Business Income Dynamics and Labor Market Fluidity*

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Abstract

Studies on the 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 construct labor reallocation rates that include business income recipients. In our more inclusive definitions, declines in the annual hire and separation rates from 1994 to 2014 were smaller by 1.3 to 1.4 percentage points (8.3% to 8.7%), mainly among jobs that were secondary sources of income or short in duration. We present evidence that workers' transitions between wage and salary jobs and self-employment largely represent actual labor reallocation (as opposed to reclassification of employees as independent contractors). We also find that secondary business income displaced fewer wage and salary jobs in the 2010s than it did in the 1990s, suggesting that self-employment is an increasingly important part of labor market fluidity.

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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. One common feature of most available data on labor market fluidity is the use of employer-reported wage and salary 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 wage and salary records is that nearly all published series on labor reallocation exclude most of the self-employed and business owners.[2]

In this paper, we use administrative records data for the U.S. to demonstrate that the population of business income recipients matters for labor market fluidity. Among the population that received either wage and salary or business income in recent years, nearly one-in-five received business income. We also find that the share of the population that receives business income in administrative records has risen in recent decades.[3] We document that most business income recipients do not receive wage and salary earnings from their owned business; and thus, most business income recipients are omitted from standard measures of labor reallocation (which focus on wage and salary employees). Given this omission, we use administrative records data to examine the relationship between recent changes in labor reallocation rates and recent increases in the share of the population that receives business income. We show that rates of entry and exit from business income

[1] Recent studies on this topic have drawn from a proliferation of public-use data sources that provide measures of labor market fluidity, including the Business Dynamics Statistics (BDS), the Business Employment Dynamics (BED), the Current Population Survey (CPS), the Job Openings and Labor Turnover Survey (JOLTS), the Quarterly Workforce Indicators (QWI), and Job-to-Job Flows (J2J). See, among many others, Hyatt and Spletzer (2013), Davis and Haltiwanger (2014), Decker et al. (2014a, 2014b), and Molloy et al. (2016).

[2] For our purposes, the most important distinction between the self-employed and business owners is that some business owners do not contribute any labor too the owned business - and thus should be ignored when measuring labor reallocation. Unfortunately, our data only identify individuals receiving business income - which includes both business owners (irrespective of whether they contribute labor to the business) and the self-employed. As a result, we will refer to business owners and the self-employed 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.

[3] This finding is consistent with Abraham et al. (2018), who document a rising prevalence of business income receipt, but 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.

receipt have been relatively constant in recent decades - which is in sharp contrast to the substantial decline in the movement into and out of wage and salary employment. Due to these differing secular trends, including business income recipients in measures of labor market fluidity reduces the measured decline in the annual hire (separation) rate by 8.3% (8.7%) between 1994 and 2014. We find that this dampening effect on the measured decline in labor reallocation is not the result of changes in the degree to which business income receipt substitutes for wage and salary income. We find that business income receipt is associated with nearly a one-for-one drop in the number of wage and salary jobs if the business income is the individual's primary source of income. When the business income is secondary to the individual's wage and salary income, however, the decline in the number of wage and salary jobs held is much smaller (and almost negligible in recent years, which is consistent with the rise of the "gig economy").

Our paper uses two datasets to examine the implications of including business income recipients in measures of labor market reallocation. The first dataset consists of survey records from the Annual Social and Economic Supplement (ASEC) to the Current Population Survey (CPS) linked to both W-2 records on wage and salary earnings, and self-employment income from Schedule SE filings (all sole proprietors and owners of partnerships earning more than $400 in self-employment income are required to file a Schedule SE). This first dataset provides information from 1990 to 2016. The second dataset consists of universe-level income records from the IRS, including W-2 records from 2005 onward, and person-level business income records from 2007 onward for three different legal forms of organization: sole proprietors, partnerships, and S corporations.[4] Our universe-level dataset provides information through 2015.

We begin by using these two datasets to document the rise of self-employment in the U.S. in recent decades. We find that the share of the population receiving business income has risen dramatically in both the CPS-linked and the universe-level datasets. Our finding is consistent with the 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 formation rate of new employer businesses in recent decades. The decline in the employer business entry rate has been

[4]Ownership 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.

small relative to the sustained growth in the number of nonemployer business entities.

