 45 or older in 1957--declined from the 1937-50 levels. For those aged 55-59, for example, average credits PYE declined from \$768 for 1937-50 to \$694 for 1951-57. Similar declines occurred among workers in each of the older age groups in the lowest-paid cohort. Despite the rise in average annual wage credits PYE, which occurred among workers of every age in the three higher-paid cohorts, the data suggest that the annual wage credits per year employed of older, lower-paid workers tend to decline as they age, regardless of the secular upward trend in wage credits of all workers.

#### Females--Average Wage Credits PYE (Table 7)

The average wage credits per year employed of the female cohorts differ from those of the male cohorts in one significant respect. Although the upward trend which characterized the male average PYE from 1937-50 to 1951-57 also characterized the female average PYE, the older lowest-paid female cohort--unlike the older lowest-paid male cohort--suffered no decline in average wage credits PYE. From 1937-50 to 1951-57 average credits per year employed of each age group (except for those 70 or older) in the lowest-paid female cohort increased. Among the lowest-paid women aged 40-44, for example, average credits PYE rose from \$593 for 1937-50 to \$708 for 1951-57, or 19 percent. For women aged 50-54, average credits PYE increased

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Table 6.--Average Wage Credits Per Year Employed (PYE) for 1937-50, 1951-57, and 1937-57, by Age in 1957 and Average Wage Credits Per Year Employed, 1951-57

Age in 1957	1937-50				1951-57				1937-57			
	Under \$1,200	\$1,200-\$2,399	\$2,400-\$3,599	\$3,600 and over	Under \$1,200	\$1,200-\$2,399	\$2,400-\$3,599	\$3,600 and over	Under \$1,200	\$1,200-\$2,399	\$2,400-\$3,599	\$3,600 and over
Total ..	\$684	\$1,020	\$1,442	\$2,048	\$666	\$1,819	\$3,069	\$3,822	\$672	\$1,461	\$2,212	\$2,747
1-15 .....	---	---	1,782	---	245	1,572	3,481	---	245	1,572	2,389	---
16-19 .....	---	---	---	---	510	1,575	2,729	4,003	510	1,575	2,729	4,003
20-24 .....	96	180	465	476	704	1,744	2,835	3,714	677	1,626	2,598	3,044
25-29 .....	425	618	833	1,104	753	1,828	3,018	3,784	642	1,384	2,144	2,593
30-34 .....	549	806	1,057	1,432	742	1,856	3,111	3,806	649	1,355	2,119	2,610
35-39 .....	616	861	1,204	1,669	701	1,885	3,143	3,820	657	1,348	2,101	2,581
40-44 .....	646	985	1,402	1,941	688	1,848	3,103	3,828	665	1,371	2,109	2,647
45-49 .....	711	1,086	1,560	2,194	685	1,875	3,083	3,830	699	1,415	2,171	2,792
50-54 .....	715	1,174	1,702	2,316	695	1,857	3,080	3,830	706	1,464	2,250	2,861
55-59 .....	768	1,226	1,882	2,435	694	1,869	3,099	3,831	737	1,499	2,352	2,932
60-64 .....	935	1,350	1,923	2,465	716	1,857	3,123	3,824	839	1,566	2,388	2,952
65-69 .....	890	1,456	2,049	2,508	732	1,825	3,047	3,812	814	1,616	2,429	2,975
70 and over	1,274	1,685	2,076	2,541	694	1,767	3,030	3,813	1,027	1,719	2,442	3,003

## FEMALE WAGE COHORTS

Table 7.--Average Wage Credits Per Year Employed (PYE) for 1937-50, 1951-57, and 1937-57, by Age in 1957 and Average Wage Credits Per Year Employed, 1951-57

