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AVERAGE CHANGE IN WAGES: THE ECI ADVANTAGE

by

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I. Introduction

The Bureau of Labor Statistics (BLS) produces three major surveys regarding employment and earnings: the Current Population Survey, Current Employment Statistics, and the National Compensation Survey. All three surveys report average wage information for each week, month, quarter, or year surveyed. In forensic economics, we often use a time series of average wages from one of these surveys to construct a wage growth rate[1]—calculated either by the average of annual percent changes in average wages or the geometric average rate of growth in average wages from a beginning to an ending date. In this paper, we argue that of all the survey-based data resources relied on by forensic economists to construct a wage growth rate, the Employment Cost Index (ECI), a part of the National Compensation Survey, produces advantage over the other surveys. The ECI advantage is that it measures the average change in wages, whereas using the other survey data the only possible wage growth calculation is a change in average wages. The specific design of the ECI survey is to produce estimates of the average changes in wages and its methodology is very different from the other BLS surveys. In this paper, we focus on the differences between BLS surveys and illustrate why the ECI's average change in wages is the relevant statistic in forensic economic analysis that requires a wage growth rate constructed from surveys of wages.

The subject areas of this paper are:

(1) to provide a general description of BLS materials pertaining to its three major wage surveys;
(2) to describe the ECI by summarizing and condensing technical information regarding the ECI that is published by the BLS;
(3) to illustrate that the differences in growth rates calculated using data from these BLS surveys can be quite large; and,
(4) to suggest that the ECI provides the best wage growth rate source in forensic economic situations.

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[1] For purposes of this paper, we define the wage growth rate in its macroeconomic context (i.e., the expected increases in earnings due to economy-wide price inflation and overall increases in labor productivity within a relevant industry and/or occupation grouping).

This paper begins with a short review of the CPS and CES surveys. Next, we describe how the ECI data is collected and how the index is calculated drawing from BLS technical information. We then show some comparable industry data found in the ECI and CES surveys. We conclude with a description of the ECI advantage when analyzing the average change in wages in industries and occupations—the basis for many forensic economic earnings projections.

II. Current Population Survey (CPS)

The CPS is a monthly household survey with origins beginning in 1940 with the Monthly Report of Unemployment. The U.S. Census Bureau collects the CPS data and the BLS analyzes and then publishes the data. Since 1948, the CPS has emphasized the collection of data regarding the employment status of individuals and providing information on the demographic characteristics (sex, age, race, education, etc.) of the labor force. The CPS last underwent a major redesign with data reporting in January 1994.

The CPS is collected each month from a probability sample of approximately 50,000 households containing over 125,000 persons. The selection of households surveyed is by street address. Although the survey is strictly voluntary, refusal rates run only four percent each month. The period covered under the monthly survey is the calendar week that includes the 12th day of the month (called the survey week). In the following week, surveyors ask respondents for their recollection of their activities and earnings during the survey week.

In the CPS, the survey collects data on earnings before taxes and other deductions. Respondents are asked to report earnings in the time frame which they find easiest, for example, hourly, weekly, biweekly, monthly, or annual. The BLS automatically calculates weekly earnings when persons respond that their pay period is other than weekly. The "wages and salaries" grouping include wages, salary, Armed Forces pay, commissions, overtime pay, tips, piece-rate payments, and cash bonuses earned, before deductions are made for taxes, bonds, pensions, union dues, etc. The survey considers the net earnings of self-employed persons as wage and salary amounts (even if those earnings are negative). Since the CPS is a household survey, it is not industry or occupationally specific. Because the CPS surveys households by address, controls for ensuring consistent industry or occupation representation in the data are not a part of the CPS survey.

CPS weekly earnings from the monthly survey are subject to top coding (or editing of large values given by respondents). Earnings data are top coded by the BLS to avoid potential wide swings in the averages when a number of respondents report large earnings in a survey week. Currently, the BLS top codes earnings based on an individual's usual hours worked variable. If the respondent's edited usual weekly earnings variable is greater than $1923, the topcode becomes in effect. The topcode also becomes in effect when the product of usual hours worked times the usual hourly wage exceeds the annualized wage of $100,000 ($1,923 per week).

