BUSINESS DYNAMICS STATISTICS BRIEFING:

# Job Creation, Worker Churning, and Wages at Young Businesses

Seventh in a series of reports using data from the U.S. Census Bureau's Business Dynamics Statistics

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## About the Business Dynamics Statistics

The Business Dynamics Statistics (BDS) is a product of the U.S. Census Bureau that measures business openings and closings, startups, job creation, and job destruction by firm size, age, industrial sector, and state. The U.S. economy is comprised of more than six million establishments with paid employees. The population of these businesses is constantly churning—some businesses grow, others decline, and yet others close. New businesses constantly replenish this pool. The BDS monitors this activity to provide a picture of the dynamics underlying aggregate net employment growth. More information about the BDS can be found at http://www.census.gov/ces/dataproducts/bds/index.html.

## About the Quarterly Workforce Indicators

The Quarterly Workforce Indicators (QWI) are a product of the U.S. Census Bureau's Longitudinal Employer Household Dynamics (LEHD) program.[1] The QWI are generated from federal and state administrative data on employers and employees combined with core Census Bureau censuses and surveys to produce a rich, quarterly dataset that tracks employment, hires, separations, job creation and destruction, and wages for stable employees and new hires. The most recent enhancement to the QWI has been the introduction of firm age and size,[2] allowing, for the first time, a detailed look at the jobs, worker earnings, and employment turnover generated by firms of varying ages and sizes, and how these differ regionally and between demographic groups. The new tabulations by firm size and firm age are available at the state by four-digit NAICS and at the county by NAICS sector levels, with data extending back as far as 1990 for some states.[3] In addition, in the near future the tabulations will include breakdowns by the gender, age, race, ethnicity, and education of the workforce.

1. The LEHD program, part of the Center for Economic Studies, was partially supported by the following National Science Foundation Grants: SES-9978093, SES-0339191, and ITR-0427889; National Institute on Aging Grant AG018854; and grants from the Alfred P. Sloan Foundation. More information about the LEHD program can be found at http://lehd.did.census.gov.

2. The firm age and firm size data are sourced primarily from microdata used in the construction of the U.S. Census Bureau's Business Dynamics Statistics (BDS, http:/www.census.gov/ces/dataproducts/bds/index.html), a data product produced by the Center for Economic Studies, with the partial support of the Ewing Marion Kauffman Foundation.

3. These tabulations are readily available online: http://lehd.did.census.gov/led/datatools/qwiapp.html.

# Job Creation, Worker Churning, and Wages at Young Businesses*

By John Haltiwanger, Henry Hyatt, Erika McEntarfer, and Liliana Sousa

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# Introduction

Prior research has established the important role of startups and fast-growing young businesses in job creation and employment growth in the U.S. economy (Haltiwanger, Jarmin, and Miranda, (2010)). New firms and young businesses account for about 70 percent of gross job creation and disproportionately contribute to net job creation.[4] The experimentation and dynamism of startups and young businesses also contribute to productivity growth (see, e.g., Haltiwanger (2012)). While the contribution to job creation and productivity is increasingly well understood, relatively little is known about the characteristics of the jobs generated by startups and young businesses. We use newly released data from the QWI using the firm size and firm age measures developed from the Business Dynamics Statistics (BDS) to shed light on characteristics of jobs at young businesses.[5] We focus on three key characteristics of jobs—job creation, the churning of workers, and earnings per worker.[6]

Job creation and earnings are well-understood concepts. By worker churning,[7] we refer to the hiring in excess of job creation and the separations in excess of job destruction that are a ubiquitous feature of the U.S. labor market. The high pace of worker churning in the United States plays a critical role in improving the allocation of workers to jobs—that is, improving the quality of matches between workers and jobs.[8] Moreover, churning (i.e., switching jobs) is very important for wage growth over the life cycle of workers.[9] In this paper, we explore how wages and churning at startups and young businesses differ from those of more mature businesses. We also explore changes in these job characteristics over time. We consider these patterns in light of the differences in gross and net job creation across firms by firm size and firm age.

We find that young firms, defined as employers in the first two years of their lives, have higher job creation and job destruction rates than older firms. A substantial fraction of the job creation for young firms is due to the job creation that occurs in the quarter of starting up. However, there is substantial subsequent job creation as well as job destruction in the succeeding quarters in the first two years. The overall net job creation (the difference between job creation and destruction) is much higher for young firms than for older firms.

Beyond the job creation and destruction patterns, young firms exhibit significantly higher worker churning than older firms do. Hiring and separation rates at young firms are extremely high. Despite very high churning rates, however, job creation accounts for a much higher fraction of hires at young firms than at more mature firms. We also find evidence of a stronger recovery in hiring and job creation in young firms after 2008, relative to established firms. In fact, it is only for young firms that we find a recovery in the pace of churning after the Great Recession. Still, we find a declining overall trend in the churning of workers across jobs in our 1998–2010 time series.

Turning to earnings per worker, we document some striking trends since the early 2000s. We find evidence that the wage gap between established firms and startups has increased significantly in the last decade, largely due to declines in earnings per worker associated with startup firms. Some of this decline is accounted for by changes in the industry composition of startups over the last decade, but, even after controlling for these changes, all real earnings growth in the last decade has occurred at established firms.

4. Throughout this report, we use the terms "young" or "new firms" to refer to firms that are younger than two years old and "small firms" to refer to those with nineteen or fewer employees.

5. Firm size is based on the total employment in all establishments belonging to the firm on March 12 of the previous year (or the current year for new firms). For any given consecutive two-year period, size is defined as the employment-weighted sum of firm size on March 12 in year t-1 of all establishments that are part of an EIN on March 12 in year t. This definition automatically covers mergers, divestitures, acquisitions, etc. For instance, if a firm in year t has three establishments belonging to three different firms in year t-1, initial firm size in year t is the weighted sum (where the weights are based on the year t size of each establishment) of the firm sizes in year t-1 of each of these three establishments. Firm age is based on the age of the oldest establishment in the year of the firm's birth, and ages naturally over its lifetime. This definition addresses issues of ownership changes. For example, a new legal entity (i.e., firm) that results from some M&A activity is not necessarily considered a young firm; instead, it is assigned the age of its oldest establishment at the time of its birth.

