Updated Weighting Methodology for the Quarterly Workforce Indicators[1]

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Overview

The U.S. Census Bureau's Longitudinal Employer Household Dynamics (LEHD) Quarterly Workforce Indicators (QWI) product uses weights to set beginning-of-quarter employment in each state equal to the Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW) month 1 employment. Until the R2021Q2 release, that weight consisted of both a firm-level and a state-level weight component. The firm-level component was recently discovered to be responsible for a consistent positive bias in LEHD estimates of within-quarter employment growth. As part of a larger package of improvements, LEHD is removing the firm-level weight component. The upcoming changes to the weights will both eliminate the persistent bias in LEHD estimates of employment growth and improve the time-series properties of our dynamic employment measures. The new weights are applied to the entire QWI time series beginning with the R2021Q2 release.

I. QWI Weights

Unlike traditional inverse probability weights, the QWI weights do not adjust for explicit sampling. Both the QCEW and the QWI are constructed from virtual population samples, therefore the expected weight for each firm is one. However, data processing errors, small differences in coverage, and differential firm non-reporting drive a wedge between the unweighted QWI and published QCEW employment estimates. The QWI weights are designed to adjust for these differences.

The BLS QCEW series is the benchmark measure of U.S. private sector point-in-time employment. The BLS QCEW program preceded the start of the LEHD program by at least 25 years and benefits from substantial resources and infrastructure devoted to accurately measuring employment and payroll. The LEHD QWI and QCEW estimates are both based on employer reports and cover a similar population of workers, therefore rather than produce two estimates of point-in-time employment we use weights to match published QWI employment with published QCEW employment. This enables users to interchangeably use LEHD beginning-of-quarter (QWI-B, or B) or QCEW month 1 (QCEW-M1) employment while also taking advantage of the additional employment dynamics measures in the QWI.

A. Description of Original Weighting Method (pre-R2021Q2 QWI releases)

The QWI weights are constructed from unweighted QWI employment estimates, QCEW firm level microdata, and the published QCEW estimates. The QWI employment estimates are tabulated from quarterly firm reports of employee earnings records collected to administer state unemployment insurance (UI) programs. Beginning-of-quarter employment is estimated as the count of all jobs where

[1] All results have been reviewed to ensure that no confidential information is disclosed (DRB clearance number CBDRB-FY21-174).

the worker receives earnings from an employer in both the previous and the current quarter. The reference day for beginning-of-quarter employment is the first day of the first month of the quarter.

The QCEW employment reports use a different methodology; QCEW estimates are constructed from employer reports of the number of employees working during the pay period containing the 12th day of each month. [2] The target employment for the current QWI weight is QCEW month 1 employment, the closest (calendar) QCEW employment estimate to QWI-B.

The current QWI weights are assembled using a two-stage process. First, the firm-level component (w_unit_{sjt}) is constructed as follows, where s = state, j = firm, and t = quarter.

$$w\_unit_{sjt} = QCEW\_M1_{sjt}/QWI\_B_{sjt}$$

The firm-level component uses BLS QCEW month 1 employment estimates $(QCEW\_M1_{sjt})$ to adjust for reporting differences between a firm's QCEW and UI based employment reports (QWI_B_{sjt}). Although not shown in the formula above, the firm-level component is bounded so that our weights are not excessively influenced by large discrepancies. If a UI firm does not appear in the QCEW micro-data in a specific quarter, then the weight is set equal to one.

In the second stage, a state-level weight correction factor $(\mathrm{wcf_{st}})$ is combined with the firm-level weight (w_unit_{sjt}) to calculate the final weight $\left(w_{final_{sjt}}\right)$. The weight correction factor is defined as follows

$$\mathrm{wcf_{st}} = \frac{QCEW\_M1\_PU_{st}}{\sum_j w\_unit_{sjt} * QWI\_B_{sjt}}$$

and the final weight is the product of the firm-level and the state-level components.

$$w_{final_{sjt}} = \mathrm{wcf_{st}} * w\_unit_{sjt}$$

The state-level weight correction factor $(\mathrm{wcf_{st}})$ adjusts for differences between publicly released state-level QCEW estimates $(QCEW\_M1\_PU_{st})$ and the QCEW micro data/UI firm employment as well as the impact of bounding the firm-level weights. [3] The state-level weight correction factor is calculated each quarter only for private-sector employment. Public sector employment aggregates in the QWI are not independently adjusted to match the corresponding measures on the QCEW due to inconsistent coverage of public sector firms in the UI data. The public-sector final weights are constructed using the private-sector weight correction factors.

The weights calculated for QWI-B employment are applied to all count measures, including the measure of total earnings (*EmpTotal*). For average earnings and ratio measures, the same weight is applied to both the numerator and denominator.

1. Problems with the Original Weighting Method

There are two main problems with the current QWI weighting method. First, changes in the weights over time, while necessary to match QCEW employment each quarter, results in two different QWI

[2] For further information on the QCEW see https://www.bls.gov/cew/overview.htm#coverage.

[3] These weights do not control for the impact of noise infusion; therefore, pre-R2021Q2 published QWI-B statewide estimates do not precisely match published QCEW month 1 statewide employment totals. The new weights are calculated using QWI-B employment *after* noise infusion, eliminating this source of discrepancy.

estimates of point-in-time employment. A second and previously unknown issue is that the firm-level weight component generates systematic bias in within-quarter measures of employment growth. These two issues are discussed in more detail below.

i. Multiple Estimates of Point-in-Time Employment

The problem with applying the same time-varying weight to each QWI estimate is most clearly demonstrated by looking at the relationship between beginning-of-quarter (QWI-B) and end-of-quarter (QWI-E, or E) employment over time.[4] In the unweighted data, QWI-B in the current quarter (B_t) is equal to QWI-E employment in the previous quarter (E_{t-1}), however, if the weight applied varies across quarters this fundamental employment relationship will not hold.[5] Table 1 shows a simple numerical example.

