

Changes in the Composition of Labor for BLS Multifactor Productivity Measures, 2007

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, and education. As a result of these economic and demographic changes over time, the skill composition of hours worked has changed dramatically.

The BLS labor composition index estimates the effects that shifts in age, 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 our traditional methods can be found in Bulletin 2426, *Labor Composition and U.S. Productivity Growth, 1948-90*.

For the years 1987 forward, a new, simplified procedure to calculate labor composition has been implemented this year to replace the previous methodology. This new procedure is based on analysis by BLS economist Cindy Zoghi.¹ BLS has removed the experience coefficient from its labor composition estimates. This conforms to the Jorgenson-Ho-Stiroh methodology which assumes that experience is implicitly represented through the data on education and age.² BLS has also moved from using a Mincer-type wage equation approach that imputes wage averages to using actual wage averages.

Recent Changes in Labor Composition

Based on data from the March 2008 Current Population Survey (CPS) of households, the annual growth rates in labor composition from 2006 to 2007 were:

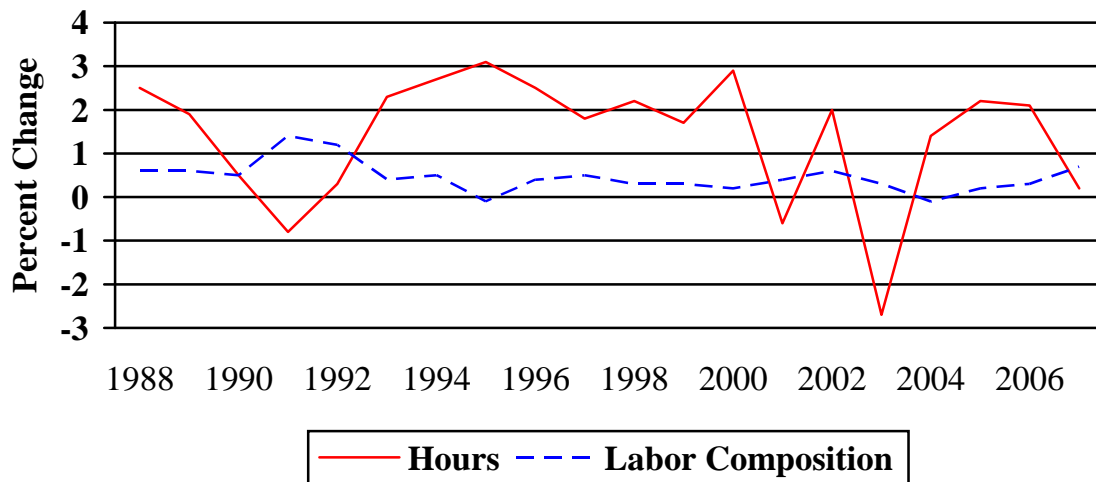
<u>Sector</u>	<u>2006-2007</u>
Private business sector	0.7%
Private nonfarm business sector	0.7%

¹ Cindy Zoghi, *Measuring Labor Composition: A Comparison of Alternate Methodologies* (<http://www.bls.gov/bls/fesacp1121407.pdf>)

² Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh. *Productivity: Information Technology and the American Growth Resurgence*. P 245

