

**Changes in the Composition of Labor
For BLS Multifactor Productivity Measures, 2006**

Characteristics of workers evolve over time and in response to changing labor market conditions. Each succeeding generation has completed more years of schooling than the one before. The large baby boom cohort entered middle age during the 1980s and 1990s and is now a dominant force in the labor market. Consequently, middle-aged workers have come to account for an ever-larger share of total hours worked, and the average age of workers has risen. Furthermore, the longest economic expansion in U.S. history ended in the first quarter of 2001. The recession that followed had varying effects on workers based on age, gender, education, and experience. As a result of these economic changes over time, the skill composition of hours worked, measured by the education and experience of the workforce, has varied considerably.

The BLS labor composition index estimates the effects that shifts in experience, education, and gender have on labor input growth and multifactor productivity growth. The Office of Productivity and Technology assembles data on workers' hours classified by their educational attainment, age and gender. Measures of labor input for the private business and the private nonfarm business sectors are then calculated by summing the annual percent changes in each group's hours of work, weighted together by that group's share of total labor compensation. These BLS labor composition indexes are reported annually in the Multifactor Productivity Trends news release. A complete description of these measures and methods can be found in Bulletin 2426, *Labor Composition and U.S. Productivity Growth, 1948-90*. For the years 2004 forward, BLS has incorporated more current data on the work experience of the labor force, taken from the 2001 SIPP (Survey of Income and Program Participation).

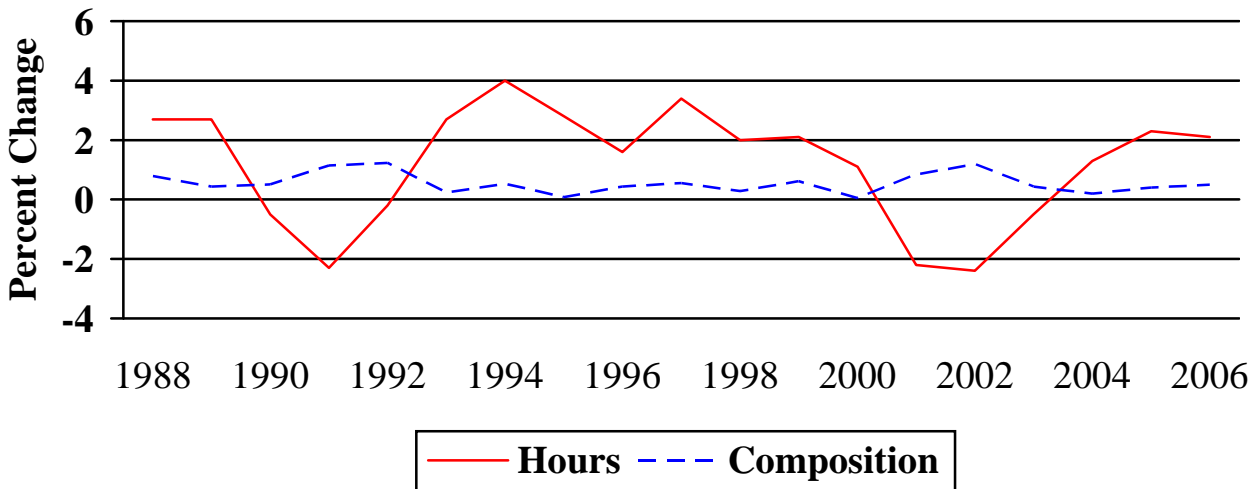
Recent Changes in Labor Composition

Based on data from the March 2007 Current Population Survey (CPS) of households, the increases in labor composition for 2006 were:

<u>Sector</u>	<u>2005-2006</u>
Private business sector	0.5%
Private nonfarm business sector	0.5%

