Quarterly Workforce Indicators (QWI) Training

Accessing and Understanding the Data

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Longitudinal Employer-Household Dynamics
U.S. Census Bureau
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Training Outline

- Where are you from and how do you use LED data?

- How can we make this training valuable for you?

- Accessing QWI Data – QWI Explorer, LED Extraction Tool, LEHD Homepage, Census API

- What's new in QWI Explorer and the LED Extraction Tool

- Example analyses in QWI Explorer

- Basics of LEHD infrastructure and data sources

- QWI Concepts – Indicators and their characteristics

Questions for You!

- Where are you from and how do you use LED data?
  - Do you use the raw QWIPU data or QWI Explorer?
  - Are you most interested in how QWI can supplement QCEW (i.e. the additional worker characteristics and firm/worker dynamics measures)
  - What data or application changes would be more useful for you?
- How can we make this training valuable for you?
  - Should we focus on training on the applications (i.e. how to use the tools and example analyses)
  - Or should we focus on the under-the-hood QWI concepts?

Why are QWIs Important?

- Indicators on Employment, Employment Change (Firm and Individual), and Earnings

- Detailed Firm Characteristics (geography, industry, age, size)

- Detailed Worker Demographics (sex, age, education, race, ethnicity)

- 3 Quarter lag, coverage varies by state

- Used by economic developers, urban planners, policy analysts, workforce researchers, and academics

	14-18	19-21	22-24	25-34	35-44	45-54	55-64
2013 Q1	50,742	105,120	147,866	502,907	479,738	540,837	377,430

LEHD's Data Dissemination Strategy

Provide a wide variety of access points to the data to accommodate as many user needs as possible:

- Web tool users: Create your own table, chart, and map using the flexible user-interface of QWI Explorer

- Intermediate data users: Extract the exact indicators and characteristics needed using the LED Extraction Tool

- Advanced data users: Access single raw QWIPU files from http://lehd.ces.census.gov/data/#qwi

- Advanced data users: Bulk download of raw QWIPU from http://lehd.ces.census.gov/pub/

- Integration into the Census API (Beta release):

    http://beta.dataweb.rm.census.gov/data/timeseries/qwi.html

What's New in the LED Extraction Tool

- National QWI
  - All Private Jobs Only
  - NAICS 3, Race/Ethnicity coming soon

- Cross-State Queries
  - All State totals in one table

- Demo!

What's New in QWI Explorer

- Share of Total/Data Normalization
  - Normalize by Time, Firm or Worker Characteristic
- Group by Indicator
  - Compare indicators within the a table, chart, or map
- Improved Bar Charts
- Demo!
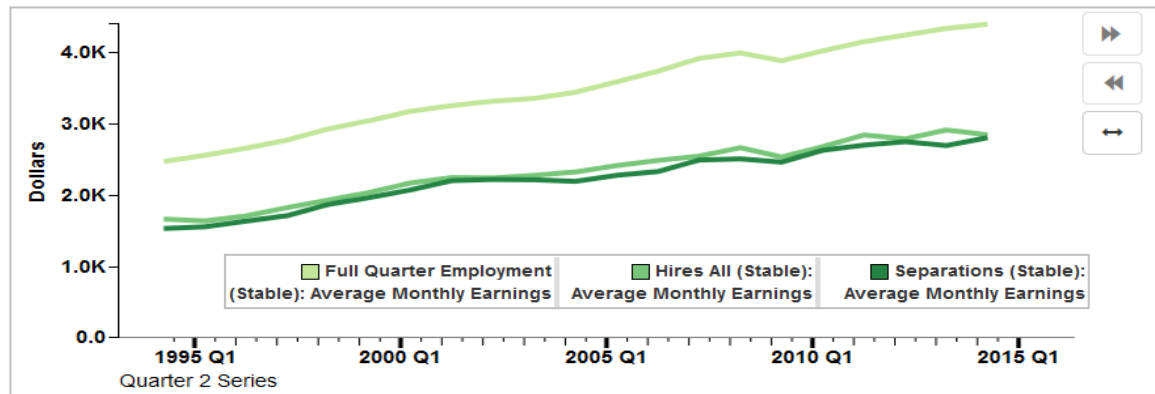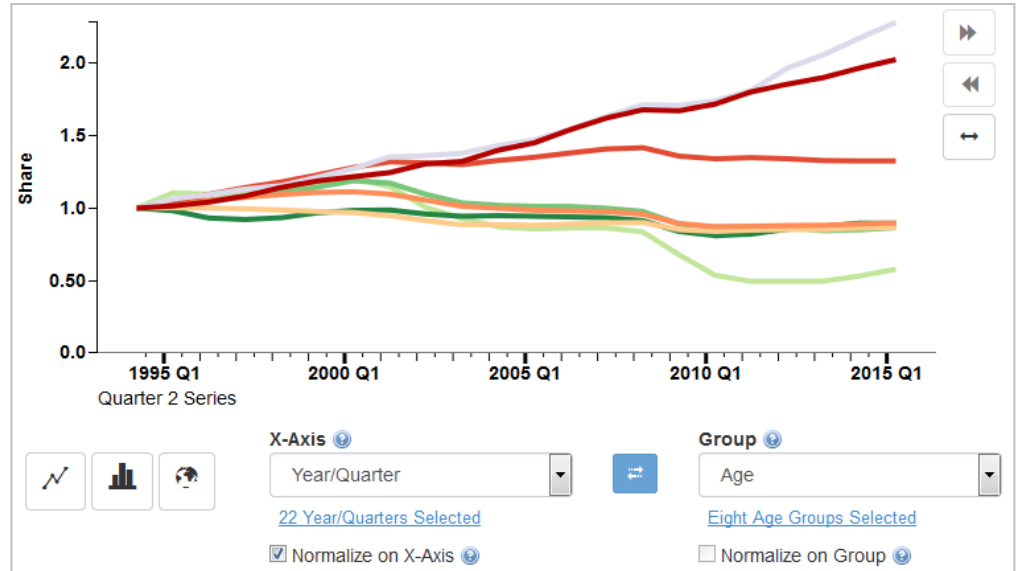
Beta Release of QWI data in Census API

- The Census API allows developers to design web/mobile apps that provide users with quick and easy access to an increasing pool of publicly available datasets – now included the Quarterly Workforce Indicators (QWI).
    - State by Race/Ethnicity: http://beta.dataweb.rm.census.gov/data/timeseries/qwi/rh?get=race,Emp,year,quarter&for=state:01&time=2015-Q1
    - County by Sex/Age: http://beta.dataweb.rm.census.gov/data/timeseries/qwi/sa?get=Emp,year,agegrp,quarter&for=county:195&in=state:02&time=2015-Q1
    - Metro/Micro Area by Sex/Education: http://beta.dataweb.rm.census.gov/data/timeseries/qwi/sa?get=Emp,year,agegrp,quarter&for=metropolitan+statistical+area/micropolitan+statistical+area:19060&in=state:24&time=2015-Q1
- Still some bugs to resolve (wildcarding not working), full release in 2-3 months
- For more information on the Census API: http://www.census.gov/developers/
- Demo!

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Coming Soon

- National QWI and cross-state queries in QWI Explorer

- Local Storage in QWI Explorer

  - Customize your preferences – choose to remove conflict popups, set default settings, etc.

- Sub-state queries across states in the LED Extraction Tool

- Full Production release of QWIs in Census API (i.e. wildcards enabled, National QWI)

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Example Analyses in QWI Explorer

- http://lehd.ces.census.gov/doc/QWIExplorerBeginnerScenario1.pdf

- http://lehd.ces.census.gov/doc/QWIExplorerBeginnerScenario2.pdf

- http://lehd.ces.census.gov/doc/QWIExplorerAdvancedScenario.pdf

- Let's jump into QWI Explorer and work through some examples
  - Single data-point lookup
  - Longitudinal Analyses
  - Categorical Analyses
  - Spatial Analyses
  - Deeper look into Startups and Job Creation

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LEHD Infrastructure and Basic Concepts

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Reference Materials

- QWI 101
    - Introduction to development and use of QWI
    - Excellent reference for new users
    - http://lehd.ces.census.gov/doc/QWI_101.pdf

- QWI Data Schema
    - http://lehd.ces.census.gov/data/schema/latest/

- "The LEHD Infrastructure Files and the Creation of the Quarterly Workforce Indicators"
    - Detailed methodology, intended for advanced users
    - http://lehd.ces.census.gov/doc/technical_paper/tp-2006-01.pdf

Primary Unit of Analysis: *Job*

- Association of: *Worker–Employer–Year–Quarter*
- Workers can have multiple jobs within a quarter
  - "Primary Job" (greatest earnings) - not defined separately in QWI, but is in LODES/OnTheMap
- In contrast, most other surveys and censuses are:
  - Household-based (ACS, CPS, Decennial), or
  - Employer-based (QCEW, Current Employment Statistics)
- Advantage of job-based frame – can produce tabulations by both worker **and** firm characteristics

