Development of an ECI excluding Workers Earning Incentive Pay

Anthony J. Barkume and Thomas G. Moehrle*
U.S. Bureau of Labor Statistics

NOTE: This paper has been prepared for presentation to the Federal Economic Statistics Advisory Committee (FESAC) on December 14, 2004. It represents work in progress and does not represent any agency's final positions on issues addressed. The FESAC is a Federal Advisory Committee sponsored jointly by the Bureau of Labor Statistics of the U.S. Department of Labor and by the Bureau of Economic Analysis and the Bureau of the Census of the U.S. Department of Commerce.

* Compensation Research and Program Development Group, Office of Compensation and Working Conditions. Helpful comments and suggestions were provided by Mark Loewenstein, Jim Buszuwski, and Larry Ernst. John Bishow provided excellent research assistance.

Measurement Concepts and Objectives

The Employment Cost Index (ECI) is intended to measure changes in the "price of labor".[1] In most jobs, the price of labor is defined in terms of time worked (hourly, weekly, or monthly). However, in some industries and occupations "pay for performance" employment contracts, such as piece rates or commissions, are an important alternative to time rate provisions in setting worker pay. The use of pay for performance provisions in job compensation can influence the volatility of labor costs, especially when workers having these kinds of contracts explicitly share risks of market demand fluctuations with the firm. In particular, Jack Triplett has argued that fluctuations in sales commission earnings due to stochastic demand shifts are dubious measures of labor cost changes because, by using a commission scheme, "….the firm shifts part of the cost of holding idle productive capacity to the workers."[2]

ECI data users interested in isolating the evolution of pay rates based on time worked can now access selected industry series that exclude pay changes in sales occupations, assuming that fluctuations in sales commissions would be the major contributor to the impact on all-worker series series. However, for some time the ECI program has collected some information on other types of incentive pay as well. (How BLS defines incentive pay is fully discussed in the next section.) This paper reports on the development of an experimental ECI that excludes pay changes of workers receiving sales commissions as well as other forms of incentive pay such as piece rates and sales overrides.

Data Collection

When the ECI field economist initiates data collection on sample jobs, a standard coding procedure that has been used since the mid-eighties is to determine whether incentive pay is used in determining job earnings. Field economists code sample jobs as "incentive pay" jobs when workers in these jobs receive "regular performance-related

[1] John W. Ruser, "The Employment Cost Index: What is it?" Monthly Labor Review, September 2001, p. 3
[2] Jack E. Triplett, "An Essay on Labor Cost," BLS Working Paper No. 130, June 1982, p.48. This paper was also published in The Measurement of Labor Cost NBER Studies in Income and Wealth, vol.48.

payments that are directly related to the employee's individual or group output".[3] Assignment of an incentive pay code to a sample job is not determined by the occupation of the job or restricted to certain types of occupations.[4] Piece rates, sales commissions and other payments linked by a specific formula to individual output are classified as incentive pay. An example of payment linked to a group output for incentive pay coding is that of sales overrides[5]. Sales overrides are paid to managers or executives as a percentage of the sales or profit generated by the group of workers that they manage or direct.

In jobs with incentive pay provisions, pay based on time rates such as base salaries may be part of earnings. Ideally, data collection would separate out the earnings component due to the incentive pay provision from other earnings. However, frequently the respondent employer cannot break down the earnings components in this way. Given these limits in data collection, we developed experimental series that exclude all earnings in "incentive pay jobs" (jobs with incentive pay provisions) without attempting to isolate the incentive pay component of earnings.

Table 1 shows the estimates from ECI sample data of the incidence and distribution of employment in incentive pay jobs in US private industry in March 2001. Workers obtaining earnings through incentive pay were estimated to be six percent of total US private industry employment.[6] The occupations with the highest incidence of employment with incentive pay provisions are jobs in sales occupations (20.4 percent) although only 40 percent of employment in jobs with incentive pay provisions is in sales occupations.