Each month, the BLS releases median weekly earnings figures from the most recently completed CPS and the medians from the last full quarter of surveys. In Table 1, we present employment and median weekly earnings for the first quarters of 1997 and 1998

for managerial and professional specialty workers.[2]

Table 1. CPS Results for 1997 and 1998

Managerial and Professional specialty workers	1997:Q1	1998:Q1	% change
Number of workers in thousands	28,164	28,748	2.1%
Men	14,562	14,516	-0.3%
Women	13,602	14,231	4.6%
Median weekly earnings	$740	$741	0.1%
Men	$875	$865	-1.1%
Women	$630	$647	2.7%

A review of the data shows men's median earnings and employment declining while women's median earnings and employment are rising. At the same time, one dollar separates all workers' median weekly earnings from 1997 to 1998. If a forensic economist is working with a male manager, it might make little sense to him or her to reduce plaintiff's earnings from 1997 to 1998 because the median fell. On the contrary, if the economist is working with a female manager, he or she might quickly accept the 2.7 percent growth in median earnings from 1997 to 1998. However, the economist should be ready to answer questions such as were the earnings of the 629,000 new women managers in 1998 greater or lower than the earnings of the 13,602,000 women managers that worked in 1997 and 1998? Or, if the earnings of the new 629,000 women managers were less than the median for the 13,602,000 women managers that worked in 1997 and 1998, might the actual earnings growth of the women managers that worked in 1997 and 1998 be greater than 2.7 percent?

After reviewing the CPS data above, the economist becomes aware of the problems when looking at year-to-year changes in median or average wages. Variation over time in the population that comprises any industry or occupation grouping will determine the resulting median or average earnings statistics. Consistent measurement of average earnings in industries or occupations is not possible in the CPS by methodological design of the survey. Increases or decreases in employment (in a wide range of demographic features such as age, experience, skill, etc.) along with variation in wage levels paid to changing groups of workers has a substantial effect on the year-to-year medians or averages. When calculating changes in averages or medians, substantial error in the CPS is always present as to the expected or actual earnings growth experience of a group of similar workers

[2] "Usual Weekly Earnings of Wage and Salary Workers: First Quarter 1998," U.S. Department of Labor News Release 98-148, April 20, 1998.

performing the same tasks over time within any occupation or industry

III. Current Employment Statistics (CES)

The CES is an establishment survey with origins dating back to 1915. Since 1949, the CES program has been a fully integrated Federal-State project that provides employment, hours, and earnings information by industry on a national, State, and area basis. The BLS asks all firms with 250 employees or more to participate in the survey, as well as a statistical sample of smaller firms. The CES is the largest monthly employer survey in existence. All data is industry specific; there are no occupational data in the CES. Currently, the CES collects data from approximately 390,000 establishments and the survey reports average hourly earnings for 531 industries at the national level and in over 4,500 hourly earnings series at the state and area level.[3]

The CES survey excludes unpaid family workers, domestic workers in private homes, proprietors, and other self-employed persons, all of whom the CPS covers. The CES bases its earnings series on returned reports of the establishments in the survey of its gross payrolls and the corresponding paid hours for production workers, construction workers, or non-supervisory workers. Average hourly earnings series, derived by dividing gross payrolls by total hours, reflect the actual earnings of workers, including premium pay. With this method of calculation, average hourly earnings differ from wage rates, which are the amounts stipulated for a given unit of work or time. Additionally, average hourly earnings do not represent total labor costs per hour for the employer, because they exclude retroactive payments and irregular bonuses, employee benefits, and the employer's share of payroll taxes. The CES estimates do not include the earnings for those employees not covered under the production worker and non-supervisory categories.

