

LED: Quarterly Workforce Indicators 101

Local Employment Dynamics

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Basic QWI Concepts¹

Concept	Description
Employer	A single account in a given state’s unemployment wage reporting system, referred to as State Employer Identification Number (SEIN).
Establishment	A physical place of work within an employer (SEINUNIT). A single employer may have one or many establishments
Employee	A single worker, identified by Social Security Number (SSN), encoded to Protected Identification Key (PIK)
Dates	Earnings for each PIK are reported on a quarterly basis, on the calendar year (January-March=Q1, April-June=Q2, etc.).
Job	The association of an individual PIK with an establishment in a given year and quarter. An individual PIK may have multiple jobs within a single quarter. The entire job history for an individual, including all jobs across all years and quarters, can be referenced in the calculation of QWI measures.

Subscripts used in technical definitions:

i = employee (PIK)

j = specific establishment within an employer (SEINUNIT)

t =reference quarter [*i.e.*, (*t-1*)=previous quarter, (*t+1*)=following quarter]

¹ For a more complete discussion, see Abowd, et. al., *The LEHD Infrastructure Files and the Creation of the Quarterly Workforce Indicators* (<http://lehd.did.census.gov/led/library/techpapers/tp-2006-01.pdf>).

QWI Measure Categories

The public use file contains 30 QWI measures, which may be divided into the following categories:

Category	Count	Comments
Employment	4	The employment measures are built directly from individual employment histories, aggregating total counts. The primary measure of employment is a point-in-time measure, but additional measures are also available, unique to the QWI system.
Employment Change, Individual	8	These measures look at the dynamics of employment at the individual level. They are also built directly from the employment histories, aggregating the total counts. The one exception in this grouping is the turnover measure, which is a composite measure calculated using totals of its components.
Employment Change, Firm	6	Firm-based dynamics measures are calculated using employment counts that have been aggregated to the establishment level. The diagrams associated with these measures reference the components that are used.
Earnings	8	Earnings from individuals with specified job histories are tabulated. The quarter of the earnings that are referenced does not always coincide with the quarter of the event.
Non-Employment	4	These measures tabulate the average number of quarters that an individual did not receive earnings from <i>any</i> employer, referencing the four quarters before or after a transition (hire or separation). The quarters of non-employment are not required to be consecutive or immediately adjacent to the transition.

Other QWI Terms

The following presents various additional terms that are commonly used in the descriptions of the QWI measures:

Stable (or Full-Quarter) Employment – When an individual receives earnings from the same employer for three consecutive quarters, it is inferred that the individual was employed for the whole of the middle quarter. Many QWI measures are provided with stable and non-stable versions.

Point-in-Time Employment – Because earnings are reported quarterly, there is no direct information as to whether an individual is employed on a given day. So, when an individual receives earnings from the same employer in consecutive quarters, that individual is interpreted as having had an active job on the boundary between the quarters.

Hire (or Accession) – A hire is indicated when a job is present in one quarter, but was not present in the previous quarter. The total is represented by **All** hires, which is equivalent to the sum of **New** hires and **Recalls**, separately identified by referencing the job history.

Separation – A separation is indicated when a job is present in one quarter, but is not present in the following quarter. Voluntary separations (retirement, leaving for a new job) and involuntary separations (layoff, firing) cannot positively be separately identified.

Average Monthly Earnings – For measures that are reported as averages, earnings are aggregated across all individuals who match the job history required, and the mean is calculated. The mean is then divided by three, to generate the monthly average.

Full-Quarter Earnings – Most average earnings measures are based on stable jobs. The number of hours worked is not available, so an hourly or weekly wage figure cannot be calculated. However, using stable jobs suggests that an employee had an ongoing relationship with the employer throughout the quarter. Therefore, earnings are representative of how much this universe of individuals earned, though work could have been either part-time or full-time.

Point-in-Time Earnings – This earnings measure calculates average earnings for all individuals employed at a firm at a point-in-time. This will tend to be lower than the full-quarter measure, since it will include individuals who began their job in the middle of the quarter, and did not receive earnings for the whole quarter.