How BLS defines incentive pay for ECI data collection excludes many types of payments that many observers would readily categorize as incentive pay, such as

---

[3] See p. 214, National Compensation Survey Procedures Manual; Volume 1: Wages and Sampling, Office of Compensation and Working Conditions, November 2003.
[4] For example, ECI micro data indicate that a substantial proportion of optometrists receive incentive pay—presumably based on the number of eye examinations conducted.
[5] See p. 233 of National Compensation Survey Procedures Manual; Volume 1: Wages and Sampling, Office of Compensation and Working Conditions, November 2003.
[6] Incentive pay jobs are more highly represented in full-time jobs; they covered 6.9 percent of employment in US private industry full time jobs in March 2001.

"employee of the year" awards, year-end bonuses and other payment schemes that do not include an explicit formula linking pay to results. In BLS data collection, these and other cash payments such as year-end bonuses that are at the discretion of the employer -- termed nonproduction bonuses—are counted as part of the employer costs for employee benefits rather than wages and salaries. Analysis of the ECI microdata indicates that jobs with incentive pay provisions are less likely to offer nonproduction bonuses than other jobs within the same establishment.[7]

The incentive pay coding in ECI data collection provides a useful flag for potential volatility of average earnings in a sample job over time. Average earnings in all ECI sample jobs can vary over time with the composition of workers in the job[8], but this compositional effect could be stronger for incentive pay jobs because the pay formula explicitly links pay to individual worker results. Furthermore, even with an unchanging composition of the workforce, jobs having a significant stochastic component to worker results due to product demand fluctuations--such as in sales occupations--could exhibit considerable volatility in earnings over time thus obscuring longer term movements in pay in wage and salary jobs. ECI data collection procedures also can increase measured volatility in sales commission earnings when sales workers receive sales draws from the employer in industries in which sales are infrequent, such as commercial real estate, because ECI data collection does not attempt to measure sales commissions net of draws.[9]

BLS does produce special indexes that exclude pay changes in sales occupations for selected industry series in which volatility of sales commissions is expected to have a substantial effect in the behavior of the ECI for the industry. To make some comparisons of volatility in these special indexes with the corresponding all-worker series, we used the standard deviation of three month changes in the indexes over the period March 1995 to December 2003 as an indicator of volatility. Chart I shows one industry where the less sales occupation index does reduce earnings volatility while Chart II shows another

[7] See Anthony Barkume, "Using Incentive Pay and Providing Pay Supplements in US Job Markets," Industrial Relations, vol. 43, no.3 (July 2004), Table 4.
[8] For example, more experienced workers in the job may receive higher rates of pay.

where the less sales occupation index does not. Chart I compares 3 month changes in the ECI for wages and salaries in Wholesale Trade with movements in the corresponding ECI excluding sales occupations. The all-worker Wholesale Trade ECI shows considerably higher volatility[10] and this volatility obscures the decline in the rate of growth in wages and salaries evident in the less sales occupation series at the onset of the 2001 recession. In contrast, Chart II shows that excluding sales occupations from the ECI for wages and salaries in Finance, Insurance, and Real Estate has little effect on volatility of wages and salaries in that industry sector.[11]

The comparisons between Charts I and II show that the ECI indexes excluding sales occupations do not always control for possible volatility in earnings due to use of incentive pay provisions. Not all sales jobs have incentive pay provisions (for example, cashiers are included among sales occupations), nor are all jobs with incentive pay provisions in sales occupations (for example, managers with earnings from sales overrides). Table 2 provides two measures of the degree of overlap in these two job characteristics across major industry sectors in March 2001. For all private industry only about a fifth (20.4 percent)) of employment in sales occupations are in jobs with incentive pay provisions while 38.8 percent of employment having incentive pay provisions are in sales occupation jobs. (See first row of Table 1.)

One advantage of the less sales occupation indexes is that their estimation fits more naturally into the ECI index methodology than does estimation of an index that removes the effects of pay changes in incentive pay jobs. The next section first reviews the ECI index methodology in order to highlight the problems—primarily data limitations—of constructing experimental ECI less incentive pay indexes.

