

Business Income Dynamics and Labor Market Fluidity*

Henry Hyatt[†], Seth Murray[‡], and Kristin Sandusky[§]

December 4, 2019

Abstract

Recent studies on the long-run decline in U.S. labor market fluidity have focused on employees and excluded most of the rapidly growing population of the self-employed and business owners. In this paper, we use administrative records data to show that including business income recipients reduces the measured decline in the rate of hires and separations from 1994 to the early 2014 by 1.3 to 1.4 percentage points (about 8.3% to 8.7%). This offsetting effect of including business income recipients is driven by jobs that are secondary sources of income, or short in duration. We also explore the relationship between self-employment income and the total number of jobs held. Self-employment displaces about one job when it is a person's primary source of income, but only up to a tenth of a job when it is a secondary source of income.

* We would like to thank Katharine Abraham, Andrew Foote, John Haltiwanger, Erika McEntarfer, Jesse Rothstein, James Spletzer, and participants at the U.S. Census Bureau research lunch, the 2018 American Economic Association conference, the 2018 IRS-Census workshop, the NBER Summer Institute 2018 CRIW Workshop, and the 2019 Comparative Analysis of Enterprise Data Conference for helpful comments and suggestions, and Claire Hou for assistance. Opinions and conclusions are those of the authors alone and do not necessarily represent the views of the U.S. Census Bureau. The statistical summaries reported in this paper have been cleared by the Census Bureau's Disclosure Review Board release authorization numbers CBDRB-FY18-093, DRB-B0101-CDAR-20180628, DRB-B0046-CED-20190425, DRB-B0050-CED-20190509, and CBDRB-FY20-CED006-0006.

[†] Center for Economic Studies, U.S. Census Bureau. Email: henry.r.hyatt@census.gov

[‡] Department of Economics, University of Maryland, and Center for Economic Studies, U.S. Census Bureau. Email: murray@econ.umd.edu

[§] Center for Economic Studies, U.S. Census Bureau. Email: lee.k.sandusky@census.gov

1 Introduction

Numerous data sources indicate that labor market fluidity in the U.S. has declined in recent decades, especially since 2000.¹ This evidence has received considerable interest because labor market fluidity is a key mechanism for efficiency enhancing reallocation, and, if the pace of labor reallocation has slowed, then productivity growth may be lower as a result. Recent studies on this topic have drawn from a proliferation of new public-use data sources which provide measures of labor market fluidity, including the Business Dynamics Statistics (BDS), the Business Employment Dynamics (BED), the Job Openings and Labor Turnover Survey (JOLTS), the Quarterly Workforce Indicators (QWI), and Job-to-Job Flows (J2J). One common feature of most available data on labor market fluidity is the use of employer-reported administrative records either through direct tabulations (e.g., BDS or QWI), or as the data frame (e.g., the JOLTS). An implication of this reliance on employer-reported administrative records is that most published series on labor reallocation exclude most or all of the self-employed and business owners.²

In this paper, we argue that the rapidly increasing population of business income recipients matters for labor market fluidity. Abraham et al. (2018) present evidence from administrative records data for recent decades that indicates a dramatic increase in the share of the population that receives business income.³ In contrast to evidence on the declining trend in the number of new employer businesses (Decker et al., 2014), the much more numerous group of nonemployer businesses has been increasing.⁴ This increase in the number of business entities is related to the rise of the “gig economy,” in which many workers are linked with customers via a platform that does not employ these workers directly, but facilitates transactions as a third party. Work facilitated by such platforms is treated as business income, as opposed to wage and salary income, for tax

¹See, among many others, Hyatt and Spletzer (2013), Davis and Haltiwanger (2014), Decker et al. (2014a, 2014b), and Molloy et al. (2016).

²There are important differences between the self-employed and business owners. However, our data do not allow us to distinguish between the two, and so we will refer to them collectively as “business income recipients.” Some of our results distinguish between sole proprietors, partnerships, and S corporations, but this distinction is at best a crude approximation of this conceptual difference.

³Abraham et al. (2018) also find that there has been no corresponding increase in the share of the population that reports being self-employed in the Current Population Survey (CPS). They use the CPS records matched with administrative records to explore the extent to which respondents with administrative records of self-employment report either no employment, or only wage and salary employment.

⁴The Census Bureau (2019) reported that there were 25.7 million nonemployer businesses in 2017, up from 19.5 million in 2004 (U.S. Census Bureau, 2006). This increase alone is greater than the total number of employer businesses in the U.S., which the BDS indicates was 5.2 million in 2016.

purposes. Because the recipients of such income are not employees, they are beyond the scope of employer-reported administrative records and therefore most measures of labor market fluidity.

We use administrative records data to examine the relationship between recent changes in labor reallocation rates and the increasing share of the population that receives business income. We show that rates of entry and exit from business income receipt have been relatively constant in recent decades. This differs from worker movements into and out of wage and salary employment, the rates of which have declined substantially. The inclusion of the recipients of business income affects the measured decline in aggregate reallocation and labor market fluidity. Specifically, the inclusion of such transitions reduces the measured decline in overall hires (separations) from 1994 to 2014 by 1.3 (1.4) percentage points, or by 8.3% (8.7%). We also estimate panel regression models that compare the number of wage and salary jobs worked when individuals have business income compared to when they do not. We find that business income receipt substitutes for about one wage and salary job when it is a person's primary form of income, but has a much smaller effect when it provides secondary income.

Our paper begins with a discussion of our data sources. Our first dataset consists of survey records from the Current Population Survey (CPS) linked to W-2 records on wage and salary earnings, as well as self-employment information from Schedule SE filings, which covers most recipients of sole proprietor and partnership income. This provides information from 1990 to 2016. Our second dataset consists of universe-level income records from the IRS. These include W-2 records for the year 2005 onward, and person-level business income records for three different legal forms of organization starting in 2007: sole proprietors, partnerships, and S corporations.⁵ Our universe-level data provides information until 2015.

Before considering business ownership, we use these data sources to document how labor reallocation rates in the U.S. have evolved in recent decades using the conventional method of excluding the self-employed. We calculate hire, separation, employer-to-employer transitions, and transitions into and out of nonemployment using W-2 records following the definitions proposed by Abowd et al. (2009) and Hyatt et al. (2014). W-2 earnings records have not previously been used to measure aggregate labor reallocation rates and our estimates therefore constitute a new

⁵Ownership information for C corporations is much more limited and the extent to which owners are able to be identified is a subject of ongoing research, see Bayard et al. (2018). Ownership data on C corporations was not available for this analysis.

reference point for the study of labor market fluidity. Evidence from the relatively long time series from the Current Population Survey linked with W-2 records has two important implications for how to interpret recent studies on labor reallocation.

First, most studies on labor market fluidity, following Hyatt and Spletzer (2013), Davis and Haltiwanger (2014), and Molloy et al. (2016), emphasize declining trends in most or all labor reallocation series in recent decades. While hire and separation rates show a substantial decline from the early 1990s to the middle 2010s, there is not a strong downward trend in employer-to-employer transitions, or transitions into and out of nonemployment. A key distinction between these measures is that hires and separations include all jobs (i.e., employer-employee combinations), while the other measures capture worker-level transitions between dominant sources of income at two particular times. These facts together indicate that any long-run decline in labor reallocation is concentrated among jobs that are secondary sources of income, or short in duration. This result echoes earlier work by Hyatt and Spletzer (2017), Hall and Schulhofer-Wohl (2018), and Pries and Rogerson (2019) on the importance of short duration jobs in characterizing the long-run decline in labor market fluidity.

A second implication concerns the multiple non-overlapping employers question to the Annual Social and Economic Supplement to the Current Population Survey, which has been used in recent studies by Hyatt (2015), Molloy et al. (2016), Molloy, Smith, and Wozniak (2017), and Hyatt et al. (2018) and is considered especially useful for characterizing the long-run trend in the employer-to-employer transition rate because of its relatively long time series. While this survey question suggests a trend decline in employer-to-employer transitions, the administrative records linked to those same survey respondents do exhibit a strong time trend. This again suggests that declines in labor reallocation rates are not associated with movements between stable jobs but are rather concentrated among those that are shorter in duration.

We then use our new data sources to document the rise of self-employment in the U.S. in recent decades. We distinguish between the population that receives business income alone, those that receive wage and salary income only, and those who receive income from both sources. We find that the share of the population with business income rises in both data sources, with double-digit proportional increases. This confirms the findings of earlier work by Abraham et al. (2018) on the rising share of the population with business income. It also offers a counterpoint to studies such as

Decker et al. (2014b), Sedláček and Sterk (2017), and Pugsley and Şahin (2018) that emphasize the decline in the rate at which employer businesses have formed in recent decades. Any recent decline in the employer business entry rate is tiny relative to the sustained growth in the number of nonemployer business entities.

We also assess whether business owners are counted as employees. We show that nearly all owners of sole proprietors and partnerships do not have reported W-2 earnings, which is unsurprising given that in most cases the Internal Revenue Service (2017) has discouraged or prohibited them from doing so. What is perhaps more surprising is that only 41% of the owners of S corporations have reported W-2 earnings at the firms they own. Because most published series on labor reallocation only consider the employees of businesses, this suggests that the overwhelming majority of transitions into and out of business income receipt are omitted from measured labor reallocation rates. While this fact is important as motivation for our remaining analysis, it also provides a necessary correction to a small but rapidly growing strand of the literature on entrepreneurship that, starting with Kerr, Kerr, and Nanda (2015), Agarwal et al. (2016), and Kerr and Kerr (2016), assumes that business owners are commonly present in U.S. matched employer-employee data. Our empirical findings challenge this assumption.

The next part of our paper assesses the implications of excluding the rapidly growing share of the U.S. population with business income from labor reallocation rates. We first compute the rates of entry into and from business income receipt. We find differences in entry and exit rates by legal form of organization: sole proprietors have higher transition rates than owners of partnerships and S corporations. We also compare business ownership entry and exit rates to the analogous employee-level hire and separation rates, and we find three main differences. First, transition rates into and out of business income receipt are lower than hire and separation rates of employees. This implies that self-employment is more stable than the typical wage and salary job. Second, entry and exit from business income receipt is less cyclical than employee-level hire and separation rates. Third, there is no trend decline in transition rates into and out of business income receipt, in contrast to the dramatic declines in hire and separation rates. These three facts imply that incorporating business income receipt into labor reallocation measures should lead to smaller measured declines in recent decades.

We then incorporate business income dynamics into our labor reallocation measures. The in-

clusion of business income has a substantial impact on hire and separation rates, reducing the measured decline by 1.3 to 1.4 percentage points, or 8.3% to 8.7%. We find much smaller offsetting effects for employer-to-employer transitions (0.2 percentage points), employment-to-nonemployment transitions (0.1 percentage points), and nonemployment-to-employment transitions (0.1 percentage points). This sizeable difference implies that most of the offsetting effect of business ownership on hire and separation rates can be attributed to jobs that are secondary sources of income, or short in duration. Inclusion of business income offsets 1.1 to 1.2 percentage points of the measured decline in the incidence of hires and separations associated with jobs that are secondary or short in duration, or 7.4% to 8.9% of the total decline. Given that these jobs are where the most dramatic measured declines in labor reallocation rates are concentrated, this finding matters for understanding recent changes in labor market fluidity. It suggests that the rapid increase in the population that receives business income is an important cause of the long-run decline in short duration wage and salary jobs. The few existing studies on declining short duration jobs by Hyatt and Spletzer (2017), Hall and Schulhofer-Wohl (2018), and Pries and Rogerson (2019) do not consider this margin of adjustment.

We next consider the relationship between business income receipt and wage and salary jobs. We assess the extent to which business income recipients otherwise would have otherwise worked at several wage and salary jobs over the same time interval. This might occur if individuals who used to work as employees of transportation and administrative support firms now provide services via ridesharing and clerical services third-party platforms. In the latter case, in a single calendar year the individual will have at most a single entry or exit from business ownership despite starting or ending a variety of different tasks. Therefore, rising self-employment can lead to lower measured reallocation rates. In contrast, the new group of business owners may have been less likely to have worked at all prior to the rise of the gig economy. Therefore, rising self-employment may increase labor reallocation rates.

To address this question, we estimate panel regression models that explain the number of jobs worked in a calendar year as a function of whether they receive business income, as well as whether business ownership was their main source of income. When individuals earn more from self-employment than from any wage and salary employer, they work at eight-tenths to one fewer wage and salary jobs. When individuals earn only secondary income from self-employment, the

measured effect is much smaller. Using our administrative records data, we find that workers are employed at 0.013 additional wage and salary jobs. Using the CPS-DER, we find that secondary income from self-employment is associated with 0.101 fewer wage and salary jobs. This evidence suggests that secondary income from self-employment increases labor reallocation in a way that employer-reported administrative records do not capture.

2 Data

Two unique datasets allow us to generate measures of labor market fluidity for both wage and salary jobs and self-employment spells. For years 1990 through 2016, we use CPS records enhanced with longitudinal administrative records. These administrative records data cover wage and salary jobs as well as self-employment spells for sole proprietors and partners. To expand the scope and granularity of covered self-employment activity, we perform similar analyses using linked administrative data covering all W-2 wage and salary jobs starting in 2005, as well as all business ownership spells (excluding ownership of C corporations) starting in 2015. Using the survey-based dataset, we obtain a much longer time series. The universe-level data allows us to consider a broader population of owners, as well as to distinguish between sole proprietors, partnerships, and S corporations. We describe each of our two datasets below.

2.1 CPS-DER

Our first dataset is the Annual Social and Economic (ASEC) Supplement to the Current Population Survey (CPS) linked with IRS records on annual wage and salary and self-employment earnings. In each year, sole proprietors and partners who receive (from all combined ownership activity) net annual earnings above \$433 are required to file a Schedule SE (Self-Employment Tax). The Master Earnings File (MEF) database maintained by the Social Security Administration contains information on self-employment earnings from Schedule SE as well as information on wage earnings from each Form W-2 a person has received during the year. Our analysis uses an extract (called the Detailed Earnings Record, or DER) that includes MEF records for each CPS respondent for whom a Protected Identity Key (PIK), a person-level longitudinal identifier, is available. Note that the CPS-DER lacks identifiers for the businesses that Schedule SE filers own. Therefore, the only dis-

inction we can make is whether or not an individual receives business income, not the dynamics associated with the businesses that they own.

By using the sample weights from the CPS ASEC in combination with DER administrative information for the same year, our dataset can be used to estimate population-level characteristics of Schedule SE recipients as well as W-2 jobholders and jobs in each year. It is worth noting that this linked dataset provides information (including weights) for only those CPS respondents who have received a PIK and are therefore linkable with administrative records data sources. Because not all respondents receive a PIK, we create sample weights that adjust for the likelihood of receiving a PIK.⁶ We limit included jobs to those observed in the DER for the CPS reference year to permit us to create estimates that are representative of the U.S. population. Because we produce statistics on entry and exit from wage and salary work and business ownership, for each wage and salary job and self-employment spell observed in the DER in the relevant year, we also include information on that job or spell from the preceding and following year. We use CPS ASEC responses from 1991 to 2016, linked with administrative records from 1990 until 2016, the last year of available linked administrative records.

2.2 Universe-Level Administrative Records Data

We construct our second dataset from universe-level sources on wage and salary earnings and business income for several legal forms of organization. First, we have the universe of W-2 records for wage and salary jobs starting in 2005. We also have employment records with the universe of business entities for which an owner can be identified. Specifically, we obtain the sole-proprietorship ownership spells from the Census Non-employer and Employer business registers and the universe of partnership and S corporation ownership spells from Schedule K-1 data (covering share of income for pass-through entities).⁷ Among sole proprietors, we have access to information on the owner (from 1040 Schedule C) from 2007 through 2015. For pass-through entities covered by Schedule K-1, each entity may have multiple owners. We have access to information on these

⁶These are the base weights for the CPS multiplied by the inverse of the estimated probability of receiving a PIK from a linear probability model. Observable characteristics used to estimate this probability are age categories, education categories, gender, race group indicators (black alone, white alone, and any other race), marital status, a foreign born indicator, and indicators for state of residence.

