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Changes in Hours Worked Since 1950*

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The number of weekly hours of market work per person in the United States has been roughly constant since World War II. At the same time, the amount of real compensation per hour worked has more than doubled. Economists have used these two facts in the aggregate analyses of many issues. For example, in their undergraduate macroeconomics textbook, Hall and Taylor (1991, pp. 418–19) use these facts to interpret the relative sizes of the income and substitution effects of wage changes on the supply of labor:

Real wages have risen dramatically over the past 40 years, but people are working just about the same amount as they did in 1950, on the average. Economists infer that a permanent increase in the real wage over a worker's lifetime has little effect on the number of hours per week or weeks per year an individual is willing to work on average throughout a lifetime. In the long run, the income and substitution effects . . . come close to canceling each other out.

Similarly, the real business cycle literature regularly uses these facts to restrict the form of preferences. Prescott (1986, p. 14), for example, argues¹ that

A key growth observation which restricts the utility function is that leisure per capita . . . has shown virtually no secular trend while . . . the real wage has increased steadily. This implies an elasticity of substitution between consumption . . . and leisure . . . near 1.

The widespread use of these two facts suggests that theory can easily account for the secular pattern in hours of

work. Such a conclusion is, however, premature. In particular, hours of work per person may have remained relatively constant in the aggregate, but a more detailed look at the data reveals large and persistent reallocations of hours worked across groups when the data are disaggregated by sex, age, and marital status. Whether theory can account simultaneously for the relative constancy of aggregate hours worked per person and the pattern of reallocations of hours worked across these demographic groups is an open question.

Our primary goal here is to document these reallocations using data collected by the U.S. Bureau of the Census during the U.S. decennial (10-year) censuses for the years 1950–90. While some of these reallocations have been noted elsewhere (for example, in Killingsworth and Heckman 1986, Pencavel 1986, and the references therein), we present a complete summary of the changes in hours worked based on the postwar decennial censuses.²

*The authors thank Narayana Kocherlakota, Lee Ohanian, and Art Rolnick for helpful comments.

†When this work was completed, Rogerson was a visitor in the Research Department of the Federal Reserve Bank of Minneapolis and a professor of economics at the University of Minnesota.

¹One of the early uses of this argument in research is by Lucas and Rapping (1969), who argue that as a result, intertemporal substitution has to account for cyclical changes in hours of work.

²We focus here on hours worked per person. Coleman and Pencavel (1993a, b) use basically the same data to analyze changes in the distribution of hours per worker.

One novel feature of our analysis is our look at the changes in life-cycle hours profiles across cohorts.³ We think that using information of this form will greatly improve attempts to connect theory with data; with such information, any life-cycle model should be able to predict how hours will vary over an individual's life.

We do not attempt here to account quantitatively for the factors that led to the reallocations of hours worked across groups over the 1950–90 period. But we do document changes in several factors that may be relevant. These include increases in Social Security benefits, decreases in fertility rates, and changes in family structure. Determining to what extent these factors have contributed to the changes in hours worked may lead to an improved understanding of the determinants of labor supply.

Data Details

Again, we use data from the U.S. decennial censuses from 1950 to 1990. For each of these five censuses, we have data for 98 groups in the population. The groups are distinguished by three characteristics: sex, age, and marital status—two categories for sex, seven categories for age, and seven categories for marital status. For each group, we know the size of the population, the number employed, and the distribution of weekly hours worked across the group. In particular, we know the number of people whose weekly hours of work lie in eight intervals. (See Appendix A for more details.)

We consider age categories that are 10-year intervals (15–24 years, 25–34 years, and so on). Using data from different censuses lets us construct partial life-cycle profiles, or the number of hours worked for different cohorts of workers. For example, piecing together data on hours of work for females who were 15–24 years old in 1950, 25–34 in 1960, 35–44 in 1970, 45–54 in 1980, and 55–64 in 1990 produces the life-cycle profile for hours worked by females born between 1926 and 1935.⁴

An advantage to using the decennial censuses is the large sample size. Studies that track individuals over time (like the Panel Study of Income Dynamics) typically involve too few people once the data are disaggregated by sex, age, and marital status.

In addition to the U.S. census data on groups, we analyze some aggregate level data. These include real compensation per hour, average Social Security benefits, and fertility rates. Sources for all the data and details on the construction of time series are in Appendix A.

Documentation

Aggregate Facts

We opened with a statement of the fact that the number of weekly hours of market work per person has changed very little over the postwar period. As a starting point for our analysis, we establish that this fact holds in our data set.

Table 1 summarizes for the 1950–90 period what the data imply for the aggregate number of weekly hours worked per person. This number has clearly changed relatively little over the postwar period—it decreased slightly from 1950 to 1970, then increased slightly from 1970 to 1990, but the 1990 level is hardly higher than the 1950 level.

For completeness, we plot in Chart 1 the two key time series, hours worked per person and real compensation per hour worked. The compensation series is an index of hourly compensation in the business sector deflated with the consumer price index.⁵ Certainly, the chart can reasonably

³In related work, Smith and Ward (1985) construct life-cycle profiles for U.S. female participation rates, and Browning, Deaton, and Irish (1985) construct life-cycle profiles for hours worked by males in the United Kingdom over a shorter period than ours.

⁴Because of immigration and death, the group of females aged 25–34 years in 1960 does not exactly correspond to the group of females aged 35–44 years in 1970. However, the differences between these groups should not be quantitatively significant.

⁵Real wage rates are relatively constant between 1970 and 1990. We use real compensation because we want to include benefits in our measure of the return to work.