Core Data Input:
UI Earnings Records

- UI = Unemployment Insurance
- Record of individual earnings for covered jobs
    - Administrative wage records, not UI claims data
- Collected for operation of state UI program
    - UI benefits are based on historical earnings
- Includes:
    - **Total** quarterly earnings for each job
    - Firm identifier = State UI account number (SEIN)
    - Worker identifier = Protected Identification Key (PIK)
        - Census identifier based on SSN

Job Coverage in UI Earnings Data

- Most private sector jobs covered

  - For-profit and not-for-profit classified together (as per QCEW standard)

- State and local government also in system, though some reporting inconsistencies

- Federal worker data from Office of Personnel Management (OPM) not yet available in QWI (have been incorporated into LODES/OnTheMap)

- Self-employed not available

Additional Data Inputs

- UI wage records are linked to a variety of other data sources
- Sources of establishment information:
    - Quarterly Census of Employment and Wages (QCEW)
    - Business Dynamics Statistics (BDS)
- Sources of demographic information:
    - Decennial Census
    - Federal Tax Records
    - Social Security Administration Records
    - Other census and administrative records
- This additional information enables tabulations by detailed worker and firm characteristics

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LEHD Processing: Merging Data

Quarterly Census of Employment and Wages (QCEW)

Employer and Establishment (Single/Multi-unit)

Geography
Industry
Ownership

Unemployment Insurance Earnings Records

Employer-Worker
(most states)
OR
Establishment-Worker
(Minnesota only)

Earnings
Job history

UI Account Number (SEIN)

Federal EIN

PIK (encoded SSN)

Business Dynamics Statistics (BDS)

Firm age and size

Census, Surveys, Other Administrative Records

Demographics, Place of Residence

QWI Measures

- 32 indicators on:
  - Employment
    - Counts of jobs (Individual)
    - Hiring and Separation counts and rates (Individual)
    - Job Creation and Destruction (Firm)
  - Earnings
    - Average earnings for selected job histories
    - Total earnings
- Some indicators are special-purpose measures used in calculation of various rates
- Files and applications organized by state

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QWI Aggregation Levels: *Overview*

- The QWI are tabulated by :
  - Firm and establishment characteristics
    - *"Firm vs Establishment?"*
      - Firm = national "headquarter" entity
      - Establishment = individual locations
  - Worker characteristics

QWI Aggregation Levels: *Firm*

- Firm-level characteristics:
  - Based on **national-level** firm, sourced from Business Dynamics Statistics (BDS)
  - Firm Age (years)
    - 0-1, 2-3, 4-5, 6-10, 11+
  - Firm Size (employees)
    - 0-19, 20-49, 50-249, 250-499, 500+
- Firm Age and Size available only for private ownership
- Reduced detail on geography/industry tabulations (3- and 4- digit NAICS are only available for state-level totals)

QWI Aggregation Levels: *Establishment*

- Establishment-level characteristics:
  - Geography
    - State totals
    - County, Metro, Workforce Investment Board (WIB) areas
  - Industry
    - All industries
    - NAICS Sectors, Sub-sectors (3-digit), Industry groups (4-digit)
  - Ownership
    - All (Public + private)
    - Private-only

- All crossings of these characteristics reported (with a few exceptions for firm age and firm size)

QWI Aggregation Levels: *Employee Age/Sex*

- Age (years)
  - 14-18, 19-21, 22-24, 25-34, 35-44, 45-54, 55-64, 65-99
- Sex
  - Male, Female
- We use the age categories specified in the Workforce Investment Act (WIA)
- Data comes from a variety of sources (Decennial Census, surveys and administrative records)

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QWI Aggregation Levels: *Employee Education*

- Education categories:
    - Less than high school
    - High school or equivalent, no college
    - Some college or Associate degree
    - Bachelor's degree or advanced degree
    - Educational Attainment Not Available (age 24 or younger)
- Valid only for individuals age 25 and up
    - Reflects person's maximum education level
- Crossed by Sex in QWI tabulations
- Sourced from decennial census where available; otherwise, imputed using multinomial logit model

QWI Aggregation Levels: *Employee Race/Ethnicity*

- Tabulated according to categories defined by the Office of Management and Budget:
  - Race
    - White alone
    - African-American or Black alone
    - Asian or Pacific alone
    - Native Hawaiian or Other Pacific Islander alone
    - American Indian or Alaska Native alone
    - Two or More Races
  - Ethnicity
    - Hispanic or Latino
    - Not Hispanic or Latino
  - Race and Ethnicity are cross-tabulated in public QWI data
  - Use data from Decennial Census where available; otherwise, impute using Census file provided from Social Security Administration (SSA)

Detailed Definitions of QWI Measures

Concept: **Employment History**

- Jobs are linked across time
- Diagram illustration:

Measure		-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
			●	●	●							
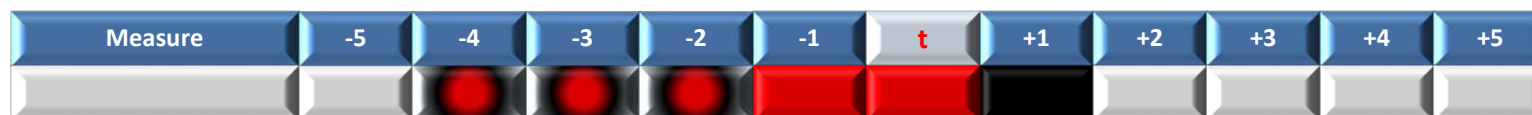
- **Diagram Legend:**
  - Reference quarter *t*
    - Earlier quarters (-), Later quarters (+)
  - **RED:** positive earning
  - **BLACK:** zero earning
  - **COMBINED**: earning in ANY ONE of the quarter
  - **GREY:** quarters not referenced

Employment Measures (5)

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Overview: Employment Measures

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Count of Jobs (Flow Employment)											
EmpTotal						■					
Beginning-of-quarter Employment											
Emp					■	■					
End-of-quarter Employment											
EmpEnd						■	■				
Full-quarter (Stable) Employment											
EmpS					■	■	■				
Full-quarter (Stable) Employment, previous quarter											
EmpSpv				■	■	■					
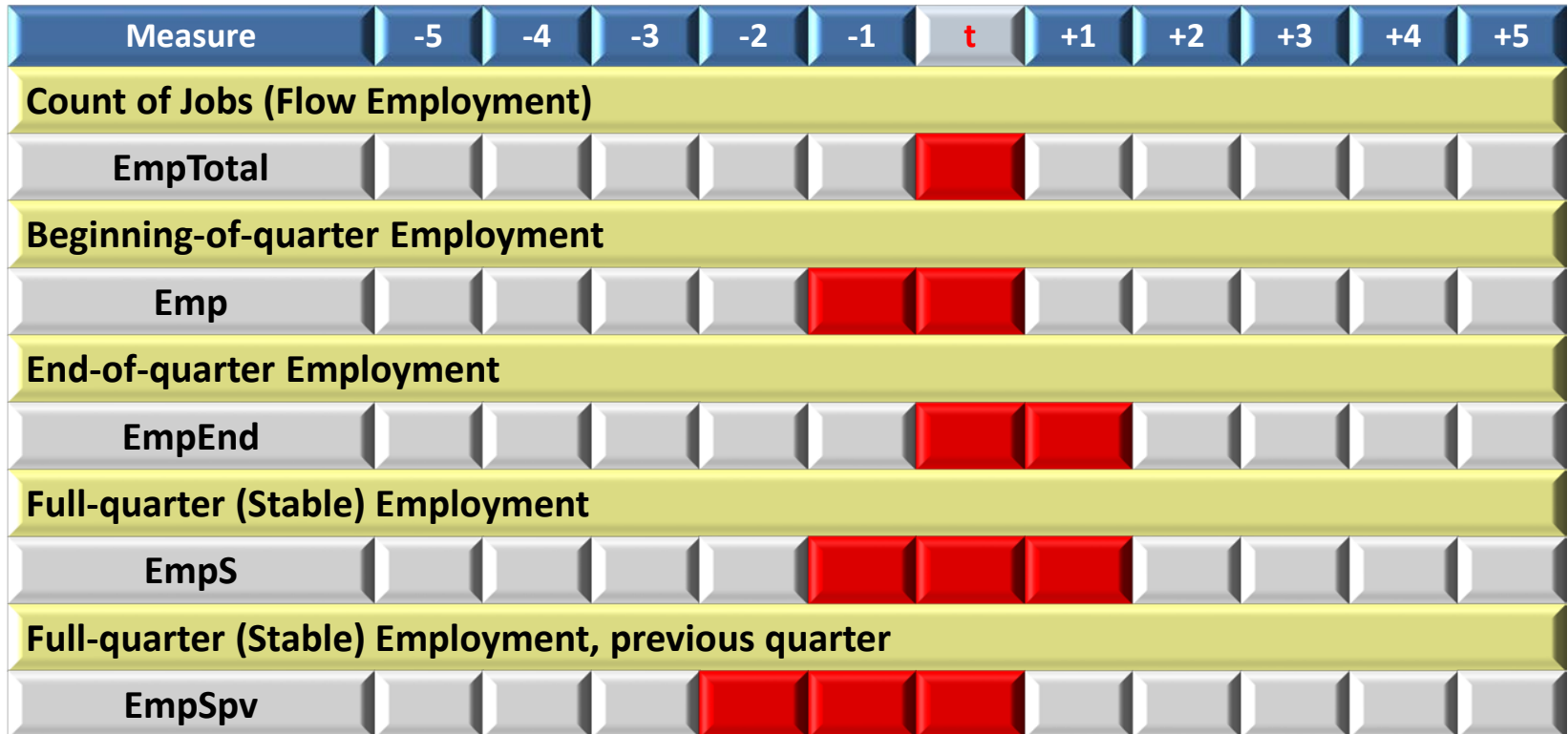
Details: Employment Measures *(1 of 5)*