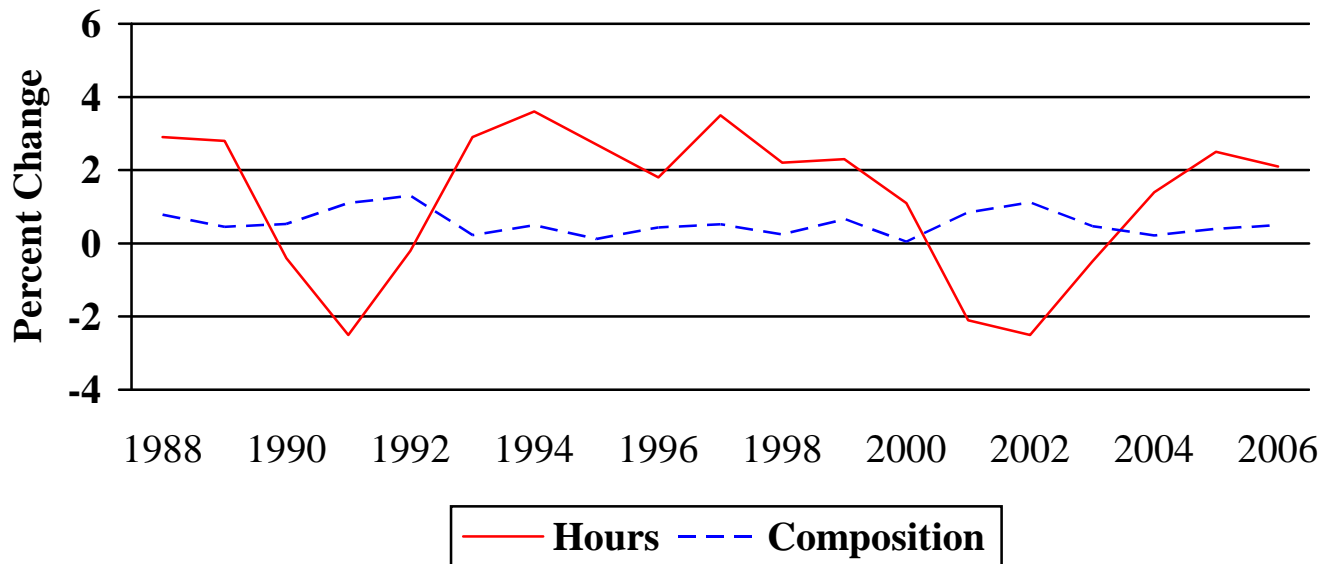
Charts 1 and 2 show annual changes in the indexes of labor composition and hours for the private business sector and the private nonfarm business sector for the 1988-2006 period. The growth rates for the private business and the private nonfarm business sectors are very similar because the two sectors cover approximately the same portions of the economy. Private nonfarm business excludes hours in the farm sector, which represent around two percent of the hours in the private business sector. Therefore, changes in the composition of hours are virtually identical in the two sectors. For this reason, the private nonfarm business sector is not discussed further.

Chart 1. Annual changes in the labor composition index and hours in private business, 1988-2006



Hours and labor composition are based on the March annual demographic file of the Current Population Survey.

Chart 2. Annual changes in the labor composition index and hours in private nonfarm business, 1988-2006



Hours and labor composition are based on the March annual demographic file of the Current Population Survey.

As can be seen in the charts above, cyclical effects also appear in the labor composition index. For example, during the 1991-1992 and 2001-2002 periods, labor composition index growth rates were around 1.0 percent. These periods coincide with economic recessions and the early stages of recovery from recession. During these periods, employment and hours declined. In 2006, hours grew 2.1 percent after growing 2.3 percent in 2005. The last slowdown in hours was in 2002.

Firms generally lay off workers with the least seniority, and blue collar workers usually experience more layoffs than well-educated white-collar workers do. As a result the skills composition of the remaining work force tends to increase during recessions. During recoveries, firms typically do not start hiring employees immediately; rather they wait for the economic expansion to mature. Therefore it is typical for an index of labor composition to increase relatively rapidly during recessions, and during the beginnings of recoveries, and relatively slowly as economic expansions mature.

The role of experienced and highly educated workers within the current composition of the work force also can be seen in tables on employment, hours, and median weekly earnings that are published by broad age intervals in the Bureau of Labor Statistics publication Employment and Earnings¹.

