

25th Meeting of the Wiesbaden Group on Business Registers
- International Roundtable on Business Survey Frames

Tokyo, 8 – 11 November 2016

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Bureau of Labor Statistics
Session No. 4

Quality and Coverage

Measuring Data Quality in the BLS Business Register: A Local Regression Model Approach

Abstract

The U.S. Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW) program maintains the Longitudinal Database (LDB). The LDB serves as the Bureau's establishment-based business register. The LDB is a relational database of over 9 million business establishments linked longitudinally. The database is built of establishment-level microdata from Unemployment Insurance (UI) tax forms that businesses submit to the state UI Agency each quarter. State Workforce Agencies obtain these records on a quarterly basis, ensure that they are accurate, and submit them to BLS. Data elements on these forms include information on monthly employment, quarterly wages, business name and addresses, industry classification, geographic codes, and other administrative data. Every establishment on the database contains a unique identifier that allows for tracking of individual establishments at the micro-level across time for the United States.

The LDB serves four critical functions. First, the database allows for the publication of longitudinal Business Employment Dynamics (BED) statistics. Second, the LDB serves as a sampling frame for establishment-based surveys for BLS. Third, the LDB serves as a source of benchmark employment for establishment-based surveys for BLS. Finally, the LDB serves as an invaluable resource for labor market research. These data are used to generate high quality, high frequency, timely and historically consistent data on business and employment. As a result, BLS has developed measures to quantify the quality and monitor the integrity of these data.

This paper develops a statistical framework for measuring and monitoring data quality in the QCEW Business Register over time. The business register data quality, as a result of a fiscal year 2014 budget cut, will be examined. The paper first provides a brief history of the program and describes the recent budget cut. Next, the authors describe the various data quality measures and dimensions available for consideration. Then, the authors fit a series of local regressions to smooth the path of changes in a number of quality metrics including a composite index to measure the overall data quality. Finally the authors discuss results of the analysis and the lessons learned.

Key Words: Bureau of Labor Statistics, Quarterly Census of Employment and Wages, data quality, business register, local regression

This paper represents the culmination of efforts on the part of more than just the authors. This paper would not have been possible without the contributions from the following people and many more not listed; Karina Beckmann, Jennifer Cruz, Melissa Edwards, David Hiles, Jake Kane, Mike LoBue, Reuel Paredes, and Emily Thomas.

1. Motivation

In fiscal year 2014 the Quarterly Census of Employment and Wages (QCEW) program was subject to a significant budget cut.¹ The overall reduction equated a 10 percent, or \$4.4 million, cut on the BLS QCEW program. Approximately \$3.3 million of that cut was borne by the State Workforce Agencies (SWA) and was implemented across a two year period. The SWA funding amount was reduced by \$1,143,450 in 2014 and \$2,123,550 in 2015. This reduction brought the inflation adjusted QCEW funding allocated to states to the lowest level in over a decade. (See Table 1 and Chart 1 in the Lab.) With 9.6 million business establishments and growing in an expanding economy, the inflation adjusted resources-per-unit in the program is down by nearly 20 percent from \$3.62 in fiscal year 2005 to \$2.92 in fiscal year 2016. (See Chart 2 in the Lab.)

The budget reduction coupled with the continuous growth in the Bureau's workload, and the QCEW program in particular, has raised concerns among data users. Academic researchers, in particular, worry about a potential slowdown in new data development². The QCEW program not only serves as a sample frame for a number of BLS surveys, but also the benchmark for the closely watched Current Employment Statistics (CES) survey. With its broad coverage (approximately 98 percent of all non-farm wage and salary employment) the QCEW provides a virtual census of these employees and their wages on a quarterly basis. Consequently, QCEW data are used in many economic and statistical applications and are a potential source for new data development opportunities.

A key external use includes Unemployment Insurance (UI) program administration; determining the UI tax rate for establishments for states that base taxes on industry (NAICS) codes, assisting UI with planning, and actuarial analysis. Further, QCEW is utilized in macro and micro economic research. Internally, the QCEW is used as a sampling frame for key economic surveys published by the BLS. One of the many programs that utilize the QCEW as a sampling frame is the CES, which is a survey produced by the BLS for publication in *The Employment Situation*, a monthly report providing current employment, unemployment, and demographic information about the labor market. Other BLS programs that use the QCEW for sampling purposes are the Job Openings and Labor Turnover Survey (JOLTS), Occupational Employment Statistics (OES), Producer Price Index (PPI), Occupational Safety and Health Surveys, Occupational Compensation Survey, Employer Benefits Survey, Employment Cost Index Survey, and Productivity Surveys. The Local Area Unemployment Statistics (LAUS) program also uses the QCEW as its source of employment when CES estimates are not available.

Any impact on QCEW data quality could affect the quality of other labor force surveys, as well as a host of programs that are dependent on QCEW outputs. This raises several questions: To what extent has the budget cut, implemented over fiscal year 2014 and 2015, impacted the quality of QCEW data? Has the QCEW shown any sign of deterioration in overall quality, either in terms

¹ For more information on the 2015 Sequestration see the Congressional Budget Office, Sequestration Update Report: August 2015 <https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/50728-Sequestration-Update-2.pdf>

² Please see Katherine Abraham, Steven Davis and John Haltiwanger "Don't Starve the BLS" October 9, 2015. <http://www.rollcall.com/news/home/dont-starve-the-bls-commentary>

of a slowdown in its historical trend of improved data quality, or in lower quality standards that are measured frequently by a built-in mechanism?

This paper intends to answer these question by looking into a number of metrics that define data quality in the QCEW program. These quality metrics are used from 2008 to 2015 third quarter at national, regional, and state levels to observe the historical path of data quality changes and to measure the impact of the budget cut. This paper will assess the effects of the budget cut on the overall quality of the program and examine the impacts on BLS regions and states grouped by size as well as on specific elements of data quality.

2. Background on How the QCEW Data are Compiled

The QCEW business register is a list of active business establishments in the United States, the District of Columbia, Puerto Rico, and the Virgin Islands. Its principal sources of information are the mandatory quarterly reports filed by all employers covered by the Unemployment Insurance system of the fifty states and the District of Columbia, Puerto Rico and the Virgin Islands. Employers report to their State Workforce Agencies (SWAs) in compliance with state Unemployment Insurance (UI) laws, and for Federal civilian workers, in compliance with the Unemployment Compensation for Federal Employee (UCFE) program. Each quarter, business and government employers report monthly employment and quarterly wages.

The QCEW data are collected from four forms required to meet program needs. Two of these are state Unemployment Insurance based forms: the Status Determination Form (SDF) and the Quarterly Contribution Report (QCR). In addition, two BLS supplemental collections were developed to enhance the administrative data to meet the needs of the QCEW program. The first of the BLS forms is the Multiple Worksite Report (MWR), and the second is the Annual Refiling Survey (ARS).

Annual Refiling Survey (ARS)

The purpose of the BLS Annual Refiling Survey is to review and, if necessary, update the classification codes (industrial and geographical) currently assigned to the establishments stored on the QCEW Business Register. The survey is initiated in July of each year with approximately one-third of the in-scope³ establishments in the QCEW Business Register being reviewed annually. The establishments are selected at random based on the Federal Employer Identification Number (EIN) range. This selection process ensures that the industrial distribution of the survey respondents is proportional to the establishments in the economy. In other words, no industrial sector is specifically targeted in any one year.

³ Most establishments with 3 or more employees are in scope for the ARS, and are resurveyed every three years. A small number of industries have historically shown substantially smaller than average movement of establishments out of the industry (for example cemeteries). Within these industries the establishments are included in the ARS once every six years.

Multiple Worksite Report (MWR)

Business enterprises with more than one establishment in a state under a single UI account file a Multiple Worksite Report (MWR) so that data for each of its establishments is reported separately. The MWR is mandatory in 26 states and compliance in the voluntary states is also very high. The EIN provides linkages among establishments of the same business enterprise across states. The EIN for establishments on the QCEW Business Register is obtained from the initial Status Determination Form and updated, if necessary, based on the quarterly UI tax form. This more comprehensive disaggregation of multi-establishment accounts is available in the QCEW Business Register which is almost entirely at the establishment level and thus provides more accurate industrial and geographic information for all establishments.

The MWR is collected each quarter to disaggregate the employment and wages of numerous establishments owned by an employer that are reporting under the same UI account number in a state. The summary information for this employer is reported on the state's Quarterly Contribution Report. This procedure allows the employment and wages for each worksite to be placed in their correct industrial and geographical classification. Also collected are the physical location address of each worksite, a worksite description (normally a store or unit number or other information meaningful to the employer), and various other business identification information. A more in-depth discussion of the purpose of these forms and collection methods is detailed in prior research.⁴

Maintenance Workload

To gain some perspective of the size and workload associated with maintaining the QCEW Business Register, there are 9.6 million worksites representing 141 million employees reported by the 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands as of the first quarter of 2016.

Approximately 7.9 million worksites were reported as being single establishment employers, whose employment and wages data were collected from the state quarterly contribution reports. The employment and wages data and other business identification information for the remaining 1.9 million worksites were collected from the multiple worksite reports.

There are approximately 7 million legal entities with only about 141,000 of those providing the MWR data. The term legal entity is used here since many large employers have accounts in more than one state and are thus counted more than once. The MWR employers only represent about 1.4 percent of total employers, but they constitute 17 percent of the total number of worksites and 41 percent of the nations' employment. Thus, without the MWR, QCEW could not accurately measure employment and wages at the county level or establishment births and deaths.

Editing Procedures

Micro data are edited by state staff and corrected as necessary. There are 150 separate edits designed to detect a wide range of invalid and inconsistent values. These edits have been refined

⁴ Richard Clayton and David Talan. "Measuring Quality in the BLS Business Register." September, 2013. <https://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.42/2013/Business-Register-Quality-August-14-2013.pdf>

and enhanced over time reflecting the many years of data editing experience of state and BLS staff. After making corrections, states submit the micro data to the BLS. Standardized edits and processing tools allow states to focus their data quality work on the largest problems first. The state editing procedure is typically to review (and correct where appropriate) successive rounds of smaller and smaller errors until the available funding for editing has been exhausted. The FY14 budget cut, implemented across fiscal years 2014 and 2015 has reduced states ability to improve the quality of the UI data to the previous standard.

3. Quality Metrics of the QCEW Business Register

QCEW Business Register metrics are based on statistical quality dimensions of relevance, accuracy, timeliness, interpretability, coherence, and accessibility in order to ensure high quality data that meets the varied requirements of different user groups. Since the QCEW Business Register is the foundation for the Bureau's employment statistics, it is essential that accurate longitudinal linkages are made between establishments to preserve data integrity.

Management Review Mechanisms

The QCEW program has a comprehensive management hierarchy to ensure that data quality permeates all levels of the QCEW structure. One of the tools used in the management structure is the BLS cooperative agreement, which is a contract that sets quality standards for each State Workforce Agency. The cooperative agreement sets goals for each state which is tied to the QCEW funding allocated to each state.

Fund allocation is another mechanism to ensure data quality. State data quality is measured on a quarterly and annual basis. On a quarterly basis, state data quality is measured via the flash report and the business register metrics report (described below). On an annual basis, states are evaluated on performance measures as described in the annual cooperative agreement. Funds may be periodically reallocated to certain states to provide additional resources for improving data quality.

Since the inputs to the QCEW Business Register are derived from the Federal-State cooperative, it is vital that communication between and among states and the BLS promotes coordination and cooperation to increase data quality. Frequent meetings for State and Regional offices are management coordination tools which allow these branches of the QCEW program to communicate questions, concerns, and standards in data quality. Regional offices ensure data quality by holding states accountable to data quality standards, providing them with training opportunities, and coordinating program directives. States also offer another management layer to ensure data quality. Each state has their own organizational structure with its own set of data users and stakeholders.

In order to coordinate all agencies involved in the QCEW data production process, the QCEW policy council was created to provide a hierarchical structure for the program. The QCEW policy council is comprised of six representatives from BLS and ten state representatives. The council's

mission is to prioritize and coordinate QCEW improvement projects. In addition, the policy council seeks the input of all states in establishing policy.

