

An Examination of All-Employee Payroll and Hours Reports in CES

Harley Frazis*

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Executive Summary

This report examines response rates, internal consistency, and data quality of payroll and hours data collected for all employees and production/nonsupervisory workers. We use CES data covering the period from January 2006 through December 2008 and also compared CES tabulations to QCEW tabulations of average weekly earnings.

Main Findings

1. Item response rates for payroll and hours are low for both all employees and production workers. Conditional on reporting an all-employee (AE) count, the response rate for the other all-employee (AE) elements (payroll and hours) is about 40 percent, while the response rate for the production worker (PW) elements is about 36 percent. Both response rates drop by about 2 percentage points if we account for the fact that two consecutive months of data are required to be included in estimates. (Table 3) There is high correlation between reporting payroll and hours—for a given group (AE or PW), respondents either report both or neither.
2. Response rates for AE and PW elements vary differently by establishment size. In small establishments (less than 25 employees), the response rate is higher for AE elements, while in medium-size establishments (25-499 employees) the response rate is higher for PW elements. In large establishments (500+ employees), there is little difference. Response rates for AE and PW elements vary differently by supersector. The AE response rate tends to be higher, with Retail Trade and Utilities being exceptions. (Table 3)
3. Response rates vary by mode of collection. Response rates for EDI are roughly equal between PW and AE elements, while the other most common modes show much greater response rates for AE elements. (Table 3)
4. While response rates for AE elements are higher for establishments that entered the sample after those elements' introduction, correcting for other characteristics reverses this effect (Tables 3 and 4).
5. The reporting of AE and PW elements is positively correlated. Overall, 27 percent of respondents report both AE and PW elements, while 55 percent report neither. Consistent with above, smaller establishments are more likely to report only AE elements, while medium-sized establishments are more likely to report only PW elements (Table 5).
6. Response/non-response status is fairly consistent from month to month. Of the CES respondents who reported AE counts, nearly 49 percent did not report AE payroll and hours data for any of the months that they were in the survey and 54 percent did not report PW payroll and hours. Of those that reported any payroll and hours data, 73 percent reported AE payroll and hours at least 80 percent of the time and 72 percent reported PW payroll and hours at least 80 percent of the time.

7. There appears to be a drop-off of about 6 to 7 percentage points in the fraction of respondents reporting complete PW data after the introduction of the AE elements. (Table 7)
8. The payroll and hours data are generally internally consistent. In 81 percent of reports, the AE elements (totals, not averages) are greater than their corresponding PW elements. And in another 17 percent of reports all of the AE elements equal their corresponding PW elements, indicating all workers are production/non-supervisory if taken literally. Most of this latter category is due to small establishments where it is likely that the two sets of elements actually are equal. Depending on how we treat these “possibly consistent” responses, we estimate that the responses are internally consistent between 95 and 97 percent of the time. (Table 8)
9. Regression analysis as well as cross-tabs show consistency rates varying by establishment characteristics and collection mode. CATI respondents have low rates of consistent responses but normal rates of “possibly consistent” responses. TDE respondents have relatively low rates of “possibly consistent” responses. (Tables 8, 9 and 10)
10. Hours and earnings of non-production workers are implied by the AE and PW data. These implied figures look reasonable for the most part. Implied growth rates for hourly earnings of non-production workers show more variability than growth rates of other data elements (Tables 11 and 12, Chart 1). Much of this may be due to variation in classification of workers as production or non-production workers within a reporting establishment rather than variation in true growth.
11. The distribution of hours and earnings for all workers look reasonable. Implied growth rates are similar to those for production/supervisory workers (Tables 11 and 12, Chart 1).
12. Average weekly earnings reported from the QCEW are approximately 20 percent greater than AE earnings from the CES for quarters 1 and 4 and approximately 10 percent greater for quarters 2 and 3. These percentages vary substantially by supersector (Table 17). Average growth rates for weekly earnings for quarters 2 and 3 are similar for all private employers. There are substantial differences in growth rates for many supersectors (Table 18).

*This report is based on an earlier draft with Jay Stewart. Lowell Mason provided research assistance.

Background

The CES program has long looked into the possibility of collecting earnings and hours information for all employees, rather than just for production/nonsupervisory (P/NS) workers. Much has been written on this topic (see the 1993 ASA report on improving the CES program), so we will not rehash those discussions here. But the general arguments for the change are that (1) users' needs would be better met by collecting all-employee (AE) payroll and hours instead of P/NS payroll and hours, and (2) AE payroll and hours data should be easier for respondents to report.

In September of 2005, the CES program began collecting earnings and hours data for all employees in addition to payroll and hours for P/NS workers. The new elements were payroll and hours paid for the period that includes the 12th of the month, and gross monthly earnings (GME) for the entire previous month. GME was later discontinued.

The goal of this project is to evaluate the quality of the AE earnings and hours data. First, we examine response rates and reporting patterns. In addition to examining raw response rates, we also examine the distribution of valid responses across establishments. Second, we examine the payroll and hours reports for internal consistency. Third, we examine the plausibility of the distribution of responses, focusing on between-month changes and the implied figures for non-production workers. Fourth, we use tabulations from the QCEW to compare average weekly earnings by supersector from that program with AE earnings.

Data

Data for the first three sections come from three datasets that we received from the CES program office:

1. bdar_aepp_mdb_extract_02mar07.sas7bdat containing data from July 2005 through January 2007. We used this extract for data from January through September 2006.
2. bdar_aeppmdb_ext_02jan09.sas7bdat containing data from July 2006 through December 2008. We used this extract for data from October 2006 through September 2007.
3. bdar_aeppmdb_ext_01aug09.sas7bdat containing data from October 2007 through December 2008.

We excluded all data for 2005 from the sample because these data were deemed to be of poor quality by the CES staff and are not representative of current data collection. Since we are concerned with item non-response, we excluded establishments that never reported all-employee (AE) counts. We also dropped observations for months prior to the first month that the establishment reported an AE count and after the last month in which the establishment reported an AE count. Establishments whose industry was classified as “Education” or “Public Administration” or with invalid NAICS codes were also excluded. The final merged data set contains 7,551,215 observations from 362,554 establishments. For tabulations of mode of collection, we merged to flat-file data containing this information. The merged dataset contains 5,965,992 observations from 349,460 establishments.

I. Item Response Rates

Preliminary research found that it was easier for respondents to report AE payroll and hours than to report the corresponding production worker (PW) elements.¹ Table 1 shows the distribution of responses for each data element. The first column indicates that CES respondents report a valid value for the AE count about 95 percent of the time. A small fraction report an unusable value and about 1 percent report a value of zero. About 4 percent are missing. Turning

¹ See Karen Goldenberg, Anthony Gomes, Marilyn Manser, and Jay Stewart, “The CES Concepts Pilot Study: Design and Analysis of Responses”, in the *Proceedings of the Section on Survey Research Methods*, American Statistical Association, 1999. We will use the terms production/nonsupervisory (P/NS) workers and production workers (PW) more or less interchangeably, depending on context.

to the other data elements, we see that the fractions of valid-value reports are significantly smaller and the fractions of missing values are significantly larger. After the AE count, the PW count is the next-most-frequently-reported element with respondents reporting valid values 50 percent of the time. Valid values for the payroll and hours elements are reported less than 40 percent of the time, with the AE elements being reported slightly more often than the PW elements (37 percent vs. 33 percent). For both the AE and PW elements, there is a very high correlation between the reporting of payroll and hours. Finally, valid values of GME are reported only 29 percent of the time. However, since GME is scheduled to be discontinued, we do not analyze this data element further.

Table 2 shows response rates, conditional on reporting a usable AE count, for the data elements by year and by establishment characteristics.² In this and subsequent tables, we collapse the four categories in Table 1 into two categories: response and nonresponse. The response category includes unusable values and zeros as well as valid values. The rationale for including these unusable responses is that the respondent took the time to respond to the survey and, with sufficient training, could eventually provide usable data. The nonresponse category includes missing and the small number of observations with values between 0 and 1 in absolute value (these are labeled as “unknown” in the table). Our results are not sensitive to this classification, because the unusable values represent less than two percent of all responses and there is not very much variation across data elements.

Response rates decrease by year for the PW elements and increase in 2007 for the AE elements before decreasing somewhat in 2008. In 2006 AE response rates were below PW rates by about 1 percentage point. As of 2008 AE response rates exceeded PW response rates for both

² Some establishments would occasionally report payroll, hours, or gross monthly earnings, but fail to report AE counts. In our analysis, we treated these records as complete nonresponses because the data cannot be used without the AE count.

payroll and hours by 7 percentage points. There are two potential explanations of this trend. One is that firms already in CES when the new AE items were introduced were increasing their response rate over time. The other is that firms introduced into the CES sample after the new items were added were more likely to respond to the AE items.

The second set of rows in Table 2 divides the sample into establishments which were members of the CES samples before the introduction of the AE elements and those that were not. Respondents who entered the sample after the introduction of AE elements responded to the AE items over 5 percentage points more often than did establishments already in the sample. They responded to the PW items about 4 percentage points less. However, both these patterns reverse after controlling for other characteristics; see below.

There is a fair amount of variation in response rates by establishment size. More importantly, the patterns differ for the AE and PW elements. For the AE elements, response rates are generally higher for smaller establishments, with the highest response rates being for establishments in the 50-99 employee category. In contrast, response rates for the PW elements are higher among establishments in the 50-99, 100-249, and 250-499 employee categories, and are the lowest for the smallest and the largest establishments.

This pattern may seem surprising. One possibility is that medium and large establishments have programmed their computer systems to generate the data required to report PW payroll and hours each month. If this is the case, then it is relatively costless to report PW elements for these establishments, whereas additional programming would be required to generate the data to report AE elements. In smaller establishments, it is likely that the data for

reporting are generated by hand, which would make reporting AE elements easier.³ In results not shown, response rates for the AE elements are higher and for the PW elements are lower in the size classes spanning 50-999 employees for establishments entering the sample after introduction of the AE elements, supplying some evidence for this theory.