Age in 1957	1937-50				1951-57				1937-57			
	Under \$1,200	\$1,200-\$2,399	\$2,400-\$3,599	\$3,600 and over	Under \$1,200	\$1,200-\$2,399	\$2,400-\$3,599	\$3,600 and over	Under \$1,200	\$1,200-\$2,399	\$2,400-\$3,599	\$3,600 and over
Total ..	\$574	\$901	\$1,282	\$1,852	\$653	\$1,764	\$2,929	\$3,800	\$621	\$1,370	\$2,063	\$2,658
1-15 .....	---	---	---	---	174	1,877	---	---	174	1,877	---	---
16-19 .....	---	---	1,126	---	467	1,542	2,623	---	467	1,540	2,332	---
20-24 .....	196	118	366	---	658	1,708	2,710	---	637	1,648	2,522	---
25-29 .....	464	696	889	1,128	662	1,776	2,875	3,741	594	1,420	2,180	2,621
30-34 .....	590	879	1,264	1,587	667	1,809	2,956	3,750	628	1,361	2,110	2,629
35-39 .....	561	790	1,188	1,595	657	1,774	2,960	3,780	605	1,253	1,965	2,492
40-44 .....	593	822	1,209	1,630	708	1,753	2,960	3,790	649	1,261	1,966	2,483
45-49 .....	597	928	1,326	1,867	694	1,794	2,947	3,812	646	1,354	2,027	2,672
50-54 .....	578	940	1,368	1,944	699	1,773	2,944	3,812	643	1,340	2,045	2,686
55-59 .....	548	1,002	1,463	2,125	705	1,792	2,940	3,821	631	1,376	2,099	2,815
60-64 .....	636	1,097	1,534	2,227	674	1,801	2,933	3,823	657	1,423	2,117	2,870
65-69 .....	656	1,147	1,593	2,139	705	1,721	2,886	3,881	684	1,421	2,117	2,975
70 and over	718	1,279	1,767	2,462	690	1,666	2,934	3,866	703	1,468	2,324	2,955

from \$578 to \$699, a rise of 21 percent. Even among women aged 65-69, average credits PYE rose, increasing from \$656 for 1937-50 to \$705 for 1951-57, or 8 percent.

Despite the substantial percentage increase in the average credits per year employed of the lowest-paid women, the low levels which characterized the average PYE of these women in both periods indicate that when employed, they were in the main part-year workers. The low levels of the average PYE for both periods also suggest that to a considerable degree the increased employment of women in the postwar period involves a rise in the number of part-year workers. While the average credits PYE of the two higher-paid female cohorts who, it might be inferred, number a larger proportion of full-year workers, also rose, the proportion of high-paid women was relatively small. Since four-fifths of the women were in the two lowest-paid cohorts, the data suggest that for most working women, employment and wages are still second in importance to their responsibilities as wives and mothers.

Changes in Average Wage Credits PYE, 1937-50 to 1951-57 (Table 8)

The relatively greater percentage increase in the ER's of women as compared to those of men from 1937-50 to 1951-57 was accompanied by a greater relative increase in the female average wage credits PYE. The average annual wage credits PYE of the males increased by 67 percent from 1937-50 to 1951-57; for the females, the average PYE increased by 73 percent. Indeed, for the lowest-paid cohort, the male average PYE declined about 3 percent, while average credits PYE for the lowest-paid women rose by 14 percent. For the three highest-paid cohorts, the increase in average wage credits PYE was greater for women

Table 8.--Average Wage Credits Per Year Employed of Four Male and Female Cohorts as They Aged, 1937-50, 1951-57, and 1937-57

Sex and Wage Cohort	1937-1957	1937-1950	1951-1957	1951-1957 as % of 1937-1950
	(1)	(2)	(3)	(4)
Male cohorts .....	\$2,181	\$1,658	\$2,770	167.1
Low-paid .....	672	684	666	97.4
Intermediate low-paid.	1,461	1,020	1,819	178.3
Intermediate high-paid	2,212	1,442	3,069	212.8
High-paid .....	2,747	2,048	3,822	186.6
Female cohorts .....	1,373	989	1,706	172.5
Low-paid .....	621	574	653	113.8
Intermediate low-paid.	1,370	901	1,764	195.8
Intermediate high-paid	2,063	1,282	2,929	228.5
High-paid .....	2,658	1,852	3,800	205.2

than for men, rising by 96 percent for intermediate low-paid women as compared to 78 percent for men in the same wage cohort; by 129 percent for women as compared to 113 percent for men in the intermediate high-paid cohort; and by 105 percent for women, but only by 87 percent for men in the highest-paid cohort.