Review Mechanisms of QCEW Business Register Systems

There are two quality control documents which are produced to review the QCEW process and systems: the Flash Report and the Business Register Metrics Report.

Flash Report

The Flash Report is a quarterly monitor of the data quality received from the states. This includes the monitoring of a number of metrics that bear on data quality such as the number of reported units, the number of imputations, the number of prorations, the number of missing units, and the number of records with invalid county and NAICS codes. The Flash Report is a comprehensive management tool that ensures that data quality goals are being met, flags potential data quality problems, and monitors the progress of each state. For example, the Flash Report monitors the number and percentage of imputed records, prorated records, and missing records. If there are large fluctuations over the quarter, increases or decreases in these numbers that might affect data quality, they are flagged and investigated.

Business Register Metrics Report

The second review mechanism is the Business Register Metrics Report. The Business Register Metrics Report monitors data quality, and quality of analyst manual matches. The Business Register Metrics Report is produced after the longitudinal linkage process is complete and evaluates the amount and type of record matches, the number of new Longitudinal Database numbers issued each quarter, the number of establishment births and deaths each quarter, the number of unmatched records, and the number of weighted matches made by the system software. Monitoring these fields allows the BLS to ensure high data quality of the QCEW Business Register.

4. Methodology in Measuring QCEW Data Quality Changes

In order to measure the effects of the budget cut on data quality, the authors examined changes over time in a number of the QCEW Flash Report and the Business Register metrics. In addition, the authors reviewed the size of the revisions in the published QCEW data for a notable changes after the budget cut. To assess the qualitative impact of the budget cut, a survey of state stakeholders was also conducted.

When examining the quantitative aspects of the budget cut, the authors utilized a local regression method to fit a smooth curve through time, across a set of data points from the quality metrics found in the Flash Report. In the local regression method, the regression function is estimated

locally by fitting a regression surface to the data points in a chosen neighborhood that are weighted by a smooth decreasing function of their distance to the center of that neighborhood. Local regression was selected in an effort to smooth out the trend in data quality measures by using time as an independent variable and develop a smooth graphical summary of data quality changes over time and detect changes before, during, and after the budget cut. The local regression method allowed the authors to quantify the change in data quality better than a visual inspection of data points. The smoothed, fitted plots reveal even the smallest movement in data quality over time and show how the quality indicators behaved before and after the budget cut went into effect⁵.

There are a total of 31 metrics in the quarterly Flash Report, showing the status of major quality related data elements in the QCEW program in the latest quarter. The report, for example, shows how many records were imputed or prorated or were missing in the quarter, as a percent of total records. These percentages are reported for the number of records as well as the total employment associated with those records. Generally, the fitted plots for the number of records and employment move in the same direction. The authors selected quality indicators for the number of units as the basis for the analysis, but for comparison purposes, the quality impacts for the employment of the impacted records were also measured.

In addition, the authors estimated a composite indicator based on a simple average of major metrics that are uniquely representative of the quality in the Flash Report. The composite indicator reflects the ratio of the following quality indicators in total QCEW records:

- The number of imputed records
- The number of prorated records
- The number of missing records
- The number of records with statewide (county 995) and unclassified (county 999) codes
- The number of records with unclassified industry codes (NAICS 999999)
- The number of records with physical location addresses
- Annual Refiling Survey (ARS) total usable response rate

For the composite indicator calculation, the authors used only the rate of reported records, which is the difference between the total and the sum of missing, prorated and imputed records, as a quality indicator. Some indicators represent a fraction of total records that are not valid, complete or perfect, while other indicators measure the large portion of records that meet the quality standards. In order to put these two different sets of measures into one quality indicator, the

⁵ Local regression is a nonparametric method for estimating regression surfaces where no specific relationship can be assumed between dependent and independent variables. It is a procedure for fitting a smooth curve to some scattered observations. It builds on standard linear and nonlinear simple models to fit linear or quadratic functions at a number of neighborhoods in the data points. A smoothing parameter controls the percentage of the data in each local neighborhood. Data points in a given neighborhood are weighted by a smooth decreasing function of the distance from the center of the neighborhood. For information on local regression see William S. Cleveland (1979) "Robust Locally Weighted Regression and Smoothing Scatterplots" Journal of the American Statistical Association, 74, 829-836. And, Robert A. Cohen "An introduction to PROC LOESS for Local Regression" SAS Institute 1999.

authors converted the incomplete or imperfect percentages to one minus that fraction to represent consistently the completed shares of all metrics in the composite quality indicator. For example, if five percent of new records have invalid NAICS code, the authors used the valid 95 percent or .95 as the contribution of this element in the composite indicator. Ideally, this indicator should move toward 100 percent or 1.00 if the QCEW data quality is on the rise.

5. Results

The overall impact of the budget cut, according to the method used in this analysis, is displayed in Chart 3 (See the Lab). Chart 3 shows the composite indicator for overall quality impacts of the budget cut as measured in terms of the number of records impacted. The vertical red line in this chart, and the charts that follow, indicate the timing of the budget cut with respect to the data being edited. The curtailment to the QCEW program took effect at the start of fiscal year 2014 beginning October 1, 2013. At that time, the QCEW was working on data for the second quarter of 2013. For second quarter 2013, deliverables from the state were due October 24th and the data were published on December 18th.

It is evident that the general level of quality, which was on the rise prior to the budget cut, has been on a downward trend since the cut. However, the decline from the peak performance in the fourth quarter of 2012 to fourth quarter 2015, accounts for less than one tenth of one percent in magnitude, a rate which seems trivial but nonetheless shows the sensitivity of the QCEW program to budgetary constraints.

Impacts on Individual Quality Metrics

Chart 3 shows the overall impact of the budget cut on the composite of QCEW data quality metrics. The effect of the budget cut on individual metrics is shown in Charts 4-8. (See Appendix A.) The results are mixed. The number of records with no specified industry classification (NAICS 999999) shows a declining quality with a lag of one year. The impact on the number of reported units (which indicates less of missing, imputed and prorated records) shows continuing improvement in quality, while the number of records with valid county codes continued its declining trend at an increasing rate after the budget cut. The number of records with physical location address started to decline simultaneous with the implementation of the budget cut.

Regional Impacts

All regions showed signs of overall data quality declines across the examined time period with the exception of the San Francisco region, where the QCEW data quality continued a trend of improvement that started in 2009. The composite quality indicators for the Philadelphia and Atlanta regions started to decline right around the time that the budget cut was implemented. Data quality in other regions were on a decline just prior to the budget cut, but accelerated after the budget cut implementation. (See Appendix B.)

Impact by State Size

To analyze the impact of the budget cut while controlling for the state size, the authors grouped states into three categories (small, medium, and large) based on the number of establishment records. (A listing of the states by size category can be found in Appendix C.)

The results showed the data quality in all three groups of states regardless of their relative sizes either started to decline or accelerated their decline at the time that the budget cut was implemented through fourth quarter 2015. (See Appendix D.) In terms of the magnitude of the decline, however, the quality level among the smaller group declined the most (0.20 percent) followed by the medium sized states (0.10 percent) and large states (.05 percent). Productivity improvements necessitated by lack of funds may have contributed to a lower reduction in the magnitude of the quality in the larger states. The state survey results, discussed later, indicate a mix of states implementing productivity improvements. However, due to the confidential nature of the survey the authors are not able to test this hypothesis.

Impact on the Magnitude of the QCEW Revisions

At the national level, revisions have stayed fairly consistent from first quarter 2008 to third quarter 2015. There is no notable change in the first revision or total revision trends.

The smoothed fitted data points from the local regression model show a rise in the ratio of the employment revision to the total employment. (See Chart 9 in the Lab.) This ratio started to rise a year prior to the budget cut and accelerated afterwards. The magnitude of this rise is negligible and it only reveals an inherent upward pressure on the QCEW revisions as a result of the budget cut.

Quality Impact Using Employment as the Unit of Measurement

In measuring the data quality changes due to the implementation of the budget cut, the analysis thus far has used the number of records affected. For comparison, the authors used the employment associated with these records in the Flash Report and measured quality changes from the employment perspective. The difference between these two measures depends on the size distribution of establishments in the quality indicator. If, for example, the number of large size establishments with invalid NAICS code declines, while the number of smaller establishments with invalid NAICS code increases by the same number, the quality level based on this data element in terms of the number of the affected units will be unchanged, but the quality level in terms of the number of employment improves because of the presence of more large size employers. (See Chart 10 in the Lab.)

In contrast to the results based on the number of records, the overall composite indicator based on employment as the unit of measurement shows an upward trend starting in fourth quarter 2011, indicating improvement in the QCEW overall data quality. One explanation for this contrast is the possibly that, because of the budget constraints, the resources are shifted to editing more of the larger size records and less of the small size records. The results by BLS region, however, are mixed.

The composite quality indicators improved in three regions (Philadelphia, Chicago and Dallas) using employment indicators. The results for other regions remained consistent with the results obtained from using the number of records as the unit of quality measurement. For small states, the quality indicator based on employment is flat since second quarter 2013 as opposed to the declining trend shown by the number of records. The data quality in medium size states improved for employment data in contrast to the declining trend shown by the number of records. For large states, data quality shows a declining trend in both employment and the number of records. (See Appendix E.)

Evidence from the State Survey

To supplement the quantitative analysis of the budget cut, the authors conducted a survey of state stakeholders to gauge the qualitative impacts of the budget cut⁶. The survey received a total of 42 responses representing a 79 percent response rate. While confidential, the typical respondent is characterized as the QCEW State Supervisor or Labor Market Information (LMI) Director level. Overall, 83 percent of respondents indicated that the reduced level of funding has negatively affected QCEW data quality in their state. (See Figure 1 in the Lab.) Of those who indicated that the cut had a negative impact on their state data quality, 74 percent evaluated the extent of the cut as either “moderate” or “high.” (See Figure 2 in the Lab.)

Nearly 60 percent of respondents suggested that the impact of the budget cut has extended so far as to be felt by data users. The table below highlights a few of the concerns shared by the respondents:

<i>Several large errors were discovered during CES benchmarking...</i>	<i>OES and CES ... are seeing units that would have been surveyed...</i>	<i>They don't know the extent to which the data has deteriorated...</i>
<i>Cannot provide the same level of services...</i>	<i>There seems to be an increase in the number of coding questions we get from OES...</i>	<i>Address refinement in OES is more costly...</i>
<i>We see this in the CES benchmarking...</i>	<i>Limited time to respond to customers...</i>	<i>Effect the county level the most...</i>

Thirty-four, or 81 percent, of the respondents identified a major risk to their program as it relates to staffing. A majority of those respondents indicated the hiring freeze was the biggest concern. Others noted human capital flight as the primary concern. Respondents indicated that senior and experienced staff may leave for better opportunities, or retirement, if they don’t have the support staff required to do the job.

When asked to describe any “workarounds” implemented to combat the reduction in funding, the responses were somewhat mixed. Multiple respondents indicated they have increased automation where possible, and using “smarter” tools to complete the job. Another block of respondents reported that there is no time or resources available to develop workarounds. Many of the respondents indicated the data quality could be better, and they have implemented cutoffs – or focused on the largest accounts. One respondent summed it up by saying “We do what we can, when we can.”

⁶ The survey was hosted by Survey Monkey and consisted of eight questions, half of which were supplemented by “additional comments” boxes. Of those respondents who completed the survey upon initial opening, the average time to complete the survey was approximately 13 minutes.

Conclusion

With 9.6 million business establishments and growing the inflation adjusted funding per unit in the QCEW program is down by nearly 20 percent over the last decade. The authors find a limited reduction in QCEW data quality for the characteristics measured, as a result of the fiscal year 2014 budget cut. However, concerns about existing and future risks to data quality are warranted because the impacts of the budget cut may still be progressing. Continuous process improvements at the state, regional, and national level make it difficult to isolate the impacts of the budget cut. In addition, the authors were unable to forecast future staffing patterns and the human capital flight as a result of the budget cut. Furthermore, the long term degradation to QCEW data quality as a result of ignoring the aforementioned components could be very costly to remedy.

