

Exploring changes in real average hourly earnings, June 2009 to December 2019

This article examines trends in real average hourly earnings (1982–84 dollars) for all employees from June 2009, the trough of the 2007–09 recession, to December 2019. It looks at real earnings at the total private and major industry levels, with more detailed analysis for select industries. The article analyzes what drove the postrecession growth in real hourly earnings. In particular, it identifies which industries contributed the most to overall earnings growth during the period.

The U.S. Bureau of Labor Statistics produces several measures of pay and benefits.^[1] This article focuses on one of the timeliest measures: real average hourly earnings (1982–84 dollars) from the Current Employment Statistics (CES) survey, also known as the establishment or payroll survey.^[2] Every month, the CES survey produces detailed estimates of industry employment, hours, and earnings of workers on nonfarm payrolls.^[3] The economy added millions of jobs during the economic expansion that began in June 2009, but whether or not these are “good” jobs remains an open question.

In this article, we examine trends in real (inflation-adjusted) average hourly earnings of all employees from June 2009, the trough of the 2007–09 recession as determined by the National Bureau of Economic Research, to December 2019.^[4] We look at hourly earnings at the total private and major industry levels, with a more detailed analysis for select industries.^[5] Our goal is to analyze what drove the postrecession growth in real hourly earnings. That is, we identify which industries contributed the most—or the least—to earnings growth at the highest level and how these sectors affected the labor market as a whole.



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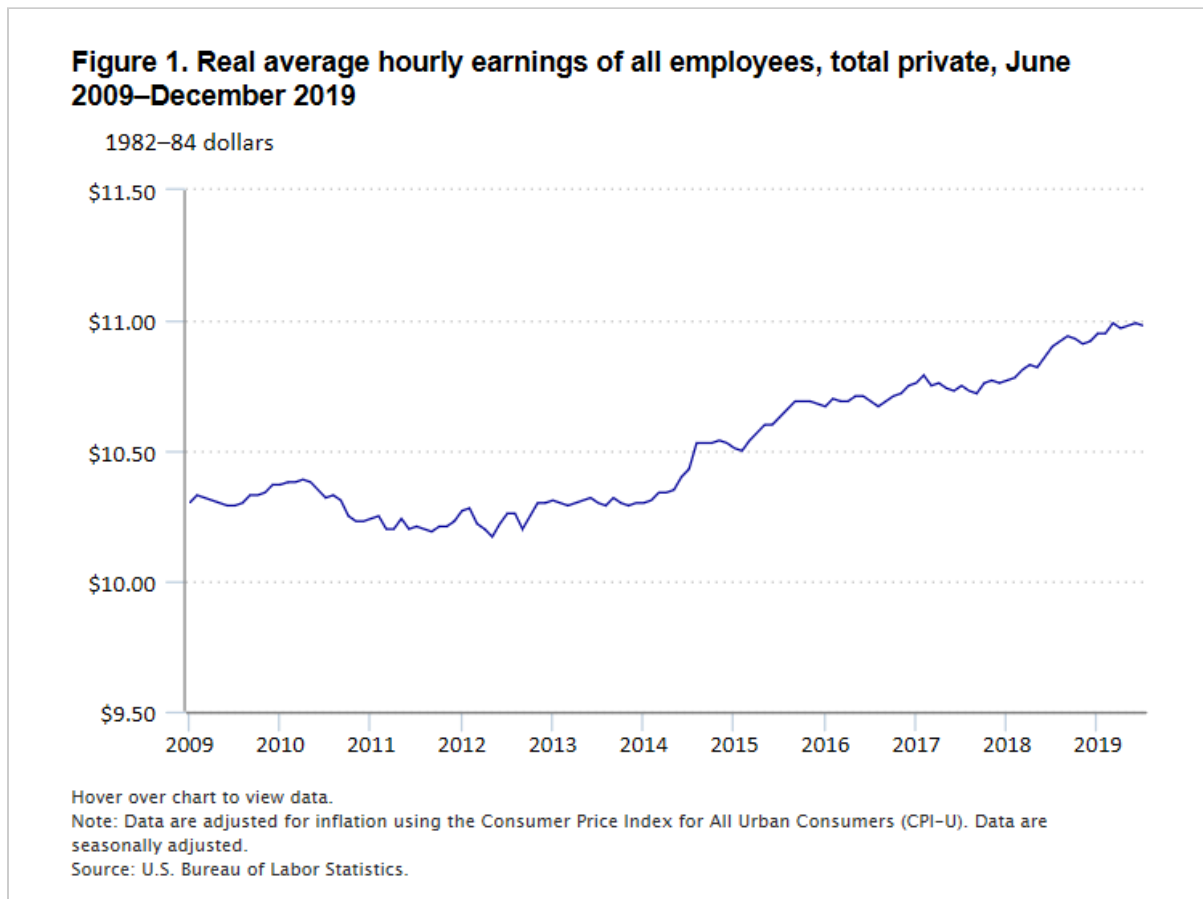
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Basis and scope

