Bureau of Labor Statistics

Local Area Unemployment Statistics

Research and Methods Branch

Report on Revision to Handbook Method Employment Estimation

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Executive Summary

The Local Area Unemployment Statistics (LAUS) program proposes implementing an updated approach to the estimation of substate "handbook method" employment. Non-agricultural wage and salary employment will be disaggregated to the county level outside of New England and the Minor Civil Division (MCD) level in New England to correspond with the geographic level at which the other components of handbook method substate employment and unemployment will be input for estimation. Also, the threshold for inclusion of commuter areas in dynamic residency adjustment ratio (DRR) calculations will be changed from 100 employed persons to 10% of residence area commuter employment. This change is being made to streamline estimation operations and to avoid the inclusion of spurious commutation areas. The methodologies for estimating "all-other" and agricultural employment have been completely revised. This methodology update is necessitated by the discontinuation of the decennial Census "long" form questionnaire. The new methodology uses more timely data captured by the Current Population Survey (CPS) and the American Community Survey (ACS) to replace Census "long" form data. For all-other employment, an advantage of this new methodology is that it no longer relies on the correlation between wage and salary employment and all-other employment. While this relationship holds true for most areas, the assumption that these two measures move in tandem is not always borne out in the data. This methodology revision also improves upon the current approach to estimating agricultural employment at the level of agricultural regions defined by the USDA Farm Labor Survey. Estimation of agricultural employment tailored to the State level is possible using the revised methodology based on CPS and ACS data.

Introduction

The "handbook method" is used by the LAUS program to generate estimates for 2,350 intrastate and interstate Labor Market Areas (LMAs). With this approach, various labor force components are individually measured and subsequently added to produce handbook labor force estimates for the LMAs. Once the handbook estimates for all the LMAs within a State have been created, they then are controlled to the official State labor force estimates produced by the time-series models to become the official LAUS estimates.

Substate handbook employment estimates are computed as the sum of Line 1 (Non-agricultural Wage & Salary Employment), Line 2 (All-other Employment), and Line 3 (Agricultural Employment). This sum is then captured in handbook Line 4, total Handbook employment.

Figure 1. Handbook Employment Line Items

Employment	
Line	*Description*
1	Non-agricultural Wage & Salary Employment
2	All-other Employment
3	Agricultural Employment
4	Total Handbook Employment (lines 1 + 2 + 3)

As part of a general evaluation of the LAUS methodology, the methodology for estimating non-agricultural wage & salary employment was selected for modification for the following reasons: Decennial Census journey-to-work employment inputs are no longer being produced; The existing threshold for including commutation areas in dynamic residency adjustment ratio calculations included many unrealistic commuting areas; and new employment and unemployment inputs will be created at the county level (MCD level in New England) instead of the LMA level to create more accurate estimates at finer levels of geographic detail.

All-other employment accounts for the employment not captured either in the handbook estimate for non-agricultural wage and salary employment (line 1) or agricultural employment (line 3). All-other employment accounts for self-employed persons who work in their own unincorporated business, unpaid family members who work for a business owned by a family member; and private household workers. The methodology for estimating all-other employment was selected

for modification for the following reasons: The Census "long" form all-other employment inputs are no longer available; the assumption that there is a positive correlation between non-agriculture wage and salary employment (NAWS) and all-other employment does not always prove to be accurate, which indicates that the step-3 ratio may introduce error resulting from indexing change in all-other employment to change in non-agriculture wage and salary employment; and the strata designed to account for local labor market conditions are assigned for a period of at least 10 years, making them less likely to reflect current conditions as result.

The methodology for estimating agricultural employment was selected for modification for the following reasons: The Census "long" form all-other employment inputs are no longer available; the employment inputs for agricultural regions adopted from the Farm Labor Survey are not always representative of the trends and seasonality of the component States.

Objective of the Research

The goal of this research into the LAUS Handbook employment methodology was to find new data sources for journey-to-work employment, non-agricultural wage and salary employment, all-other employment, and agricultural employment and to develop an approach that would provide more accurate measures of the components of substate handbook method employment.