Table 1: Constant vs Time-Varying Weights

Panel A - Constant Weight

	Unweighted				QWI Weighted					
Quarter	QCEW-M1	QWI-B	QWI-E	Weight	B_t	E_t	$E_t - B_t$	$B_{t+1} - B_t$	$E_t - E_{t-1}$	$B_{t+1} - E_{t-1}$
4	1,100	1,000	1,050	1.10	1,210	1,155				
1	1,155	1,050	1,150	1.10	1,155	1,265	110	110	110	110
2	1,265	1,150	1,250	1.10	1,265	1,375				

Panel B - Time-Varying Weight

	Unweighted				QWI Weighted					
Quarter	QCEW-M1	QWI-B	QWI-E	Weight	B_t	E_t	$E_t - B_t$	$B_{t+1} - B_t$	$E_t - E_{t-1}$	$B_{t+1} - E_{t-1}$
4	1,100	1,000	1,050	1.10	1,210	1,155				
1	1,025	1,050	1,150	0.98	1,025	1,123	98	125	-32	-5
2	1,150	1,150	1,250	1.00	1,150	1,250				

Comparing the impact of the weights between panel A (constant weight) and panel B (time-varying weight) of Table 1, we see that weighted E employment in the previous quarter matches weighted B employment in the subsequent quarter (yellow and green cells) in panel A, however this relationship does not hold in panel B. Further, the weighted employment growth (orange cells) estimates in panel A, as expected, are the same across each of the four possible growth calculations. However, in panel B the estimates of employment growth vary substantially from -5 when using ($B_{t+1} - E_{t-1}$) to 125 when using ($B_{t+1} - B_t$). While this drawback of the current weighting method has always been known, the initial development of the QWI prioritized consistency with the QCEW over internal consistency. This example illustrates one of the irregularities present in our current estimates and also provides insight into the

[4] In public use QWI tabulations, beginning-of-quarter (B) and end-of-quarter (E) employment are referred to as *Emp* and *EmpEnd,* respectively.
https://lehd.ces.census.gov/data/schema/j2j_latest/lehd_public_use_schema.html#_national_qwi_and_state_level_qwi

[5] Within sub-state tables, firms or workers whose tabulation characteristics change over time (i.e. location and age) can also break this identity. However, in statewide aggregates, changes to the weights are responsible for most of the difference.

new weighting methodology. Our new weighting procedure will both minimize the variability in the weights over time and apply different weighting factors/adjustments for each QWI measure.

ii. Firm-Level Weighting Bias

Recently, Census Bureau staff identified a previously unknown problem with the QWI weights. The firm-level weight component is systematically greater than one for firms with positive within-quarter employment growth, inflating published net job flows, job creation, hires, and end-of-quarter employment. The upward bias induced by the weights can most easily be observed in the public data by comparing annual employment growth rates, or equivalently net job flow rates, across different measures of employment growth.

The QWI within-quarter employment change identity $E_{jt} - B_{jt} = A_{jt} - S_{jt}$ relates the change in firm employment between the beginning and the end of the quarter $(E_{jt} - B_{jt})$ with net job flows $(A_{jt} - S_{jt})$.[6] In the QWI, the employment change identity holds at the firm level and at higher levels of aggregation in both the unweighted and the weighted data due to all quantities receiving the same weight. Although the identity holds within a quarter, the weighted quarterly net job flow estimates are often not consistent with longer term (multiple quarter) changes in employment estimated on both the QWI and the QCEW.

Below are the definitions of three different measures of annual employment growth. The first two measures, the annual job flow rate, and the annualized quarterly job flow rate are QWI estimates of annual employment growth, while the last measure is based on the QCEW. Note, to facilitate comparisons of the rates, all measures use the same denominator.

Annual job flow rate, quarter t:

$$AJFR_t = \frac{E_{t-1} - B_{t-4}}{(B_t + B_{t-4})/2}.$$

Annualized quarterly job flow rate, quarter t:

$$AQJFR_t = \frac{\sum_{s=(t-4)}^{(t-1)} (E_s - B_s)}{(B_t + B_{t-4})/2}.$$

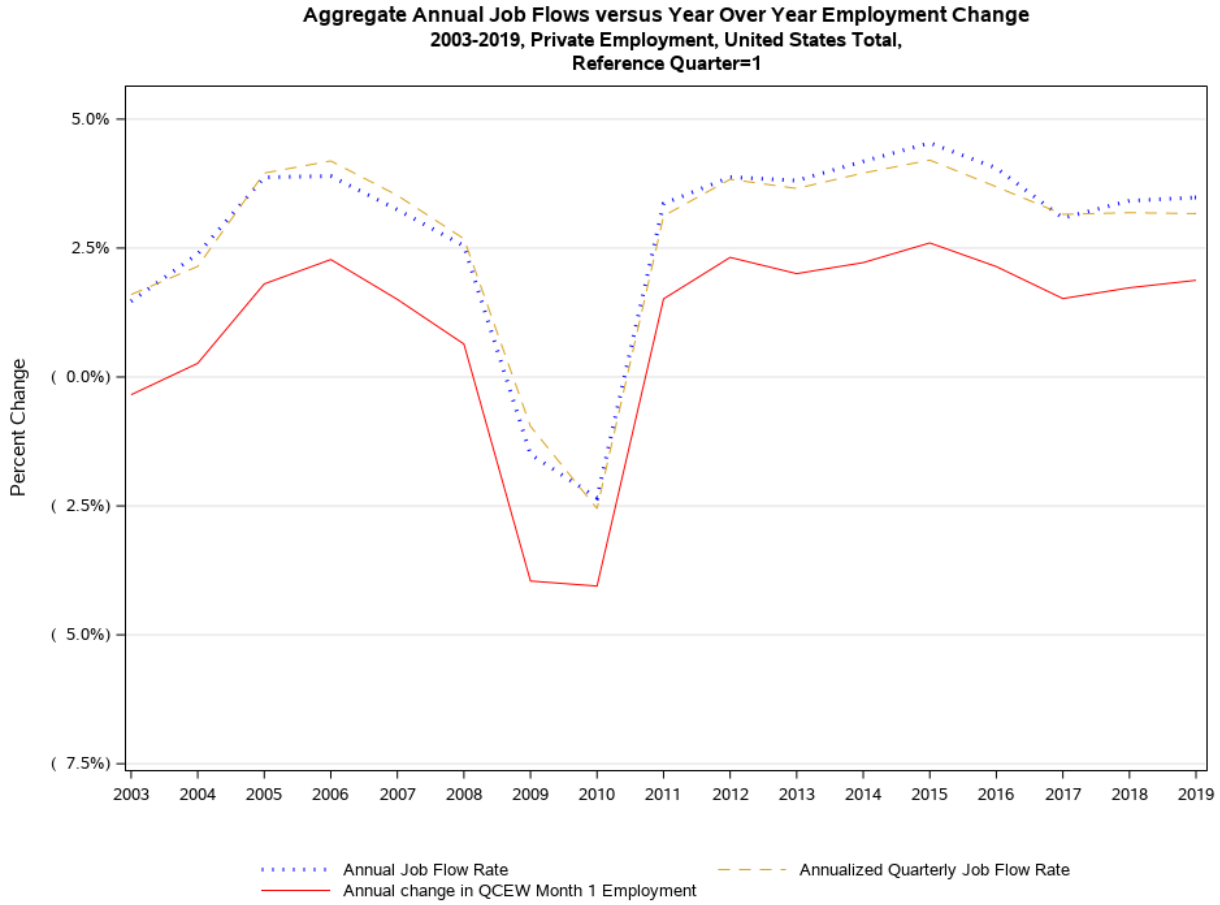
Annual change in QCEW month 1 Employment, quarter t:

$$\Delta QCEW_t = \frac{QCEW\_M1_t - QCEW\_M1_{t-4}}{(B_t + B_{t-4})/2}.$$

Absent any systematic relationship between the current weights and firm changes in employment, we would expect the two QWI measures of employment growth to be equal and relatively close to the QCEW estimate of employment growth. However, as we can see in Figure 1A, the expected result is only partially realized. Although both QWI job flow rates are similar, they are substantially higher than the comparable QCEW employment growth estimate.

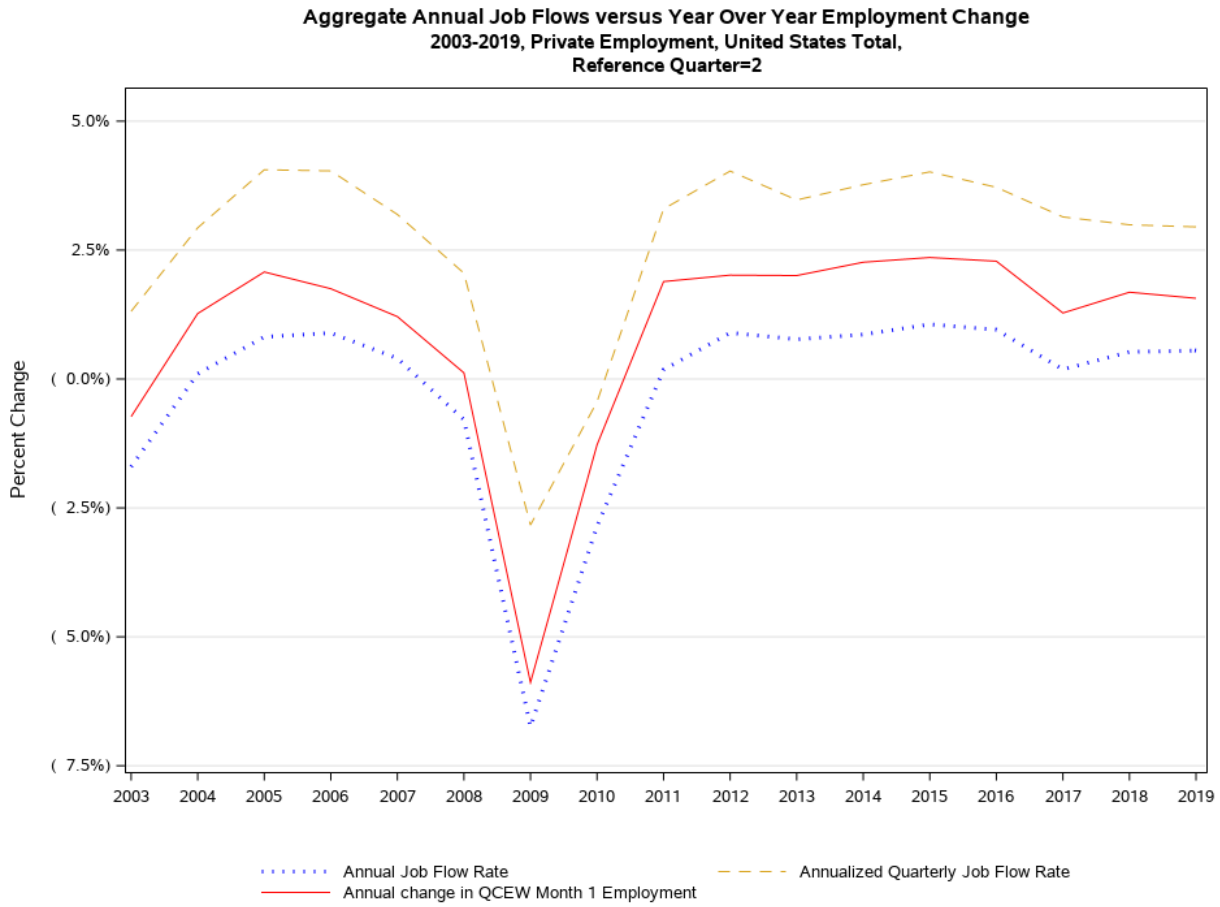
[6] Net job flows represent the minimum number of accessions (A_t) or separations (S_t) needed to realize an observed change in employment, although most firms typically have accessions and/or separations above the minimum.

Figure 1A: QWI Annual Employment Growth Rates: Annual Employment Change vs. the Annualized Sum of Quarterly Net Job Changes (previous weighting method, quarter 1)



The results in Figure 1A are computed for quarter 1 and show the growth rate from the beginning of the first quarter of the previous year to the end of the fourth quarter of the previous year. Due primarily to seasonality in the weight correction factor, the relationship between the annual job flow rate and the annualized quarterly job flow rate varies depending on the reference quarter. Figure 1B shows the same series as Figure 1A, except in Figure 1B the 2nd quarter is the reference. In Figure 1B the growth rate is calculated from the beginning of the second quarter of the previous year to the end of the first quarter of the current year, dramatically reducing the estimated annual job flow rate $(AJFR_t)$ relative to the same series in Figure 1A. In quarter one, the weight correction factor is relatively low compared with the other quarters, affecting the estimated annual job flow rates in Figure 1A and 1B in opposite ways. When the starting quarter in the growth calculation is quarter 1, the relatively low weight correction factor reduces the initial employment level relatively to quarter 4, resulting in higher estimated growth, while the opposite effect happens when quarter 1 is the ending quarter. Quarter 1 and quarter 2 are the extreme values, with the estimated annual job flow rates for quarters 3 and 4 lying between quarter 1 and 2.