Average hourly earnings from the CES survey are a measure of gross payrolls divided by total hours for which employees receive pay—including sick pay or vacation pay—during the pay period that includes the 12th of the month. They do not represent employers’ total compensation costs because they exclude items such as employee benefits, irregular bonuses and commissions, retroactive payments, and the employer’s share of payroll taxes.^[6]

How have earnings changed since the end of the 2007–09 recession? Figure 1 illustrates the rise in total private real average hourly earnings, with a notable uptick in earnings beginning in 2014. Real hourly earnings rose by 68 cents, from \$10.30 in June 2009 to \$10.98 in December 2019, for a 6.6-percent total increase. Real earnings also increased over the 2009–19 period for every major industry group.

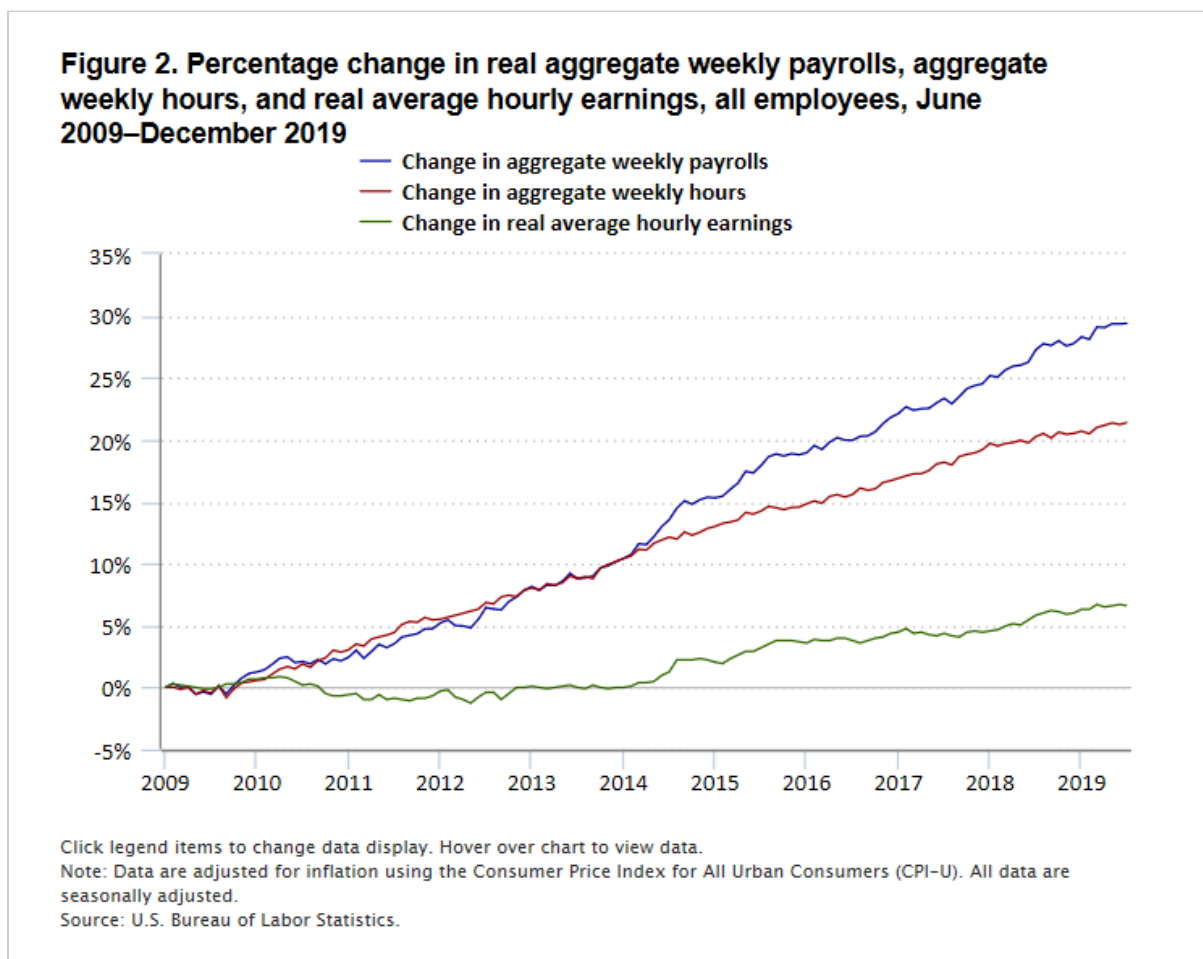


Several key components factor into total private earnings growth. Nominal average hourly earnings for all employees from the CES survey are calculated as follows: Aggregate weekly payrolls of all employees divided by aggregate weekly hours of all employees. This formula represents earnings at the nominal level. However, in this article, we use “real” or inflation-adjusted hourly earnings to compare earnings in 2009 with earnings in 2019 by removing the inflation factor. Real earnings are a better reflection of purchasing power and provide a more accurate comparison of earnings at different points in time. Using current-dollar values—as opposed to real or “constant-dollar” values—would show large increases in earnings across all industries, which would overstate earnings growth by not accounting for inflation.

We use a deflator to calculate real earnings from the nominal values. For all employees, the deflator is the Consumer Price Index for All Urban Consumers (CPI-U).^[7] Therefore, real average hourly earnings for all employees are calculated as follows: Real aggregate weekly payrolls of all employees divided by aggregate weekly hours of all employees.