Response rates also vary considerably by supersector. Across supersectors, there is generally a positive correlation between the response rates for the AE and PW elements. But there are a few exceptions. Response rates are considerably higher for the AE elements in Manufacturing, Construction; Finance; Real Estate; Professional/Technical; Management; Support; Health; and Leisure; while they are considerably lower for AE elements only in Retail Trade.

Collection mode is grouped into 8 categories in the tables.⁴ Of the four most common modes, CATI, the Web, and TDE all have substantially higher response rates for the AE than the PW elements, but Electronic Data Interchange (EDI) response rates are very similar. (The similarity of the EDI rates to some extent goes against the theory that lower AE rates reflect programming, as EDI is a programming-intensive mode.)

Response Rates - Usable Data

Looking at response rates for individual data elements overstates the amount of usable data collected because the change estimators used by the CES program require establishments to report complete data for two consecutive months to be included in estimates. A report is

³ This hypothesis is based on the results of cognitive interviews reported in Karen L. Goldenberg and Jay Stewart, "Earnings Concepts and Data Availability for the Current Employment Statistics Survey: Findings from Cognitive Interviews," in *Proceedings of the Section on Survey Research Methods*, American Statistical Association, 1999.

⁴ See "Technical Notes to Establishment Survey Data Published in Employment and Earnings", <http://www.bls.gov/web/empsit/cestn1.htm>, for descriptions of collection modes.

considered to be *complete* for a group (AE or PW) if all three elements (the worker count, payroll, and hours) are present.⁵ A response is considered to be *usable* for a group if it is complete in the current month and the previous month.

The requirement of two consecutive months means that the pattern of reporting matters. An establishment that reports all elements for the six consecutive months and fails to report for six consecutive months will be included in estimation five times, while an establishment that reports every other month will never be included. Both establishments provided data for half the months in the year, but there is a large difference in the amount of usable data collected.

Table 3 shows the percentage of establishments with complete and usable responses conditional on reporting an AE count. The first two columns show the percentage of complete reports in the current month for AE and PW elements. Compared to Table 2, the response rates are lower when all elements in a group are required, but they are only slightly lower—0.1 of a percentage point overall and less than 0.4 of a percentage point for any characteristic. The next two columns show the usable-response rate conditional on reporting an AE count for two consecutive months. This lowers the effective response rates by about 2 percentage points overall. There is some variation in difference between the complete-response rate and the usable-response rate by industry and length of pay period, but there is almost no variation by year, sample entry after introduction of AE elements, or establishment size. Thus, both measures tell essentially the same story.

⁵ This requirement is stronger than is necessary to compute some series, but it ensures internal consistency. To illustrate, average weekly earnings of production and nonsupervisory workers are computed using only the PW count and payroll. Similarly, average weekly hours are computed using only the PW count and hours. Average hourly earnings are computed by dividing average weekly earnings by average weekly hours, but could also be computed using just payroll and hours. If establishments with incomplete data were included in the estimates, then the two average hourly earnings would not be the same, because establishments with missing elements would be included in some series but not in others.

As in Table 2, there is generally a positive correlation between the reporting of AE and PW elements across supersectors. In most supersectors, AE response rates are greater than PW response rates, while the reverse is true in only two supersectors, Utilities and Retail Trade.

The pattern of reporting by closing is similar to that found in Table 2. The differences by closing are not dramatic, but the later the closing (up to the third) the more likely respondents are to report payroll and hours. And as in Table 2, there is very little difference in response rates between AE and PW elements by closing.

Table 4 examines difference in response rates by establishment characteristics in a multivariate framework using a linear probability model. The sample is restricted to establishment-months in which an AE count was reported, and the dependent variable equals 1 if the respondent reported all elements in the group for the current and previous month. To examine the effect of being introduced to the sample after introduction of the AE elements more closely, we interacted a dummy for post-AE introduction with number of months in the sample (starting from January 2006). We also include a linear trend in calendar month and the number of times the unit responded reported data (hereafter “count”).

The most prominent result is that in contrast to the cross-tabulation results, the dummy for post-AE introduction to the sample is substantially negative—4.5 percentage points—for AE items, though the effect diminishes over time. The coefficient is smaller and positive for the PW items. Most of the difference between the cross-tabulation and regression results appears to be due to the calendar month and count variables, though adding the other control variables without introducing calendar month and count reduces the effect to zero.

As in Tables 2 and 3, small establishments are more likely to report the AE elements, while medium-size establishments are more likely to report the PW elements. The patterns by

supersector are also basically similar to those in Table 3. The effects for collection mode are very large and similar to those implied by the earlier tables.

Table 5 shows that there is considerable overlap in AE and PW reporting. Overall, establishments report complete data for both AE and PW elements about 27 percent of the time (conditional on reporting an AE count), and fail to report complete data for either set of elements about 55 percent of the time. The rest of the time (18 percent), complete data are reported for only one set of elements. By size category, small (less than 25 employees) and large (1000+) establishments are the least likely to report any usable hours and payroll data. Establishments in the 250-499 category are the most likely to report some usable data, mainly because of the high fraction that reports complete PW data.

By supersector, we can see that there are several industries in which a high percentage of establishments report complete data for neither AE nor PW elements. The fraction failing to report either AE or PW elements is particularly high (over 70 percent) in Utilities, Transportation, and Information.

Respondents who entered after the introduction of AE elements are more likely to report those elements and less likely to report PW elements, but overall response rates are similar. This pattern is likely to be due to other characteristics, given our regression results above. Among collection modes, overall response rates are highest (around 50 percent) for Web and TDE respondents. Response rates are similar by year, but AE response rates increase and PW response rates decrease after 2006.

Table 6 summarizes reporting for AE and PW elements for each establishment over the sample period as a whole. We can see that the fraction of establishments that report complete data for at least one month is higher for the AE elements than for the PW elements (51 percent

vs. 46 percent). The last column shows that about 43 percent of all establishments that report AE counts never report complete AE or PW payroll and hours. About 37 percent of establishments report complete AE data for 80 percent or more of the months that they report an AE count. Thus, 73 percent of establishments that report complete AE data for at least one month report complete data at least 80 percent of the time (72 percent for PW elements).

The final response rate issue we address here is whether the response rate for PW elements fell after August 2005 when the collection of AE payroll and hours began. We show transition matrices between different frequencies of responding to the PW elements.⁶ The top half of Table 7 shows how frequency of response changed from the period March – July 2005 and the period July 2005 – February 2006. For comparison, the bottom half of Table 7 shows results for the equivalent period a year later, a period with no changes in the data elements requested. The universe for each half of the table is establishments that provided at least one month of AE employment data for both of the sub-periods relevant for the half.

Respondents either provided no complete data for PW elements, provided data in one-half or fewer months of the reference period, or provided data in more than half of the months. The table entries are row percentages. Comparing the two halves of Table 7 shows that respondents who supplied data for the PW elements some of the time in the period March-July (either half or fewer months or more than half the months) provided data in more than half the months in October-March at a 6 to 7 percentage point lesser rate in 2006-07 than in 2007-08. On the other hand, respondents who never provided complete PW data in March – July supplied the PW items at a slightly higher rate in 2006-07 than in 2007-08. Overall, our results indicate some decline in the PW response rates after introduction of the AE elements.

II. Internal Consistency Checks

⁶ For this analysis, we appended some earlier data to our dataset.

Our second set of analyses examines whether responses are internally consistent. For this analysis, we restricted our sample to observations with valid data for all six elements (employee counts, payroll amounts, and hours paid for all employees and for production workers). Given that production workers are a subset of all employees, it follows that an observation is internally consistent if all of the AE elements are greater than all of their corresponding PW elements. However, it is also possible that, especially in smaller establishments, all of the establishment's employees are production or nonsupervisory workers. For this reason, we use two definitions of internal consistency.

Under the first definition, the data are internally consistent if all AE data elements are greater than their corresponding PW elements. The second definition admits the possibility that all employees are PW workers. Specifically, we call the data "possibly consistent" if all AE elements are equal to their corresponding PW elements.

Given that there are three variables (employee count, payroll amount, and hours paid) for both AE and PW, and that there are three possible relationships between the corresponding elements ($AE > PW$, $AE = PW$, and $AE < PW$), there are 27 possible combinations for the relationship between the three AE elements and the three PW elements. Table 8 shows the percent of observations accounted for by the seven most-common combinations, broken down by establishment characteristics.

Over all establishments, 81.1 percent of observations are internally consistent and another 17.1 percent are possibly consistent. The other 5 combinations shown in Table 8 account for about 0.1 to 1.0 percent of observations, while the 20 combinations that are not shown account for 0.1 percent of all observations.

Respondents who were in the sample prior to the introduction of the AE elements have a higher rate of internal consistency than those who were not, but this is reversed if one includes possibly consistent responses. Consistency appears to improve slightly by year. Looking at these patterns by establishment size reveals that the possibly consistent response pattern is due mainly to small establishments. About 41 percent of 1-9 employee establishments report the same numbers for the AE and PW elements. About 10 percent of 10-24 employee establishments report this pattern, and about 3-5 percent of larger establishments report this pattern. Cutting the data the other way (not shown in Table 8), 1-9 employee establishments account for 80 percent of all possibly consistent observations, while 10-24 employee establishments account for another 11 percent. Finally, to arrive at an alternative estimate of the fraction of consistent responses, we treated the possibly-consistent responses as consistent for establishments with fewer than 25 employees and as inconsistent responses for larger establishments. Under this assumption, we estimate that about 97 percent of responses are internally consistent. If we treat the possibly consistent responses in 10-24 employee establishments as inconsistent, the percentage of consistent responses drops to 95.

The rest of Table 8 shows how the response patterns vary by supersector and collection mode. There are often substantial differences in response patterns, especially for consistent responses. For collection mode, CATI respondents have particularly low rates of consistent responses but relatively high rates of potentially consistent responses. TDE respondents have low rates of potentially consistent responses.

Table 9 summarizes these results at the establishment level. For each establishment with 11 or more complete set of responses, we computed the percent of responses across time that are consistent, and the fraction that are possibly consistent. These are shown in the first two

columns of Table 9. Note that the percentages are very similar to the percentages in the first and sixth columns of Table 8, indicating that there is relatively little within-establishment variation in the patterns.