Figure 1B: QWI Annual Employment Growth Rates: Annual Employment Change vs. the Annualized Sum of Quarterly Net Job Changes (previous weighting method, quarter 2)



Although the estimated annual job flow rate varies by the reference quarter, the annualized quarterly job flow rate is computed using each of the quarterly job flows and is minimally affected by the starting and ending quarter. Regardless of the reference quarter, the annualized quarterly job flow rate is about 1.5 to 2.0 percentage points higher than the rate of change in QCEW Month 1 employment.

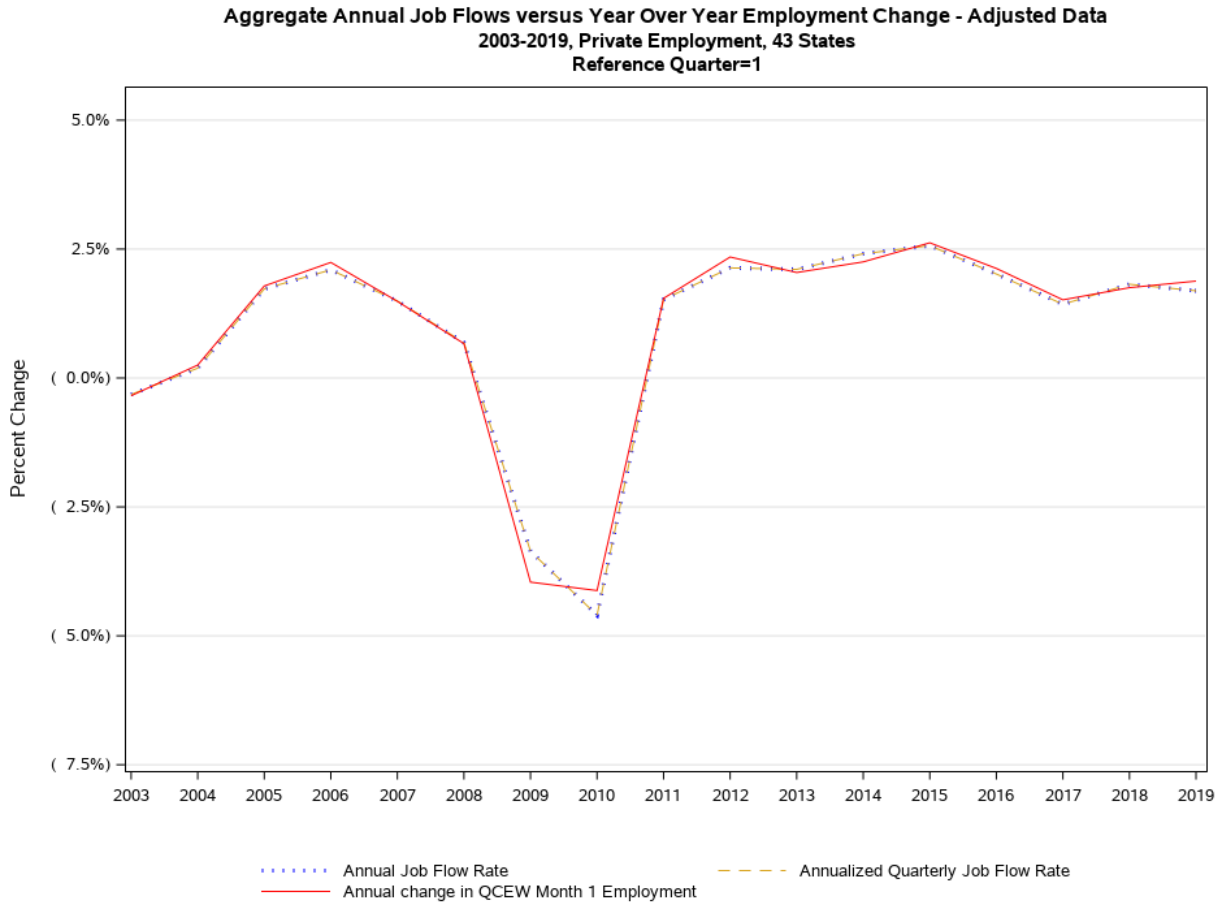
The comparison of the three employment growth measures highlights three problems with the current weights. First, the seasonality in the weight correction factor generates noticeably different annual job flow rates depending on the reference quarter used in the calculation. Second, the firm-level weight component biases upwards QWI estimates of annualized quarterly job flows relative to QCEW employment growth estimates. Third, the weights often drive a wedge between the annual job flow rate and the annualized quarterly job flow rate, two quantities which should always be equal.

The new weighting method solves the three problems with the pre-R2021Q1 weights outlined in the previous paragraph. In Figure 1C we present employment growth rate estimates calculated using the revised weighting methodology for 43 states.[7] The estimates in Figure 1C are a dramatic improvement

[7] The complete set of state estimates using the revised weighting methodology were not available at the time this memo was created, although the missing states are small and do not have a significant impact on the results. For

relative to those in Figures 1A and 1B. The two QWI job flow rate series now perfectly overlap, showing that the sum of the quarterly job flow rates equals the annual job flow rate, as expected. In addition, both QWI series are very close to the QCEW employment growth estimates.[8] The next section provides details of our revised weighting methodology.

Figure 1C: QWI Annual Employment Growth Rates: Annual Employment Change vs. the Annualized Sum of Quarterly Net Job Changes (revised weighting method, quarter 1)



B. Revised Weighting Method (release R2021Q2 and all subsequent releases)

The revised weighting method is designed to improve both the internal and the longitudinal consistency of the QWI estimates. The new weighting method is different from the previous approach in two key respects. First, the firm level weights are eliminated in the new methodology. As shown in the previous section, the firm-level weights are largely responsible for the positive bias in pre-R2021Q2 QWI estimates of employment growth. Second, the weights are now based on differences in long-term

example, the QCEW employment growth estimates in Figures 1A and 1C are almost identical in both the complete and the 43-state sample.

[8] Although quarters 2-4 are not shown here, the relationships between the series in quarters 2-4 are almost identical to the results presented in Figure 1C.

trends between the QWI and QCEW, instead of short-term quarterly fluctuations in the two point-in-time employment series. The revised weighting method preserves the unique dynamics of the QWI series, while retaining a close point-in-time employment relationship with the QCEW. The revised method also preserves QWI identities at the state level and brings them closer together in sub-state tabulations.

An outline of the new QWI weighting methodology follows. Note, all calculations are performed on QWI measures after noise infusion.