Flow Employment (EmpTotal)

Measure		-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Count of Jobs (Flow Employment)												
EmpTotal							■					
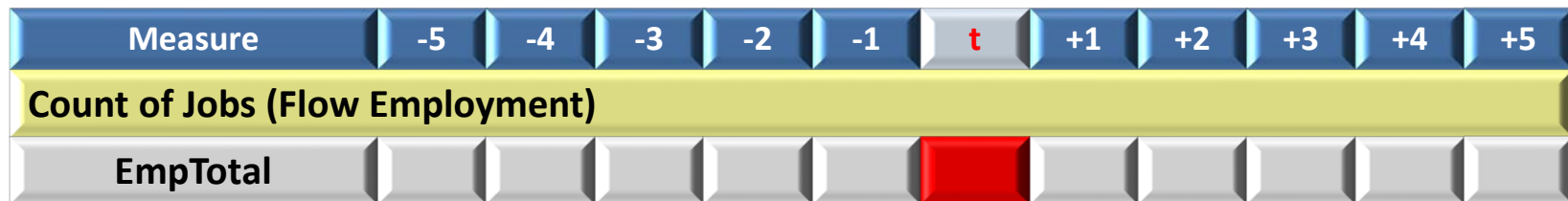
- Anyone who receives positive earnings from a particular employer in the quarter
- Not a count of jobs
- Drawbacks to this measure:
  - May double count people transiting between jobs
  - Many very short jobs
- *How can I use this?*

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Details: Employment Measures *(2 of 5)*

Beginning-of-quarter Employment (Emp)

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Beginning-of-quarter Employment											
Emp					■	■					

- Primary employment measure for QWI and OnTheMap
- Job present in both current and previous quarter
  - Employed on **first day** of quarter *t*
- Similar to QCEW Month 1 employment
  - Precise definitions, data sources, and methodology result in differences
- *How can I use this?*
  - *Our best indicator for point-in-time quarterly employment*

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End-of-quarter Employment (EmpEnd)

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
End-of-quarter Employment											
EmpEnd						🟥	🟥				

- Job is present in both current and next quarter
  - Employed on the **last day** of quarter *t*
- Symmetric concept to Beginning-of-quarter (Emp)
- *How can I use this?*
  - *Special-purpose*
    - *Used in calculations of various job flows and accession/separation rates*

Full-Quarter Stable Employment (EmpS)

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Full-quarter (Stable) Employment											
EmpS											

- Job is present in previous, current, and next quarter
  - Employed on the **first and last day** of quarter *t*
- Reflects stable, ongoing employment
- *How can I use this?*
  - *"Which industry has the most **stable** workers?"*
  - *Used as reference for calculating earnings measures*

Full-Quarter Stable, Previous Quarter (EmpSpv)

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Full-quarter (Stable) Employment, previous quarter											
EmpSpv											

- Job is present in current and previous two quarters
- Stable jobs in the quarter **before** the reference quarter *t*
- *How can I use this?*
  - *Special-purpose*
    - *Reported for particular estimates related to full quarter job growth*

Demonstration: Comparing Employment Measures in Prince George's County, MD

Employment Counts for Prince George's County, MD, 1990 -2013

Source: US Census Buraeu, LEHD Program, Quarterly Workforce Indicators, 2014Q2 Release
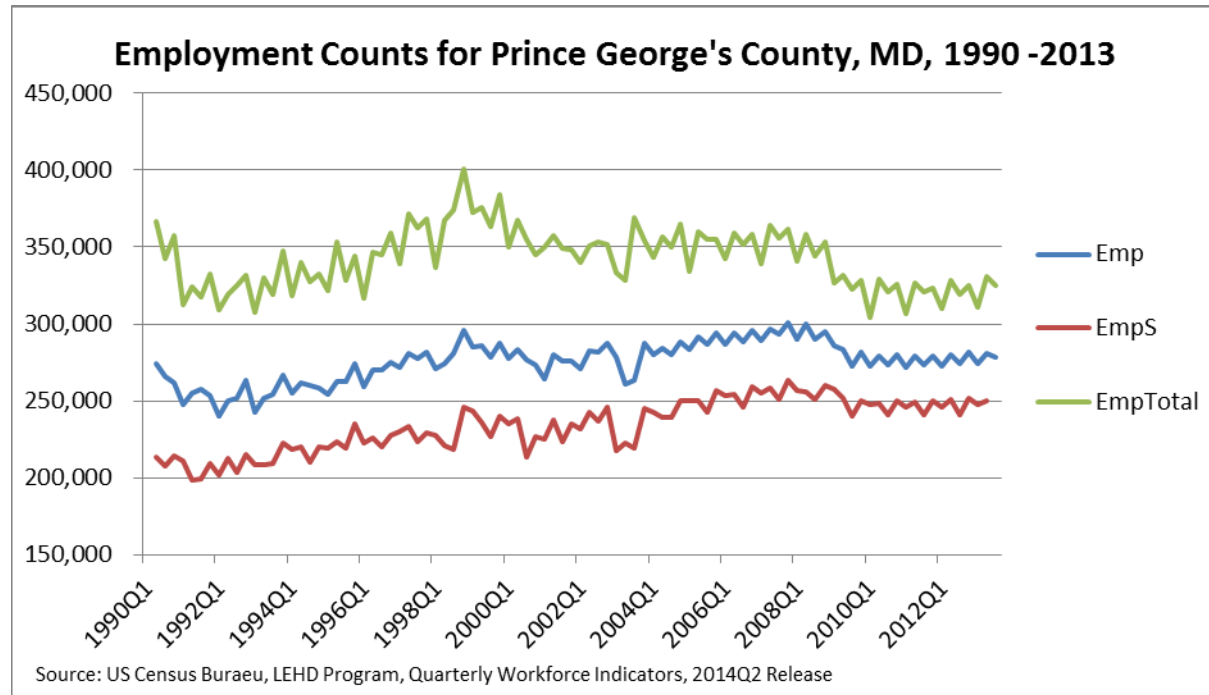
- **EmpTotal** is greater than **Emp**; both are greater than **EmpS**
- All three measures trended up during the first part of the time series, but are now lower than their pre-recession highs
- **EmpTotal** has the most seasonal variation (typically lowest in Q1)

Earnings Measures for Employment Counts (3)

Overview: Earnings Measures for Employment Counts

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Average Monthly Earnings for Beginning-of-quarter Jobs											
EarnBeg						$					
Average Monthly Earnings for Full-quarter Jobs											
EarnS						$					
Total Reported Earnings											
Payroll						$					
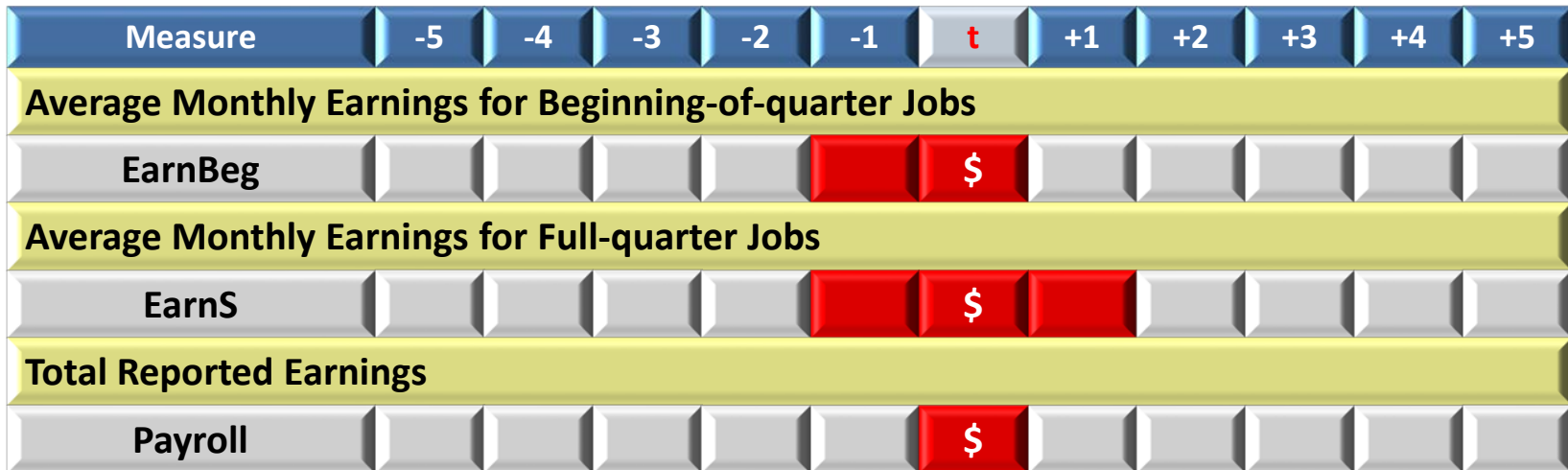
- All income amounts reported for UI wages
- Mix of full-time and part-time jobs (not adjusted for hours)
- Average earnings are based on quarterly wage record, divided by 3 (monthly estimate)

