Adjustment to QWI Weights Resulting from Employment Impact of COVID-19

Overview

The COVID-19 pandemic resulted in a large decrease in employment beginning in the second quarter of 2020. Employment counts for the Quarterly Workforce Indicators (QWI) and the Quarterly Census for Employment and Wages (QCEW), which provide the benchmark employment target used to develop weights for the QWI, are comparable in most quarters. However, the 2020Q2 employment drop manifested very differently in the two data products, leading to sharply divergent point-in-time employment counts. This imposes significant additional discontinuities on the **weighted** QWI data series. To compensate for this, an alternative employment target and weighting approach for the QWI series has been developed for QWI release R2021Q1.

QWI Weighting Methodology

The Quarterly Workforce Indicators (QWI) state-level employment measure is adjusted to match estimates from the Quarterly Census of Employment and Wages (QCEW) by applying weights.[1] The weights enforce a rough equivalence between two point-in-time employment measures, QWI Beginning-of-Quarter (QWI-B) and QCEW Month 1(QCEW-Month1) employment. Although the definitions and data sources for these measures are different, unweighted QWI-B tracks QCEW-Month1 well in the historical time series, with minor seasonal differences (roughly one percent or less in the multistate aggregate for the last decade). However, in the second quarter of 2020, major employment changes brought about by the COVID-19 pandemic had very different impacts on the two measures. In the QCEW, there was a very sharp drop in April, followed by a quick partial recovery in May and June. The corresponding drop in QWI-B was much less severe, with QCEW-Month1 being approximately 10% lower than the QWI-B measure. This results in a very low weight of 0.9, while earlier quarters have a weight close to 1.0. Note that QWI weights each quarter target QCEW-Month1 employment. An illustration of the comparable employment trend can be seen in the following graph. The graph includes aggregates for 37 states for which 2020Q2 QWI estimates were available.

---

[1]Abowd, et al, "The LEHD Infrastructure Files and the Creation of the Quarterly Workforce Indicators," section 5.3.

QCEW Monthly Employment and QWI Beginning-of-Quarter (Unweighted) Employment, and Ratio 2008Q1-2020Q2, Private Employment (Sum of 37 States)