Over the time period analyzed in this report a number of process improvements were implemented in an effort to maintain the QCEW reputation as the “gold standard” of data quality. Such improvements include automation, the development and sharing of best-practices, electronic web collections, and leveraging other technological enhancements. While the program continues to reap the dividends from those earlier investments, budget reductions may prove to limit future process improvements.

Concerns exist about long-term data quality and most states indicate they have already seen negative impacts associated with the QCEW budget cut. An example of the current degradation is the discontinuation or reduction of lower priority tasks like editing establishment addresses. In this example, the inability to refine addresses become costs that are shifted to other BLS programs. Analysis raises concerns that critical employees will retire earlier than they otherwise would have and, to compound the problem, staff do not have the time or resources to dedicate to succession planning. If critical staff retire without the proper succession planning, QCEW data quality will suffer. In that scenario, reduction in data quality would be abrupt, easy to quantify, and costly to remedy.

The findings of this research coupled with the many voices of our stakeholders raise valid concerns that further reductions to QCEW’s funding would be harmful to long-term data quality and potentially increase costs to other BLS programs. QCEW has leveraged process improvements and technological advancements from the decade preceding the fiscal year 2014 budget cut that have allowed the program to mitigate, in part, the effects of the reduction in funding. However, the 2014 budget cut may result in some future, yet unknown, degradation to QCEW data quality.

LAB

Table 1

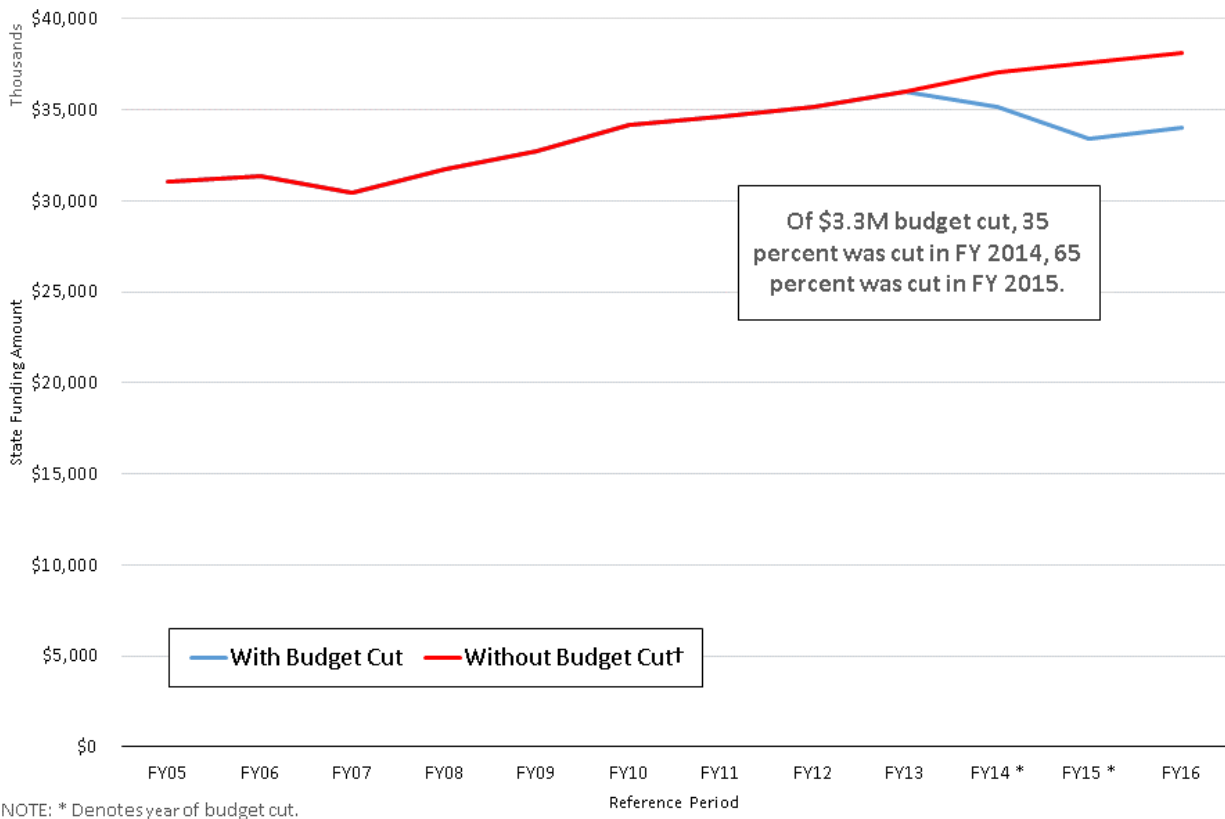
Table 1: Quarterly Census of Employment and Wages State Funding Amount

Year	Funding	CPI	Inflation Adjusted Funding (in 2005 \$)	Units	Nominal Funding per Unit	Inflation Adjusted Funding per Unit
FY05	\$31,054,755	195.3	\$31,054,755	8,571,144	\$3.62	\$3.62
FY06	\$31,343,917	201.6	\$30,364,420	8,784,027	\$3.57	\$3.46
FY07	\$30,445,667	207.342	\$28,677,445	8,971,897	\$3.39	\$3.20
FY08	\$31,734,336	215.303	\$28,786,017	9,082,049	\$3.49	\$3.17
FY09	\$32,741,412	214.537	\$29,805,571	9,003,197	\$3.64	\$3.31
FY10	\$34,169,160	218.056	\$30,603,317	8,993,109	\$3.80	\$3.40
FY11	\$34,628,897	224.939	\$30,066,034	9,072,796	\$3.82	\$3.31
FY12	\$35,182,739	229.594	\$29,927,563	9,121,868	\$3.86	\$3.28
FY13	\$35,966,690	232.957	\$30,152,752	9,294,762	\$3.87	\$3.24
FY14 *	\$35,134,187	236.736	\$28,984,636	9,470,933	\$3.71	\$3.06
FY15 *	\$33,403,318	236.119	\$27,628,730	9,470,933	\$3.53	\$2.92
FY16	\$34,012,661	236.119	\$28,132,733	9,629,260	\$3.53	\$2.92
FY16 – FY05 Funding Difference			-\$2,922,022			-\$0.70

NOTE: Latest CPI value is based on March 2015. Inflation adjusted dollars for 2015 and 2016 is based on the March CPI.

*** The FY14 QCEW budget cut was implemented across two years. In FY14, 35 percent of state funding was cut (\$1,143,450). The remaining 65 percent was cut in FY15 (\$2,123,550).The full budget cut was \$3,267,000.**

Chart 1: Reduction in QCEW State Funding



NOTE: * Denotes year of budget cut.
 NOTE: † This amount reflects an estimated level of funding.