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Details: Earnings for Employment Counts *(1 of 3)*

Average Monthly Earnings for Full-Quarter Jobs (EarnS)

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Average Monthly Earnings for Full-quarter Jobs											
EarnS						$					
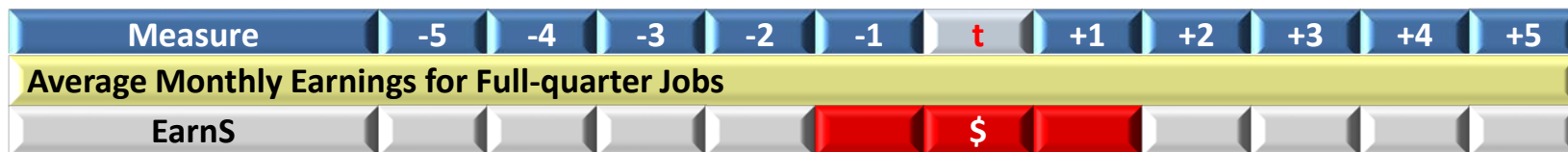
- Our preferred average earnings measure
  - References stable jobs
  - Less biased by part-quarter jobs
- Average earning for jobs on the **first and last day** of quarter *t*
- *How can I use this?*
  - *"Highest paying industry?"*
  - *"Average earning by metro area?"*

Details: **Earnings for Employment Counts** *(2 of 3)*

Average Monthly Earnings for Beginning-of-Quarter Jobs (EarnBeg)

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Average Monthly Earnings for Beginning-of-Quarter Jobs											
EarnBeg						$					

- Average earning for jobs on the **first day** of quarter *t*

- Includes earnings from jobs that may not have lasted the entire quarter *t*
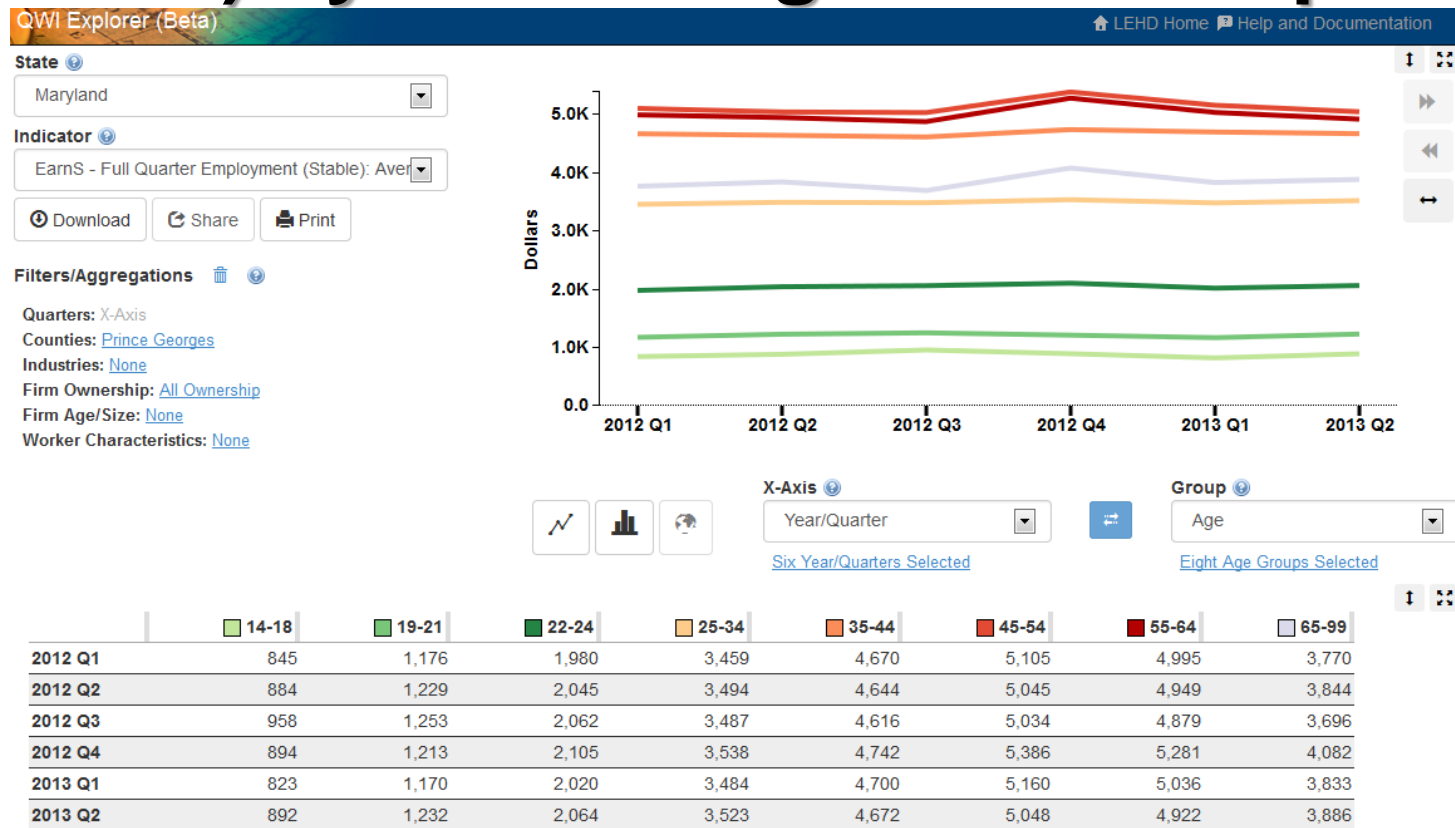
- *How can I use this?*

Details: **Earnings for Employment Counts** *(3 of 3)*

Total Quarterly Payroll (Payroll)

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Total Quarterly Payroll											
Payroll						$					

- Sum, not average, of all earnings for all jobs in quarter *t*
  - Total earnings for Flow Employment *(EmpTotal)*
- *How can I use this?*
  - *"Total payroll by industry?"*

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Demonstration: **Monthly Earnings (Stable) by Worker Age in QWI Explorer**

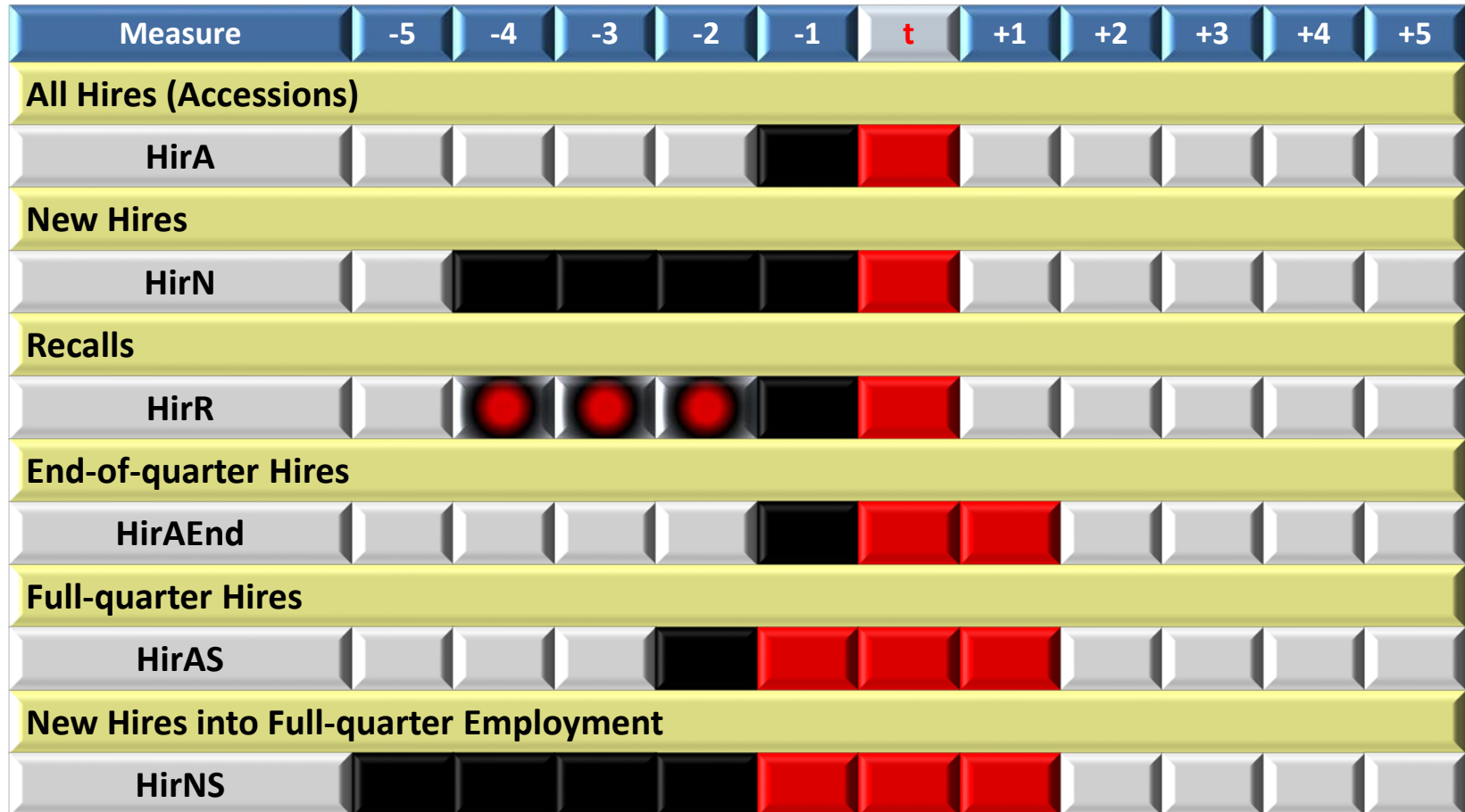|	14-18	19-21	22-24	25-34	35-44	45-54	55-64	65-99
2012 Q1	845	1,176	1,980	3,459	4,670	5,105	4,995	3,770
2012 Q2	884	1,229	2,045	3,494	4,644	5,045	4,949	3,844
2012 Q3	958	1,253	2,062	3,487	4,616	5,034	4,879	3,696
2012 Q4	894	1,213	2,105	3,538	4,742	5,386	5,281	4,082
2013 Q1	823	1,170	2,020	3,484	4,700	5,160	5,036	3,833
2013 Q2	892	1,232	2,064	3,523	4,672	5,048	4,922	3,886