Real earnings as a function of the payroll-to-hours relationship

At its most basic level, the growth in real earnings stems from real aggregate payrolls increasing at a faster rate than total hours worked. Therefore, mathematically, both the numerator and the denominator in the real earnings formula play a key role in the direction of the data series. That is, if the numerator increases more quickly than the denominator, then earnings *must* increase. The opposite holds true as well—if the denominator increases at a faster rate than the numerator, then earnings must decrease. Figure 2 illustrates this relationship clearly.



Payrolls and hours increased at almost the same rate from June 2009 until the middle of 2014, with real earnings growth hovering around 0 percent. At some points during the early part of the recovery, aggregate hours (denominator) were even growing slightly faster than aggregate payrolls (numerator), yielding a decline in real earnings. When payrolls began to increase faster than hours, as we see beginning in the second half of 2014, real earnings grew and continued to do so through 2019.

Total private real average hourly earnings have been rising since 2014, so which industries are driving this growth? Table 1 shows the percentage change in real total payrolls and aggregate weekly hours at the major industry level over the June 2009–December 2019 period. It thus shows the payroll-to-hours relationship, with the most relevant information being the *difference* between payroll and hours growth. If payrolls increase quickly and hours increase at a similar rate, then they will cancel each other out and real earnings growth will be stagnant. From 2009 to 2019, payrolls increased more than hours in all major industries, leading to an increase in total private real average hourly earnings over the period.

