


# Business Employment Dynamics

Business Employment Dynamics (BED) is a quarterly and annual series of statistics on gross job gains and gross job losses from 1992 forward. The BED dataset aims to provide a picture of the dynamic state of the labor market and is generated from the Quarterly Census of Employment and Wages (QCEW) program of the Bureau of Labor Statistics (BLS).



**HANDBOOK  
of  
METHODS**

CONCEPTS  
DATA SOURCES  
DESIGN  
CALCULATION  
PRESENTATION

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## Concepts

Business Employment Dynamics (BED) is a set of quarterly and annual data on gross job flows. The BED dataset provides a measure of the dynamic state of the labor market. The BED program publishes national North American Industry Classification System (NAICS) sub sector data, national firm-size data, state industry NAICS sector data, national industry NAICS sector data on establishment age and survival, and state data on establishment age and survival, as well as data on the size of employment change in establishments.

Whereas a firm would represent an entire business, an establishment affords data that offer a more granular look at the labor market. Establishments represent smaller elements that are based on location and/or primary economic activity. BED data are produced with the use of establishment-level microdata from the BLS longitudinally linked database containing employment and wage data collected by the QCEW program. A unique identifier assigned to each record allows tracking of each business across time despite changes in name or ownership. These longitudinal histories are then used to calculate BED statistics such as gross job gains and losses and business births and deaths. Gross job gains are jobs gained from establishment expansions plus openings. Gross job losses are jobs lost from establishment contractions plus closings. All BED data are available on the BLS website (<https://www.bls.gov/bdm/>); the most recent data can be found in the BED press release (<https://www.bls.gov/news.release/pdf/cewbd.pdf>).

*Openings.* These are establishments either with positive third-month employment for the first time in the current quarter, with no links to the previous quarter, or with positive third-month employment in the current quarter following zero employment in the previous quarter.

*Expansions.* These are establishments with positive employment in the third month in both the previous and current quarters, with a net increase in employment over this period.

*Gross job gains.* This is the sum of all jobs from opening and expanding establishments.

*Closings.* These are establishments with positive third-month employment in the previous quarter and with either zero third-month employment reported in the current quarter or an inactive status in the current quarter.

*Contractions.* These are establishments with positive employment in the third month in both the previous and current quarters, with a net decrease in employment over this period.

*Gross job losses.* This is the sum of all jobs from closing and contracting establishments.

*Births.* These are establishments with positive third-month employment for the first time in the current quarter and with no links to the previous quarter, or units with positive third-month employment in the current quarter and zero employment in the third month of the previous four quarters. Births are a subset of openings and do not include reopenings of seasonal businesses.

*Deaths.* These are establishments with no employment or zero employment reported in the third month of four consecutive quarters following the last quarter with positive employment. Deaths are a subset of closings and do not include temporary shutdowns of seasonal businesses. An establishment that closes during the quarter may be a death, but the BED program waits three quarters to determine whether the closing is permanent or is just a temporary shutdown. Therefore, there is a lag of three quarters between a permanent closing and its publication as an establishment death.

All employment changes are measured from the third month of the previous quarter to the third month of the current quarter. Not all establishments and firms change their employment levels. Establishments with no change in employment count toward estimates of total employment, but not for levels of gross job gains and gross job losses.

## Industry Classification of Establishments

All federal statistical agencies currently use the North American Industry Classification System (NAICS) to define industries and classify establishments. NAICS revises its industry classifications every 5 years, to stay current with industrial organization in North America.

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## ***Data Sources***

Business Employment Dynamics (BED) utilizes data collected by the Quarterly Census of Employment and Wages (QCEW) and, as a result, no additional response burden is imposed in generating these data. BED links QCEW establishment data across quarters to provide a longitudinal history for each establishment.

QCEW data are derived from reports of employment data and wage data for workers covered by unemployment insurance (UI) and Unemployment Compensation for Federal Employees. These reports are a result of the administration of state unemployment insurance through State Employment Security Agencies (SESAs). All employers subject to state UI laws are required to submit quarterly reports detailing their monthly employment and quarterly wages. The data are compiled from quarterly contribution reports submitted to the states by employers. BLS directs the states toward turning the incoming UI administrative data into highly accurate economic statistics. (For more information on the QCEW, visit the QCEW website (<https://www.bls.gov/cew/>)).