Table 1
A Look Behind an Aggregate Fact
In the United States, 1950–90

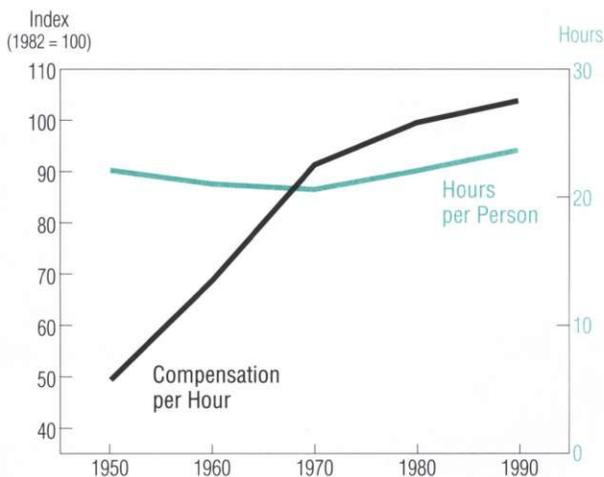
Year	Average Weekly Hours Worked		Employment-to-Population Ratio
	Per Person	Per Worker	
1950	22.03	40.71	.52
1960	20.97	37.83	.52
1970	20.55	36.37	.53
1980	22.00	35.97	.58
1990	23.62	36.64	.61
% Change 1950–90	7.2	–10.0	17.3

Source: U.S. Department of Commerce, Bureau of the Census

Chart 1

Two Aggregate Facts

Average Weekly Hours Worked per Person and Real Compensation per Hour Worked* in the United States, 1950–90



*The compensation series is an index of hourly compensation in the business sector, deflated by the consumer price index for all urban consumers.

Sources: Tables 1 and 14

be characterized as depicting roughly constant hours of work and steadily increasing real wages.

What is true of the aggregate, however, is not so true of the two components of weekly hours worked per person. The aggregate breaks down into the number of weekly hours per worker (what economists call the *intensive margin*) and the portion of the population employed (the *extensive margin*).⁶ As shown in Table 1, both of these components changed between 1950 and 1990, especially the second: hours per worker decreased about 10 percent while the employment-to-population ratio increased nearly twice as much, about 17 percent. If secular labor market developments are completely summarized by two elements—substantial real wage growth coupled with offsetting income and substitution effects—how do those elements account for the changes in the components of hours per person?

Disaggregate Facts

Now we examine how the number of hours worked has changed over time. First we simply look at the time series

of cross-sectional distributions with regard to several demographic attributes. Then we construct estimates of life-cycle hours of work for several consecutive cohorts.

□ Cross-Sectional Time Series

The cross-sectional distribution of hours worked has changed significantly over time. Large numbers of weekly work hours have shifted from males to females, from older people to younger people, and from single-person households to married-person households.⁷

First let's consider changes in weekly hours worked by sex. Table 2 presents data for males and females along with, for reference, average hours for the total population. The male and female columns are quite different. If we look at each of them separately, to assess the effect of permanent wage increases on hours of work, we cannot help but be led to two very different conclusions: the data for males suggest a strong negative effect on hours of work, and the data for females suggest a strong positive effect. This shift in hours of work from males to females may be a result of changes in fertility rates and in relative wages of males and females. (See, for example, Rosenzweig and Schultz 1985 and Katz and Murphy 1992.)

Next we consider changes in the distribution of hours worked by age. Table 3 shows that, despite increasing college enrollments over the period, the number of weekly hours worked by individuals aged 15–24 increased almost two hours, or nearly 10 percent. At the same time, the number of hours worked by individuals aged 25–54 increased about 20 percent. Older people, however, are working less. The work hours of people aged 55–64 fell 6.5 percent between 1950 and 1990, and those of people aged 65–74 fell 57 percent. These drops in hours of older people may be partly due to changes in Social Security benefits for retired workers. (See, for example, Feldstein 1974.)

Last we consider changes in hours worked by marital status. In Table 4, we filter out the effects of young people, since age was already considered in Table 3. In Table 4, then, we consider only people who are at least 25 years old. The table indicates that trends are changing. Hours for people single, divorced, and married with spouse absent fell between 1950 and 1970, whereas these hours rose be-

⁶In Appendix B, we consider some aggregation issues that arise when constructing our measure of hours per person.

⁷Again, note that many of the facts we document here can be found elsewhere (for example, in Killingsworth and Heckman 1986, Pencavel 1986, and the many references listed therein). We include the facts here to provide a complete picture of the data.

Tables 2–4

A Distribution of Hours Worked

Average Weekly Hours Worked per Person
for Demographic Categories in the United States, 1950–90

Table 2 By Sex

Year	Weekly Hours Worked per Person by		
	Total Population	Sex	
		Males	Females
1950	22.03	33.46	10.95
1960	20.97	30.70	11.82
1970	20.55	28.54	13.29
1980	22.00	28.30	16.24
1990	23.62	28.53	19.09
% Change 1950–90	7.2	-14.7	74.3

Table 4 By Marital Status*

Year	Weekly Hours Worked per Person by Marital Status				
	Married With Spouse		Single	Widowed	Divorced
	Present	Absent			
1950	23.89	23.11	28.10	11.82	28.65
1960	23.86	20.43	25.72	10.37	26.31
1970	24.31	20.50	24.19	9.41	26.17
1980	24.15	22.71	25.42	6.86	27.22
1990	26.26	22.22	27.73	5.98	28.41
% Change 1950–90	9.9	-3.9	-1.3	-49.4	-8

*This excludes individuals less than 25 years old.

Table 3 By Age

Year	Weekly Hours Worked per Person by Age (in Years)						
	15–24	25–34	35–44	45–54	55–64	65–74	75–84
1950	17.47	24.92	27.09	26.31	22.19	12.03	3.93
1960	14.15	24.73	27.00	27.63	22.58	8.43	2.97
1970	14.05	26.16	28.03	28.27	23.28	6.91	2.17
1980	19.64	28.80	29.89	28.16	20.68	5.11	1.39
1990	19.13	30.83	32.62	31.47	20.75	5.15	1.18
% Change 1950–90	9.5	23.7	20.4	19.6	-6.5	-57.2	-70.0

Source: U.S. Department of Commerce, Bureau of the Census

tween 1970 and 1990. The only steady decline in hours occurred with the widowed. Comparing 1950 with 1990, however, we see some reallocations of hours worked, from the single and the widowed to households with married couples.