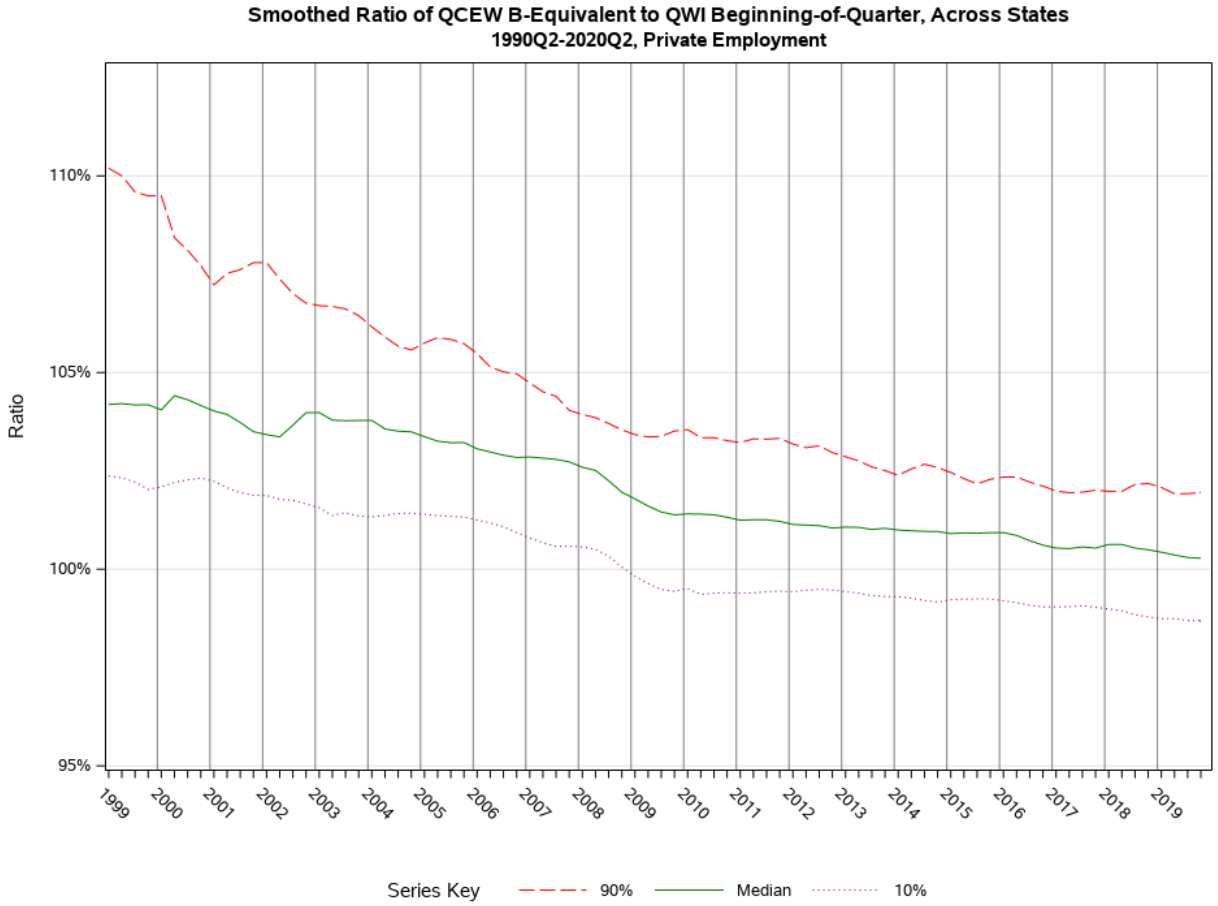
1. Generate Smoothed State-Level Employment Weights

Instead of adjusting state-level QWI-B to exactly match QCEW month 1 employment every quarter, we smooth the quarterly weights, which absent the firm-level component are a simple ratio. The steps to create the smooth state-level weights are as follows:

1.1. Calculate a QCEW-sourced estimate of beginning-of-quarter employment (QCEW-B) by interpolating between month 1 employment of the reference quarter and month 3 of the previous quarter.
1.2. Calculate the provisional weights as the ratio between QCEW-B and QWI-B employment (noise-infused) in each quarter.
1.3. Perform seasonal adjustment on the series calculated in step 1.2 using X11.
  1.3.1. Remove outliers
  1.3.2. Perform seasonal adjustment
1.4. Create the final state-level weight by further smoothing the seasonally adjusted weights from step 1.3 using a 5-quarter moving average.

Figure 2 displays the evolution of the distribution of the final state-level weights calculated using the revised methodology. Every quarter, Figure 2 shows the median, 10th percentile, and the 90th percentile smoothed weight. We can see clearly that the median weight has dropped steadily over time as UI reporting has improved, with the median in recent quarters now slightly above parity. The dispersion in the ratio of UI to QCEW employment across states has also declined as shown by the narrowing gap between the 10th and the 90th percentile.

Figure 2: Smoothed QWI State-Level Weights



2. Apply New Weights While Preserving State-Level Identities

The final weights from step 1.4 are used to set B and E employment at the state level. A series of adjustments are then made to the other QWI measures to generate a set of internally consistent state-level estimates. The new method preserves all QWI identities at the state-level. The primary steps in the adjustment are as follows.

2.1. Multiply beginning-of-quarter employment by the final weight calculated in step 1.4
2.2. Set end-of-quarter employment equal to beginning-of-quarter employment in the subsequent quarter, enforcing the longitudinal identity between quarters.
2.3. Adjust the remaining count measures by using QWI identities and ratios to produce flows consistent with the revised beginning and end-of-quarter employment targets.
2.4. Calculate the final sub-state weights as the ratio of the adjusted version of the QWI measures to the original tabulated values. These weights will be used to adjust measures in lower level QWI tabulations.

3. Adjustment to Sub-State and Public QWI Tabulations

The sub-state aggregations are adjusted using a similar method as the statewide data. The primary difference is that the cross-quarter identities are not enforced, as they do not hold in many sub-state series due to changing characteristics of firms (e.g. beginning-of-quarter

employment is not forced to equal end-of-quarter employment in the previous quarter). All measures within the quarter however will be consistent after adjustments, up to rounding and item suppression.