---

[9] p. 235, National Compensation Survey Procedures Manual; Volume 1: Wages and Sampling, Office of Compensation and Working Conditions, November 2003.
[10] The standard deviation for 3 month changes in the all-worker series for Wholesale Trade is 0.73 while the corresponding statistic for the less sales occupation series was 0.35.
[11] The standard deviation for 3 month changes in the all-worker series for Finance, Insurance and Real Estate is 1.22 while the corresponding statistic for the less sales occupation series was 1.12.

Experimental Index Number Construction

The ECI is designed as a Laspeyres, fixed weight index so as to eliminate the effects of employment shifts. Private industry sample jobs are sorted into 720 estimation cells (10 major occupational groups sorted across 72 industries) and sample-weighted hourly average compensation is computed for each of these cells. To derive base period cost shares, employment data from the 1990 Occupational Employment Statistics Survey (OES) are used to determine base period weights for each of the estimation cells.

Since the ECI survey data do provide information on compensation of jobs with incentive pay, average hourly compensation in each estimation cell can be recomputed excluding these observations. To strictly follow the same fixed employment-weighted methodology of the ECI (such as is done for the less sales occupation series) the construction of the weights should also exclude base period employment for incentive-pay workers within each estimation cell. However the OES, the source for the fixed employment counts, does not collect the requisite information on incentive-pay provisions nor is the ECI sample of jobs with incentive pay sufficiently large to make the appropriate employment adjustments for each estimation cell.

Work is now underway to apply an alternative strategy to account for differences in the number of incentive workers within each of the estimation cells. The cell-weight adjustment will follow the computational procedure for the published regional, union/nonunion and metropolitan/nonmetropolitan indexes released each quarter in the ECI program. The procedure entails calculating, each quarter, the current sample proportion of nonincentive workers within each cell, and then to use the proportion to adjust up or down the cell weight. Each quarter, the adjusted cell weight will be moved by the percentage change in nonincentive workers in the cell. Although the base-cell weight—as in any Laspeyres index—is held constant, the implied relative employment of the nonincentive sector within each cell will vary over time as the sample proportion varies.

Until this additional work is completed, interim experimental series have been developed using the same base employment weights as the corresponding published

series, allowing the exclusion of incentive pay to affect only the compensation component of the cell cost share weights. Table 3 compares the base period cost shares for these experimental indexes to corresponding base period cost shares for the published all-worker indexes (the cost shares aggregated to major occupation and industry levels). Since the base employment is the same in both cost weights, a lower cost weight for the experimental index reflects higher average hourly compensation among the sample incentive pay observations excluded from the estimation cell, relative to average hourly compensation in other cells.

By not adjusting the employment component of the cost share weight in the experimental less incentive-pay indexes, the estimation gives too much weight to occupational categories that have a high incidence of employment with incentive pay provisions (such as sales occupations) and too little weight to occupational categories that have a low incidence of incentive pay. But employment in incentive pay jobs has a relatively low incidence in most occupations (see Table 1) and, as shown in Table 3, cost weights are not always proportional to employment shares because of differences in average hourly compensation across occupations and industries. In an earlier study[12], we gauged the possible error with the methodology by adjusting downward the employment in sales occupations. Sales employment was adjusted downward by using sample proportions of workers in incentive pay jobs derived from the 1997 sample. The sales index series was then estimated for the period 1994-1999. Using such sample information is not consistent with ECI index methodology, but if these employment adjustments are important, then their effects on the cost weights and the resulting indexes should be most important among sales occupations. The correlation of the indexes with employment-adjusted weights with the indexes derived holding employment constant (the methodology we did choose) was 0.95, with half of the estimated 3-month changes in the two series being exactly equal. Based on these results, we believe that adjusting the employment component of the cost weights for the experimental indexes would have

[12] Anthony Barkume and Thomas Moehrle, "The Role of Incentive Pay in the Volatility of the Employment Cost Index" Compensation and Working Conditions, Summer 2001, p.13

[14] We also computed the standard deviation of quarterly differences in the 12 month index changes, which would isolate "within-year" variance in an additive model of the "within-year" and "between-year"

only minor effects on the resulting series and that our approach thus provides a reasonable approximation to the ideal index formula.