Thus far we have presented data for each demographic

category separately. Now, in order to examine the patterns of change more completely, we present hours of work data disaggregated by all three categories—sex, age, and marital status. We provide this breakdown in Tables 5 and 6. Several patterns are worth noting: a significant increase in hours worked by married females under the age of 65 with

Tables 5-6

A More Comprehensive Distribution of Hours Worked

Average Weekly Hours Worked per Person for Sets of Demographic Categories in the United States, 1950-90

Table 5 **Married . . .**

Status	Sex	Year	Weekly Hours Worked per Person by Age (in Years)							
			15-24	25-34	35-44	45-54	55-64	65-74	75-84	
Spouse Present	<i>Total</i>	Males	1950	38.69	41.14	43.06	41.95	37.58	23.39	9.77
			1960	36.58	40.67	41.79	40.99	35.74	14.74	6.22
			1970	34.19	40.30	41.52	40.65	34.74	11.51	4.08
			1980	33.63	38.70	40.22	38.89	29.83	8.20	2.95
			1990	34.18	40.25	41.34	40.03	28.39	7.71	2.50
		% Change 1950-90	-11.7	-2.2	-4.0	-4.6	-24.5	-67.0	-74.4	
		Females	1950	9.17	8.09	9.60	8.61	4.60	1.79	.56
			1960	10.00	9.10	12.35	13.55	8.66	2.27	.94
			1970	14.65	12.21	14.95	16.18	11.75	2.55	1.03
			1980	18.36	18.77	19.64	18.16	11.95	2.48	.70
	1990		21.13	23.90	25.41	24.04	13.83	2.79	.65	
	% Change 1950-90	130.4	195.4	164.7	179.2	200.7	55.9	16.1		
	<i>Youngest Child Under 6 Years Old</i>	Females	1950	3.40	4.60	6.49	6.41	4.24	3.93	6.82
			1960	5.71	5.75	6.36	9.17	7.25	2.10	2.25
			1970	9.08	8.33	9.04	12.11	10.13	3.70	6.02
1980			11.72	13.47	13.00	11.77	9.32	1.34	.30	
1990			15.49	19.48	19.62	18.55	13.11	6.61	7.86	
% Change 1950-90	355.6	323.5	202.3	189.4	209.2	68.2	15.2			
<i>Youngest Child 6-17 Years Old</i>	Females	1950	3.89	5.57	7.64	6.81	4.50	2.28	10.08	
		1960	13.27	13.44	13.75	11.99	8.75	2.53	1.45	
		1970	16.23	15.90	15.85	14.49	11.41	4.15	6.81	
		1980	15.46	20.79	20.01	16.76	11.91	3.90	3.41	
		1990	23.43	24.85	25.70	23.01	15.09	5.98	11.01	
% Change 1950-90	502.3	346.1	236.4	237.9	235.3	162.3	9.2			
Spouse Absent	<i>Total</i>	Males	1950	24.17	27.54	31.56	30.48	26.62	16.54	5.93
			1960	17.13	25.80	27.83	29.49	24.69	9.66	3.47
			1970	16.49	27.12	29.67	30.48	25.06	9.13	2.94
			1980	25.27	30.64	31.99	29.18	20.58	5.99	2.40
			1990	21.03	27.31	28.80	29.84	21.63	6.23	1.48
	% Change 1950-90	-13.0	-8	-8.7	-2.1	-18.7	-62.3	-75.0		
	Females	1950	15.37	20.00	22.26	19.74	13.82	4.42	1.04	
		1960	14.24	17.52	20.51	20.74	15.58	4.30	1.57	
		1970	16.05	18.03	20.17	21.43	17.25	5.43	2.16	
		1980	17.12	21.77	22.78	21.32	15.79	3.75	1.50	
1990		15.89	21.95	25.26	24.22	15.72	4.01	.84		
% Change 1950-90	3.4	9.8	13.5	22.7	13.7	-9.3	-19.2			

Table 6 . . . And Not Married

Status	Sex	Year	Weekly Hours Worked per Person by Age (in Years)						
			15-24	25-34	35-44	45-54	55-64	65-74	75-84
Single	Males	1950	18.29	31.58	33.82	31.97	27.18	15.47	6.12
		1960	12.67	30.61	30.35	28.98	24.30	9.74	5.01
		1970	11.37	29.78	29.82	28.03	22.60	8.58	4.17
		1980	19.23	30.55	29.01	26.24	19.60	6.26	2.06
		1990	18.76	31.50	30.17	26.64	17.87	5.83	2.03
		% Change 1950-90	2.6	-3	-10.8	-16.7	-34.3	-62.3	-66.8
	Females	1950	14.33	30.58	30.51	28.61	22.77	10.36	3.14
		1960	10.70	29.33	29.37	28.94	24.40	10.63	3.35
		1970	10.43	28.82	27.65	27.62	24.23	8.41	3.07
		1980	17.23	29.15	28.24	25.76	20.68	4.93	1.19
1990		17.35	29.73	30.21	27.59	18.55	4.98	1.02	
	% Change 1950-90	21.1	-2.8	-1.0	-3.6	-18.5	-51.9	-67.5	
Widowed	Males	1950	19.65	33.50	35.76	34.12	29.15	14.99	4.67
		1960	19.74	32.00	31.33	31.97	25.95	9.24	3.56
		1970	19.68	29.63	32.08	31.93	25.36	7.24	2.34
		1980	18.64	28.31	29.66	29.10	20.89	5.24	1.70
		1990	15.20	26.62	28.70	29.06	18.32	4.90	1.38
		% Change 1950-90	-22.6	-20.5	-19.7	-14.8	-37.2	-67.3	-70.4
	Females	1950	17.02	21.75	23.90	20.11	12.96	4.31	.83
		1960	15.64	17.61	22.82	23.35	15.71	4.72	1.18
		1970	17.66	21.00	21.85	23.52	17.82	4.20	1.04
		1980	17.12	17.25	21.13	20.71	15.68	3.30	.66
1990		10.56	18.50	24.06	24.41	15.16	3.59	.57	
	% Change 1950-90	-38.0	-14.9	.7	21.4	17.0	-16.7	-31.3	
Divorced	Males	1950	29.53	32.82	34.93	32.71	28.77	15.76	11.67
		1960	24.08	30.54	31.51	29.50	25.75	9.75	4.95
		1970	25.56	33.14	33.35	31.16	24.62	8.63	4.12
		1980	29.16	33.73	34.39	30.90	22.34	6.09	2.65
		1990	29.17	33.94	34.23	32.90	22.23	6.76	2.46
		% Change 1950-90	-1.2	3.4	-2.0	.6	-22.7	-57.1	-78.9
	Females	1950	25.27	28.72	30.68	27.32	21.99	10.07	1.96
		1960	24.01	27.69	29.87	29.51	24.05	9.19	2.48
		1970	25.16	27.59	29.73	29.71	25.04	7.99	3.26
		1980	24.42	29.38	30.38	28.73	22.65	5.53	1.48
1990		23.26	29.13	32.82	31.86	23.73	6.68	1.49	
	% Change 1950-90	-8.0	1.4	7.0	16.6	7.9	-33.7	-24.0	