Chart 2: QCEW Resources per Unit Collected

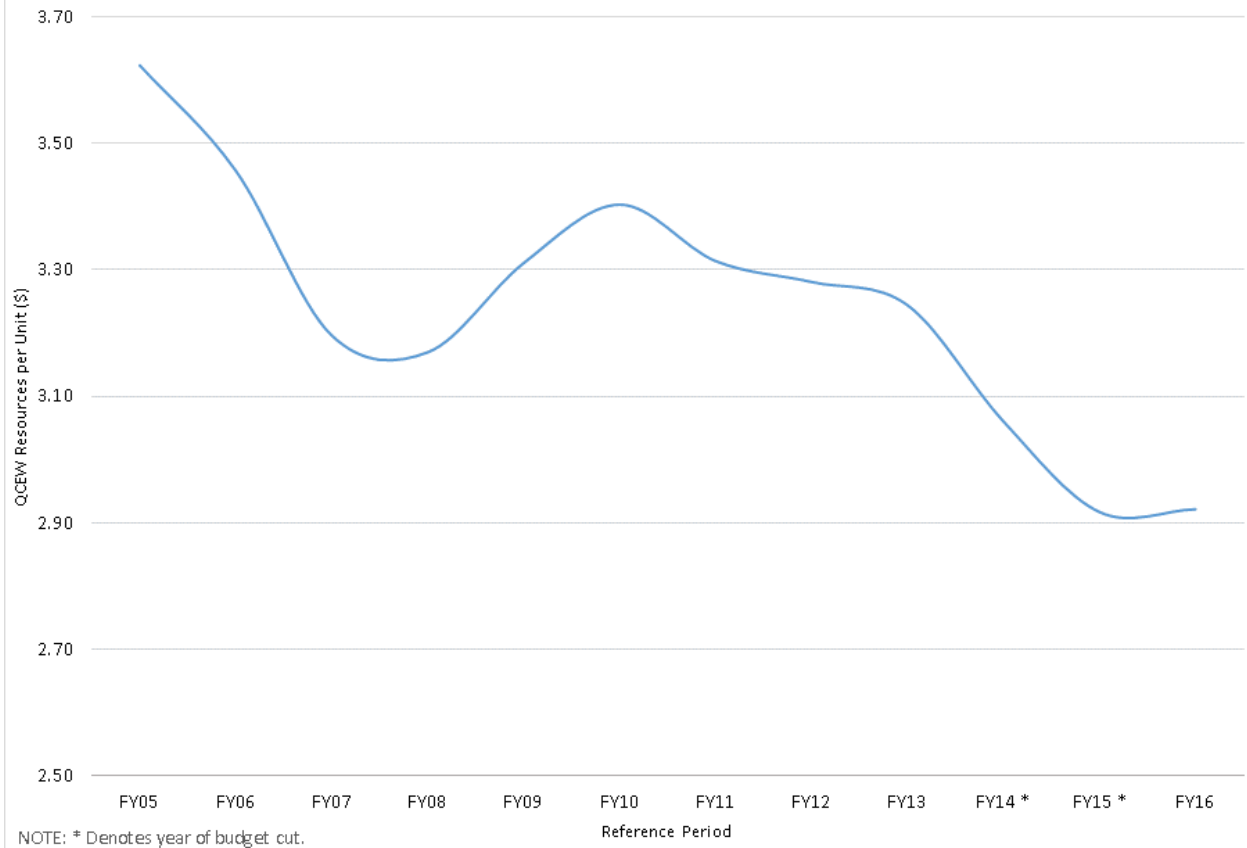


Chart 3: QCEW Data Quality: National

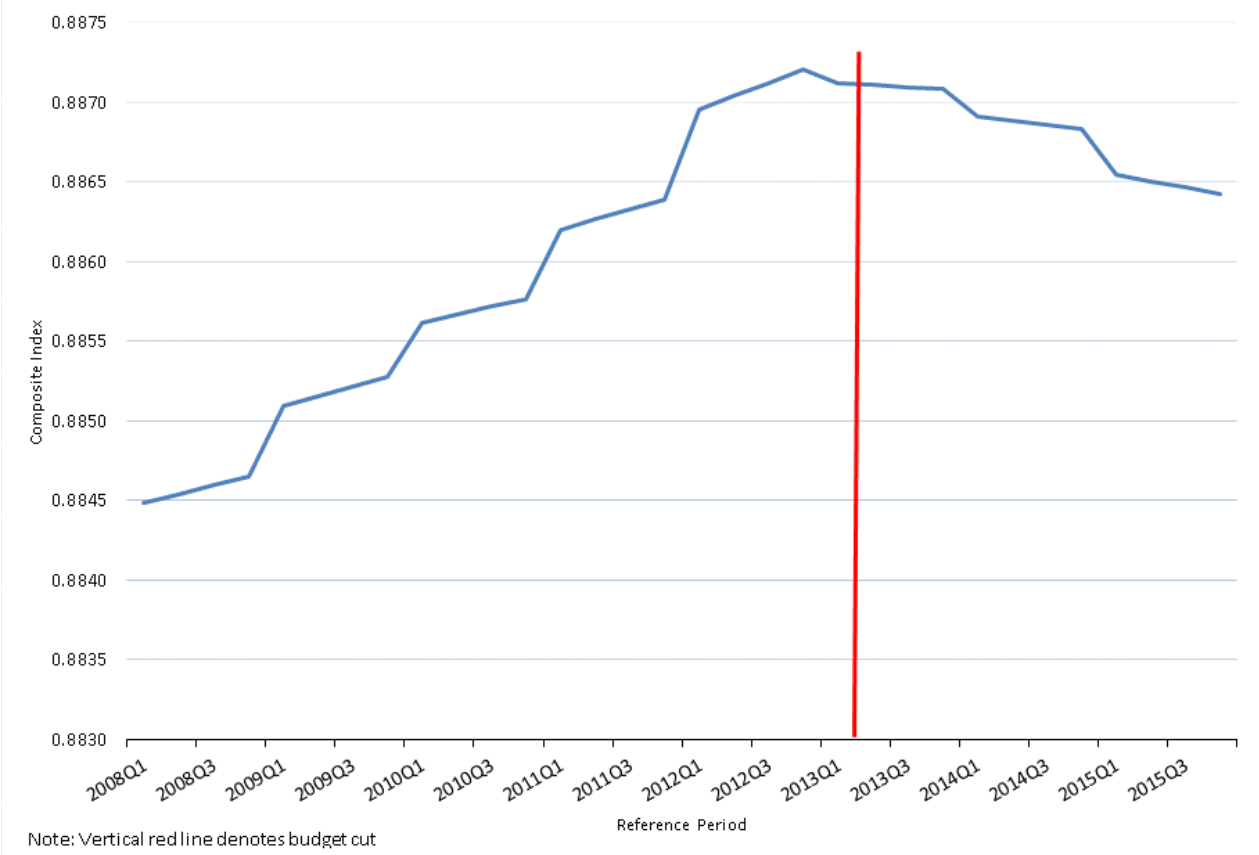


Chart 9: QCEW Revisions

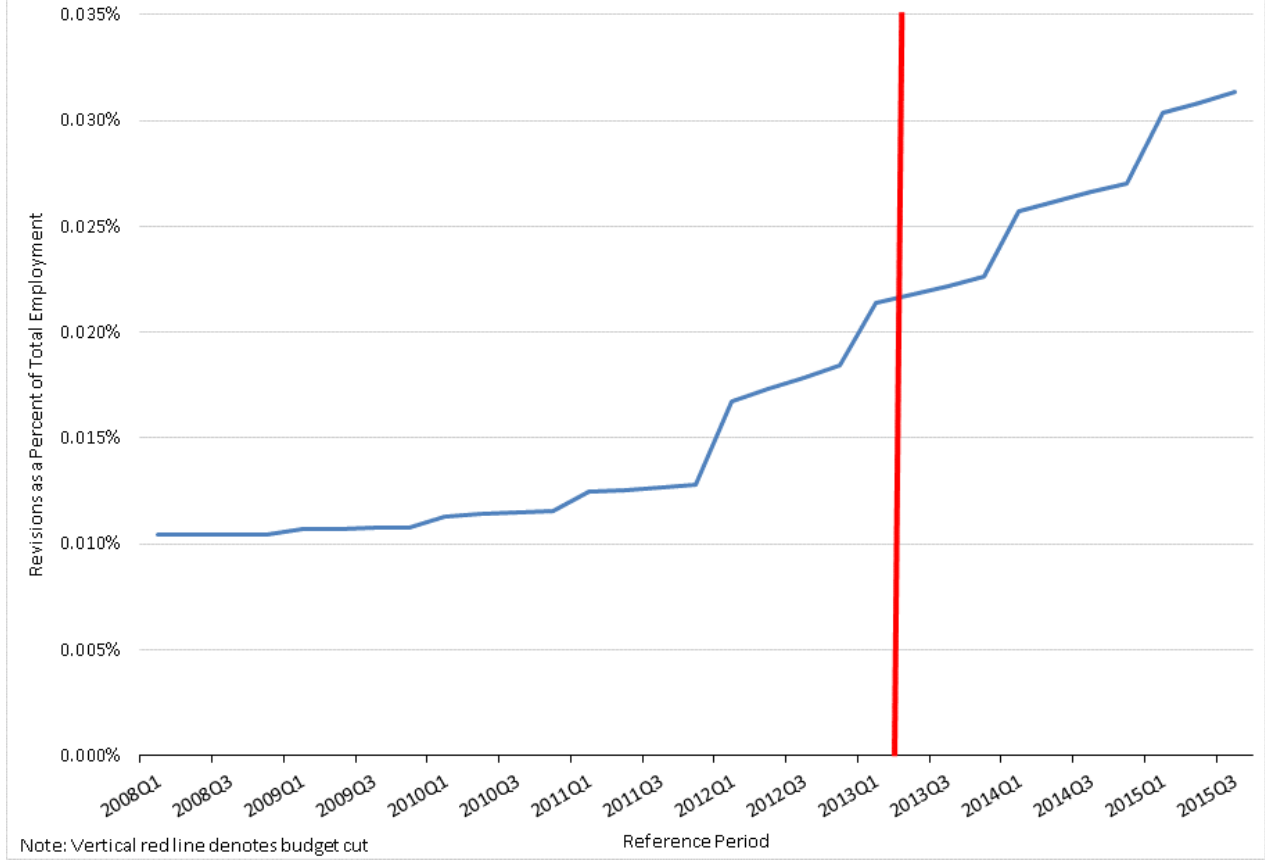
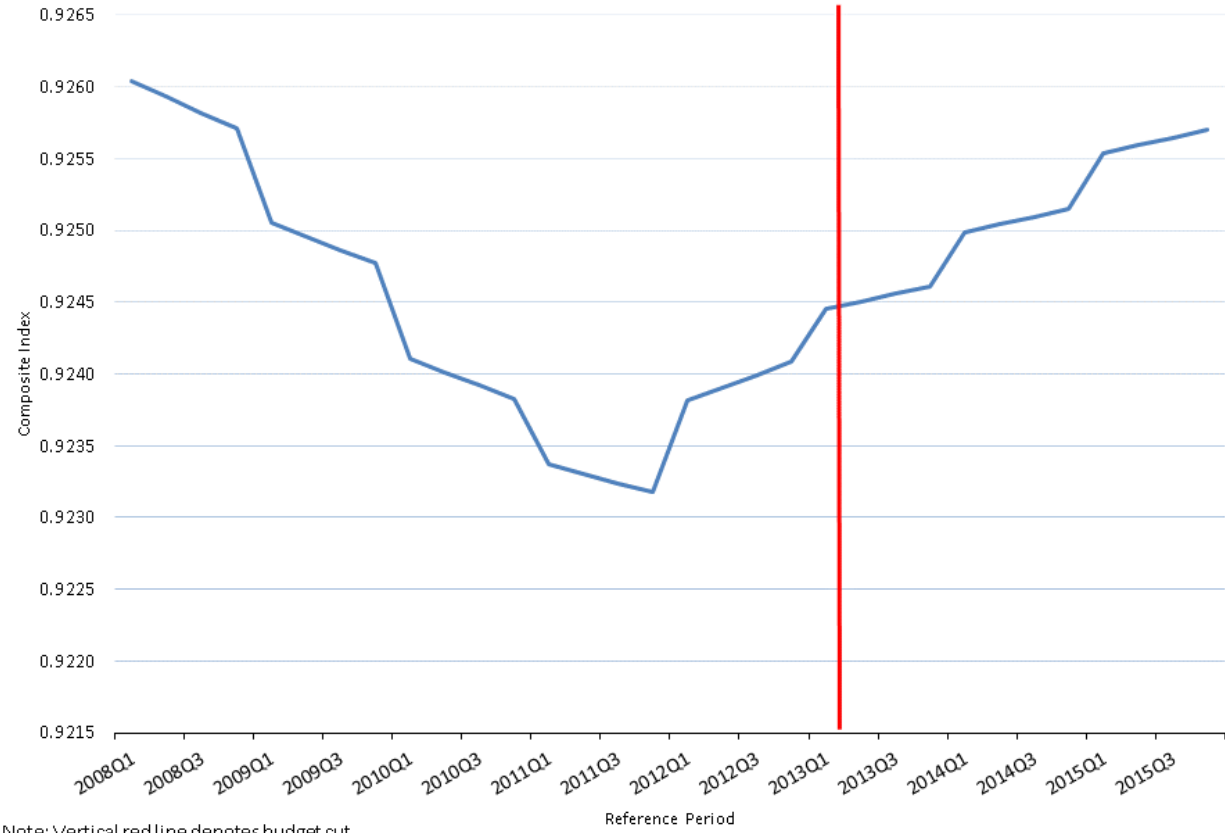


Chart 10: QCEW Data Quality by Employment: National



Note: Vertical red line denotes budget cut

Figure 1.