Males--Average Wage Credits PEY, 1937-50 and 1951-57 (Table 9)

The discussion thus far has demonstrated that as workers aged from 1937 to 1957 there was a general increase in intensity of employment, as measured by the ER, and in the level of average annual wage credits per year employed. The joint effects of these two factors may be discerned in the average wage credits per elapsed year.

For the four male cohorts, Table 9 indicates that when the cohorts are defined on the basis of the level of average wage credits PYE for 1951-57 there is a close association between the relative levels of average wage credits PYE and average wage credits PEY for both the 1937-50 and 1951-57 periods, and consequently for the entire 21-year time span, 1937-57. For each of the four male cohorts average wage credits PEY for 1951-57 varied directly with their respective average wage credits PYE for 1951-57. The levels of the average credits PEY for the four male cohorts for 1951-57 were also consistent with the respective levels of the average credits PYE for these same cohorts for 1937-50--i.e., the highest-paid cohort in 1951-57 had the highest average wage credits PEY for both 1951-57 and 1937-50; the lowest-paid cohort in 1951-57 had the lowest average wage credits PEY, 1937-50 and 1951-57. The relative average wage credits PEY for 1937-50 and 1951-57 for the two intermediate cohorts were in an intermediate position in both time periods.

An interesting instance of the difference between the average PYE and the average PEY, and of its significance, may be found when we compare the two types of wage credits for those aged 55-59 in the lowest-paid male cohort for 1937-50 and 1951-57, as follows:

Type of wage credit	1937-50	1951-57
Average PYE .....	\$768	\$694
Average PEY .....	\$346	\$460

What is true for the 55-59 year-old group in the lowest-paid male cohort is true for each of the groups aged 40 to 69 in this cohort. Although the level of their average wage credits PYE declined as they aged from 1937-50 to 1951-57, the intensity of their employment--i.e., their ER--increased to such an extent that their average credits per elapsed year increased. Thus, the increase in employment resulted in an increase in average wage credits PEY, despite the decline in their average wage credits PYE.

## MALE WAGE COHORTS

Table 9.--Average Wage Credits Per Elapsed Year (PEY) for 1937-50, 1951-57, and 1937-57, by Age in 1957 and Average Wage Credits Per Year Employed, 1951-57

Age in 1957	1937-50				1951-57				1937-57			
	Under \$1,200	\$1,200-\$2,399	\$2,400-\$3,599	\$3,600 and over	Under \$1,200	\$1,200-\$2,399	\$2,400-\$3,599	\$3,600 and over	Under \$1,200	\$1,200-\$2,399	\$2,400-\$3,599	\$3,600 and over
Total ..	\$88	\$313	\$711	\$1,507	\$352	\$1,390	\$2,701	\$3,666	\$176	\$672	\$1,374	\$2,227
1-15 .....	---	---	1,146	---	49	524	2,486	---	---	---	---	---
16-19 .....	---	---	---	---	170	606	964	1,144	---	---	---	---
20-24 .....	1	5	20	41	431	1,213	2,189	2,449	145	408	743	843
25-29 .....	67	128	226	379	463	1,317	2,469	3,233	199	524	974	1,330
30-34 .....	165	299	430	696	479	1,516	2,715	3,638	269	705	1,192	1,677
35-39 .....	224	393	619	1,085	483	1,565	2,774	3,649	310	784	1,337	1,940
40-44 .....	267	513	901	1,553	463	1,558	2,834	3,680	333	861	1,546	2,262
45-49 .....	284	652	1,081	1,850	463	1,617	2,872	3,739	344	973	1,678	2,479
50-54 .....	291	704	1,215	2,001	470	1,640	2,904	3,719	351	1,016	1,778	2,574
55-59 .....	346	736	1,411	2,140	460	1,656	2,929	3,742	384	1,042	1,917	2,674
60-64 .....	401	819	1,456	2,112	481	1,673	2,990	3,681	428	1,104	1,967	2,635
65-69 .....	344	843	1,596	2,184	528	1,617	2,913	3,681	405	1,101	2,035	2,683
70 and over	600	1,035	1,571	2,068	408	1,535	2,854	3,554	563	1,202	1,999	2,564