Source: U.S. Department of Commerce, Bureau of the Census

a spouse present; a significant decrease in hours worked by older people, especially married males; and a broad similarity in changes in hours worked by single females and single males.

□ *Life-Cycle Profiles*

Again, one way to view the data we have gathered from the five U.S. censuses is that they provide incomplete work life-cycle histories for many cohorts. Those individuals who are, for example, between 25 and 34 years old in the 1950 census are the same individuals who are between 35 and 44 years old in the 1960 census, between 45 and 54 years old in the 1970 census, and so on.⁸

Table 7 presents some of the census data in a manner consistent with this view. These data are for all males. Each row in the table corresponds to a different cohort. For example, the cohort born between 1926 and 1935 had a five-decade life-cycle pattern of weekly work hours of, roughly, 23, 38, 40, 37, and 27—the typical hump-shaped pattern.

The number of aggregate work hours per person has remained relatively constant since World War II, so we

might expect that life-cycle patterns have not changed much across generations either. To check that, we need complete life-cycle data for the individual cohorts. As Table 7 shows, the census data have five observations for several cohorts, but fewer for others. Therefore, we extrapolate the census data in both directions in order to construct complete life-cycle profiles for several consecutive cohorts.⁹ We extrapolate for three different groups—all males, all females, and all individuals. Since marital status changes over the life cycle, we do no calculations for groups based on marital status. The results are shown in Tables 8–10 and Charts 2–4.

What these extrapolated profiles represent is simply how the work life-cycle profiles would look if the trends

⁸This is, of course, subject to the qualification mentioned earlier about immigration and death.

⁹The details of our extrapolation procedure are discussed in Appendix C. We used several different procedures for the extrapolation and found that the results are similar across procedures for the statistics on which we focus.

Table 7
Partial Life-Cycle Profiles of Hours Worked by Males
Based on U.S. Census Data

Year Born	Average Weekly Hours Worked per Person at Age (in Years)						
	15–24	25–34	35–44	45–54	55–64	65–74	75–84
1866–75	—	—	—	—	—	—	7.46
1876–85	—	—	—	—	—	20.75	5.12
1886–95	—	—	—	—	35.34	13.31	3.53
1896–1905	—	—	—	40.06	33.60	10.65	2.57
1906–15	—	—	41.41	39.15	32.84	7.71	2.16
1916–25	—	38.60	39.98	38.95	28.38	7.28	—
1926–35	22.65	38.20	39.79	37.20	26.73	—	—
1936–45	17.65	37.89	38.59	37.75	—	—	—
1946–55	15.96	36.15	38.40	—	—	—	—
1956–65	21.59	36.00	—	—	—	—	—
1966–75	20.23	—	—	—	—	—	—

Source: U.S. Department of Commerce, Bureau of the Census

Tables 8–10

Extrapolated Life-Cycle Profiles of Hours Worked

U.S. Census Data Extrapolated as Explained in Appendix C*

Table 8 By Males

Year Born	Average Weekly Hours Worked per Person at Age (in Years)						
	15–24	25–34	35–44	45–54	55–64	65–74	75–84
1866–75	34.08	41.71	45.23	42.55	39.27	25.10	7.46
1876–85	31.90	41.13	44.28	41.70	37.66	20.75	5.12
1886–95	29.67	40.50	43.20	41.01	35.34	13.31	3.53
1896–1905	27.92	39.93	42.35	40.06	33.60	10.65	2.57
1906–15	25.35	39.42	41.41	39.15	32.84	7.71	2.16
1916–25	23.00	38.60	39.98	38.95	28.38	7.28	1.17
1926–35	22.65	38.20	39.79	37.20	26.73	5.27	.39
1936–45	17.65	37.89	38.59	37.75	24.44	3.48	.00
1946–55	15.96	36.15	38.40	37.28	21.64	2.07	.00
1956–65	21.59	36.00	37.87	36.73	19.39	.33	.00
1966–75	20.23	35.27	37.23	36.57	16.95	.00	.00

Table 9 By Females

Year Born	Average Weekly Hours Worked per Person at Age (in Years)						
	15–24	25–34	35–44	45–54	55–64	65–74	75–84
1866–75	8.19	.08	3.63	4.44	4.65	4.12	1.01
1876–85	8.69	2.20	6.02	7.45	7.16	3.87	1.36
1886–95	9.19	4.61	8.19	10.18	8.85	4.23	1.29
1896–1905	10.00	6.43	10.38	12.58	12.30	3.98	.74
1906–15	10.18	8.58	13.17	16.48	14.71	3.13	.66
1916–25	10.68	11.84	14.70	18.38	13.91	3.48	.43
1926–35	12.43	11.87	16.97	19.78	15.41	3.23	.14
1936–45	10.73	15.03	21.53	25.48	16.45	2.98	.00
1946–55	12.18	21.63	26.96	28.48	17.03	2.93	.00
1956–65	17.68	25.67	31.05	31.85	18.06	2.75	.00
1966–75	17.99	30.27	35.74	35.87	18.95	2.59	.00

*Highlighted areas indicate actual U.S. census data. The other data are extrapolations.