⁷See Garcia-Perez et al. (2013) for further description of sole proprietorship linkages. See Goldschlag, Kim, and McCue (2017) for further descriptions of the Schedule K1 data and linkages.

entities linked to their owners for years 2007 through 2015. The combined data offer two key advantages over the DER. First, it is universe-level data rather than a sample-based representation of the population. Second, it has greater detail on self-employment spells. Third, by obtaining ownership information directly from tax reports, we gain a wealth of information on the entities they own and operate. If an individual has two businesses (distinct at the Employer Identification Number, or EIN, level), then ownership is considered separately for each business. This contrasts with the DER, which pools together all sole proprietorship and partnership earnings for the person in a calendar year and so does not allow this distinction. Finally, the business identifiers in our universe-level data, along with the universal coverage of wage and salary payments for these businesses, allows us to assess the extent to which business owners receive wage and salary payments.

2.3 Measuring Labor Market Fluidity

Using these data, we construct individual-level annual indicator variables for working, for working as a newly hired employee, and for separating using the concepts developed by Abowd et al. (2009) for quarterly data, and implement them on our annual data.⁸ If an individual has no earnings from an employer in the one year but positive earnings in the next, we infer a hire in the subsequent year. Similarly, if an individual has positive earnings in one year, but have no earnings in the next, we infer a separation in the first year. Earnings from an employer in two consecutive years indicates that an individual was an employee of the business at the start of the second year. We also apply the person-level definitions of employer-to-employer transitions, as well as transitions into and out of nonemployment developed by Hyatt et al. (2014). If an individual has a different employer at the start of a year than at the end of that year, we infer an employer-to-employer transition. If a person is employed at the beginning of a year but not at its end, we infer a employment-to-nonemployment transition. Finally, if a person is employed at the end of a year but not at its beginning, we infer a nonemployment-to-employment transition.

⁸For formal definitions, see Appendix A.

3 Reallocation Rates for Wage and Salary Employment

3.1 Labor Reallocation Rates: Evidence from Administrative Records Data

The hire and separation rates of wage and salary workers in recent decades are shown in Figure 1. Hire and separation rates calculated from W-2 earnings follow the familiar “stair-step” pattern noted by Hyatt and Spletzer (2013): rates drop sharply around the 2001 and 2007-2009 recessions, and show little evidence of an increase between the two. The hire (separation) rate in the CPS-linked W-2 data increases during the 1990s, from 56.8% (57.5%) in 1991 to 69.5% (69.0%) in 2000, and then drops during and after the 2001 recession reaching 53.9% (53.8%) in 2003.⁹ The hire (separation) rate recovers to 57.9% (56.4%) in 2005, before dropping again to 41.1% (44.3%) in 2009. The hires series recovers after that, reaching 51.3% in 2016. The separation series is rather flat from 2009 to 2012, when it is 44.7%, and it afterwards recovers to 50.0% in 2015.

The hire and separation rates calculated from universe-level W-2 data show similar cyclical declines during the 2007-2009 recession, with the hire (separation) rate falling from 63.7% (61.7%) in 2006 to a low of 45.4% (46.7%) in 2009 (2010). At the end of our time series, hire and separation rates still have yet to fully recover to their 2006 level: in the CPS-matched W-2 data, the hire (separation) rate only reaches 51.3% (50.0%) in 2016 (2015), and in the universe-level W-2 data, the hire (separation) rate reaches 58.9% (51.6%) in 2015 (2014).

The W-2 based hire and separation from the universe-level files are consistently a few percentage points above those from the CPS-DER W-2 records. This difference may be due to sample selection and record linkage effects that are not completely accounted for by our linkage-adjusted CPS-DER weights. For example, people who respond to the CPS ASEC may have slightly more stable employment histories than the population as a whole. Nevertheless, the rate calculated from the CPS-DER W-2 records is highly correlated with that of the universe-level W-2 records. The correlation between the hires series for years 2006-2015 is 0.978, and that of the separation series for years 2005-2015 is 0.984.

⁹The hire and separation rates that we report in Figure 1 are in the range of 41% to 69%. These hire and separation rates are much higher than most published series. The reason for this is that they are calculated on an annual basis, where most other series are published on a monthly or quarterly basis. In Appendix Figure B.2, we compare the annual hire and separation rates with other available data by summing the monthly or quarterly rates for any given year. Hire and separation rates from W-2 data are higher than our calculated annual rates from the JOLTS, but lower than those from the CPS and QWI.

Figure 2 shows the evolution of the employer-to-employer, nonemployment-to-employment, and employment-to-nonemployment transition rates for our two data sources.¹⁰ Results for the CPS-DER are shown in Panel 2(a). The employer-to-employer transition rate is procyclical, with large declines associated with the 2001 and 2007-2009 recessions. It rises from 12.0% in 1991 to 15.7% in 2001, then declines after the 2001 recession, reaching 12.7% in 2003. Thereafter, it recovers to 13.9% in 2006 and then falls again during the 2007-2009 recession, reaching a series low of 10.1% in 2009. By 2015, the employer-to-employer transition rate had recovered to 14.0%, slightly exceeding its pre-recession peak in 2006. The transition rates into and out of nonemployment also have clear cyclical properties. During expansions, the rate of nonemployment-to-employment transitions exceeds that of employment-to-nonemployment transitions, and so employment grows. During recessions, this pattern reverses as the employment-to-nonemployment transition rate surges. Both transition rates are about 11.4% in 1991, when the 1990-1991 recession ended. Employment grows in the 1990s, and the nonemployment-to-employment transition rate reaches a series maximum of 13.2% in 1999, when the employment-to-nonemployment transition rate is 10.9%. In the recession year of 2001, the workforce contracts slightly and the employment-to-nonemployment rate is 11.9% and the nonemployment-to-employment rate is only 11.5%. The nonemployment-to-employment transition rate then increases to 12.0% in 2006, when the employment-to-nonemployment rate is 10.3%. In the 2007-2009 recession, the rates reverse again. In 2009, transitions out of nonemployment are only 9.3% of employment while transitions into nonemployment are 11.6% of employment. In 2015, the most recent year of available data, transitions out of nonemployment are 11.0% of employment and transitions into nonemployment are 9.6%.

Transition rates evolve similarly in the shorter time series of universe-level W-2 data, shown in Panel 2(b). In 2006, the employer-to-employer transition rate calculated from universe-level administrative records is 16.2%. The rate then drops to 12.0% in 2009, and recovers to 15.3% in 2014. In 2006, transitions out of nonemployment are 13.7% of average W-2 employment, while transitions into nonemployment are 11.9%. In the 2007-2009 recession, these rates reverse, with the

¹⁰In Appendix Figure B.3, we compare these transition rates with other available data by summing the monthly and quarterly rates for any given year. The sum of rates from published series are consistently higher than our estimates using W-2 data. The natural explanation for this is that individuals can have multiple transitions during a particular calendar year, whereas our definitions restrict individuals to have at most one transition.

employment-to-nonemployment transition rate reaching 14.1% in 2009, and the nonemployment-to-employment transition rate is only 11.3%. In the years that follow, the nonemployment-to-employment rate recovers, and is 12.7% in 2014, when the employment-to-nonemployment rate is 11.8%.

The transition rates in the universe-level W-2 data are somewhat higher than for the W-2 earnings that match to the Current Population Survey. For example the employer-to-employer transition rate calculated from universe-level administrative records is 16.2% in 2006, compared to 13.9% in the CPS-DER. The universe-level W-2 records are highly correlated with the CPS-DER. The correlation between the employer-to-employer transition rates is 0.997, the employment-to-nonemployment rates is 0.884, and the nonemployment-to-employment rates is 0.908.

These findings from our new data sources indicate that any decline in labor reallocation rates is concentrated among jobs that provide secondary income, or are short in duration (that is, starting and ending in the same calendar year). The declines in the hire and separation rates are much more dramatic than the declines seen for employer-to-employer transitions, or transitions into and out of nonemployment. The residual between hires and separations and these measures, as formalized by Hyatt and Speltzer (2013), are jobs that are either secondary or short in duration. Hyatt and Speltzer (2013) and Pries and Rogerson (2019) previously showed this outsized role of short-duration jobs using the Quarterly Workforce Indicators, and Hyatt and Speltzer (2017) explore this further using the Longitudinal Employer-Household Dynamics microdata which underlie those measures. Hall and Schulhofer-Wohl (2018) make a similar argument using data from the Current Population Survey. Our analysis of W-2 data confirms that recent declines in reallocation rates are most apparent for jobs that are shorter in duration. The decline in secondary and short duration jobs is therefore of central importance for understanding the trend decline in labor market fluidity.

3.2 Comparing Administrative Records Tabulations to Survey Responses

Our new data give us the opportunity to benchmark a labor reallocation measure available from the CPS ASEC. Since 1976, the CPS ASEC has asked respondents “For how many employers did [you or someone else in your household] work? If more than one at same time, only count it as one employer.” Farber (1999) and Stewart (2007) studied the time series of survey responses

to this question to understand the evolution of the employer-to-employer transition rate and its cyclical properties. More recently, Hyatt (2015), Molloy et al. (2016), and Molloy, Smith, and Wozniak (2017), and Hyatt et al. (2018) have used this data source to provide evidence of a long-run trend in employer-to-employer transitions. We compare the survey responses with the matched administrative records for CPS ASEC respondents in Figure 3.¹¹ While the two data sources have similar levels and tend to move together (with a correlation of 0.73 for years 1991-2015), there are some important differences.

These measures of the employer-to-employer transition rates of CPS ASEC respondents exhibit striking differences in the 1990s. While the employer-to-employer transition rate calculated from administrative records data increases during the expansion between the 1990-1991 and 2001 recessions, survey responses show a basically flat employer-to-employer transition rate. The administrative records data indicate an employer-to-employer transition rate of 12.0% in 1991, which is much lower than the rate of 14.6% for survey responses. The administrative records data increase steadily to 15.6% in 2000 (an increase of 3.6 percentage points), while survey responses indicate 15.3% (an increase of only 0.7 percentage points). The survey data also indicates a local maximum of 15.8% in 1994, which is absent from the administrative records data.

The precipitous decline among CPS ASEC survey respondents that starts in 2001 is less severe and more cyclical in the administrative records matched to these same survey respondents. While both data sources indicate that transition rates did not fully recover between from the 2001 recession and start of the 2007-2009 recession, there is a much greater drop of 3.2 percentage points from 2000 to 2006 (from 15.3% to 11.7%) among survey responses, while the administrative records data indicate a decline of 1.8 percentage points (from 15.7% to 13.9%). The recovery from the 2007-2009 recession is also more muted in the survey data, which increase from 2009 in 9.1% in 2009 to 10.8% in 2015 (an increase of 1.7 percentage points), while the administrative records surge from 10.1% to 14.0% (3.9 percentage points).

This analysis provides an important new reference point on how labor reallocation rates have evolved in recent decades. Responses to the multiple non-overlapping employers question in the CPS ASEC suggest a trend decline in the employer-to-employer transition rate that began with, or accelerated during, the 2001 and 2007-2009 recessions. In contrast, the administrative records

¹¹ Survey response data was downloaded from iPUMS, see Ruggles et al. (2010).

data indicate that labor reallocation rates are procyclical but do not indicate a trend decline. These results suggest that researchers should exercise caution when using the multiple non-overlapping employers question from the CPS ASEC to measure the trend in the employer-to-employer transition rate.

We propose two potential explanations for this discrepancy between the trend in the employer-to-employer transition rate as measured by survey responses and administrative records data. First, the employer-to-employer transition concepts are different in the two data sources. The administrative records data only records employees with different employers at the beginning and end of the year as employer-to-employer transitions. The CPS ASEC asks about whether a respondent had multiple non-overlapping employers in the last year, without requiring that particular timing. Therefore, the CPS ASEC may record employer-to-employer transitions that are not associated with one job held at the start of a calendar year to but another at its end.

A second explanation is survey effects, which is consistent with the unusual properties that the series displays during the 1990s, as well as the fact that measured reallocation rates decline more in the 2001 recession than the much more severe 2007-2009 recession. Kaplan and Schulhofer-Wohl (2012) have attributed the strong measured decline in interstate migration in the early 2000s in the CPS ASEC to survey effects, especially for imputed and proxy responses. Hyatt et al. (2018) note increasing divergence between CPS ASEC survey responses on interstate migration and administrative records for the same time period. It is possible that similar survey effects contribute to the measured decline in the multiple non-overlapping employers question in the CPS ASEC.

4 Self-Employment and Business Ownership

4.1 Shifts in Composition

We first measure trends over time in wage and salary employment, as well as self-employment. We consider a worker to be in one of four types of employment in any given year based on their receipt of wage and salary income, as well as business income. Our first group consists of those who only have income from self-employment. Our second category consists of those who work both

business income and wage and salary income and earn more from the former, and third category consists of those who earn more from the latter. Our residual fourth category consists of workers who have only wage and salary income. Our calculations omit the nonemployed, so these four shares sum to 100% in each year and are exhaustive of the population with positive income.

In both the CPS-DER and the universe-level administrative records, the set of individuals with only wage and salary income dominates, although it declines over time. We show this in Figure 4. In the CPS-DER, the share of such individuals declines from 90.1% in 1991 to 88.5% in 2016. Although this change is small, it indicates an increase from 9.9% to 11.5% in the share of business income recipients, a proportional increase of about 15%. The share of individuals with only wage and salary income is lower in the administrative records data, and declines from 81.3% in 2007 and 80.4% in 2014. The higher share of the population with positive business income in the universe-level data is likely due to the fact that our CPS-DER only includes business owners who file a Schedule SE, which only applies to most sole proprietors and partnerships, and necessarily excludes owners of S corporations.

The relative frequency of the self-employment categories are also shown in Figure 4. Of those with self-employment income, the largest category is of those with only self-employment income and no wage and salary income. In the CPS-DER, the share of individuals in this category increases from 6.0 in 1991 to 6.5% in 2016, a proportional increase of 8%. In the universe-level administrative records data, 9.5% have only self-employment income in 2007, while 10.9% do in 2014, a proportional increase of about 14%. The next-largest category consists of those with more income from wage and salary employment than from self-employment. In the CPS-DER, the share of individuals with secondary self-employment income increases from 2.7% to 3.5%, a proportional increase of about 29%. The universe-level administrative records data, the share of the population declines slightly from 7.2% in 2007 to 6.7% in 2014, a proportional decline of about 7%. The smallest share of the population consists of those with primary business income and a positive amount of wage and salary income. In the CPS-DER, the share of the population with secondary wage and salary income increases from 1.1% to 1.5% in 2016, a proportional increase of about 22%. In the universe-level administrative records data, the share with secondary wage and salary income increases from 1.6% in 2007 to 1.8% in 2014.

These seemingly modest changes of a couple of percentage points in the share of the population

that receives business income reflect important changes in employment and the number of business entities in the U.S. in recent decades. Each percentage point increase in the share of this population corresponds with more than one million new business income recipients, and roughly as many new business entities.¹² This finding has important implications for studies that emphasize the decline in the employer business entry rate Decker et al. (2014b), Sedláček and Sterk (2017), and Pugsley and Şahin (2018) and almost exclusively rely on data from the BDS. Data from the U.S. Census Bureau (2006, 2019) indicates that the total number of nonemployer business entities increased from 19.5 million to 24.8 million in 2016, a proportional increase of about 24%. It is true that the number of employer business entities has grown much more slowly, from 5.0 million to 5.2 million between these same years, a much more modest change of only about 4%. A complete picture of both total employment, as well as business dynamism in the U.S. needs to consider employer and nonemployer businesses. Studies on the rapid growth of nonemployer businesses, such as Abraham et al. (2018), in contrast, usually omit employer business entities. We hope that that future studies on employment, reallocation, and business entry will consider both employer and nonemployer business entities, as well as the relationship between the two.