Table 10 shows the results of a regression with response consistency as a dependent variable, defined as either internally consistent (first column) or internally consistent or possibly consistent (second column). In general the results are consistent with Table 8. The coefficients in the second column indicate that most variables have only slight effects on consistency in the broader sense. As in the cross-tabs, respondents who were not in the sample before the AE elements were introduced show somewhat more consistency in the broader sense, though this difference dissipates somewhat over time.

Table 1: Distribution of Responses

	AE Count	AE Payroll	AE Hours	PW Count	PW Payroll	PW Hours	GME
Valid Value	95.2	37.4	37.6	49.8	33.3	33.4	28.7
Unusable Value	0.1	0.7	0.4	0.1	0.5	0.3	1.2
Zero	0.9	0.7	0.6	1.7	0.7	0.6	0.2
No Response	3.8	61.3	61.4	48.4	65.6	65.7	70.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: N = 7,551,215

**Table 2: Response Rates for Individual Data Elements by Establishment Characteristics
(Conditional on reporting AE count)**

	AE Payroll	AE Hours	PW Count	PW Payroll	PW Hours	GME
All Establishments	40.0	39.9	53.5	35.9	35.8	31.3
Year						
2006	36.9	36.5	54.7	38.1	37.9	30.8
2007	42.3	42.3	53.7	36.6	36.6	30.8
2008	40.7	40.7	52.2	33.1	33.1	32.4
Pre-AE Respondent						
Yes	39.4	39.2	53.5	36.3	36.3	31.9
No	44.5	44.5	53.8	32.5	32.5	27.3
Establishment Size						
1-9	39.6	39.5	51.0	29.6	29.6	31.2
10-24	39.7	39.6	50.1	31.4	31.3	31.5
25-49	42.3	42.2	58.4	40.2	40.1	30.8
50-99	43.0	42.8	59.2	44.7	44.6	33.2
100-249	40.8	40.7	57.2	46.8	46.8	33.8
250-499	33.9	33.8	62.6	53.0	52.9	26.7
500-999	36.6	36.3	50.3	38.2	38.1	28.7
1000+	34.0	33.8	41.8	30.0	29.9	27.3
Supersector						
AFF+Mining	44.4	44.2	64.3	42.6	42.4	33.9
Utilities	19.8	19.7	27.1	23.4	23.4	14.4
Construction	58.6	58.3	71.7	47.8	47.7	43.9
Manufacturing	56.4	56.1	66.5	50.1	50.0	43.9
Wholesale Trade	41.7	41.6	60.2	39.0	39.0	32.0
Retail Trade	31.5	31.5	58.2	43.7	43.7	26.4
Transportation	15.3	15.2	24.3	14.7	14.6	13.0
Information	27.3	27.2	76.6	24.0	24.0	23.8
Finance	44.8	44.8	17.3	11.9	11.9	39.3
Real Estate	39.8	39.7	54.2	32.2	32.1	30.6
Professional/Technical	46.6	46.4	59.8	38.2	38.1	37.2
Management	51.1	51.0	57.6	42.0	42.0	39.0
Support	39.8	39.7	48.4	31.4	31.3	29.2
Health	43.2	42.9	52.5	33.6	33.5	33.3
Leisure	39.9	39.7	49.4	32.2	32.1	30.4
Hospitality	47.2	47.0	64.2	45.8	45.7	29.5
Other Services	50.0	49.8	74.2	44.2	44.1	37.2

**Table 2: Response Rates for Individual Data Elements by Establishment Characteristics
(continued)**

	AE Payroll	AE Hours	PW Count	PW Payroll	PW Hours	GME
Closing						
First	39.5	39.4	51.7	33.7	33.6	31.1
Second	43.2	43.0	59.3	43.6	43.5	34.6
Third	47.7	47.4	62.0	43.6	43.5	35.0
After Final Closing	23.7	23.7	44.6	24.8	24.7	14.9
Mode of Collection						
State	17.0	17.0	28.4	22.0	22.0	10.0
EDI	31.0	31.0	39.6	30.4	30.4	26.9
TDE	61.4	61.3	63.6	52.3	52.3	49.7
CATI	36.8	36.8	77.4	29.8	29.8	24.5
FAX	53.5	53.5	65.5	50.5	50.5	42.5
Web	70.7	70.6	69.1	58.0	57.9	54.8
Mail	26.0	25.9	36.7	28.8	28.7	19.3
Other	45.8	45.8	66.5	36.3	36.3	34.0

Notes: Response rates include responses of zero and responses that were later deemed to be unusable.

**Table 3: Percent of Establishments with Complete Data
(Conditional on reporting AE count)**

	All Data Elements Reported...			
	in Current Month		in Current and Previous Month*	
	AE	PW	AE	PW
All Establishments	39.8	35.8	38.0	34.1
Establishment Size				
1-9	39.5	29.6	37.7	27.9
10-24	39.6	31.3	37.7	29.6
25-49	42.2	40.1	40.1	38.3
50-99	42.8	44.6	40.7	42.8
100-249	40.7	46.8	38.9	45.2
250-499	33.8	52.9	32.1	51.1
500-999	36.3	38.1	34.6	36.4
1000+	33.7	29.9	32.2	28.5
Supersector				
AFF+Mining	44.2	42.4	41.7	40.2
Utilities	19.7	23.4	18.8	22.1
Construction	58.3	47.7	55.3	45.0
Manufacturing	56.1	50.0	53.4	47.5
Wholesale Trade	41.6	38.9	39.5	37.1
Retail Trade	31.5	43.7	30.3	42.2
Transportation	15.2	14.6	14.0	13.5
Information	27.2	23.9	26.3	23.1
Finance	44.8	11.9	44.0	11.4
Real Estate	39.7	32.1	38.6	31.1
Professional/Technical	46.4	38.1	44.2	36.2
Management	51.0	42.0	48.9	40.2
Support	39.7	31.3	37.2	29.4
Health	42.9	33.5	40.4	31.5
Leisure	39.7	32.1	36.9	29.7
Hospitality	47.0	45.7	44.5	43.6
Other Services	49.8	44.1	47.1	41.7
Pre-AE Respondent				
Yes	39.2	36.3	37.4	34.5
No	44.5	32.5	42.7	31.1
Year				
2006	36.5	37.9	33.9	35.8
2007	42.3	36.6	40.4	34.9
2008	40.7	33.1	39.3	31.9

Table 3: Percent of Establishments with Complete Data (continued)

	All Data Elements Reported...			
	in Current Month		in Current and Previous Month*	
	AE	PW	AE	PW
Closing				
First	39.4	33.6	37.8	32.3
Second	43.0	43.5	41.2	41.9
Third	47.4	43.5	42.0	39.4
After Final Closing	23.7	24.7	18.4	19.4
Mode of Collection				
State Collection (all modes)	17.2	22.1	15.9	20.1
EDI	30.1	29.5	29.9	29.3
TDE	61.7	51.8	59.6	49.6
CATI	37.8	29.0	36.1	27.4
FAX	55.3	49.2	53.5	47.8
Web	73.1	55.6	70.7	53.0
Mail	25.8	28.1	24.5	26.8
Other	45.5	33.0	43.5	31.5

Table 4: Linear Probability Model - Determinants of Complete Reporting for Two Consecutive Months (Conditional on reporting AE count)

	All Data Elements Reported in Current and Previous Month	
	AE	PW
Non Pre-AE Respondent	-0.0445 (0.0041)	0.0149 (0.0039)
Number of Months Since First Report (within sample)	-0.0025 (0.0002)	0.0033 (0.0002)
No. of Mth. Since 1st Report x Non-Pre-AE	0.0016 (0.0002)	0.0023 (0.0002)
Calendar Month	0.0027 (0.0002)	-0.0053 (0.0002)
Establishment Size (Reference = 25-49)		
1-9	-0.003 (0.0025)	-0.0329 (0.0025)
10-24	-0.0359 (0.0025)	-0.0482 (0.0025)
50-99	-0.0178 (0.0031)	0.0595 (0.0032)
100-249	-0.0235 (0.0034)	0.0734 (0.0035)
250-499	-0.1091 (0.0043)	0.1372 (0.0047)
500-999	-0.1337 (0.0060)	-0.0071 (0.0064)
1000+	-0.1826 (0.0064)	-0.0884 (0.0063)

Table 4: Linear Probability Model - Determinants of Complete Reporting for Two Consecutive Months (Conditional on reporting AE count) (continued)

Supersector (Reference = Wholesale Trade)	All Data Elements Reported in Current and Previous Month	
	AE	PW
AFF and Mining	-0.0249 (0.0102)	-0.1141 (0.0107)
Utilities	-0.214 (0.0086)	-0.2632 (0.0089)
Construction	0.0822 (0.0041)	-0.0636 (0.0041)
Manufacturing	0.092 (0.0042)	-0.0674 (0.0043)
Retail Trade	0.0037 (0.0045)	-0.1035 (0.0047)
Transportation	-0.1936 (0.0031)	-0.3203 (0.0033)
Information	-0.0878 (0.0045)	-0.2199 (0.0043)
Finance	0.1772 (0.0034)	-0.301 (0.0025)
Real Estate	-0.0273 (0.0071)	-0.1284 (0.0067)
Professional/Technical	0.0277 (0.0041)	-0.1098 (0.0041)
Management	0.1103 (0.0104)	-0.0832 (0.0103)
Support	-0.0367 (0.0042)	-0.2045 (0.0043)
Health	-0.0343 (0.0037)	-0.1904 (0.0036)
Leisure	-0.0558 (0.0062)	-0.1986 (0.0062)
Hospitality	0.0408 (0.0035)	-0.0359 (0.0036)
Other Services	0.0294 (0.0052)	-0.0595 (0.0053)

Table 4: Linear Probability Model - Determinants of Complete Reporting for Two Consecutive Months (Conditional on reporting AE count) (continued)