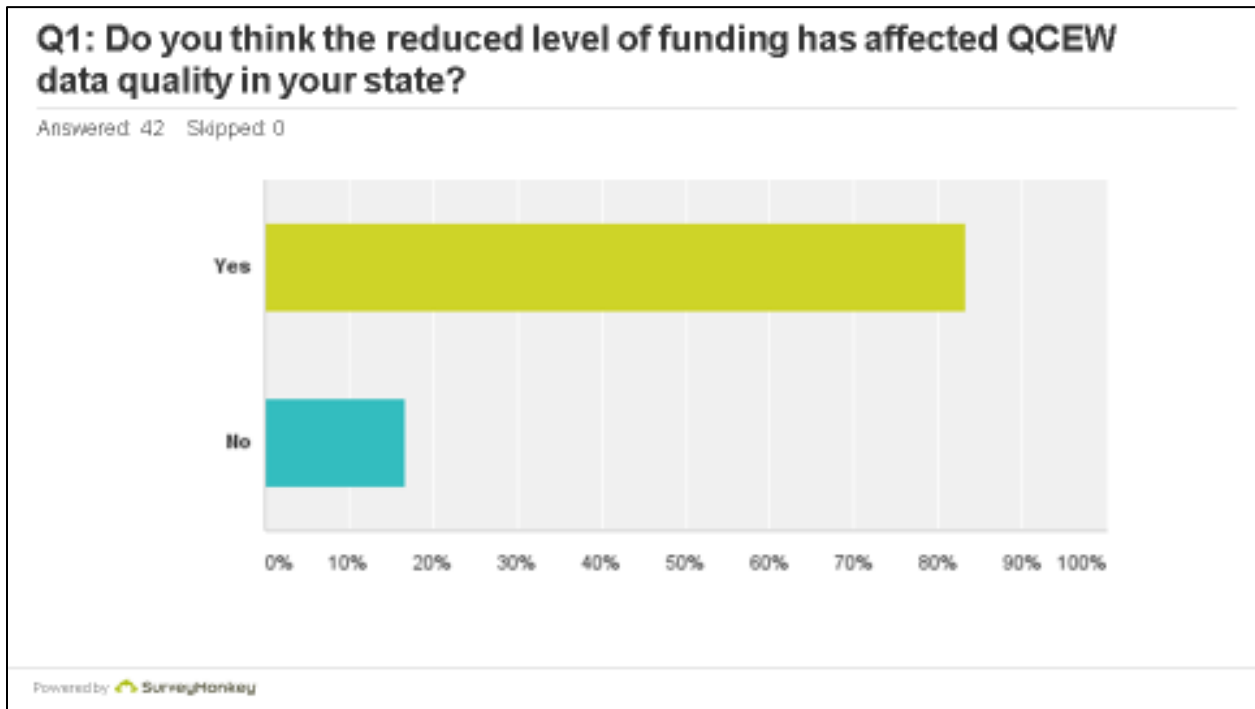
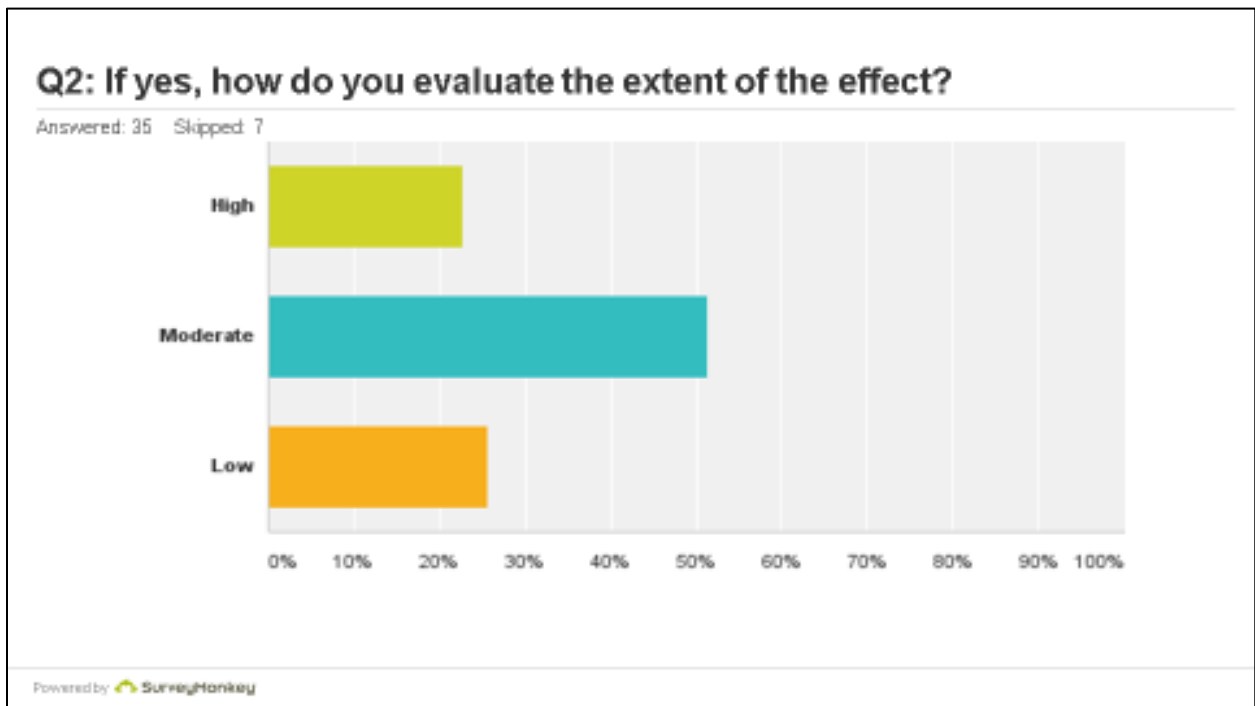
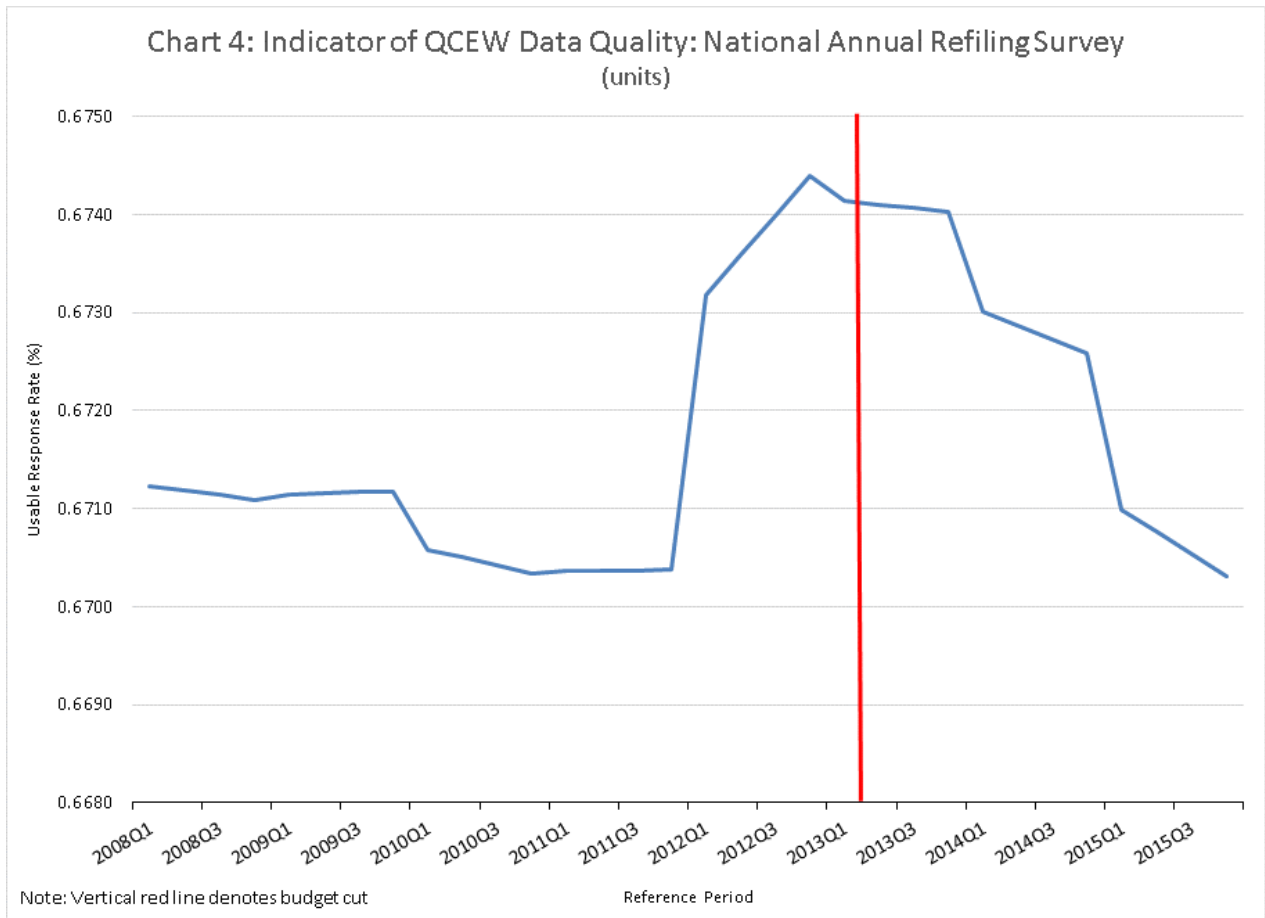


Figure 2.



APPENDIX A.



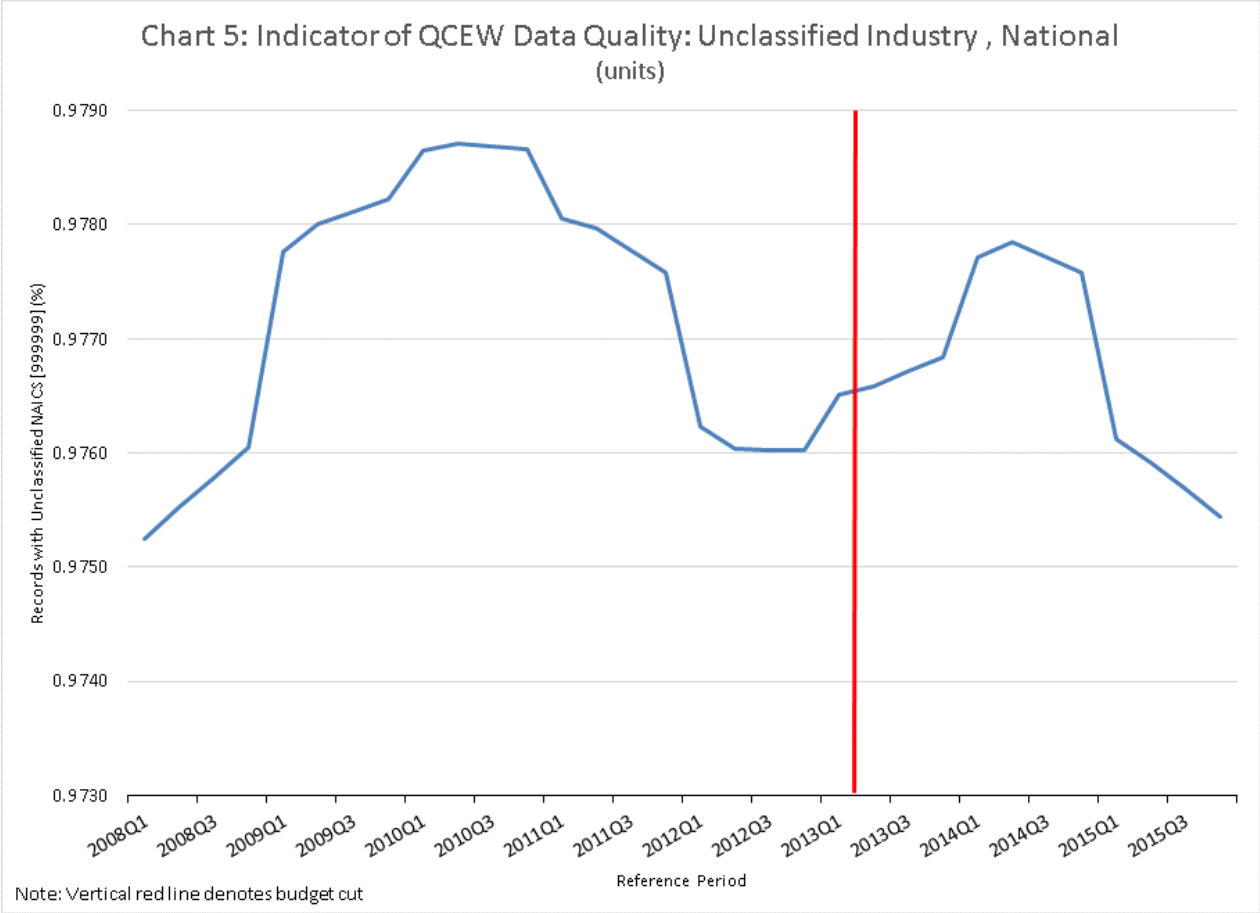


Chart 6: Indicator of QCEW Data Quality: Third Month Reported Employment, National (units)