The cyclical features of Figure 4 are modest but important to note. The periods of most rapid growth in self-employment are around recessions. The periods when self-employment grows the slowest, or reverses its share, are late into the expansions that precede the 2001 and 2007-2009 recessions. This evidence indicates that business income receipt is less cyclical than wage and salary employment. This differential cyclicity of wage and salary vs. business income is more apparent in the transition rates we analyze in the next Section.

4.2 Do Business Owners Receive Wage and Salary Payments?

We now explore when business owners receive wage and salary payments from the businesses they own. We do this by merging our business ownership data with the W-2 data based on the EIN of the employer and the PIK of the owner. A match on EIN and PIK indicates that the owner receives

¹²To see this, note that the employed population in the U.S. was 157 million in June of 2019, according to the Bureau of Labor Statistics (2019). We also explore this further in Appendix Figure B.1, which presents totals for the data sources we consider. The number of individuals with business income in the CPS-DER rises from 13.0 million in 1996 to 19.4 million in 2015. In the universe-level administrative records data, from 16.7 million to 18.9 million in 2015. As noted above, the total number of number of employer business entities was 5.2 million in the BDS.

wage and salary payments from the business. Our results, shown in Table 1, indicate that business owners are usually omitted from employment-based reallocation statistics.¹³ Only 7.4% of the owners of sole proprietor businesses receive wage and salary income from their business, and 1.1% of the owners of partnerships receive wage and salary income from their businesses. The owners of S corporations are more frequently employees of the businesses that they own. 40.4% of the owners of S corporations receive wage and salary income from their own business. These results indicate that most business owners are not present in employer-reported administrative records.

These results have implications for the literature that, starting with Kerr, Kerr, and Nanda (2015), Agarwal et al. (2016), and Kerr and Kerr (2016), attempts to identify business founders, owners, and entrepreneurs from matched employer-employee data as high-earning employees. The popularity of this approach is somewhat surprising given that the Internal Revenue Service (2017, 2019) discourages and in many cases prohibits sole proprietors and the owners of partnerships from paying themselves a salary.¹⁴ There is therefore evidence apart from any empirical findings that such methods will almost always fail to identify the owners of sole proprietor and partnership businesses. Owners of S corporations, by contrast, are in some cases required to receive wage and salary payments. According to the IRS (2019b), “an officer of a corporation is generally an employee; however, an officer who performs no services or only minor services, and neither receives nor is entitled to receive any pay, isn’t considered an employee.” In practice, the IRS (2019c) asks that only businesses that have \$500,000 or more in revenue report officer compensation directly. This reporting requirement may also influence the extent to which owners receive wage and salary payments.

Table To assess the extent to which business owners are present in matched employer-employee data, we include two additional rows in Table 1. One row measures how frequently owners of businesses are present in the W-2 records conditional on having W-2 records, that is, conditional on the business having at least one employee. By construction, the share of business owners that are present in the data is higher. 11.2% of the owners of partnerships with W-2 records receive wage and salary income. 70.3% of the owners of employer S corporations receive wage and salary income.

¹³Note that most sole proprietor businesses do not have EINs, and they are beyond the scope of Table 1.

¹⁴Note that the Tax Cuts and Jobs Act of 2017 changed the tax treatment of sole proprietor businesses and so since 2018 owners of such businesses have been able to deduct some payments to owners.

The third row mimics the entrepreneur identification strategy of Kerr, Kerr, and Nanda (2015) and Kerr and Kerr (2016), we also look specifically at the top 3 earners at employer businesses.¹⁵ We find that owners are among the top 3 earners for 10.2% of sole proprietor employers, 7.9% of partnership employers, and 60.8% of S corporation employers. These results suggest that researchers not assume that the owner of a business will be present in matched employer-employee data. In the case of sole proprietor and partnership employer businesses, a much better approximation of the data can be obtained by assuming that the owner is not present in the data.¹⁶ Even for S corporations, any attempts identify business owners as the high-earning employees in U.S. matched employer-employee appears is unlikely to be successful. The top 3 earners of an S corporation will include at least one owner most of the time, although most of the top 3 earnings in S corporations are not owners, so these approaches yield at best a proxy for ownership. It would of course be convenient (and, indeed, would validate the results of numerous empirical papers) if the owners of businesses were usually present in U.S. matched employer-employee data. But business owners are usually not counted as employees of their businesses.

5 Incorporating Business Owners into Labor Reallocation

5.1 Entry and Exit from Business Income Receipt

We now assess the implications of the exclusion of the self-employed for the study of labor market fluidity. We first compare individual entry and exit rates from business income receipt with hire and separation rates in Figure 5.

Panel 5(a) shows wage and salary hire and separation rates, as well as business income entry and exit rates for the CPS-DER. The entry rate of new Schedule SE business owners increases

¹⁵In Appendix Table B.1, we present results derived from wage records collected by U.S. states as part of unemployment insurance payroll taxation, and results are quite similar to 1. In Appendix Table B.2 we present analogous results that incorporate additional commonly used sample selection techniques that are used to identify business owners in matched employer-employee data. Such methods consider only businesses that start as single establishment firms, and require that owners receive wage and salary payments in the year the business hires its first employee. We also measure the share of owners present in the unemployment insurance wage records maintained by the Longitudinal Employer-Household Dynamics program. Results are broadly similar for sole proprietor and partnership businesses. For S corporations, these sample selection techniques result in a lower share of owners.

¹⁶While most studies that identify business founders or entrepreneurs implement their method to sole proprietors, partnerships, and corporations, and do not distinguish between these different legal forms of organization, recent exceptions include Choi (2017) and Azoulay et al. (2018).

from 45.9% in 1993 to 50.4% in 2004, but then declines to 45.0% 2010 recession and shows little recovery afterwards. Exit from Schedule SE business ownership similarly rises from 42.9% in 1990 and reaches 49.2% in 2007, before declining to 44.7% in 2010 and is mostly level thereafter. Business ownership entry and exit rates in the universe-level ownership records that distinguish between partnerships, S corporations, and sole-proprietorships available from 2007 in Panel 5(b) also are relatively constant through the 2007-2009 recession and the subsequent years.¹⁷

Business entry and exit rates have substantial differences from hire and separation rates. We notice three major differences when comparing business income entry and exit rates with hire and separation rates. First, business entry and exit rates, which range from 42% to 51%, are usually lower than hire and separation rates, 41% to 70%. Second, business income entry and exit rates are more stable and less cyclical than hire and separation rates. The entry rates increases around the 2001 recession, from 44.7% to 47%, while the exit rate is flat. In contrast, the from 2000 to 2002, hire rate drops from 69.5% to 55.4% and the separation rate drops from 69.0% to 56.5%. Business income entry and exit rates show some response to the 2007-2009 recession, with the entry rate dropping from 50.0% in 2006 to 45% in 2010, and the exit rate falling from 47.4% to 44.7%. But these changes are nowhere near as dramatic as the decline in the hire rate from 55.4% to 43.5%, and the separation rate from 55.0% to 43.4%. Third, business income entry and exit rates do not show evidence of a trend decline. The entry rate is virtually unchanged from 45.9% in 1991 to 44.6% in 2016, and the exit rate shows a modest increase from 42.9% in 1009 to 46.7% in 2015. For the same years, hires decline from 56.8% to 51.3%, and separations from 64.2% to 50.0% (although the high value in 1990 is likely cyclical, the separation rate is 57.5% in 1991 and 57.0% in 1992). All three of these facts imply that when we incorporate business income into hires and separations, we should expect to see a series that is lower, more stable, less cyclical, and which shows less of a trend decline than our hire and separation rates calculated from W-2 data alone.

Panel 5(b) shows that business ownership entry and exit rates also differ substantially across legal forms of organization. Sole proprietor businesses have entry and exit rates between 38 and 52%, which is broadly consistent with but somewhat lower than rates calculated for Schedule SE filers from the CPS-linked sample.¹⁸ Partnership ownership is much more stable than sole

¹⁷Note that the Schedule SE business owners from the CPS-linked records do not include S corporation owners.

¹⁸Note that Goetz et al. (2017) present the results of an early version of such an estimation strategy, and show transition rates for 2009.

proprietorship ownership, with the entry (exit) rate in the range of 12% to 19% (10% to 13%). S corporation owners have the most stable ownership patterns with entry (exit) rates in the range of 9% to 17% (9% to 12%).

5.2 Hire and Separation Rates

We include entry and exit from self-employment and business ownership hires and separations, as shown in Figure 6. We show the combined W-2 hires and business owner entry in Panel 6(a), with the hire rate calculated from the W-2 records alone included for comparison. Similarly, the combined W-2 separations and business owner exits are included in Panel 6(b). Because there are only 6% to 9% of consecutive quarter employment is attributed to business income recipients, the more inclusive hire and separation series mimic those created using only wage and salary workers with W-2 records.¹⁹ Because business ownership entry and exit rates are relatively low, the combined hire and separation rates are usually lower than the W-2 hire and separation rates. The largest differences are apparent in the 1990s, where the inclusion of entry and exit dynamics lowers measured hire and separation rates by up to 1.8 percentage points. This difference is driven by the fact that business income entry and exit rates are usually lower than hire and separation rates, and this difference is especially pronounced in the earlier years of the time series when hire and separation rates are high. At the start of the time series in 1991, the hire rate is 56.8% using W-2 records alone, and 56.0% when business income recipients are included. This difference reaches a maximum for hires in 2000 (69.5% without, 67.7% including business income) and for separations in 1998 (67.7% vs. 65.9%). Between the 2001 and 2007-2009 recessions, this difference is 1 percentage point or less, and for 2008 onward these are 0.6 percentage points or less, and hire and separation rates using W-2 data alone are slightly lower in 2009 and 2010 than those that include business income recipients. This convergence can be attributed to the fact that in the 2010s the lower hire and separation rates are approximately equal to the business income entry and exit rates. This difference also affects the measured decline from the start to the end of the time series. Hires calculated using W-2 records alone decline from 56.8% to 51.3% (5.5 percentage points), but including business income entry and exit they decline from 56% to 50.7% (5.3 percentage points).

¹⁹For a time series of the employment shares of total consecutive year employment, and employment that is dominant among consecutive year employment, see Appendix Figure B.4.

Separations decline from 64.2% in 1990 to 50.0% in 2015 (14.2 percentage points) using W-2 data alone, and from 62.7% to 49.7% (13.0 percentage points) when including business income.

The universe-level datasets show a more substantial impact of including business income when calculating hire and separation rates. Hire rates are 2.7 to 6.5 percentage points lower, and separation rates 0.5 to 5.3 percentage points lower, when including those with business income. However, we lack a sufficient time series to be able to make inferences about their impact on a trend decline in labor reallocation rates. However, we can compare these series in 2008 and 2010 in order to assess how the inclusion of those with business income affects the measured decline associated with the 2007-2009 recession. The hire rate declines from 55.4% to 47.5% (7.9 percentage points) using W-2 income alone, and 51.1% to 44.5% (6.6 percentage points) including business income recipients. For separation rates, the decline between those years is from 57.7% to 46.7% (11.0 percentage points) using W-2 income alone, and from 53.0% to 42.7% (10.3 percentage points) including business income recipients. This universe-level data therefore suggests that including those with business income leads to lower declines associated with the 2007-2009 recession. This finding is qualitatively consistent with the change around the 2007-2009 recession using CPS-DER, but larger in magnitude.

5.3 Employer-to-Employer and Transitions into and out of Nonemployment

In Figure 7, we consider how self-employment affects the employer-to-employer transition rate, as well as the rate at which workers transition into and out of nonemployment. Here, we find that inclusion of self-employment has less of an effect on measured reallocation rates. The employer-to-employer transition rate is basically identical after including the self-employed, as shown in Panel 7(a). In any given quarter using the CPS-DER, differences between the employer-to-employer transition rate using W-2 data alone relative to that which includes business income recipients are at most 0.2 percentage points. In 1991, the employer-to-employer transition rate including (excluding) the self-employed is 12.0% (11.9%). Through the 1990s, the employer-to-employer transition rates increases, reaching 15.7% (15.5%) in 2000, and, following the 2001 recession, declines to 12.7% (12.7%) in 2002. In the expansion that follows the 2001 recession, this rises to 13.9% (13.9%) in 2006, and during the 2007-2009 recession reaches a low of 10.1% (10.3%)

in 2009. In the expansion that follows, the employer-to-employer transition rate reaches 14.0% (13.9%).

The employer-to-employer transition rates including and excluding business income recipients are virtually identical. Both series increase by about 2.0% from 1991 to 2015. There three reasons to believe that this small increase does not capture the long-run decline in labor market fluidity as highlighted by Hyatt and Spletzer (2013), Davis and Haltiwanger (2014), and Molloy et al. (2016). First, 1991 was a recession year and so can be lower than a transition rate during an expansion year. Second, 2015 is the last year which can be calculated given available data, and so is most likely to be subject to revision with updates to the administrative records data. Third, the increase from 1993 to 1994 (1.3 percentage points using W-2 data alone, 1.1 including business income) is the largest in the time series and so may not be driven economic conditions. For these reasons, our preferred years for considering the decline in transition rates is 1994-2014. Even for these years, the measured decline are virtually identical in our two methods: 0.7 percentage points using W-2 data alone, and 0.6 percentage points including business income recipients.

Panel 7(a) shows more substantial differences in the employer-to-employer transition rate using universe-level administrative records, but the range of years available is much smaller. The employer-to-employer transition rate is 0.4 to 1.2 percentage points higher when business income recipients are included. The employer-to-employer transition rate appears to exhibit less of a decline during the 2007-2009 recession using universe-level administrative records. Both series exhibit a sharp decline of about 2.4 to 2.5 percentage points from 2008 to 2009. The W-2 data alone stay at a low point of 12.0% in both 2009 and 2010, before rising to 12.9% in 2011. the employer-to-employer transition rate using business income recipients increases from 12.4% in 2009 to 13.1% in 2010, and then to 13.7% in 2011. The recovery in the employer-to-employer transition rate therefore appears slightly more U-shaped in the W-2 data alone, and more V-shaped when business income recipients are included. This albeit limited evidence suggests that the omission of business income recipients may affect the slow measured labor market recovery to the 2007-2009 recession in employer-reported administrative records data. More generally, more research on the role of self-employment and business ownership in labor market recoveries is needed.

Results for employment-to-nonemployment transitions are shown in Panel 7(b). Again, the rates are similar including and excluding business income recipients data. In the CPS-DER, transi-

tion rates excluding business income recipients consistently higher than those that include them, by 0.1 to 0.5 percentage points. Such evidence may highlight the fact that to measured transition rates into and out of nonemployment using employer-reported administrative records alone omit transitions between wage and salary work and self-employment. However, the universe-level administrative records data suggests that such an explanation may not be the dominant factor in this relationship. Omission of the self-employed necessarily excludes transitions between self-employment and nonemployment. The transition rate excluding business income recipients is sometimes lower, and sometimes higher. Thus the universe-level administrative records data suggests more of a role for omitted transitions into and out of nonemployment rather than misclassified transitions into and out of wage and salary employment. Results for nonemployment-to-employment transitions, shown in Figure 7(c), tell a broadly similar story. Transition rates excluding business income recipients are almost always higher than those that include them, by as much as 0.6 percentage points (the exception is 2009, when they are lower by less than 0.1 percentage point). The relative rankings of nonemployment-to-employment transitions are somewhat mixed in the universe-level administrative records data.