	All Data Elements Reported in Current and Previous Month	
	AE	PW
Mode of Collection		
State Collection (all modes)	-0.4237 (0.0059)	-0.3141 (0.0061)
EDI	-0.316 (0.0031)	-0.1754 (0.0033)
CATI	-0.2467 (0.0035)	-0.2011 (0.0034)
FAX	-0.0626 (0.0037)	-0.0396 (0.0037)
Web	0.0836 (0.0035)	0.0418 (0.0038)
Mail	-0.2946 (0.0088)	-0.1973 (0.0090)
Other	-0.1779 (0.0032)	-0.1503 (0.0032)
Total Number of Months Respondent Reported Data	0.0012 (0.0001)	-0.0008 (0.0001)
Observations	5,606,713	5,606,713

Table 5: Overlap Between Reporting of AE and PW Elements
(Conditional on reporting AE count)

	All Data Elements Reported in Current and Previous Months for...			
	Both AE and PW Elements	AE Elements Only	PW Elements Only	Neither AE nor PW Elements
All Establishments	27.2	10.8	6.9	55.1
Establishment Size				
1-9	25.4	12.3	2.5	59.8
10-24	25.1	12.6	4.5	57.8
25-49	31.1	9.1	7.2	52.7
50-99	31.5	9.2	11.3	48.0
100-249	31.6	7.3	13.6	47.5
250-499	23.8	8.3	27.3	40.6
500-999	24.5	10.1	11.9	53.5
1000+	22.7	9.6	5.8	62.0
Supersector				
AFF+Mining	30.6	11.1	9.5	48.8
Utilities	16.5	2.3	5.6	75.6
Construction	41.7	13.5	3.1	41.7
Manufacturing	40.7	12.7	6.7	39.9
Wholesale Trade	29.4	10.2	7.7	52.8
Retail Trade	27.5	2.8	14.7	55.0
Transportation	10.8	3.2	2.7	83.2
Information	21.8	4.5	1.3	72.3
Finance	9.7	34.3	1.7	54.3
Real Estate	29.6	9.0	1.5	60.0
Professional/Technica				
I	33.8	10.4	2.4	53.4
Management	34.2	14.7	6.0	45.2
Support	25.9	11.4	3.5	59.3
Health	29.6	10.8	1.8	57.8
Leisure	28.0	9.0	1.6	61.5
Hospitality	34.4	10.2	9.3	46.2
Other Services	34.5	12.6	7.2	45.8
Pre-AE Respondent				
Yes	27.0	10.4	7.5	55.1
No	28.4	14.4	2.7	54.6
Year				
2006	26.6	7.3	9.2	56.9
2007	27.8	12.6	7.1	52.5
2008	27.1	12.2	4.8	55.9

**Table 5: Overlap Between Reporting of AE and PW Elements
(Conditional on reporting AE count) (continued)**

	All Data Elements Reported in Current and Previous Months for...			
	Both AE and PW Elements	AE Elements Only	PW Elements Only	Neither AE nor PW Elements
Closing				
First	25.4	12.5	6.9	55.3
Second	34.7	6.5	7.2	51.6
Third	32.2	9.8	7.1	50.9
After Final Closing	13.2	5.2	6.2	75.5
Mode of Collection				
State Collection (all modes)	10.7	5.2	9.4	74.7
EDI	19.1	10.8	10.2	59.9
TDE	47.3	12.2	2.2	38.2
CATI	25.3	10.8	2.0	62.0
FAX	39.3	14.2	8.4	38.1
Web	51.1	19.6	1.8	27.5
Mail	19.7	4.8	7.1	68.4
Other	28.8	14.7	2.6	53.9

Table 6: Establishment-Level Response Rates Conditional on Reporting AE Count

	AE Elements		PW Elements		Fraction of Establishments with All AE or PW Elements for at Least 1 Month
	Fraction of Establishments with		Fraction of Establishments with		
	All Elements in at Least 1 Month	All Elements in 80 Percent of Months	All Elements in at Least 1 Month	All Elements in 80 Percent of Months	
All Establishments	51.1	37.3	45.6	32.8	57.0
Establishment Size					
1-9	51.6	34.8	41.6	25.3	54.4
10-24	49.9	35.7	41.7	29.9	54.2
25-49	54.3	42.6	50.2	39.6	60.1
50-99	53.5	42.5	53.2	42.4	63.0
100-249	51.1	41.8	54.0	44.8	62.7
250-499	44.1	35.0	56.3	47.5	66.4
500-999	45.6	34.8	43.6	33.4	54.6
1000+	40.6	30.3	36.0	26.2	45.5
Supersector					
AFF and Mining	66.4	47.3	53.0	30.3	67.2
Utilities	27.1	21.5	30.5	23.7	31.9
Construction	72.8	54.9	63.1	39.1	74.9
Manufacturing	67.8	53.7	62.9	44.4	72.7
Wholesale Trade	53.5	38.8	52.3	35.7	61.8
Retail Trade	38.1	32.0	48.8	42.2	52.5
Transportation	26.4	19.0	24.5	15.9	29.3
Information	34.0	28.5	30.6	24.1	35.6
Finance	52.8	22.2	16.8	11.1	54.4
Real Estate	40.4	29.0	33.8	21.2	41.6
Professional/Technical	59.0	44.7	50.3	33.5	61.5
Management	60.2	47.5	51.3	35.7	66.2
Support	54.1	39.6	44.8	27.4	56.5
Health	56.0	42.8	45.4	30.8	57.0
Leisure	56.6	40.4	48.3	28.4	58.0
Hospitality	58.9	43.6	54.7	38.5	65.0
Other Services	63.0	45.8	57.5	37.3	69.2

**Table 6: Establishment-Level Response Rates Conditional on Reporting AE Count
(continued)**

Mode of Collection	AE Elements		PW Elements		Fraction of Establishments with All AE or PW Elements for at Least 1 Month
	Fraction of		Fraction of		
	All Elements in at Least 1 Month	All Elements in 80 Percent of Months	All Elements in at Least 1 Month	All Elements in 80 Percent of Months	
State	28.3	14.5	35.4	20.4	38.3
EDI	31.0	30.0	31.5	29.4	42.6
TDE	70.5	59.6	63.3	47.4	71.6
CATI	53.7	34.3	44.3	22.9	55.8
FAX	63.4	49.6	55.6	42.0	68.7
Web	81.6	70.4	70.0	50.9	82.6
Mail	31.1	22.6	32.9	25.0	36.2
Other	58.6	44.0	43.3	26.2	59.7
Total	51.1	37.3	45.6	32.8	57.0

Note: The universe for this table is establishments that reported an AE count in at least one month. The percentages are computed only using months with a valid AE count.

Table 7: The Effect of Requesting AE Payroll and Hours on PW Reporting

Transition Matrices

In Scope October 2005 - March 2006				
	No Payroll & Hours Data	Data for Half or Fewer Months	Data for More Than Half of Months	Total
In Scope March-July 2005				
No Payroll & Hours Data	93.2	3.1	3.7	100.0
Data for Half or Fewer Months	33.0	12.4	54.6	100.0
Data for More Than Half of Months	8.9	4.9	86.3	100.0
In Scope October 2006 - March 2007				
	No Payroll & Hours Data	Data for Half or Fewer Months	Data for More Than Half of Months	Total
In Scope March-July 2006				
No Payroll & Hours Data	96.9	1.3	1.8	100.0
Data for Half or Fewer Months	30.9	8.5	60.6	100.0
Data for More Than Half of Months	3.6	2.7	93.7	100.0

Table 8: Internal Consistency Check - All-Employee vs. Production Worker Reporting

	(1) AE > PW AE PR > PW PR AE Hrs > PW Hrs	(2) AE > PW AE PR > PW PR AE Hrs = PW Hrs	(3) AE > PW AE PR = PW PR AE Hrs = PW Hrs	(4) AE = PW AE PR > PW PR AE Hrs > PW Hrs	(5) AE = PW AE PR > PW PR AE Hrs = PW Hrs	(6) AE = PW AE PR = PW PR AE Hrs > PW Hrs	(7) AE = PW AE PR = PW PR AE Hrs = PW Hrs	Other Patterns
All Establishments	81.1	1.0	0.4	0.1	0.2	0.1	17.1	0.1
Establishment Size								
1-9	58.0	0.7	0.3	0.1	0.1	0.0	40.5	0.2
10-24	88.0	1.3	0.3	0.1	0.4	0.1	9.7	0.1
25-49	93.6	1.2	0.3	0.1	0.1	0.5	4.1	0.1
50-99	94.7	1.0	0.4	0.0	0.1	0.1	3.7	0.1
100-249	96.2	0.7	0.3	0.0	0.0	0.0	2.7	0.1
250-499	94.6	0.6	0.3	0.0	0.1	0.0	4.4	0.1
500-999	93.3	0.6	0.8	0.0	0.1	0.0	5.2	0.1
1000+	95.9	0.2	0.4	0.0	0.0	0.0	3.5	0.0
Supersector								
AFF and Mining	77.7	1.2	0.6	0.1	0.1	0.0	20.2	0.1
Utilities	65.0	0.1	0.8	0.0	0.1	0.0	33.9	0.1
Construction	77.3	0.7	0.5	0.1	0.1	0.0	21.3	0.1
Manufacturing	86.6	0.8	0.7	0.1	0.1	0.0	11.7	0.1
Wholesale Trade	74.4	0.9	0.2	0.1	0.2	0.0	24.1	0.2
Retail Trade	91.3	0.9	0.2	0.0	0.3	0.0	7.2	0.1
Transportation	77.2	0.8	0.5	0.1	0.2	0.0	21.0	0.1
Information	63.3	0.2	0.1	0.0	0.1	0.0	36.3	0.1
Finance	80.4	0.3	0.1	0.2	0.1	0.0	18.8	0.2
Real Estate	65.7	0.6	0.4	0.1	0.1	0.0	32.9	0.2
Professional/Technical	62.3	0.5	0.8	0.1	0.1	0.0	36.0	0.2
Management	89.0	0.4	0.4	0.0	0.2	0.0	10.0	0.1
Support	71.5	1.3	0.2	0.1	0.1	0.0	26.6	0.1
Health	82.4	0.9	0.3	0.1	0.1	0.0	16.2	0.1
Leisure	84.3	1.8	0.3	0.1	0.0	0.0	13.2	0.2
Hospitality	84.8	1.7	0.2	0.1	0.0	0.9	12.2	0.1
Other Services	66.7	1.2	0.4	0.1	0.2	0.0	31.3	0.2
Pre-AE Respondent								
Yes	81.1	1.0	0.4	0.1	0.2	0.1	17.1	0.1
No	79.2	0.4	0.1	0.1	0.1	0.2	19.9	0.0
Year								
2006	79.6	1.3	0.5	0.1	0.2	0.1	18.1	0.2
2007	80.9	0.9	0.3	0.1	0.2	0.2	17.5	0.1
2008	82.1	0.7	0.2	0.1	0.1	0.1	16.8	0.0