3.1. Apply the final sub-state weights calculated in 2.4 to the respective QWI measure on the detail table.
3.2. Adjust remaining count measures by using QWI identities and applying ratios to estimate flows consistent with the measures calculated in 3.1

Due to variabilities in the UI coverage of state and local governments, weighting the statewide QWI public-sector employment towards the QCEW levels in a similar way is inappropriate. As such, public-sector data are allowed to self weight (weight=1), although corrections are made to the tabulated counts to preserve statewide identities. Private-sector counts are aggregated with the public-sector counts to create the "All Ownership" totals. Public-sector statistics are not published separately in the QWI.[9]

II. Impact of New Weights on QWI Measures

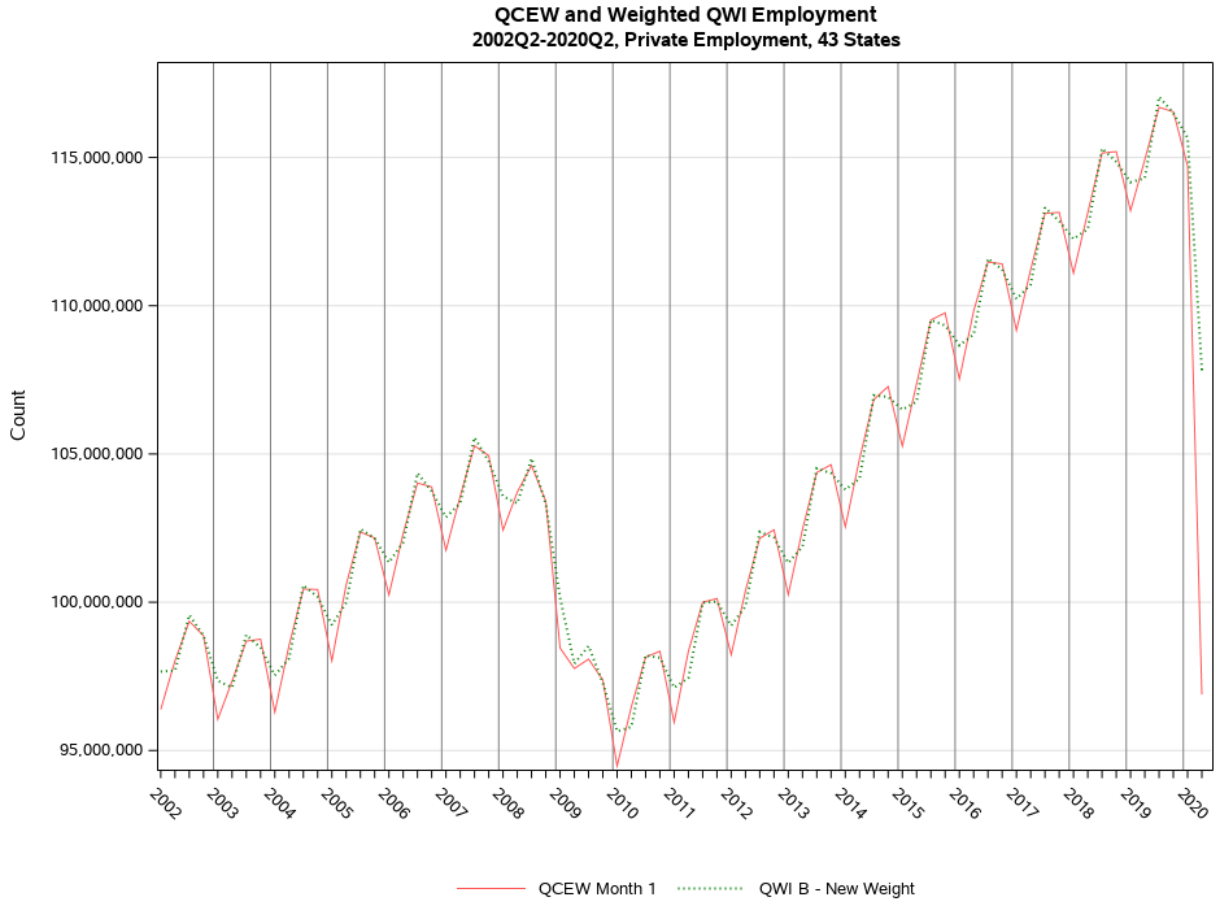
As with all QWI releases, the entire QWI time series is recalculated using the latest methodology. Users should expect to see substantial changes to QWI measures compared with earlier releases.

A. Comparison of QCEW and QWI Employment Estimates

At the statewide level, the new methodology changes the relationship of QWI-B employment to QCEW month 1 employment. While the QWI still follow QCEW private-sector employment trends, short-term fluctuations in QWI measures are largely independent. Figure 3 shows total QCEW month 1 employment and QWI-B employment for a panel of 43 states from 2002 through 2020.

[9] A technical paper describing both the state and sub-state weighting methodology in detail is forthcoming.

Figure 3: Comparison of QWI-B and QCEW Month 1 Employment (revised weighting method)



Although QWI-B employment calculated using the original weighting methodology is not displayed in Figure 3, QCEW month 1 employment is an excellent proxy (QWI-B employment differs by less than 0.1% from QCEW month 1 employment). Comparing weighted QWI-B to QCEW month 1, there is a more significant difference in quarter 1, where there is a relatively large seasonal drop in QCEW monthly employment. This feature does not manifest as strongly in the QWI series, perhaps due to the different timing and methodology used in the QCEW (e.g. many workers active in the first quarter on the QWI have left holiday employment prior to the payroll period that includes the 12th of January).

B. Changes in QWI Employment Flow Measures

Substantial changes can be observed when comparing QWI measures using the original versus the new weighting methodology. First, we discuss the elimination of the upward bias of hires, job creation, and net job flows by calculating the percent difference in QWI count measures before and after the methodology changes. The percent difference is calculated as:

$$Z_{kt}^{diff} = \frac{Z_{kt}^{new} - Z_{kt}^{old}}{(Z_{kt}^{new} + Z_{kt}^{old})/2},$$

where Z represents a QWI measure and k represents one value from a mutually exclusive combination of tabulation characteristics. Note, measures with zero change using either weighting methodology are

recorded as having no change. A consistent panel of 43 states available from 2003-2019 was used for this analysis.

1. Shifts in QWI Measures: Old Weights vs. New Weights

Aggregate counts for select QWI measures are calculated before and after the weight enhancement, with the percentage change calculated every quarter, as per the method above. The mean percentage change is presented in Table 2. The old weighting method generated downward bias in separations and job destruction, while inflating hires and job creation. The new weighting method corrects this, and those measures change accordingly. The changes induced by the new weights represent a rebalancing of the measures to more accurately reflect the change in employment levels across quarters.