We also assess whether business income recipients are counted as employees in administrative wage and salary records. We show that less than one-tenth of the owners of sole proprietors and partnerships received 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 less than half of the owners of S corporations reported W-2 earnings at the firms they own. Because most published series on labor reallocation only consider the employees of businesses, this absence of W-2 earnings for most business owners 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.

Having established both the growing prevalence of business income receipt in the U.S. and that business income recipients are largely omitted from wage and salary records, we then turn to evaluating the implications of these findings for measures of labor market reallocation. Because this is the first time that W-2 wage and salary records have been used to evaluate labor market fluidity, we begin by documenting that the standard measures of labor market reallocation (which exclude business income recipients) have evolved in a similar fashion in our two datasets relative to previous studies that use alternative datasets. We calculate the rates of hires, separations, 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) for employer-employee linked datasets.

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. Using the W-2 records from 1990-2016, we similarly find that hire and separation rates exhibited a substantial long-term decline between 1990 and 2016 (as well significant cyclicality).[5] In contrast, employer-to-employer transitions, as well as transitions into

[5]Here we focus on the trends in the CPS-linked W-2 records which cover the period from 1990-2016. The labor re-

and out of nonemployment exhibited significant cyclical variation but negligible long-term trends.

These differing long-term trends in our measures of labor reallocation serve as evidence that secondary and short-duration jobs have played a critical role in the observed long-run decline in the hire and separation rates - echoing earlier work by Hyatt and Spletzer (2017), Hall and Schulhofer-Wohl (2018), and Pries and Rogerson (2019). A key distinction between these measures is that the hire and separation rates include all jobs, whereas the other labor reallocation measures only capture transitions in a worker's dominant employer between two points in time (e.g. the start and end of the calendar year). Thus, these latter measures ignore changes in either a worker's secondary source of income or any job that starts and ends within a calendar year. The fact that declining labor market fluidity is only observed in the measures that include all jobs, indicates that these long-run declines have been concentrated among jobs that are either secondary sources of income or short in duration.[6]

The next part of our paper assesses the implications of excluding the large and growing share of the U.S. population with business income from labor reallocation rates. We first compute the rates of entry into and exit 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 have been lower than hire and separation rates of employees. This implies that self-employment has been more stable than the typical wage and salary job. Second, entry and exit from business income receipt has been 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 of wage and salary workers. These three facts imply that incorporating business income receipt

allocation patterns are similar for the universe-level W-2 records, but the universe-level W-2 records are only available from 2005-2015.

[6]Further evidence regarding the role of short-duration jobs in the decline in labor reallocation comes from the CPS-ASEC which asks how many non-overlapping employers a respondent has had in the previous year. A number of recent studies by Hyatt (2015), Molloy et al. (2016), Molloy, Smith, and Wozniak (2017), and Hyatt et al. (2018) have used this question to measure the employer-to-employer transition rate and document a long-term decline in the employer-to-employer transition rate. While we find a similar decline in the employer-to-employer transition rate using the survey responses, no such decline is evident when we use the W-2 salary records linked to those same survey respondents to measure transitions between respondents' start-of-year dominant employers. This discrepancy is consistent with the important role of short-duration jobs in declining reallocation rates.

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 inclusion of business income has a substantial impact on hire and separation rates, reducing the measured declines by 1.3 and 1.4 percentage points respectively (accounting for 8.3% and 8.7% of the observed declines measured using only wage and salary earnings). 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).

These sizeable differences in the trends of the hire and separation rates versus other measures of labor reallocation imply that most of the offsetting effect of including business income recipients in hire and separation rates can be attributed to jobs that are secondary sources of income or short in duration. When focusing only on jobs that are secondary or short in duration, inclusion of business income recipients offsets 1.1 and 1.2 percentage points of the measured decline in the incidence of hires and separations, respectively. Given that these secondary and short-duration jobs had the most dramatic measured declines across the various measures of labor reallocation, this finding suggests that the increase in the population receiving business income has played a role in 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.