Series Key
- QCEW Monthly Employment
- QWI Beginning-of-quarter
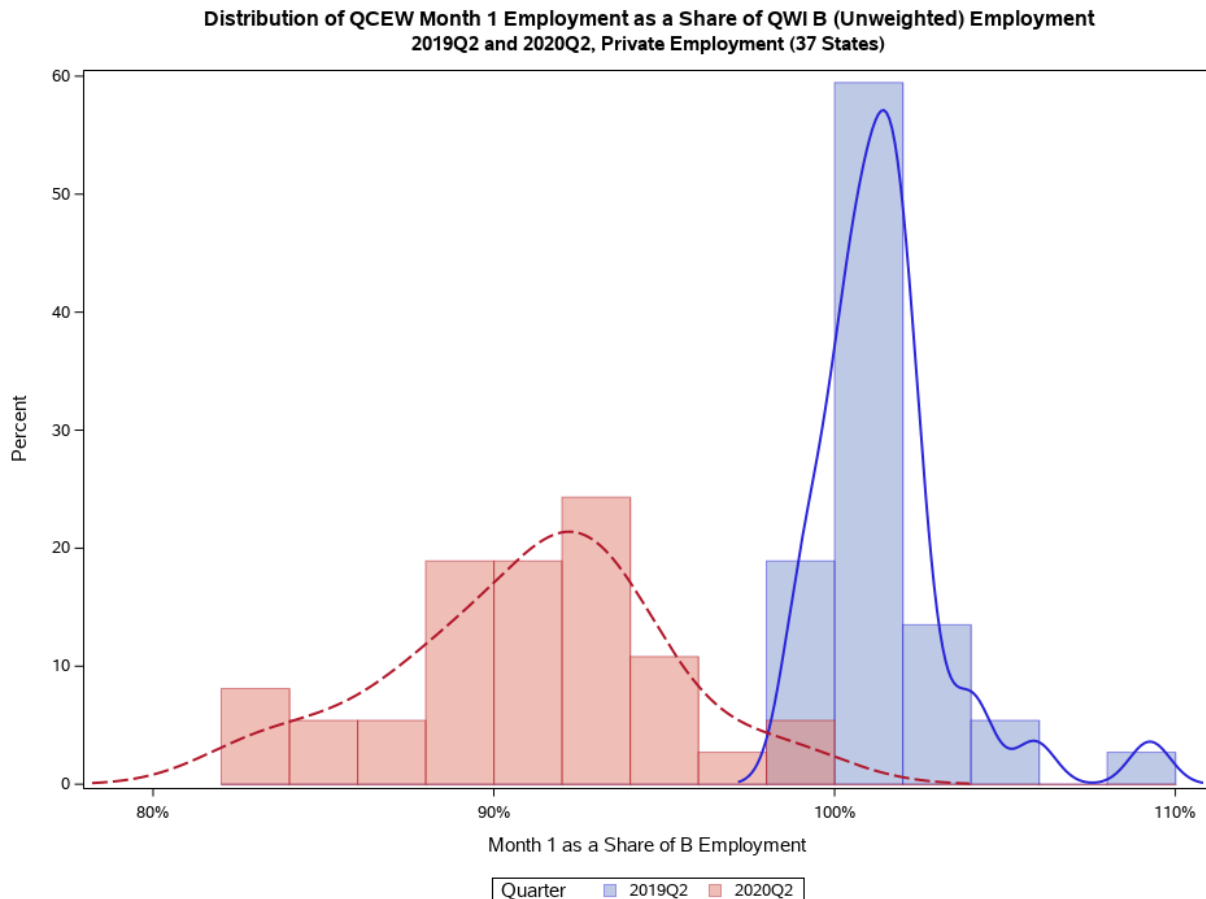- Ratio: (QCEW Month 1) / (QWI B)
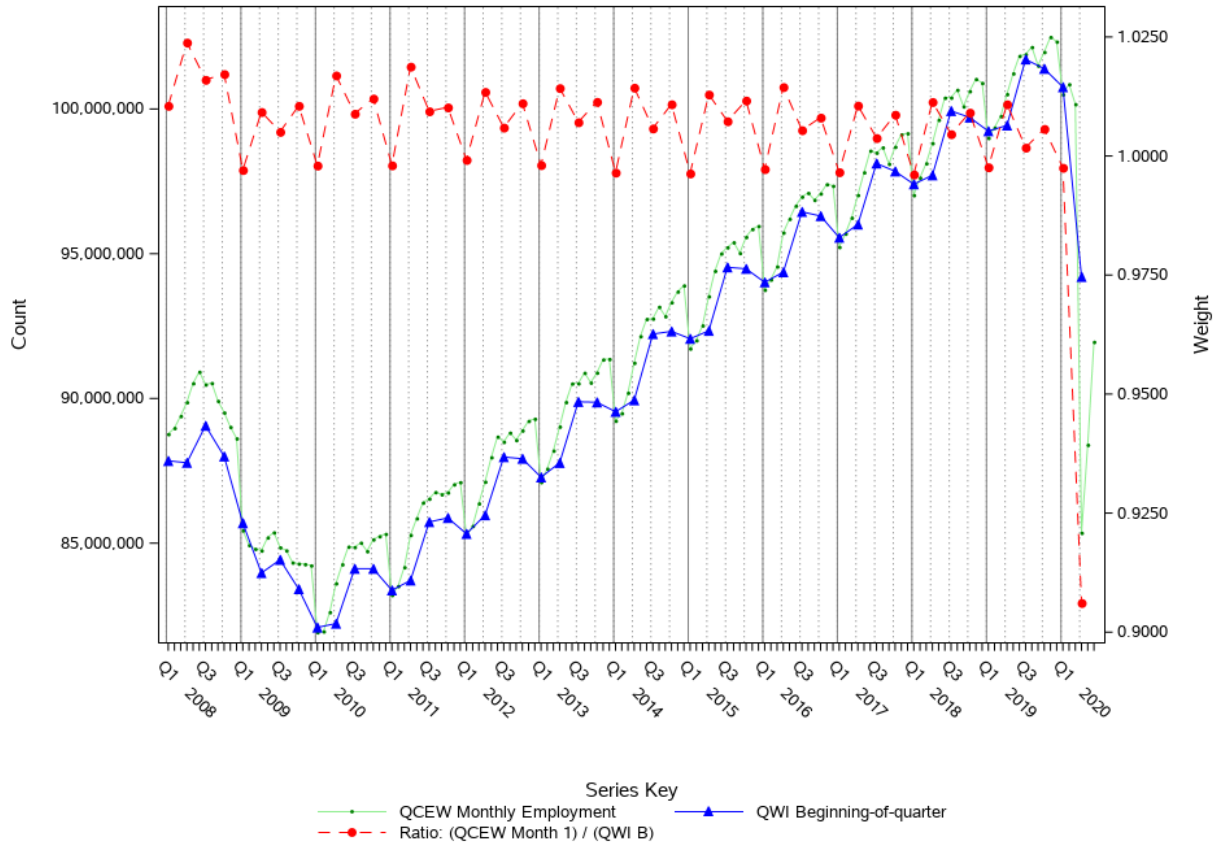
The differences observed in the two point-in-time employment measures are largely due to the methodologies and data sources used to construct the measures. QCEW employment counts are collected from employer reports of the number of employees working during the pay period containing the 12th day of each month.[2] The QCEW data thus provides separate measures for employment in Months 1, 2 and 3 in each quarter – hence, the graph displays three estimates per quarter.