Table 1. Percentage change in real aggregate weekly payrolls and aggregate weekly hours for all employees, by major industry, June 2009–December 2019

Industry	Change in aggregate weekly payrolls	Change in aggregate weekly hours	Difference, in percentage points
Total private	29.4%	21.4%	8.0
Mining and logging	19.8	14.2	5.6
Construction	37.3	31.8	5.5
Manufacturing	16.4	14.5	1.8
Durable goods	18.8	18.4	0.4
Nondurable goods	12.1	8.7	3.4
Trade, transportation, and utilities	19.1	12.3	6.8
Wholesale trade	14.9	10.5	4.4
Retail trade	14.6	5.7	8.9
Transportation and warehousing	38.2	35.4	2.7
Utilities	9.7	2.7	7.1
Information	23.8	2.8	21.0
Financial activities	32.7	15.8	16.9
Professional and business services	41.3	34.4	6.8
Education and health services	32.1	26.3	5.9
Health care and social assistance	32.3	26.5	5.7
Leisure and hospitality	40.0	29.9	10.1
Other services	21.5	12.1	9.5

Note: Payroll data are adjusted for inflation using the Consumer Price Index for All Urban Consumers (CPI-U). Data are seasonally adjusted.

Source: U.S. Bureau of Labor Statistics.

Table 2 shows the percentage change in real earnings from June 2009 to December 2019. As can be seen in the table, real earnings increased in all of the major industry groups, which indicates that payrolls increased at a faster rate than hours for each of the groups during the postrecession period. Transportation and warehousing experienced very high payroll and hours growth over the period (as shown in table 1), but because pay and hours increased at almost the same rate, real earnings rose by only 2.0 percent.

Table 2. Real average hourly earnings (1982–84 dollars) and percentage change, all employees, by major industry, June 2009–December 2019

Industry	Real average hourly earnings, June 2009	Real average hourly earnings, December 2019	Percentage change
Total private	\$10.30	\$10.98	6.6%
Mining and logging	12.75	13.38	4.9
Construction	11.57	12.05	4.1
Manufacturing	10.72	10.89	1.6
Durable goods	11.42	11.46	0.4
Nondurable goods	9.60	9.90	3.1
Trade, transportation, and utilities	8.94	9.48	6.0
Wholesale trade	11.76	12.23	4.0
Retail trade	7.15	7.75	8.4
Transportation and warehousing	9.45	9.64	2.0
Utilities	15.26	16.31	6.9
Information	13.68	16.47	20.4
Financial activities	12.33	14.13	14.6
Professional and business services	12.60	13.24	5.1
Education and health services	10.30	10.78	4.7
Health care and social assistance	10.39	10.86	4.5
Leisure and hospitality	6.02	6.49	7.8
Other services	9.12	9.89	8.4

Note: Data are adjusted for inflation using the Consumer Price Index for All Urban Consumers (CPI-U). Data are seasonally adjusted.

Source: U.S. Bureau of Labor Statistics.

On the other end of the spectrum, the rate of payroll growth in the information industry (23.8 percent) was about average relative to other industries, yet real earnings increased by a substantial 20.4 percent, as aggregate hours in the industry increased by only 2.8 percent. (See table 1.) As a result, information had the largest percentage change in real earnings of all major industries over the period; at \$16.47 per hour, information also had the highest earnings rate, surpassing that of utilities (\$16.31), which had the highest rate (\$15.26) in June 2009. (See table 2.) This large earnings growth occurred because information had the largest difference between payroll growth (23.8 percent) and hours growth (2.8 percent). Hence, although information had relatively little increase in total hours worked between 2009 and 2019, establishments in the industry were paying their employees nearly 24 percent more by the end of the period.