5.4 Secondary and Short Duration Jobs

The number of hire and separations that occur in a calendar year are much larger than the total number of employer-to-employer transitions and transitions into and out of nonemployment. We now turn our attention to a residual category: the hires and separations that are in excess of those that facilitate employer-to-employer and nonemployment transitions. These are secondary jobs, as well as jobs that start and end in the same calendar year and so do not span two consecutive calendar years. We plot such transitions in Figure 8, both using W-2 data alone, as well as using data on self-employment income. Its results are broadly similar to those in Figure 6, consistent with most hires and separations behind associated with secondary or short duration jobs. Secondary and short duration jobs exhibit a pronounced “stair-step” pattern, with declines in the 2001 and 2007-2009 recession, with a muted recovery between 2002 and 2006. Such jobs appear to drive the stair-step pattern in aggregate hires and separations, consistent with the findings of Hyatt and Spletzer (2017). Excluding the self-employed (i.e., using W-2 data alone), the hires (separations) associated

with secondary and short duration jobs increase from 56.8% (57.5%) in 1991 to 69.5% (69.0%) in 2001, then drop to 53.9% (53.8%) in 2003, rising to 57.9% (56.4%) in 2005, before declining to 41.1% (44.3%) in 2009, then recovering to 50.6% (50.0%) in 2015. These rates are broadly similar calculating hire and separation rates including the self-employed, especially in the more recent years. After including the self-employed, hire and separation rates are nearly a percentage point lower in the 1990s, but only 0.2 to 0.3 percentage points lower in more recent years. This differential shows that the inclusion of the self-employed has a modest offsetting effect on the measured decline in the hire and separation rates for secondary and short duration jobs.

5.5 Taking Stock

These results provide a detailed picture of how the inclusion or exclusion of business owner income affects empirical measures that are used to assess changes in labor market fluidity and the extent of its decline. We summarize these results in Table 2, which considers our results from the CPS-DER for the years 1994 and 2014. Because self-employment entry and exit rates are stable over time, and, during the 1990s much lower than hire and separation rates, their inclusion lowers the total measured decline in the hire rate by 1.3 percentage points (from 15.7% to 14.4%) and separation rate by 1.4 percentage points (from 16.1% to 14.7%). The inclusion of self-employment therefore offsets 8.3% to 8.7% of the decline in hire and separation rates. The inclusion of self-employment also offsets some of the measured declines in the employer-to-employer, employment-to-nonemployment, and employment-to-nonemployment transition transition rates, but the magnitude of these declines was smaller in magnitude and so only offsets 0.1 to 0.2 percentage points change in each measure. The residual comparing these measures with each other is secondary and short duration jobs, which (mechanically) end up being the dominant mechanism by which rising self-employment offsets the measured declines in hire and separation rates. Inclusion of self-employment income changes the measured decline in the secondary and short duration job hire rate by 1.1 percentage point (from 13.9% to 12.8%) and its separation rate by 1.2 percentage points (from 13.8% to 12.6%).

These findings highlight the importance of increasing business income receipt on understanding changes in labor market fluidity, both on the underlying economic phenomena as well as the

measurement issues. Declines in measured labor market fluidity are concentrated among hires and separations into and from jobs that either provide relatively little income, or do not last very long. Instances of secondary and short duration business income receipt are appearing in the U.S., while over these same decades wage and salary jobs have disappeared. The magnitudes of these changes are, however, very different. Therefore, the offsetting effect is about an order of magnitude smaller than the decline in hire and separation rates.

6 Substitution of Wage and Salary Jobs for Self-Employment

We now assess the extent to which self-employment displaces wage and salary jobs and whether this displacement has changed over time. Since we do not observe the activities of self-employed individuals, it is possible that earnings reported on an individuals Schedule SE may represent activities that would have generated multiple W-2s for a wage and salary worker. For example, in previous decades a particular worker might have received multiple W-2s for short stints as a taxi driver and as an office temp worker, whereas in today's "gig economy," that same worker may instead work short stints via a ridesharing platform and a clerical services platform. If this is the case, then our accounting method used in the previous section, which allows at most one Schedule SE or sole proprietorship job (and hence business owner entry and exit) per person per year may understate the true amount of worker reallocation. In this case, our estimate of the offsetting effect of self-employment dynamics on labor reallocation would be a lower bound. If, on the other hand, the rise of online platforms have simply facilitated new economic activity, then the growing number of self-employment jobs should exceed the decline in wage and salary jobs for the affected population. This would imply that there is little need to make adjustments for longitudinal consistency when studying changes in labor market fluidity.

To examine the degree of displacement of wage and salary jobs by self-employment, we conduct a regression analysis. Our specifications exploit within-person, over time variation in self-employment status. Our outcome variable of interest is the number of jobs held at a given time. If the movement of self-employed workers via the rise of online platforms and the "gig economy" means that a single sole proprietor business includes activity that previously would have been classified as wage and salary work, then we would expect that the total number of wage and salary and

self-employment jobs is lower when a worker is self-employed.

Results are shown in Tables 3 and 4. Table 3 contains simple point estimates from a bivariate regression of the number of jobs held an individual on an indicator for whether the individual is self-employed in that year (in this table we only consider individuals who are ever self-employed). We have two dependent variables, the total number of jobs worked (including both wage and salary jobs and self-employment) or the total number of wage and salary jobs worked. We report estimation results for regressions done both with and without worker-specific fixed effects. The typical worker receives earnings from about one and a half employers when they receive only wage and salary income. All estimates suggest that having self-employment income displaces wage and salary jobs, but on a less than one-for-one basis. This suggests that the net effect of self-employment on total jobs held is positive, generating increased employment among the self-employed population.

In Table 4 we add to our regression model an interaction term indicating whether a workers self-employment earnings are dominant, i.e. the self-employment earnings are greater than the workers earnings from any wage and salary employer in the year. We also expand the set of individuals to include all workers, but now we include an indicator as to whether a worker ever receives self-employment income. In a typical year, workers who are ever self-employed work a small fraction of a job more than workers who only ever have wage and salary earnings. When a worker receives self-employment earnings at all, the net effect of such work on the workers wage and salary job count is slightly negative in most of our specifications. This suggests that self-employment displaces a small fraction of wage and salary jobs. When, however, we measure the displacement of wage and salary jobs from having dominant self-employment earnings, we find that self-employment displaces wage and salary jobs approximately one-for-one. Overall, these results suggest that when workers obtain only a small amount of income from self-employment, that their wage and salary job count is relatively unaffected. When, however, workers earn more from self-employment, they work fewer wage and salary jobs.

7 Conclusion

We have demonstrated that the rise in the share of the U.S. population that receives business income offsets a small but nontrivial portion of the apparent decline in labor market fluidity that occurred in recent decades. To do so, we used a unique set of survey and administrative records data that allows us to measure hires, separations, and employment of workers engaged in wage and salary work and those who receive business income. We first confirmed that most business owners do not receive wage and salary payments and are therefore outside the scope of published statistics on labor reallocation. We then compared hire and separation rates using wage and salary employment alone with analogues that incorporate business ownership dynamics. We find that including business income recipients reduces the measured decline in the rate of hires and separations from 1994 to the early 2014 by 1.3 to 1.4 percentage points (about 8.3% to 8.7%).

We conducted a regression analysis to assess whether this offsetting effect is an understatement of the impact of self-employment on labor market fluidity. In our assessment of hire and separation rates, we counted the start of a persons self-employment spell as exactly one hire and its end as exactly one separation. If increasing self-employment replaces work that previously would have been done for multiple employers, our business income adjusted labor reallocation series may miss some increases in employment volatility. We found that when such activity constitutes a dominant source of income, business owners receive earnings from one fewer wage and salary job. These regression results indicate that missing volatility of this nature is not a problem that is of first order importance for our adjusted labor reallocation series.

Our results imply that accounting for self-employment is important when analyzing labor market fluidity. The volatile tail of the labor market has undergone profound shifts in recent decades as short duration jobs have shifted into the "gig economy." Measurement of the changing role of wage and salary work vs. self-employment is important for assessing the magnitude of any long-run trend decline in labor market fluidity.

References

- [1] Abowd, John, Bryce Stephens, Lars Vilhuber, Fredrik Andersson, Kevin McKinney, Marc Roemer, and Simon Woodcock. 2009. “The LEHD Infrastructure Files and the Creation of the Quarterly Workforce Indicators.” In *Producer Dynamics: New Evidence from Micro Data*, 68, Studies in Income and Wealth, ed. Timothy Dunne, J. Bradford Jensen and Mark J. Roberts, 149-230. Chicago: University of Chicago Press.
- [2] Abowd, John, and Lars Vilhuber. 2011. “National Estimates of Gross Employment and Job Flows from the Quarterly Workforce Indicators with Demographic and Industry Detail.” *Journal of Econometrics* 161(1): 82-99.
- [3] Abraham, Katherine, John Haltiwanger, James Spletzer, and Kristin Sandusky. 2018. “Measuring the Gig Economy: Current Knowledge and Open Issues.” NBER Working Paper #24950.
- [4] Agarwal, Rajshree, Benjamin Campbell, April Mitchell Franco, and Martin Ganco. 2016. “What Do I Take With Me? The Mediating Effect of Spin-out Team Size and Tenure on the Founder-Firm Performance Relationship” *Academy of Management Journal* 59(3): 1060-1087.
- [5] Azoulay, Pierre, Benjamin Jones, J. Daniel Kim, and Javier Miranda. 2018. “Age and High-Growth Entrepreneurship.” NBER Working Paper #24489.
- [6] Bayard, Kimberly, Emin Dinlersoz, Timothy Dunne, John Haltiwanger, Javier Miranda, and John Stevens. 2018. “Early-Stage Business Formation: An Analysis of Applications for Employer Identification Numbers.” NBER Working Paper #24364.
- [7] Choi, Joonkyu. 2017. “Entrepreneurial Risk Taking, Young Firm Dynamics and Aggregate Job Creation. Unpublished draft, University of Maryland.
- [8] Davis, Steven, R. Jason Faberman, John Haltiwanger, and Ian Rucker. 2010. “Adjusted Estimates of Worker Flows and Job Openings in JOLTS.” In *Labor in the New Economy*, ed. Katharine G. Abraham, James R. Spletzer, and Michael Harper. Chicago, IL: University of Chicago Press, 187-216.

- [9] Davis, Steven, and John Haltiwanger. 2014. "Labor Market Fluidity and Economic Performance." NBER Working Paper #20479.
- [10] De Loecker, Jan, and Jan Eeckhout. 2017. "The Rise of Market Power and the Macroeconomic Implications." NBER Working Paper #23687.
- [11] Decker, Ryan, John Haltiwanger, Ron Jarmin, and Javier Miranda. 2014a. "The Secular Decline in Business Dynamism in the U.S." Unpublished draft, University of Maryland.
- [12] Decker, Ryan, John Haltiwanger, Ron Jarmin, and Javier Miranda. 2014b. "The Role of Entrepreneurship in U.S. Job Creation and Economic Dynamism." *Journal of Economic Perspectives* 28(3): 3-24.
- [13] Engbom, Niklas. 2019. "Firm and Worker Dynamics in an Aging Labor Market." Federal Reserve Bank of Minneapolis Working Paper #756.
- [14] Fallick, Bruce, and Charles Fleischman. 2004. "Employer-to-Employer Flows in the U.S. Labor Market: The Complete Picture of Gross Worker Flows." Federal Reserve Board of Governors Finance and Economics Discussion Paper Series #2004-34.
- [15] Farber, Henry. 1999. "Mobility and stability: The dynamics of job change in labor markets." In: Ashenfelter, O., and D. Card (eds). *Handbook of Labor Economics*, Volume 3. Amsterdam: North Holland: 2439-2483.
- [16] Garcia-Perez, Monica, Christopher Goetz, John Haltiwanger, and Kristin Sandusky. 2013. "Don't Quit Your Day Job: Using Wage and Salary Earnings to Support a New Business." Unpublished draft, University of Maryland.
- [17] Goetz, Christopher, Henry Hyatt, Erika McEntarfer, and Kristin Sandusky. 2017. "The Promise and Potential of Linked Employer-Employee Data for Entrepreneurship Research." In: *Measuring Entrepreneurial Businesses: Current Knowledge and Challenges*, John Haltiwanger, Erik Hurst, Javier Miranda, and Antoinette Schoar, ed. Chicago: University of Chicago Press: 433-462.

- [18] Goldschlag, Nathan, J. Daniel Kim, and Kristin McCue. 2017. “Just Passing Through: Characterizing U.S. Pass-Through Business Owners.” U.S. Census Bureau Center for Economic Studies Working Paper #CES-17-69.
- [19] Hall, Robert, and Sam Schulhofer-Wohl. 2018. “Measuring Job-Finding Rates and Matching Efficiency with Heterogeneous Job-Seekers.” *American Economic Journal: Macroeconomics* 10(1): 1-32.
- [20] Hyatt, Henry. 2015. “The Decline in Job-to-Job Flows.” *IZA World of Labor* 175.
- [21] Hyatt, Henry, Erika McEntarfer, Kevin McKinney, Stephen Tibbets, and Douglas Walton. 2014. “Job-to-Job (J2J) Flows: New Labor Market Statistics from Linked Employer-Employee Data.” *JSM Proceedings 2014*, Business and Economics Statistics Section: 231-245.
- [22] Hyatt, Henry, Erika McEntarfer, Ken Ueda, and Alexandria Zhang. 2018. “Interstate Migration and Employer-to-Employer Transitions: New Evidence From Administrative Records Data.” *Demography* 55(6): 2161-2180.
- [23] Hyatt, Henry, and James Spletzer. 2013. “The Recent Decline in Employment Dynamics.” *IZA Journal of Labor Economics* 2(3): 1-21.
- [24] Hyatt, Henry, and James Spletzer. 2017. “The Recent Decline of Single Quarter Jobs.” *Labour Economics* 46(1): 166-176.
- [25] Internal Revenue Service. 2017. “Paying Yourself.” <https://www.irs.gov/businesses/small-businesses-self-employed/paying-yourself> (accessed: December 20, 2017).
- [26] Internal Revenue Service. 2019a. “Paying Yourself.” <https://www.irs.gov/businesses/small-businesses-self-employed/paying-yourself> (accessed: June 26, 2019).
- [27] Internal Revenue Service. 2019b. “Employer’s Supplemental Tax Guide (Supplement to Pub. 15, Employer’s Tax Guide) For use in 2019.” <https://www.irs.gov/pub/irs-pdf/p15a.pdf> (accessed: August 12, 2019).

- [28] Internal Revenue Service. 2019c. “Form 1125-E Compensation of Officers.” <https://www.irs.gov/pub/irs-pdf/f1125e.pdf> (accessed: August 12, 2019).
- [29] Kaplan, Greg and Sam Schulhofer-Wohl. 2012. “Interstate migration has fallen less than you think: Consequences of hot deck imputation in the Current Population Survey.” *Demography* 49(3): 1061-1074.
- [30] Kerr, Sari Pekkala, and William Kerr. 2016. “Immigrant Entrepreneurship.” NBER Working Paper #22385.
- [31] Kerr, Sari Pekkala, William Kerr, and Ramana Nanda. 2015. “House Money and Entrepreneurship. NBER Working Paper #21458.
- [32] Molloy, Raven, Christopher Smith, Riccardo Trezzi, and Abigail Wozniak. 2016. “Understanding Declining Fluidity in the U.S. Labor Market.” *Brookings Papers on Economic Activity*, Spring, 183-237.
- [33] Molloy, Raven, Christopher Smith, and Abigail Wozniak. 2017. “Labor Market Transitions and the Decline in Long-Distance Migration in the US.” *Demography* 54(2): 631-653.
- [34] Pries, Michael, and Richard Rogerson. 2019. Declining Worker Turnover: The Role of Short Duration Employment Spells.” NBER Working Paper #26019
- [35] Pugsley, Benjamin, and Ayşegül Şahin. 2018. “Grown-Up Business Cycles.” *Review of Financial Studies* 32(3): 1102-1147.
- [36] Ruggles, Steven, Matthew Sobek, and Trent Alexander, Catherine Fitch, Ronald Goeken, and Patricia Kelly Hall, Miriam King, and Chad Ronnander. 2010. “Integrated Public Use Microdata Series: Version 3.0.” Machine-readable database. Minneapolis: Minnesota Population Center.
- [37] Sedláček, Petr, and Vincent Sterk. 2017. ”The Growth Potential of Startups over the Business Cycle.” *American Economic Review*, 107 (10): 3182-3210.
- [38] Stewart, Jay. 2007. “Using March CPS data to analyze labor market transitions.” *Journal of Economic and Social Measurement* 32(2-3) : 177-197.