Table 8: Internal Consistency Check - All-Employee vs. Production Worker Reporting (continued)

Mode of Collection	(1)	(2)	(3)	(4)	(5)	(6)	(7)	Other Patterns
	AE > PW	AE > PW	AE > PW	AE = PW	AE = PW	AE = PW	AE = PW	
	AE PR > PW PR	AE PR > PW PR	AE PR = PW PR	AE PR > PW PR	AE PR > PW PR	AE PR = PW PR	AE PR = PW PR	
	AE Hrs > PW Hrs	AE Hrs = PW Hrs	AE Hrs = PW Hrs	AE Hrs > PW Hrs	AE Hrs = PW Hrs	AE Hrs > PW Hrs	AE Hrs = PW Hrs	
State	64.1	1.0	1.0	0.1	0.2	0.1	33.5	0.0
EDI	86.1	0.5	0.2	0.0	0.3	0.4	12.5	0.0
TDE	85.7	2.3	0.6	0.1	0.1	0.0	11.2	0.2
CATI	51.5	0.2	0.3	0.1	0.1	0.1	47.6	0.1
FAX	89.3	0.2	0.1	0.1	0.1	0.0	10.1	0.1
Web	87.6	1.1	0.2	0.1	0.1	0.0	10.8	0.1
Mail	92.0	1.1	0.3	0.1	0.1	0.1	6.2	0.2
Other	72.6	0.4	0.2	0.1	0.1	0.1	26.6	0.1

Table 9: Establishment-Level Internal Consistency Check - Average Fraction of Internally Consistent Responses

	Average Fraction of Responses that are Internally Consistent	Average Fraction of Responses that are Possibly Consistent	Average Fraction of Responses that are Internally Consistent or Possibly Consistent
All Establishments	81.65	16.77	98.42
Establishment Size			
1-9	59.41	39.16	98.57
10-24	88.41	9.47	97.88
25-49	94.01	3.97	97.99
50-99	94.86	3.68	98.54
100-249	96.27	2.66	98.93
250-499	94.81	4.35	99.16
500-999	92.77	5.53	98.30
1000+	95.98	3.53	99.50
Supersector			
AFF and Mining	78.42	19.41	97.84
Utilities	67.30	31.43	98.72
Construction	78.25	20.45	98.71
Manufacturing	87.07	11.34	98.41
Wholesale Trade	74.76	23.74	98.51
Retail Trade	91.81	6.87	98.68
Transportation	78.21	20.16	98.37
Information	65.60	34.00	99.60
Finance	80.04	19.26	99.30
Real Estate	64.81	33.72	98.53
Professional/Technical	63.20	35.23	98.43
Management	89.54	9.40	98.94
Support	72.79	25.52	98.30
Health	82.62	15.97	98.59
Leisure	85.08	12.56	97.64
Hospitality	85.03	11.98	97.01
Other Services	68.06	30.16	98.22
Pre-AE Respondent			
Yes	81.41	16.88	98.28
No	82.09	17.12	99.21
Mode of Collection			
State	54.26	44.46	98.72
EDI	86.40	12.27	98.68
TDE	86.59	10.43	97.01
CATI	51.77	47.40	99.17
FAX	89.80	9.70	99.51
Web	88.78	9.32	98.11
Mail	91.51	6.92	98.43
Other	77.41	21.82	99.23

* AE > PW, AE PR > PW PR, AE Hrs > PW Hrs

** AE > PW, AE PR > PW PR, AE Hrs > PW Hrs or AE > PW, AE PR > PW PR, AE Hrs = PW Hrs

Table 10: Linear Probability Model - Determinants of Consistent Responses

	Individual Responses		Establishment Level (fraction of responses)	
	Internally Consistent	Consistent or Possibly Consistent	Fraction Internally Consistent	Fraction Consistent or Possibly Consistent
Not Pre-AE Respondent	0.0131 (.0048)	-0.0029 (.0010)	-.0104 (.0032)	.0055 (.0009)
Number of Months Since First Report (within sample)	.0005 (.0002)	(.0003) (.0001)		
No. of Mth. Since 1st Report x Not Pre-AE Respondent	-0.0026 (.0003)	0.0001 (.0001)		
Calendar Month	.0000 (.0002)	.0006 (.0001)		
Establishment Size (Reference = 25-49)				
1-9	-0.0031 (.0450)	-0.0011 (.0015)	-.4062 (.0030)	-.0016 (.0011)
10-24	-0.0027 (.0192)	-0.0013 (.0080)	-0.0567 (.0028)	-.0020 (.0012)
50-99	-0.0025 (.0209)	-0.0012 .0116	.0185 (.0028)	.0003 (.0014)
100-249	-0.0026 (.0010)	-0.0012 .0129	-.0064 (.0028)	.0045 (.0014)
250-499	-0.0039 (.0106)	-0.0015 (.0098)	-.0033 (.0045)	.0064 .0045
500-999	-0.0057 (.0231)	-0.0022 (.0172)	.0069 (.0061)	-.0014 (.0029)
1000+	-0.0054 (.0000)	-0.0016 (.0000)	-.0008 (.0067)	.0064 (.0020)

Table 10: Linear Probability Model - Determinants of Consistent Responses
(continued)

	Individual Responses		Establishment Level (fraction of responses)	
	Internally Consistent	Consistent or Possibly Consistent	Fraction Internally Consistent	Fraction Consistent or Possibly Consistent
Supersector (Reference = Wholesale Trade)				
AFF and Mining	-0.1852 (.0130)	0.0002 (.0041)	-.1894 (.0124)	-.0040 (.0049)
Utilities	-0.2858 (.0176)	0.0053 (.0036)	-.2485 (.0151)	.0111 (.0033)
Construction	-0.1492 (.0047)	0.0069 (.0014)	-.1337 (.0043)	.0078 (.0015)
Manufacturing	-0.1462 (.0045)	0.0011 (.0014)	-.1143 (.0041)	.0022 (.0016)
Retail Trade	-0.1327 (.0060)	0.0033 (.0016)	-.1102 (.0053)	.0056 (.0017)
Transportation	-0.1764 (.0081)	-0.0013 (.0024)	-.1498 (.0071)	.0040 (.0023)
Information	-0.2988 (.0077)	0.0128 (.0009)	-.1958 (.0063)	.0148 (.0013)
Finance	-0.0847 (.0057)	0.0098 (.0010)	-.0563 (.0054)	.0126 (.0013)
Real Estate	-0.1725 (.0094)	0.0054 (.0018)	-.1274 (.0083)	.0047 (.0025)
Professional/Technical	-0.2562 (.0055)	0.0025 (.0017)	-.1856 (.0047)	.0075 (.0015)
Management	-0.0684 (.0090)	0.0045 (.0025)	-.0489 (.0095)	.0056 (.0031)
Support	-0.2315 (.0067)	-0.0008 (.0018)	-.2226 (.0058)	.0026 (.0018)
Health	-0.1421 (.0045)	0.0026 (.0013)	-.1158 (.0042)	.0073 (.0014)
Leisure	-0.1150 (.0074)	-0.0045 (.0032)	-.0981 (.0071)	.0008 (.0028)
Hospitality	-0.1651 (.0035)	-0.0133 (.0015)	-.1579 (.0036)	-.0110 (.0015)
Other Services	-0.1735 (.0070)	-0.0009 (.0019)	-.1319 (.0059)	.0024 (.0019)

**Table 10: Linear Probability Model - Determinants of Consistent Responses
(continued)**

	Individual Responses		Establishment Level	
	Internally Consistent	Consistent or Possibly Consistent	Fraction Internally Consistent	Fraction Consistent or Possibly Consistent
Mode of Collection (Reference = TDE)				
State	-0.2782 (.0150)	0.0078 (.0039)	-.2823 (.0107)	.0012 (.0044)
EDI	0.0271 (.0040)	0.0173 (.0016)	.0736 (.0037)	.0300 (.0014)
CATI	-0.2008 (.0046)	0.0239 (.0013)	-.1634 (.0043)	.0276 (.0014)
FAX	0.0023 (.0034)	0.0279 (.0013)	.0216 (.0033)	.0314 (.0013)
Web	0.0231 (.0034)	0.0131 (.0014)	.0088 (.0041)	.0101 (.0019)
Mail	0.0134 (.0091)	0.0128 (.0035)	-.0141 (.0117)	.0024 (.0063)
Other	-0.0730 (.0035)	0.0224 (.0012)	-.0337 (.0036)	.0268 (.0014)
Total Number of Months Respondent Reported Data	-0.0002 (.0001)	0.0001 (.0000)	-.0004 (.0001)	.0000 (.0000)
R-Squared	0.2761	0.0100	0.2805	0.0139
Observations	1,676,646		123,695	

III. Distribution of Responses for Production and Non-production Workers

This section describes the distribution of average earnings, wages and hours across establishments for all workers and for non-production or supervisory workers (hereafter just ~~non-production~~) relative to production/non-supervisory workers (hereafter ~~production~~). Statistics for non-production workers for a given establishment are estimated by subtracting production worker totals from all worker totals. Observations where the implied total for non-production workers is negative indicate inconsistent replies and are omitted.

In general the data look plausible. The most serious concern is that the implied distribution of wage growth across establishments for non-production workers shows more extreme values than for production workers or all workers, possibly indicating a problem with data quality. As is explained below, we found support for the explanation that shifting classifications of workers as production or non-production are at least partially responsible, lending support to the quality of the ~~all employees~~ data.