Employment

At first glance, information, financial activities, and utilities industries might appear to have performed the best during the postrecession period, because they make up the top three industries in terms of real earnings growth and they are the highest paying industries overall. On the basis of these data alone, one might assume that the

three industries together represent one of the driving forces of the strong economy during the 2009–19 period. This assumption ignores a major factor, though—employment. Table 3 shows the number of employees added to each major industry from June 2009 to December 2019. Over that period, total private employment increased by about 20.9 million, with some industries adding many more jobs than others.

Table 3. Change in employment and percentage change, all employees, by major industry, June 2009–December 2019

Industry	Change in employment	Percentage change
Total private	20,887,000	19.3%
Mining and logging	29,000	4.2
Construction	1,545,000	25.7
Manufacturing	1,140,000	9.7
Durable goods	882,000	12.3
Nondurable goods	258,000	5.7
Trade, transportation, and utilities	2,974,000	12.0
Wholesale trade	420,000	7.6
Retail trade	1,131,000	7.8
Transportation and warehousing	1,436,000	34.0
Utilities	–12,000	–2.2
Information	87,000	3.1
Financial activities	994,000	12.7
Professional and business services	5,006,000	30.3
Education and health services	4,851,000	24.7
Health care and social assistance	4,133,000	25.0
Leisure and hospitality	3,708,000	28.4
Other services	553,000	10.3

Note: Data are seasonally adjusted.

Source: U.S. Bureau of Labor Statistics.

The professional and business services industry added the most jobs over the 2009–19 period—about 5 million, or nearly 24 percent of the total jobs gained—with education and health services close behind. Interestingly, employment in utilities actually declined over the 10-year span. Although utilities had the highest real average hourly earnings level as well as positive earnings growth over the period, the industry had fewer employees in December 2019 than it had in June 2009.

Therefore, it is difficult to argue that an industry is driving real earnings growth when it has been losing workers. One job added to the economy increases both payrolls and hours. In order to boost total private earnings, that job must pay enough so that the marginal added payroll-to-hours ratio exceeds the total private average. In other words, employment growth in industries such as utilities, information, and professional and business services will more likely put upward pressure on the total private earnings average because these industries have a higher earnings rate than the total private average. One job added to leisure and hospitality, on the other hand, will likely decrease the total private average because the industry’s hourly earnings rate is lower than the total private rate.

The opposite holds true as well. Although adding one job to utilities would put upward pressure on total private earnings, eliminating one job in the industry would have a negative impact on total private earnings—which is what

actually happened in the industry, as utilities employment declined slightly (–12,000) over the period. In this regard, employment acts as a weight on that upward or downward pressure on total private earnings. Because pressure on total private earnings is affected by scale, a small industry such as utilities does not have as much impact on overall earnings as a large industry such as professional business services.

For example, we can compare the information industry, which is similar to utilities in terms of employment size and earnings level, to professional and business services. Although information had a higher real earnings level in December 2019 (\$16.47) than professional and business services (\$13.24), the latter added 5 million jobs to the economy, while the former added only 87,000. Generally speaking, because information had a higher earnings rate than professional and business services, adding one job to that industry would increase real earnings at the total private level more than adding one job to professional and business services.

A perfectly efficient labor market never exists in reality. Both industries contributed in a positive way to total private earnings. But because professional and business services added many more jobs than information, it had a stronger positive effect on the labor market than information did over the 10-year period. To summarize this effect, table 4 displays the ratio of real earnings in each industry group to total private earnings. A ratio above 1 signifies that the industry had a higher real earnings level than the total private average and thus any jobs added would put upward pressure on the total private earnings average. Similarly, ratios below 1 indicate that added jobs would put downward pressure on the total private average. Industries with decreasing employment have the opposite effect: a ratio greater than 1 will negatively affect the total private earnings level, while a ratio of less than 1 will positively affect the total private earnings level.