The CES collects data for *production workers* in manufacturing and mining industries. In manufacturing, this group covers employees, up through the level of working supervisors, who engage directly in the manufacture of the establishment's product. Among those excluded from this category are persons in executive and managerial positions and persons engaged in activities such as accounting, sales, advertising, routine office work, professional and technical functions, and force-account construction. (Force-account construction is construction work performed by an establishment, primarily engaged in some business other than construction, for its own account and for use by its own employees.) The CES defines production workers in mining in a similar manner.

In construction industries, the term *construction workers* covers workers up through the level of working supervisors, who are engaged directly on the construction project either at the site or in shops or yards at jobs ordinarily performed by members of construction trades. Excluded from this category are executive and managerial personnel, professional and technical employees, and workers in routine office jobs.

In the remaining private sector industries (transportation, communications, and public utilities; wholesale and retail trade; finance, insurance, and real estate; and services), the CES collects data on *nonsupervisory workers*. Nonsupervisory workers include most

[3] Technical Notes to Establishment Survey Data Published in Employment and Earnings" published at the BLS's Internet site at http://www.bls.gov/cestn1.htm.

employees except those in top executive and managerial positions.

In Table 2, we show data from the CES survey for SIC 4011, Class I railroads. Forensic economists often use this data as a basis for forecasting the wage growth for railroad workers. We show this data for the past ten years to illustrate an important problem with CES data. Railroads report the data in Table 2 using BLS form 790H: Transportation, Communication, and Public Utilities, Finance, Insurance, Real Estate, and Services. Each month a railroad records data in the five columns of this form:

Column 1: **All Employees**: Report the number of paid employees who worked during or received pay for any part of the pay period that includes the 12th of the month.

Column 2: **Women Employees**: Report the number of employees from column 1 who are women.

Column 3: **Nonsupervisory employees**: Report the number of employees from column 1 who are non-supervisory employees.

Table 2. CES data for SIC 4011, Class 1 Railroads[4]

Year	Nonsupervisory Employment	Average Hourly Earnings of Nonsupervisory Employees	Average Weekly Hours of Nonsupervisory Employees	Average Weekly Earnings of Nonsupervisory Employees
1989	251,600	$15.68	44.2	$693.06
1990	241,400	$16.08	45.2	$726.82
1991	231,000	$15.68	45.1	$707.17
1992	222,400	$16.66	44.2	$736.37
1993	217,600	$16.93	46.2	$782.17
1994	213,600	$16.76	46.9	$786.04
1995	212,100	$17.48	46.4	$811.07
1996	205,500	$17.71	48.0	$850.08
1997	201,800	$18.10	49.3	$892.33
1998	205,100	$17.95	47.1	$845.45

Column 4: **Nonsupervisory Payroll**: Report the total nonsupervisory employee payroll, including overtime and excluding lump sum payments, for the pay period that includes the 12th of the month.

Column 5: **Nonsupervisory Employee Hours**: Report the total nonsupervisory employee hours paid, including overtime, for the pay period that includes the 12th of the

[4] These BLS data series, respectively across the tables, are EEU41401101, EEU41401106, EEU41401105, AND EEU41401104. We downloaded these data series from LABSTAT at www.bls.gov on the Internet.

month.

The data recorded by the railroads into these five columns form the entirety of our knowledge from the CES concerning wages for non-supervisory railroad employees. To calculate average hourly earnings of non-supervisory workers in the CES survey, the BLS divides the nonsupervisory employee payroll data reported by the railroads in column 4 of the form by nonsupervisory employee hours reported in column 5 of the form. The BLS calculates the average weekly hours of nonsupervisory workers by dividing the data supplied by the railroads in column 5 by column 3, nonsupervisory employees.