## FEMALE WAGE COHORTS

Table 10.--Average Wage Credits Per Elapsed Year (PEY) for 1937-50, 1951-57, and 1937-57, by Age in 1957 and Average Wage Credits Per Year Employed, 1951-57

Age in 1957	1937-50				1951-57				1937-57			
	Under \$1,200	\$1,200-\$2,399	\$2,400-\$3,599	\$3,600 and over	Under \$1,200	\$1,200-\$2,399	\$2,400-\$3,599	\$3,600 and over	Under \$1,200	\$1,200-\$2,399	\$2,400-\$3,599	\$3,600 and over
Total ..	\$107	\$303	\$650	\$1,124	\$357	\$1,421	\$2,666	\$3,268	\$190	\$675	\$1,322	\$1,839
1-15 .....	---	---	---	---	32	939	---	---	---	---	---	---
16-19 .....	---	---	56	---	141	543	1,087	---	---	---	---	---
20-24 .....	3	2	13	---	395	1,236	2,146	---	133	413	724	---
25-29 .....	76	144	222	338	413	1,508	2,669	2,993	189	599	1,038	1,223
30-34 .....	181	333	586	805	400	1,466	2,764	3,514	254	711	1,312	1,708
35-39 .....	188	355	696	1,014	376	1,426	2,720	3,363	251	712	1,371	1,797
40-44 .....	186	381	725	1,107	429	1,463	2,706	3,379	267	742	1,386	1,864
45-49 .....	179	411	796	1,133	431	1,541	2,681	3,267	263	788	1,424	1,845
50-54 .....	157	436	830	1,264	438	1,515	2,672	3,243	250	796	1,444	1,923
55-59 .....	153	494	898	1,305	443	1,578	2,720	3,209	250	855	1,505	1,940
60-64 .....	163	572	997	1,367	436	1,637	2,720	3,139	254	927	1,571	1,958
65-69 .....	169	565	1,002	794	489	1,553	2,499	2,619	275	895	1,501	1,402
70 and over	241	622	871	1,918	529	1,537	2,650	3,223	337	927	1,464	2,353

Females---Average Wage Credits  
PEY, 1937-50 and 1951-57 (Table 10)

Average wage credits per elapsed year of the four female cohorts increased for each age group from 1937-50 to 1951-57. While the average PEY of the lowest-paid female cohort increased about three and a half times from 1937-50 to 1951-57, the level of the average PEY for these women, even in 1951-57 is still quite low. This reinforces our conclusion that the increased employment of women in the post-World War II period in the main involves an increase in the number of women who are employed on a part-year basis and whose employment patterns tend to be intermittent, or perhaps in many instances, casual in nature.

Changes in Average Wage Credits  
PEY, 1937-50 to 1951-57 (Table 11)

The joint effects of increasing levels of employment and annual wage credits per year employed are reflected in the changes in average wage credits PEY from 1937-50 to 1951-57. Average credits per elapsed year of the females increased at a faster rate than those of the males, rising by 302 percent for females, but by only 197 percent in the case of the males. Although the average PEY increased among all the four cohorts, it varied substantially by average PYE level, increasing most among the two lowest-paid male cohorts, and among the two intermediate-paid female cohorts. For the males, the largest increase in average credits per elapsed year occurred among the intermediate low-paid cohort, rising by 339 percent for this cohort, and by 300 percent for the lowest-paid cohort. Average credits per elapsed year of the highest-paid cohorts increased by about 282 and 142 percent, respectively.