The following are unweighted averages from the data used in the previous section. Table 11 shows selected percentiles for weekly hours and weekly and hourly earnings for production workers, non-production workers, and all workers. The sample for each measure is restricted to establishments where the measure is available for both production and non-production workers.

The values for non-production workers and all workers look plausible. Non-production workers make in the neighborhood of two to three times production workers' earnings on a weekly basis, slightly less than that on an hourly basis. Non-production workers work slightly longer hours than production workers.

The values for all workers are between the production and non-production worker values with the exception of weekly hours at the 5th, 75th, and 95th percentiles, where the values for all

workers are greater than both production workers and non-production workers for the 5th percentile but less for the 75th and 95th percentile.

We now examine growth rates for establishments where adjoining months have valid observations. The charts show kernel densities for the distribution of percentage changes, omitting extreme values above 50 percent in magnitude. Selected percentiles are shown in Table 12.

The distribution of non-production workers' weekly pay growth is more concentrated than that for production workers in the center of the distribution but more spread out in the tails, as the 5th and 95th percentiles are greater in magnitude for non-production workers. The distribution for all workers is between that for production and non-production workers except in the tails of the distribution (the 10th percentile and below, the 90th percentile and above). The pattern for weekly hours growth is similar, although non-production workers' growth is somewhat more concentrated relative to production workers' growth.

The middle half of the distribution of hourly pay growth is approximately the same for production and non-production workers, but beyond the 25th and 75th percentiles non-production workers changes are relatively more spread out, with values about twice the magnitude of those for production workers at the 10th and 90th percentiles. The distribution for all workers is strikingly similar to the distribution for production workers. (When establishments with no reports for production workers or invalid reports for non-production workers are included, the distribution for all workers is between that for production and non-production workers.)

About 21 percent of observations of hourly pay growth for non-production workers are less than the 5th percentile or greater than the 95th percentile of the distribution for production workers. The large magnitude at the tails of the hourly pay growth distribution for non-

production workers raises the question of possible response error. To further investigate this, we examined how observations with extreme values of hourly pay growth for non-production workers, defined as less than the 5th percentile or greater than the 95th percentile of the distribution for production workers, were distributed across reporting units. Table 13 shows how outliers and non-outlier observations are distributed across reporting units by number of times the reporting unit observation is an outlier. As shown, 76 percent of outlier observations come from units with 4 or more reported outliers in our sample (out of a possible 30). Thus outliers are concentrated in particular establishments.

Outliers in wage growth for non-production workers appear to be associated with greater than average wage levels. Table 14 shows the distribution of mean wages for non-production workers across establishments with low non-production worker wage growth (below the 5th percentile for production workers), high non-production worker wage growth (above the 95th percentile for production workers), and overall. As can be seen, wage levels are higher for those with high wage growth. Levels are similar between those with low wage growth and establishments as a whole. This suggests that wage growth outliers for non-production workers might be associated with incorrect high wage levels, which are then corrected (note that the 5th percentile of production workers growth is -10.7 percent).

One possibility for the greater variation in non-production worker's wages is that the classification of workers into production or non-production varies from month to month, so that the group over which pay and hours are being averaged changes composition without a corresponding change in payroll. This would be expected to affect both production and non-production workers, but have a greater effect on non-production workers as they are the smaller group. To test this, we ran a probit regression of outlier status of the absolute value of changes

in the proportion of production workers and the absolute value of percentage change in employment (as changes in the proportion of production workers would be expected to the extent that total employment is changing). At the sample mean, the effect of a unit change in the absolute value of percentage of production workers was 1.44 (standard error .02), while the effect of a unit change in the absolute value of percent employment change was -.11 (.01). The results support the idea that changes in the classification of workers may contribute to large observed changes in wages for non-production workers, as there is a large effect of changes in the proportion of production workers (standard errors are corrected for clustering at the reporting unit level). This is reassuring with regard to “all employee” statistics, as the classification between production and non-production does not affect these.

Table 15 shows wage-growth outlier status by establishment characteristics. Respondents who were in the sample prior to the introduction of AE elements had fewer outliers than those who joined the sample after the all-employee elements were introduced. Defining size classes as class of the average size of the establishment between the two months of the pay growth comparison, it appears that very small and very large establishments report with fewer outliers. The low rate for small establishments points against an explanation that we are simply observing the effect of a small number of employees, where a wage change for a single employee may have large effects on the establishment mean. There is also some variation by industry, with trade, transportation, and utilities and information supersectors having the lowest percentages. Outliers appear to decrease with time, possibly indicating more accurate reporting.

Table 16 shows the results for a regression of outlier status on the same covariates as shown in Table 4. The results are very similar to Table 15 with the exception that once again, as in previous sections, the sign of the effect of sample entry is reversed.

Table 11**Selected Percentiles of Establishment Distribution for Production Workers, Non-Production Workers, and All Workers for Selected Statistics.**

Hourly pay

	Production workers	Non-prod workers	All Workers
5 th percentile	6.94	11.23	8.30
25 th percentile	8.77	16.66	10.38
50 th percentile	12.36	24.23	14.68
75 th percentile	18.43	35.37	21.93
95 th percentile	32.39	69.13	38.57
N	1,622,453	1,622,453	1,622,453

Weekly pay

	Production workers	Non-prod workers	All Workers
5 th percentile	151	394	202
25 th percentile	246	681	315
50 th percentile	409	945	498
75 th percentile	694	1,362	821
95 th percentile	1,281	2,573	1,495
N	1,652,098	1,652,098	1,652,098

Weekly hours

	Production workers	Non-prod workers	All Workers
5 th percentile	18.0	19.5	20.1
25 th percentile	26.8	37.9	28.7
50 th percentile	33.8	40.0	34.6
75 th percentile	39.5	43.0	39.4
95 th percentile	46.1	48.0	45.1
N	1,662,555	1,662,555	1,662,555

Chart 1a
Density of Hourly Pay Change
Production, Non-production, and All Workers

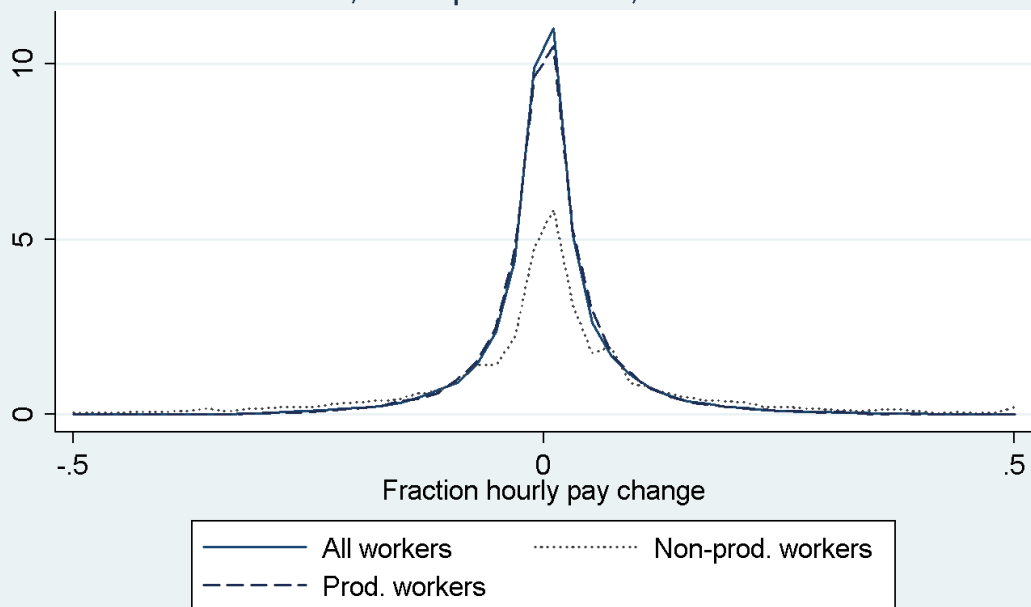


Chart 1b
Density of Weekly Hours Change
Production, Non-production, and All Workers

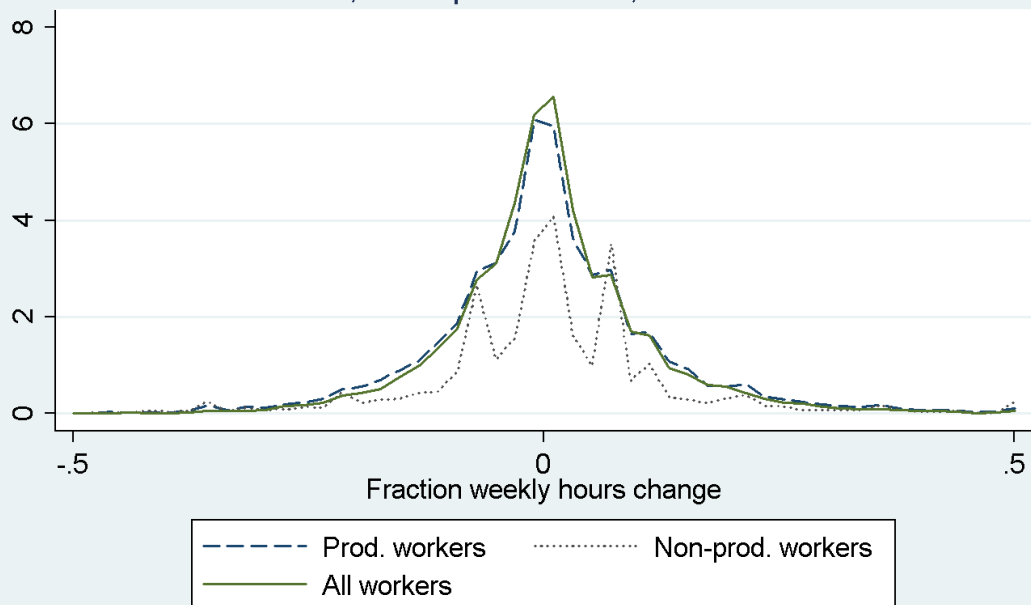


Chart 1c
Density of Weekly Pay Change
Production, Non-production, and All Workers