Using the interim methodology described above, experimental ECI series that exclude pay changes in jobs with incentive pay provisions have been derived for the period March 1995 through December 2003. The next section presents a set of simple comparisons of the experimental less incentive pay series to published all-worker series. Work is now underway to derive associated variance estimates and to consider development of a public use file for selected industry and occupation series. Since we have not yet developed the variances for these estimates so we have not conducted tests of statistical significance on differences. For this paper, we concentrate our attention on the very large differences between the series.

Comparisons of Experimental Indexes to Published Series

Use of incentive pay provisions could influence both the timing and the long term trend of compensation. As mentioned above, ECI data collection conventions for sales commissions also contribute to higher measured volatility for those sample jobs in which workers receive draws against future sales commissions; ECI data collection does not attempt to measure sales commissions net of draws. If pay volatility is higher in incentive pay jobs, volatility of the published ECI series should be higher than in our experimental series. We present some comparisons of the standard deviation of quarterly changes in indexes between the published all-worker series and the experimental series over the period May 1995 to December 2003. This measure will provide a useful comparison of short term volatility only if the long term growth trends of the series being compared are similar.[14] Thus, we also examine the cumulative growth and variability in annual changes between the published and experimental series to see in which series this condition is not met.

---

variance terms if these variance components were independently distributed. The results for this simple time series model are very similar to those shown in Table 4.

Table 4 compares the measure of volatility for wages and salaries[15] between the published all-worker series and experimental series by major industry and occupation. The ratio of the standard deviation of three month changes for the all worker series to the corresponding measure for the experimental series, (ALL/LIP) estimates the relative increase in the volatility of the published series by including sample incentive pay jobs in the published index. With a few exceptions (Transportation/Public Utilities, Service Industries, Administrative Support and Services), the inclusion of incentive pay jobs increases the volatility of the published series, with volatility more than doubling in the Wholesale Trade, Finance, Insurance and Real Estate, and Sales Occupations. The source of volatility of earnings in Wholesale Trade appears to be from sales commissions because the published less sales occupation series for Wholesale Trade (see Chart I) reduces volatility by approximately the same amount as the experimental less incentive pay series.[16] (As shown by the data in Table 2, Wholesale Trade has the highest overlap between employment representation in sales occupations and use of incentive pay provisions among the major industry sectors.) In contrast, excluding sales occupations from the Finance, Insurance, and Real Estate all-worker series has little effect on volatility (see Chart II). In particular, the less sales occupations series retains large spikes in earnings observed in June 2002 and June 2003 that are absent from the less incentive pay series (see Chart III).

The data in Tables 5 and 6 indicate that, in most of the series examined, the higher volatility of the all-worker series is not due to differences in trends in the relative wage paid to incentive pay jobs, although the Finance, Insurance, and Real Estate series is the prominent exception to this pattern. Table 5 shows that in most industry sectors or occupation groups the standard deviation of annual changes in the published all-worker series (indicating year-to year variability) is similar in magnitude or lower than the corresponding standard deviation for the experimental series. However, in Finance, Insurance, and Real Estate this variability is twice as high in the published series as in the less incentive pay series. And as shown in Table 6, including incentive pay jobs altered

[15] We also examined the measure of volatility in the Total Benefit series. In all the series examined, the volatility of the less incentive pay series was within 5 percent of the corresponding published series.
[16] See footnote 9.

the cumulative 1994-2003 growth in wages and salaries in most series by less than one percent, but relative compensation grew by 12.3 percent in the all-worker Finance, Insurance, and Real Estate series.