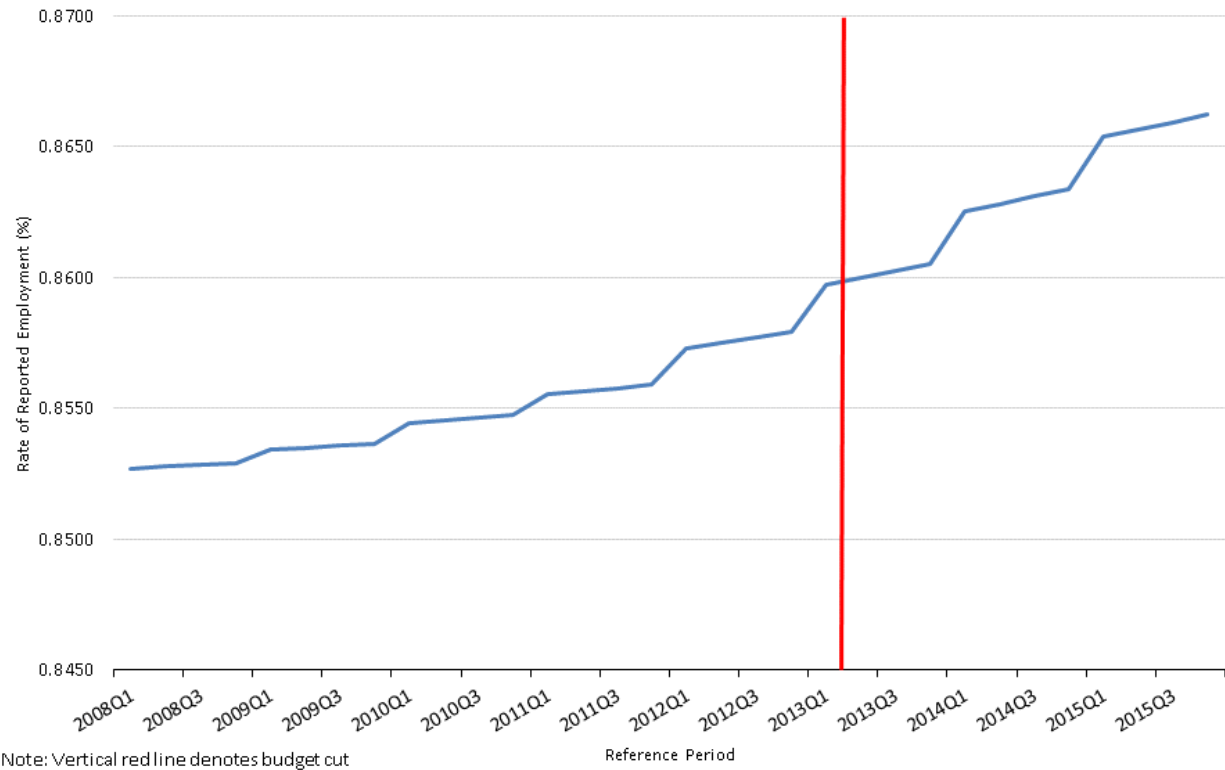
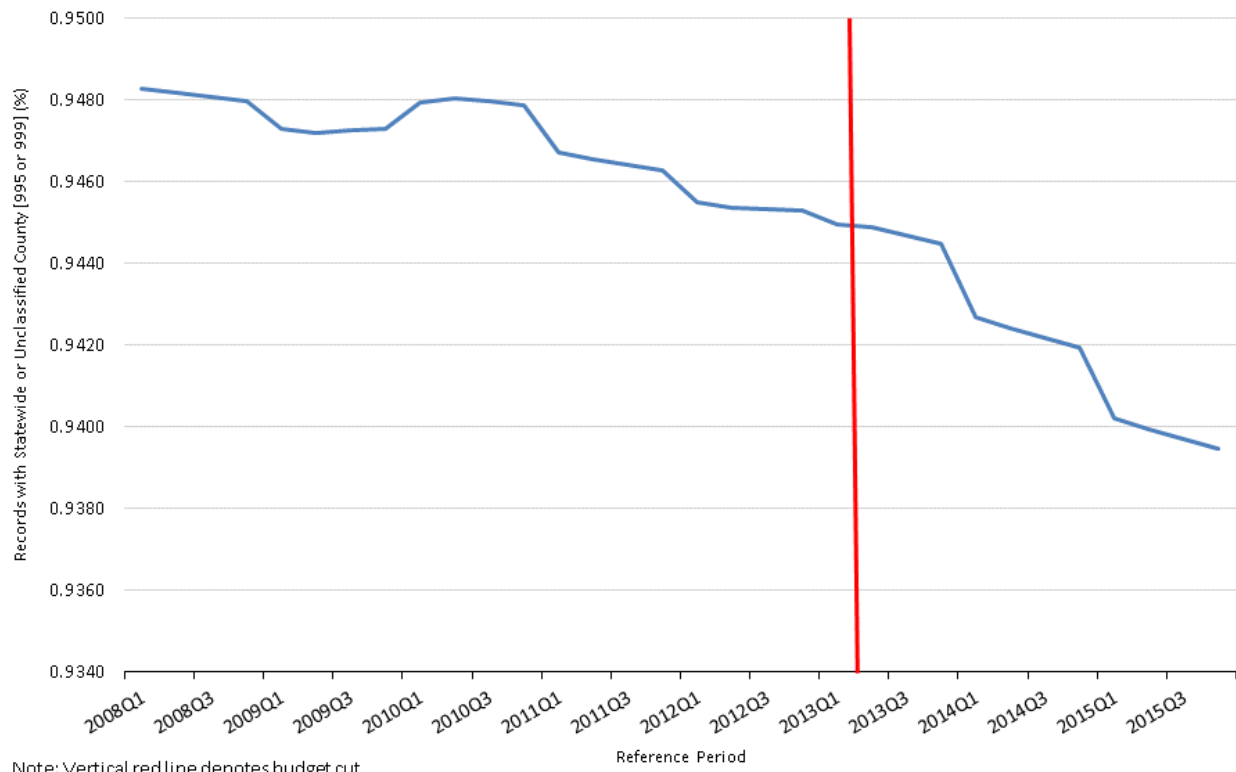
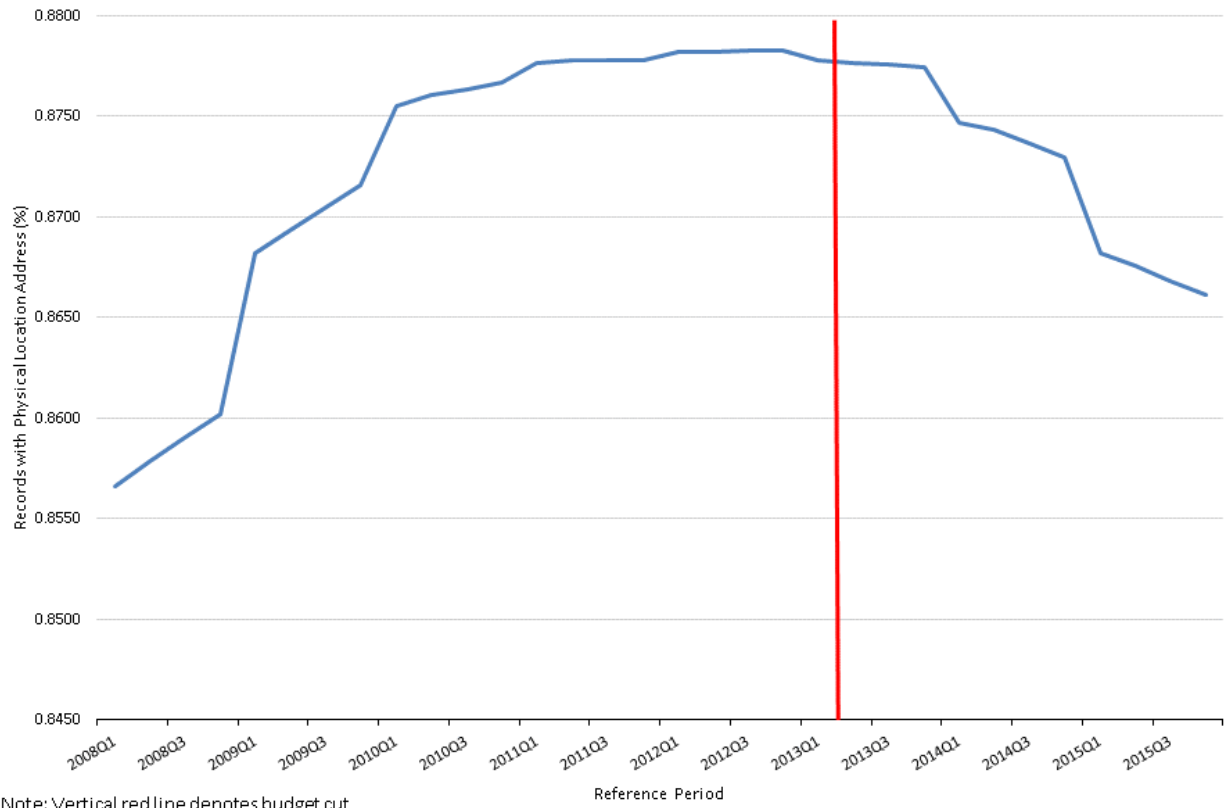


Chart 7: Indicator of QCEW Data Quality: Statewide or Unclassified County Code, National (units)



Note: Vertical red line denotes budget cut

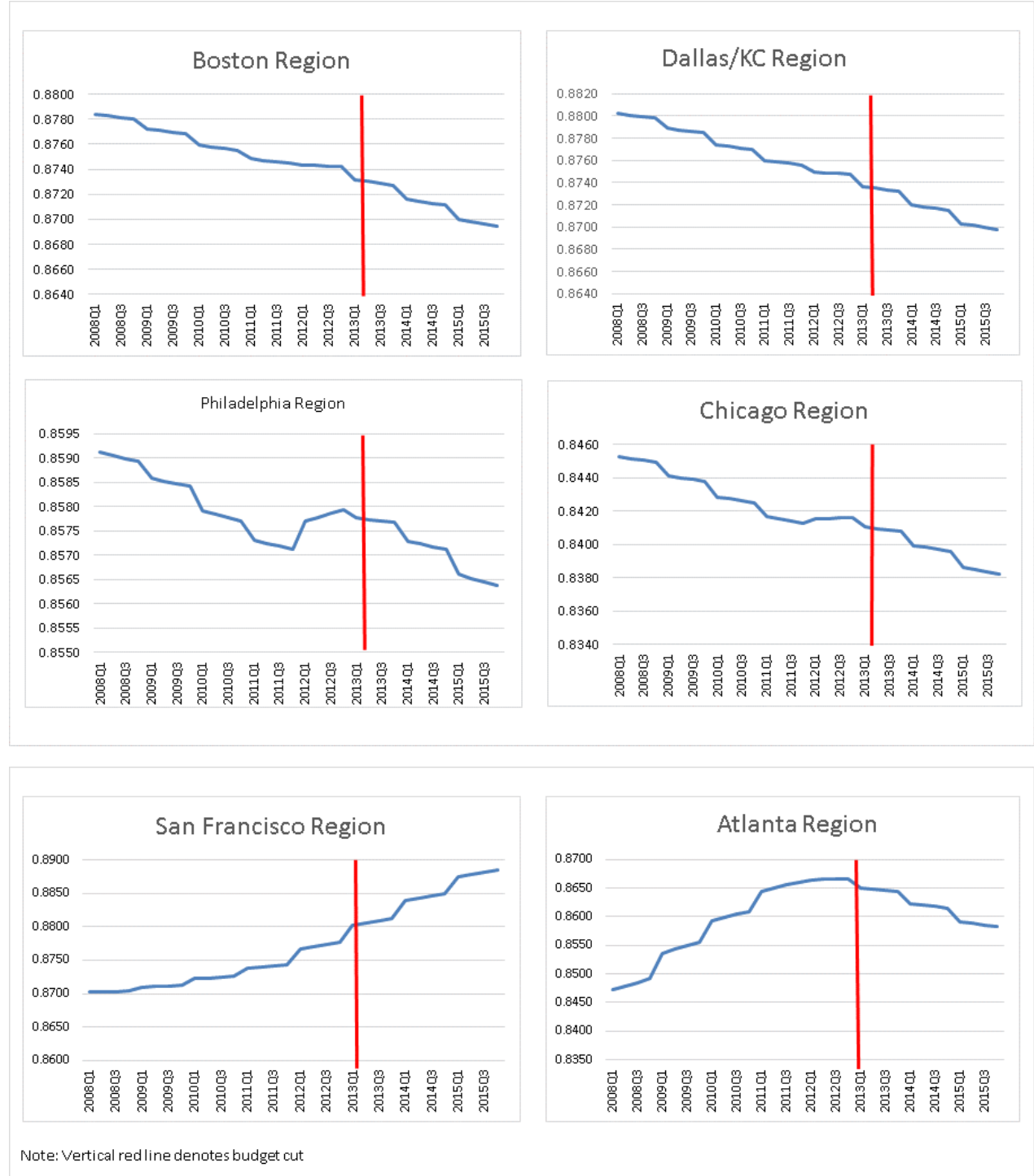
Chart 8: Indicator of QCEW Data Quality: Physical Location Address, National (units)



Note: Vertical red line denotes budget cut

APPENDIX B.

Composite indicator of QCEW data quality at the Regional level. The x-axis is the reference period and spans from first quarter 2008 to fourth quarter 2015. The y-axis is the composite indicator.