Reviewing the railroad data, in 1991 there was a 40 cent drop (-2.5 percent) in average hourly earnings while hours changed 0.1 hours in a week and employment fell by 10,400 workers. Average hourly earnings also fell in 1994 and 1998. Employment fell every year from 1989 to 1997. A plausible explanation for the drop in average hourly wages from 1997 to 1998 is that 3,300 new workers were hired with most likely lower starting pay than tenured workers thereby causing a drop in average pay. However, what caused the wage changes in the other years? Many possible combinations of explanation might exist for each change in average wages. Absent specific knowledge, the economist can only speculate regarding the reasons for movement in average wages.

The CES reports hourly and weekly earnings data by establishments regardless of any division in occupation, responsibility, and task or skill level of the workers in the establishment. The survey combines all workers in an establishment together, from the lowest paid workers such as gardeners maintaining company grounds to the highest skilled computer programmers in the firm responding to the CES survey. The scope of data surveyed is so small that the BLS estimates that it takes the respondent firm an average of 7 minutes each month to complete the CES form including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information on the form. If one month, the example CES respondent firm decides to fire all of the gardeners, hire a landscaping company to tend the grounds, and not give any raises or hire any new workers, the average hourly earnings reported to the BLS in the CES survey will rise from the previous month because the low-paid gardeners are no longer represented in the calculation of the average. However, no worker in the firm received any increase in wages!

While it is very common to find forensic economists using the CES data in making earnings projections for a specific Plaintiff, it is not common to find forensic economists addressing the underlying industry specific information concerning why the average wages change over time. Using the example of railroads, employment has been declining sharply over the past 25 years as the railroads have offered early buy-outs of tenured workers as they downsize employment and capitalize the industry. Nonsupervisory workers in the railroad industry are seniority based in many ways concerning pay and possible earnings levels. If an economist makes a reasonable assumption that railroad workers leaving the industry had earnings on average greater than the average of all workers, the remaining railroad workers most likely had an earnings growth experience entirely different from a calculation of the changes in average railroad wages would reveal.

The problems with using average wage data for an entire industry (or even all workers in a specific occupation) persist no matter the industry selected. We presented the railroad industry as an example because it is small and often analyzed in the forensic

economic literature as a part of FELA litigation. No matter the industry or occupation, changes in average wages are often irrelevant to the calculation of an expected average change in the wages that forms the economist's wage growth rate.

IV. Employment Cost Index

A. Background

The ECI provides a quarterly measure of change in the employers' cost for employee compensation, which includes wages and salaries and employers' cost for employee benefits. For each industry and occupation, the BLS reports a wage and salary ECI and a total compensation ECI. Benefit ECI's are limited to a fewer number of industries and occupations. All data in the ECI program are index values designed to allow the calculation of wage growth rates for industries, occupations, and occupations within industries.[5]

The ECI is a Laspeyres, fixed-weight index. By controlling for employment shifts across 2-digit industries and major occupational groups, the ECI shows how average wages and salaries, benefits, and total compensation paid by employers would have changed over time if the industrial-occupational composition of employment had not changed from the base period. Currently, the ECI contains ninety-one industry and occupation groups and data for private industry, state and local government, and the civilian sectors.[6] The BLS reports ECI's for wages and salaries and total compensation for all groups and benefits for a limited number of groups. While the CES covers 531 industries, the ECI is limited to 47 major industry and 57 major occupation groupings. However, as mentioned above in the CES section, occupational data is unavailable in the CES survey and all workers regardless of job skills or pay levels are combined together in the CES for analysis while in the ECI they are analyzed separately.

The Employment Cost Index has been designated a principal federal economic indicator by the Office of Management and Budget. The BLS states that the ECI "*is the only measure of labor costs that treats wages and salaries and total compensation consistently, and provides consistent subseries by occupation and industry.*"[7] The Federal Reserve Board also uses the ECI as a primary indicator to monitor the effects of its fiscal and monetary policies and in formulating those policies. The ECI enables analysts and policy makers to assess the effect of labor cost changes on the economy—taken together and by sectors. Because the ECI is a fixed-weight index providing consistent representation of jobs and skills, it is particularly important in studies of the relationships between prices, productivity, labor costs, and employment.