Table 10 By Total Population

Year Born	Average Weekly Hours Worked per Person at Age (in Years)						
	15-24	25-34	35-44	45-54	55-64	65-74	75-84
1866-75	20.91	20.40	24.36	23.90	22.50	14.34	3.93
1876-85	20.09	21.20	25.04	24.83	22.69	12.03	2.97
1886-95	19.26	22.13	25.53	25.69	22.19	8.43	2.17
1896-1905	18.81	22.78	26.16	26.31	22.58	6.91	1.39
1906-15	17.65	23.63	27.09	27.63	23.28	5.11	1.18
1916-25	16.75	24.92	27.00	28.27	20.68	5.15	.58
1926-35	17.47	24.73	28.03	28.16	20.75	4.06	.05
1936-45	14.15	26.16	29.89	31.47	20.14	3.11	.00
1946-55	14.05	28.80	32.62	32.75	19.09	2.44	.00
1956-65	19.64	30.83	34.49	34.24	18.56	1.53	.00
1966-75	19.13	32.86	36.65	36.27	17.84	.69	.00

Source: U.S. Department of Commerce, Bureau of the Census

present during 1950-90 were to continue for a much longer time.¹⁰ The extrapolation is thus only a way to exposit the accumulated effects of changes occurring over this period. The extrapolation should not be seen as a way to necessarily predict whether the trends present in 1950-90 are likely to continue.

Clearly, the data suggest that if trends continue, the shifts in life-cycle profiles will be dramatic, especially for middle-aged females and older males. For example, over the century, hours for females aged 35-44 will increase from about 4 to about 36—almost tenfold. At the same time, hours for males aged 65-74 will fall from about 25 to 0. These are very large reallocations of hours worked.

One simple calculation of interest is the change in average lifetime hours of work for each of the three groups (males, females, and the total population). Results of this calculation are presented in Table 11. Because the beginning and ending cohorts require the most extrapolation, we focus on the middle five cohorts—those for whom we have at least four data points. The result that emerges is that lifetime hours of work are remarkably constant over this period for the total population, but not for either males

or females; hours worked by those groups have both changed significantly. A comparison of these data with those in Table 2, which simply reports cross-sectional averages over time, reveals some differences. In particular, the percentage increase in hours worked by females is slightly larger in Table 2 than in Table 11. One reason for this is that the age distribution is changing over time in Table 2, whereas that is not true for the lifetime calculations in Table 11.

So far we have focused on hours worked per person. Now let's examine the two components of that aggregate time series (the extensive and intensive margins) separately. In Tables 12-13, we report partial life-cycle histories for males and females for each component. Some interesting patterns emerge.

For the portion of the population employed, we see changes in both directions (Table 12). Females have ex-

¹⁰Our procedure also extrapolates backward in time and may not generate good estimates of how much work young people did in 1900. This would simply indicate that the trends between 1950 and 1990 are different from those between 1900 and 1950.

Charts 2-4

Possible Shifts in Hours Worked

Extrapolated Average Weekly Hours Worked per Person
by Cohorts at Various Ages in the United States

Chart 2 Males

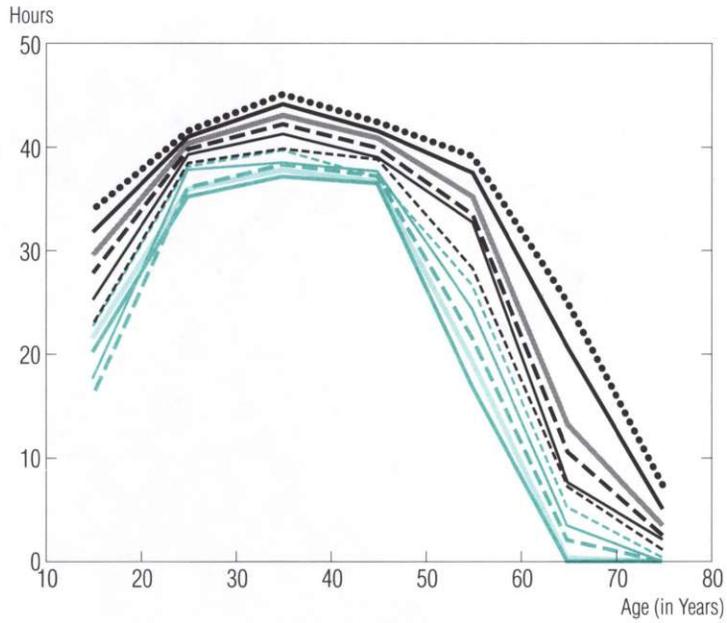


Chart 3 Females

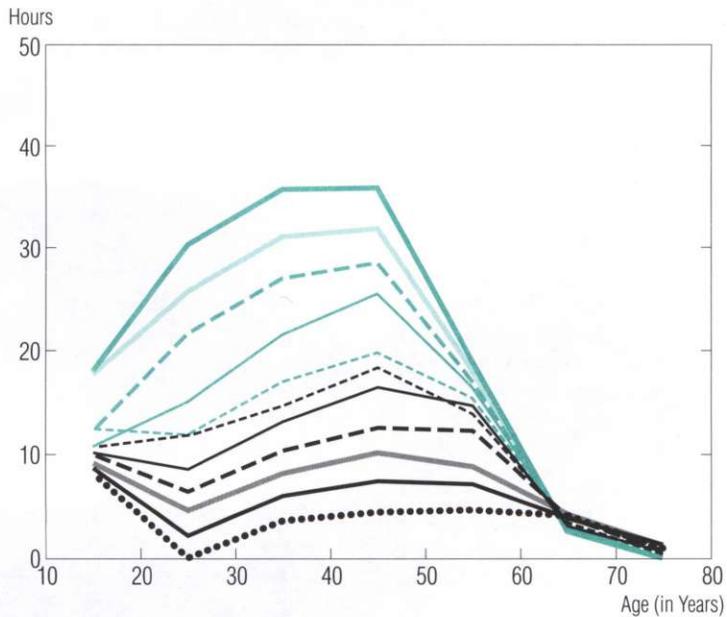
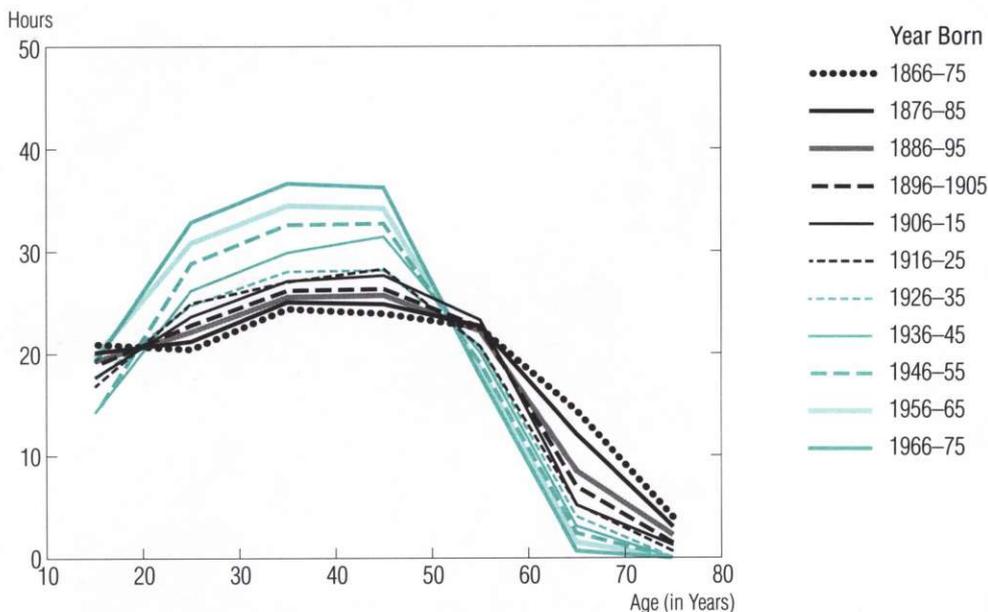