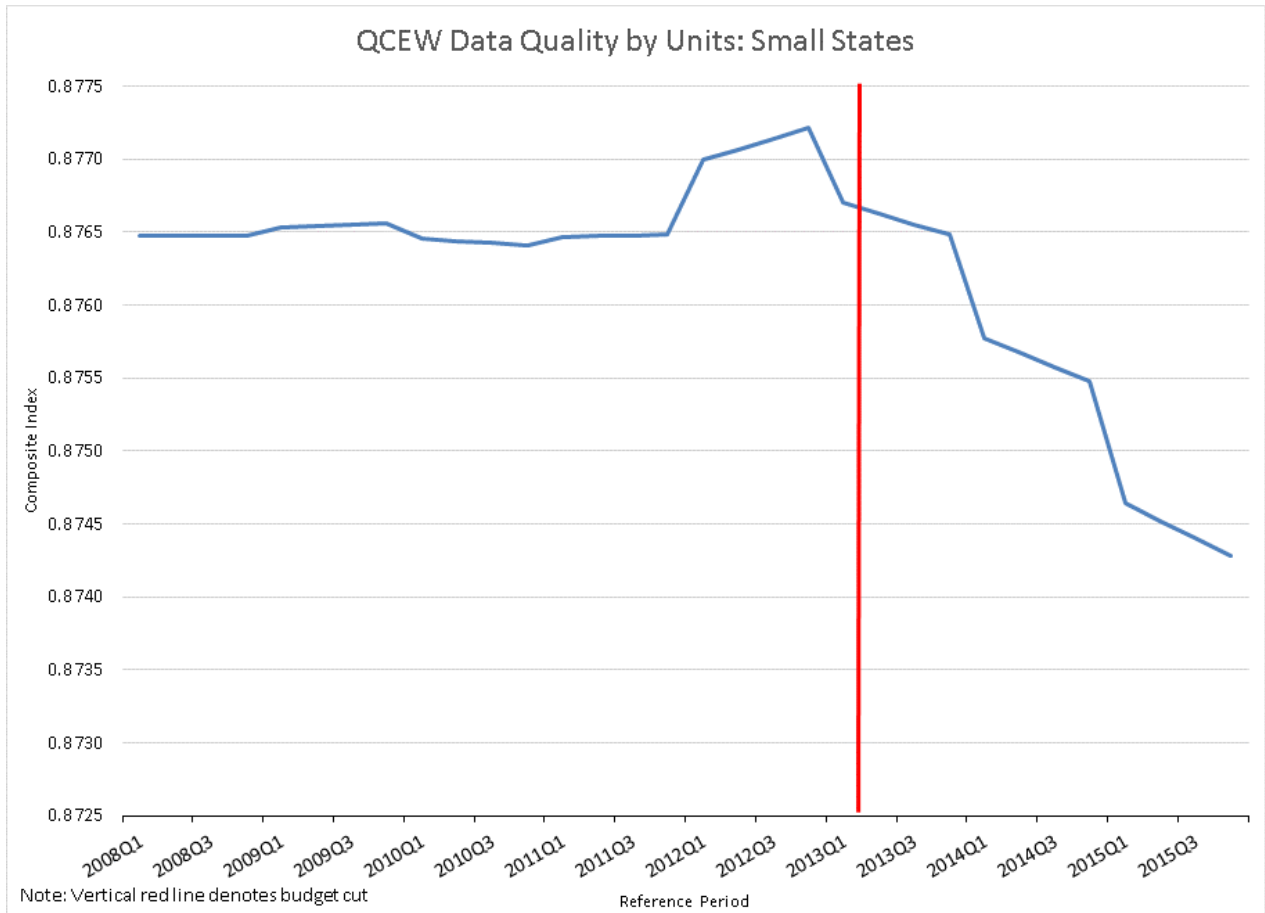
APPENDIX C.

States grouped by establishment count.

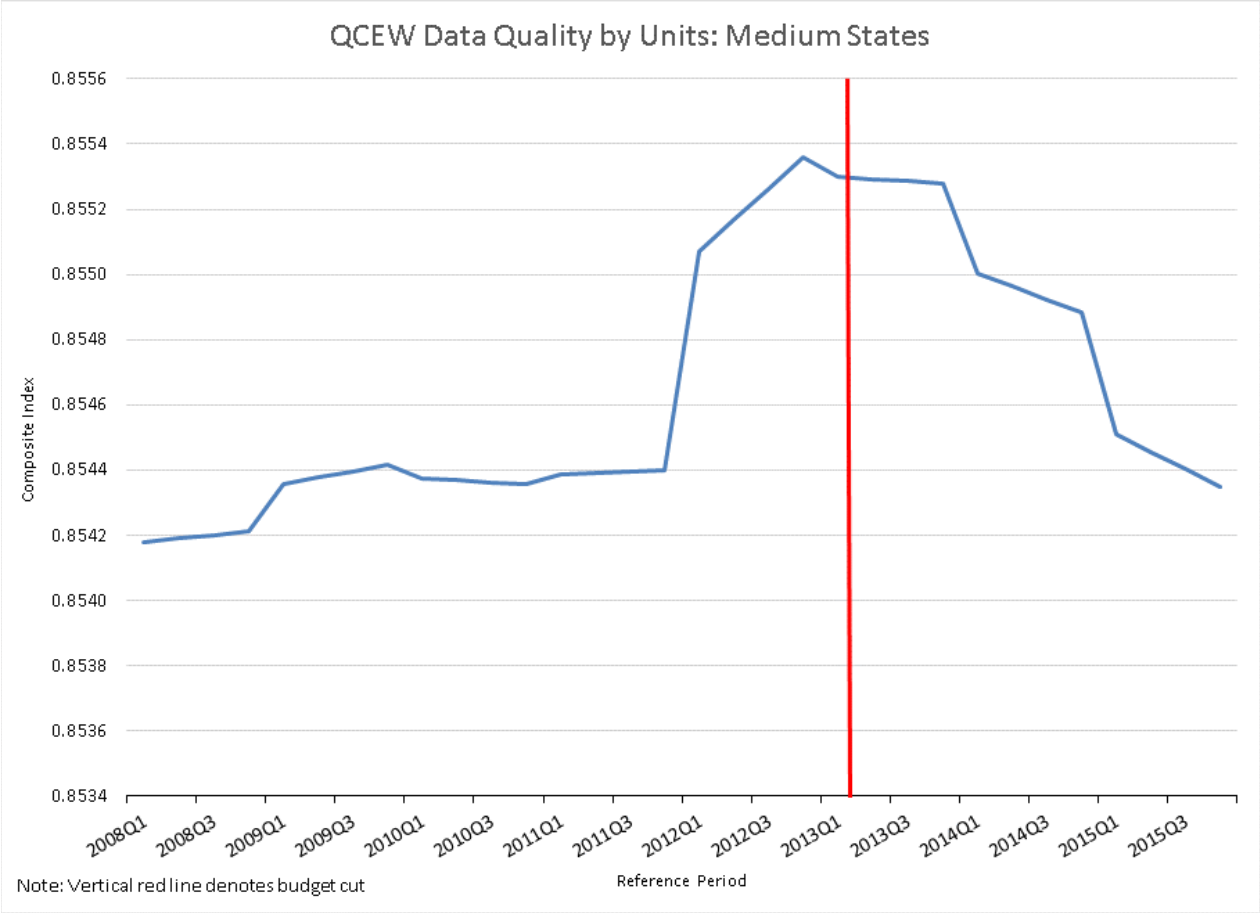
Large	California	Texas
	Florida	New York
Medium	Illinois	Washington
	Pennsylvania	Virginia
	Ohio	Michigan
	Georgia	Massachusetts
	New Jersey	Missouri
	North Carolina	Colorado
Small	Maryland	Nebraska
	Minnesota	New Mexico
	Wisconsin	Idaho
	Indiana	New Hampshire
	Arizona	West Virginia
	Tennessee	Maine
	Oregon	Puerto Rico
	Louisiana	Montana
	Kentucky	Hawaii
	South Carolina	District of Columbia
	Alabama	Rhode Island
	Connecticut	South Dakota
	Oklahoma	North Dakota
	Iowa	Delaware
	Utah	Wyoming
	Arkansas	Vermont
	Kansas	Alaska
	Nevada	Virgin Islands
Mississippi		

APPENDIX D.

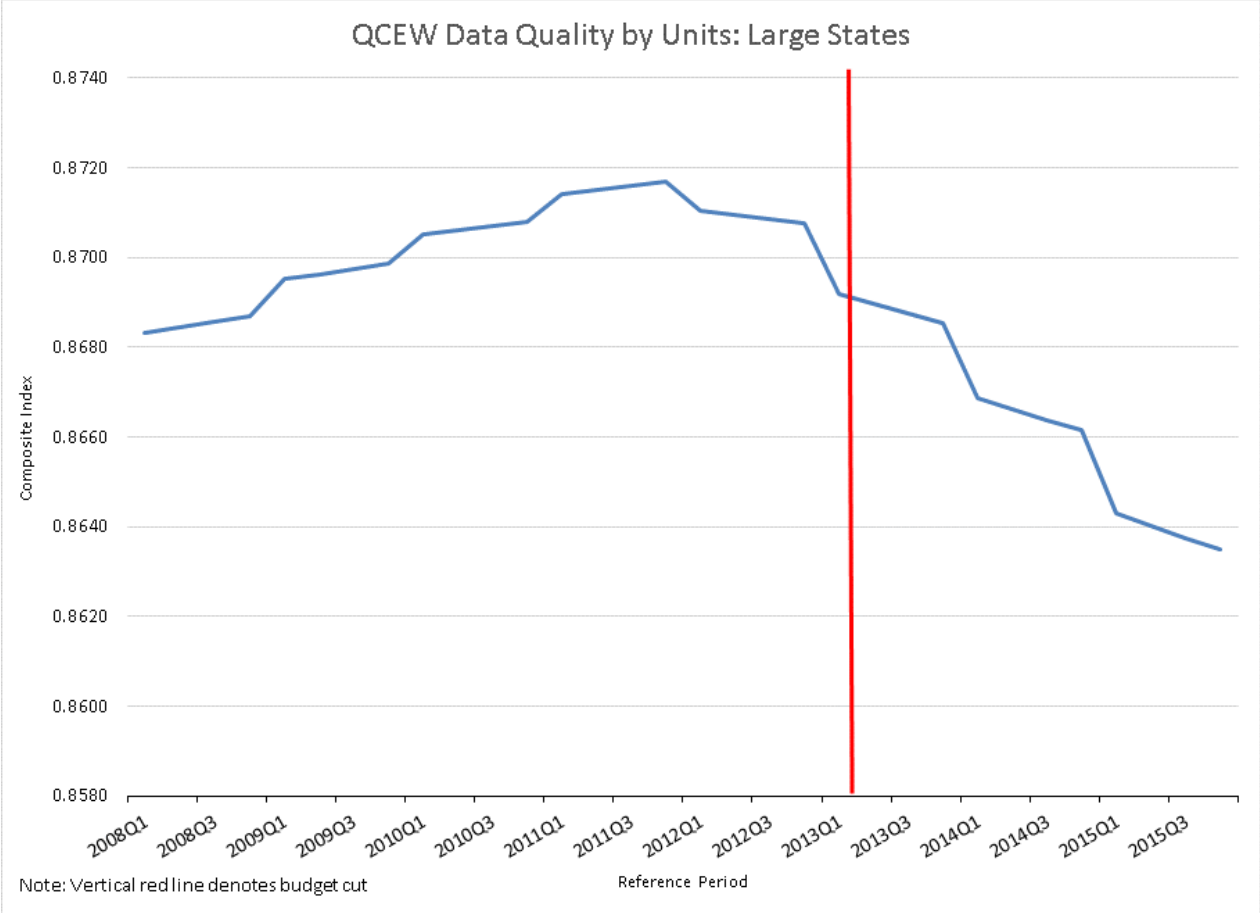
Effect of QCEW budget cut by size of state as measured by overall data quality composite index on units. Charts below include: Composite Indicator of the QCEW Data Quality, Small States, Medium States, and Large States.



Small States: Maryland, Minnesota, Wisconsin, Indiana, Arizona, Tennessee, Oregon, Louisiana, Kentucky, South Carolina, Alabama, Connecticut, Oklahoma, Iowa, Utah, Arkansas, Kansas, Nevada, Mississippi, Nebraska, New Mexico, Idaho, New Hampshire, West Virginia, Maine, Puerto Rico, Montana, Hawaii, District of Columbia, Rhode Island, South Dakota, North Dakota, Delaware, Wyoming, Vermont, Alaska, Virgin Islands.