[5] Once a year, the BLS releases a report called *Employer Costs for Employee Compensation,* which contains average wage, benefit, and total compensation dollar levels that are a part of the data that forms the ECI.

[6] The current coverage of ECI's can be found at the BLS website at http://www.bls.gov/ectgroup.htm.

[7] Handbook of Methods, Chapter 8, U.S. Bureau of Labor Statistics [http://www.bls.gov/opub/hom/homch8%5Fk.htm].

The initial ECI series, introduced in 1976, was limited to wages and salaries. In 1980, the ECI expanded to cover changes in total employee compensation. In November 1981, the ECI expanded again to include state and local government units. All ECI's have index values equal to 100 in June 1989.

B. Data Collection

There are two separate steps in the ECI data collection process: the initiation and the quarterly update. Initiation occurs the first time a trained field economist visits an establishment onsite to collect data for the survey from the respondent's payroll and personnel files. The update occurs each subsequent quarter the establishment is in the ECI sample. Generally, an establishment is in the ECI sample for about five years before an establishment from a new sample replaces it. The ECI sample rotates such that in any given quarter $1/20^{th}$ of the sample is new and the average time an establishment has been in the sample is 2 ½ years.

At the initiation of each establishment, the field economist informs the respondent face-to-face about the survey, randomly selects from 4 to 8 jobs—the number depending on the size of the establishment—to represent the establishment, and then obtains wage, benefit, and other information required to estimate the cost of the compensation package for each surveyed job. The jobs selected in each establishment at the time of initiation are the same ones for which data are collected in the quarterly updates. The jobs are defined narrowly enough that all workers in the job carry out the same job for which data are collected in the quarterly updates; and, they are defined narrowly enough that all workers in the job carry out the same task at roughly the same level of skill.

The ECI defines wages and salaries as the hourly straight-time wage rate or, for workers not paid on an hourly basis, straight-time earnings divided by the corresponding hours. Straight-time wage and salary rates are total earnings before payroll deductions, excluding premium pay for overtime and for work on weekends and holidays, shift differentials, and non-production bonuses such as lump-sum payments provided instead of wage increases. Production bonuses, incentive earnings, commission payments, and cost-of-living adjustments are included in straight-time wage and salary rates.

The employer provided benefits covered by the ECI for the benefits and total compensation series are: paid leave—vacations, holidays, sick leave, and other leave; supplemental pay—premium pay for work in addition to the regular work schedule (such as overtime, weekends, and holidays), shift differentials, non-production bonuses, and lump-sum payments provided in lieu of wage increases; insurance benefits—life, health, short-term disability, and long-term disability; retirement and savings benefits—defined benefit and defined contribution; legally required benefits—Social Security, Federal and State unemployment insurance, and, workers' compensation; and other benefits—severance pay and supplemental unemployment plans. To measure benefit costs, the field economist first identifies the ECI benefits existing for each surveyed job in the establishment, and then collects information required to estimate their cost per hour worked. Benefit costs are measured using a current cost approach—annual costs based on the current price of the

benefit under the current plan provisions.[8] Once the annual cost is determined, that cost is divided by annual hours worked, that is, the annual work schedule (for example, 34 hours per week times 52 weeks per year) minus annual hours for vacations, holidays, and other leave, plus annual overtime hours.

The BLS performs the quarterly update of information using a combination of mail and telephone surveying. The BLS sends forms to each respondent firm describing and listing the information recorded by the field economist at the initiation or the previously reported wage and salary rates and benefit provision for each survey occupation. The respondent identifies any changes from the previous quarter's data. A change in wages and salaries occurs if wages change, regardless of whether it is due to pay increases, longevity payments, changes in commissions, or changes in the workers in the occupation. While wages may change, the jobs surveyed do not change. From our previous example of gardeners and computer programmers, no change in wages would be reported by the firm responding to the ECI survey when in a following quarter it fires all of their gardeners and does not give pay increases to its computer programmers. However, the same firm responding to the CES survey would report a false increase in average wages. Again, at this example firm, the average change in wages is zero, but the change in average wages is positive.