Table 4. Ratio of real average hourly earnings in specific industries to total private level, all employees, June 2009 and December 2019

Industry	June 2009	December 2019
Total private	1.00	1.00
Mining and logging	1.24	1.22
Construction	1.12	1.10
Manufacturing	1.04	0.99
Durable goods	1.11	1.04
Nondurable goods	0.93	0.90
Trade, transportation, and utilities	0.87	0.86
Wholesale trade	1.14	1.11
Retail trade	0.69	0.71
Transportation and warehousing	0.92	0.88
Utilities	1.48	1.49
Information	1.33	1.50
Financial activities	1.20	1.29
Professional and business services	1.22	1.21
Education and health services	1.00	0.98
Health care and social assistance	1.01	0.99
Leisure and hospitality	0.58	0.59
Other services	0.89	0.90

Source: U.S. Bureau of Labor Statistics.

The dynamic relationships between the earnings levels in individual industries and the total private level are evident in table 4. Some sectors, such as information, utilities, and financial activities, experienced high wage growth relative to the total private average, indicated by a higher ratio in December 2019 than in June 2009. Others, such as durable goods manufacturing and transportation and warehousing, experienced diminished relative wage growth, represented by their lower ratios. The ratios in manufacturing and education and health services went below 1 over the period, meaning that, on average, adding one job would likely have exerted upward pressure in 2009 but downward pressure in 2019.

As mentioned previously, employment acts as a weight for both payrolls and hours and therefore indirectly affects total private earnings. Differences in weekly hours across industries complicate this issue further. Some industries carry more part-time workers, while others are more likely to have overtime. Also, some industries pay higher wages, on average, which can be attributed to a variety of factors not limited to productivity, education, labor demand, and so on.

To help us visualize the weights by industry, figure 3 illustrates what happened over the 2007–09 period in the major industry groups. The sizes of the bubbles in figure 3 represent the total employment in each of the industries in December 2019, the y-axis represents real average hourly earnings in December 2019, and the x-axis represents the number of jobs added from June 2009 to December 2019. The horizontal dotted line represents the total private real average hourly earnings level of \$10.98 in December 2019, and the vertical dotted line represents the average added employment across all 14 industry groups over the period, which is about 1.5 million jobs. From there, we assigned quadrants as follows: Quadrant I contains the industries with above-average earnings and below-average employment gains, quadrant II contains the industries with above-average earnings and above-average employment gains, quadrant III contains the industries with below-average earnings and above-average employment gains, and quadrant IV contains the industries with below-average earnings and below-average employment gains.

Figure 3. Change in employment, June 2009 to December 2019, and real average hourly earnings, by industry, for all employees, December 2019

Bubble sizes represent December 2019 employment



As long as the industry is in quadrants I or II with positive employment, it puts upward pressure on total private earnings. Industries in quadrant II are more impactful than those in quadrant I in that regard because they had above-average earnings and added an above-average amount of employment. Industries in quadrants III and IV negatively affect the total private earnings level when they add employment. Therefore, the leisure and hospitality industry, which is in quadrant III, puts strong downward pressure on average earnings at the total private level.

However, recall from table 2 that leisure and hospitality experienced a 7.8-percent increase in real average hourly earnings over the 2009–19 period. Although the industry still put downward pressure on total private earnings growth, it is not as much as it was in the earlier part of the study period. From Figure 3, we see that professional and business services was the most impactful major industry for increases in total private real earnings because it

had higher-than-average earnings and added a very large amount of employment over the period. The education and health services industry had a relatively neutral impact because its earnings were roughly in line with the total private average.

Detailed industry analysis

Because employment acts as a weight for both the numerator and the denominator in the average hourly earnings equation, the results can sometimes be surprising. In a 2018 article, Angela Clinton discusses the math behind counterintuitive scenarios such as when earnings increase in the component industries but decrease at the more aggregate level.^[8] The interactions of payrolls, hours, and employment occasionally lead to statistical anomalies such as Simpson's Paradox.^[9] Thus, it can be difficult to determine which industries are performing the best, which are having the heaviest impact on total private trends, and the reasons why.