Line 1: Non-agricultural Wage & Salary Employment

The Handbook method calculation of non-agricultural wage and salary employment begins with input data that pertain to jobs by place of work. Because employment estimates from these sources are based on the location of the establishment, these "place-of-work" estimates must be adjusted to reflect the place-of-residence concept used in the CPS survey of households. Resident employment includes workers living and working in the same area and also those who work in other areas within commuting distance. Estimates of resident employment should, therefore, reflect employment changes in those related commutation areas as well. In 2005, LAUS introduced dynamic residency ratios (DRRs) to provide this adjustment. Multiple residency adjustment ratios were produced, using Census 2000 county-to-county worker commuting data and March/April 2000 total nonfarm job estimates. Separate residency adjustment ratios were developed for each estimating area and up to four additional labor market areas into which at least

100 residents commuted to work. Ratios for each of the commuting areas are multiplied by their respective monthly nonfarm jobs estimates to produce estimates of estimating area residents who work in each of the commuting areas. Separate commuting area estimates are summed to create a total of the resident nonfarm wage-and-salary employed for the estimating area. This adjustment also accounts for multiple jobholding and unpaid absences in the payroll employment estimates.

The following equation displays the DRR calculations for LMA_1:

Ratio 1:

$$\frac{\text{Employed residents } LMA_1 \text{ working in } LMA_1}{\text{Nonfarm employment Mar/Apr 2000 } LMA_1} \times \frac{\text{Census NAWS}_1}{\text{Total Commuters}_{1+2+\ldots+n}}$$

Ratio 2:

$$\frac{\text{Employed residents } LMA_1 \text{ working in } LMA_2}{\text{Nonfarm employment Mar/Apr 2000 } LMA_2} \times \frac{\text{Census NAWS}_1}{\text{Total Commuters}_{1+2+\ldots+n}}$$

Ratio n:

$$\frac{\text{Employed residents } LMA_1 \text{ working in } LMA_n}{\text{Nonfarm employment Mar/Apr 2000 } LMA_n} \times \frac{\text{Census NAWS}_1}{\text{Total Commuters}_{1+2+\ldots+n}}$$

When the LAUS implemented dynamic residency ratios, an important consideration in implementing this change was that it would be at least a decade until the DRR commuting areas would be updated using journey-to-work data from the next decennial census. For this reason, a relatively low threshold for the inclusion of commuting areas was applied in order to capture as much change in area commuting patterns over a long time frame as possible. Up to five total commuting areas with 100 or more commuters each from the residence area (50 or more commuters in New England) were included in residence area DRR calculation. We no longer face the time frame associated with decennial Census journey-to-work employment estimates, as ACS releases journey-to-work employment estimates every five years for the purpose of the OMB metro and micro area geography updates. It has been determined that 10% of total commuter employment is a preferable threshold for including commutation areas in a residence area's DRR calculation. This new threshold achieves a desirable balance between operational streamlining and

capturing as much economic information as necessary. This change was based on the increased frequency of availability of these commutation data from ACS combined with the appearance of many superfluous and unreasonable commuting areas when the current threshold was applied to the ACS journey-to-work data. The list of DRR areas will be updated each time a new ACS commutation employment dataset is released.

LAUS estimation is currently undertaken at the LMA level for substate areas calculated using the handbook method. Establishment-based Non Agricultural Wage and Salary employment estimates and labor-management disputants are input at the LMA level. A dynamic residency ratio is then applied to these inputs to convert the establishment-based employment to a residency employment basis. As part of the methodology revision, all MCDs in New England and counties outside of New England will be treated as Handbook method areas. This change will bring about a distinction between the geography of Handbook Method areas and the geography of establishment-based employment inputs. Developing handbook line 1 estimates at the county and MCD levels will be accomplished by building a disaggregation step into the line 1 calculation. Line 1 values will be calculated in an intermediate step for multi-county or multi-MCD areas. These intermediate handbook line 1 values will then be disaggregated to the county- or MCD-level using ACS non-agricultural wage and salary employment ratios derived from the most recent ACS five-year dataset. Essentially, the calculation of Handbook line 1 will be the same as it is currently but with the added step of disaggregating the multi-county or multi-MCD area line 1 value to the county- or MCD-level. This change in the calculation of line 1 employment estimates will bring about geographic consistency with the other components of handbook employment and unemployment estimation, which will also be input at the county or MCD level. In addition, developing handbook method inputs at a more granular geographic level will allow better operational flexibility in future updates to the geographic definitions of labor market areas as counties (and MCDs in New England) are the basic component in OMB definitions of LMAs.