¹<http://www.bls.gov/cps/home.htm#empstat>. Employment Tables use 1-8, hours tables use 19 and 20, and for weekly earnings use tables 37-39.

Changes in the Distribution of Hours

Table 1 below shows the distribution of hours of men and women in the private business sector by educational attainment. In 2006, men and women with advanced degrees (17+ years of schooling) saw a similar increase in their share of hours. Men with advanced degrees have a larger share of hours than do women with advanced degrees. Meanwhile, women with some college (13-15 years of schooling) or a college degree (16 years of schooling) have a larger share of hours than do men with some college or a college degree.

Women with a college degree or an advanced degree have seen an increase in their share of hours since 2002, whereas women with a high school diploma have seen a decrease since 2002. There was a large decrease in the share of hours among men and women with some college. The difference was reflected in an increase in share of hours among men and women with a college degree or an advanced degree.

The hours-weighted average level of educational attainment for men is 13.47 years in 2006, lower than women at 13.70 years. Women have seen a steady increase, whereas men have not seen a steady increase or decrease. (See table 1a) The hours-weighted average level of educational attainment for men and women combined was 13.56 years in 2006, and 13.54 in 2005. (See Appendix 1)

**Table 1. Distribution of hours by years of school completed
Men and Women in the private business 2002-2006
(Percent)**

Years	Men					Women				
	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006
0-4	1.07	1.10	1.18	1.06	1.02	0.64	0.50	0.50	0.49	0.52
5-8	3.76	3.49	3.69	3.67	3.49	2.13	2.05	2.06	1.97	2.03
9-11	7.37	7.11	6.83	6.55	6.93	5.81	5.45	5.52	4.96	5.15
12	32.17	32.94	33.97	33.62	33.30	33.34	32.68	31.77	31.55	31.18
13-15	26.64	25.91	25.45	26.14	25.53	31.41	32.35	32.93	32.98	32.30
16	19.17	19.56	19.05	19.16	19.70	19.24	19.40	19.61	20.14	20.75
17+	9.82	9.89	9.83	9.80	10.03	7.43	7.57	7.61	7.91	8.07

Sum over all schooling levels in each year equals 100 for men and for women.

**Table 1a. Average years of school completed Men and Women in the private
business 2002-2006**

Years	Men					Women				
	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006
Mean	13.43	13.46	13.41	13.44	13.47	13.55	13.61	13.63	13.69	13.70

The Mean is a Weighted Mean

Table 2 shows the distributions of hours by level of potential work experience, defined as age minus years of completed schooling minus 6. The mean years of potential experience increased for men and women in 2006.

The share of hours worked by the original baby boom generation continues to rise in large part because the population of this group increased considerably more rapidly than the remainder of the population. This age group most closely corresponds to workers with 30-39, and 40+ years of potential experience as seen in table 2. In 2006, the women with 30-39, and 40+ years of potential experience saw an increase in experience for the second year, whereas men in these categories have increased steadily the last five years.

The largest gains were made by men and women with 30-39 years of potential experience, especially for women. The share of hours for men with 30-39 years of potential work experience rose 0.7 percent and women with 30-39 years of potential work experience saw an increase of 0.8 percent. Men and women with 40+ years of potential experience both saw a similar increase in 2006. Men with 5-9 years of potential experience saw an increase of 0.2 percent in hours, whereas women saw a 0.2 percent decrease in hours.

The largest declines were seen among men and women with 20-29 years of experience because they are following the baby boom cohort. The share of hours for men with 20-29 years of experience fell 1.0 percent for men, and 0.7 percent for women. The weighted mean of potential experience, in 2006, for men was 12.66, the same as 2005. The weighted mean of potential experience, in 2006, for women was 12.02, an increase from 2005's 11.96. (See table 2a) The hours-weighted average level of educational attainment for men and women combined is 12.39 years in 2006, and 12.36 in 2005. (See Appendix 2)

**Table 2. Distribution of hours by years of potential experience
Men and Women in the private business, 2002-2006
(percent)**

