

## RESEARCH WORKING PAPER SERIES

### MEASURING JOB TRENDS AMONG ENTREPRENEURIAL AND OLDER FIRMS: A METHODS NOTE

October 2022

#### ABSTRACT



Job trends among entrepreneurial firms are important considerations for policymakers and others interested in entrepreneurship and economic development. In an effort to track trends related to private sector jobs among firms of various ages, over time, and across geographies, we developed the Entrepreneurial Jobs Indicators. These four indicators – *creation*, *contribution*, *compensation*, and *constancy* – are calculated using the Quarterly Workforce Indicators, an administrative data series from the U.S. Census Bureau. This working paper details the data and methods used to create the Entrepreneurial Jobs Indicators.<sup>1</sup>

**Keywords:** jobs, entrepreneurship, measurement, indicators, firm age, job creation, earnings

**Acknowledgments:** Travis Howe and Sameeksha Desai developed the original framework for this project. Diane Burton, Robert Fairlie, Alyse Freilich, John Haltiwanger, Jessica Looze, Derek Ozkal, Stephen Tibbets, and Aleksandra Tsvetkova provided thoughtful discussion and ideas for refinement of this project. Katie Andersen, Thom Goff, Erin Kenney, and Hayden Murray provided methodological and data analysis support.

Explore the Kauffman Indicators further at: [www.kauffman.org/indicators](http://www.kauffman.org/indicators)

Questions and correspondence: [indicators@kauffman.org](mailto:indicators@kauffman.org)

**Suggested citation:** Ewing Marion Kauffman Foundation. (2022). *Measuring Job Trends Among Entrepreneurial and Older Firms: A Methods Note*, Ewing Marion Kauffman Foundation, Kansas City.

*Research Working Papers are made available by the Ewing Marion Kauffman Foundation to share research and encourage discussion. These papers have not necessarily been peer reviewed, and the views and findings expressed are those of the authors and do not reflect the official views of the Foundation.*

---

<sup>1</sup> Python code used to obtain and transform the data and calculate the indicators is available at <https://github.com/EMKF/eji>.



## INTRODUCTION

The Kauffman Foundation created the Entrepreneurial Jobs Indicators to provide information on private sector job trends related to entrepreneurship. This series includes four indicators:

- **Creation** is the net private sector job change per 1,000 people. It is measured as the annualized difference between jobs held at the end of the quarter and jobs held at the start of the quarter among a specific firm age group in a particular geographic location.
- **Contribution** is the relative share of private sector employment in a geographic area that is attributable to firms of a certain age group. It is measured as the ratio of the employment of firms in a specific age category in a geographic area to total employment in that area.
- **Compensation** is the relative earnings from jobs in a particular firm age group and geographic area. It is measured as the average earnings of a private sector employee at firms in a certain age group and geography, relative to the average earnings of all private sector employees in the U.S. as a whole.
- **Constancy** is a measure of employment stability. It is calculated as the ratio of the number of private sector jobs with earnings from the same employer in three consecutive quarters (specifically time  $t-1$ ,  $t$ , and  $t+1$ ; also called “stable jobs”) to the number of people employed at any time during the quarter (i.e., during time  $t$ ).

These indicators allow for comparisons within and across firm age groups, geographies, and years. Firm age comparisons offer insight regarding differences as firms mature, and we compare the four indicators across five firm age categories: 0-1 year old, 2-3 years old, 4-5 years old, 6-10 years old, and 11+ years old. Geography is also important because regional characteristics are relevant for understanding job dynamics across the U.S. All indicators are calculated at the national, state, and county levels, as well as the metropolitan statistical area (MSA) level for the 50 most populous MSAs.<sup>2</sup> For each of the indicators, then, there are five values based on firm age for a given year and geographic unit.

The calculations for each indicator are based primarily on data from the Quarterly Workforce Indicators, an administrative data series from the U.S. Census Bureau. Definitions and methods are consistent across the geographic levels. Estimates are presented for the years 2001–2020, as data are available.<sup>3</sup>

These indicators reflect complex relationships between firms and jobs over time and across geographic areas. As these relationships can be influenced by a number of factors, the indicators should be interpreted within a broad context. They are not meant to rank or score the performance of states or MSAs. Many factors can shape the

---

<sup>2</sup> Data used to determine the most populous MSAs in the U.S. are from 2020. See United States Census Bureau, *Metropolitan and Micropolitan Statistical Areas Totals: 2010-2020*.

<sup>3</sup> Data are not available for some years for certain MSAs, counties, and states.

strength of a given geography’s economy, and a higher or lower number for one of the indicators is not necessarily more or less desirable. Rather, the indicators are intended to help us understand the relationships between firm age and various dimensions of job trends across geographies, as well as changes in these relationships over time. A decline in job creation by new firms over time, for example, may prompt questions about the reasons that new firms are not creating jobs, and it may inspire inquiries regarding broader economic conditions and their consequences for business dynamism and economic competitiveness.