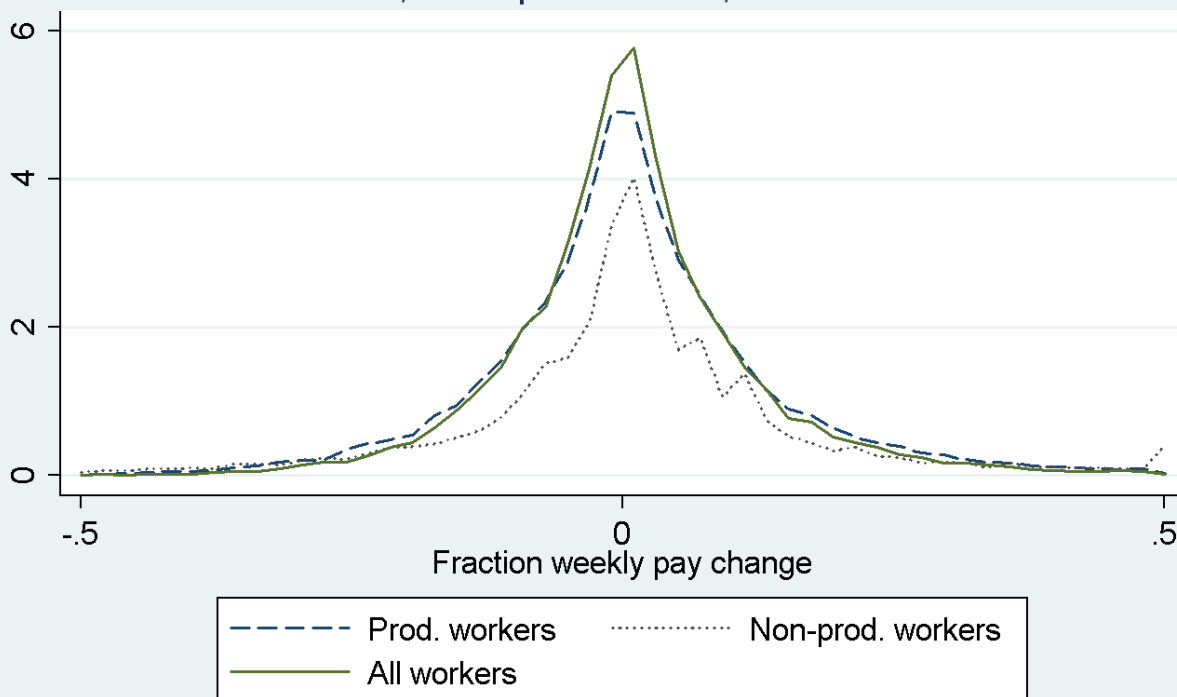


Table 12
Selected Percentiles of Establishment Distribution for Production Workers, Non-Production Workers, and All Workers for Selected Statistics on Month-to-Month Growth.

Hourly Pay Growth

	Production workers	Non-prod workers	All workers
5 th percentile	-10.7%	-23.0%	-10.5%
10 th percentile	-6.3%	-11.6%	-6.4%
15 th percentile	-4.1%	-6.6%	-4.4%
20 th percentile	-2.8%	-3.4%	-3.1%
25 th percentile	-1.9%	-1.6%	-2.2%
50 th percentile	0.1%	0.0%	0.1%
75 th percentile	2.6%	2.5%	2.7%
80 th percentile	3.6%	4.3%	3.7%
85 th percentile	5.0%	7.6%	5.1%
90 th percentile	7.4%	13.5%	7.5%
95 th percentile	12.6%	29.8%	12.2%
N	1,417,700	1,417,700	1,417,700

Weekly Pay Growth

	Production workers	Non-prod workers	All workers
5 th percentile	-20.6%	-22.8%	-17.2%
10 th percentile	-14.1%	-12.3%	-11.9%
15 th percentile	-10.4%	-8.4%	-8.9%
20 th percentile	-7.9%	-4.8%	-6.7%
25 th percentile	-5.9%	-2.3%	-4.9%
50 th percentile	0.0%	0.0%	0.1%
75 th percentile	6.7%	3.2%	5.6%
80 th percentile	9.0%	5.6%	7.6%
85 th percentile	12.0%	9.6%	10.2%
90 th percentile	16.8%	14.3%	13.8%
95 th percentile	26.4%	29.4%	21.0%
N	1,420,093	1,420,093	1,420,093

Table 12 Selected Percentiles of Establishment Distribution for Production Workers, Non-Production Workers, and All Workers for Selected Statistics on Month-to-Month Growth (continued)

Weekly Hours Growth

	Production workers	Non-prod workers	All workers
5 th percentile	-19.0%	-20.0%	-15.9%
10 th percentile	-12.9%	-10.0%	-11.0%
15 th percentile	-9.7%	-6.1%	-8.3%
20 th percentile	-7.2%	-2.8%	-6.2%
25 th percentile	-5.3%	-1.0%	-4.5%
50 th percentile	0.0%	0.0%	0.0%
75 th percentile	5.5%	1.0%	4.7%
80 th percentile	7.7%	2.8%	6.5%
85 th percentile	10.6%	6.4%	8.9%
90 th percentile	14.6%	11.1%	12.2%
95 th percentile	23.1%	25.0%	18.7%
N	1,426,827	1,426,827	1,426,827

Table 13**Distribution of Outlier Observations among Reporting Units**

	Reporting unit # obs. (out of 30) with outlier non-prod worker pay growth				
	0	1	2	3	4+
% of non-outlier observations	27.5	12.3	15.0	9.3	35.9
% of outlier observations	0.0	4.8	9.6	9.2	76.4
% of all observations	21.7	10.7	13.8	9.3	44.5

Outlier defined as <5th or >95th percentile of production worker distribution.

Table 14

Distribution of Non-production Worker Wages across Establishments by Month-to-Month Non-Production Worker Wage Growth

Level percentile	Non-production worker wages, period t (Wage growth = $Wage_t/Wage_{t-1}$)		
	Wage growth <5th percentile of production workers	Wage growth >95th percentile of production workers	All
10	11.38	15.72	12.90
20	14.51	20.00	15.48
30	17.40	23.95	18.16
40	20.20	27.66	21.12
50	22.88	31.83	24.28
60	26.16	36.91	28.03
70	30.70	43.99	32.53
80	37.66	55.81	38.82
90	52.07	80.22	52.53
N	151,315	148,861	1,417,706

Table 15
Non-production worker wage growth outlier status by establishment characteristic

	% outliers	N
Pre-AE Respondent		
Yes	20.8%	1,251,183
No	23.8%	166,523
Year		
2006	23.4%	409,200
2007	21.4%	486,221
2008	19.2%	522,285
Size Class		
0-9.5	12.4%	345,746
10-19.5	26.0%	215,659
20-49.5	24.4%	325,913
50-99.5	23.9%	182,302
100-249.5	24.9%	217,130
250-499.5	20.0%	65,474
500-999.5	19.1%	32,571
1000+	14.8%	32,911
Industry		
Natural Resources and Mining	25.9%	9,225
Utilities	11.9%	8,148
Construction	27.3%	106,620
Manufacturing	25.2%	127,299
Wholesale	19.9%	58,463
Retail	17.2%	441,204
Transportation	21.0%	26,804
Information	18.5%	38,064
Finance	19.7%	54,872
Real Estate	19.3%	21,065
Professional and Technical	20.8%	83,949
Management	16.4%	16,782
Support	27.7%	52,538
Health	21.0%	121,480
Leisure	25.4%	25,262
Hospitality	24.2%	183,736
Other Services	22.5%	42,195

Table 15
Non-production worker wage growth outlier status by establishment characteristic
(continued)

	% outliers	N
Mode of Collection		
State	16.7%	5,822
EDI	15.6%	395,850
TDE	24.4%	242,796
CATI	25.9%	67,414
FAX	19.4%	171,868
Web	24.1%	144,160
Mail	23.2%	6,815
Other	25.6%	148,139

**Table 16: Linear Probability Model
Determinants of Non-production Wage Growth Outliers**

Not Pre-AE Respondent	-0.0272 (.0045)
Number of Months Since First Report (within sample)	-0.002 (.0002)
No. of Mth. Since 1st Report x Not Pre-AE	-0.0007 (.0003)
Calendar Month	0.0004 (.0002)
Establishment Size (Reference = 25-49)	
1-9	-0.1017 (.0023)
10-24	0.0143 (.0025)
50-99	-0.0116 (.0026)
100-249	0.0196 (.0028)
250-499	-0.0415 (.0037)
500-999	-0.0483 (.0054)
1000+	-0.0769 (.0049)

**Table 16: Linear Probability Model
Determinants of Non-production Wage Growth Outliers
(continued)**

Supersector (Reference = Wholesale Trade)	
AFF and Mining	0.0133 (.0099)
Utilities	-0.0791 (.0079)
Construction	0.0253 (.0037)
Manufacturing	0.0081 (.0034)
Retail Trade	-0.0224 (.0037)
Transportation	-0.0215 (.0057)
Information	-0.0254 (.0051)
Finance	-0.009 (.0041)
Real Estate	-0.0063 (.0058)
Professional/Technical	-0.0245 (.0035)
Management	-0.0308 (.0068)
Support	0.0378 (.0048)
Health	-0.0219 (.0033)
Leisure	0.0067 (.0065)
Hospitality	0.0167 (.0030)
Other Services	-0.0093 (.0048)

**Table 16: Linear Probability Model
Determinants of Non-production Wage Growth Outliers
(continued)**

Mode of Collection (Reference = TDE)	
State	-0.0785 (.0108)
EDI	-0.049 (.0028)
CATI	0.0196 (.0035)
FAX	-0.0521 (.0026)
Web	-0.0065 (.0027)
Mail	-0.0135 (.0101)
Other	-0.0028 (.0027)
Total Number of Months Respondent Reported Data	-0.002 (.0001)
R-Squared	0.0305
Observations	1,177,474

IV. Comparison with QCEW.

This section uses tables published by the QCEW and CES programs to compare weekly earnings for all employees. (We do not use the microdata used in earlier sections.) The top panel of Table 17 averages reported CES monthly average weekly earnings into annual averages (quarters 2-4 for 2006) from 2006 quarter 2 to 2009 quarter 4; the bottom panel shows reported annual average weekly earnings from the QCEW program. To summarize the seasonal pattern, quarters 2 and 3 are shown in a separate column. As shown in the table, there is a pronounced seasonal pattern apparent in the QCEW data, with earnings significantly higher for all quarters than for quarters 2 and 3. Little or no seasonal pattern is apparent in the CES (this is confirmed if all quarters are shown separately). The contrast in the seasonal pattern may be due to seasonal bonuses, which are part of the earnings concept in the QCEW but not in the CES. (Differences in the seasonal pattern of employment between QCEW and CES may be another factor.)