Years	Men					Women				
	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006
0-4	5.26	5.19	5.06	5.09	5.07	7.73	7.71	7.99	7.46	7.43
5- 9	10.24	10.79	10.62	11.08	11.23	12.12	12.61	12.74	12.97	12.79
10-14	12.79	12.23	12.32	12.15	12.07	10.36	9.98	9.47	9.51	9.51
15-19	13.37	13.51	13.42	12.96	12.86	14.67	14.26	14.51	13.63	13.67
20-29	29.74	28.78	28.56	27.88	26.84	35.11	35.34	35.43	35.50	34.80
30-39	20.19	21.01	21.12	21.71	22.41	18.87	18.79	18.49	19.47	20.28
40+	8.41	8.48	8.90	9.13	9.52	1.14	1.31	1.37	1.46	1.52

The sum over all experience levels in each year equals 100 for men and for women. Potential experience represents the number of years since leaving school (age-schooling-6).

**Table 2a. Average years of potential experience Men and Women in the
private business, 2002-2006**

Years	Men					Women				
	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006
Mean	12.59	12.59	12.64	12.64	12.66	11.92	11.91	11.88	11.96	12.02

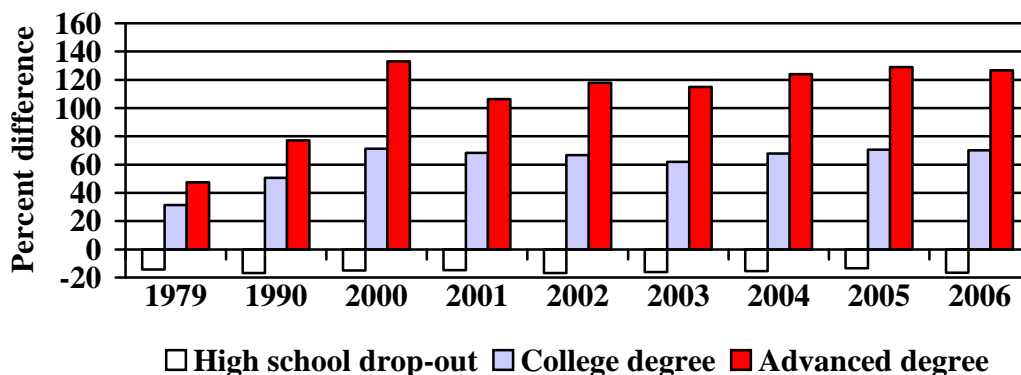
The Mean is a Weighted Mean

Wage Equation Estimates

The labor composition index is affected both by shifts in the distribution of hours employed and by changes in the relative wage rates received by different groups of workers. For example, suppose that the total hours of highly educated workers are growing more rapidly than the hours of less educated workers. Then, all else equal, an increase in the wage rates of highly educated workers relative to less well-educated workers will result in an increase in the growth rate of the labor composition index. Many studies have shown that returns to schooling and work experience increased throughout the 1980s and early 1990s. These trends are reflected in wage equation parameters that are used to construct the labor composition index.

As noted above, the BLS labor composition indexes are weighted sums of growth rates of hours. A standard human capital wage equation is used to construct the labor cost share weights used in these calculations. Relative earnings by educational attainment based on these parameters are found in the following charts. These parameter estimates capture the wage rate differentials between different categories of workers. In 2006, male college graduates earned 70.0 percent more than high school graduates. For men with advanced degrees, earnings were 126.8 percent higher. Men who dropped out of high school earned 16.7 percent less than high school graduates in 2006. (See Chart 3.)