Given that these short-duration and secondary wage and salary jobs are the types of jobs that one might expect would be shifted to "gig" employment, we assess the extent to which business income receipt reduces the number of wage and salary jobs held by the recipient. We find that the degree to which business income receipt displaces wage and salary jobs depends on whether the business income is the dominant source of income for the individual. When individuals earned more from self-employment than from wage and salary employment, then the business income receipt displaced wage and salary jobs almost one-for-one. If instead the business income was a secondary source of income (as is the case with most "gig" workers), then receiving business income had a much smaller effect on the number of wage and salary jobs - reducing the average number of wage and salary jobs held in a year by only one-tenth of a job. Furthermore, we find that this displacement of wage and salary jobs by secondary business income receipt has weakened

over time.

Finally, we explore the extent to which these trends of fewer secondary wage and salary jobs and growing self-employment simply represent an reclassification of tasks from within a business entity to external self-employed contractors. To do so, we examine the industry composition of individuals' jobs (both self-employment and wage and salary jobs) and how the number of industries adjusts as the individual moves into and out of self-employment. As with the number of wage and salary jobs held, we find that it matters whether the self-employment income is the worker's dominant source of income. If the self-employment income is the secondary source of income, then the average number of industries worked rose by 0.392 when the individual was self-employed. If, instead, the self-employment income was the individual's dominant source of income, then the average number of industries worked rose by 0.508 when the individual was self-employed. These results suggest that business income recipients tend to work in new industries rather than the same industries from which they receive wage and salary payments - implying that the rise in business income receipt has led to true increases in labor reallocation rather than mere reclassification of wage and salary jobs to self-employment. The rising share of the U.S. workforce that receives business income is therefore important for understanding the measured declines in labor reallocation rates considered by Hyatt and Spletzer (2013), Davis and Haltiwanger (2014), and many others.

2 Data

We generate measures of labor market fluidity for both wage and salary jobs and self-employment spells using two administrative datasets. First, 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. Second, to expand the scope and granularity of covered self-employment activity, we perform similar analyses using all W-2 wage and salary job records starting in 2005. Starting in 2007, we link these administrative W-2 records to administrative business income records covering all sole proprietors, partnerships, and S corporations (but excluding C corporations). 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 cor-

porations. 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 distinction 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.[7] Although the DER includes the entire W-2 and Schedule SE history of CPS respondents (back to 1978), we limit our analysis to jobs observed in the DER for the CPS reference year - so as to ensure that the survey-weighted sample is 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

[7]These 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.

responses from 1991 to 2016, linked with administrative records from 1990 through 2016.

2.2 Universe-level W-2, Schedule C, and Schedule K-1 records

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 proprietor 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).[8] 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 entities linked to their owners for years 2007 through 2015.

This dataset offers several advantages over the CPS-DER. First, it is universe-level data rather than a sample of the population. Second, it includes S corporations and distinguishes between sources of business income (by legal entity). 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 proprietor 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, allow us to assess the extent to which business owners receive wage and salary payments.

2.3 Measuring labor market transitions

Using these data, we construct individual-level annual measures of employment, hires, and separations using the concepts developed by Abowd et al. (2009) for quarterly data, and implement them on our annual data (see Appendix A for formal definitions). If an individual has no earnings

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

from an employer in one year but positive earnings in the next, we infer a hire in the second year. Similarly, if an individual has positive earnings from an employer in one year, but has no earnings from the employer in the next, we infer a separation in the first year.

Following Hyatt et al. (2014), we also construct annual measures of an individual's transitions into and out of employment, as well as a worker's transitions between dominant employers from one year to the next. We identify the worker's dominant employer at the start of a given year as the employer that: (1) paid the worker positive earnings in both the current and previous year (indicating that the worker was employed at the start of the current year), and (2) paid the highest cumulative earnings, over those two years, among the set of firms that employed the worker at the start of the current year. If an individual's dominant start-of-year employer changes from one year to the next, then 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.

3 Self-employment and business ownership

We document three facts regarding self-employment and business ownership in the United States. First, nearly one-in-five income recipients in the U.S. received business income in 2014. Second, the share of workers receiving business income grew by 15% between 1991 and 2016. And third, the overwhelming majority of these business income recipients did not receive wage and salary income from their owned businesses - and thus their labor activities for their owned businesses are largely absent from standard labor reallocation measures that focus on wage and salary workers.