QWI Measure Descriptions

The following table lists all measures available on the public release file. Within each indicator, several additional references may be provided, as per this sample:

Sample	Description
Beginning of Quarter Employment: Counts Emp A.1.7 A.2.2 (A.2) A.2.3 (A.39)	Beginning of Quarter Employment: Counts – label for variable <i>(Alternative description may be italicized)</i> Emp –variable name in QWI public use file A.1.7 – Reference to relevant subsection in appendix of infrastructure document ² A.2.2 – Subsection referencing Individual-level calculation (A.2 - formula number) A.2.3 – Subsection referencing Establishment-level calculation (A.39 - formula number)

Employment

Indicator: Employment	Description	Technical Definition	Questions
Beginning of Quarter Employment: Counts Emp A.1.7 A.2.2 (A.2) A.2.3 (A.39)	Estimate of the total number of jobs on the first day of the reference quarter. Beginning-of-quarter employment counts are similar to point-in-time employment measures, such as the QCEW (see: www.bls.gov/cew/).	A worker i is beginning-of-quarter employed with employer j in t if worker has positive earnings at j in $t-1$ and t .	<ul style="list-style-type: none"> •Top area industries? •Who is filling what jobs? Who are the top employers of young, older, or female workers? •Where are similar local economies?
End of Quarter Employment: Counts EmpEnd A.1.7 A.2.2 (A.3) A.2.3 (A.40)	Estimate of the number of jobs on the last day of the quarter.	A worker i is end-of-quarter employed with employer j in t if worker has positive earnings at j in t and $t+1$.	Same as for beginning-of-quarter employment, but about workers employed on the last day of the quarter.
Full-Quarter Employment (Stable): Counts EmpS A.1.8 A.2.2 (A.6) A.2.3 (A.42)	Estimate of stable jobs, <i>i.e.</i> , the number of jobs that are held on both the first and last day of the quarter with the same employer. This is often, but not necessarily, the same as being employed for a full quarter (e.g., an on-call substitute teacher may have earnings in each of three consecutive quarters, but intermittently).	A worker i is full-quarter employed with employer j in t if worker has positive earnings at j in $t-1$, t , and $t+1$.	Same as for employment measures above, with emphasis on workers in more stable jobs.

² Abowd, et al, *The LEHD Infrastructure Files and the Creation of the Quarterly Workforce Indicators* (<http://lehd.did.census.gov/led/library/techpapers/tp-2006-01.pdf>).

Indicator: Employment	Description	Technical Definition	Questions
Employment - Reference Quarter: Counts EmpTotal A.1.1 – A.1.6 A.2.2 (A.1) A.2.3 (A.41)	This is a count of people employed in a firm at any time during the quarter. It is not a count of jobs. This measure may also be referred to as “flow” employment.	A worker i is flow-employed with employer j in t if worker has positive earnings at j in t .	This measure is provided for informational purposes for state partners. For total employment we recommend using Beginning-of-Quarter employment.

Employment Change, Individual

Indicator: Employment Change, Individual	Description	Technical Definition	Questions
Hires All: Counts (Accessions) HirA A.1.9 A.2.2 (A.4) A.2.3 (A.57)	Estimated number of workers who started a new job in the specified quarter. It is the sum of “Hires New” and “Hires Recalls.”	A worker i is defined as acceding to employer j in t if the worker has positive earnings at j in t but no earnings from j in $t-1$.	<ul style="list-style-type: none"> •What industries are hiring the most workers and in what geographic areas? •Which industries are hiring older workers? Younger workers?
Hires New: Counts HirN A.1.11 A.2.2 (A.7) A.2.3 (A.61)	Estimated number of workers who started a new job. More specifically, total hires that, while they worked for an employer in the specified quarter, were not employed by that employer in any of the previous four quarters.	A worker i is defined as a new hire for employer j in t if has positive earnings at j in t but no earnings from j in $t-1, t-2, t-3, t-4$.	Same as above but refers to newly hired workers.
Hires Recalls: Counts HirR A.1.11 A.2.2 (A.8) A.2.3 (A.63)	Estimated number of workers who returned to the same employer where they had worked within the previous year (<i>i.e.</i> , total hires that are not new hires).	A worker i is defined as a recall for employer j in t if the worker has positive earnings at j in t but no earnings from j in $t-1$, and positive earnings at j in one or more of the quarters $t-2, t-3, t-4$.	<ul style="list-style-type: none"> •What industries are most likely to rehire or recall workers? •Of those rehired, are younger or older workers more likely to be rehired? Men or women?
Separations: Counts Sep A.1.9 A.2.2 (A.5) A.2.3 (A.59)	Estimated number of workers whose job with a given employer ended in the specified quarter.	A worker i is defined as separating from employer j in t if the worker has positive earnings at j in t but no earnings from j in $t+1$.	<ul style="list-style-type: none"> •What types of workers are leaving jobs? •What types of industries are workers leaving?