- [39] U.S. Bureau of Labor Statistics. 2019. “The Employment Situation – June 2019.” July 5, 2019.
- [40] U.S. Census Bureau. 2006. “Nonemployer Statistics: 2004.” <https://www.census.gov/prod/2006pubs/ns0400a01.pdf> (accessed: June 27, 2019).
- [41] U.S. Census Bureau. 2019. “Nonemployer Businesses Increased in 2017.” <https://www.census.gov/newsroom/press-releases/2019/nonemployer-businesses.html> (accessed: June 27, 2019).

Tables and Figures

Table 1: Frequency with which Owners Receive Wage & Salary Payments

	Schedule C Sole Proprietors	Form K-1 Partnerships	Form K-1 S Corps.
Share of owners:			
Owners of EIN firms in W-2	7.4%	1.1%	40.4%
Owners of employer firms in W-2	12.5%	11.2%	70.3%
Owners of employer firms, top 3	10.2%	7.9%	60.8%
Share of firms:			
Any owner of EIN firms in W-2	7.5%	3.8%	48.8%
Any owners of employer firms in W-2	13.2%	24.3%	84.8%
Any owners of employer firms, top 3	11.0%	7.9%	78.5%

Notes: Authors calculation of the frequency which businesses owners receive a W-2 record of the wage and salary income from the businesses that they own, as well as the frequency with businesses have at least one owner with a W-2 record. “Top 3” indicates that the owner is among the top 3 highest earners at that employer.

Table 2: Measured decline in reallocation including vs. excluding self-employed: 1994 vs. 2014

Reallocation Measure	Decline in W-2	Decline in W-2 & Schedule SE	Difference	Percent Offset
Hires	15.7	14.4	1.3	8.3%
Separations	16.1	14.7	1.4	8.7%
Emp.-to-Emp.	0.72	0.55	0.17	23.8%
Emp.-to-Nonemp.	1.8	1.7	0.1	4.1%
Nonemp.-to-Emp.	1.3	1.1	0.2	15.6%
2 nd /Short Hires	13.9	12.8	1.1	7.4%
2 nd /Short Seps.	13.8	12.6	1.2	8.9%

Notes: Authors calculations of CPS-DER microdata. See text for additional details.

Table 3: Regression of Number of Jobs Worked on Self-Employment

	Wage and Salary (W-2) Jobs and Business Income Sources				Wage and Salary (W-2) Jobs			
	CPS-DER	Universe	CPS-DER	Universe	CPS-DER	Universe	CPS-DER	Universe
Intercept	1.495*** (0.000)	1.490*** (0.001)			1.495*** (0.000)	1.490*** (0.001)		
Is SE	0.117*** (0.001)	0.567*** (0.001)	0.404*** (0.001)	0.748*** (0.001)	-0.883*** (0.001)	-0.757*** (0.002)	-0.596*** (0.001)	-0.313*** (0.001)
Worker Fixed Effects	N	N	Y	Y	N	N	Y	Y
R ²	0.003	0.026	0.323	0.757	0.148	0.146	0.421	0.618

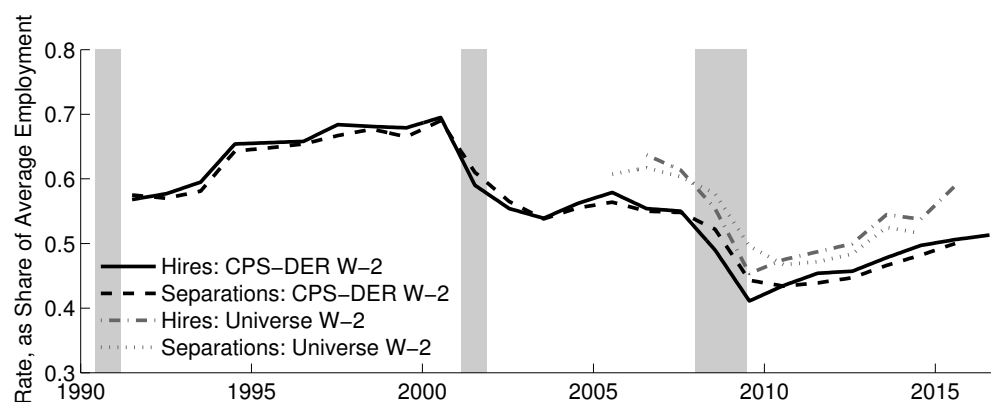
Notes: Authors calculations of the CPS-DER microdata, as well as universe-level wage and salary earnings, and sole proprietor, partnership and S corporation ownership. See text for additional details.

Table 4: Regression of Number of Jobs Worked on Self-Employment, Dominant Earnings

	Wage and Salary (W-2) Jobs and Business Income Sources				Wage and Salary (W-2) Jobs			
	CPS	Universe	CPS	Universe	CPS	Universe	CPS	Universe
Intercept	1.456*** (0.000)	1.409*** (0.000)			1.420*** (0.000)	1.409*** (0.000)		
Ever SE	0.077*** (0.001)	0.081*** (0.001)			0.074*** (0.000)	0.081*** (0.001)		
Ever SE*Is SE	0.829*** (0.001)	1.251*** (0.001)	0.899*** (0.002)	1.805*** (0.002)	-0.143*** (0.001)	-0.088*** (0.001)	-0.101*** (0.001)	0.013*** (0.001)
Ever SE*Is SE*SE dom	-1.002*** (0.001)	-1.080*** (0.001)	-0.818*** (0.002)	-0.841*** (0.002)	-1.002*** (0.001)	-1.010*** (0.002)	-0.818*** (0.001)	-0.817*** (0.001)
Worker Fixed Effects	N	N	Y	Y	N	N	Y	Y
R ²	0.028	0.074	0.351	0.768	0.096	0.151	0.446	0.652

Notes: Authors calculations of the CPS-DER, and sole proprietor, partnership and S corporation ownership. See text for additional details.

Figure 1: Hire and Separation Rates: Wage and Salary (W-2) Employment

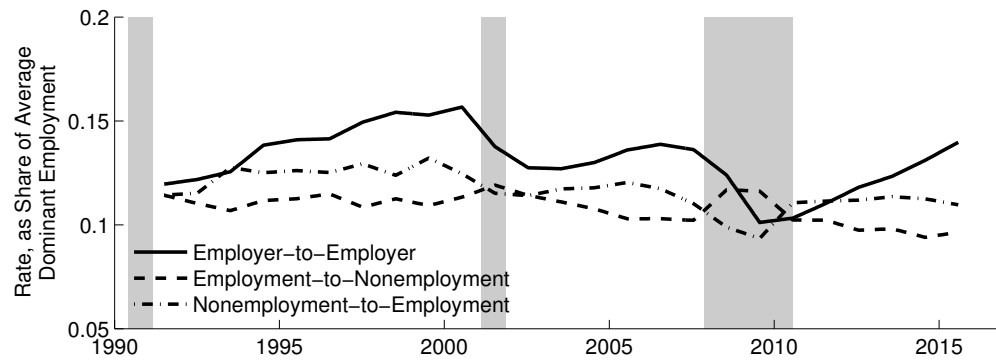


Notes: Authors calculations of hires and separations using CPS ASEC respondents matched with administrative records for wage and salary earnings from W-2 records, as well as universe-level W-2 records. The denominator for all rates is the average of employment at the beginning and end of the year. See text for additional details.

Figure 2: Employer-to-Employer and Nonemployment Transitions:

Wage and Salary (W-2) Employment

(a) CPS-DER W-2

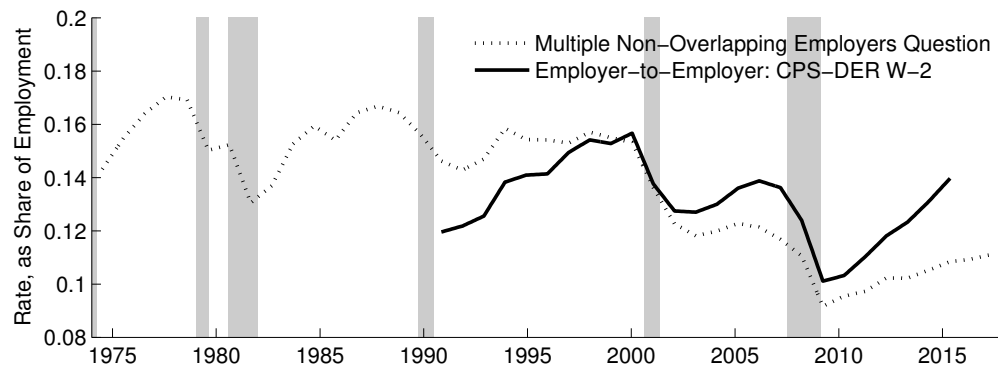


(b) Universe W-2



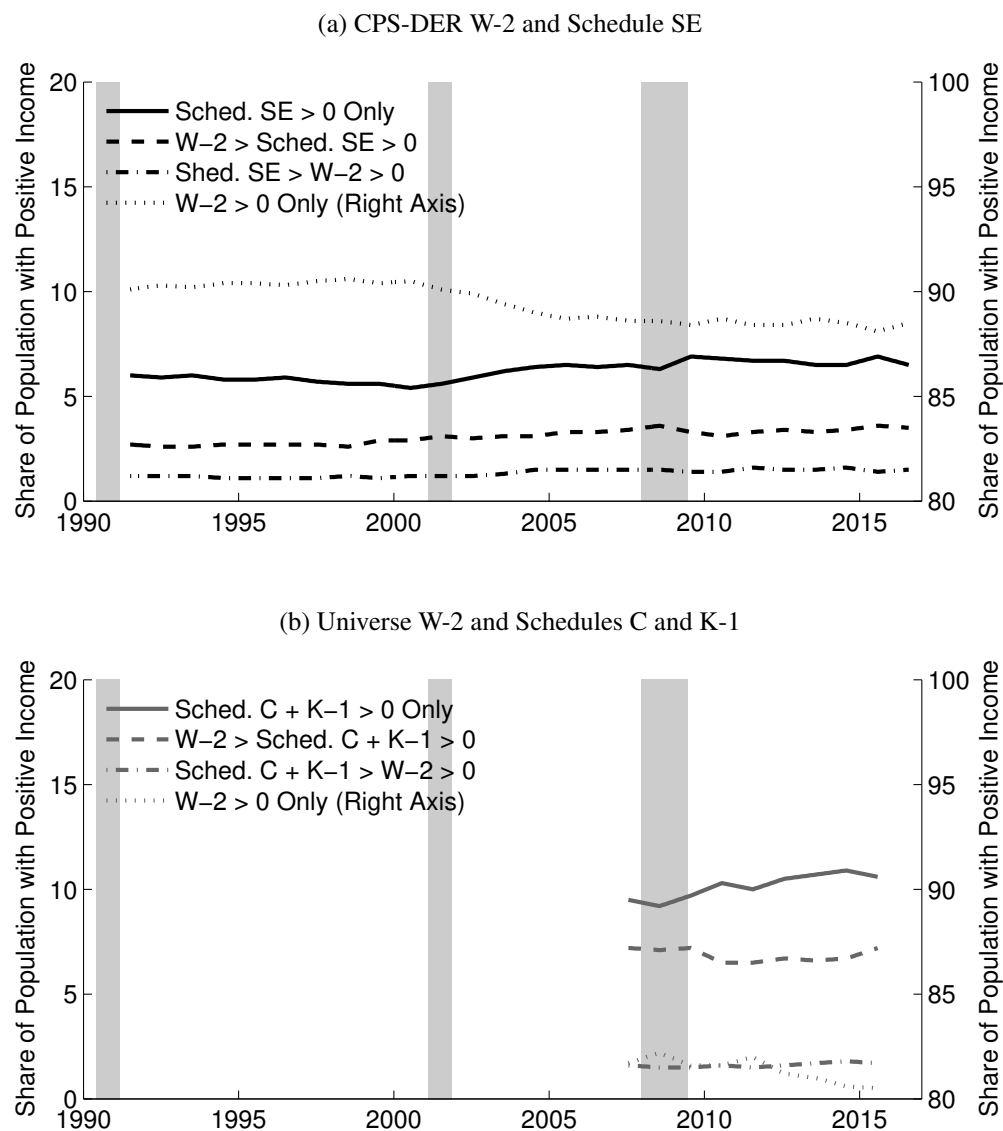
Notes: Authors calculations of employer-to-employer, employment-to-nonemployment, and nonemployment-to-employment transitions using CPS ASEC respondents matched with administrative records for wage and salary earnings from W-2 records, as well as universe-level W-2 records. The denominator for all rates is the average of dominant employment at the beginning and end of the year. See text for additional details.

Figure 3: CPS ASEC: Multiple Non-Overlapping Employers Question vs. Administrative Records



Notes: Authors' calculations of hires and separations using CPS ASEC respondents who report multiple noncoincident jobs in the prior year, as well as CPS ASEC respondents matched with administrative records for wage and salary earnings from W-2 records. For the CPS ASEC responses, the denominator is those who were in scope of the multiple non-overlapping employers question. For the employer-to-employer transition rate derived from administrative records, the denominator is the average of employment at the beginning and end of the year.

Figure 4: Shares of the Population with Income in a Calendar Year, by Income Source



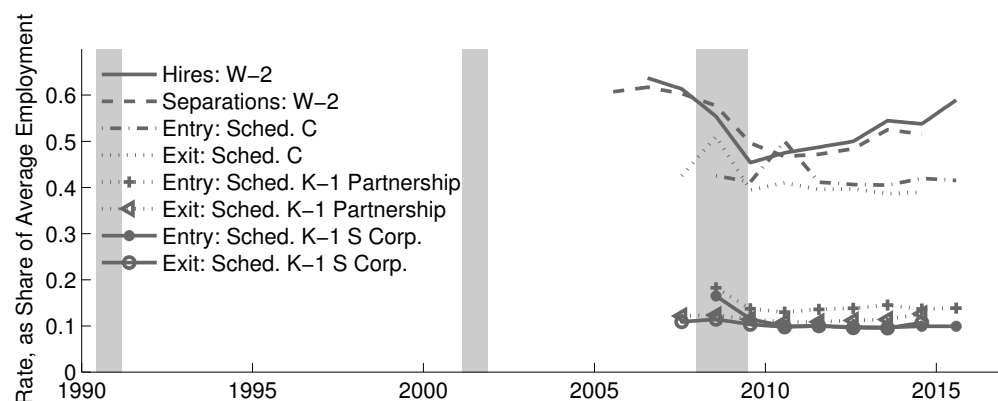
Notes: Authors calculations of the CPS linked with administrative records, as well as universe-level W-2 wage and salary records, and business income information for sole proprietors, partnerships, and S corporations. Schedule C covers sole proprietors, and K-1 covers partnership and S corporations income. Wage and salary income comes from W-2 records. See text for additional details.