Line 2: All-other Employment

Description of the Current Methodology
The current approach to estimating all-other employment is based on the assumption that there is a correlation at the national level between changes in non-agriculture wage and salary employment

and all-other employment. The original analysis which led to this estimating methodology was based on an examination of the relationship between all-other employment and wage-and-salary employment in the Nation as a whole and in a randomly selected sample of areas using the 1940 and 1950 Census data. It was found that in both the areas and the Nation, the relative change in wage-and-salary employment was accompanied by a proportional relative change in all-other employment. In other words, slow wage and salary growth was accompanied by slow all-other employment growth, and rapid wage and salary growth was accompanied by rapid all-other employment growth. It was also found that the proportional relative changes in all-other employment in the areas and in the Nation were very close to each other. This meant that the relative change in area all-other employment could be derived given the relative change in area wage and salary employment and the ratio of the relative national change in all-other employment to the relative national change in wage-and-salary employment.

Analyses utilizing data from subsequent Censuses corroborated the findings of the original study. However, discrepancies between individual areas, on the one hand, and areas and the Nation on the other, proved quite common and pointed out the need for area adjustment. The CPS sample expansion of the 1970's provided additional geographic detail on all-other employment and allowed the opportunity for analysis and testing of differences in the proportionality factor between States.

Following each Census, the relative change in wage and salary employment divided by the relative change in all-other employment was calculated and reviewed. Clusters of States with similar proportionality constants were grouped into strata. Four strata were defined following the 1980 Census and three were defined following the 1990 and 2000 Censuses. By grouping States into strata based on their ratio of relative change, it was found that LMA all-other employment estimates could be improved. Specifically, using the proportionality factor for State-based strata to estimate all-other employment for LMAs significantly reduced the range of error in estimating all-other employment.

These ratios of relative change are called "Step 3 Ratios" and are created and distributed on a monthly basis. States with similar relative changes in non-agriculture wage and salary

employment and all-other employment are grouped into one of three strata. Once the State strata are established, LMAs are assigned to one of the three State strata based on the LMA's relative change in non-agriculture wage & salary employment and all-other employment.

Three steps are then taken to estimate all-other employment: First, the LMA's change ratio of nonagricultural wage & salary employment is created using the decennial Census base estimate and the reference month estimate. In the second step, this ratio is used to extrapolate the LMA's Census all-other employment base estimate through the reference month. In the third step, the extrapolated LMA estimate is adjusted using the Step 3 ratio corresponding to the assigned State stratum.

For example, if the LMA's Census all-other employment count is 10,000 and the change ratio between the LMA's Census and the current non-agriculture wage & salary employment is 15%, the extrapolated estimate is 11,500 (10,000*.15). If the Step-3 ratio is .98, the LMA all-other employment estimate is 11,270 or (11,500*.98).

One issue with this methodology is its reliance on a decennial Census input that becomes progressively more outdated as time elapses from the previous decennial Census. In the attempt to produce an all-other employment component of handbook employment estimation that reflects current economic conditions in LMAs, change in non-agricultural wage and salary employment is used as a proxy for change in all-other employment. Furthermore, LMAs are differentiated within three separate strata to account for differing relationships between change in all-other employment and change in non-agricultural wage and salary employment. While this method mostly proves effective, subsequent analysis using ACS all-other employment estimates has highlighted that for certain areas, the relationship between changes in all-other and non-agricultural wage and salary employment does not hold true.

Development and evaluation of alternative methods

The CPS and the ACS were identified as the most appropriate sources for the all-other employment data that were previously obtained from the decennial Census long-form survey. For LAUS purposes, both ACS and CPS offer differing strengths and drawbacks. The goal was to

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utilize the strengths and to mitigate the drawbacks of each data source. For instance, the CPS data are only available at the State level, while the ACS data are available at the detailed geographic level needed for LAUS substate Handbook method estimation. Also, the CPS data are current and are available on a monthly basis, while the required ACS data are available on a yearly basis in the form of 5-year estimates.