Chart 4 Total Population



Sources: Tables 8-10

perienced dramatic increases in the employment-to-population ratio. For all females under age 65, that ratio has roughly doubled. In contrast, for all males over age 25, the ratio has decreased. While the decreases are modest—roughly 5 percent—for ages 25-54, they are dramatic for ages 55 and over. Note that for males aged 15-24, the ratio has increased.

For the other component of hours worked per person, the picture is somewhat different (Table 13). The number of hours per worker has fallen for every age and sex category. The largest declines have occurred for teenagers and older workers (those 65 years and over). For older workers, the changes are as large as 25 percent. In contrast, for workers between ages 25 and 54, the number of hours per worker has declined less than 5 percent.

Changes in Relevant Factors

We have documented several large reallocations of hours worked across various groups. Now we examine data on several factors that may be relevant in accounting for these reallocations: changes in Social Security benefits, fertility rates, and family structure. For completeness, we also display changes in real compensation per hour.

Table 11
Lifetime Hours Worked

Average Weekly Hours Worked Between Ages 15 and 84 by Cohorts Born Between 1896 and 1945 in the United States

Year Born	Weekly Hours Worked per Person by		
	Total Population	Sex	
		Males	Females
1896-1905	17.85	28.15	8.06
1906-15	17.94	26.86	9.56
1916-25	17.62	25.34	10.49
1926-35	17.61	24.32	11.40
1936-45	17.85	22.83	13.17
% Change 1896-1945	0	-18.9	63.4

Sources: Tables 8-10

Table 12
 Partial Life-Cycle Profiles for the Portion of the Population Employed . . .

Sex	Year Born	Employment-to-Population Ratio at Age (in Years)						
		15-24	25-34	35-44	45-54	55-64	65-74	75-84
Males	1866-75	—	—	—	—	—	—	.19
	1876-85	—	—	—	—	—	.49	.15
	1886-95	—	—	—	—	.80	.36	.11
	1896-1905	—	—	—	.89	.79	.31	.09
	1906-15	—	—	.91	.89	.78	.23	.08
	1916-25	—	.87	.90	.90	.68	.22	—
	1926-35	.55	.87	.90	.86	.64	—	—
	1936-45	.50	.87	.88	.86	—	—	—
	1946-55	.47	.85	.87	—	—	—	—
	1956-65	.61	.83	—	—	—	—	—
	1966-75	.60	—	—	—	—	—	—
	% Change	9.1	-4.6	-4.4	-3.4	-20.0	-55.1	-57.9
Females	1866-75	—	—	—	—	—	—	.03
	1876-85	—	—	—	—	—	.10	.04
	1886-95	—	—	—	—	.23	.13	.04
	1896-1905	—	—	—	.32	.34	.13	.03
	1906-15	—	—	.34	.45	.41	.11	.03
	1916-25	—	.31	.41	.51	.40	.12	—
	1926-35	.33	.33	.48	.56	.44	—	—
	1936-45	.32	.43	.62	.68	—	—	—
	1946-55	.38	.61	.73	—	—	—	—
	1956-65	.56	.69	—	—	—	—	—
	1966-75	.59	—	—	—	—	—	—
	% Change	78.8	122.6	114.7	112.5	91.3	20.0	0

Source: U.S. Department of Commerce, Bureau of the Census

Table 13

... And for the Hours Worked per Worker

Sex	Year Born	Average Weekly Hours Worked per Worker at Age (in Years)						
		15-24	25-34	35-44	45-54	55-64	65-74	75-84
Males	1866-75	—	—	—	—	—	—	38.62
	1876-85	—	—	—	—	—	42.07	34.13
	1886-95	—	—	—	—	43.95	37.35	32.56
	1896-1905	—	—	—	44.96	42.53	34.88	29.59
	1906-15	—	—	45.22	43.92	42.02	33.06	28.64
	1916-25	—	44.47	44.44	43.43	41.50	32.89	—
	1926-35	40.49	43.84	44.02	43.06	41.69	—	—
	1936-45	33.94	43.19	43.58	43.93	—	—	—
	1946-55	32.10	42.46	44.20	—	—	—	—
	1956-65	34.80	43.09	—	—	—	—	—
	1966-75	33.46	—	—	—	—	—	—
	% Change	-17.4	-3.1	-2.3	-2.3	-5.1	-21.8	-25.8
Females	1866-75	—	—	—	—	—	—	36.34
	1876-85	—	—	—	—	—	37.56	32.37
	1886-95	—	—	—	—	38.10	32.17	31.08
	1896-1905	—	—	—	38.58	36.04	30.36	25.08
	1906-15	—	—	38.32	36.62	35.77	27.64	24.51
	1916-25	—	38.14	35.79	36.00	34.73	27.94	—
	1926-35	37.71	35.45	34.94	35.30	34.98	—	—
	1936-45	33.25	34.72	34.79	37.12	—	—	—
	1946-55	31.48	35.47	36.91	—	—	—	—
	1956-65	31.57	37.14	—	—	—	—	—
	1966-75	30.53	—	—	—	—	—	—
	% Change	-19.0	-2.6	-3.7	-3.8	-8.2	-25.6	-32.6