Table 2: Percentage Change in State-Level Quarterly Measures, New vs. Old Weights

QWI-B, Separations, and Job Destruction		QWI-E, Hires, and Job Creation	
Measure	Mean Change	Measure	Mean Change
Beginning-of-quarter (B)	0.14%	End-of-quarter (E)	(0.28%)
Separations (S)	(0.91%)	Accessions (A)	(3.05%)
Continuing Quarter Separations (CS)	0.43%	Continuing Quarter Accessions (CA)	(2.77%)
Full Quarter Separations (FS)	0.71%	Full Quarter Accessions (FA)	(0.84%)
Job Destruction (JD)	3.18%	Job Creation (JC)	(5.34%)
Full Quarter Job Destruction (FJD)	1.64%	Full Quarter Job Creation (JC)	(1.78%)

Notes: Panel of 43 States. Private QWI Employment, 2003-2019. Negative changes are in parenthesis.

Figures 4(a) and 4(b) show the distribution of the percentage changes for selected state-level private-sector totals. Standard boxplots were constructed for the selected measures. The employment counts have the smallest interquartile range (IQR). The IQR for accessions and separations is larger and the change for job creation and destruction measures is most dispersed, reflecting the elimination of the previous bias in the growth rates. Due to the typical relatively small number of workers who change jobs each quarter, small changes in the point-in-time employment measures result in much larger percentage changes in employment dynamics measures such as job creations and destructions.

Figure 4 (a): Distribution of Changes to QWI Measures: QWI-B, Separations, and Job Destruction

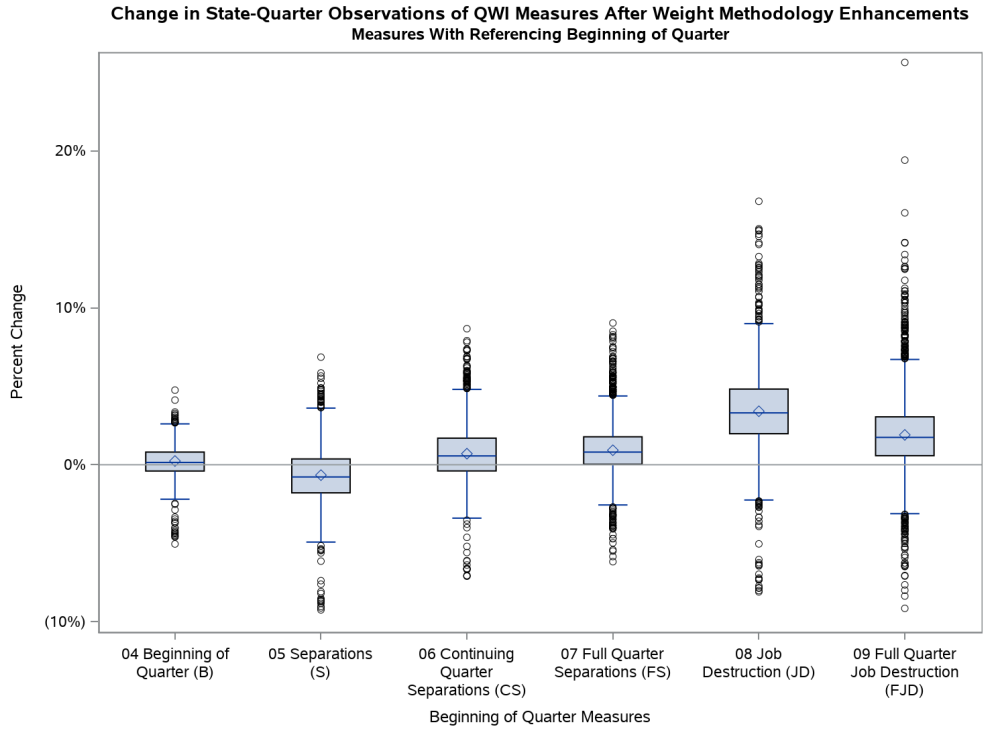
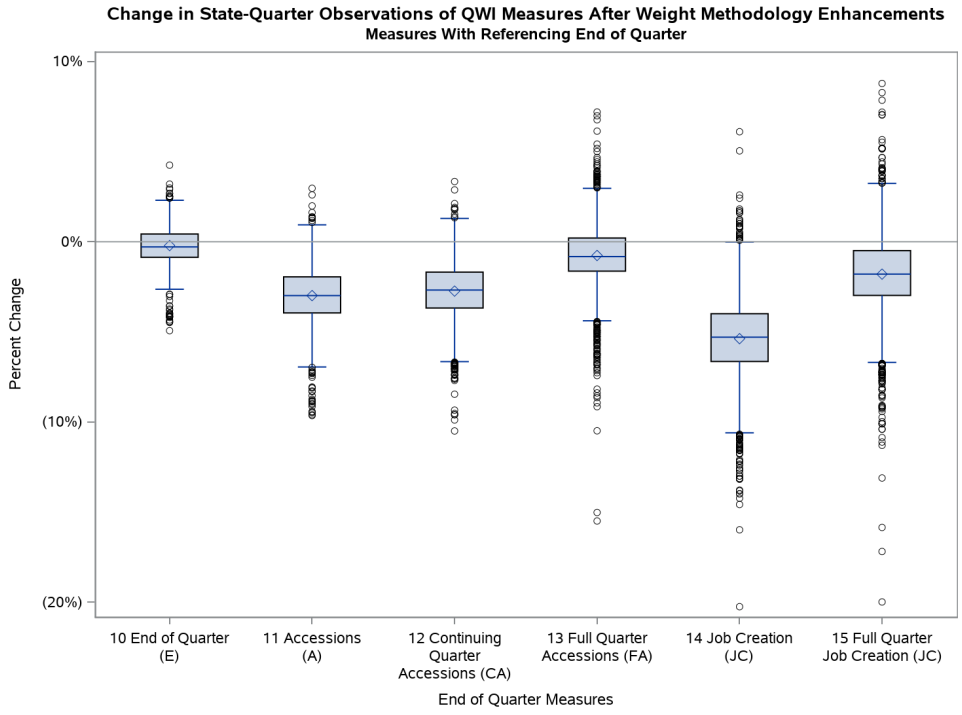


Figure 4 (b): Distribution of Changes to QWI Measures: QWI-E, Hires, and Job Creation



C. Longitudinal Consistency of QWI Series

The new weighting methodology enforces longitudinal consistency at the state level by targeting the same employment total for both end-of-quarter employment in the previous quarter and beginning-of-quarter employment in the subsequent quarter. However, when applying these same weights to lower level aggregations, beginning-of-quarter employment may not always equal end-of-quarter employment in the previous quarter. This is primarily due to person and firm characteristics associated with a job changing from one quarter to the next. For example, if the primary industry of a firm changes from wholesale to retail, the jobs associated with that firm will be counted in wholesale at the end of the quarter and in retail at the beginning of the next quarter, creating an apparent shift in the QWI employment time series for both industries without corresponding changes in hires, separations, or other job flows. The frequency of these shifts varies depending on the tabulation characteristic.