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## Design

Data analysts have known for a long time that estimating the number of jobs created by small businesses is extremely sensitive to the statistical methodology used.<sup>1</sup> During the development phase of Business Employment Dynamics (BED) firm-size data, multiple “sizing” methodologies were analyzed, primarily by Cordelia Okolie.<sup>2</sup> Ultimately, the BED program decided to use dynamic sizing.

Dynamic sizing is a straightforward measurement methodology that allocates a firm’s quarterly employment growth or loss to the size class in which the growth or loss occurred. Firms are initially assigned to a size class each quarter on the basis of their employment in the previous quarter, but are reassigned to a new size class during the quarter when their employment change indicates that a size-class threshold has been crossed. For example, for a firm growing from 3 to 13 employees, the growth of 10 would be allocated as follows: size class 1–4 would be credited with the growth of 1 employee (the growth from 3 to 4), size class 5–9 would be credited with the growth of 5 employees (the growth from 4 to 9), and size class 10–19 would be credited with the growth of 4 employees (the growth from 9 to 13). The methodology of dynamic sizing—also referred to as momentary sizing—was initially proposed by Per Davidsson in two research papers in the mid- to late 1990s.<sup>3</sup>

Dynamic sizing is based on a measurement process that assumes continuous linear employment growth or loss from one quarter to the next, with the growth or loss allocated to the appropriate size class at the moment it occurred. Thus, for a firm growing from 3 employees in June to 13 employees in September, its growth of 10 employees can be linearly modeled as the growth of 1 employee every 9 days (over a total of 13 weeks from one quarter to the next, for a total growth of 10 employees over the 91 days that make up the quarter during which the growth occurred). If a firm’s employment change could be measured on a daily basis, and if the change occurred linearly within the quarter, then the statistics from this measurement process would be equivalent to the statistics from dynamic sizing with quarterly point-in-time employment data.<sup>4</sup>

### NOTES

<sup>1</sup> This relationship was explained by Steven J. Davis, John C. Haltiwanger, and Scott Schuh, *Job Creation and Destruction* (Cambridge, MA: MIT Press, 1996) and was confirmed by Cordelia Okolie, “Why size class methodology matters,” *Monthly Labor Review*, July 2004, pp. 3–12, <https://www.bls.gov/opub/mlr/2004/07/art1full.pdf>. Okolie used BED microdata in her article.

<sup>2</sup> Cordelia Okolie, “Why size class methodology matters.” *Monthly Labor Review*, July 2004, pp. 3–12, <https://www.bls.gov/opub/mlr/2004/07/art1full.pdf>.

<sup>3</sup> See Per Davidsson, “Methodological concerns in the estimation of job creation in different firm size classes,” Working Paper (Jönköping, Sweden: Jönköping International Business School, 1996), and Per Davidsson, Leif Lindmark, and Christer Olofsson, “The extent of overestimation of small firm job creation—an empirical examination of the regression bias,” *Small Business Economics*, November 1998, pp. 87–100.

<sup>4</sup> Data users interested in learning more about BED firm-size data and the process by which dynamic sizing was selected may consult the article "[Business Employment Dynamics: tabulations by employer size](#)" and Okolie, "[Why size class methodology matters](#)".

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## Calculation

Business Employment Dynamics (BED) data are captured from a near-census of all businesses. Because these data are gathered for the entire population of businesses, there is no need to conduct a sample estimate; thus, the published data are not subject to sampling error. BED has published multiple articles on methodology, including the [creation of BED](#), [measuring establishment employment flows](#), [size-class methodology](#), [dynamic sizing](#), and [establishment birth and death](#) data.

## Linkage Methodology

Prior to the measurement of gross job gains and gross job losses, QCEW records are linked across two quarters. The linkage process matches establishments' unique State Employment Security Agency identification numbers (SESA-IDs). Between 95 percent and 97 percent of establishments identified as continuous from quarter to quarter are matched by SESA-ID. The rest are linked in one of three ways. The first method uses predecessor and successor information, identified by the states, that relates records with different SESA-IDs across quarters. Predecessor and successor relations can come about for a variety of reasons, including a change in ownership or the restructuring of a firm or a UI account. If a match cannot be attained in this manner, a statistical programming-based match is used. This match attempts to identify two establishments with different SESA-IDs as continuous. The match is based upon comparisons such as the same name, address, and phone number. Third, analysts examine unmatched records and matched records where appropriate.