Overall, CES earnings are significantly lower than QCEW earnings. In quarters 1 and 4 (not shown), the discrepancy for private industry as a whole is close to 20 percent, while in quarters 2 and 3 it is approximately 10 percent. The ratio of CES to QCEW earnings varies substantially by industry. QCEW earnings in construction and retail trade are fairly close to CES earnings. In finance, information, and wholesale trade CES earnings are substantially below QCEW earnings, in the neighborhood of 20 percent even for quarters 2 and 3. For other services CES earnings are above QCEW earnings.

Table 18 shows year-over-year changes in average weekly earnings from the two surveys. On average, the changes are reasonably close between the two surveys over the period studied, with the CES minus QCEW difference in year-over-year percentage change averaging 0.6 percentage points overall and 0.1 percentage points over quarters 2 and 3 for all private

industries. However, there is substantial variation, both over time and between supersectors. The average absolute difference is 1.4 percentage points overall and 0.8 percentage points for quarters 2 and 3. Financial activities show growth rates about 2.5 percentage points greater in the QCEW for all quarters; utilities and wholesale trade average earnings growth around 1 percentage points greater in CES than in QCEW for quarters 2 and 3; .

The earnings concept differs between CES and QCEW, so we would not expect an exact correspondence. The CES concept “excludes bonuses, commissions, and other lump-sum payments (unless earned and paid regularly each pay period or month), or other pay not earned in the pay period (such as retroactive pay). Tips and the value of free rent, fuel, meals, or other payments in kind are not included”,⁷ whereas these elements are included in the QCEW. In addition, the reference period for the CES is the pay period including the 12th of each month, in contrast to the QCEW which covers all pay during the quarter.

These differences in concept appear to us unlikely to completely account for the magnitude of the difference between the surveys. Bonuses are most likely to affect quarters 1 and 4, not accounting for the still-substantial differences in quarters 2 and 3. Tips would most likely affect leisure and hospitality, which is not one of the sectors with the largest differences. We believe this merits further investigation.

⁷ BLS Handbook of Methods.

Table 17
Average Weekly Earnings by Quarter, CES and QCEW

Industry	Period								
	2006			2007		2008		2009	
	Q 2-4	Q 2-3	All	Q 2-3	All	Q 2-3	All	Q 2-3	
CES									
Total private	703	699	725	728	745	744	753	748	
Construction	850	843	875	881	905	911	923	926	
Manufacturing	839	832	861	863	882	881	898	892	
Wholesale trade	882	875	913	918	936	934	964	956	
Retail trade	481	483	480	485	478	483	481	484	
Transportation and warehousing	740	740	758	760	781	785	780	780	
Utilities	1,215	1,210	1,264	1,271	1,352	1,348	1,348	1,336	
Information	991	990	1,014	1,019	1,048	1,046	1,073	1,067	
Financial activities	909	903	937	942	955	953	969	959	
Professional and business services	836	828	875	878	909	904	947	940	
Education and health services	684	682	716	718	745	744	739	732	
Leisure and hospitality	310	308	323	325	330	331	331	330	
Other services	571	570	579	579	597	598	618	616	
QCEW									
	Q 2-4	Q 2-3	All	Q 2-3	All	Q 2-3	All	Q 2-3	
Total private	805	775	853	810	873	830	868	825	
Construction	866	825	900	870	944	912	935	920	
Manufacturing	978	949	1,029	991	1,046	1,008	1,058	1,006	
Wholesale trade	1,111	1,060	1,168	1,113	1,190	1,134	1,187	1,122	
Retail trade	493	487	502	497	503	501	502	496	
Transportation and warehousing	791	778	819	820	827	811	821	808	
Utilities	1,420	1,402	1,583	1,462	1,620	1,498	1,683	1,501	
Information	1,233	1,204	1,330	1,264	1,362	1,309	1,386	1,296	
Financial activities	1,207	1,137	1,424	1,202	1,426	1,208	1,456	1,183	
Professional and business services	993	942	1,060	999	1,106	1,045	1,119	1,060	
Education and health services	765	742	779	768	807	795	813	812	
Leisure and hospitality	344	332	356	345	365	355	362	353	
Other services	521	509	538	529	554	544	551	543	

Table 18
Year-over-Year Percent Changes in Average Weekly Earnings by Quarter, CES and QCEW

Industry	Quarter	CES Weekly Earnings										Average	Average	
		2007-2	2007-3	2007-4	2008-1	2008-2	2008-3	2008-4	2009-1	2009-2	2009-3	2009-4	CES-QCEW all Q	CES - QCEW Q2-3
Total private		3.9%	4.3%	3.3%	3.8%	2.7%	1.7%	2.7%	2.5%	0.1%	0.9%	0.9%	0.6%	0.1%
Construction		4.7%	4.3%	3.8%	4.8%	3.3%	3.5%	2.5%	2.9%	2.2%	1.2%	1.5%	-0.4%	-0.5%
Manufacturing		3.8%	3.5%	2.5%	3.2%	2.5%	1.7%	2.5%	1.8%	0.5%	2.0%	3.0%	0.4%	0.4%
Wholesale trade		5.0%	4.7%	3.3%	4.5%	2.2%	1.3%	2.3%	3.7%	1.7%	3.0%	3.3%	1.4%	1.0%
Retail trade		0.0%	0.7%	0.0%	0.6%	0.1%	-1.0%	-1.3%	0.5%	-0.7%	1.4%	1.7%	-0.5%	-0.6%
Transportation and warehousing		2.2%	3.4%	4.0%	3.8%	4.0%	2.5%	1.6%	1.0%	-0.9%	-0.3%	0.1%	0.5%	0.5%
Utilities		4.7%	5.5%	5.3%	10.2%	6.8%	5.4%	5.7%	1.6%	-0.8%	-0.9%	-1.1%	1.3%	1.1%
Information		2.5%	3.2%	2.7%	4.1%	3.2%	2.2%	3.6%	2.5%	0.7%	3.3%	3.3%	0.4%	0.0%
Financial activities		3.9%	4.7%	2.8%	4.0%	2.6%	-0.4%	1.6%	2.1%	-0.8%	2.2%	2.2%	2.5%	0.7%
Professional and business services		5.8%	6.2%	3.9%	4.3%	3.4%	2.4%	5.7%	6.6%	3.6%	4.4%	1.9%	0.7%	0.3%
Education and health services		5.2%	5.5%	5.9%	5.8%	3.8%	3.3%	3.5%	1.7%	-1.6%	-1.5%	-1.7%	-0.5%	-0.6%
Leisure and hospitality		5.7%	5.7%	4.3%	4.3%	2.8%	0.8%	0.7%	0.6%	-1.5%	0.7%	1.7%	0.4%	0.3%
Other services		0.8%	2.4%	2.0%	2.9%	3.8%	2.6%	3.4%	4.0%	2.7%	3.5%	3.7%	0.8%	0.4%
Industry	Quarter	QCEW Weekly Earnings										Average	Average	
		2007-2	2007-3	2007-4	2008-1	2008-2	2008-3	2008-4	2009-1	2009-2	2009-3	2009-4	CES-QCEW all Q	CES-QCEW Q2-3
Total private		4.7%	4.5%	4.0%	2.2%	2.1%	2.8%	2.1%	-3.4%	-0.6%	-0.6%	2.4%	1.4%	0.8%
Construction		5.1%	5.8%	5.6%	4.8%	4.6%	5.1%	4.9%	0.9%	0.3%	1.3%	0.1%	1.3%	1.1%
Manufacturing		4.4%	4.3%	3.8%	1.6%	1.4%	2.0%	1.8%	-1.3%	-0.2%	-0.1%	4.9%	1.3%	0.9%
Wholesale trade		5.3%	4.7%	4.0%	2.3%	1.4%	2.4%	1.5%	-1.3%	-0.7%	-1.4%	1.5%	1.8%	1.5%
Retail trade		2.5%	1.8%	2.4%	0.6%	0.8%	0.6%	-1.0%	-2.2%	-1.8%	-0.2%	3.9%	1.5%	1.4%
Transportation and warehousing		7.9%	2.9%	2.8%	2.8%	-3.1%	1.1%	2.9%	-2.7%	-0.2%	-0.5%	1.9%	2.2%	2.6%
Utilities		7.2%	1.4%	6.3%	2.9%	0.4%	4.6%	1.3%	-2.0%	1.5%	-1.1%	5.5%	3.6%	2.7%
Information		5.4%	4.5%	5.1%	2.2%	2.3%	4.9%	0.2%	-2.0%	-0.9%	-1.2%	6.4%	2.6%	2.3%
Financial activities		5.8%	5.7%	3.6%	0.1%	0.1%	0.8%	-0.4%	-15.9%	-1.8%	-2.3%	2.3%	3.4%	2.0%
Professional and business services		5.7%	6.5%	5.8%	4.2%	4.6%	4.6%	3.8%	-0.1%	1.3%	1.4%	2.9%	1.9%	1.5%
Education and health services		3.4%	3.6%	3.7%	3.6%	3.4%	3.6%	3.7%	1.2%	2.3%	2.0%	4.5%	2.1%	1.9%
Leisure and hospitality		4.0%	4.2%	4.1%	2.6%	2.6%	2.9%	1.8%	-2.2%	-0.9%	-0.3%	2.3%	1.2%	1.2%
Other services		3.7%	4.1%	3.5%	3.2%	3.0%	2.4%	2.8%	-0.7%	0.0%	-0.2%	1.4%	1.9%	2.0%