The large increase in relative compensation for incentive pay jobs in Finance, Insurance, and Real Estate (FIRE) that is evident in the ECI data appears to be concentrated in one specific sub sector, Banking, Savings and Loan, and other Credit Agencies. Table 7 compares the summary measures of volatility and cumulative growth for the Banking, Savings and Loan, and other Credit Agencies and Insurance published all-worker ECI series and the corresponding experimental less incentive pay series. The Banking, Savings and Loan, and other Credit Agencies and Insurance all-worker ECI series experienced a phenomenal growth of 80 percent in the nine year period 1995-2003 despite the fact that the bulk of the workers in the industry not having incentive pay experienced growth in wages and salaries similar to that of all workers in US private industry. Chart IV shows that a large jump in wages and salaries of the all-worker series occurred in 2003, which suggests that these high earnings are related to the most recent home refinancing boom as well as increased demand for home equity line of credit financing.

Questions for FESAC Committee members

(1) Aside from value as a volatility filter, would a less incentive pay index have potential analytical value?
(2) What additional information on incentive pay provisions should the BLS be regularly collecting?
(3) Should only changes in incentive pay rates (piece rates, sales commission percentages), rather than dollar amounts earned, be measured in estimating changes in the "price of labor"?

TABLE 1. **Distribution and incidence of incentive-pay compensation provisions in U.S. private industry employment, by major occupational group, March 2001**

Occupational group	Incidence[1]	Distribution[2]
All Private Industry	6.0	100.0
Professional and technical occupations	3.0	6.9
Executive, administrative, and managerial occupations	6.2	8.1
Sales occupations	20.4	38.8
Administrative support, including clerical occupations	2.5	7.0
Precision production, craft, and repair occupations	5.4	9.4
Machine operators, assemblers, and inspectors	7.9	11.0
Transportation and material moving occupations	11.4	9.8
Handlers, equipment cleaners, helpers and laborers	2.7	3.7
Service occupations, except private household.	1.8	5.4

[1] Percent of total employment in the occupational group.
[2] Percent of all private industry employment in jobs with incentive-pay provisions.

Chart I. Comparison of 3-month percent changes in the published ECI Wholesale Trade all worker and excluding sales occupations series, March 1995-December 2003

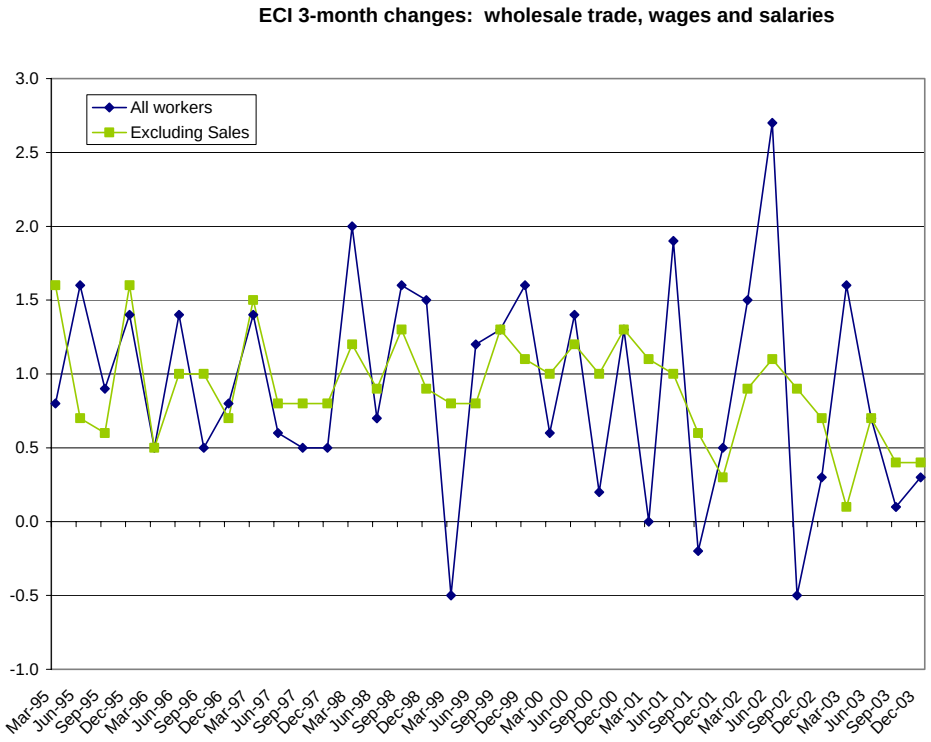

Chart II. Comparison of 3-month percent changes in the published ECI Finance, Insurance and Real Estate all-worker and excluding sales occupations series, March 1995-December 2003