As defined by the ECI, benefit costs in an establishment can change for any of the following reasons: (1) the cost for an unchanged benefit plan may increase or decrease (for example, the cost of a 2-week vacation changes because of a wage-rate increase); (2) a benefit plan may be added or eliminated (for example, a dental plan may be added to a medical policy); (3) the provisions of a benefit plan may be modified (for example, the type of work covered by a dental plan is enhanced); or (4) usage of the benefit may change because changes in the plan (for example, more employees elect health insurance because of improved dental benefits).

C. Data coverage

The ECI provides data for the civilian economy, which includes the total private economy and the public sector—excluding farms, households, and the Federal government. The private industry series and the State and local government series provide data for the two sectors separately. The BLS collects quarterly data from a probability sample of approximately 17,300 occupations within about 4,200 sample establishments in private industry and approximately 4,100 occupations within about 800 sample establishments in state and local governments.[9]. The ECI classifies sample establishments in industry categories based on the 1987 Standard Industrial Classification (SIC), as defined by the U.S. Office of Management and Budget. The ECI collects data for the pay period including the 12th day of the survey months of March, June, September, and December.

[8] See Felicia Nathan, "Analyzing Employers' Costs for Wages, Salaries, and Benefits," *Monthly Labor Review*, October 1987, page 6-7, for a complete discussion of how benefit costs per hour worked are calculated.

[9] Employment Cost Index-September 1999", U.S. Department of Labor, Bureau of Labor Statistics news release 99-306.

D. ECI Interpretation

The ECI index is a measure of the employers' cost for employee wages and salaries, benefits, or compensation depending on the ECI series analyzed. It shows changes in the "rate" of a given wage and salary, benefit, or compensation package assuming constant usage. Theoretically, absent such changes, the snapshot of the characteristics of the labor force at the time data from the establishment are first collected for the survey (i.e., overtime, tenure, longevity, and insurance and leave usage) remains unchanged throughout the duration of the series.

E. ECI Error Rates

Average standard errors for all ECI series (excluding seasonally adjusted series) are regularly available. The published standard errors—for both 3-month and 12-month percent changes—are a 5-year moving average through the current quarter. Standard errors provide the user an additional tool to judge the quality of the estimate to ensure that it is within an acceptable range for their intended use.

Because standard errors vary from quarter to quarter, the ECI uses a five-year moving average of standard errors to evaluate published series. Currently, in the higher level aggregate series of industries and occupations, the standard errors for 3-month changes are generally 0.1 percent or less; for 12-month changes, standard errors are generally 0.25 percent or less. Currently, in the lower level series, standard errors are generally 0.3 percent or less for 3-month changes and 0.6 percent or less for 12-month changes. Since standard errors for series may vary from quarter to quarter, the BLS examines ECI series once a year to determine if they should be footnoted in the ECI published tables.

F. Analysis

Economists using the ECI do not have to speculate regarding upward or downward movements in an ECI data series. *When the ECI moves up (down) its because it costs more (less) to employ a worker in a industry performing a specific occupation or job task at a specific level of skill.* The ECI is a fixed-weight index where other surveyed wage data has no control of its composition.

Suppose an industry in March 1998 has 200,000 workers and 100,000 were paid $14.00 per hour and 100,000 were paid $6.00 per hour. In March 1998, the total payroll was $2,000,000 and the average hourly pay was $10.00 per hour. Suppose that in March 1999, all workers in the industry get a 10 percent pay increase but now only 50,000 of the workers who were paid $6.00 per hour in March 1998 are employed in the industry. Using the pay increase, industry payroll is now $1,870,000 and the average wage is $12.47 per hour, or a change in average wages of 24.7 percent from 1998 to 1999; however, the average change in wages was only 10 percent per worker. The forensic economist is only interested in the 10 percent change in wages. In the example, the observed 24.7 percent change in average wages in the industry is irrelevant to a forensic economic analysis of either group of workers. Similar distortions of the actual wage growth experience of workers persist in the CPS and CES surveys.