Since the monthly CPS data are only available at the State level and the ACS provides more geographically detailed data, the ACS data are used to distribute the CPS data to substate areas. To do this, the ACS all-other employment estimate for a given area is divided by the sum of ACS all-other employment for all areas within the State. The resulting ratio for a given area is referred to as the "ACS share". The ACS share is expressed as:

$$\mathbf{ACSshare \ = \ ACS}o \ \div \ \sum_{i=1}^{n} \mathbf{ACS}o$$

> *Where:*
> $\mathbf{ACS}o$ = area estimate of ACS all-other employment
> $\sum_{i=1}^{n} \mathbf{ACS}o$ = sum of areas' estimates of ACS all-other employment

The ACS shares of all-other employment are relatively stable from year to year and are used to disaggregate CPS monthly statewide all-other employment to the area level. While Handbook line 2 all-other employment was previously calculated at the LMA level, the ACS data allow for the development of these inputs at the county level outside of New England and at the MCD level for New England. The precedent for using ACS data to disaggregate CPS all-other employment comes from the handbook methodology used to estimate new entrant and reentrant unemployment. This method assigns a portion of the CPS statewide new entrant and reentrant unemployment to individual areas based on a population-specific ratio derived for the specific area.

Research showed that CPS all-other employment estimates at the State level tend to be volatile month-to-month and are not suitable for direct use. To mitigate the volatility of the CPS monthly statewide all-other employment estimates and obtain inputs more suitable for handbook estimation, five years of CPS data for a given month are used to develop weighted-average estimates. This allows the current month's CPS estimate to gain strength from prior year estimates while retaining the seasonality of the reference month. (Figure 2. shows the weights

used, where "y" is the current year.) For consistency, the sum of 5-year State weighted averages is controlled to the current monthly national CPS estimate of all-other employment.

Figure 2.

Year	Weight
y	0.40
y − 1	0.25
y − 2	0.20
y − 3	0.10
y − 4	0.05

Using a weighted average of statewide CPS all-other employment and the area ACS share to generate the handbook method area all-other employment estimate is expressed as follows:

$$\text{All-Other Emp}_{area} = (\text{CPS}_{wto} * \text{ACSshare}_{o}) * \text{CPS}_{r}$$

Where:

CPS_{wto} = Weighted average of the given month's CPS all-other employment for the area

ACSshare_{o} = ACS share of all-other employment for the area

CPS_{r} = Ratio for controlling sum-of-State weighted averages to national CPS all-other employment

ACS data provide estimates for all-other employment at a more detailed level of geography and allow for the elimination of the Step 3 ratios, which introduce error into the estimate when all-other employment moves differently from non-agriculture wage and salary employment.

Research findings show that the new methodology generally improves handbook method all-other employment estimates. For example, for some areas the new methodology produces estimates that much more closely approximate the most recent corresponding ACS all-other employment estimates. ACS data are a suitable benchmark in this instance, since they are the only available direct estimates of all-other employment at the detailed area level to be published since the Census 2000 long form data was made available. Overall, for most handbook method areas the incorporation of all-other employment estimates based on the new methodology has a limited impact on total handbook employment and the corresponding unemployment rate due to the

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limited proportion of all-other employment in the majority of handbook-estimated areas. Occasional large differences in labor force estimates between the current and the new methodology appear to be caused by improvements over the shortcomings of the old methodology, which sometimes deviated from the more current ACS direct estimates of all-other employment.