6. It is important to emphasize that the new tabulations permit detailed analysis at state, county, and industry level of detail. We focus on aggregated statistics in this brief as a way to help introduce the measures and the findings possible from these new measures.

7. See, Burgess, Lane, and Stevens (2000).

8. For a model and evidence about the importance of worker churning for improving allocative efficiency, see; e.g., Jovanovic and Moffitt (1990).

9. For evidence about the importance of job switching for wage growth, see, e.g., Topel and Ward (1992).

To explore these issues, we first quantify the patterns of job creation and destruction by firm age in the QWI. Patterns of job creation and destruction by firm size and firm age have been the focus of much recent research (e.g., Haltiwanger, Jarmin, and Miranda (2010)), but such statistics using the QWI are new. Exploring these first provides a basis for putting our novel findings on worker churning and wages into perspective.

## Job Creation and Destruction by Firm Age: A View from the QWI

The newly released statistics from the QWI include quarterly establishment-level job creation and destruction by firm size and firm age using the firm age and size concepts and measures derived from the BDS.[10] Job creation measures the employment gains from the expansion of existing establishments and the creation of new establishments. Job destruction measures the employment losses from contracting and closing establishments. In the QWI, these measures reflect the changes at the establishment level over the course of a quarter.[11] The newly released QWI statistics provide such measures classified by the age and size of the parent firm. For additional details of how the data are constructed, see Haltiwanger et al. (2012).

Figure 1 shows the rates[12] of job creation and destruction by broad firm age groups from 1998:2 to 2011:1 for a selection of twenty-eight states.[13] These twenty-eight states account for 56 percent of total U.S. nonfarm employment in the second quarter of 1998, according to the BLS's Current Employment Statistics. Fluctuating around 20 percent, job creation rates for the youngest businesses—those that are zero to one year old—are much higher than for more mature businesses.[14] Job creation rates for the youngest firms are twice those in the firm age range of two to ten years and four times as large as the rates for mature businesses (eleven-plus years old). Though less dramatic than the differences in job creation rates, job destruction rates also are higher for the youngest businesses than for more mature businesses.

In comparing the job creation and destruction rates across firm age groups illustrated in Figure 1, it is evident that young firms have the largest net job creation rate (the difference between job creation and destruction). For the youngest firms, the net job creation rate in booms exceeds 10 percent and, even in the recent recession, exceeded 6 percent. In

10. In interpreting the findings in this paper, it is important to note that the job creation, job destruction, hires, and separation measures are at the establishment level, whereas firm size and firm age categories are based on the characteristics of the parent firm. This implies, for example, that even if the establishment is young and small, it will be classified into the large firm size class and mature firm age class if it belongs to a large, mature firm.

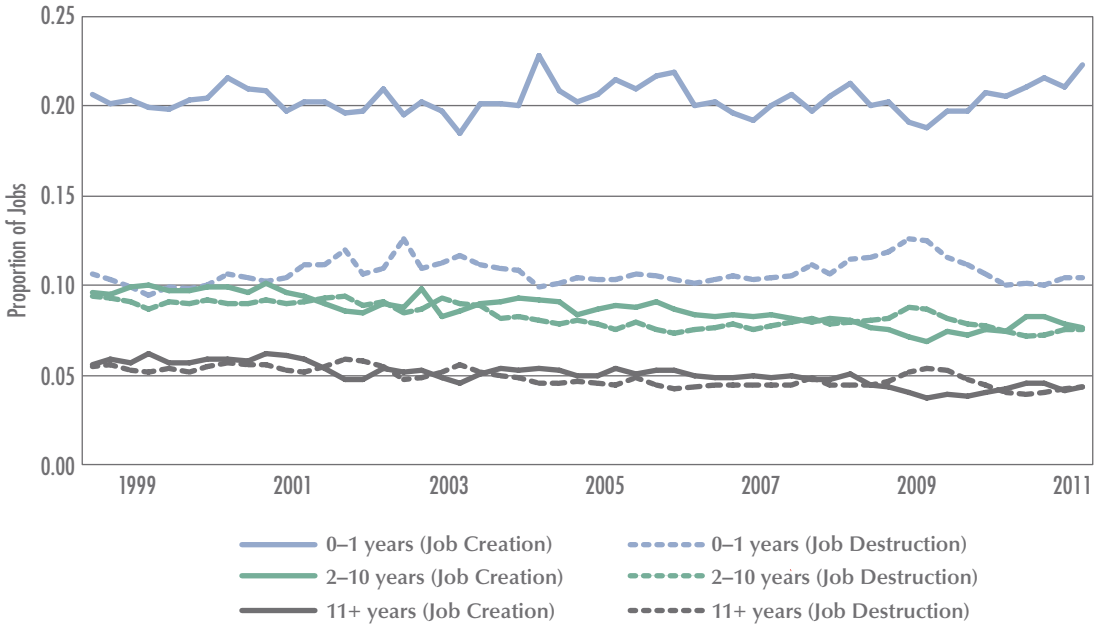
11. See Abowd et. al. (2009) for a detailed description of the QWI, including job creation and destruction measures. The quarterly rates of job creation and destruction in the QWI are quite similar to those found in the Business Employment Dynamics (BED). The patterns by firm size and firm age are not directly comparable to seemingly similar classifications in the BED because the concept of the firm is narrower in the BED than in the QWI and BDS. In the QWI and the BDS, a firm is based on the concept of operational control: entities under the operational control of a national enterprise are associated with the same firm. In the BED, the firm size concept is based on activity operating under common taxpayer (EIN) identification numbers. It is not uncommon for large firms to have many EINs.

12. These rates are constructed as follows: the numerator is job creation or job destruction, the net employment change between the beginning and end of a quarter at employers with expanding and contracting employment, respectively. The denominator is the average of employment at the beginning and end of the quarter. For technical definitions of beginning- and end-of-quarter employment, see Abowd et al. (2009).