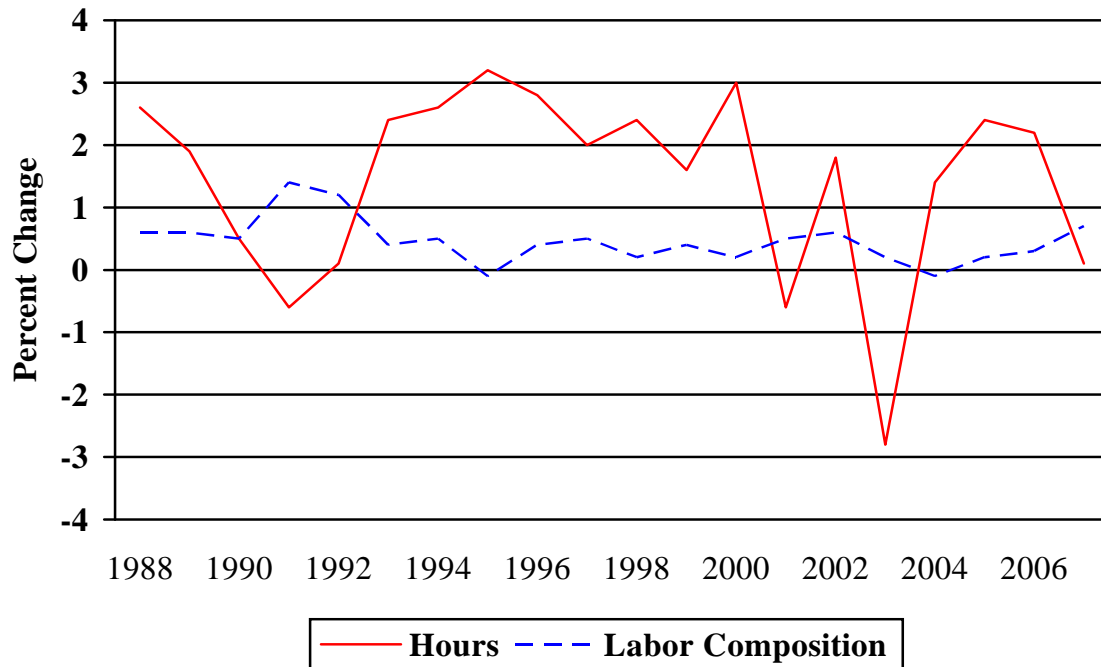
Charts 1 and 2 show annual changes for the 1988-2007 period in the indexes of labor composition and hours for the private business sector and the private nonfarm business sector. The growth rates for the private business and the private nonfarm business sectors are very similar because the two sectors 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 in this report.

Chart 1. Annual changes in the labor composition index and hours in private business, 1988-2007



Note: 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, 1988-2007



Note: 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 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 2007, hours grew significantly slower, 0.2 percent, after growing 2.1 percent in 2006 and 2.2 percent in 2005. The growth rate of hours has slowed for three consecutive years.

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 Earnings.³

³<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 2007, both men and women with advanced degrees (17+ years of schooling) increased 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.

The share of hours worked by women with a college degree or an advanced degree has increased since 2003, whereas women with 12 years of school have seen a decrease since 2003. There was a large decrease in the share of hours among men and women with 0-12 years of school. The difference was reflected in an increase in the share of hours among men and women with some college, a college degree, or an advanced degree.

The hours-weighted average level of educational attainment for men is 13.54 years in 2007, lower than women's level of 13.81 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 both 2006 and 2007 (see appendix tables 1 and 1a).

**Table 1. Distribution of hours by years of school completed
Men and Women in the private business 2003-07
(Percent)**

Years	Men					Women				
	2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
0-4	1.10	1.18	1.06	1.02	0.89	0.50	0.50	0.49	0.52	0.43
5-8	3.49	3.69	3.67	3.49	3.29	2.05	2.06	1.97	2.03	1.75
9-11	7.11	6.83	6.55	6.93	6.47	5.45	5.52	4.96	5.15	4.81
12	32.94	33.97	33.62	33.30	32.90	32.68	31.77	31.55	31.18	29.89
13-15	25.91	25.45	26.14	25.53	26.34	32.35	32.93	32.98	32.30	33.03
16	19.56	19.05	19.16	19.70	19.96	19.40	19.61	20.14	20.75	21.29
17+	9.89	9.83	9.80	10.03	10.16	7.57	7.61	7.91	8.07	8.80

Note: 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 2003-07**

Years	Men					Women				
	2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
Mean	13.46	13.41	13.44	13.47	13.54	13.61	13.63	13.69	13.70	13.81