Source: U.S. Department of Commerce, Bureau of the Census

Table 14
Possible Factors Behind Work Reallocations
In the United States, 1950–90

Year	Index of Real Compensation* (1982=100)	Average Monthly Social Security Benefit (1990 \$)	Total Fertility Rate**	% of Population in Each Marital Status Category				
				Married With Spouse		Single	Widowed	Divorced
				Present	Absent			
1950	49.4	238	3,337	64.45	4.01	21.10	8.25	2.24
1960	68.8	327	3,449	65.45	3.87	20.12	8.01	2.55
1970	91.3	397	2,480	61.33	3.86	23.23	8.17	3.41
1980	99.5	541	1,840	57.95	2.25	25.98	7.62	6.20
1990	103.8	603	2,081	53.56	4.29	26.42	7.37	8.35
% Change 1950–90	110.1	153.4	-37.6	-16.9	7.0	25.2	-10.7	272.8

* This is an index of hourly compensation in the business sector, deflated by the consumer price index for all urban consumers.

** The fertility rate for any year is the number of births that 1,000 females would have in their lifetime if, at each age, they experienced that year's birthrate.

Sources: See Appendix A.

Table 14 shows average monthly U.S. Social Security benefits for retired workers in constant (1990) dollars. Over the 1950–90 period, these benefits have nearly tripled. Since eligibility rates also changed over this period, the near-tripling of benefits actually underestimates the economic impact of Social Security. Such changes can be expected to have some impact on retirement and hence on the number of hours that older individuals are willing to work.¹¹

Table 14 also shows total U.S. fertility rates for the 1950–90 period. The total fertility rate for any year is the number of births that 1,000 females would have in their lifetime if, at each age, they experienced that year's birthrate. Between 1960 and 1980, the fertility rate declined dramatically. In 1980 and 1990, in fact, it was below the replacement level, given mortality conditions over that period. Such dramatic changes in fertility can be expected to have some impact on the female labor supply.

To document changes in family structure over the 1950–90 period, we report what portions of the population have been in each of several marital status categories. The data in Table 14 clearly show major shifts over time: by

1990, much larger portions of the population are single or divorced, and much smaller portions are married with a spouse present. If marital status is a significant determinant of hours of work, these shifts in family structure should imply significant reallocations of work hours across these groups.

Another factor that may have contributed to the large reallocations of hours of work is changes in relative wages across groups; that is, although wages have increased substantially in the aggregate, wages may have increased at different rates for different groups. Katz and Murphy (1992) argue, for example, that over the 1963–87 period, the wages of females have grown more than the wages of males. This finding, however, is sensitive to controlling for unobserved differences across people, so we do not emphasize it.

Given the data we have presented, why have many economists argued for model preferences which display

¹¹ For evidence of how retirement plans influence the hours worked by older people, see Lumsdaine, Stock, and Wise 1994.

offsetting income and substitution effects? The standard argument asserts that since the level of wages has increased substantially and the number of hours worked has not, the income and substitution effects must offset each other. However, this argument implicitly assumes that the level of wages is the only factor that substantially changed over the relevant period, and the data just presented challenge the validity of that assumption. Note that if the same logic were applied to each of the various factors individually, we would conclude that none of them has any effect on hours worked, a conclusion which hardly seems reasonable.

Lastly, remember that our data set is limited to the United States. An examination of cross-country data may be useful to understand which factors have contributed the most to the changes in hours worked across groups, since these other factors have presumably changed by differing amounts across countries.

Conclusion

We have documented three points about how much people have worked in the United States since World War II. There have been

- Large changes in several factors that theory suggests may be important for the number of hours worked—real wages, Social Security benefits, fertility rates, and family structure.
- Large changes in life-cycle profiles of hours worked for various demographic groups.
- A negligible change in average weekly hours worked per person at the aggregate level.

Because the level of real wages has risen so dramatically while the aggregate number of hours worked per person has remained roughly constant, macroeconomists have tended to infer that permanent increases in wage levels have no effect on the desired number of hours of work. However, this conclusion relies on the unstated premise that there are no other large changes that might reasonably be expected to affect hours of work. Since there have in fact been large changes in other relevant factors, we think that the effect of wage changes on the desired hours of work is still unknown. We also think that economists could learn something by further study of the data presented here, by attempting to quantitatively account for both the large reallocations of hours worked and the relative constancy of aggregate hours per person.

Appendix A Data Sources and Construction

Here we provide the sources of our data and details on the construction of the data series we use in the preceding paper.

Hours, Employment, and Wages

The sources of most of our data on hours, employment, and wages are surveys taken by the Bureau of the Census of the U.S. Department of Commerce. In particular, we use data from the Bureau's *Census of Population and Housing* and its *Public-Use Microdata Sample*. (Electronic files of these data are available in the Research Department's electronic archive of *Quarterly Review* articles through the Minneapolis Fed's home page at <http://woodrow.mpls.frb.fed.us>.)

For each decennial year during 1950–90, we have 128 records. Each record contains 16 fields, some of which are broken down into several categories. The fields and categories (numbered as they appear on the Fed's Web site) are as follows:

- | | |
|-----------------------------|---|
| 1. Sex | 0 = Males, 1 = Females |
| 2. Age | 0 = Total (15 years and over)
1 = From 15 to 24 years
2 = From 25 to 34 years
3 = From 35 to 44 years
4 = From 45 to 54 years
5 = From 55 to 64 years
6 = From 65 to 74 years
7 = 75 years and over |
| 3. Marital Status | 0 = Total
1 = Single
2 = Married, spouse present
3 = Married, spouse present,
youngest child under 6 years*
4 = Married, spouse present,
youngest child from 6 to
17 years*
5 = Married, spouse absent
6 = Widowed
7 = Divorced |
| 4. Total Population | N |
| 5. Number Employed | E |
| 6. Total Employed Part-Time | E_p |

*Males have zero in these records.