13. All figures in this report are based on the QWI, a publicly available data product produced by LEHD. All values have been seasonally adjusted. All figures are based on the universe of UI-covered, private-sector jobs from 1998:2 to 2011:1 for a sample of twenty-eight states chosen from the Local Employment Dynamics federal-state partnership. Note that the QWI has statistics for almost all states in recent years, but to generate a consistent time series to 1998, we limit analysis to twenty-eight states (some state time series extend to as early as 1990). For our purposes, we chose to include quarters in the late 1990s to capture the robust period of job growth prior to the 2001 recession. The included states are Colorado, Connecticut, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Kansas, Maine, Maryland, Minnesota, Missouri, Montana, Nevada, New Jersey, New Mexico, North Carolina, North Dakota, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Washington, West Virginia, and Wisconsin. These figures do not include public-sector employment or self-employment. As a robustness check, we have replicated the analysis in this paper for the 2005:4 period using data for all states except for California, Virginia, Massachusetts, and Louisiana, and Washington, D.C. All of the latter states are undergoing some further data infrastructure developments on the QWI so that the firm size and firm age tabulations are not yet available for these states. We note that the results we obtain from the larger sample of states are virtually identical to those we report here, which makes us confident that our results are representative.

14. Supplemental estimation (not shown) shows that about half of the job creation of the zero to one age category is due to establishment births. Note that in the QWI and BDS, since a new firm is not simply a new establishment but a new firm where all of the establishments of the new firm also are new, establishment births also contribute some job creation in older firm age groups. There is some advantage of quantifying the gross and net job creation over the first two years rather than simply at the quarter of birth. In the first quarter of activity, new establishments/firms can only contribute to job creation. But an increasingly well-understood pattern is that young firms exhibit an up-or-out dynamic. Taking such dynamics into account, the net job creation rates over two years provide some perspective of the net employment gains. That is, the net job creation rate for establishments belonging to firms zero to one years old will reflect the combined contribution of the job creation from entry, job creation from post-entry growth of establishments of young firms, and job destruction from establishment contractions over this period. Note that there is no mechanical implication that the net job creation from young firms must be positive, even though it includes the contribution of job creation from entry, which can only be positive. It could be that entry is dominated by short-lived firms that enter and almost immediately exit (within the zero to one age category). In that specific example, net job creation from young firms would be zero.

Figure 1
## Quarterly Job Creation and Destruction by Firm Age




Source: Authors' calculations based on seasonally adjusted QWI tabulations for twenty-eight states.

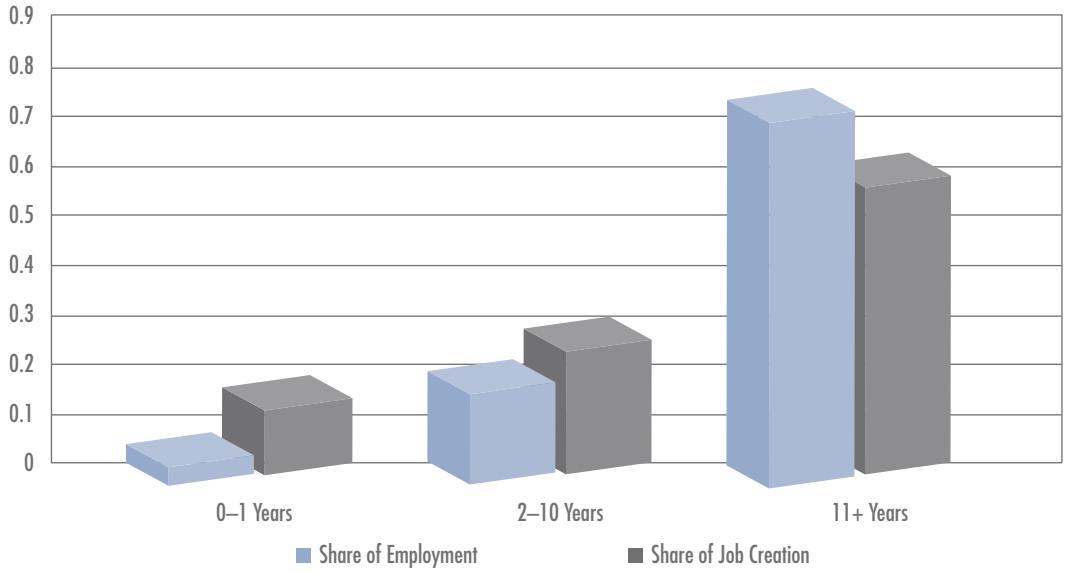
contrast, the net job creation rates for more mature businesses are positive in booms and negative in recessions, with a slightly higher average for businesses between two to ten years old than for those eleven years old or older. The finding that the highest net job creation rates are from young firms is consistent with the evidence in Haltiwanger, Jarmin, and Miranda (2010) from the BDS.

Job creation rates are procyclical, that is, they rise during economic expansions for all firm age groups, while job destruction rates are countercyclical. Though these patterns are not surprising, the cyclical patterns differ sharply across the 2001 and 2007/09 recessions. While there was a notable increase in the job destruction rate for young businesses in the 2001 recession, the job creation rate for these businesses did not change much. In contrast, the 2007/09 recession exhibited a more pronounced decline in job creation for the youngest businesses, along with an accompanying increase in job destruction. The implication is that the 2007/09 recession hit the youngest businesses much harder than the 2001 recession did. Though the youngest businesses were hit hard in the 2007/09 recession, they are the group that has had the most robust recovery, with their job creation rate growing from 0.18 to 0.23 between 2009 and 2011.[15]

Figure 2 shows the distribution of employment and job creation by firm age. Though most jobs are at the most mature firms, young firms disproportionately create jobs. The youngest firms (ages zero to one) account for about 15 percent of overall job creation while firms between two and ten years old account for about 25 percent of job creation. So, combined,

15. The Business Dynamics Statistics also shows an increase in net and gross job creation for young firms from March 2009 to March 2010 (for example, see Haltiwanger, Jarmin, and Miranda (2012)). Overall job creation rates also rise in the BDS from March 2009 to March 2010, although net employment growth in 2010 is still negative. In the BDS, net employment growth is less negative than in 2009, but, although job creation rises some and job destruction falls substantially, the BDS shows a net decline from March 2009 to March 2010. In comparing the statistics from the QWI to the BDS, appropriate caution is called for, given differences in frequency (QWI is quarterly and BDS is annual from March to March) and scope. Still, the overall patterns are similar. We also note that the BDS shows a declining share of employment of young firms, consistent with what we find in Figure 3.