Figure 5: Hire and Separation Rates vs. Business Income Entry and Exit Rates

(a) CPS-DER W-2 and Schedule C

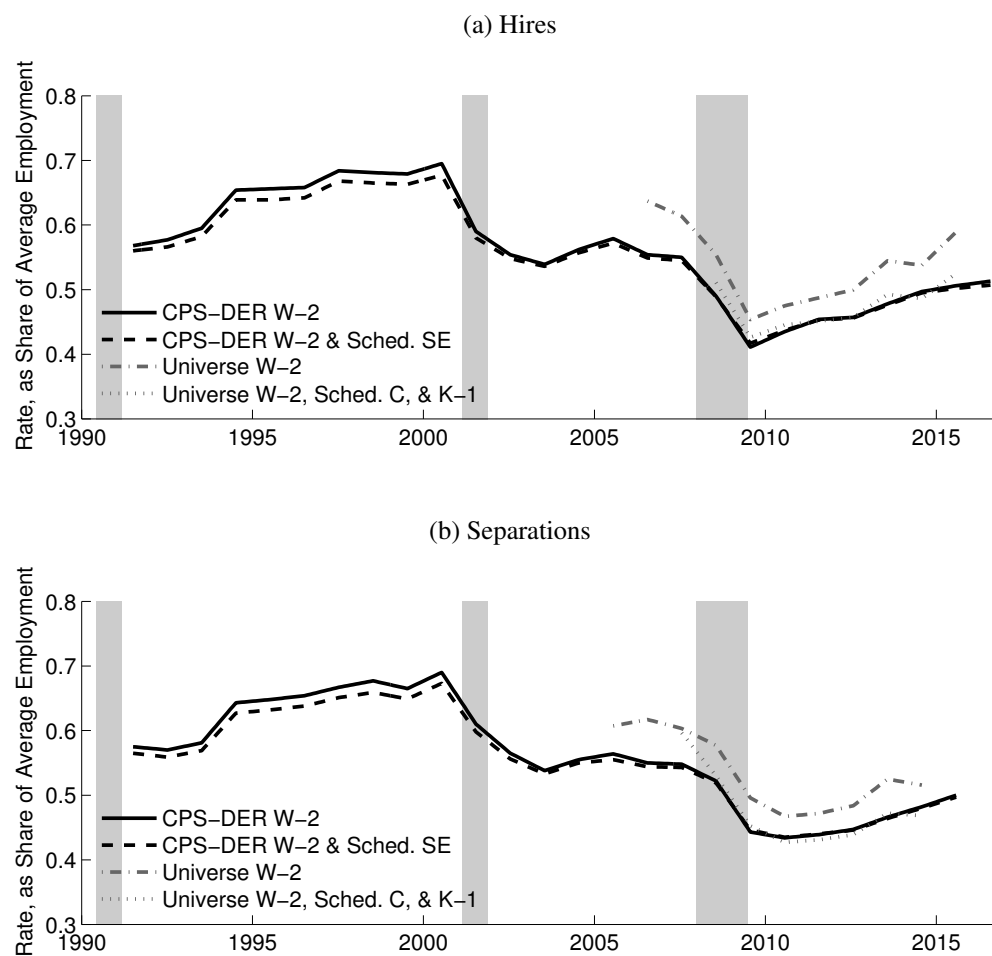


(b) Universe W-2 and Schedules C and K-1



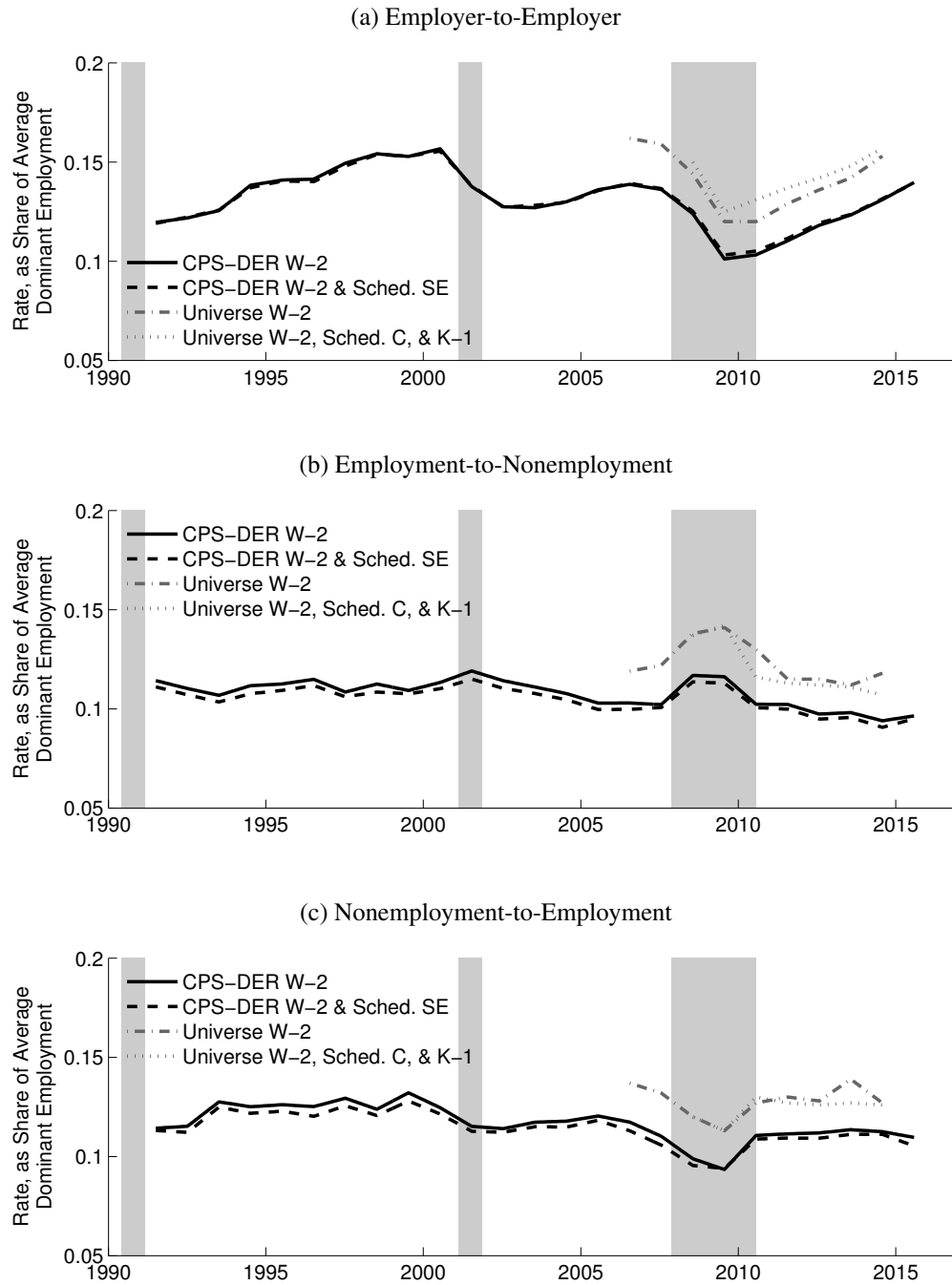
Notes: Authors calculations of business ownership entry and exit using CPS ASEC respondents matched with administrative records reporting positive Schedule SE earnings, as well as universe-level administrative self-employment tax filings with positive earnings from sole proprietor, partnership, or S corporation business entities. Entry includes any business owners who begin receiving earnings from the owned business in the given year. Exits include any business owners where the current year is the last year with earnings from the owned business. Rates in this figure have as denominators the average of total number of owners of the given entity type at the beginning and end of the year.

Figure 6: Hires and Separations: Including and Excluding Business Income Recipients



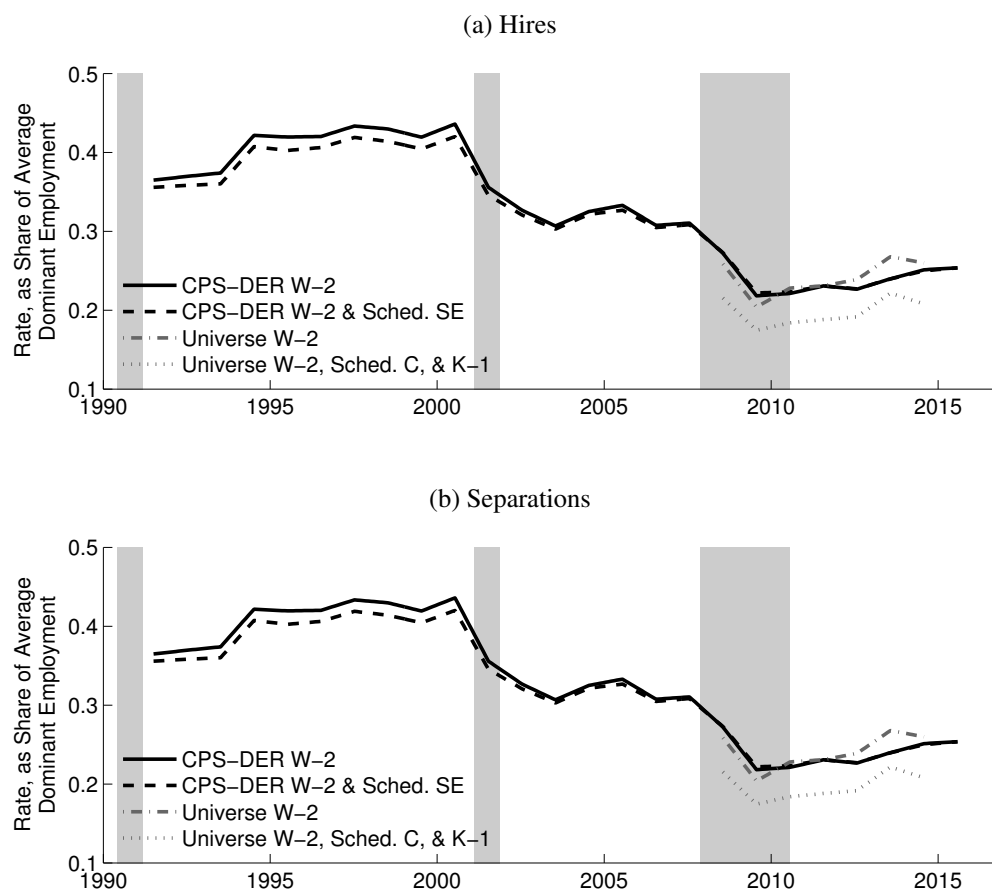
Notes: Authors calculations of administrative records data for the CPS matched with administrative records for wage and salary earnings from W-2 records, along with business ownership information on sole proprietors, partnerships, and S corporations. For business owners, hire rates indicate entry to business ownership, and separation rates indicate exit from business ownership. See text for additional details.

Figure 7: Wage and Salary vs All Employer-to-Employer Transitions



Notes: Authors calculations of administrative records data for the CPS matched with administrative records for wage and salary earnings from W-2 records, along with business ownership information on sole proprietors, partnerships, and S corporations. For business owners, separation rates indicate exit from business ownership. See text for additional details.

Figure 8: Wage and Salary vs All Secondary and Short Duration Job Hires and Separation



Notes: Authors calculations of administrative records data for the CPS matched with administrative records for wage and salary earnings from W-2 records, along with business ownership information on sole proprietors, partnerships, and S corporations. For business owners, hire rates indicate entry into business ownership, and separation rates indicate exit from business ownership. See text for additional details.

Appendices

A Definitions

A.1 Overview and Employment Concepts

This appendix provides definitions of employment concepts used in this paper and follows the notation in Abowd et al. (2009), and note that we are applying to our annual data concepts that were developed for quarterly data. Let w_{ijt} denote earnings for individual i from employer j in year t . If an individual has reported earnings from an employer in a given year and $w_{ijt} > 0$, then we infer the individual worked for the employer and call this employment relationship a job.

To count the set of individuals employed at a given point in time, we consider the subset of jobs that span two consecutive years. Formally, an individual is counted as employed at the beginning of year t if:

$$b_{ijt} = \begin{cases} 1, & \text{if } w_{ijt-1} > 0 \text{ and } w_{ijt} > 0 \\ 0, & \text{otherwise.} \end{cases}$$

Likewise, an individual is employed at the end of the year t if

$$e_{ijt} = \begin{cases} 1, & \text{if } w_{ijt} > 0 \text{ and } w_{ijt+1} > 0 \\ 0, & \text{otherwise.} \end{cases}$$

A.2 Hire and Separation Rates

The average of employment at the beginning and end of the year, i.e. $(b_{ijt} + e_{ijt})/2$, is used as the denominator for our hire and separation rates.

A hire is dated to year t when earnings first appears at that employer. Formally,

$$h_{ijt} = \begin{cases} 1, & \text{if } w_{ijt-1} = 0 \text{ and } w_{ijt} > 0 \\ 0, & \text{otherwise.} \end{cases}$$

Similarly, an individual separates from an employer in year t if it is the last year that an employee is observed at an employer. Formally,

$$s_{ijt} = \begin{cases} 1, & \text{if } w_{ijt+1} = 0 \text{ and } w_{ijt} > 0 \\ 0, & \text{otherwise.} \end{cases}$$

A.3 Employer-to-Employer and Nonemployment Transitions

Employer-to-employer and nonemployment transitions are calculated at the person level following the employment transition concepts developed by Hyatt et al. (2014). We consider the jobs that span two consecutive years. By definition, in such jobs the employee was employed by the employer at the time of the break between the years, and so $b_{ijt} = 1$.

For any two-year pair, we disambiguate the data by considering jobs that are maximal earning among all jobs a worker holds at the beginning of year t . To do so, the job with the greatest (nominal) earnings summed across years $t - 1$ and t is identified, as follows:

$$domb_{ijt} = \begin{cases} 1, & \text{if } b_{ijt} = 1 \text{ and} \\ & w_{ijt} + w_{ijt-1} > w_{ikt} + w_{ikt-1} \forall k \\ & \text{s.t. } b_{ikt} = 1 \text{ and } j \neq k \\ 0, & \text{otherwise.} \end{cases}$$

The set of jobs defined in $domb_{ijt}$ are those we use in all of our empirical analysis. Such jobs are unique at the person-year level. Average employment in the year, $(domb_{ijt} + domb_{ijt+1})/2$, serves as the denominator for employer-to-employer and nonemployment transition rates.

We consider within-year employer-to-employer transitions, as follows,

$$j2j_{ijkt} = \begin{cases} 1, & \text{if } domb_{ijt} = 1 \text{ and } domb_{ikt+1} = 1 \\ & \text{and } j \neq k \\ 0, & \text{otherwise,} \end{cases}$$

Flows into nonemployment in year t are defined as

$$en_{ijt} = \begin{cases} 1, & \text{if } domb_{ijt} = 1 \\ & \text{and } domb_{ilt+1} \neq 1 \forall l \\ 0, & \text{otherwise,} \end{cases}$$

Flows nonemployment into employment in year t are defined as

$$ne_{ikt} = \begin{cases} 1, & \text{if } domb_{ikt+1} = 1 \\ & \text{and } domb_{ilt} \neq 1 \forall l \\ 0, & \text{otherwise.} \end{cases}$$

A.4 Measuring Secondary and Short Duration Jobs

We follow Hyatt and Spletzer (2013) in recovering secondary and short duration jobs from hires, separations, employer-to-employer transitions, as well as transitions into and out of nonemployment. Total hires into secondary and short duration jobs $h2_{ijt}$ are defined as:

$$\sum_{i,j} h_{ijt} = \sum_{i,j,k} j2j_{ijkt} + \sum_{i,k} ne_{ikt} + \sum_{i,j} h2_{ijt}$$

and total separations from secondary and short duration jobs $h2_{ijt}$ can be defined analogously as

$$\sum_{i,j} h_{ijt} = \sum_{i,j,k} j2j_{ijkt} + \sum_{i,j} en_{ijt} + \sum_{i,j} s2_{ijt}.$$

Some additional arithmetic is required to measure the hire and separation rates associated with secondary and short duration jobs because the input measures have slightly different denomina-

tors. The denominator for hires and separations are total jobs, that is, consecutive-year employer-employee combinations. The denominator for employer-to-employer, nonemployment-to-employment, and employment-to-nonemployment is total workers employed in any consecutive-year employer-employee combination. Therefore, we multiply these by the ratio of the denominators to express secondary and short duration hires and separations in terms of total consecutive-year jobs.