The QWI are developed from quarterly earnings records collected for the administration of state unemployment insurance programs. The point-in-time measure – QWI-B – is defined as the count of all jobs where the worker receives earnings from the same employer for two consecutive quarters. An inference is made that jobs with consecutive quarter earnings are active at the beginning of the quarter (the 1st day of the month). QWI-B is likely to be a good proxy of actual beginning-of-quarter employment if workers are continuously active at the firm during their entire employment spell.

The definitions of the two measures indicate both timing and methodological differences. We should expect discrepancies due to the different reference dates. Further, short spells of inactivity, a common occurrence, can drive a difference between the two measures if jobs are not active during the QCEW reference period but are active at other times in the quarter.

---

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

The drop in QWI-B was much less severe than the QCEW-Month1 drop in the second quarter of 2020 for two potential reasons: first, the QCEW-Month1 employment drop presented in the QCEW in April, but many affected workers in quarter 1 likely received earnings very early in the second quarter, before the 12th of April; and second, many workers returned to the same jobs in May and June, leading to these workers being classified on the UI as beginning-of-quarter employed. The dramatic change in the weight from roughly 1.0 in previous quarters to close to 0.9 in the second quarter of 2020 is driven by this divergence in the two measures in 2020Q2.

Distribution of QCEW Month 1 Employment as a Share of QWI B (Unweighted) Employment
2019Q2 and 2020Q2, Private Employment (37 States)

The differences between the QWI-B and QCEW-Month1 varies by state. This paired histogram illustrates the distribution across states of the weight (presented as a share) in the second quarters of 2019 and 2020. In 2019, most states are clustered just above parity (100%) with a long right tail, likely related to underreporting of UI wage records in several states. However, in 2020, the center of the distribution is about 93%, with all of the values less than parity. A substantial share of the states in 2020 lie below 90%, implying a change in their weight in excess of 15%.

The extreme values calculated for the weights have a cascading impact on other QWI measures, such as accessions, which will be similarly downweighted. Further, QWI-B in the second quarter of 2020 would diverge substantially from QWI End-of-Quarter (QWI-E) employment in the first quarter of 2020. While these measures do differ in other quarters, largely as a result of the application of differential weights, the discrepancy observed in this quarter would be extreme.

Revised Weighting Approach for 2020Q2 in QWI release R2021Q1

An alternative statewide weight will be used for 2020Q2 QWI measures in QWI release R2021Q1. This weight creates a revised target that leverages the historical relationship between QWI-B and QCEW-Month1, discounting the extreme fluctuation observed in the relationship during the last quarter. The steps in the calculation follow:

1. Calculate QWI-B employment (with noise infusion, no weights applied).
2. Calculate the ratio of QCEW Month 1 employment in the reference quarter to QWI-B.
3. Seasonally adjust the ratio series, correcting for outliers, and subsequently smooth the weights using a five-quarter moving average.
4. Calculate a revised employment target for 2020Q2 by multiplying the initial beginning-of-quarter employment by the smoothed weight calculated for that quarter.
5. Replace the QCEW-Month1 target used in QWI production with the revised target.

In addition to revising the statewide employment target, a separate firm-specific component of the weights will not be applied in the second quarter of 2020. Retaining the firm-specific component would potentially defeat the purpose of the weight adjustment by redistributing jobs within the state away from firms that had relatively large drops in QCEW-Month1, while correspondingly inflating firms that did not experience a large relative drop in QCEW-Month1. Removing the firm weight component allows for a consistent impact of the weight across all firms.

Irregularities in Longitudinal Series Due to the COVID-19 Pandemic

The revised weighting method applied to the second quarter of 2020 data in QWI release R2021Q1 provides employment counts at all levels that are consistent with QWI definitions. However, users may encounter increased irregularities when comparing quarter 1 estimates with quarter 2 estimates due to the removal of the firm-level weights. This change will cause anomalous jumps or drops in many detailed industry or geography series.

In addition, the imputation methodology that corrects for suspected underreporting was not applied for 2020Q2. This action was taken to avoid filling real drops in employment with supplemental wage records, but it may lead to unexpected drops in employment in some cells. This will be reviewed and potentially revised in a future QWI release.

Future Development

While the economic impact of COVID-19 in the second quarter of 2020 was severe, the regular quarterly fluctuations in the weights introduce significant bias in the historical QWI time series. Research has been underway for some time to develop an alternate weighting methodology that provides more consistent QWI estimates. At the time of this writing, it is anticipated we will implement a more comprehensive revised methodology in the spring of 2021 (QWI release R2021Q2).

For further information, please contact us at CES.QWI.Feedback@census.gov.