Figure 2
## Shares of Employment and Job Creation by Firm Age, 1998–2011




Source: Authors' calculations based on seasonally adjusted QWI tabulations for twenty-eight states.

these two groups account for about 40 percent of job creation—much higher than their combined employment share of 25 percent.

The share of young firms has been declining over our sample, as observed in Figure 3. The decline in the share of young businesses exhibited in the QWI is consistent with the declines identified in the BDS and reflects the declining pace of business startups (see, Haltiwanger, Jarmin, and Miranda (2011, 2012), Stangler and Kedrosky (2010), and Litan and Reedy (2011)).[16] Given that job creation and destruction rates are higher for younger businesses on average, a declining share of young businesses helps account for the overall decline in job creation and destruction in the QWI. For example, the average quarterly job creation rate for our sample of twenty-eight states in the cyclical peak in 1999 is more than 15 percent higher than in the cyclical peak of 2006.[17]

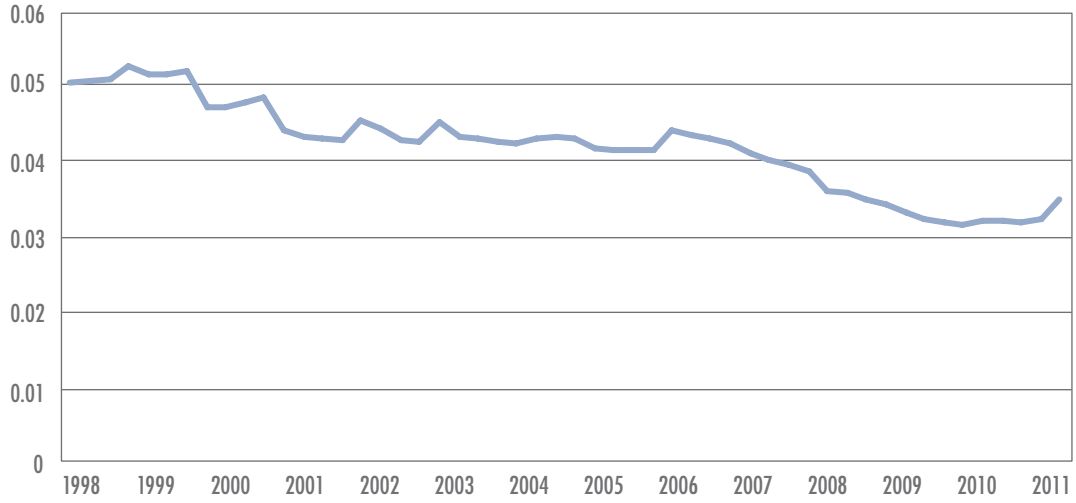
## Despite High Turnover at Young Firms, Job Creation is a Larger Share of Hiring at Young Employers Relative to Established Firms

While Figure 1 confirms the findings of earlier studies that the youngest firms have the highest net job creation rates, the newly released QWI with firm

16. Figure 3 reflects the overall share of employment of young firms, defined as firms less than two years old. Many factors may underlie this pattern—a decline in the startup rate, a decline in the job creation rate for young firms, and/or an increase in the job destruction rate for young firms. Figure 2 does not show changing trends for job creation and destruction rates, and evidence from the BDS suggests the patterns in Figure 3 are due to declining cohort size of entrants. In comparing Figures 2 and 3, it is important to distinguish between the net and gross rates for the cohort of young firms in any given year (Figure 2) with the possible changing size of each entering cohort, which will inherently influence Figure 3. Note that in any year in which the cohort size of entry changes, we will observe a change in the net and gross job creation rate of young firms. However, if this reflects a change in the trend of cohort sizes, then in the steady state the share will continue to change while the net growth rate of each cohort will converge in the steady state to a constant. The reason is that Figure 2 reflects the growth rates for specific cohorts, while Figure 3 captures changing size of cohorts over time.

17. This is consistent with evidence from the BDS and BED, which also show a declining trend in job creation and destruction (see, Haltiwanger, Jarmin, and Miranda (2011) and Davis, Faberman, and Haltiwanger (2012)).

Figure 3
## Share of Employment at the Youngest Firms




Source: Authors' calculations based on seasonally adjusted QWI tabulations for twenty-eight states.

size and firm age show that these firms also exhibit higher worker turnover. We start by examining patterns of hires and separation rates by firm age. Hires and separation rates reflect the flow of workers into and out of establishments in a given quarter. Figure 4 shows that both hires and separation rates, the proportion of the workforce in each quarter that either is hired or leaves employment in each firm age category in that same quarter, are highest for young firms and fall as firms age.

Between 1998 and 2011, the average quarterly hiring rate for young firms (zero to one years old) moved between a high of almost 38 percent in the late 1990s to a low of less than 32 percent in 2009. In other words, during most of the past decade, more than a third of all workers in young firms had been hired in the current quarter. For older firms, the quarterly hires rates were significantly lower, declining from 28 percent to 18 percent for firms in the two- to ten-year age range, and 19 percent to 11 percent for mature firms. Figure 4 also illustrates that young firms have higher separation rates than older firms do. Between 1998 and 2011, between 25 percent and 30 percent of all workers in young firms left those firms in each quarter. Also revealed in Figure 4 is that, while all firm age groups exhibited decreases in hires and separations during the Great Recession, only the youngest showed significant signs of recovery by the first quarter of 2011.

Worker churning, the movement of workers between jobs not associated with job creation or destruction, is a substantial fraction of overall hires and separations.[18] One way to gauge the relative importance of worker churning is to examine the ratio of job creation to hires and the ratio of job destruction to separations. Figure 5 graphs these ratios by firm age.