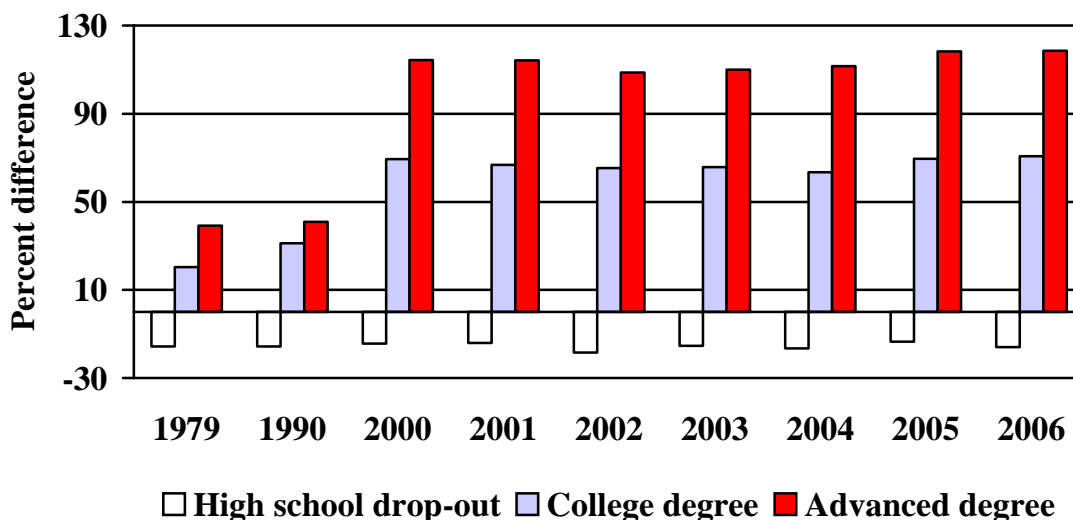
Chart 3. Earnings of men by educational attainment relative to high school graduates



Relative earnings of employees in the private business sector are measured holding all other socioeconomic characteristics constant. Data are based on the March annual demographic file of the Current Population Survey.

The increase of relative earnings for men with a college degree or advanced degree, in comparison to high school graduates, was not as large in 2006 as it was in 2005. Men who dropped out of high school showed a significant decrease in relative earnings of 3.3 percent in 2006.

Chart 4. Earnings of women by educational attainment relative to high school graduates



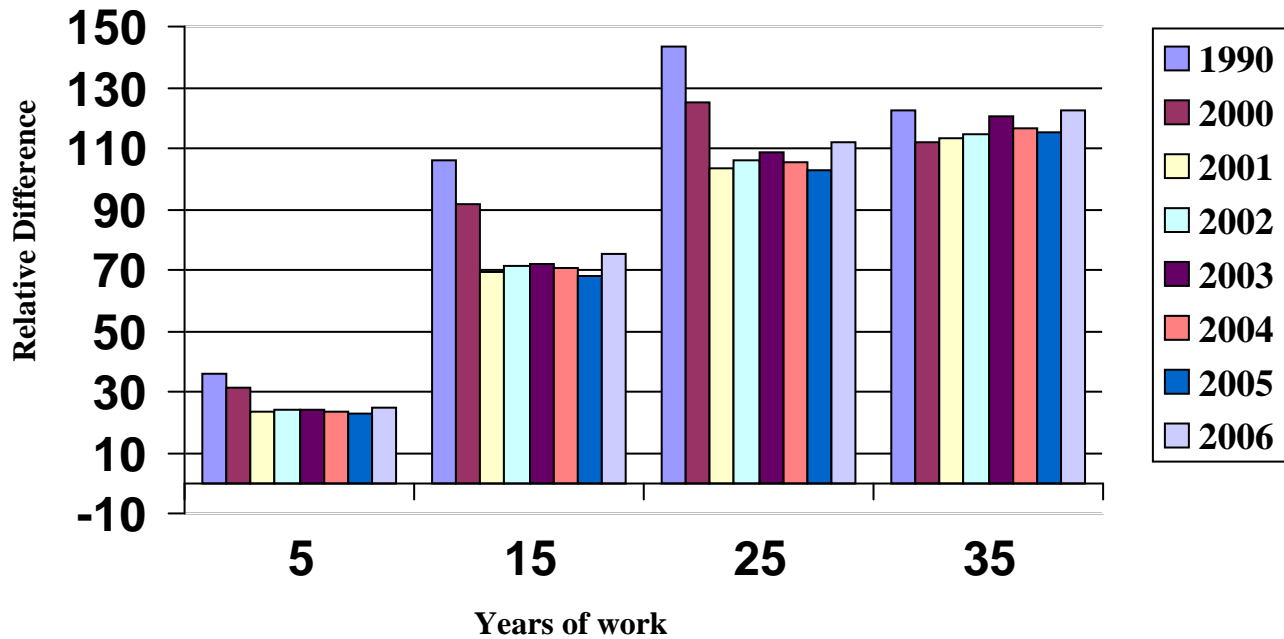
Relative earnings of employees in the private business sector are measured holding other socioeconomic characteristics constant. Data are based on the March annual demographic file of the Current Population Survey.