7. Employed 1–14 Hours per Week	E_{1-14}
8. Employed 15–29 Hours per Week	E_{15-29}
9. Employed 30–34 Hours per Week	E_{30-34}
10. Total Employed Full-Time	E_F
11. Employed 35–39 Hours per Week	E_{35-39}
12. Employed 40 Hours per Week	E_{40}
13. Employed 41–48 Hours per Week	E_{41-48}
14. Employed 49–59 Hours per Week	E_{49-59}
15. Employed 60 or More Hours per Week	E_{60+}
16. Mean Personal Earned Income	I

Note that we do not use records with age group = 0 or marital status = 0 (the “total age group” or “total marital status” categories); therefore, we use only 98 records.

From those records, we construct these series:

- Number of People Reporting Hours $N_R = E_P + E_F$
- Hours $H = (7.5E_{1-14} + 22E_{15-29} + 32E_{30-34} + 37E_{35-39} + 40E_{40} + 44.5E_{41-48} + 54E_{49-59} + 62.5E_{60+}) (E/N_R)$
- Hours per Person H/N
- Hours per Worker H/E
- Employment/Population E/N

To construct aggregates from these data, we compute weighted sums. For each aggregate, the weight for each particular group’s population is the fraction of the total population that the group represents. (For each aggregate, that is, weights sum to 1.)

Real Compensation per Hour

Real compensation per hour is represented by an index of hourly compensation of the business sector divided by the consumer price index for all urban consumers (1982 = 100). Hourly compensation is wages and salaries of employees plus employers’ contributions for social insurance and private benefit plans. Compensation also includes an estimate of wages, salaries, and supplemental payments for the self-employed.

The primary source for all these data is the Bureau of Labor Statistics of the U.S. Department of Labor. The data can also be found in U.S. President 1995, Table B-47.

Social Security Benefits

Social Security benefits are the average monthly benefits for retired workers in current dollars divided by the consumer price index for all items for all urban consumers (converted to 1990 dollars).

The primary sources for these are the U.S. Social Security Administration (its *Annual Statistical Supplement* to the *Social Security Bulletin*) and the Bureau of Labor Statistics of the U.S. Department of Labor. The data can also be found in U.S. De-

partment of Commerce 1975, Table 459, and 1995, Table 594, and in U.S. President 1996, Table B-56.

Fertility Rates

The total fertility rate is the number of births that 1,000 females would have in their lifetime if, at each year of age, they experienced the birthrate occurring in the specified year. A total fertility rate of 2,110 represents the *replacement level* fertility for the total population under current mortality conditions (and under the assumption of no net immigration).

The primary source for these data is the National Center for Health Statistics of the U.S. Department of Health, Education, and Welfare (its *Vital Statistics of the United States*). The data are also available in U.S. Department of Commerce 1975, Table 69, and 1995, Table 91.

Appendix B Decomposing Hours per Person

The number of weekly hours worked per person differs across demographic groups, for example, with age and marital status. If the distribution of people across demographic groups is changing over time, a natural question is, To what extent do changes in aggregate hours per person reflect changes in hours across demographic groups and to what extent do they reflect changes in the distribution of people across those groups? Here we try to answer that question by decomposing changes in aggregate hours.

The accompanying table shows the result. The demographic categories used in the calculation are sex, age, and marital status. (See Appendix A for explanation of the categories.) The table first shows the actual hours of work per person for 1950–90, as reported in the preceding paper’s Table 1 and Chart 1. Then the accompanying table shows the result of using the category weights for 1950 to aggregate the hours per person per category for the other years. Finally the table shows the result of using the hours per person per category for 1950 to aggregate, using weights for each of the other years.

The basic message of this table is that if category weights had not changed at all over the 1950–90 period, the increase in hours per person would have been about 13 percent rather than the 7 percent actually observed. The increase would thus have been nearly twice as large. However, even if hours had increased 13 percent, the increase in compensation would be far greater.

A Decomposition of Average Weekly Hours Worked per Person

Year	Actual Hours per Person	Hours per Person Recalculated With	
		1950 Weights	1950 Hours
1950	22.03	22.03	22.03
1960	20.97	21.40	21.57
1970	20.55	21.93	20.92
1980	22.00	23.30	20.99
1990	23.62	25.00	21.50
% Change 1950–90	7.2	13.5	–2.4

Source of basic data: See Appendix A.

Appendix C The Extrapolation Procedure

Here we provide the details of our extrapolation procedure for constructing the full life-cycle profiles of Tables 8–10 in the preceding paper.

Consider, for example, Tables 7 and 8 in the paper. Basically, we use the data reported in Table 7 to construct estimates of the entire life-cycle histories reported in Table 8.

To fill in missing observations, we use data on average weekly hours worked for other cohorts of the same age. For example, suppose we want to fill in an estimate of average hours worked by males aged 35–44 born in 1956–65. To do so, we use the hours for the four earlier cohorts (those born in 1916–55) and extrapolate. In particular, we estimate the missing element by taking a weighted sum of the past three changes in hours of work. For males aged 35–44 born in 1956–65, our estimate looks like this:

$$38.40 + \omega_1(38.40 - 38.59) + \omega_2(38.59 - 39.79) \\ + \omega_3(39.79 - 39.98).$$

The estimates in Tables 8–10 use equal weights: $\omega_1 = 1/3$, $\omega_2 = 1/3$, and $\omega_3 = 1/3$. Therefore, our estimate of average hours worked by males aged 35–44 born in 1956–65 is 37.87.

To estimate the average weekly hours worked by males aged 35–44 born in 1966–75, then, we use data for cohorts born in 1926–55 and our estimate for those born in 1956–65 and proceed as before. Applying this procedure for all missing observations leads to the estimates of Table 8.

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