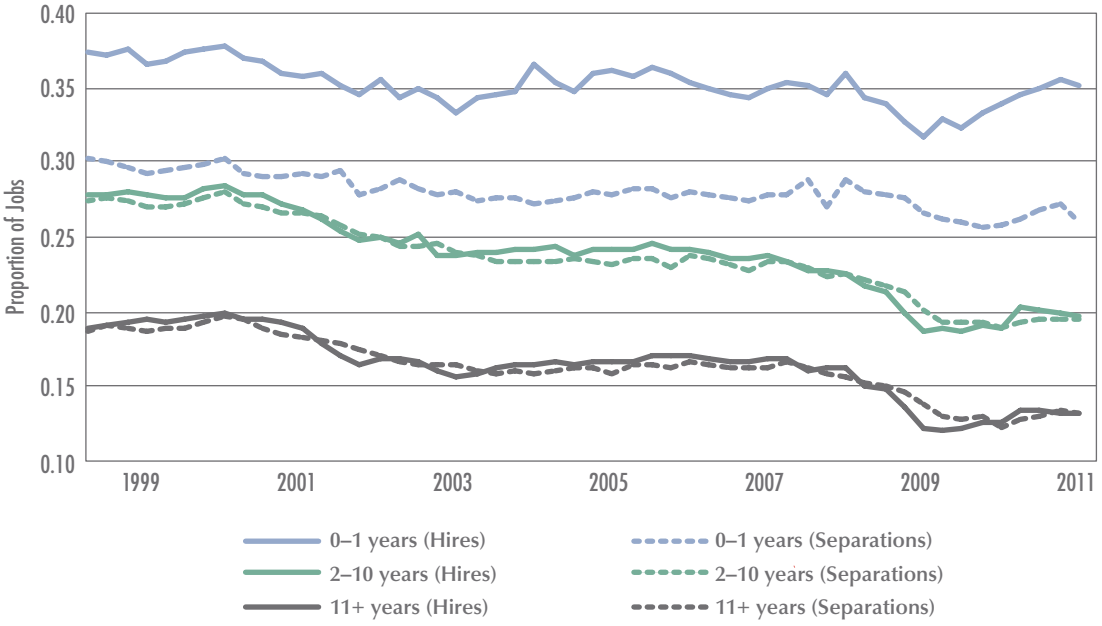
18. Some caution is required in comparing the job creation and destruction rates in Figure 1 and the hires and separations rates in Figure 4. Job creation and destruction rates reflect net changes in employment at the establishment level from the beginning to the end of the quarter. Hires and separation rates reflect the cumulative flow of hires and separations over the quarter. A worker who is hired and separates within the same quarter will contribute to the hires and separations measures but not to job creation or destruction.

With an average job-creation-to-hires ratio of 0.40, young firms have the highest share of hires accounted for by job creation, as shown in Figure 5. In other words, four out of every ten hires at young firms are for newly created jobs. This ratio is much higher than in older firms, where the ratio fluctuates between 0.25 and 0.33. Interestingly, the job-destruction-to-separation ratio for younger firms is no higher than for other firms, implying that the fraction of separations at the youngest firms due to worker churning is about as high as at more mature firms. Taken together, these two ratios show that, while a large fraction of the hires at the youngest firms is due to job creation, the share of separations due to job destruction at such firms is in line with older firms.

Figure 5 also shows a striking upward trend in the ratio of job creation to hires during the past decade, indicating a decline in worker churning for all firm ages.[19] That is, employers of all ages are hiring fewer workers in excess of the number of jobs being created. Many factors may underlie these trends, but it may reflect an increasing hesitation of workers to leave current jobs for new employment. Because job change accounts for a substantial portion of earnings growth, especially for younger workers (Topel and Ward (1992)), this decrease in churning reflects a decrease in workers' opportunities for earnings growth.

Figure 5 not only shows that the share of separations due to job destruction is rising over the time period, but also that the cyclical patterns of this ratio vary substantially. The peaks of the job-destruction-to-separations ratios coincide with the two recessions captured in this time series. During these peaks, workers were more than twice as likely to be

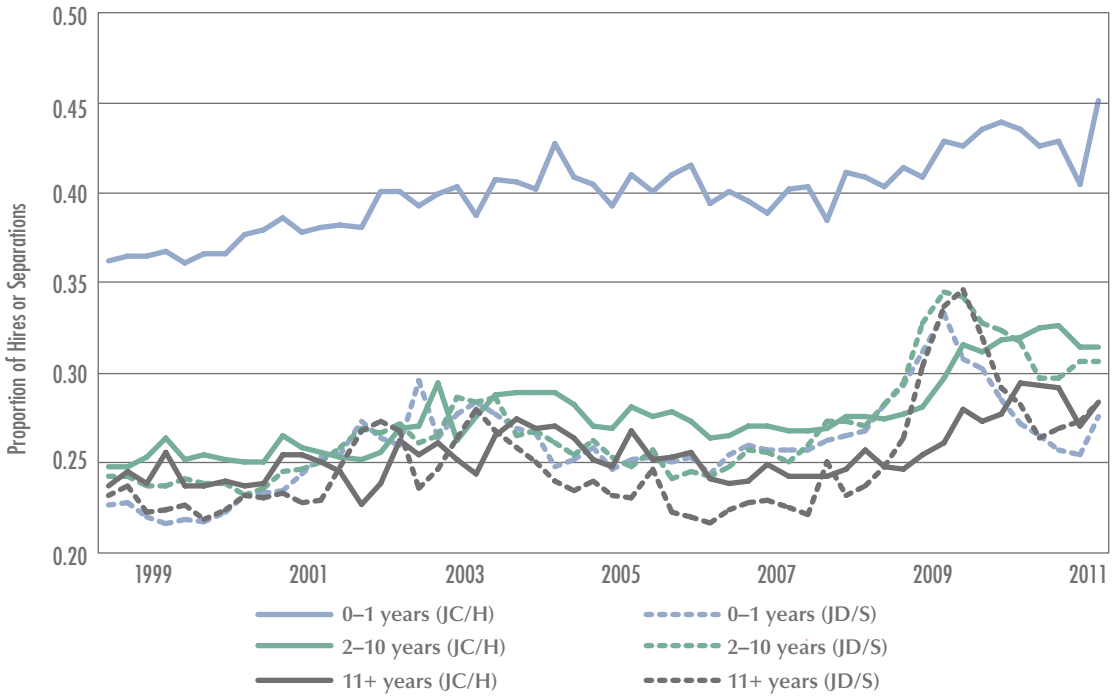
Figure 4
## Hires and Separations as a Share of Employment in Young vs. Established Firms




Source: Authors' calculations based on seasonally adjusted QWI tabulations for twenty-eight states.