Table 11.--Average Wage Credits Per Elapsed Year of Four Male and Female Cohorts as They Aged, 1937-50, 1951-57, and 1937-57

Sex and Wage Cohort	1937-1957	1937-1950	1951-1957	1951-1957 as % of 1937-1950
	(1)	(2)	(3)	(4)
Male cohorts .....	\$1,237	\$746	\$2,216	297.1
Low-paid .....	176	88	352	400.0
Intermediate low-paid.	668	313	1,377	439.9
Intermediate high-paid	1,380	711	2,719	382.4
High-paid .....	2,225	1,507	3,658	242.7
Female cohorts .....	595	297	1,194	402.0
Low-paid .....	189	107	355	331.8
Intermediate low-paid.	671	303	1,411	465.7
Intermediate high-paid	1,327	650	2,677	411.8
High-paid .....	1,834	1,124	3,257	289.8

For the women, average credits per elapsed year increased most among the two intermediate cohorts, rising by 366 percent and 312 percent in the case of the intermediate low-paid and intermediate high-paid cohorts, respectively. Average credits per elapsed year of the lowest-paid women increased by 232 percent, and by 190 percent in the case of the highest-paid women.

2. Joint Effects of Changes in ER and PYE on Changes in PEY, 1937-50 to 1951-57

Use of cohort analysis permits us to evaluate the relative effects of changes in intensity of employment and in the level of average credits PYE on changes in average credits per elapsed year. Put somewhat differently, this means that the joint effects of changes in employment and wage credit levels on the movement of average wage credits per elapsed year can be disentangled, and the relative importance of each of these changes can be measured.

The data in Tables 12 and 13 indicate that the impact of changes from 1937-50 to 1951-57 in these two factors on changes in average credits per elapsed year differed for each sex, but for both the male and female cohorts, these changes were age-related. For workers in each of the four wage cohorts, however, the relative impact of changes in ER's and average wage credits PYE on changes in average credits PEY was approximately the same.

Males --Effect of Changes in ER's  
and Average Wage Credits PYE (Table 12)

From 1937-50 to 1951-57, the ER's of each of the four male cohorts increased substantially, but the extent of the increase varied inversely with the level of average wage credits PYE, 1951-57. Average credits PYE, however, did not rise in the same fashion. For the three highest-paid male cohorts, the percent increase in the average PYE, by age group, was greatest for the intermediate high-paid cohort, of somewhat lesser proportion for the highest-paid cohort, and was smallest for the intermediate low-paid cohort. For the lowest-paid cohort, average wage credits PYE did not increase, but declined from 1937-50 to 1951-57 for cohort members aged 45 or older.

The joint effect of these changes is reflected in the changes in average credits per elapsed year. For each of the male cohorts, average credits PEY increased substantially from 1937-50 to 1951-57. For the three lowest-paid cohorts the extent of the increase varied directly with the level of average credits PYE; for the highest-paid cohort, the percentage increase in average credits PEY was greater than the increase in the average credits PYE of the lowest-paid cohort, but of lesser proportions than the increase in the average PEY's of the two intermediate-paid cohorts.

In general, the percentage increase in ER's and average credits PYE varied inversely with age among the three higher-paid cohorts--the older the age group, the lower was the percent increase

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Table 12.--ER's, Average Wage Credits PYE and PEY--1951-57 Levels as a Percent of 1937-50 Levels