For women, the earnings of college graduates in 2006 were about 70.7 percent higher than those of high school graduates. Earnings of women with advanced degrees were 118.6 percent higher, and women who dropped out of high school earned 16.0 percent less. Women who dropped out of high school saw a relative decrease in earnings of 2.5 percent in 2006, a similar trend as men who dropped out of high school in 2006. (See Chart 4.)

Work experience parameters can be interpreted in a similar fashion, although the exact calculations are slightly more complex². Estimated work experience is modeled using the characteristics of workers and their work histories taken from a sample of Social Security Administration records (see Bulletin 2426, *Labor Composition and U. S. Economic Growth, 1948-90*). For 2006, men with 5 years of estimated work experience earn 25.0 percent more than men with no estimated work experience (See Chart 5.). Men with 15 years of work experience earned 75.2 percent more than inexperienced workers. Men with 25 years of work experience earned 112.2 percent more than inexperienced workers, and men with 35 years of work experience earned 122.1 percent more than men with no experience. At some point, additional experience ceases to have any positive effect. Wages may cease to increase or may even fall for some older workers because of job changes, career changes or other reasons. Thus, on average, workers nearing retirement often have somewhat lower wage rates than those in their late 40s.

² 1949-2003 data, estimated work experience is modeled using the characteristics of workers and their work histories taken from a sample of Social Security Administration records (see Bulletin 2426, *Labor Composition and U. S. Economic Growth, 1948-90*). 2004-2006 data uses (Survey of Income and Program Participation) to estimate work experience.

Chart 5. Earnings of men by years of estimated work experience relative to inexperienced workers, 1990-2006