In order to ensure the highest possible quality of data, SESAs verify with employers the industry, location, and ownership classification of all establishments and update any misinformation if necessary. Verification and updating are done on a 4-year cycle. Changes in establishment classification codes resulting from the verification process are introduced with the data reported for the first quarter of the year. Changes resulting from improved employer reporting also are introduced in the first quarter.

## Seasonal Adjustment

The sole estimation technique applied to the BED data series is that of seasonally adjusting the aggregated components. Seasonal adjustment is a statistical method used to facilitate the analysis of a data series across time by removing typical movements found at the same point of time from year to year. For example, we expect to see employment levels increase in June because most secondary and tertiary academic institutions have an extended break during the summer. The smoothing of seasonal fluctuations through seasonal adjustment highlights the true shift in the demand or supply of labor by removing well-behaved, predictable patterns from the series. The BED data are produced quarterly and are based on two of the series' components: gross job gains and gross job losses. Gross job gains normally rise in the second and fourth quarters, whereas increases in gross job losses are expected in first and third quarters. All of the BED components are seasonally adjusted with the airline model, one of the most recognizable statistical methods in economic time series modeling.

The airline model was developed in the 1970s by the statisticians, George Box and Gwilym Jenkins. As the name suggests, the model arose from a project intended to forecast airline ticket sales, using past sales data as the only predictive variable. Because of its functionality and universality, the original autoregressive integrated moving average (ARIMA) (0,1,1)(0,1,1) airline model is applied to all of the quarterly BED time series. Also, because of limited resources and the vast number of BED series that are seasonally adjusted, the X-13-ARIMA program, originally constructed by the Census Bureau, is utilized through call functions in macros coded in the associated Statistical Analysis System (SAS) software. Finally, in order to maintain the additive properties of each series, gross job gains and gross job losses are indirectly seasonally adjusted by summing the seasonally adjusted expansions and openings components and the seasonally adjusted contractions and closings components, respectively. Net changes are calculated on the basis of the difference between seasonally adjusted gross job gains and losses.

## Sizing Methodology

The method of dynamic sizing is used in calculations for the BED size-class data series. Dynamic sizing allocates each firm's employment gain or loss during a quarter to each respective size class in which the change occurred. For example, if a firm grew from 2 employees in quarter 1 to 38 employees in quarter 2, then, of the 36-employee increase, 2 would be allocated to the first size class (1 to 4), 5 to the size class 5 to 9, 10 to size class 10 to 19, and 19 to size class 20 to 49.

Dynamic sizing provides symmetrical firm-size estimates and eliminates any systematic effects that might be caused by the transitory, back-and-forth changes in firms' sizes over time. In addition, it allocates each job gain or loss to the actual size class in which it occurred.

## Reliability of the Data

As mentioned earlier, because the BED data series are based on administrative data rather than a sample estimate, no issues related to sampling error arise. Nonsampling error, however, still exists. Nonsampling errors can occur for many reasons, such as the employer submitting corrected employment data after the end of the quarter or businesses making typographical errors when providing information. Such errors, however, are likely to be distributed randomly throughout the dataset.

Changes in administrative data sometimes create complications for the linkage process. These complications can result in overstating openings and closings while understating expansions and contractions. BLS continues to refine methods for improving the linkage process in order to alleviate the effects of such complications.

The BED data series are subject to periodic minor changes based on corrections in QCEW records, updated information on predecessors and successors, and seasonal adjustment revisions.

Annual revisions are published each year with the release of the first-quarter data. These revisions cover the last four quarters of data that are not seasonally adjusted and 5 years of seasonally adjusted data.



A primary input to the QCEW program is derived from employers' mandatory reports of UI taxation information. Enforcement of these UI reporting requirements is substantial in order to ensure the solvency of the UI system. Thus, coverage for all UI-covered businesses is very high. Other sources of statistical error are controlled through significant editing and review of employment and wage data and of industry and geographic codes. Imputation for employment is very low, about 2 percent. The magnitude of the changes produced by revisions also is very low. Over the course of the yearly refinement cycle, during which analysts revise four quarters of data that are not seasonally adjusted and 5 years of seasonally adjusted data, the average magnitude of total revisions for the last 5 years, at the U.S. total level, has been less than  $\pm 50,000$  jobs. The average magnitude of net revisions has been less than +25,000 jobs. For more information on BED methodology and the reliability of BED data, see [technical note](#) published with every BED news release.