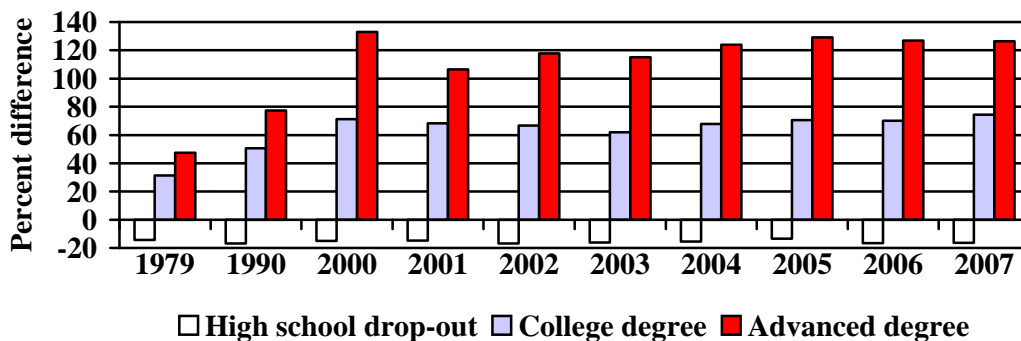
Note: The Mean is a weighted mean.

Wage Structure

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.

Relative earnings by educational attainment are found in the following charts. The wage rate differentials between different categories of workers are captured in the data. In 2007, men who were college graduates earned 74.4 percent more than high school graduates. For men with advanced degrees, earnings were 126.4 percent higher. Men who dropped out of high school earned 16.4 percent less than high school graduates in 2007 (see Chart 3).

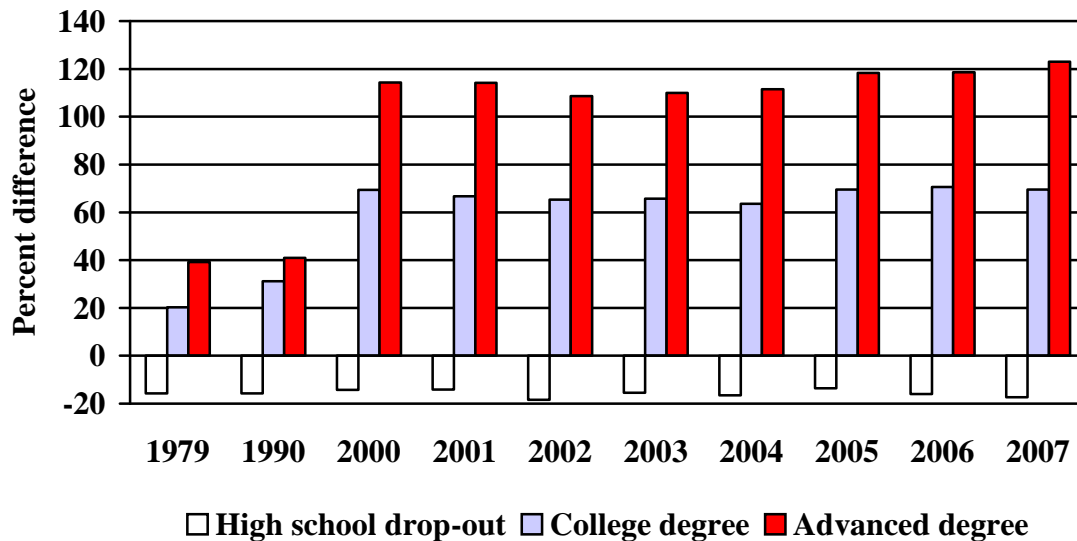
Chart 3. Earnings of men by educational attainment relative to high school graduates



Note: 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, in comparison to high school graduates, was 4.4 percentage points larger in 2007 versus 2006. Men with an advanced degree saw a small decline of 0.4 percentage points in 2007 versus 2006.

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



Note: 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 2007 was about 69.6 percent higher than those of high school graduates, 1.1 percentage points lower in comparison to 2006. The earnings of women with advanced degrees was 123.0 percent higher than high school graduates, an increase of 4.5 percentage points from 2006. Women who dropped out of high school earned 17.3 percent less than high school graduates. Women who dropped out of high school saw a relative decrease in earnings of 1.3 percentage points in 2007 following a decrease in earnings of 2.5 percentage points in 2006 (see Chart 4).