19. Hires are referred to as H in the graphs, and separations are referred to as S in the graphs.

Figure 5
## Shares of Hires and Separations Due to Job Creation and Destruction in Young vs. Established Firms




Source: Authors' calculations based on seasonally adjusted QWI tabulations for twenty-eight states.

leaving jobs due to job destruction as they had been in the late 1990s. During the Great Recession, by far the worse of the two recessions, between 30 percent and 35 percent of job separations were due to job destruction, implying a higher share of layoffs.

The increase in the job-destruction-to-separations ratio is especially large for the oldest businesses in the Great Recession. The changing composition of separations in recessions reflects changes in the nature of the reallocation of workers and jobs in recessions. In good times, many separations are quits, with workers moving up the career ladder by switching employers. In contrast, during recessions, job destruction and layoffs increasingly dominate separations. Related research shows that workers who are laid off are more likely to experience an unemployment spell and suffer an earnings loss from separations.[20]

Another way to characterize worker churning is in terms of the difference between hires and job creation and the difference between separations and job destruction as shares of employment. In considering these difference measures, observe that there is an identity such that Hires – Job Creation = Separations – Job Destruction.[21] Figure 6 shows the resulting

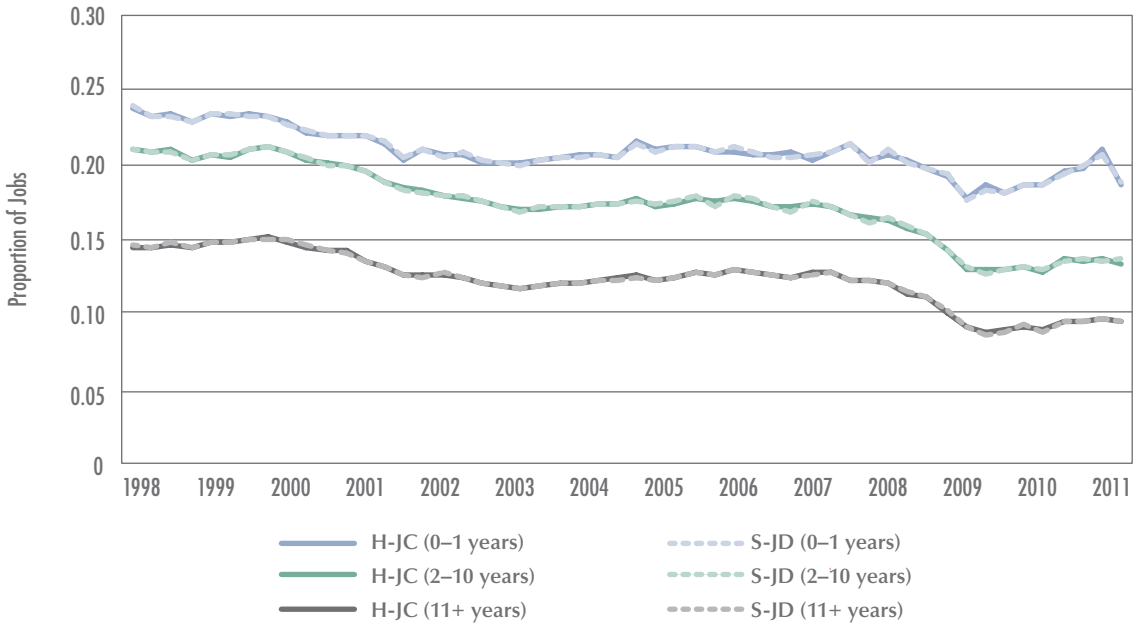
20. See Davis, Faberman, and Haltiwanger (2012) and Elsby, Hobijn, and Sahin (2010) for discussion of this related research.

21. This identity follows from the identity that Net Employment Change = Hires – Separations = Job Creation – Destruction. This identity holds even given the fact that hires and separations represent flows over the entire quarter while job creation and destruction represent changes from the beginning to the end of the quarter. Seasonal adjustment is different for each of the series, which can break the identity. We also note that these identities don't hold in the published QWI for highly disaggregated data, given the noise infusion used for disclosure avoidance in the QWI. Even at high levels of aggregation, noise infusion can yield very modest differences. In spite of these two factors, Figure 6 shows that these identities essentially hold in the published, seasonally adjusted series.

worker churning rates (as shares of employment) by firm age.[22] It is apparent that worker churning as a percent of employment declines with firm age. This finding holds in spite of the high job-creation-to-hires ratio for young firms. The hiring rate is so high for young businesses relative to older businesses that the difference between hires and job creation (as a percent of employment) is larger for young businesses.

Churning rates are procyclical. In the recessions of 2001 and 2007/09, the churning rates for firms of all ages dropped substantially. These patterns reflect workers and firms becoming more cautious about making new matches in recessions. In recessions, workers are less likely to quit, which in turn reduces the number of vacancies and, thus, hires. Figure 6 also shows a trend decline in worker churning rates for firms of all ages.[23] This decline is over and above the decline in job reallocation (creation and destruction) that we observe for this same period. The implication is that, not only is there less reallocation of jobs across producers, but also less reallocation of workers across existing jobs in the last fifteen years. The decline in

Figure 6
## Worker Churning Rates by Firm Age




Source: Authors' calculations based on seasonally adjusted QWI tabulations for twenty-eight states. Worker churning is measured in two ways: Hires-Jobs Creation (H-JC) and Separations-Job Destruction (S-JD). Note that these two measurements should yield identical worker churning, with some variation created by noise infusion used to protect the confidentiality of the data and by seasonal adjustment factors.

22. The employment measure we use for these rates is the number of job matches in the quarter ("m" in the QWI statistics). This measure of employment is most appropriate for the flow-based hires and separation statistics, which reflect changes in this number of matches. This employment measure is larger (by about 23 percent) than is the number of workers who have a match in both the prior and current quarters (the "b" measure in the QWI). The large ratio of m to b reflects many matches that have short durations. It is important to consider such matches in interpreting the hires and separation rates reported here as well as the comparison between the hires and separations to job creation and destruction.