B Additional Empirical Evidence

B.1 Benchmarking Exercises

We here describe the results of additional empirical exercises that assess our data sources against each other, as well as additional available data sources.

B.1.1 Counting the Self-Employed and Business Owners

We first assess the extent to which the universe-level administrative records capture a similar universe to the CPS-DER. Population totals for the total number of business income recipients are shown in Figure B.1. We calculate four totals. The first is the total number of CPS-DER Schedule SE filers, after applying weights to recover the population totals. Note that the CPS-DER Schedule SE totals from 1996-2010 are taken from Abraham et al. (2018). The total number of business income recipients in the CPS-DER increases steadily from 13.0 million in 1996 to 18.3 million in 2007, then declines to 17.3 million 2010, just after the 2007-2009 recession. In later years, it increases to 19.6 million in 2014 and dips slightly to 19.4 million in 2015.

The second group in B.1 is the total number of recipients of income from sole proprietor partnership businesses who file a Schedule SE in the universe-level administrative records. This includes a subset of those who report sole proprietor income, as well as those who report income from a partnership. This indicates 16.7 million Schedule SE filers in 2007, declining to 15.1 million in 2009, and then increasing to 18.9 million in 2015. These total Schedule SE files are similar to the DER. The largest difference is about 15% in 2009, other years are different by less than 10%. Overall, the correlation between these two series is 0.78, but the correlation is much higher for 2010-2015, when it is 0.97.

Our third group is the total number of recipients of income from sole proprietor and partnership businesses, which is much larger than those who file a Schedule SE. 29.6 million report such income in 2007, and this declines to 28.3 million in 2009, and then increases to 33.9 million in 2010. Overall, 55% to 57% of those who report income from a sole proprietor or partnership business file a Schedule SE.

Finally, the fourth group in B.1 is the total number of recipients of income from sole proprietor, partnership, and S corporations. Note that this group excludes business owner entities that are EINs

(i.e., excluding businesses that own other businesses). There are 33.3 million business income recipients in our universe-level administrative records in 2007. This declines to 32.1 million in 2009, then increases to 37.6 million in 2015. Comparing the third group to the fourth yields the total number of owners of S corporations, which in any given year ranges from 3.6 to 3.8 million.

B.1.2 Benchmarking Hires, Separations, Employer-to-Employer, and Nonemployment Transitions

We next compare our new hire, separation, employer-to-employer, and nonemployment transitions calculated using the CPS-DER, as well as universe-level, with other available data sources. As the scope of most available data consists of tabulations for employer businesses, we focus on the CPS-DER linked with W-2 records, as well as our universe-level administrative records.

Our additional data sources are as follows. Total JOLTS hires, separations, layoffs, and quits were downloaded from <https://www.bls.gov/jlt/>. The national QWI hires and separations were taken downloaded from <https://ledextract.ces.census.gov/static/data.html>. For additional details on the construction of national QWI hires and separations, see Abowd and Vilhuber (2011). J2J data on employer-to-employer, and nonemployment-to-employment, and employment-to-nonemployment transitions were downloaded from https://lehd.ces.census.gov/data/j2j_beta.html, see Hyatt et al. (2014). We use the J2JHires, NEPersist, and EN Persist for employer-to-employer transitions, nonemployment-to-employment, and employment-to-nonemployment transitions, respectively. We divide each by the average of MainB and MainE, employment at the beginning and end of every quarter.

For transitions from the CPS, we use data from two data sources. The CPS gross flows series, downloaded from <https://www.bls.gov/webapps/legacy/cpsflowstab.htm>, provides information on nonemployment-to-employment and employment-to-nonemployment transitions. Monthly rates of nonemployment-to-employment transitions are calculated in two steps. First, we sum unemployment to employment transitions (LNU07100000), not in the labor force transitions (LNU07200000), and other transitions to employment (LNU07300000). This sum is divided by total employment (LNU02000000). Analogously, we calculate monthly transition rate from employment-to-nonemployment as the sum of employment to unemployment (LNU07400000), employment to not in the labor force (LNU07800000), and other transitions out of employment (LNU08200000),

divided by the same total employment. To measure employer-to-employer transitions, we use the EEhaz series calculated from CPS microdata by Fallick and Fleischman (2004), and downloaded from <https://www.federalreserve.gov/pubs/feds/2004/200434/200434abs.html>. Although data are available starting in 1994, we use these data starting in 1996 because published rates are missing for several months in 1995. Our CPS hire rate is the sum of the EEhaz series and our nonemployment-to-employment series. Our CPS separation rate is the sum of the EEhaz series and our employment-to-nonemployment series.

A challenge in attempting to benchmark our new data from the CPS-DER and universe-level administrative records against other data sources concerns the frequency of the underlying microdata. Our new transition rates are calculated using annual data, and so we calculate the rate of hire, separation, employer-to-employer, and nonemployment transitions on an annual basis. However, the other data sources are calculated at higher frequencies. The JOLTS and CPS are published at a monthly frequency, and the QWI and J2J are calculated at a quarterly frequency. We therefore approximate an annual rate from these data sources by taking the sum of the monthly or quarterly rates within a particular calendar year.

Our benchmarking exercises are affected by measurement issues, and these are somewhat different for hires and separations and the other transition rates. Employer-reported hire and separation rates from the QWI and JOLTS are calculated at a higher frequency than our new annual data, and therefore are more likely to record recalls as distinct separations and hires. In our annual data, if a separation and a recall occur in the same calendar year, we record it as a continuous employment spell because the employee's lapse in employment is not observed. This should occur less frequently in quarterly and monthly data. The employer-to-employer and nonemployment series involve more significant aggregation issues. These involve transitions among dominant employers at particular points in time. In the CPS, such transitions occur between the months in which a person is surveyed. A person has at most one recorded transition, even if they had several transitions within a single month. Similarly, the J2J consider transitions between dominant employers from the beginning of a quarter to its end, and, again, employees can have at most one transition in a quarter. In our new annual series, people have at most one recorded transition in a calendar year. In our new transition rates calculated from W-2 data, workers can have at most one transition between employers, or into or from nonemployment in a calendar year. In the J2J, an individual can have

up to four transitions in a calendar year, and in the CPS an individual can have a transition between any pair of months, and so up to 12 transitions in a calendar year.

The results of our first such exercise are shown in Figure B.2. We include hire and separation rates from the CPS-DER linked with W-2 records, as well as universe-level W-2 records. We compare these with three additional measures of hires and separations from JOLTS, QWI, and CPS. The QWI has the highest hire and separation rates, and the JOLTS has the lowest hire and separation rates. The CPS has the least cyclical transition rates. These findings are consistent with quarterly comparisons by Hyatt and Spletzer (2013).

Panel B.2(a) shows the results for hires, while B.2(b) shows the results for separations. In 1993, our hire (separation) rate from the CPS-DER is 59.5% (58.1%). The QWI has a much higher hire (separation) rate of 102.1% (99%). In other words, total hires and separations in 1993 in the QWI are roughly the same as total employment, while in the W-2 data they are closer to three-fifths of employment. In 1996, our hire (separation) rate using aggregates of monthly CPS data is 80.9% (78.7%), which is between the QWI's rate of 107.4% (102.6%) and the CPS-DER's rate of 65.8% (65.4%). In 2001, the annual hire (separation) rate from the JOLTS is the lowest at 47.2% (48.8%), that of the CPS-DER is higher at 59.0% (61.0%), the aggregates of CPS monthly data yield a yet higher rate of 80.6% (81.7%), and the QWI is again highest at 100.9% (100.7%). All available data show that separations exceed hires in the recession year of 2001.

In 2006, a business cycle peak, we have hire and separation rates from the universe-level W-2 data and therefore every data series. Like the CPS-DER linked with W-2 data, our universe-level tabulations are consistently between the JOLTS and the monthly CPS. In 2006, the lowest hire (separation) rate is in the JOLTS at 47.6% (46.0%), the CPS-DER reports higher number at 55.4% (55.0%), the universe-level W-2 records yield a rate of 63.7% (61.7%), the CPS monthly aggregates imply a rate of 77.9% (75.7%), and the QWI have a rate of 94.2% (90.1%). At the end of the 2007-2009 recession, hires reach a local minimum in 2009 in each series: 35.6% in the JOLTS, 41.1% in the CPS-DER W-2 records, 45.3% in the universe-level W-2 records, 68.0% in the CPS monthly aggregates, and 67.8% in the QWI. Separations reach a local minimum in every series in 2010 except the aggregates of CPS microdata. In 2010, separations are 37.3% in the JOLTS, 43.4% in the CPS-DER W-2 records, 46.7% in the universe-level W-2 records, 68.5% in the QWI, and 69.6% in the aggregates of CPS monthly data. The separation rate in the CPS

monthly data continues to decline until 2013, when it reaches 68.5%.

The last year in which data from all series are available is 2014. In that year, the hire (separation) rate is 42.5% (40.2%) in the JOLTS, 49.7% (48.2%) in the CPS-DER W-2 records, 53.7% (51.5%) in the universe-level W-2 records, 70.5% (68.6%) in the aggregates of CPS monthly data, and 76.9% (72.5%) in the QWI. Most series show a steady increase in the expansion that follows the 2007-2009 recession. The exception is the aggregates of CPS monthly data, which show a hire (separation) rate of 69.2% (67.3%) in 2018.

Despite the level differences, our new hire and separation rates are highly correlated with these other series. The correlation between the hire (separation) rate in the CPS-DER W-2 records and the monthly aggregates from the CPS is 0.93 (0.91), 0.98 (0.98) with the QWI, and 0.97 (0.98) with the JOLTS. The correlation between the hire (separation) rate in the universe-level administrative records is 0.78 (0.81) with the monthly CPS aggregates, 0.93 (0.98) with the QWI, and 0.98 (0.97) with the JOLTS.

We conduct a similar benchmarking exercise for our annual employer-to-employer, employment-to-nonemployment, and nonemployment-to-employment transitions in Figure B.3. The transition rates using CPS-DER W-2 and universe-level W-2 records are consistently the lowest. We also find less agreement on the level of transitions into and from nonemployment than for hires, separations, or employer-to-employer transitions.

Our employer-to-employer transition series are shown in Panel B.3(a). In 1996, the CPS-DER W-2 records show an annual employer-to-employer transition rate of 14.1%, while the sum of the monthly hazard rates from Fallick and Fleishman (2004) is more than twice that, at 31.3%. In 2001, we also compare the CPS-DER W-2 employer-to-employer transition rate with the employer-to-employer rate from J2J, as well as the quit rate from the JOLTS. Note that the JOLTS quit rate is not a direct measure of the employer-to-employer transition rate, but Hyatt et al. (2014) show it has a very high correlation with that of J2J. There is also a conceptual relationship between these measures since employer-to-employer transitions usually involve a quit to take a new job. In 2001, the employer-to-employer transition rate is 13.8% in the CPS-DER W-2 records, 23.6% in J2J, and 29.8% when we aggregate the monthly CPS rates, while the JOLTS quit rates sum to 26.4%. In 2006, we can start to benchmark our rate from universe-level W-2 records. In that year, the employer-to-employer transition rate is 13.9% in the CPS-DER W-2 records, 16.2% in

the universe-level W-2 records, 22.6% in the J2J, and 27.1% when we aggregate the monthly CPS rates, while the JOLTS quit rates sum to 16.4%. The last year for which all rates are available is 2014. In that year, the CPS-DER W-2 records have an employer-to-employer transition rate of 13.1%, while the universe-level W-2 records show 15.3%, the COS monthly rates sum to 19.9%, the J2J rate is 20.4%, and the JOLTS quit rate is 21.9%.

The CPS-DER W-2 and universe-level W-2 employer-to-employer transition rates are highly correlated with these other annual measures. The CPS-DER W-2 rate has a correlation of 0.85 with the monthly CPS rates, 0.98 with J2J, and 0.95 with the JOLTS quit rate. The rate from universe-level W-2 records has a correlation of 0.83 with the monthly CPS rates, 0.99 with J2J, and 0.97 with the JOLTS quit rate.

The employment-to-nonemployment transition rate series, shown in Panel B.3(b) exhibit considerable level differences. The rates from the CPS-DER W-2 and universe-level W-2s is consistently the lowest, and the sum of the monthly transition rates from the CPS Gross Flows is by far the highest. In 1991, the CPS-DER reports an employment-to-nonemployment transition rate of 11.4%. In other words, somewhat more than one tenth of workers employed at the beginning of 1991 were employed at the end of 1991. The monthly transition rates from the CPS Gross Flows sum to 51.7%. These rates can be consistent with each other if many workers who exit employment were not employed at the beginning of the year, or if many who enter nonemployment at some point during the year have a job at the end of the year. The J2J employment-to-nonemployment rate and the JOLTS layoff rate are between the CPS-DER W-2 rates and the sum of the CPS monthly rates, and are available starting in 2001. In that year, the CPS-DER W-2 data have an employment-to-nonemployment transition rate of 11.9%, the J2J rates sum to 24.4%, the CPS monthly rates sum to 51.9%, and the JOLTS monthly layoff rates sum to 18.9%. The JOLTS layoff series is not a direct measure of employment-to-nonemployment transitions, but Hyatt et al. (2014) show that it is highly correlated with the J2J employment-to-nonemployment series. These measures are also conceptually related because spikes in the employment-to-nonemployment rates that occur during recessions are driven by layoffs. The universe-level W-2 records yield an employment-to-nonemployment transition rate starting in 2006. In that year, the CPS-DER W-2 records have a rate of 10.3%, the universe-level administrative records have a rate of 11.9%, the J2J rates sum to 21.7%, the CPS rates sum to 48.6%, and the JOLTS layoffs sum to 16.4%. In 2014, the last year

for which data from all series are available, the CPS-DER has a rate of 9.4%, the universe-level administrative records has a rate of 11.8%, the J2J rates sum to 18.7%, the CPS-DER rates sum to 48.7%, and the JOLTS layoff rates sum to 15.2%.

The correlations between employment-to-nonemployment rates using W-2 records are highly correlated with the analogous rate from J2J: the CPS-DER has a correlation of 0.94 and the universe-level records has a correlation of 0.83. Both are also highly correlated with JOLTS layoff rate: the CPS-DER has a correlation of 0.89, and the universe-level records yield a correlation of 0.88. Correlations with the sum of the monthly employment-to-unemployment transition rates are much weaker: the CPS-DER has a correlation of 0.30, and the universe-level records yield a correlation of 0.72.

The nonemployment-to-employment transition rate series, shown in Panel B.3(c), also exhibit considerable level differences. In 1991, CPS-DER W-2 records have a nonemployment-to-employment rate of 11.4%. In other words, just over one-tenth of workers employed at the end of 1991 were not employed at the beginning of 1991. The sum of the nonemployment-to-employment transitions in the CPS Gross Flows over the course of the year yields a far higher number, 51.7%. In 2001, we have two additional data sources for comparison. The first is the nonemployment-to-employment rate from J2J. The second is the difference between the JOLTS hire rate and the JOLTS quit rate. This difference serves as a proxy for the number of workers who are hired who are not currently employed, as most quits involve a departure from one employer and a new job at another. In 2001, the nonemployment-to-employment transition rate from CPS-DER W-2 records is 11.5%, the J2J rates sum to 23.3%, and the differences between JOLTS hire and quit rates sum to 20.8%, and the rates from the CPS Gross Flows sum to 50.7%. Starting in 2006, there are also transition rates from the universe-level W-2 records. In that year, nonemployment-to-employment transition rate is 11.7% in the CPS-DER W-2 records, 13.7% in the universe-level W-2 records, the J2J rates sum to 23.4%, the CPS Gross Flows sum to 50.8%, and the differences between the JOLTS hire and quit rates sum to 21.3%. In 2014, the last year in which data for all series is available, the rate is 11.25% in the CPS-DER, 12.7% in the universe-level W-2 records, the J2J rates sum to 21.0%, the transitions from the CPS Gross Flows sum to 50.6%, and the differences between the JOLTS hire and quit rates sum to 20.6%.