To understand the total private trends, we analyzed the major industry groups. A natural response to viewing the major industries is to ask, Why are some sectors doing well and others lagging behind? We can attempt to answer this question by examining the data at a more detailed industry level. As an example, we take a more detailed look at the information sector.

As shown in table 2, the information industry posted the highest growth in real average hourly earnings over the 2009–19 period. We saw that payrolls increased modestly, but hours and employment had only minor gains. So what is happening in the information industry that is causing its earnings to increase more than those of other industries? The hours and employment relationship makes sense, because small gains in employment tend to lead to small increases in total hours worked. From an economist's perspective, if labor demand is high and labor supply is low, then wages could increase while employment remains flat.

The information industry has six component industries: publishing industries, except Internet; motion picture and sound recording industries; broadcasting, except Internet; telecommunications; data processing, hosting and related services; and other information services. Table 5 shows the percentage change in real hourly earnings for the information industry and each of its components over the period from June 2009 to December 2019. Looking at the table, we can see why information is the leading sector in terms of earnings growth—each of its components shows above-average earnings gains. All components except motion picture and sound recording industries and telecommunications experienced earnings growth rates of more than 20 percent.

Table 5. Percentage change in real average hourly earnings (1982–84 dollars) for the information industry and its components, all employees, June 2009–December 2019

Industry	June 2009	December 2019	Percentage change
Information	\$13.68	\$16.47	20.4%
Publishing industries, except Internet	15.03	18.21	21.2
Motion picture and sound recording industries	13.04	15.05	15.4
Broadcasting, except Internet	12.81	15.95	24.5
Telecommunications	13.07	15.19	16.2
Data processing, hosting, and related services	13.70	16.73	22.1

See footnotes at end of table.

Table 5. Percentage change in real average hourly earnings (1982–84 dollars) for the information industry and its components, all employees, June 2009–December 2019

Industry	June 2009	December 2019	Percentage change
Other information services	14.04	16.96	20.8

Note: Data are adjusted for inflation using the Consumer Price Index for All Urban Consumers (CPI-U). Data are seasonally adjusted.

Source: U.S. Bureau of Labor Statistics.

The largest component within the information industry—publishing industries, except Internet—provides an interesting story. The industry consists of two component industries, newspaper, book, and directory publishers; and software publishers. Table 6, shows that in June 2009, two-thirds of employment in publishing industries, except Internet, was in newspaper, book, and directory publishers, with 536,800 employees and real average hourly earnings of \$11.66. The software publishing industry had only 257,800 employees in June 2009, but its hourly earnings level was more impressive, at \$21.40.

Table 6. Employment and real average hourly earnings (1982–84 dollars) in publishing industries, except Internet, all employees, June 2009 and December 2019

Industry	June 2009		December 2019	
	Employment	Average hourly earnings	Employment	Average hourly earnings
Publishing industries, except Internet	794,700	\$15.03	764,400	\$18.21
Newspaper, book, and directory publishers	536,800	11.66	287,700	11.75
Software publishers	257,800	21.40	477,100	21.85

Note: Data are adjusted for inflation using the Consumer Price Index for All Urban Consumers (CPI-U). Data are seasonally adjusted.

Source: U.S. Bureau of Labor Statistics.

By the end of 2019, employment in newspaper, book, and directory publishers had declined to 287,700 and hourly earnings had increased to \$11.75, whereas employment in software publishers had expanded to 477,100 and earnings had increased to \$21.85. Those changes represent an 85-percent increase in employment for software publishers and a 46-percent decrease in employment for newspaper, book, and directory publishers. As noted previously, increasing employment in industries with above-average earnings increases total private earnings, while declining employment in industries with below-average earnings also increases total private earnings. Thus, the increase in real earnings in publishing industries, except Internet, resulted from its lower paying component industry losing employment and its higher paying component industry gaining employment.