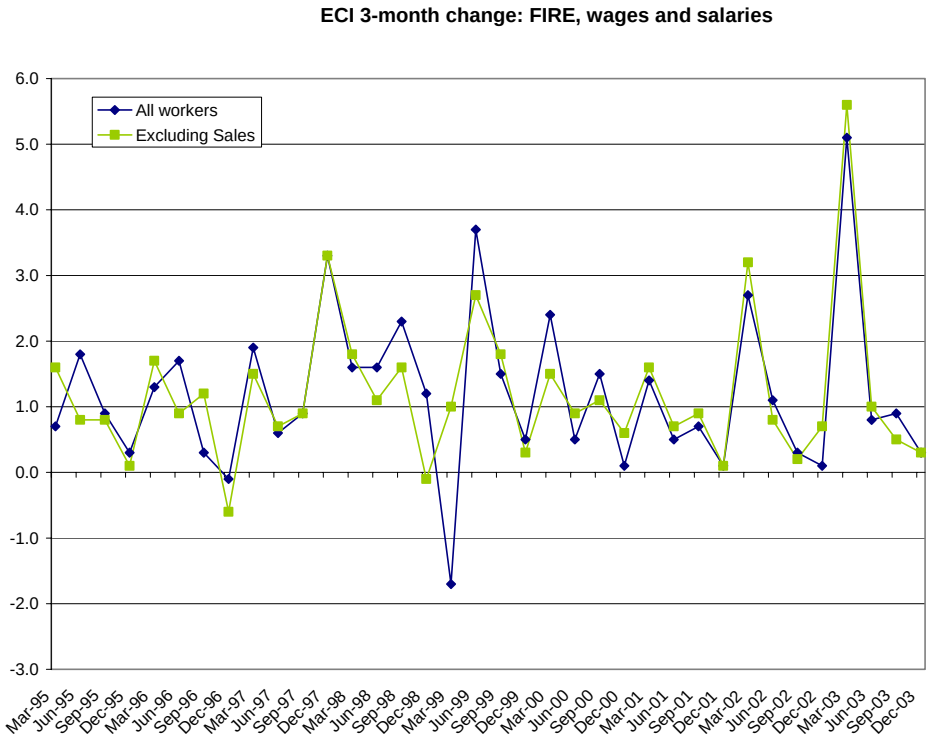

TABLE 2. Overlap of employment representation in sales occupations and in jobs with incentive pay provisions in U.S. private industry, by major industry sector, March 2001

	Sales occupations		Incentive-pay provisions	
	Percent of industry employment	Percent with incentive-pay provisions	Percent of industry employment	Percent in sales occupations
All private industry	11.5	20.4	6.0	38.8
Construction	1.9	45.8	2.5	36.0
Manufacturing	1.9	29.6	5.2	10.9
Transportation	1.8	2.4	13.7	0.3
Public Utilities	4.1	45.4	4.1	46.1
Wholesale Trade	20.4	41.5	12.4	68.4
Retail Trade	37.3	14.2	8.0	66.3
Finance, Insurance, and Real Estate	8.8	39.3	8.2	42.4
All services	3.6	24.2	3.8	23.5
Business services	6.6	36.9	5.0	49.0

TABLE 3 Comparison of base cost share weights for published all-worker and experimental less incentive pay wage and salary indexes (Wage relative importance, March 1995)