3.1 Prevalence of business income receipt in the U.S.

To measure the prevalence of business income receipt, we categorize workers into one of four types of employment based on their receipt of wage and salary income and/or business income in a given year. Our first category of income recipients consists of workers who only have wage and salary income. Our second category consists of individuals who only receive business income. Our third and fourth categories consist of those individuals who receive both business income and wage and

salary income - with the two categories being distinguished by whether the business income is greater or less than the wage and salary income. Our calculations exclude the nonemployed, so these four shares sum to 100% in each year and are exhaustive of the population with positive wage and salary or business income.

As shown in Figure 1(b), according to the universe-level W-2 and business income records, 19.6% of income recipients received some business income in 2014. Furthermore, business income was the dominant source of income for 12.7% of income recipients in 2014 (and the sole source of income for 10.9% of income recipients). When considering the CPS-DER records in 2014 (see Panel (a), a smaller share of income recipients had business income (11.5%). 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 sample only includes business owners who file a Schedule SE; thus excluding owners of S corporations as well as sole proprietors and owners of partnerships who earn less than $400 from the business.

Figure 1 also shows that when an individual received any business income, it is most likely that this was the individual's sole source of income. If, however, the individual received both wage and salary income and business income, then the wage and salary income tended to be the individual's primary source of income.

3.2 Shifts in the composition of income receipt

We use the same four income-recipient categories to measure the trends in business income receipt over time. Figure 1(a) shows that the share of individuals receiving any business income in the CPS-DER records rose 15% between 1991 and 2016 (as the share with only wage and salary income fell from 90.1% in 1991 to 88.5% in 2016, corresponding to a rise in the share with any business income from 9.9% in 1991 to 11.5% in 2016).

Figure 1 also displays the trends in the three income-recipient categories that include some business income. Panel (a) shows that the share of individuals in the CPS-DER sample with only business income grew from 6.0% of all income recipients in 1991 to 6.5% in 2016. The next-largest category receiving some business income, and the category with the largest percentage point growth, consisted of those income recipients with more income from wage and salary employment

than from business ownership. In the CPS-DER, the share of these individuals with secondary business ownership income increased from 2.7% in 1991 to 3.5% in 2016. The smallest category consists of those individuals with more business income than wage and salary income. In the CPS-DER, the share of the population with secondary wage and salary income grew from 1.1% in 1991 to 1.5% in 2016.[9]

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.[10] This finding has important implications for studies that emphasize the decline in the employer business entry rate - which almost exclusively rely on data from the BDS (e.g. Decker et al. (2014b), Sedláček and Sterk (2017), and Pugsley and Şahin (2018)). Data from the U.S. Census Bureau (2006, 2019) indicates that the total number of nonemployer business entities increased from 19.5 million in 2004 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 total employment and business dynamism in the U.S. needs to consider both employer and nonemployer businesses.

The cyclical features of Figure 1 are modest but important to note. The periods of most rapid growth in self-employment were around recessions. The periods with the slowest growth in self-employment were late into the expansions that preceded the 2001 and 2007-2009 recessions. This evidence indicates that business income receipt is less cyclical than wage and salary employment.

[9] As shown in Panel 1(b), the administrative records data indicate that the share of individuals with only wage and salary income declined from 81.3% in 2007 to 80.4% in 2014. The ordinal ranking of the shares of business income categories was similar in both the CPS-DER sample and the universe-level sample. In the universe-level administrative records data, 9.5% of income recipients had only business income in 2007, while 10.9% did in 2014. The share of income recipients receiving more wage and salary income than business income declined slightly between 2007 to 2014 (falling from 7.2% in 2007 to 6.7% in 2014). Lastly, in the universe-level administrative records data, the share of income recipients with business income and secondary wage and salary income grew from 1.6% in 2007 to 1.8% in 2014.

[10] To 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 increased from 13.0 million in 1996 to 19.4 million in 2016. In the universe-level administrative records data, it increased from 16.7 million in 2008 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.

This differential cyclicality of wage and salary versus business income is more apparent in the transition rates we analyze in Section 5.

3.3 Do business owners receive wage and salary payments?

In order for the sizable and growing share of the population receiving business income to affect the measured trends in labor market reallocation, it is necessary that most business income recipients do not appear as wage and salary employees at their owned businesses. In this section, we examine how often business owners receive wage and salary payments from the businesses they own. To do so, we merge our universe-level business ownership data with the W-2 wage and salary records based on the EIN of the employer and the PIK of the owner. A match on EIN and PIK indicates that, in addition to the business income, the owner also receives wage and salary payments from the owned business.