Sometimes economists use long time-series to base their projections of a future

wage growth for a plaintiff performing a specific job (i.e. a plaintiff remaining an administrative support worker for the rest of his or her working life). If an industry has undergone changes in composition, changes in average industry wages might not be appropriate for use in making earnings projections for a specific plaintiff's anticipated future experience. There are many industries in the United States that have had a change in worker composition from abundant low-paid tender workers and few machine-operator workers to few low-paid tender workers without much change in machine-operator workers.[10] Even if machine operators and tender workers each received the same percentage wage increases over time, the reliance on historical average industry wages to calculate a wage growth rate will cause error in the calculation of the average change in workers' wages in that industry. The problem compounds if each class of worker in the industry had differing wage growth due to a variety of economic reasons over time. Since the ECI uses the fixed weight measurement system, distortions are minimal. The average change in the laborer and machine operator earnings can be consistently measured over time. If the occupation breakout is not available within the industry, the industry ECI will still present a consistent estimate of the average changes in the wages of all workers in that industry as they do the same types of jobs across time.

In Table 3, we provide a comparison of ECI and CES data for the Transportation and Public Utilities industries. Annual ECI data for wages and salaries is now available from 1976 to 1998. Annual ECI data for total compensation is available from 1985 to 1998. The average annual growth in the CES average hourly and weekly earnings series is 4.0 percent per year[11] over the 1976 to 1998 period. However, the ECI average annual wages and salaries growth is 4.8 percent per year over the same period. The fixed employment-weighted ECI results in a growth rate 20 percent higher than the CES growth in average wages. Since 1985, the ECI growth in total compensation has been nearly 50 percent greater than the growth in CES wages. Without exhaustive analysis of this industry's labor force composition, a plausible explanation for the ECI/CES differences may be the relative substitution of a greater number of lower paid workers into this industry driving the average wage to fall over time causing the change in average wages to be less than the average change in wages.

As a comparison across all production and nonsupervisory workers, using the beginning ECI time period of 1976 through 1998, the CES average annual change in the average weekly wages of all private industry production and nonsupervisory workers was 4.3 percent, average hourly CES earnings changed at an average annual rate of 4.5 percent, and the ECI for the wages and salaries of all private industry production and nonsupervisory workers changed at an average annual rate 4.8 percent.[12] Illustrating these CES and ECI

[10] A good example industry experiencing this trend is the railroad industry as they now use heavy machinery for track repairs as opposed to the past when labor gangs performed track repairs with their physical labor.

[11] We use the geometric mean formula for all average annual growth rate calculations. As a comparison, the average of the annual changes in average wages from 1976 to 1998 is 4.05 percent and for average weekly wages, the average from 1976 to 1998 is 4.00 percent.

[12] These BLS data series, respectively, are EEU00500004, EEU00500006, and ECU21012I. We downloaded these data series from LABSTAT at www.bls.gov on the Internet.

averages in a possible forensic economic situation, the difference between base earnings of $30,000 increased per year for 30 years of working life at 4.3 percent and 4.8 percent is a 9.4 percent difference in lifetime earnings.