- Average monthly earnings (for full-quarter employees) in Prince George's County, MD is highest for workers in the 45-54 age category, exceeding $5,000
- Potential analysis: Compare Prince George's County to the state of Maryland as a whole. Or, compare to other counties (Montgomery, Fairfax, etc.)

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Worker Flows Measures – Accession (6)
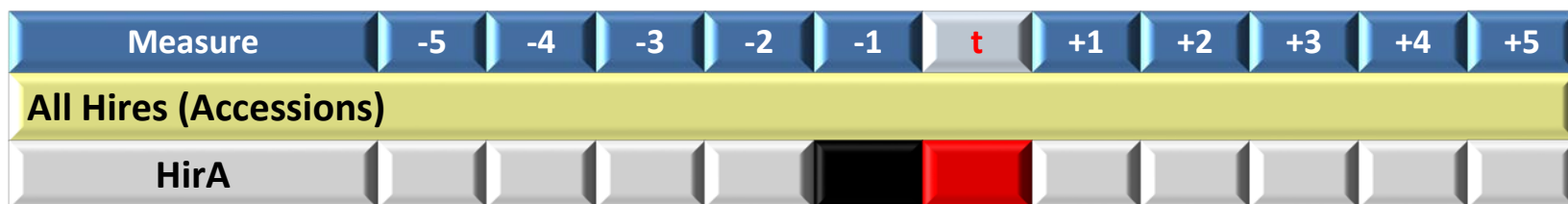
Worker Flows - Background Knowledge

- Use longitudinal job history to identify changes in employment status

- Average earnings are calculated for some full-quarter measures

- Turnover is as a composite measure based on aggregates of flow measures

Overview: Worker Flows Measures – Accessions

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
All Hires (Accessions)											
HirA					■	🔴					
New Hires											
HirN		■	■	■	■	🔴					
Recalls											
HirR		🔴	🔴	🔴	■	🔴					
End-of-quarter Hires											
HirAEnd					■	🔴	🔴				
Full-quarter Hires											
HirAS				■	🔴	🔴	🔴				
New Hires into Full-quarter Employment											
HirNS	■	■	■	■	🔴	🔴	🔴				

All Hires/Accession (HirA)

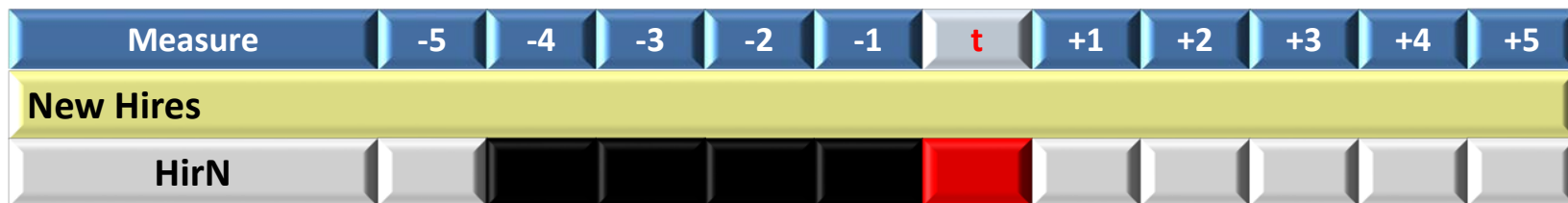| Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
All Hires (Accessions)											
HirA											

- ■ What is an Accession?

  - ■ Positive earnings from a particular employer in current quarter *t*, but not the previous quarter

- ■ *How can I use this?*

  - ■ *"Which industry is hiring the most?"*

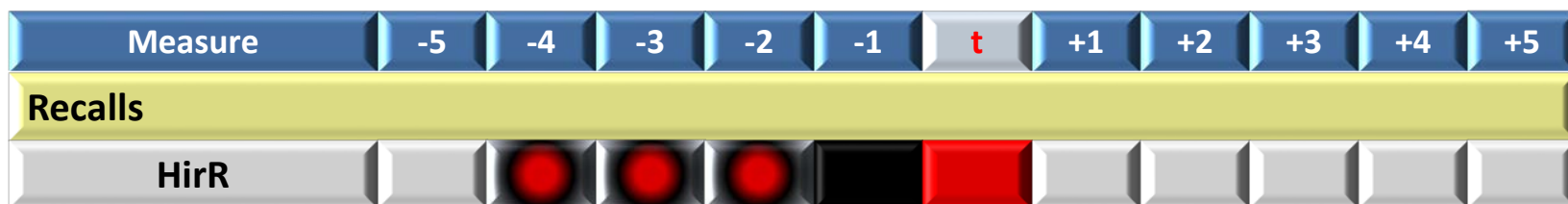# *Details:* Worker Flows – Accessions *(2 of 6)*

New Hire (HirN)

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
New Hires											
HirN											

- Accession with earnings from the employer in quarter *t*, but not in the previous **four** quarters
- *How can I use this?*
  - *"Number of workers that started NEW jobs?"*
  - *"Which age group gets hired the most into NEW jobs?"*

Recall Hire (HirR)

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Recalls											
HirR			●	●	●	■	■					

- An accession in quarter *t*, but also received earnings from the employer during **one of the last three** quarters

- *How can I use this?*
  - *"Which industry tends to rehire or recall workers?"*
  - *"Age, education of rehired workers?"*
  - *"Seasonality patterns in recalls?"*

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Details: Worker Flows – Accessions *(4 of 6)*

End-of-Quarter Hire (HirAEnd)

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
End-of-quarter Hires											
HirAEnd											

- Accession in quarter *t*, and also receives earnings from that job in quarter *t+1*

- End-of-Quarter employed in *t*

- *How can I use this?*
  - *Special-purpose*
    - *Used to calculate hiring rate*

Full-Quarter Hires (HirAS)

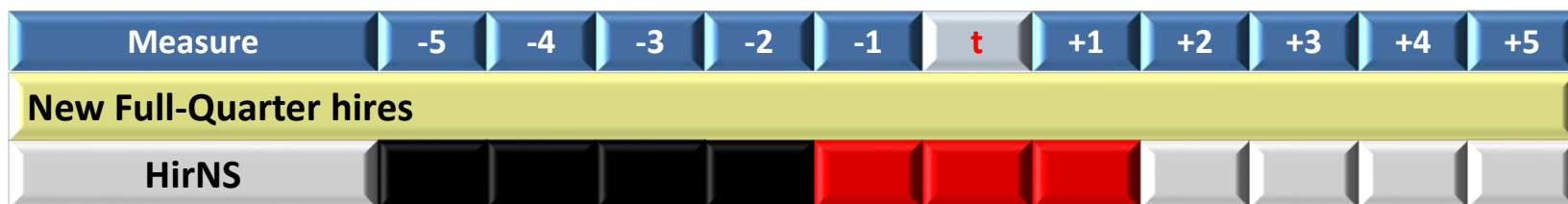| Measure		-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Full-Quarter Hires												
HirAS					■	█	█	█				

- Flow into Full-Quarter Employment
- Accession into **3 consecutive quarters** of employment. Reference period (quarter *t*) is the first quarter of full-quarter (**stable**) status
- *How can I use this?*
    - *"Which industry is hiring stable workers?"*
    - *"How does Education level affect hiring into stable jobs?"*