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## Presentation

The Business Employment Dynamics (BED) data series are published quarterly, approximately 7 months after the reference period. BED data are offered at the national and state levels. Data on establishment births and deaths, as well as establishment age and survival are also available. In addition, the BED program publishes firm-size data, available for nine size classes defined by the Office of Management and Budget (OMB) as well as the standard “small” (1–49 employees) “medium” (50–249 employees) and “large” (250 or more employees) size classes. The most up-to-date data can be found on the BED website: <https://www.bls.gov/bdm/>.

## Uses

BED data products have a number of uses. For example, the Federal Reserve Board uses BED data on job creation and destruction. Regional Federal Reserve Banks, such as the Federal Reserve Bank of Richmond, use BED data for regional analysis. At the state level, state labor market information bureaus use BED data to compare state and national business cycle trends. BED data also are used by other federal agencies; for example, the Small Business Administration uses BED data tabulated by size of firm to measure job creation and destruction by small businesses. National and local media use BED job-flow and firm-size data to explain and discuss economic trends. On an international level, the Organisation for Economic Co-operation and Development (OECD) uses BED birth and death data to measure entrepreneurship in the OECD–Eurostat Entrepreneurship Indicators Programme.

## Data available

Data on the private sector are available for the nation as a whole and by NAICS sector and subsector. In addition, BED state data are available by NAICS sector.

The BED program also publishes data on firms by size class of the firm. Size-class data are available for small (1–49 employees), medium (50–249 employees), and large (250 or more employees) firms, as well as for nine OMB-defined size classes.

The longitudinal aspect of BED data allows for the publication of data on business births and deaths and on the age of establishments.

## Research

The BED program allows for multiple research pathways. Staff are continuously working on new data products for the public. Researchers have used BED data to examine the role of [high-growth](#) firms, also known as “gazelles,” in the labor market. Other research interests include, but are not limited to, the [geospatial distribution of employment](#), [firm sizes and the business cycle](#), and [the role of younger and older establishments in the labor market](#).

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# History

Business Employment Dynamics are based on data collected in the Quarterly Census of Employment and Wages. The conceptual basis for the BED dataset comes out of academic discussions that look at calculating new measures from existing data.<sup>1</sup> Such calculation requires that the cross-sectional QCEW be linked longitudinally across time in order to capture and link noneconomic changes. The linkage methodology avoids overstating establishment openings and closings and thus overstating job turnover in the economy. The BED data series was first published in September 2003, covering the period from September 1992 to December 2002. BLS has continued to publish gross job gains and gross job losses, quarterly and annually, on the basis of employment levels in the third month of each quarter. These data are published approximately 7 months after the reference quarter. The BED program develops and releases new data products frequently. In September 2003, the program began publishing gross job flows. Since then, it has expanded, with greater industry, size, and geographic detail. Following is a time line of the month and year the various BED data series were released for publication:

## Major Milestones

- **September 2003:** BED data are first released; dataset consists of data on national total private businesses.
- **May 2004:** National NAICS sector BED data are first released.
- **December 2005:** National firm size BED data are first released.
- **August 2007:** State total private BED data are first released.
- **September 2008:** BED national data on the size of employment change are first released.
- **May 2009:** Annual national and state BED data are first released.
- **May 2009:** National and state BED data on births and deaths of establishments are first released.
- **August 2010:** Three-digit NAICS sector BED data are first released.
- **August 2010:** BED data on establishment age and survival are first released.
- **February 2012:** Two-digit state NAICS Sector BED data are first released.

## NOTES

<sup>1</sup> Steven J. Davis, John C. Haltiwanger, and Scott Schuh, *Job creation and destruction* (Cambridge, MA: MIT Press, 1996).

## Archives

- [October 04, 2018](#)

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## More Information

Several other programs within BLS produce information closely related to BED data:

The QCEW program provides both quarterly and annual estimates of employment by state, county, and detailed industry. The program also publishes news releases on quarterly county employment and wages and an annual bulletin.

The Current Employment Statistics (CES) program produces monthly estimates of employment, of net changes in employment, and of earnings by detailed industry. These estimates are part of the *Employment Situation* report, put out monthly by BLS.