These indicators should also not be used to compare whether a job in a younger firm is “better” or “worse” than a job in an older firm, as the indicators do not provide that type of specific insight for job seekers. The compensation indicator, for example, should be understood in the context of worker characteristics (such as age, educational attainment, skills, and work experience) and firm characteristics (such as firm size and industry). It is also important to consider local conditions, including industry composition and other factors that affect earnings and the cost of living in a given geographic area.



## DATA AND METHOD

The Entrepreneurial Jobs Indicators rely primarily on data from the Quarterly Workforce Indicators (QWI), which are published by the U.S. Census Bureau.<sup>4</sup> QWI is a public-use dataset derived from the Longitudinal Employer-Household Dynamics (LEHD) linked employer-employee microdata. The LEHD data include over 95% of U.S. private sector jobs.<sup>5</sup> QWI data consist of quarterly measures of labor market activity, including variables related to employment, job creation and destruction, job hires and separations, turnover, wages, and longevity. The data are available at the MSA, county, state, and national levels, and they can be disaggregated by firm characteristics (ownership type, firm size, firm age, and industry) and worker demographics (sex, age, education, race, and ethnicity). QWI data are available beginning in 1993, though not for all states until 2010.<sup>6</sup>

The data used in the construction of the Entrepreneurial Jobs Indicators are disaggregated by firm age, which restricts the underlying class of firms to those in the private sector. In order to create indicators that are annual measures, the quarterly QWI data are aggregated to yearly data. In instances in which four quarters of data for a year are not available in the dataset, the corresponding indicator value is missing [i.e., not reported]. The resulting dataset of indicators includes values for each of the four indicators for the years 2001 through 2020.

---

<sup>4</sup> The data available on <https://indicators.kauffman.org/> reflect the 2022Q2 vintage of the QWI data and were compiled using both the Census API (<https://api.census.gov/data/timeseries/qwi/sa>) and web tools (<https://ledextract.ces.census.gov/static/data.html>). Please see <https://github.com/EMKF/eji> for details.

<sup>5</sup> See U.S. Census Bureau, *Quarterly Workforce Indicators 101*.

<sup>6</sup> See [https://ledextract.ces.census.gov/loading\\_status.html](https://ledextract.ces.census.gov/loading_status.html) for start and end quarters by state.

The indicators are also based on yearly population estimates from the Census's Population Estimates Program (PEP).<sup>7</sup> These data are merged with the annualized QWI data to create a per capita measure. We present more detail regarding this process below in the discussion of the *creation* indicator.

## QWI measures

The QWI variables<sup>8</sup> used in the calculations of the indicators include “Beginning-of-Quarter Employment: Counts,” “End-of-Quarter Employment: Counts,” “Full-Quarter Employment (Stable): Counts,”<sup>9</sup> “Employment-Reference Quarter: Counts,” and “Beginning of Quarter Employment: Average Monthly Earnings.”<sup>10</sup> These variables are denoted below as  $Emp_{yqia}$ ,  $EmpEnd_{yqia}$ ,  $EmpS_{yqia}$ ,  $EmpTotal_{yqia}$ , and  $EarnBeg_{yqia}$ , respectively, where  $y$  indexes the measurement year,  $q$  the measurement quarter,  $i$  the geographic level (i.e., a particular MSA, county, state, or the entire U.S.), and  $a$  the firm age group (0-1 year old, 2-3 years old, 4-5 years old, 6-10 years old, or 11+ years old).

While the QWI data have a quarterly frequency, the population data are available yearly. To compute a time-comparable set of measures, we converted the QWI data from quarterly metrics to annualized (yearly) metrics. In the case of “Beginning-of-Quarter Employment: Counts,” “End-of-Quarter Employment: Counts,” “Full-Quarter Employment (Stable): Counts,” and “Employment-Reference Quarter: Counts,” each yearly measure (denoted  $Emp_{yia}$ ,  $EmpEnd_{yia}$ ,  $EmpS_{yia}$  and  $EmpTotal_{yia}$ ) is simply the sum of the four quarterly values for that year:



---

<sup>7</sup> The data were accessed June 24, 2021, through the relevant Census APIs. These include <https://www2.census.gov/programs-surveys/pepest/tables/1990-2000>, [https://api.census.gov/data/2000/pep/int\\_population](https://api.census.gov/data/2000/pep/int_population), and <https://api.census.gov/data/2019/pep/population>. Please see <https://github.com/EMKF/eji> for details.

<sup>8</sup> For more information on QWI variable definitions, see U.S. Census Bureau, *Quarterly Workforce Indicators 101*.

<sup>9</sup> According to the U.S. Census Bureau's QWI documentation, “[Stable jobs reflect] The number of jobs that are held on both the first and last day of the quarter with the same employer. Note, 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).” See U.S. Census Bureau, *Quarterly Workforce Indicators 101*.