Indicator: Employment Change, Individual	Description	Technical Definition	Questions
Hires All (Stable): Counts <i>(Flow into Full- Quarter Employment)</i> HirAS A.1.10 A.2.2 (A.10) A.2.3 (A.64)	Estimated number of workers that started a job that lasted at least one full quarter with a given employer. <i>Jobs are counted as a stable hire in the first quarter of full quarter employment, rather than the first quarter of employment.</i>	A worker i is defined as a flow into full-quarter employment with employer j in t if the worker has positive earnings at j in t , $t-1$ and $t+1$ but no earnings from j in $t-2$.	<ul style="list-style-type: none"> •Which industries are hiring stable workers?
Hires New (Stable): Counts <i>(New Hires to Full- Quarter Status)</i> HirNS A.1.12 A.2.2 (A.12) A.2.3 (A.65)	Estimated number of workers who started a job that they had not held within the past year and the job turned into a job that lasted at least a full quarter with a given employer. <i>Jobs are counted as a stable hire in the first quarter of full quarter employment, rather than the first quarter of employment.</i>	A worker i is defined as a full quarter new hire with employer j in t if the worker has positive earnings at j in t , $t-1$ and $t+1$ but no earnings from j in $t-2$, $t-3$, $t-4$, and $t-5$.	Same as Flow into Full-Quarter Employment, but with emphasis on new hires.
Separations (Stable): Counts <i>(Flow out of Full- Quarter Employment)</i> SepS A.1.10 A.2.2 (A.16) A.2.3 (A.67)	Estimated number of workers who had a job for at least a full quarter and then the job ended. <i>Jobs are counted as a stable separation in the last quarter of employment.</i>	A worker i is defined as a flow out of full-quarter employment with employer j in t if the worker has positive earnings at j in t , $t-1$ and $t-2$ but no earnings from j in $t+1$.	<ul style="list-style-type: none"> •What industries are stable workers leaving?
Turnover (Stable) <i>(Job Churning)</i> TurnOvrS A.2.6	The rate at which stable jobs begin and end. It is calculated by summing the number of stable hires and separations, and dividing by the average full-quarter employment.	One half times the sum of full-quarter “Hires – All” and full-quarter separations, divided by the number of full-quarter employees.	<ul style="list-style-type: none"> •What industries have the most employment churning? The least? •What industries have the lowest and highest rates of employment churning for older and for younger workers? For men compared with women?

Employment Change, Firm

Indicator: Employment Change, Firm	Description	Technical Definition	Questions
Firm Job Gains: Counts (<i>Job Creation</i>) FrmJbGn A.1.13 A.2.3 (A.46)	Estimated number of jobs gained at firms throughout the quarter. This measure counts total employment increase at firms that grew over the course of the quarter.	End-of-quarter employment in t minus Beginning-of-quarter employment in t , or 0, whichever is larger	<ul style="list-style-type: none"> •Regions with most new jobs? •Industries most likely to create jobs? •Which industries are most likely to create jobs that younger workers gain?
Firm Job Loss: Counts (<i>Job Destruction</i>) FrmJbLs A.1.13 A.2.3 (A.48)	Estimated number of jobs lost at firms throughout the quarter. This measure counts employment decrease at firms that shrank over the course of the quarter.	End-of-quarter employment in t minus beginning-of-quarter employment in t , or 0, whichever is smaller, (reported in absolute value).	<ul style="list-style-type: none"> •Regions where job loss is highest? •Industries most likely to reduce employment? •In industries with net job losses, are older workers more likely to be job losers than younger workers?
Firm Job Change: Net Change FrmJbC A.1.14 A.2.3 (A.43)	Difference between firm job gain and firm job loss.	End-of-quarter employment in t minus beginning-of-quarter employment in t	<ul style="list-style-type: none"> •Regions where employment growth is fastest? •Top expanding industries?
Firm Job Gains (Stable): Counts FrmJbGnS A.1.15 A.2.3 (A.53)	Estimated number of full-quarter jobs gained at firms.	Full-quarter employment in t minus full-quarter employment in $t-1$, or 0, whichever is larger.	Same as for Firm Job Gains, but the focus is on jobs that lasted a full quarter.
Firm Job Loss (Stable): Counts FrmJbLsS A.1.15 A.2.3 (A.55)	Estimated number of full-quarter jobs lost at firms.	Full-quarter employment in t minus full-quarter employment in $t-1$, or 0, whichever is smaller (reported in absolute value).	Same as for Firm Job Loss, but the focus is on jobs that lasted a full quarter with a given employer.
Job Change (Stable): Net Change FrmJbCS A.1.15 A.2.3 (A.50)	Net growth in jobs that last a full quarter. Change in net estimate of full-quarter jobs at firms	Full-quarter employment in t minus full-quarter employment in $t-1$.	Similar to Firm Job Change, but the focus is on jobs lasting a full quarter.