The Job Openings and Labor Turnover Survey (JOLTS) program provides monthly measures of job openings, as well as measures of employee hires and separations.

### **More information on the Business Employment Dynamics dataset can be found in the following publications:**

Zhi Boon, Charles M. Carson, R. Jason Faberman, and Randy E. Ilg, “Studying the labor market using BLS labor dynamics data,” *Monthly Labor Review*, February 2008, pp. 3–16, <https://www.bls.gov/opub/mlr/2008/02/art1full.pdf>

Shail J. Butani, Richard L. Clayton, Vinod Kapani, James R. Spletzer, David M. Talan, and George S. Werking, Jr., “Business Employment Dynamics: tabulation by employer size” *Monthly Labor Review*, February 2006, pp. 3–22, <https://www.bls.gov/opub/mlr/2006/02/art1full.pdf>

Richard L. Clayton, Akbar Sadeghi, David M. Talan, and James R. Spletzer, “High-employment-growth Firms: Defining and Counting them,” *Monthly Labor Review*, June 2013, <https://www.bls.gov/opub/mlr/2013/article/clayton.htm>

Steven J. Davis, John C. Haltiwanger, and Scott Schuh, *Job creation and destruction*. Cambridge, MA: MIT Press, 1996.

Jessica Helfand, “All firm sizes hit hard during the current recession,” *Issues in Labor Statistics*, March 2010, Summary 10-02, pp. 1-4, <https://www.bls.gov/opub/ils/pdf/opbils79.pdf>

Jessica Helfand, Akbar Sadeghi, and David Talan, “Employment dynamics: small and large firms over the business cycle,” *Monthly Labor Review*, March 2007, pp. 39–50, <https://www.bls.gov/opub/mlr/2007/03/art3full.pdf>

Amy E. Knaup and Merissa C. Piazza, “Business Employment Dynamics data: survival and longevity, II” *Monthly Labor Review*, September 2007, pp. 3–10, <https://www.bls.gov/opub/mlr/2007/09/art1full.pdf>

Sheryl Konigsberg, “The geospatial distribution of employment: a new visual asset,” *Monthly Labor Review*, March 2007, pp. 51–60, <https://www.bls.gov/opub/mlr/2007/03/art4full.pdf>

Sheryl L. Konigsberg, James R. Spletzer, and David M. Talan, “Business employment dynamics: tabulations by size of employment change,” *Monthly Labor Review*, April 2009 pp. 19–29, <https://www.bls.gov/opub/mlr/2009/04/art2full.pdf>

Carol Leming, Akbar Sadeghi, James R. Spletzer, and David M. Talan, “The role of younger and older business establishments in the U.S. labor market,” *Issues in Labor Statistics*, August 2010, Summary 10-09, [https://www.bls.gov/opub/ils/summary\\_10\\_09/younger\\_older\\_business\\_establishments.htm](https://www.bls.gov/opub/ils/summary_10_09/younger_older_business_establishments.htm)

Cordelia Okolie, “Why size class methodology matters in analyses of net and gross job flows,” *Monthly Labor Review*, July 2004, pp. 3–12, <https://www.bls.gov/opub/mlr/2004/07/art1full.pdf>

Joshua C. Pinkston and James R. Spletzer, “Annual measures of gross job gains and gross job losses,” *Monthly Labor Review*, November 2004, pp. 3–13, <https://www.bls.gov/opub/mlr/2004/11/art1full.pdf>

Timothy R. Pivetz, Michael A. Searson, and James R. Spletzer, “Measuring job and establishment flows with BLS longitudinal microdata,” *Monthly Labor Review*, April 2001, pp. 13–20, <https://www.bls.gov/opub/mlr/2001/04/art2full.pdf>

Akbar Sadeghi, “The births and deaths of business establishments in the United States,” *Monthly Labor Review*, December 2008, pp. 3–18, <https://www.bls.gov/opub/mlr/2008/12/art1full.pdf>

James R. Spletzer, R. Jason Faberman, Akbar Sadeghi, David M. Talan, and Richard L. Clayton, “Business employment dynamics: new data on gross job gains and losses,” *Monthly Labor Review*, April 2004, pp. 29–42, <https://www.bls.gov/opub/mlr/2004/04/art3full.pdf>

**Additional information on the BED can be found online at <https://www.bls.gov/bdm/>.**

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