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 2007, the labor composition index increased 0.7 percent for both the private business and the private nonfarm business sectors. These gains were considerably higher than in 2006 and showed the fastest rate of growth since the post-recession year 1992. While the aging of the baby-boom generation and the increases in educational attainment added to labor composition growth in 2007, there was a strong shift in the labor market away from workers with lower education and experience.

Table 3. Sources of labor input growth in the private business sector, 1974-2007
(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	2.8	2.7	0.1
1988	3.1	2.5	0.6
1989	2.4	1.9	0.6
1990	1.0	0.5	0.5
1991	0.6	-0.8	1.4
1992	1.5	0.3	1.2
1993	2.7	2.3	0.4
1994	3.2	2.7	0.5
1995	3.0	3.1	-0.1
1996	2.8	2.5	0.4
1997	2.4	1.8	0.5
1998	2.5	2.2	0.3
1999	2.0	1.7	0.3
2000	3.1	2.9	0.2
2001	-0.2	-0.6	0.4
2002	2.5	2.0	0.6
2003	-2.5	-2.7	0.3
2004	1.3	1.4	-0.1
2005	2.5	2.2	0.2
2006	2.4	2.1	0.3
2007	0.8	0.2	0.7
1973-1990	2.2	2.0	0.3
1990-2000	2.4	1.9	0.5
2000-2007	1.0	0.6	0.3

1. Note: The growth rate of labor input equals the growth rates of hours and labor composition.
2. The hours are from the Current Population Survey (CPS), not based on published measures for the private business sector which uses the CPS, the Current Employment Statistics program, and the National Compensation Survey.

**Table 4. Sources of labor input growth in the private business sector, 1973-2007
(Indexes)**

Year	Input¹	Hours^{1,2}	Labor Composition
1973	54.79	59.54	90.16
1974	52.05	56.21	90.70
1975	53.25	57.50	90.70
1976	55.16	59.74	90.43
1977	57.70	62.49	90.43
1978	60.53	65.49	90.52
1979	62.89	68.31	90.24
1980	63.39	68.65	90.52
1981	64.34	69.20	91.15
1982	64.09	68.23	92.06
1983	66.07	70.07	92.43
1984	69.64	73.78	92.52
1985	71.94	76.07	92.71
1986	74.31	78.20	93.17
1987	74.16	79.31	93.44
1988	76.43	81.26	94.01
1989	78.30	82.79	94.53
1990	79.10	83.20	95.03
1991	79.59	82.52	96.39
1992	80.78	82.75	97.57
1993	82.94	84.63	97.96
1994	85.58	86.89	98.46
1995	88.11	89.57	98.34
1996	90.60	91.78	98.69
1997	92.73	93.47	99.19
1998	95.05	95.56	99.45
1999	96.96	97.16	99.79
2000	100.00	100.00	100.00
2001	99.82	99.37	100.44
2002	102.36	101.33	101.02
2003	99.81	98.56	101.28
2004	101.07	99.92	101.14
2005	103.55	102.15	101.37
2006	106.00	104.32	101.63
2007	106.90	104.49	102.32

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 (CPS), not based on published measures for the private business sector which uses the CPS, the Current Employment Statistics program, and the National Compensation Survey.

Appendix table 1. Total distribution of hours by years of school completed in the private business sector, 2005-07

(Percent)

Years	Men and Women		
	2005	2006	2007
0-4	0.83	0.81	0.70
5-8	2.97	2.90	2.66
9-11	5.91	6.21	5.79
12	32.78	32.44	31.67
13-15	28.93	28.29	29.08
16	19.56	20.12	20.50
17+	9.03	9.23	9.60

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

Appendix table 1a. Average years of school completed in the private business sector, 2005-07

Years	Men and Women		
	2005	2006	2007
Mean	13.54	13.56	13.56

Note: The Mean is a weighted mean.
Note: Men and women combined.