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New Full-Quarter Hires (HirNS)

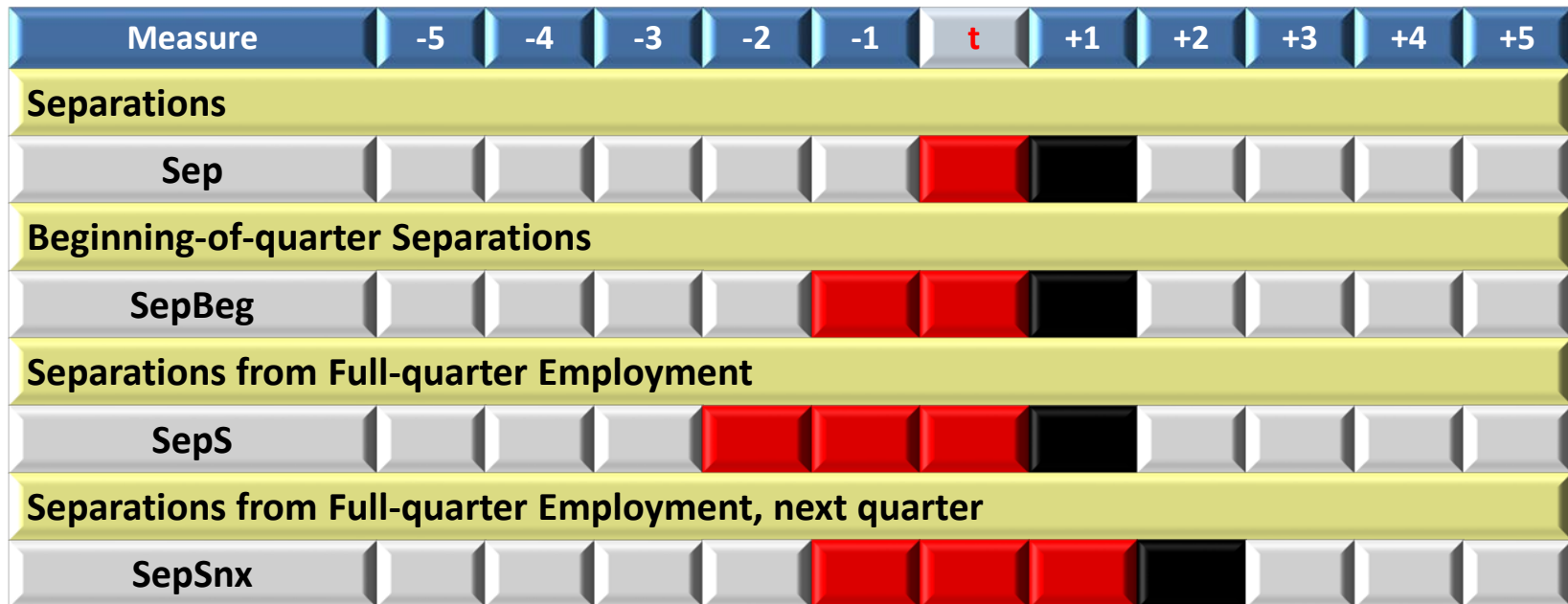| Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
New Full-Quarter hires											
HirNS											

- New Hires into Full-Quarter Employment
- Full-Quarter (**stable**) hire to a firm that did not employ that worker in previous 4 quarters
- *How can I use this?*
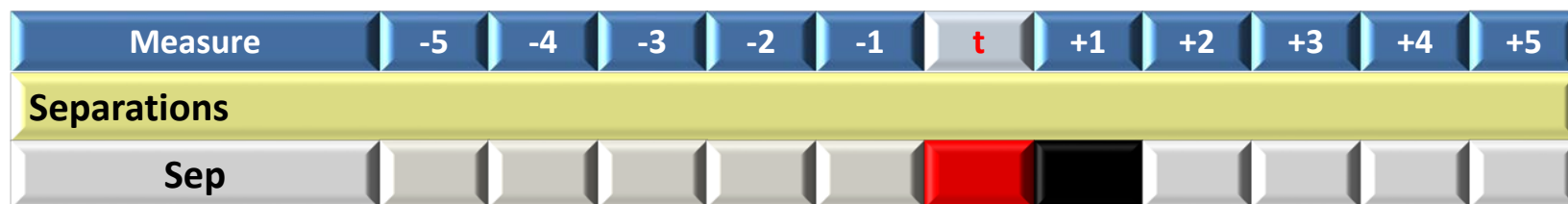 - *Same as full-quarter hires, but emphasizes NEW hires*

Worker Flows Measures – Separation (4)

Overview: Worker Flows Measures – Separations

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Separations											
Sep						�mred	▮black				
Beginning-of-quarter Separations											
SepBeg				▮red	▮red	▮black					
Separations from Full-quarter Employment											
SepS				▮red	▮red	▮red	▮black				
Separations from Full-quarter Employment, next quarter											
SepSnx				▮red	▮red	▮red	▮black				

Separation (Sep)

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Separations											
Sep											

- Positive earning from an employer in current quarter *t*, but not the next quarter
- Job ended in quarter *t*
- *How can I use this?*
  - *"Which Workforce Investment Area has the highest number of separations"?*
  - *"From which industries are workers leaving?"*

Beginning-of-Quarter Separation (SepBeg)

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Beginning-of-Quarter Separations											
SepBeg											

- Separation from jobs for which workers are Beginning-of-Quarter employed in *t*
- Leaving jobs with at least 2 consecutive quarters of earnings
- *How can I use this?*
  - *Special-purpose*
    - *Used to calculate separations rate*

Details: Worker Flows – Separations *(3 of 4)*

Full-Quarter Separation (SepS)

Measure		-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Separation from Full-Quarter Employment												
SepS												
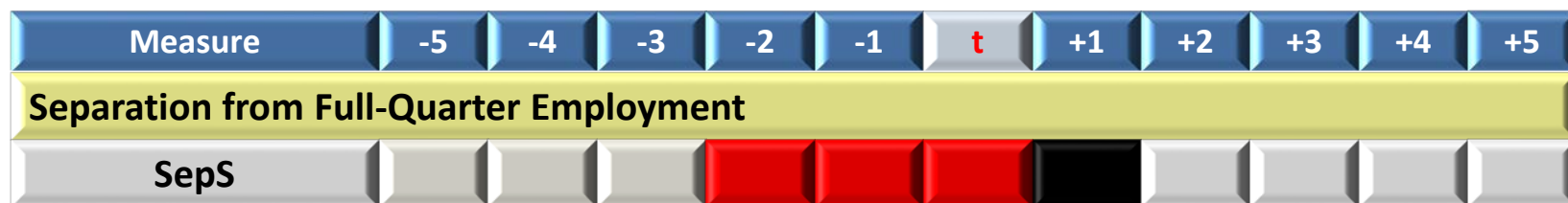
- Separation from jobs with at least 3 consecutive quarters of earnings
- Full-Quarter employment status is in the quarter before that of the separation
  - Separation in *t*
  - Full-quarter status in *t-1*
- *How can I use this?*
  - *"What industries are STABLE workers leaving?"*

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Full-Quarter Separation, next quarter (SepSnx)

Measure		-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Separation from Full-Quarter Employment, next quarter												
SepSnx												

- Full-quarter employment in *t*, separation in the **next quarter** after full-quarter status (*t+1*)

- *How can I use this?*
  - *Special-purpose*
    - *Used to calculate turnover rate*

Average Earnings for Worker Flow Measures (3)

Overview: Earnings for Worker Flow Measures

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Average Monthly Earnings for Hires to Full-Quarter Employment											
EarnHirAS				■		$					
Average Monthly Earnings for New Hires to Full-Quarter Employment											
EarnHirNS	■	■	■	■		$					
Average Monthly Earnings for Separations from Full-Quarter Employment						$		■			

- All are based full-quarter counts, which are less biased by jobs that began or ended part-way through the quarter
- Average earnings are based on quarterly wage record, divided by 3 (monthly estimate)

Average Monthly Earnings for Hires into Full-Quarter Employment (EarnHirAS)

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Average Monthly Earnings for Hires to Full-Quarter Employment											
EarnHirAS						$					

- Average earning for hires that are full-quarter employed in current quarter *t*
- *How can I use this?*
  - *"What is the average starting salary in an industry?"*
  - *"Which metro area in the state offers the highest starting salary?"*

Details: Earnings for Worker Flow Measures *(2 of 3)*

Average Monthly Earnings for New Hires into Full-Quarter Employment (EarnHirNS)

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Average Monthly Earnings for New Hires to Full-Quarter Employment											
EarnHirNS						$					

- Average earning for **NEW** hires that are full-quarter employed in current quarter *t*

- *How can I use this?*
  - *"What are the best paying regions in the state for NEW hires?"*
  - *"How do starting wages rank by firm age or size?"*

Average Monthly Earnings for Separations from Full-Quarter Employment (EarnSepS)

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Average Monthly Earnings for Separations from Full-Quarter Employment											
EarnSepS						$					