<sup>10</sup> According to the U.S. Bureau of Labor Statistics' Handbook of Methods, earnings in the QWI derive from quarterly earnings reported for unemployment insurance purposes. Coverage may vary from state to state, but coverage overall is similar to that for the BLS Quarterly Census of Employment and Wages. In most states, it includes “bonuses, stock options, severance pay, the cash value of meals and lodging, tips and other gratuities.” In some states, wages also include “employer contributions to certain deferred compensation plans, such as 401(k) plans.” See U.S. Bureau of Labor Statistics, *Handbook of Methods: Quarterly Census of Employment and Wages*.



$$Emp_{yia} = \sum_{q=1}^4 Emp_{yqia}$$

$$EmpEnd_{yia} = \sum_{q=1}^4 EmpEnd_{yqia}$$

$$EmpS_{yia} = \sum_{q=1}^4 EmpS_{yqia}$$

$$EmpTotal_{yia} = \sum_{q=1}^4 EmpTotal_{yqia}$$

To create the yearly level of employment (denoted  $EmpMid_{yia}$ ), we take the average of the beginning of quarter employment and end of quarter employment,<sup>11</sup> and then we take the average of that value across quarters:

$$EmpMid_{yia} = \frac{\sum_{q=1}^4 \frac{(Emp_{yqia} + EmpEnd_{yqia})}{2}}{4}$$

In the formula for the *contribution* indicator, we use an overall measure of the yearly employment level, which encompasses firms of all ages for a specific geography. This measure is denoted  $EmpMid_{yi}$ :

$$EmpMid_{yi} = \frac{\sum_{q=1}^4 \frac{(\sum_{a=1}^5 Emp_{yqia} + \sum_{a=1}^5 EmpEnd_{yqia})}{2}}{4}$$

In the construction of the *compensation* indicator, we annualize “Beginning of Quarter Employment: Average Monthly Earnings” by averaging the quarterly values for a given year. We use two variants of this measure – the first is specific to firm age and geography, and the other pertains to the entire U.S. These variables are denoted  $EarnBeg_{yia}$  and  $EarnBeg_{y,US}$ , respectively:

---

<sup>11</sup> “Beginning-of-Quarter Employment: Counts” and “End-of-Quarter Employment: Counts” are similar to point-in-time metrics.

$$EarnBeg_{yia} = \frac{\sum_{q=1}^4 EarnBeg_{yqia}}{4}$$

and

$$EarnBeg_{y,US} = \frac{\sum_{q=1}^4 EarnBeg_{yq,US}}{4}$$

where  $EarnBeg_{yq,US}$  represents the average monthly earnings in year  $y$  and quarter  $q$  of employees across all private firms, throughout the U.S.

### PEP measures

We use PEP estimates for measures of population size. The population of a specific geographic location for a particular year is denoted  $pep_{yi}$ . This variable is a yearly metric.

### Indicator calculations

We construct each indicator using the yearly variables presented above. The unit of observation for each of the four indicators is uniquely identified by geography, firm age, and year.

#### **Job creation**

*Creation*, representing per capita net job change, reflects the difference between private sector jobs held at the end of the quarter and jobs held at the start of the quarter in a particular geography among a specific firm age group.

$$creation_{yia} = 1000 \cdot \frac{(EmpEnd_{yia} - Emp_{yia})}{pep_{yi}}$$

#### **Job contribution**

*Contribution* is defined as the ratio of the employment of firms in age category  $a$  to total employment. It reflects the share of private sector employment attributable to firms of a certain age group.

$$contribution_{yia} = \frac{EmpMid_{yia}}{EmpMid_{yi}}$$



### **Job compensation**

*Compensation* reflects the average earnings of private sector employees at firms in a certain age group and geography, relative to the average earnings of all private sector employees in the U.S. as a whole.

$$compensation_{yia} = \frac{EarnBeg_{yia}}{EarnBeg_{y,US}}$$

### **Job constancy**

*Constancy* is a measure of employment stability. It is the ratio of the number of private sector stable jobs (*EmpS*), to the number of people employed at any time during the quarter (*EmpTotal*). *EmpS* is expressed in QWI as the number of jobs held on the first and last day of the quarter with the same employer, based on positive earnings of a worker with the same employer in three consecutive quarters (i.e., during time t-1, t, and t+1).

$$constancy_{yia} = \frac{EmpS_{yia}}{EmpTotal_{yia}}$$



## REFERENCES

Ewing Marion Kauffman Foundation. (n.d.). Kauffman Indicators of Entrepreneurship. <https://indicators.kauffman.org/>

U.S. Bureau of Labor Statistics. (n.d.). *Handbook of Methods: Quarterly Census of Employment and Wages*. <https://www.bls.gov/opub/hom/cew/concepts.htm>

U.S. Census Bureau. (n.d.). *LED Extraction Tool—Quarterly Workforce Indicators (QWI)*. <https://ledextract.ces.census.gov/static/data.html>

U.S. Census Bureau. (n.d.). *Metropolitan and Micropolitan Statistical Areas Totals: 2010-2020*. <https://www.census.gov/programs-surveys/popest/technical-documentation/research/evaluation-estimates/2020-evaluation-estimates/2010s-totals-metro-and-micro-statistical-areas.html>

U.S. Census Bureau. (n.d.). *Quarterly Workforce Indicators 101*. [https://lehd.ces.census.gov/doc/QWI\\_101.pdf](https://lehd.ces.census.gov/doc/QWI_101.pdf)