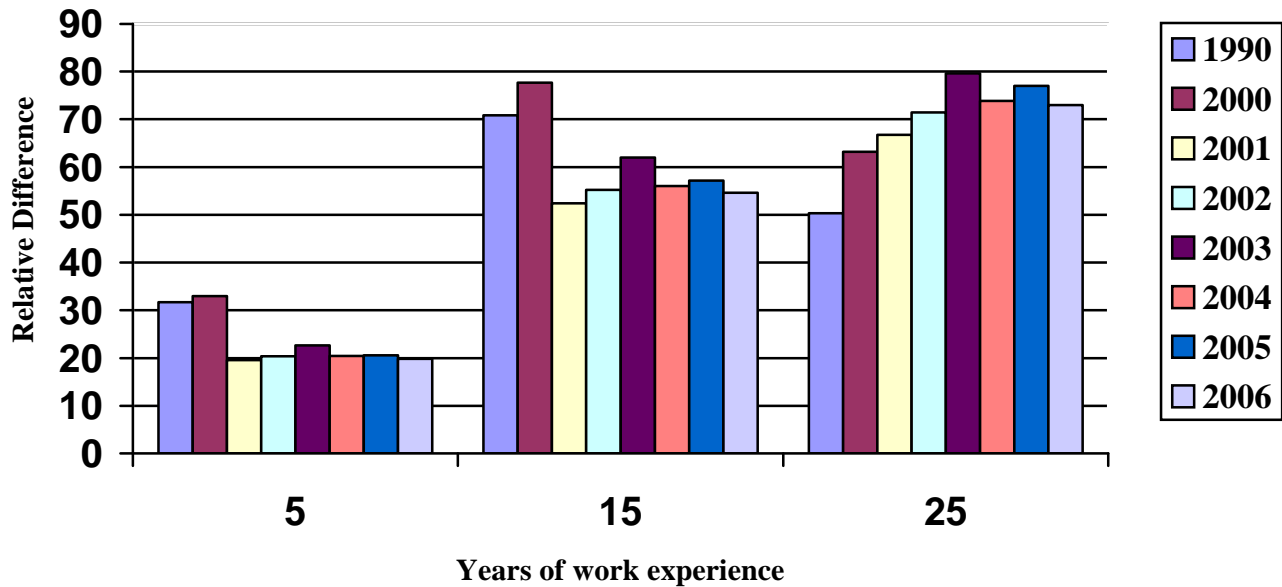


Relative to earnings of employees in the private business sector with no experience are measured holding other socioeconomic characteristics constant. Data are based on the March annual demographic file of the Current Population Survey.

Chart 5 may also hint at a break in the compression in the relative earnings of men with different amounts of estimated work experience over the last 5 years. While men with 5 years of work experience earned 25.0 percent more than inexperienced workers, the premium paid to workers with more years of experience sharply increased in 2006. The premium paid to men with 35 or more years of work experience in 2006 had the largest increase since 2000.

For women, estimated work experience has less impact on earnings in comparison to men. Furthermore, over the last 5 years the return to work experience has varied without any clear trend. (See Chart 6.) In 2006, women with 5 years of work experience earned 19.8 percent more than women without any experience, about the same as in the previous four years, except for 2003 when women saw a sharp increase. For the most experienced workers, women with 25 years, the wage premium did not increase as much in 2006, 73.0 percent, as in 2005, when women saw an increase of 77.0 percent. For women, the largest decrease has been seen for women with 25 years of work experience. Unlike the men with 15, and 25 years work experience who saw an increase, women with 15, and 25 years experience saw their first decrease since 2004.

Chart 6. Earnings of women by years of estimated work experience relative to inexperienced workers, 1990-2006



Relative to earnings of employees in the private business sector with no experience are measured holding other socioeconomic characteristics constant. Data are based on the March annual demographic file of the Current Population Survey.

Table 3 (at the end of this document) divides the sources of labor input into changes in hours and changes in labor composition for the private business sector. While annual changes in labor input as measured by the Current Population Survey are usually dominated by changes in hours, labor composition growth generally provides a small but steady positive contribution to labor input. Within a growth accounting framework, an increase in the labor composition index, in workers' skill levels, has the same effect on output and productivity growth as an increase in hours worked. Therefore, a 1.0 percent increase in labor composition is equivalent to a 1.0 percent increase in hours worked.

Summary and Conclusions

In 2006, the labor composition index increased 0.5 percent for both the private business and the private nonfarm business. These gains were slightly higher than in 2005, but considerably lower than the post-recession year 2002. From 2001-2003, where we saw larger growth in labor composition; there was a decline in growth for hours. While the aging of the baby-boom generation and the increases in educational attainment added to labor composition growth in 2006, a relatively strong labor market reinforced a shift away from more educated and experienced workers.

Table 3. Sources of labor input growth in the private business sector, 1948-2006
(Percentage from the preceding year and compound growth rates)

Year	Input¹	Hours^{1,2}	Labor Composition
1974	-5.0	-5.6	0.6
1975	2.3	2.3	0.0
1976	3.6	3.9	-0.3
1977	4.6	4.6	0.0
1978	4.9	4.8	0.1
1979	3.9	4.3	-0.3
1980	0.8	0.5	0.3
1981	1.5	0.8	0.7
1982	-0.4	-1.4	1.0
1983	3.1	2.7	0.4
1984	5.4	5.3	0.1
1985	3.3	3.1	0.2
1986	3.3	2.8	0.5
1987	3.1	2.9	0.3
1988	3.5	2.7	0.8
1989	3.1	2.7	0.4
1990	0.0	-0.5	0.5
1991	-1.2	-2.3	1.1
1992	-0.8	-0.2	1.2
1993	2.9	2.7	0.2
1994	4.5	4.0	0.5
1995	2.9	2.8	0.1
1996	2.0	1.6	0.4
1997	4.0	3.4	0.6
1998	2.3	2.0	0.3
1999	2.7	2.1	0.6
2000	1.2	1.1	0.1
2001	-1.3	-2.2	0.9
2002	-1.2	-2.4	1.2
2003	-0.1	-0.5	0.5
2004	1.5	1.3	0.2
2005	2.6	2.3	0.4
2006	2.6	2.1	0.5
1949-1973	0.2	0.2	0.3
1973-1990	-0.1	-0.2	0.3
1990-2000	0.1	0.2	0.5
2000-2006	0.1	0.0	0.1