	1990 Census Employment share	Cost shares, all-worker indexes	Cost shares, less incentive-pay indexes
By industry sector :			
Construction	0.056	0.066	0.067
Manufacturing	0.211	0.229	0.233
Transportation and Public Utilities	0.064	0.084	0.087
Wholesale Trade	0.068	0.076	0.072
Retail Trade	0.216	0.131	0.126
Finance, Insurance, and Real Estate	0.074	0.089	0.087
All services	0.303	0.315	0.316
By occupation group:			
Professional and technical occupations	0.125	0.201	0.201
Executive, administrative, and managerial occupations	0.105	0.187	0.190
Sales occupations	0.131	0.110	0.097
Administrative support, including clerical occupations	0.190	0.154	0.158
Precision production, craft, and repair occupations	0.116	0.132	0.135
Machine operators, assemblers, and inspectors	0.086	0.067	0.069
Transportation and material moving occupations	0.044	0.040	0.040
Handlers, equipment cleaners, helpers and laborers	0.052	0.035	0.036
Service occupations, except private household.	0.152	0.074	0.076

TABLE 4. Comparison of standard deviation of three month changes, wages and salary series, March 1995-December 2003

	All workers (ALL)	Less Incentive-Pay (LIP)	(ALL/LIP)
All Private Industry Workers	0.23	0.18	1.255
By industry sector :			
Construction	0.40	0.35	1.118
Manufacturing	0.22	0.19	1.133
Transportation and Public Utilities	0.34	0.36	0.948
Wholesale Trade	0.73	0.33	2.204
Retail Trade	0.54	0.30	1.788
Finance, Insurance, and Real Estate	1.22	0.45	2.709
All services	0.27	0.26	1.049
By occupation group:			
Professional and technical occupations	0.29	0.26	1.149
Executive, administrative, and managerial occupations	0.55	0.37	1.688
Sales occupations	1.04	0.42	2.458
Administrative support, including clerical occupations	0.24	0.24	0.989
Precision production, craft, and repair occupations	0.29	0.23	1.284
Machine operators, assemblers, and inspectors	0.24	0.20	1.149
Transportation and material moving occupations	0.34	0.31	1.219
Handlers, equipment cleaners, helpers and laborers	0.28	0.25	1.121
Service occupations, except private household.	0.31	0.30	1.016

TABLE 5. Comparison of standard deviations of twelve month changes in wages and salaries March 1995-December 2003

	All workers (ALL)	Less Incentive-Pay (LIP)	(ALL/LIP)
All Private Industry Workers	0.43	0.48	0.903
By industry sector:			
Construction	0.71	0.78	0.909
Manufacturing	0.40	0.41	0.983
Transportation and Public Utilities	0.81	0.79	1.019
Wholesale Trade	0.81	0.71	1.136
Retail Trade	0.90	0.78	1.157
Finance, Insurance, and Real Estate	1.71	0.78	2.188
All services	0.62	0.80	0.962
By occupation group:			
Professional and technical occupations	0.74	0.70	1.045
Executive, administrative, and managerial occupations	0.66	0.62	1.334
Sales occupations	1.49	1.13	1.100
Administrative support, including clerical occupations	0.49	0.52	0.938
Precision production, craft, and repair occupations	0.46	0.45	1.014
Machine operators, assemblers, and inspectors	0.34	0.41	0.832
Transportation and material moving occupations	0.70	0.59	1.190
Handlers, equipment cleaners, helpers and laborers	0.53	0.56	0.956
Service occupations, except private household.	0.71	0.70	1.069

TABLE 6. Cumulative growth in wages and salaries, December 1994-December 2003 (Value of December 2003 index level; December 1994= 100)