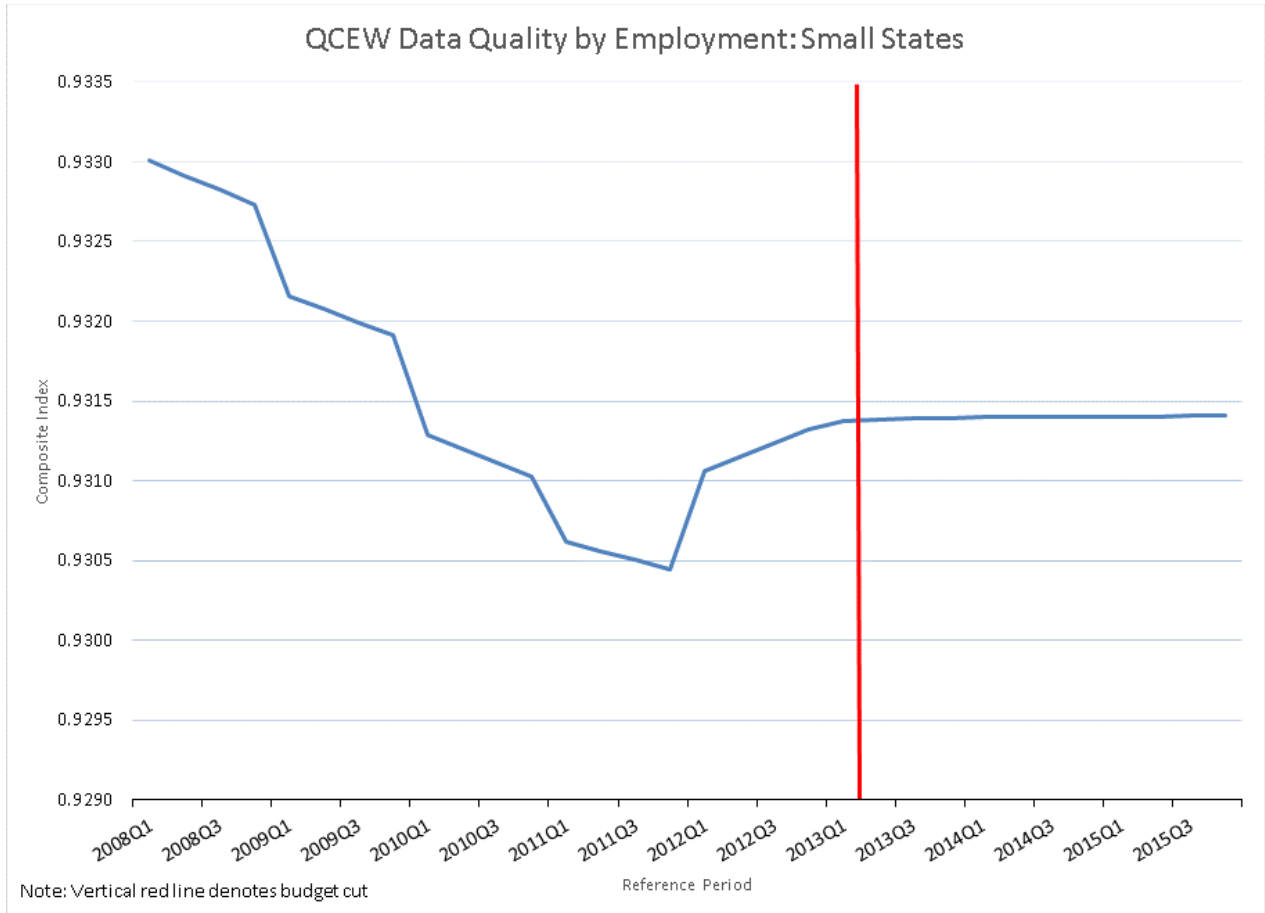
Medium States: Illinois, Pennsylvania, Ohio, Georgia, New Jersey, North Carolina, Washington, Virginia, Michigan, Massachusetts, Missouri, Colorado.



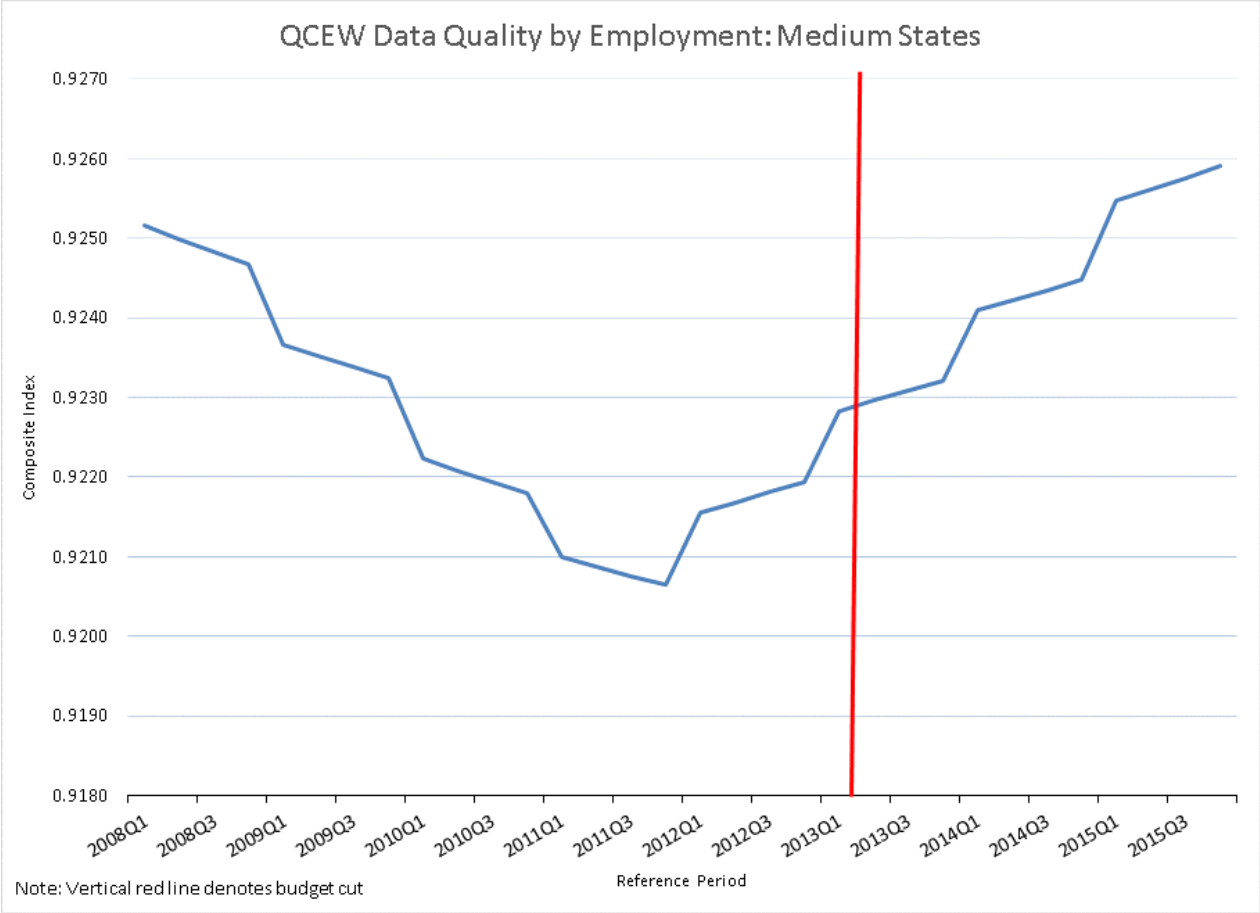
Large States: California, Florida, Texas, New York.

APPENDIX E.

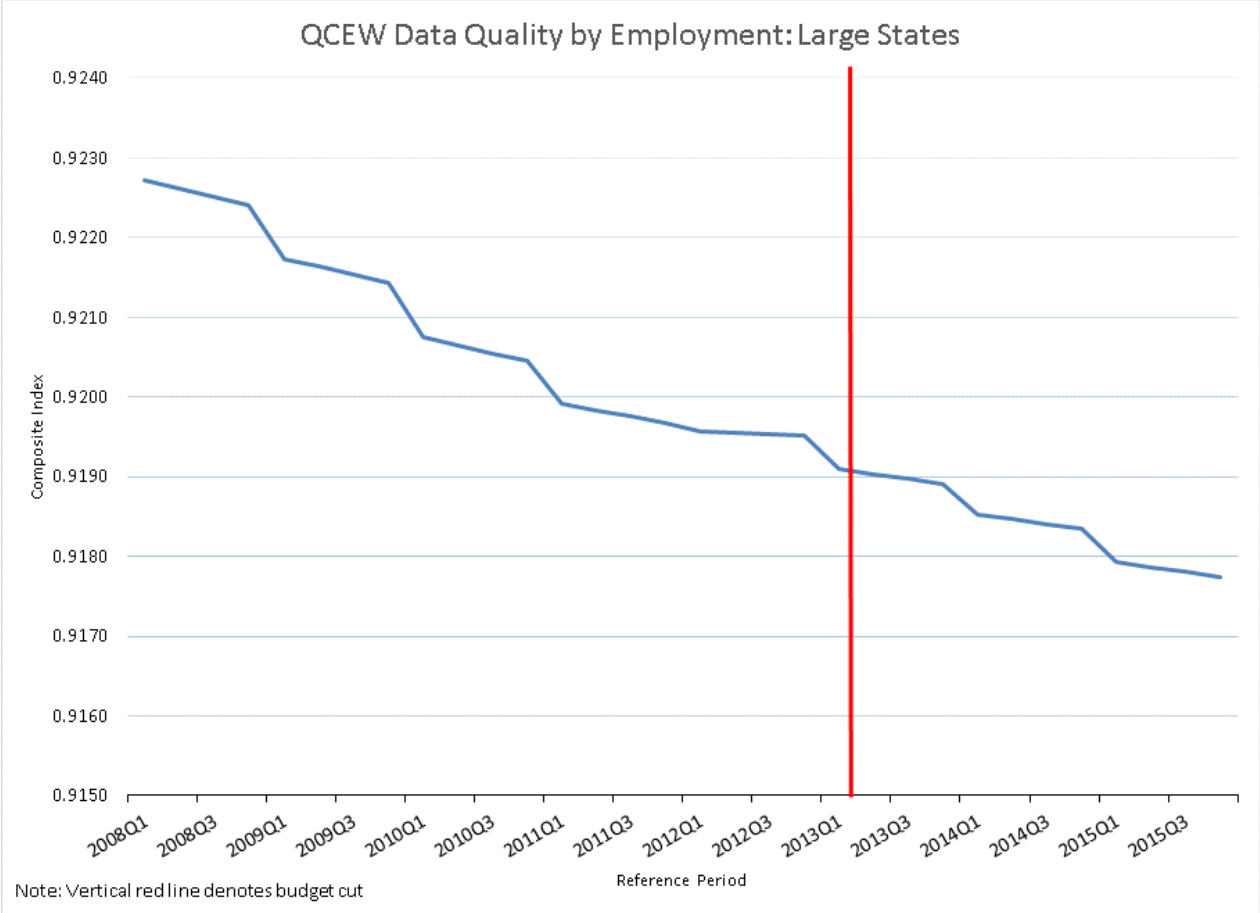
Effect of QCEW budget cut by size of state as measured by overall data quality composite index on employment. Charts below include: Composite Indicator of the QCEW Data Quality, Small States, Medium States, and Large States.



Small States: Maryland, Minnesota, Wisconsin, Indiana, Arizona, Tennessee, Oregon, Louisiana, Kentucky, South Carolina, Alabama, Connecticut, Oklahoma, Iowa, Utah, Arkansas, Kansas, Nevada, Mississippi, Nebraska, New Mexico, Idaho, New Hampshire, West Virginia, Maine, Puerto Rico, Montana, Hawaii, District of Columbia, Rhode Island, South Dakota, North Dakota, Delaware, Wyoming, Vermont, Alaska, Virgin Islands.



Medium States: Illinois, Pennsylvania, Ohio, Georgia, New Jersey, North Carolina, Washington, Virginia, Michigan, Massachusetts, Missouri, Colorado.



Large States: California, Florida, Texas, New York.