We measure the longitudinal consistency in the QWI series by taking the difference between current quarter B and previous quarter E employment. This measure is converted to a rate (*B_Shift*) by dividing by the mean of the two components. The formula is as follows:

$$B\_Shift_{kt} = \frac{B_{kt} - E_{k,t-1}}{(B_{kt} + E_{k,t-1})/2}.$$

In Table 3, we show selected percentiles of the B_Shift distribution for various levels of aggregation, with the levels of aggregation presented from high to low.

Table 3: Longitudinal Consistency of QWI-B and QWI-E Measures Improves with New Weights

	B_Shift					
Level of Aggregation	**Original Weighting**			**New Weighting**		
	P10	**P50**	**P90**	**P10**	**P50**	**P90**
State	(2.13%)	(0.61%)	1.57%	0.00%	0.00%	0.00%
NAICS Sector * State	(3.72%)	(0.44%)	2.44%	(0.37%)	0.00%	0.36%
NAICS Subsector * State	(4.57%)	(0.32%)	3.23%	(0.56%)	0.00%	0.54%
NAICS Industry Group * State	(5.50%)	(0.30%)	4.19%	(0.74%)	0.00%	0.70%
County	(3.33%)	(0.55%)	2.49%	(0.69%)	0.00%	0.69%
NAICS Sector * County	(7.55%)	(0.08%)	6.28%	(0.92%)	0.00%	0.99%
NAICS Subsector * County	(8.70%)	0.00%	7.41%	(0.65%)	0.00%	0.72%
NAICS Industry Group * County	(9.52%)	0.00%	8.45%	(0.48%)	0.00%	0.55%

The differences (in absolute value) between B and E are much lower using the revised methodology. In addition, the bias in the shift has been largely eliminated. With the previous methodology, the medians are generally negative at most levels of aggregation, however when using the new method, the medians are all zeros. The relative prevalence of negative values of B_Shift when using the original weight is evidence of the systematic positive bias in within quarter employment growth: weighted E employment in the current quarter was typically higher than weighted B employment in the subsequent quarter.

The absolute values of B_Shift in the tails of the distribution are much larger using the original weighting methodology, reflecting the impact of unsmoothed weights. With the revised methodology, the median is zero, and the 10th and 90th percentiles are close in magnitude.

1. QWI Tabulations by Age

The longitudinal consistency of age tabulations merits special discussion, as this represents an extreme case of job characteristic changes over time. Job tabulations by age are based on the age of the worker at the end of the quarter, therefore an active job can be counted as end-of-quarter employed in one age group and then in the next quarter the same job is beginning-of-quarter employed in a different age group. As younger workers enter the workforce, they are hired and then relatively quickly age into the next category (due at least in part to the relatively narrow age categories for workers under the age of 25).[10] The high rates of young worker entry are represented in the QWI as positive job flows, however, this should not be interpreted as growth in youth employment; workers who age out are largely replaced with new young workers in the next quarter, resulting in very little change in young worker point-in-time employment from one quarter to the next.

The impact of age change can be demonstrated by looking at State*Age tabulations of B_Shift. Table 4 shows B_Shift both before and after the weighting revisions. The new methodology has a relatively small effect, particularly for younger workers. Lower level tabulations (not shown) have a similar pattern with a higher level of dispersion.

Table 4: Longitudinal Consistency of QWI-B and QWI-E Measures By Age

		B_Shift					
		Original Weighting			**New Weighting**		
		P10	**P50**	**P90**	**P10**	**P50**	**P90**
	Age Group						
State * Age	**14-18**	(17.82%)	(13.56%)	(9.62%)	(16.03%)	(12.38%)	(9.74%)
	19-21	(6.42%)	(3.13%)	0.00%	(3.66%)	(2.35%)	(1.35%)
	22-24	(4.01%)	(1.64%)	1.03%	(1.84%)	(0.86%)	(0.02%)
	25-34	(2.04%)	(0.49%)	1.71%	(0.18%)	0.09%	0.42%
	35-44	(2.10%)	(0.55%)	1.43%	(0.49%)	(0.06%)	0.39%
	45-54	(1.70%)	(0.08%)	1.75%	(0.22%)	0.24%	0.94%
	55-64	0.14%	1.72%	3.62%	1.51%	2.14%	2.75%
	65-99	1.78%	3.64%	6.10%	3.73%	4.18%	4.81%

[10] Although the first age category covers five years, very few workers enter before the age of 16 and the rate of entry increases dramatically for persons age 17-18, resulting in an effectively very narrow active worker age range concentrated near the right age boundary.

D. Differences in Counts Across Aggregations

The QWI tables are presented as a series of nested aggregation levels. In the original weighting methodology, all aggregation levels provided consistent sums, up to the limits of item suppression and rounding errors. For example, the sum of accessions across 2-digit NAICS sectors would be the same as the sum of accessions across 3-digit NAICS subsectors, except for suppression/rounding. This was possible because the weight applied to a job did not vary by measure or aggregation level.

With the new methodology, this relationship does not hold for all measures. Fixed weights are calculated for beginning-of-quarter and end-of-quarter employment, and these weights are applied uniformly to all aggregation levels. For beginning and end-of-quarter employment, the totals will sum correctly across aggregation levels. However, when the adjustment methodology is applied to other measures, bounding is sometimes imposed within cells to maintain identities. This is more likely to happen in cells that are highly asymmetric – for example, a cell with several hundred separations but fewer than 10 accessions. For some measures, applying statewide weights to beginning and end-of-quarter employment may occasionally generate impossible negative values in related measures. To correct this, the offending measure is bounded at zero, and the related measures are adjusted accordingly. The overall pattern in a cell remains consistent with the observed data; however, this can in some cases result in sums for different levels of aggregation producing different results.

III. Further Information

More detailed methodological information will be provided in a future publication. For questions or comments, please contact CES.QWI.Feedback@census.gov.