Age in 1957	Average Wage Credits PYE, 1951-57															
	Under \$1,200				\$1,200-\$2,399				\$2,400-\$3,599				\$3,600 and Over			
	ER	PYE	PEY	Ratio of (1) to (2)	ER	PYE	PEY	Ratio of (1) to (2)	ER	PYE	PEY	Ratio of (1) to (2)	ER	PYE	PEY	Ratio of (1) to (2)
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Total.	410.1	97.4	400.0	4.21	246.6	178.3	444.1	1.38	179.7	212.8	379.9	.84	130.0	186.6	243.3	.70
1-15 ..	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
16-19 ..	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
20-24 ..	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
25-29 ..	391.1	177.2	---	2.21	344.9	295.8	---	1.17	300.4	362.3	---	.83	249.9	342.8	---	.73
30-34 ..	214.3	135.2	290.3	1.59	219.4	230.3	507.0	.95	214.0	294.3	631.4	.73	196.9	265.8	522.7	.74
35-39 ..	188.5	113.8	215.6	1.66	181.4	218.9	398.2	.83	172.4	261.0	448.1	.66	147.2	228.9	336.3	.64
40-44 ..	162.1	106.5	173.4	1.52	161.8	187.6	303.7	.86	142.1	221.3	314.5	.64	119.6	197.2	237.0	.61
45-49 ..	167.8	96.3	163.0	1.74	142.8	172.7	248.0	.83	134.1	197.6	265.7	.68	115.2	174.6	202.1	.66
50-54 ..	164.9	97.2	161.5	1.70	147.7	158.2	233.0	.93	132.1	181.0	239.0	.73	112.4	165.4	185.9	.68
55-59 ..	146.0	90.4	132.9	1.62	147.7	152.4	225.0	.97	125.7	164.7	207.6	.76	110.5	157.3	174.9	.70
60-64 ..	156.4	76.6	120.0	2.04	148.3	137.6	204.3	1.08	126.4	162.4	205.4	.78	111.7	155.1	174.3	.72
65-69 ..	185.0	82.2	153.5	2.25	153.0	125.3	191.8	1.22	122.8	148.7	182.5	.83	111.5	152.0	168.5	.73
70 and over ..	148.6	54.5	81.3	2.73	141.9	104.9	148.3	1.35	124.6	146.0	181.7	.85	114.1	150.1	171.9	.76

## FEMALE COHORTS

Table 13.--ER's, Average Wage Credits PYE and PEY--1951-57 Levels as a Percent of 1937-50 Levels

Age in 1957	Average Wage Credits PYE, 1951-57															
	Under \$1,200				\$1,200-\$2,399				\$2,400-\$3,599				\$3,600 and Over			
	ER	PYE	PEY	Ratio of (1) to (2)	ER	PYE	PEY	Ratio of (1) to (2)	ER	PYE	PEY	Ratio of (1) to (2)	ER	PYE	PEY	Ratio of (1) to (2)
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Total.	291.9	113.8	333.6	2.57	238.1	195.8	469.0	1.22	180.3	228.5	410.2	.79	141.2	205.2	290.7	.69
1-15 ..	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
16-19 ..	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
20-24 ..	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
25-29 ..	383.5	142.7	---	2.69	407.2	255.2	---	1.60	371.6	323.4	---	1.15	226.7	331.6	---	.80
30-34 ..	195.4	113.1	221.0	1.73	214.8	205.8	440.2	1.04	200.2	233.9	471.7	.86	186.0	236.3	436.5	.79
35-39 ..	169.9	117.1	200.0	1.45	177.8	224.6	401.7	.79	156.0	249.2	390.8	.63	139.3	237.0	331.7	.59
40-44 ..	191.1	119.4	230.6	1.60	178.7	213.3	384.0	.84	152.3	244.8	373.2	.62	130.5	232.5	305.2	.56
45-49 ..	204.7	116.2	240.8	1.76	193.5	193.3	374.9	1.00	152.3	222.2	336.8	.69	141.2	204.2	288.3	.69
50-54 ..	232.1	120.9	279.0	1.92	184.7	188.6	347.5	.98	150.6	215.2	321.9	.70	131.8	196.1	256.6	.67
55-59 ..	225.4	128.6	289.5	1.75	179.7	178.8	319.4	1.01	151.3	201.0	302.9	.75	137.3	179.8	245.9	.76
60-64 ..	250.2	106.0	267.5	2.36	172.7	164.2	286.2	1.05	142.9	191.2	272.8	.75	135.0	171.7	229.6	.79
65-69 ..	266.9	107.5	289.3	2.48	182.6	150.0	274.9	1.22	136.2	181.2	249.4	.75	184.9	181.4	329.8	1.02
70 and over ..	229.5	96.1	219.5	2.39	191.2	130.3	247.1	1.47	182.6	166.0	304.2	1.10	108.2	157.0	168.0	.69