	All workers (ALL)	Less Incentive-Pay (LIP)	(ALL/LIP)
All Private Industry Workers	135.5	133.8	1.013
By industry sector:			
Construction	134.2	134.8	0.995
Manufacturing	132.4	132.5	0.999
Transportation and Public Utilities	130.9	130.2	1.005
Wholesale Trade	137.8	135.0	1.021
Retail Trade	132.9	132.0	1.007
Finance, Insurance, and Real Estate	152.4	135.7	1.123
All services	135.5	135.7	0.998
By occupation group:			
Professional and technical occupations	132.4	132.7	0.997
Executive, administrative, and managerial occupations	142.8	135.7	1.052
Sales occupations	137.9	131.5	1.048
Administrative support, including clerical occupations	136.1	135.5	1.004
Precision production, craft, and repair occupations	132.5	131.9	1.004
Machine operators, assemblers, and inspectors	132.1	132.5	0.996
Transportation and material moving occupations	129.5	128.7	1.006
Handlers, equipment cleaners, helpers and laborers	134.9	135.2	0.997
Service occupations, except private household.	132.9	132.4	1.003

Chart III. Three month changes in Finance, Insurance and Real Estate, March 1994-December 2003. Published less sales occupations vs. experimental less incentive pay jobs

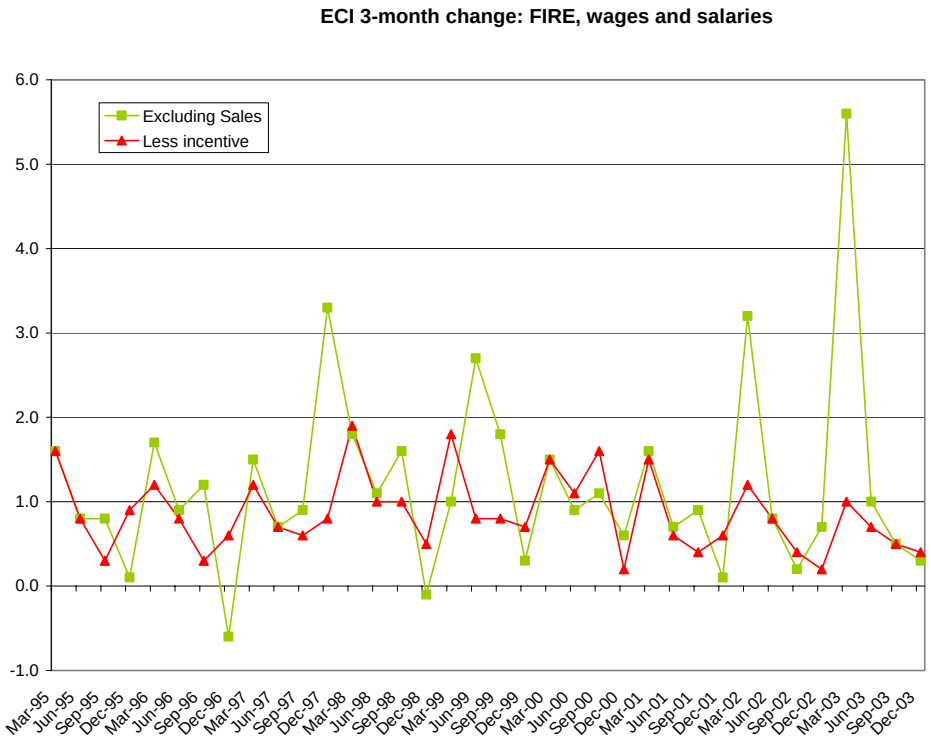

TABLE 7. Comparisons of Finance, Insurance, and Real Estate Sector ECI with 2 industry sub sectors, December 1994-December 2003

	All workers (ALL)	Less Incentive-Pay (LIP)	(ALL/LIP)
Finance, Insurance, and Real Estate sector			
Standard deviation of quarterly changes	1.22	0.45	2.709
Cumulative growth (Dec. 1994 = 100)	152.4	135.7	1.123
Banking, savings and loan, and other credit agencies sub sector			
Standard deviation of quarterly changes	2.56	0.59	4.340
Cumulative growth (Dec. 1994 = 100)	180.3	135.0	1.335
Insurance sub sector			
Standard deviation of quarterly changes	0.81	0.37	2.210
Cumulative growth (Dec. 1994 = 100)	138.4	133.0	1.041

CHART IV. Comparison of index levels (December 1994 = 100) for published and interim experimental series, banking, savings and loan, and other credit agencies, December 1994-December 2003.