The publishing industry itself has shifted from a paper-based industry to a largely electronic industry, shedding jobs in the former and gaining them in the latter. The diverging employment trends between software publishers and newspaper, book, and directory publishers are not visible at the aggregate level of publishing industries, except Internet, let alone at the information-sector level. The trends at the detailed level remind us that these are what drive the higher level industry trends. Major industries are not monolithic entities in which employment levels move in one direction. Some specific industries, such as software publishers, had substantial increases in employment

over the 2009–19 period, while others, such as newspaper, book, and directory publishers, had substantial declines.

Conclusion

Although the question of which industries are driving real average hourly earnings growth is nuanced, other factors are clear. Adding employment to a relatively high-earning industry will drive overall earnings up; in that sense, professional and business services was the most successful industry because it added about 5 million jobs, or nearly a fourth of the 20.9 million total jobs added since the end of the 2007–09 recession. Employment in other industries, such as utilities and information, changed little, while real earnings grew rapidly. Even relatively low-paying industries, such as leisure and hospitality, had improvement in their real earnings. Substantial employment gains in leisure and hospitality lowered total private average earnings but not as much as occurred during the last recession.

The monthly CES survey data during the period of expansion from June 2009 to December 2019 raise the question, Is the economy adding good jobs? That question has always been difficult to answer. Although every major industry experienced real earnings growth over the period, detailed industry analysis reveals more nuanced trends. The real earnings gap between certain industries has grown as well, as high-earning industries such as information and utilities have seen their earnings increase at a faster rate than low-earning industries. As this article demonstrates, real average hourly earnings can be a complex statistic.

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NOTES

¹ The U.S. Bureau of Labor Statistics (BLS) has 12 surveys or programs that provide information on pay and benefits. For more information, see "Overview of BLS statistics on pay and benefits," <https://www.bls.gov/bls/wages.htm>.

² For the latest issue of the real earnings news release, see <https://www.bls.gov/news.release/realer.toc.htm>. For technical information about the real earnings data, see "Real earnings technical note" (part of the news release), <https://www.bls.gov/news.release/realer.tn.htm>.

³ The Current Employment Statistics (CES) program surveys about 145,000 private businesses and government establishments each month, representing approximately 697,000 individual worksites. For more information, see "Current Employment Statistics—CES (national)," <https://www.bls.gov/ces>.

⁴ The starting and ending dates of recessions are determined by the National Bureau of Economic Research (NBER). NBER determined that the peak of the most recent expansion occurred in February 2020. For more information, see "U.S. business cycle expansions and contractions" (National Bureau of Economic Research, June 8, 2020), <http://www.nber.org/cycles.html>.

⁵ Throughout this article, "average hourly earnings," "earnings," and "hourly earnings" are used interchangeably. All data discussed in this article are seasonally adjusted and adjusted for inflation using the Consumer Price Index for All Urban Consumers (CPI-U).

⁶ For more information about CES survey earnings and other concepts, see "Current Employment Statistics—CES (national): technical notes for the Current Employment Statistics survey," <https://www.bls.gov/web/empsit/cestn.htm>.

⁷ BLS does not produce real aggregate weekly payrolls of all employees as a distinct time series; however, historical real aggregate payrolls can be derived from other existing data series.

⁸ Angela Clinton, “An average mystery in hours and earnings data entails a weighty explanation,” *Beyond the Numbers: Employment and Unemployment*, vol. 7, no. 9, June 2018, <https://www.bls.gov/opub/btn/volume-7/mystery-in-average-of-hours-and-earnings.htm>.

⁹ For more information, see “Simpson’s Paradox,” *Stanford Encyclopedia of Philosophy* (Stanford University, 2020), <https://plato.stanford.edu/entries/paradox-simpson/>.

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