Line 3: Agricultural Employment

Description of the Current Methodology

Unlike the non-agricultural Handbook employment estimates, which split employment by class of worker—wage and salary (line 1) and "all-other" (line 2)—the agricultural Handbook employment estimate encompasses all classes of worker—wage and salary, self-employed, and unpaid family—in a single estimate. This is accomplished by applying a monthly change factor to a decennial base of agricultural employment obtained from 2000 Census long form data. The following formula shows the calculation for each LMA.

$$L03 \ = \ (\,C05\,) \ \times \ (\,\text{Change factor}\,)$$

Where:

Variable	Description (LSS Plus Variable ID)
L03	Handbook Agricultural Employment
C05	Census Agricultural Employment (C05)
Change factor	Agricultural Employment Monthly Change Factor (G01 – G21)

Development of the Agricultural Employment Methodology

Prior to the incorporation of 2000 Census data into the Handbook methodology, the procedure for agricultural employment estimation utilized information from the 1990 Census, the Current Population Survey (CPS), and the Department of Agriculture's Farm Labor Survey (FLS). As of 2002, the FLS ceased to provide information for all farm workers and began limiting its quarterly

publication to information for hired workers only. Because hired workers account for only 35 to 50 percent of all agricultural workers, the FLS data became an inadequate benchmark for Handbook agricultural employment estimation.

To be congruent with the CPS definition of employment, the self-employed and unpaid family workers must be included in addition to hired workers. Because of this, FLS data are no longer used. Currently, unpublished monthly estimates of agricultural employment from the CPS are used in lieu of FLS data.

Agricultural Regions

The Agriculture Department, through the FLS, designated twenty-one estimating regions. Fifteen of the regions were creating by grouping States that have similar agricultural activities, while six others each comprise only one State. Though LAUS no longer uses FLS data, the Handbook methodology continues to utilize the FLS agricultural regions. The regions are listed in the following table.

Region Number	Agricultural Region	State(s)*
1	Northeast I	CT, ME, MA, NH, NY, RI, and VT
2	Northeast II	DE, MD, NJ, and PA
3	Appalachian I	NC and VA
4	Appalachian II	TN and WV
5	Southeast	AL, GA, and SC
6	Florida	FL
7	Lake	MI, MN, and WI
8	Corn Belt I	IL, IN, KY, and OH
9	Corn Belt II	IA and MO
10	Delta	AR, LA, and MS
11	Northern Plains	KS, NE, ND, and SD
12	Southern Plains	OK and TX
13	Mountain I	ID, MT, and WY
14	Mountain II	CO, NV, and UT
15	Mountain III	AZ and NM

16	Pacific	OR and WA
17	California	CA
18	Hawaii	HI
19	Michigan	MI
20	Minnesota	MN
21	Wisconsin	WI

* Alaska, the District of Columbia, and Puerto Rico are not included in any agricultural estimating region.

Agricultural Employment Monthly Change Factors

A change factor created at the agricultural region level from the component States' annual average CPS agricultural employment estimates is used annually to rebase to the LMA's decennial Census agricultural employment estimate. This ratio is then multiplied by the annual change factor from the previous year in order to move the decennial Census area estimate forward. The annual change factor is calculated as the CPS annual average agricultural employment for the agricultural region in the recently completed year (y) divided by the CPS annual average agricultural employment for the agricultural region from the prior year (y-1) multiplied by the annual change factor from the previous year.

$$\textit{Annual change factor} = \left(\frac{\textit{AACPS (y)}}{\textit{AACPS (y-1)}} \right) \textit{Annual change factor (y-1)}$$

A current production month change factor is then created by applying the annual change factor to a ratio of the reference month CPS agricultural employment for the agricultural region divided by the July CPS agricultural employment of the previous completed year.

$$\textit{Monthly factor} = \textit{Annual change factor} \left(\frac{\textit{Ref month CPS}}{\textit{July CPS}} \right)$$

Each month the current change factor produced using the above formula is applied to the LMA agricultural employment estimate from the 2000 Census to arrive at the current month's total agricultural employment estimate for the LMA.

Development and evaluation of alternative methods

The CPS and the ACS were identified as the most appropriate sources for the agricultural employment data that were previously obtained from the decennial Census long-form survey. For LAUS purposes, both ACS and CPS offer differing strengths and drawbacks. The goal was to utilize the strengths and to mitigate the drawbacks of each data source. For instance, the CPS data are only available at the State level, while the ACS data are available at the detailed geographic level needed for LAUS substate Handbook method estimation. Also, the CPS data are current and are available on a monthly basis, while the required ACS data are available on a yearly basis in the form of 5-year estimates.