- Average earning for workers leaving **stable** jobs for which they are full-quarter employed in current quarter *t*

- *How can I use this?*
  - *"How much are workers aged 25-34 earning, on average, when they leave stable jobs?"*

Hiring, Separation, and Turnover Rates

Hiring Rate

- End-of-Quarter hires divided by the average of Beginning-of-Quarter and End-of-Quarter employment

$$\textbf{HirAEndR}_t = \frac{\text{HirAEnd}_t}{\frac{1}{2}(\text{Emp}_t + \text{EmpEnd}_t)}$$

- Bounded by 0% and 200%
- *How can I use this?*
    - *"What fraction of the workforce are starting or returning to new jobs?"*

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
HirAEnd					■	■	■				
Emp					■	■					
EmpEnd						■	■				

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Separation Rate

- Beginning-of-Quarter separations divided by the average of Beginning-of-Quarter and End-of-Quarter employment

$$\text{SepBegR}_t = \frac{\text{SepBeg}_t}{\frac{1}{2}(\text{Emp}_t + \text{EmpEnd}_t)}$$

- Bounded by 0% and 200%
- *How can I use this?*
  - *"What fraction of the workforce are leaving their jobs?"*

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
SepBeg											
Emp											
EmpEnd											

Turnover Rate

- Measure of worker reallocation ("churn")
- Measure of employment volatility
  - Incorporates both hires and separations

$$\text{TurnOvrS}_t = \frac{(\text{HirAS}_t + \text{SepSnx}_t)}{2 \times \text{EmpS}_t}$$

- If a firm of 100 individuals has 10 separations, and replaces them with 10 hires => **10%** turnover
- *How can I use this?*
  - *"Which age group has the most employment volatility?"*
  - *"Which industry has the highest employment churning?"*

Measure	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
HirAS				■	▰	▰	▰				
SepSnx					▰	▰	▰	■			
EmpS					▰	▰	▰				

Firm-Based Measures (8)

Overview: Firm-Based Measures: Flows, Creations, Destructions

Measure	Description	Category
FrmJbGn	Job Creation (Gain)	Creations
FrmJbGnS	Full-quarter Job Creation	
FrmJbLs	Job Destruction (Loss)	Destructions
FrmJbLsS	Full-quarter Job Destruction	
FrmJbC	Net Job Flows	Flows
FrmJbCS	Net Full-quarter Job Flows	
HirAEndRepl	Replacement Hires	
HirAEndReplR	Replacement Hire Rate	

Measuring Firm-Level Worker Flows

- Firm job flows display dynamics at the establishment level
  - Job creation
    - Establishments that grow over the quarter
    - Establishment births
  - Job destruction
    - Establishments that shrink over the quarter
    - Establishment deaths
  - Net Job Change = Job Creation – Job Destruction

Firm Job Flow Measures *(1 of 2)*

- Calculated at establishment level
  - Job Gain *(FrmJbGn)*
    - Difference between End-of-quarter and Beginning-of-quarter employment *(EmpEnd - Emp)*
      - zero if negative
  - Job Loss *(FrmJbLs)*
    - Difference between Beginning-of-quarter and End-of-quarter employment *(Emp - EmpEnd)*
      - zero if negative
  - Net Job Flows *(FrmJbC)*
    - Difference between End-of-quarter and Beginning-of-quarter employment *(EmpEnd - Emp)*
      - Can be positive (net job creation) or negative (net job destruction)

	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
Emp					■	■					
EmpEnd						■	■				

Firm Job Flow Measures *(2 of 2)*

- Full-Quarter measures are defined similarly:
  - Full-Quarter Job Creation *(FrmJbGnS)*
    - Difference between Full-Quarter employment *(EmpS - EmpSpv)*
      - zero if negative
  - Full-Quarter Job Destruction *(FrmJbLsS)*
    - Difference between Full-Quarter employment *(EmpSpv - EmpS)*
      - zero if negative
  - Full-Quarter Net Job Flows *(FrmJbCS)*
    - Difference between Full-Quarter employment *(EmpS - EmpSpv)*
      - Can be positive (net job growth) or negative (net job destruction)

	-5	-4	-3	-2	-1	t	+1	+2	+3	+4	+5
EmpSpv				■	■	■					
EmpS					■	■	■				

Replacement Hiring

- Hiring and Job Creation are not necessarily equal:
  - Job Creation means more end-of-quarter employment than beginning-of-quarter employment at a firm
    - But – there may be high levels of "churn" at firms, even without net employment growth
- To capture this, we define replacement hires:
  - **Replacement Hires (HirAEndRepl)** are hires in excess of job creation:

$$\text{HirAEndRepl} = \text{HirAEnd} - \text{FrmJbGn}$$

  - The **Replacement Hiring Rate (HirAEndReplR)** is replacement hires as a percentage of average employment:

$$\text{HirAEndReplR} = \frac{\text{HirAEndRepl}_t}{\frac{1}{2}(\text{Emp}_t + \text{EmpEnd}_t)}$$

QWI Estimates:
Source of Replacement Hires
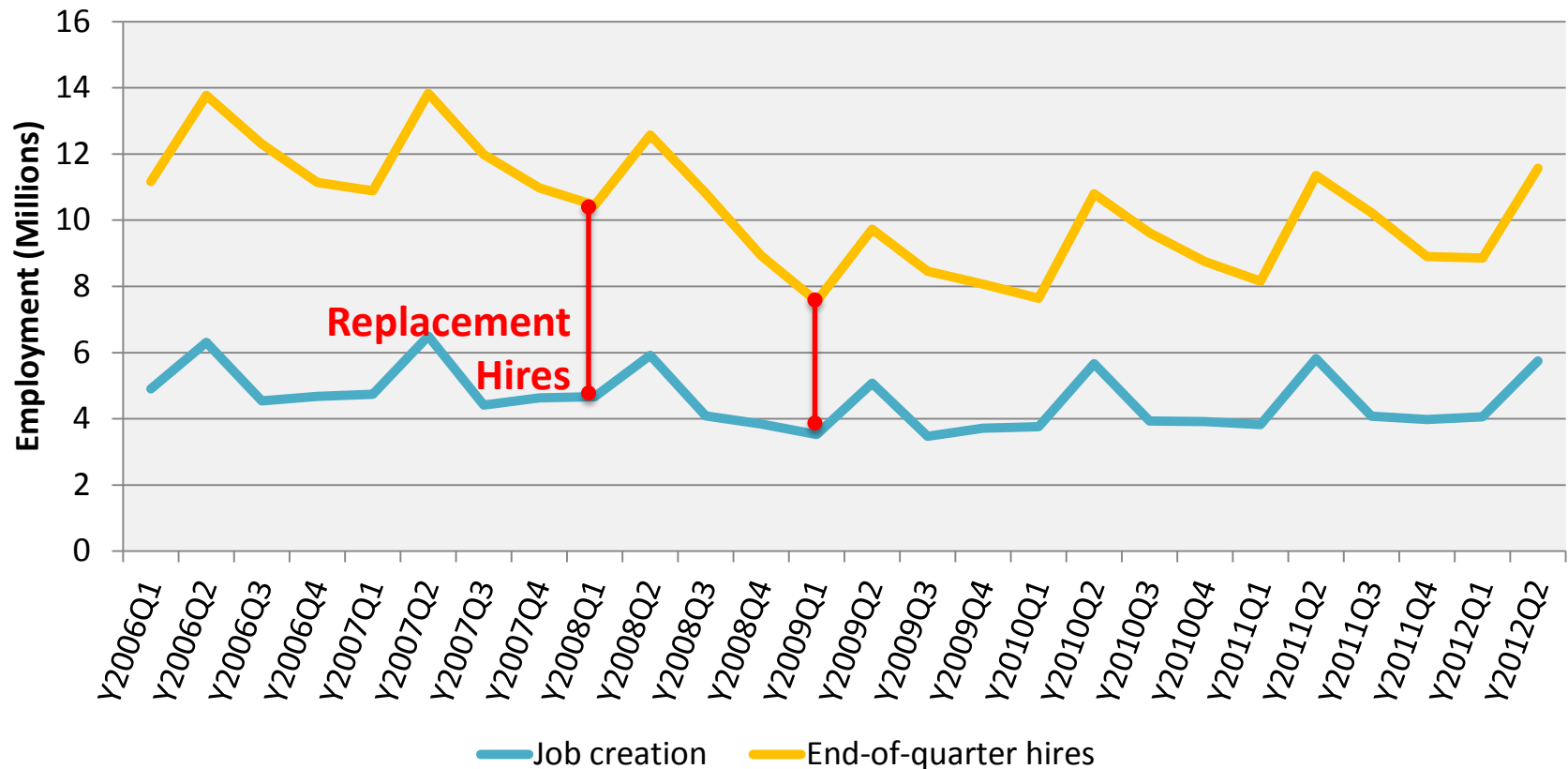
Data: QWI pooled across all available states

Summary

- The QWI provide 32 measures of employment counts, employment flows, and earnings
- By linking to a variety of data sources, the QWI can be tabulated by detailed geography, firm characteristics and worker demographics
- The LEHD program has developed multiple web-based tools for accessing the QWI. These will be demonstrated in the next session.