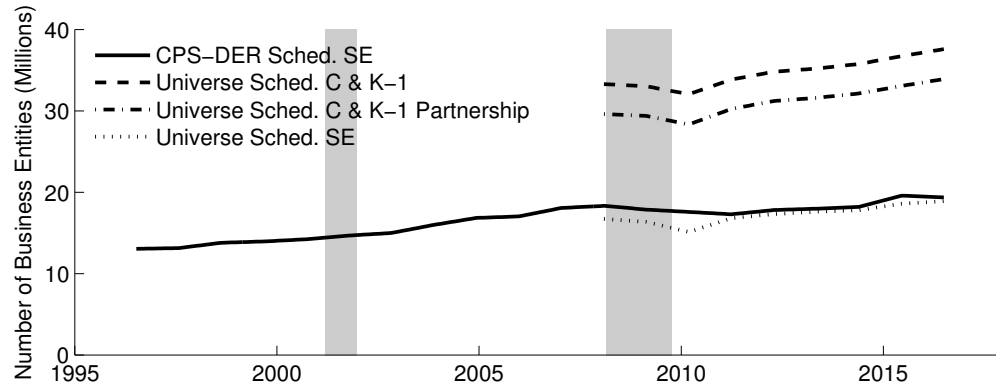
Our new nonemployment-to-employment measures from W-2 have lower correlations with

other available data sources than our other transition rates. The correlation between the CPS-DER W-2 rate and that of J2J is 0.79, while the universe-level W-2 rate has a correlation of 0.74 with J2J. The correlation between the CPS-DER W-2 nonemployment-to-employment transition rate and the difference between the JOLTS hire and quit rates is 0.81, and the universe-level W-2 data has correlation with this JOLTS differential of 0.56. The lowest correlations are with the sum of the monthly nonemployment-to-employment transitions in the CPS Gross Flows, which have a correlation of only 0.14 with the CPS-DER W-2 transitions, and 0.29 with the universe-level W-2 transitions.

B.2 Self-Employed Share of Consecutive Year Employment

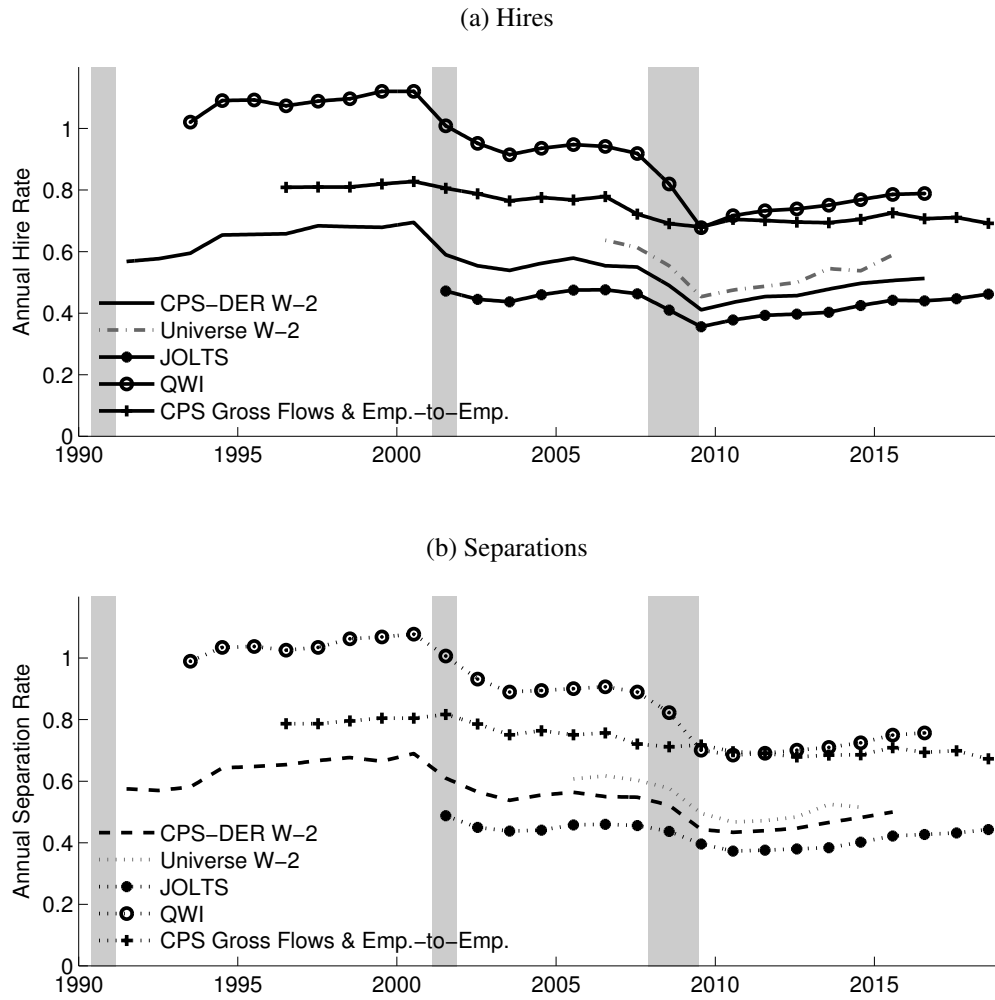
Figure B.4 shows the share of consecutive year employment attributable to Schedule SE filers in the CPS-DER. This is as a share of consecutive year employment, which is the denominator of the transition rates. At the start of 1991, self-employment constituted 7.2% of all employer-employee combinations, and 6.7% of all such that are dominant among a person's employer-employee combinations. Note that this treats Schedule SE income as a distinct employer. The Schedule SE share of employment (dominant employment) declines to 7.1% (6.5%) in 2000, and then surges to 8.1% (7.5%) in 2005. Thereafter, the share of employment accounted for by Schedule SE filers is flat, and in 2016 Schedule SE files are 8.2% of employment and 7.5% of dominant employment.

Figure B.1: Total Number of Administrative Records Self-Employed (Millions)



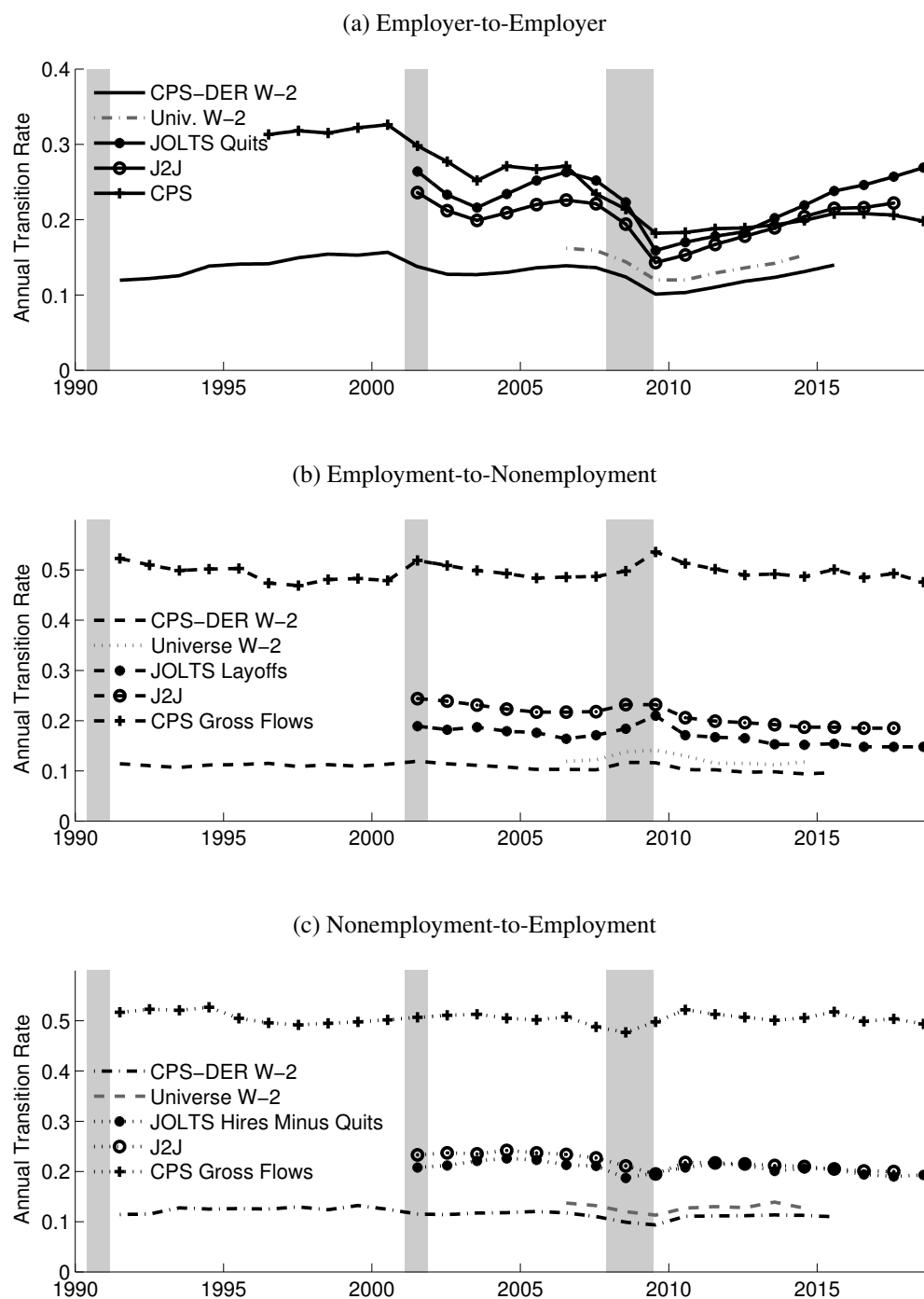
Notes: CPS-DER numbers from 1996-2010 are from Figure 1 of Abraham et al. (2018). Other totals are authors' calculations on U.S. Census Bureau microdata.

Figure B.2: Annual Hire and Separation Rates



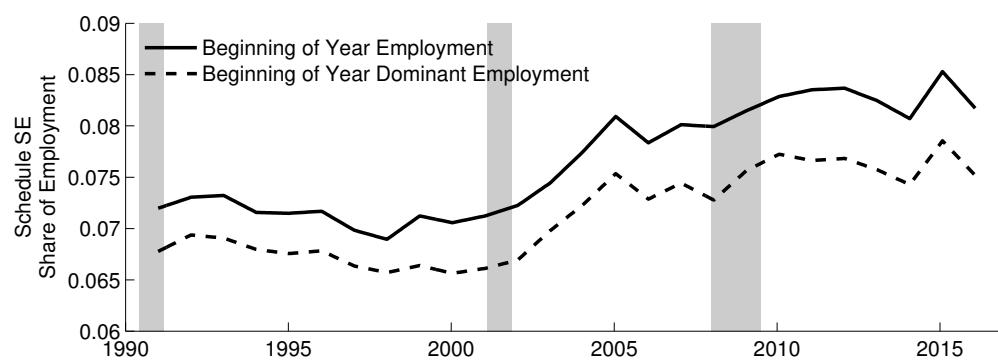
Notes: Authors calculations of hires and separations using CPS ASEC respondents matched with administrative records for wage and salary earnings from W-2 records, as well as universe-level W-2 records. The denominator for the W-2 based rates is the average of employment at the beginning and end of the year. Job Openings and Labor Turnover Survey (JOLTS), Quarterly Workforce Indicators (QWI), and CPS Gross Flows and Employer-to-Employer Transitions series sum rates within a calendar year. See text for additional details.

Figure B.3: Annual Transition Rates



Notes: Authors calculations of employer-to-employer, employment-to-nonemployment, and nonemployment-to-employment transitions using CPS ASEC respondents matched with administrative records for wage and salary earnings from W-2 records, as well as universe-level W-2 records. The denominator for the W-2 based rates is the average of employment at the beginning and end of the year. Job Openings and Labor Turnover Survey (JOLTS), Quarterly Workforce Indicators (QWI), and CPS Gross Flows and Employer-to-Employer Transitions series sum rates within a calendar year. See text for additional details.

Figure B.4: Schedule SE Share of Total Consecutive-Year Employment



Notes: Authors' calculations on U.S. Census Bureau microdata.

B.3 Business Owner Overlap with Wage and Salary Earnings

Table B.1 reports the frequency with which business owners are present in the Longitudinal Employer-Household Dynamics (LEHD) data. The LEHD data are derived from unemployment insurance wage records provided by U.S. states to the U.S. Census Bureau as part of the Local Employment Dynamics federal-state partnership. The results are quite similar to Table 1, suggesting that owner wage and salary receipt is similar in W-2 data, which reflects federal income taxes, and unemployment insurance wage records, which reflect state payroll taxes.

Table B.2 reports the frequency that a business owners are present in matched employer-employee data for a particular subset of firms. Following Kerr, Kerr, and Nanda (2015) and Kerr and Kerr (2016), we include only employer firms in their first year, where the firm had only one establishment in that year. For these employer firms, we identify the top three wage and salary earners at the firm and report the frequency that the business owner is one of these top three earners. Relative to Table 1 and B.1, this sample selection technique results in an increased fraction of business owners in sole proprietor businesses, and a lower share of business owners for S corporations. These results imply that owners are relatively more likely to be employed at older S corporations rather than new S corporations.

Table B.1: Share of owners who receive wage & salary payments (unemployment insurance)

	Schedule C Sole Proprietors	Form K-1 Partnerships	Form K-1 S Corps.
Share of owners:			
Owners of EIN firms in W-2	7.3%	1.1%	39.4%
Owners of employer firms in W-2	12.3%	9.3%	69.0%
Owners of employer firms, top 3	9.8%	6.9%	59.4%
Share of firms:			
Any owner of EIN firms in W-2	7.8%	4.5%	48.6%
Any owners of employer firms in W-2	13.6%	26.5%	83.0%
Any owners of employer firms, top 3	10.8%	22.4%	77.0%

Notes: Authors calculation of the frequency which businesses owners receive a W-2 record of the wage and salary income from the businesses that they own, as well as the frequency with businesses have at least one owner with a W-2 record. “Top 3” indicates that the owner is among the top 3 highest earners at that employer.

Table B.2: Share of owners who receive wage & salary payments: first year, single establishment

	Sole Props.	Partnerships	S Corps.
<i>W-2 Data</i>			
Owners of employer firms in W-2	16.1%	14.3%	61.5%
Owners of employer firms, top 3	13.9%	11.4%	57.1%
Owners of employer firms in W-2	17.0%	26.9%	74.6%
Owners of employer firms, top 3	14.6%	23.5%	71.1%
<i>LEHD Data</i>			
Owners of employer firms in UI	15.5%	13.8%	59.6%
Owners of employer firms, top 3	13.5%	11.3%	55.4%
Owners of employer firms in UI	16.4%	27.2%	72.7%
Owners of employer firms, top 3	14.2%	23.8%	69.3%

Notes: Authors' calculation of the frequency which businesses owners receive a W-2 or LEHD unemployment insurance (UI) payroll record of the wage and salary income from the businesses that they own. Numbers are averages over time of annual averages from 2007-2014 for firms in their first year as employers that consist of a single establishment. "Top 3" indicates that the owner is among the top 3 highest earners at that employer.