1. The growth rate of labor input equals the growth rates of hours and labor composition.

2. The hours are from the Current Population Survey, not based on published measures for the Private Business Sector.

Table 4. Sources of labor input growth in the private business sector, 1948-2006
(Indexes)

Year	Input¹	Hours^{1,2}	Labor Composition
1948	98.64	99.02	84.00
1950	96.84	96.14	84.83
1955	101.28	101.19	86.71
1960	98.52	98.12	88.12
1965	100.30	100.49	89.60
1970	97.33	97.03	90.24
1971	101.28	101.68	89.98
1972	102.47	102.47	90.02
1973	100.89	101.19	89.86
1974	93.87	93.37	90.43
1975	101.09	101.19	90.47
1976	102.37	102.77	90.23
1977	103.36	103.46	90.25
1978	103.66	103.66	90.36
1979	102.67	103.17	90.08
1980	99.60	99.41	90.36
1981	100.30	99.70	91.02
1982	98.42	97.53	91.96
1983	101.88	101.58	92.35
1984	104.15	104.15	92.45
1985	102.08	101.98	92.68
1986	102.08	101.68	93.12
1987	101.88	101.78	93.36
1988	102.27	101.58	94.10
1989	101.88	101.58	94.51
1990	98.81	98.42	95.00
1991	97.63	96.64	96.08
1992	98.02	98.71	97.26
1993	101.68	101.58	97.48
1994	103.26	102.87	98.00
1995	101.68	101.68	98.08
1996	100.79	100.49	98.51
1997	102.77	102.27	99.06
1998	101.09	100.89	99.33
1999	101.48	100.99	99.95
2000	100.00	100.00	100.00
2001	97.53	96.74	100.85
2002	97.63	96.54	102.04
2003	98.72	98.42	102.48
2004	100.30	100.20	102.68
2005	101.38	101.19	102.83
2006	101.38	100.99	103.33

1. The growth rate of labor input equals the growth rates of hours and labor composition.
2. The hours are from the Current Population Survey, not based on published measures for the Private Business Sector.

**Appendix 1. Total distribution of hours by years of school completed
in the private business sector, 2004-2006**
(Percent)

Years	Men and Women		
	2004	2005	2006
0-4	.90	.83	.81
5-8	3.03	2.97	2.90
9-11	6.29	5.91	6.21
12	33.07	32.78	32.44
13-15	28.50	28.93	28.29
16	19.28	19.56	20.12
17+	8.93	9.03	9.23

Sum over all schooling levels in each year equals 100 for men and for women.
Men and Women combined.

**Appendix 1a. Average years of school completed in the private business
sector, 2004-2006**

Years	Men and Women		
	2004	2005	2006
Mean	13.50	13.54	13.56

The Mean is a Weighted Mean.
Men and Women combined.

**Appendix 2. Total distribution of hours by years of potential experience
in the private business sector, 2004-2006**
(percent)

Years	Men and Women		
	2004	2005	2006
0-4	6.25	6.08	6.03
5- 9	11.48	11.85	11.87
10-14	11.16	11.07	11.03
15-19	13.86	13.23	13.19
20-29	31.36	30.98	30.08
30-39	20.05	20.79	21.54
40+	5.83	6.00	6.26

The sum over all experience levels in each year equals 100 for men and for women. Potential experience represents the number of years since leaving school (age-schooling-6).
Men and Women combined.

**Appendix 2a. Average years of potential experience in the private business
sector, 2004-2006**

Years	Men and Women		
	2004	2005	2006
Mean	12.33	12.36	12.39

The Mean is a Weighted Mean
Men and Women combined.