- Contact us: CES.QWI.Feedback@census.gov

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Thank You!

- Questions? Patrick.Hayward@census.gov
- Please submit feedback to CES.QWI.Feedback@census.gov

Appendix: Advanced Topics

Firm Job Flows:
Be Careful about Aggregation

- Note that for worker demographic categories (such as age and sex), the published net job flows for the subcategories will sum to the margin
- But for gross Job Creation and gross Job Destruction, this is not true
- (Job Creation for men) + (Job Creation for women) does not equal (total Job Creation)
  - Why? Consider this example: A job could be created at a firm and filled by a woman, while another job at the same firm is destroyed, previously filled by a man
  - Job Creation and Job Destruction should be 0, since these are defined at the firm level. Summing across characteristics would produce the wrong totals.
- QWI Explorer has built-in rules to prevent these incorrect aggregations

	Men	Women	Incorrect Total (sum across characteristics)	Correct Total
Job Creation	0	1	1	0
Job Destruction	1	0	1	0
Net Job Flows	-1	+1	0	0

Noise Infusion ("Fuzzing")

- Why infuse noise into data?
  - Reduce the amount of cell suppression while preserving confidentiality and analytic validity
- Properties of noise
  - Every data item is distorted by a minimum amount
  - For a given workplace, data are always distorted in the same direction, by the same percentage in every period and release of QWIs
  - When aggregated, the effects of the distortion cancel out for the vast majority of the estimates
- QWI statistics are flagged when the value is significantly distorted
- See infrastructure document, section 6, for more details

QWI Status Flags

Each data item in the QWI is assigned a status flag.

Status flags indicate why data items are missing, or whether they are significantly distorted:

- -2   No data available in this category for this quarter
- -1   Data not available to compute this estimate
- 1   OK, fuzzed value released
- 5   Value suppressed because it does not meet US Census Bureau publication standards
- 9   Data significantly distorted, distorted value released
- 10   Aggregate of cells, no significant distortion
- 11   Aggregate of cells not released because component cells do not meet US Census Bureau publication standards
- 12   Aggregate of cells, some of which have significantly distorted data

*Note that suppression does not mean zero

LEHD Processing: Weighting

- QWI Beginning-of-Quarter Employment is benchmarked against QCEW Mon1 employment

- Firm-level weights (within bounds) are applied to adjust employment towards Mon1 employment

- Secondary weights are applied to match statewide private-only employment

- Weights are calculated at ECF stage, applied at QWI

QWI Explorer – Exercise/Examples

Advanced Scenario

Comprehensive Laborforce Analysis of the City of Phoenix LWIB.

- **How has Phoenix's Employment changed over the last 10 years?**
  Filter by WIB Geography, Look at Quarter 2 series only, set Group to "No Group". Show Emp and EmpS.
    o Beginning of Quarter and Stable Employment increased to a high point in 2008, but the Great Recession created a valley from 2010-2012. Since then, Emp has slowly increased.

- **Does Grouping by Worker Demographics show different or the same trends in Employment over the last 10 years?** Group by Sex, then Sex, then Education, then Race (Remove White Alone so others can be viewed), then Ethnicity.
    o Sex: Female workers appeared to be closing the Employment gap prior to the Great Recession, and did not appear to be hit quite as hard between 2008 and 2010.
    o Age: Young and middle aged workers had similar patterns of Employment related to the Great Recession, yet workers in the 55-99 age range weathered the recession better, with significantly lower rates of job loss between 2008 and 2010.
    o Education: Young workers (with indeterminable educational attainment) were hit hardest and have not seemed to recover since 2008.
    o Race: No new trends
    o Ethnicity: No new trends

- **Let's look at a Categorical Analysis of the Current Laborforce. Looking at NAICS Sectors as the X-Axis, what are the industries that currently employ the most people in Phoenix?** Set X-Axis to NAICS

Sectors, Group to No Group, hen Sex, then Education, then Race (Remove White Alone so others can be viewed), then Ethnicity.

- o Sex: Female workers appeared to be closing the Employment gap prior to the Great Recession, and did not appear to be hit quite as hard between 2008 and 2010.

Overview

The following example scenarios highlight some of the analyses possible using QWI Explorer: http://qwiexplorer.ces.census.gov. The first set of scenarios include step-by-step instructions, followed by some scenarios to try on your own.

Example Scenarios

1. Let's analyze employment growth in North Dakota's counties due to the recent oil/gas extraction boom. Which ND counties have highest employment in these industries? How fast has employment changed over time?

   - **Set State to "North Dakota" and Group to "Counties". Click the "None" link next to Industries in Filters/Aggregations. Select "NAICS 3-digit Subsectors" from the dropdown and click the checkboxes for "211 Oil and Gas Extraction" and "213 Support Activities for Mining". To see a longer longitudinal view of employment, click "20 Years/Quarters Selected" (under the X-Axis dropdown) and click the green checkmark under "Q2" and unselect all Q1, Q3, and Q4 checkboxes, then click "Set". If desired, counties with no employment can be removed from the analysis by clicking "53 Counties" (under the Group dropdown) and unchecking their boxes. Williams County has the largest total employment and growth, with Ward, Stark, Mountrail, McKenzie, and Dunn counties all growing as well.**

2. What are the average monthly earnings for these six counties in this sector? Have they been growing as well? How do earnings in these sectors compare to earnings in other subsectors in these counties?

   - **Select only the 6 counties from above in the Group Characteristics popup (i.e. click the blue link under Group). Set Indicator to "EarnS". Average monthly earnings for 2014Q2 for the six counties mentioned above range from $8,100 to $9,400. All have seen their earnings increase significantly since 1998.**

     To compare earnings across industries, click the X-Axis dropdown and select "NAICS 3-digit Subsectors" (click "Continue" twice in each Settings Conflict

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popup). Click the column heading for the counties twice to sort by the industries with the highest earnings.

3. How does employment in "Oil and Gas Extraction" in western Pennsylvania (Allegheny, Greene, Indiana, McKean and Washington counties) compare to those counties in North Dakota? Which set of counties have higher earnings?

   - **Set State to "Pennsylvania" and indicator to "Emp". Click "67 Counties" (under the Group dropdown) and check only the boxes for the five counties listed above. Click the "Show Line Chart View" button and click Continue. Click the "None" link next to Industries in Filters/Aggregations. Select "NAICS 3-digit Subsectors" from the dropdown and click the checkboxes for "211 Oil and Gas Extraction" and "213 Support Activities for Mining". Employment has grown significantly over the last 17 years in these counties, but not quite at the rate of North Dakota.**

     Change the indicator to "EarnS".

4. Switching gears, let's look at new hires in Florida. What two counties hired the most young females (14-21 years of age) in 2014 Q4? What NAICS Sectors are the new hires in these counties taking place in? If we look at older females (55-99 years of age), are new hires taking place in different sectors?

   - **Set State to "Florida" and indicator to "HirAEnd". Click the trash can icon next to Filters/Aggregations to clear active filters and then set X-Axis to Counties (the chart should change to a map).**

     Click the "None" link next to Worker Characteristics in Filters/Aggregations. In the Sex/Age selections, activate the "Female", "14-18" and "19-21" checkboxes and then click Set. Double click on the "All" column in the table to sort descending – Miami-Dade and Broward counties had the most new hires in 2012 Q4. You can also confirm this by looking at the map of county employment.

     In order to normalize these counts against average employment, lets change the indicator to "End of Quarter Hiring Rate (HirAEndR)". Now we can see that Hardee and Collier Counties have the most hires in relation to average employment.

     Click "Show Bar Chart" and set Group to NAICS Sectors. Then click the pivot button, and then select only Miami-Dade and Broward counties as the Group. Click each counties name in the column heading once to sort ascending and once more to sort descending – Finance and Insurance and Public Administration have the lowest hiring rate while Retail Trade and Agriculture/Hunting/Fishing have the highest hiring rate. If you change the indicator back to "HirAEnd", you can see the most hires (even though the rate is low) occur in Retail Trade and Accommodation/Food Services.

To see older worker new hires, click "14-18, 19-21" in Filters/Aggregations and check "55-64" and "65-99" as the age filters. For Broward County, hires for this age group happen in "Admin and Support and Waste Management…" and "Health Care".

5. Video rental stores are slowly becoming a thing of the past - can we use QWI Explorer to see longitudinal trends in employment in this industry (5322 Consumer Goods Rental) in Florida? Do the trends in employment change when looking at large firms (i.e. Blockbuster) or small firms (i.e. mom/pop stores)? What happens if you change to a new state (i.e. are trends the same, more dramatic, etc.) like California?

6. What NAICS Sector in Maine had the highest amount of turnover in 2013 Q3? What about in 1998 Q2? Is there much difference between the turnover rates for Males and Females in these NAICS Sectors?

7. As of 2014 Q1, what metropolitan area in Ohio had the largest amount of firm job change? In what NAICS Sector did most of that metro area's net increase come from? Did the increase in jobs come primarily from college educated workers or from a different educational attainment category?