in their ER's and average wage credits PYE. For the lowest-paid cohort, the pattern of change was also inversely related to age, but in this instance, the level of average credits PYE of cohort members aged 45 or older declined from 1937-50 to 1951-57.

These findings are stated abstractly, because of the limitations of time. A brief description of changes in the employment and wage levels of workers aged 55-59, and of the joint effects of the changes in these factors on average wage credits PEY, may serve to illustrate in a more concrete fashion some of the uses to which this mode of analysis may be used.

For men aged 55-59 in the lowest-paid cohort, average credits per elapsed year increased by 33 percent from 1937-50 to 1951-57. Their average credits per year employed, however, declined by 10 percent during this period, but the decline was more than offset by an increase of 46 percent in their ER's. For these workers, therefore, the increase in ER's had a measurably greater impact on changes in average credits per elapsed year than did the changes in the level of average credits PYE. The ratio of changes in ER's to changes in the average PYE indicates that the ER factor was 62 percent more significant than the PYE factor in causing the increase in average credits per elapsed year. The increase in employment intensity from 1937-50 to 1951-57, therefore, was the major factor responsible for the rise in the average credits PEY of the lowest-paid men in this age group.

For men aged 55-59 in the highest-paid cohort, the increase in average credits per elapsed year must be explained by an entirely different relationship between the ER and PYE components. Although average credits per elapsed year of this group increased by 75 percent from 1937-50 to 1951-57, the primary cause of the increase is to be found in the change in average credits PYE. ER's of this group increased by only 11 percent, but average credits PYE rose by 57 percent. While the joint effect of these two changes resulted in a rise of 75 percent in average wage credits PEY, the "change" ratio indicates that for this age group, ER changes were only 70 percent as significant as the changes in the level of average credits

in causing the increase in average credits per elapsed year. Thus, in the case of the lowest-paid males aged 55-59, the increase in employment intensity was the sole cause of the increase in the average wage credits PEY; for the highest-paid cohort, the increase in employment intensity was responsible only to a minor degree for the significant increase in average credits per elapsed year.

Females--Effect of Changes  
in ER's and PYE's (Table 13)

For the women cohorts, the relationship between changes in ER's and average credits PYE is more complex. Because of the intermittency of employment, the female patterns of change are less regular than the male patterns, and the ever-present time limitation requires that we confine our discussion to a single age group--women aged 55 to 59 years of age. The data for all the age groups in each of the cohorts may be examined in detail in Table 13.

For women aged 55-59, the ER of the lowest-paid cohort rose by 125 percent from 1937-50 to 1951-57. During this period, the level of average credits PYE of this age group increased by only 29 percent. The joint effect of these patterns resulted in an increase of 190 percent in their average credits per elapsed year. Although the average PYE rose substantially, the ratio of ER to average PYE changes indicates that the increase in employment intensity was one and three-fourths times more significant than the increase in the level of average credits PYE in causing the rise in average credits per elapsed year.

For the highest-paid women in this age group--as among the highest-paid men--the relative significance of the two components of PEY was reversed. ER's of the highest-paid female cohort increased by 37 percent from 1937-50 to 1951-57, but average wage credits PYE rose by 80 percent during this time. Thus, although average credits of the highest-paid women rose by 146 percent, the increase in ER's was only 76 percent as important as the increase in the level of average credits PYE in accounting for the rise in average credits per elapsed year.