Table 3. ECI and CES data for Transportation and Public Utility Industries[13]

	ECI Wages & Salaries in Transportation & Public Utilities	ECI Total Compensation in Transportation & Public Utilities	CES Average Hourly Earnings Transportation & Public Utilities	CES Average Weekly Earnings Transportation & Public Utilities
1976	48.0		$6.45	$257
1977	52.3		$6.99	$279
1978	56.5		$7.57	$303
1979	61.5		$8.16	$326
1980	67.9		$8.87	$351
1981	74.5		$9.70	$382
1982	80.0		$10.32	$402
1983	85.0		$10.79	$421
1984	88.4		$11.12	$438
1985	91.4	88.9	$11.40	$450
1986	93.8	91.6	$11.70	$459
1987	95.7	94.0	$12.03	$472
1988	98.1	96.9	$12.24	$468
1989	100.4	100.2	$12.57	$481
1990	103.6	103.9	$12.92	$496
1991	107.0	108.1	$13.20	$503
1992	110.8	112.4	$13.43	$514
1993	114.3	116.3	$13.55	$533
1994	118.0	120.6	$13.78	$547
1995	122.5	125.3	$14.13	$557
1996	125.6	129.0	$14.45	$572
1997	129.6	132.5	$14.93	$593
1998	133.6	137.7	$15.34	$606
1976-1998	4.8%		4.0%	4.0%
1985-1998	3.0%	3.4%	2.3%	2.3%

V. The ECI Advantage in Forensic Economics

In forensic economics, we project plaintiffs' earnings over a remaining working

[13] These BLS data series, respectively across the table columns, are ECU225021, ECU125021, EEU39100006, and EEU40000004. We downloaded these data series from LABSTAT at www.bls.gov on the Internet.

life. Depending upon the characteristics of the plaintiff, the economist might expect earnings to change as result of individual productivity changes, industry productivity changes in which the plaintiff is employed, or a combination of industry/individual productivity changes. Suppose a plaintiff was a forklift driver and had planned to remain a forklift driver until retirement. The future earnings of a fork lift driver are more than likely to have a closer relationship to the future anticipated costs to employ fork lift drivers than to the change in the average wages of all workers, regardless of wage or skill level, in the plaintiff's industry in which he was employed as a fork lift driver.

As an alternative example, assume that a young Assistant Professor of Economics is injured. The evidence of the case provides information that this young professor had an excellent academic future and it was expected that he or she would move up through the ranks to become a Full Professor. The forensic economist is working with the current salary schedule for Assistant, Associate, and Full Professors. Individual productivity drives the estimates of future expected earnings through the age-earnings-professor level profile of earnings. However, at each stage within the profile, the average changes in the wages and salaries paid by state and local governments to college and university employees (ECI series ECU22993I) is the relevant wage growth estimate to increase the current earnings levels of assistant, associate, and full professors at each future date within each assumed age-earnings-professor level profile.

A variety of economic factors will affect average wages in any industry (are there more or less Full Professors of Economics today as there were 30 years ago effecting the change in the average wages of Professors of Economics at any level?). The ECI is specifically designed by the BLS to minimize distortions created by a changing mix of workers in any industry or occupational grouping and allows for the analysis of consistent wage histories for workers performing the same job over time. Growth in wages does not equate to the change in average wages in a firm or in an industry. Forensic economic analysis begins with a plaintiff in an occupation performing a specific task or at a specific skill level (or at other specific tasks or skill levels in the future) with a current wage rate known for each task and skill level. The ECI advantage results because the Employment Cost Index is a fixed-weight measure tied to a similar base—exactly the base level calculation that is performed in many forensic economic situations: earnings of a specific plaintiff performing a specific job or staying within a specific industry for the remaining of working life.

VI. Conclusion

We began this paper with a description of the major BLS wage surveys. We pointed out that in the CPS and CES surveys, looking at the data alone, the economist knows little about the changes in earnings that consistently represented groups of workers in any industry or occupation would likely experience as they continued in that industry or occupation at a specific job or skill level. The CPS and CES data reveal little about individual anticipated earnings growth because changes in employment and wage mixes alter changes in average wages over time. We described the ECI methodology and pointed out its economic superiority as a measure specifically designed by the BLS to analyze average changes in wages. We showed the ECI and CES data can result in largely different annual rates of wage growth. While we provided examples for the Transportation and

Public Utilities and all private industry workers, future research could compare average growth in all CES and ECI industries or all CPS and ECI occupations.

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