Since the monthly CPS data are only available at the State level and the ACS provides more geographically detailed data, the ACS data area used to distribute the CPS data to substate areas. To do this, the ACS agricultural employment estimate for a given area is divided by the sum of ACS agricultural employment for all areas within the State. The resulting ratio for a given area is referred to as the "ACS share". The ACS share is expressed as:

$$\mathbf{ACSshare} \ = \ \mathbf{ACS}a \ \div \ \sum_{i=1}^{n} \mathbf{ACS}a$$

Where:

$\mathbf{ACS}a$ = area estimate of ACS agricultural employment

$\sum_{i=1}^{n} \mathbf{ACS}a$ = sum of areas' estimates of ACS agricultural employment

The ACS shares of agricultural employment are relatively stable from year to year and are used to disaggregate CPS monthly statewide agricultural employment to the area level. While Handbook line 3 agricultural employment was previously calculated at the LMA level, the ACS data allow for the development of these inputs at the county level outside of New England and at the MCD level for New England. Developing handbook method inputs at a more granular geographic level will allow better operational flexibility in future updates to the geographic definitions of labor

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market areas. The precedent for using ACS data to disaggregate CPS agricultural employment comes from the handbook methodology used to estimate new entrant and reentrant unemployment. This method assigns a portion of the CPS statewide new entrant and reentrant unemployment to individual areas based on a population-specific ratio derived for the specific area.

Research showed that CPS agricultural employment estimates at the State level tend to be volatile month-to-month and are not suitable for direct use. To mitigate the volatility of the CPS monthly statewide agricultural employment estimates and obtain inputs more suitable for handbook estimation, five years of CPS data for a given month are used to develop weighted-average estimates. This allows the current month's CPS estimate to gain strength from prior year estimates while retaining the seasonality of the reference month. (Figure 2. shows the weights used, where "y" is the current year.) For consistency, the sum of 5-year State weighted averages is controlled to the currently monthly national CPS estimate of agricultural employment.

Figure 2.

Year	Weight
y	0.40
y − 1	0.25
y − 2	0.20
y − 3	0.10
y − 4	0.05

Using a weighted average of statewide CPS agricultural employment and the area ACS share to generate the handbook method area agricultural employment estimate is expressed as follows:

$$\text{Agricultural Emp}_{area} = (\text{CPS}_{wta} * \text{ACSshare}_{a}) * \text{CPS}_{r}$$

Where:

CPS_{wta} = Weighted average of the given month's CPS agricultual employment for the area

ACSshare_{a} = ACS share of agricultural employment for the area

CPS_{r} = Ratio for controlling sum-of-State weighted averages to national CPS agricultural employment

ACS data provide estimates for agricultural employment at the detailed level of geography required for substate handbook estimation and CPS weighted averages provide State-specific monthly control totals for the application of ACS area agricultural employment shares. This allows for the preservation of State-specific trend and seasonality in agricultural employment, and enables us to eliminate reliance on the agricultural regions inherited from when FLS data was still used in estimating handbook line 3.

Research findings show that the new methodology generally improves handbook method agricultural employment estimates. For example, for some areas the new methodology produces estimates that much more closely approximate the most recent corresponding ACS agricultural employment estimates. ACS data are a suitable benchmark in this instance, since they are the only available direct estimates of all agricultural employment at the detailed area level to be published since the Census 2000 long form data was made available. Overall, for most handbook method areas the incorporation of agricultural employment estimates based on the new methodology has a limited impact on total handbook employment and the corresponding unemployment rate due to the limited proportion of agricultural employment in the majority of handbook-estimated areas. Occasional large differences in labor force estimates between the current and the new methodology appear to be caused by improvements over the shortcomings of the old methodology, which sometimes deviated from the more current ACS direct estimates of agricultural employment.

Recommendations

The LAUS program recommends the use of the new approaches to estimating the various components of handbook method employment enumerated above. Changes to the estimation of line 1 reflect the increased availability of journey-to-work employment data and ensure the geographic consistency of the input level for handbook method estimation. State data from the CPS represents the most current source of all-other and agricultural employment and the use of ACS shares of all-other and agricultural employment prove to be the best method to effectively distribute these data to the States' LMAs. These changes in methodology should be incorporated into the 2015 redesign.