23. The decline in worker churning rates is consistent with the findings in Lazear and Spletzer (2012).

churning accounts for nearly three-quarters of the decline in turnover that appears in Figure 4. Many factors may underlie this trend decline in churning. One factor might be the aging of the U.S. workforce, with young workers inherently engaged in more job switching than older workers are. The planned release of QWI by firm age with the workforce demographic characteristics will permit exploring this hypothesis.

The secular and cyclical declines in worker churning rates are greater for older businesses, but are apparent for all categories. In both the 2001 and (especially) 2007/09 recessions, worker churning rates decline, but fail to recover to their previous peak after the recession ends. After the 2001 recession, the gap between worker churning rates for the oldest and youngest businesses widened. In addition, worker churning rates for the youngest businesses exhibit a modest recovery after the 2007/09 recession, but remain low for the more mature businesses. In the first quarter of 2011, the churning rate for young businesses exhibits a slight reduction. Data for subsequent periods will be needed to understand this reduction, but, in one way, churning can be thought of as an indicator of the confidence of workers and firms to engage in job switching. From that perspective, this slight dip in 2011 may reflect an increase in caution (erosion of confidence) by workers and firms for young firms.

## Earnings at Startups Peaked in the Early 2000s and Have Stagnated or Fallen Since

Real monthly earnings per worker are shown in Figure 7 by firm age and by firm size. For this purpose, we calculate earnings per worker only for workers who work full quarters.[24] Since churning rates are higher at younger and smaller businesses, this implies that younger and smaller businesses have a larger fraction of workers in any given quarter who have only partial earnings for the quarter. Such differences in churning are interesting in their own right as discussed above, but, for this discussion on earnings, we want to abstract from such variation.[25] In what follows, we often refer to earnings per worker as wages for shorthand.

Figure 7 shows that workers at young and small firms have substantially lower earnings than workers at larger and more mature firms do. Figure 7 also shows that real earnings have been growing at the large and mature businesses while either falling or remaining stagnant at young and small businesses. Figure 8 helps highlight the changing relative patterns by showing the ratios of the real monthly earnings across firm age and firm size groups. The relative premium for being at a large and mature firm in terms of average monthly earnings per worker has risen substantially over this period. Just before the recession of 2001, workers at new firms earned about 85 percent as much as workers at mature firms (eleven-plus years old). By 2011, this earnings ratio had dropped to 70 percent. The earnings premium associated with working in a large employer versus a smaller employer also grew during this time period: average real monthly earnings in small firms fell from a high of 78 percent in 2001 to a low of 66 percent in 2011.

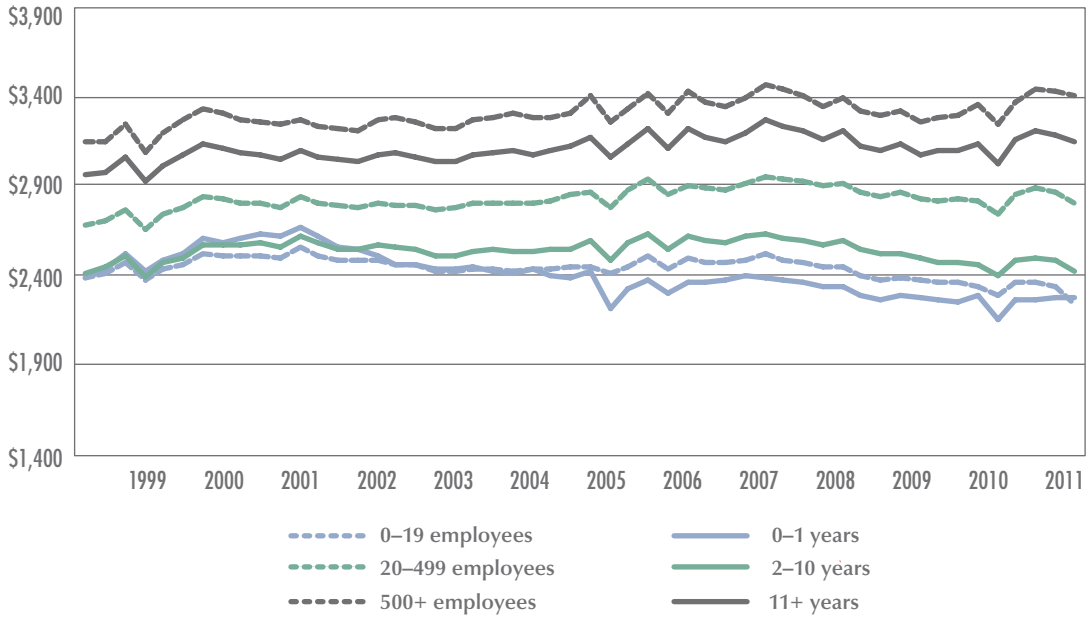
An important reason for the change in earnings premiums associated with firm age and size is the changing industrial composition over the past decade. To the extent that small or young firms are associated with lower-wage industries, we would expect the wage premiums to change as the industry compositions change. To address this, Figure 8 also plots the average monthly earnings premiums, fixing industry composition at the level present in the second quarter of 1999. Though this greatly diminishes the decrease in earnings at young firms relative to old firms (implying, indeed, that startups later in the decade are more likely to be in lower-wage sectors), industry reweighting does not explain the drop in relative earnings in small firms. Small employers, it seems, have become increasingly unable to match the wages offered by large employers.[26] Demographic tabulations slated for production in future QWI releases will allow us to take a closer look at this phenomenon.

24. Earnings in the QWI are the UI-covered earnings of each employee reported by his or her employer in each quarter. Earnings have been adjusted for inflation.

25. The patterns for real monthly earnings for all workers are quite similar to those presented in Figure 7.

26. This explanation abstracts from potential differences in non-earned compensation and unmeasured benefits. Research in this area has documented lower benefits in startups and young firms (for example, Litwin and Phan, 2012).