Earnings

Indicator: Earnings	Description	Technical Definition	Questions
Full Quarter Employment (Stable): Average Monthly Earnings EarnS A.1.17 A.2.2 (A.22) A.2.3 (A.89)	Average monthly earnings of employees with stable jobs (<i>i.e.</i> , worked with the same firm throughout the quarter).	Add all quarterly earnings at j in t for all i who are full-quarter employees. Divide this by the number of full-quarter employees at j . Then divide that by three (number of months in a quarter).	<ul style="list-style-type: none"> • Highest and lowest paying industries in an area? • Average earnings for employees in a particular industry?
End of Quarter Employment: Average Monthly Earnings EarnEnd A.1.16 A.2.2 (A.21) A.2.3 (A.88)	Average monthly earnings of employees who worked on the last day of the reference quarter.	Add all quarterly earnings at j in t for all i who are end-of-quarter employees. Divide this by the number of end-of-quarter employees at j . Then divide that by three.	Similar to average earnings in stable jobs but includes jobs that lasted less than the entire quarter. Because this includes people who did not work the entire quarter, average earnings tend to be lower than for full-quarter workers.
Hires All (Stable): Average Monthly Earnings EarnHirAS A.1.18 A.2.2 (A.26) A.2.3 (A.92)	Average monthly earnings for workers who started a job that turned into a job lasting a full quarter. That is, average monthly earnings of full-quarter employees who started working with a firm in the previous quarter.	Add all quarterly earnings at j in t for all i who are hires (all) to full-quarter status employees. Divide this by the number of hires (all) to full-quarter status at j in t . Divide that by three.	<ul style="list-style-type: none"> • What are average starting wages for different types of workers in a particular industry?
Hires New (Stable): Average Monthly Earnings EarnHireNS A.1.19 A.2.2 (A.27) A.2.3 (A.93)	Average monthly earnings of newly stable employees (<i>i.e.</i> , full-quarter employees who were new hires with a firm in the previous quarter.	Add all quarterly earnings at j in t for all i who are full-quarter new hires. Divide this by the number of full-quarter new hires at j in t . Divide that by three.	<ul style="list-style-type: none"> • What are the best paying industries for new hires? In what regions can new hires get the best pay, on average?

Indicator: Earnings	Description	Technical Definition	Questions
Separations (Stable): Average Monthly Earnings EarnSepS A.1.20 A.2.2 (A.31) A.2.3 (A.100)	Average monthly earnings of separations from full-quarter status at an establishment.	Add all quarterly earnings at j in t for all i who are separations from full-quarter status in $t+1$. Divide this by the number of separations from full- quarter status at j in $t+1$. Divide that by three.	<ul style="list-style-type: none"> •What were averages wages for workers that separated from specific industries in different regions?
Hires All: Average Change in Monthly Earnings EarnHirAC A.1.23 A.2.2 (A.28) A.2.3 (A.91)	Average change in total monthly earnings, summed across all employers, for workers who started a job in the reference quarter.	For workers i who are hires (all) at j in quarter t : Add all earnings for i over all j who employ i in t . Then subtract the sum of earnings for i over all j who employ i in $t-1$; Sum the differences over all i ; Divide by the number of hires (all) in t ; Divide that by three.	<ul style="list-style-type: none"> •Which industry accessions are associated with the highest average earnings gains for workers?
Separations: Average Change in Monthly Earnings EarnSepC A.1.23 A.2.2 (A.32) A.2.3 (A.99)	Average change in total earnings monthly earnings, summed across all employers, for workers who leave an employer in the reference quarter.	For workers i who are separations from j in quarter t : Add all earnings for i over all j who employ i in $t+1$. Then subtract the sum of earnings for i over all j who employ i in t ; Sum the differences over all i ; Divide by the number of hires (all) in t ; Divide that by three.	<ul style="list-style-type: none"> •To help target workers for training programs, what industries are associated with the smallest and the largest average earning losses?
Total Quarterly Payroll: Sum Payroll A.2.2 (A.17) A.2.2 (A.71)	Total quarterly payroll for all jobs	Sum of all earnings for all jobs in a quarter.	<ul style="list-style-type: none"> •What are the largest industries in my geographic area in terms of total payroll?

Average Quarters of Non-Employment

Indicator: Average Quarters of Non-Employment	Description	Technical Definition	Questions
Hires All: Average Quarters of Non-Employment NEmpHirA A.122 A.2.2 (A.34) A.2.3 (A.95)	The number of quarters that an individual did not receive any earnings within the year prior to a hire.	For all individuals i who are hires in quarter t , sum the number of quarters from $t-4$ to $t-1$ where i had no earnings from any employer j , and divide the total by the number of hires in quarter t .	<ul style="list-style-type: none"> •Have individuals starting jobs had consistent attachment to the labor force?
Hires New: Average Quarters of Non-Employment NEmpHirN A.2.2 (A.35) A.2.3 (A.96)	The number of quarters that an individual did not receive any earnings within the year prior to a new hire.	For all individuals i who are new hires in quarter t , sum the number of quarters from $t-4$ to $t-1$ where i had no earnings from any employer j , and divide the total by the number of new hires in quarter t .	<ul style="list-style-type: none"> •Have individuals starting new jobs had consistent attachment to the labor force?
Hires Recalls: Average Quarters of Non-Employment NEmpHirR A.2.2 (A.36) A.2.3 (A.97)	The number of quarters that an individual did not receive any earnings within the year prior to a recall.	For all individuals i who are recalls in quarter t , sum the number of quarters from $t-4$ to $t-1$ where i had no earnings from any employer j , and divide the total by the number of recalls in quarter t .	<ul style="list-style-type: none"> •When individuals have a break in employment, in how many quarters are they out of the labor force?
Separations: Average Quarters of Non-Employment NEmpSep A.2.2 (A.37) A.2.3 (A.102)	The number of quarters that an individual did not receive any earnings within the year following a separation.	For all individuals i who are separations in quarter t , sum the number of quarters from $t+1$ to $t+4$ where i had no earnings from any employer j , and divide the total by the number of separations in quarter t .	<ul style="list-style-type: none"> •After individuals leave a job, do they continue in the labor force?

QWI Identities

There are a number of identities that serve to relate the various QWI measures to each other, which hold at the establishment level. Some relationships may not always hold in the higher aggregates (published data), because of weighting, changes in firm characteristics over time (e.g., industrial/geographic assignment), or other factors. Several of the basic identities are provided here, using the short variable names listed above. For a more complete list of identities, see Abowd, *et. al.*, section [A.2.4](#).

Employment at beginning of period t equals end of period $t-1$

$$Emp_{jt} = EmpEnd_{jt-1}$$

Job Flow Identity

$$FrmJbC_{jt} = FrmJbGn_{jt} - FrmJbLS_{jt}$$

Creation-Destruction Identity

$$EmpEnd_{jt} = Emp_{jt} + FrmJbGn_{jt} - FrmJbLS_{jt}$$

Creation-Destruction/Accession-Separation Identity

$$HirA_{jt} - Sep_{jt} = FrmJbGn_{jt} - FrmJbLS_{jt}$$

New Hires/Recalls Identity

$$HirA_{jt} = HirN_{jt} + HirR_{jt}$$