Figure 7
## Real Monthly Earnings for (Full-Quarter) Workers at Young vs. Established Firms



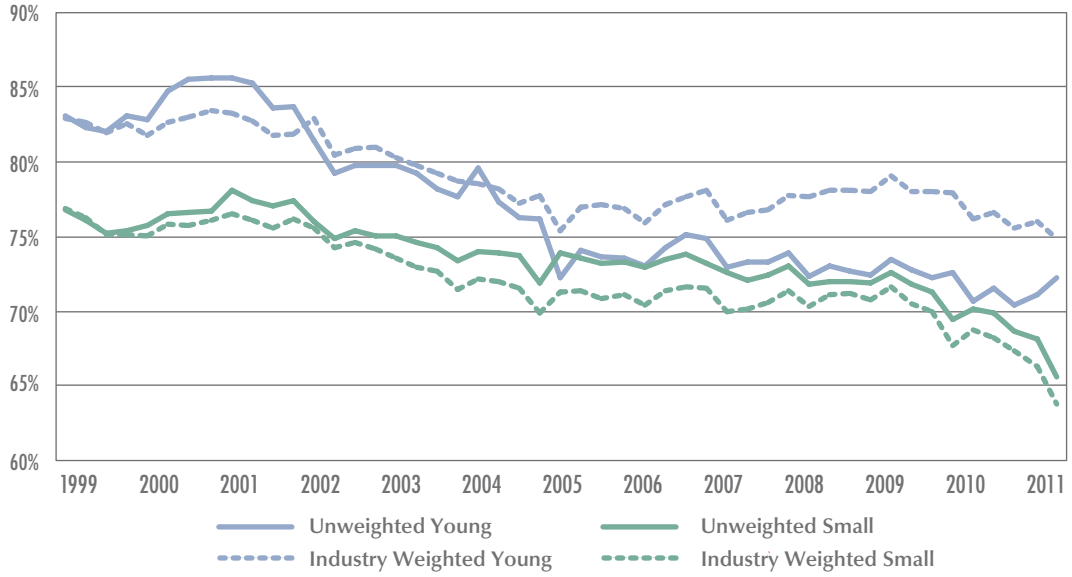

Source: Authors' calculations based on seasonally adjusted QWI tabulations for twenty-eight states. Reported earnings have been adjusted for inflation to 2000Q1 values.

Partly, these patterns reflect the well-known and well-documented employer-size wage premium—that is, wages are higher at larger businesses. Young businesses are typically also small businesses (see Haltiwanger, Jarmin, and Miranda (2011)), so the firm age premium is closely linked to the firm size premium. Of course, many factors underlie the employer size wage premium itself (see, e.g., Brown and Medoff (1989)). Understanding all factors that underlie the employer size wage premium and the related employer age wage premium is beyond the scope of this short paper.[27] Part of this may reflect differences in human capital accumulation. For example, by construction, it is not feasible to have developed much firm-specific capital at new firms. Moreover, it might be that the new and young firms offer the prospect of future wage growth if the firm is successful (e.g., offering stock options at startups in the information and other high-tech sectors is a common means of attracting and retaining highly talented workers in these sectors). Our initial analysis of the newly released QWI statistics by firm size and firm age do not immediately yield insights into these issues but they do show that there are distinct cross-sectional and time series differences in wages by firm size and firm age that warrant further attention. Moreover, one striking pattern in Figure 8 is that the age premium is much smaller than the size premium. Investigating this difference is beyond the scope of this analysis, but should be an area for future research.

27. Brown and Medoff (2003) explore the role of factors underlying the employer age premium.

Figure 8

## The Employer Age and Size Premium Increases: Real Monthly Earnings (of Full-Quarter Employees) at Young and Small Firms as a Percentage of Real Monthly Earnings at Established and Large Firms[28]




Source: Authors' calculations based on seasonally adjusted QWI tabulations for twenty-eight states. Reported earnings have been adjusted for inflation to 2000Q1 values.

# Conclusion

It is well known that young businesses have higher net job creation rates and a higher pace of gross job creation and destruction. Using newly released statistics from the QWI by firm age and firm size, we show this well-known pattern holds in the QWI. But the QWI offer a unique perspective on additional features of the dynamics of workers and jobs by firm age and firm size. In this report we focus on two key features—worker churning and earnings dynamics.

We show that a much larger fraction of hiring at young firms is due to job creation relative to more mature firms. However, in spite of this high ratio, the difference between the hiring and job creation rates (what we call worker churning) declines with firm age. The high pace of churning at young firms is consistent with the view that young firms are undergoing a period of experimentation and trial and error. The new findings on worker churning show that this experimentation results in a high churning rate for young firms.

Worker churning rates fell substantially in the 2001 and 2007/09 recessions and also exhibit a related secular decline. The cyclical and secular declines in worker churning rates over the last fifteen years are over and above the previously documented decline in business dynamism as measured by job reallocation over the same period. Worker churning reflects the reallocation of workers across existing jobs, and the evidence here is that the pace of such churning has declined. Worker churning arguably contributes to improved match quality between workers and firms; hence, this decline potentially implies a decline in

28. Industry weighing is based on the industry composition in the thirty-four states in this sample in the second quarter of 1999. This figure excludes three types of employers: public sector, auto manufacturers, and household appliance manufacturers.

match quality in the United States. In a related fashion, it is an indicator that the U.S. labor market has become less flexible over time, at least in terms of the tendency to have workers move across firms.

The secular and cyclical declines in worker churning are connected, since, in both the 2001 and 2007/09 recessions, worker churning declined substantially and then failed to recover to the previous peak. This downward pattern is more apparent for more mature firms; in that respect, young firms are more engaged in this form of flexibility. However, we also know that the share of startups and, therefore, young firms is declining over this same period (which we verify holds in the newly released QWI data). With fewer young firms, the overall decline in worker churning is even greater.

Another new perspective on these dynamics that the QWI permits is tracking earnings per worker. We find that workers at young firms have lower earnings per worker than at more mature firms. This is not surprising, since it is clearly related to the well-known finding that workers at larger firms have higher wages and young firms tend to be small. However, we also document that the firm age wage premium has been rising over time. Thus, adding to the trend decline in the pace of startups, we also observe that earnings for workers at such startups have declined in relative terms as well.

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