As shown in Table 1, it is rare that business owners receive wage and salary income from their owned businesses.[11] Only 7.4% of sole proprietors and 1.1% of the owners of partnerships received wage and salary income from their businesses. The owners of S corporations were more frequently employees of the businesses that they own, with 40.4% of the owners of S corporations receiving wage and salary income from their owned business. These results indicate that most business owners are not present in employer-reported wage and salary records - and thus business income recipients are generally omitted from labor reallocation statistics.

These results also have implications for the literature that attempts to identify business founders, owners, and entrepreneurs using matched employer-employee wage and salary records (e.g. Kerr, Kerr, and Nanda (2015), Agarwal et al. (2016), and Kerr and Kerr (2016)). This literature labels an individual as a business founder if the individual was one of the three highest earning employees in the first year that the business had employees. The popularity of this approach is somewhat surprising given that the Internal Revenue Service (2017, 2019a) discourages and in many cases prohibits sole proprietors and the owners of partnerships from paying themselves a salary.[12] Given this legal prohibition, this method is unlikely to successfully identify the owners of sole proprietor

[11] The sole proprietor businesses that do not have EINs (which are a majority of sole proprietors) are beyond the scope of Table 1.

[12] The Tax Cuts and Jobs Act of 2017 changed the tax treatment of sole proprietor businesses. As a result, since 2018 sole proprietors have been able to deduct some wage and salary payments to owners.

and partnership businesses. Conversely, owners of S corporations are legally required to receive wage and salary payments if they provide labor services to their firms.[13]

We assess the accuracy of this methodology that labels high earning employees as business founders in two ways. First, we measure the frequency with which owners of employer businesses receive wage and salary income from their owned business (and thus appear as employees in matched employer-employee linked datasets). The second row in Table 1 shows that about three-tenths of the owners of employer S corporations and almost nine-tenths of the owners of employer sole proprietors and partnerships do not appear in the wage and salary records of their own businesses. Furthermore, the fifth row of the table shows that none of the owners of an employer business receive wage and salary income from the owned business at 86.8% of employer sole proprietors, 75.7% of employer partnerships, and 15.2% of employer S corporations.

Second, we measure the accuracy of the the entrepreneur identification strategy of Kerr, Kerr, and Nanda (2015) and Kerr and Kerr (2016) by focusing on the top three earners at employer businesses.[14] The third row of Table 1 indicates that the likelihood that a given owner was among the top three wage and salary earners at an employer business was 10.3% for sole proprietors, 7.9% for partnerships, and 59.7% for S corporations.[15] Relatedly, the sixth row of the table shows that none of the top three wage and salary earners was an owner at 89.0% of employer sole proprietors, 79.8% of employer partnerships, and 21.5% of employer S corporations.

These results suggest that researchers should not assume that the owner of a particular business is present in U.S. 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 no owner is present.[16] For S corporations, the top three earners of an S corporation include at least

[13] 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.

[14] In 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 Table 1. In Appendix Table B.2, we incorporate commonly used sample selection techniques: including only businesses that start as single establishment firms, and requiring that owners receive wage and salary payments in the year the business hires its first employee. Results are broadly similar for sole proprietor and partnership businesses. For S corporations, these sample selection techniques result in a lower share of owners.

[15] Azoulay et al. (2018) report that 90% of S corporation owners who are also employees of their firms are among the top three highest earning employees. Table 1 implies something comparable: $59.7\%/70.3\% = 84.9\%$.

[16] While most studies that identify business founders or entrepreneurs implement their method without distinguish-

one owner nearly four-out-of-five times, but most of the top three wage and salary earners at S corporations are not owners. Thus, even for S corporations these approaches yield at best a proxy for ownership.

4 Reallocation rates for wage and salary employment

Because this is the first time that W-2 wage and salary records have been used to evaluate labor market fluidity, this section documents the evolution of standard labor market reallocation measures computed using W-2 records. We find dramatic differences in the long-term trends of the various labor reallocation measures depending on whether the measure focuses on all jobs or on just workers' dominant jobs. According to the W-2 wage and salary records, the hire and separation rates, which include all jobs, fell between 1994 and 2014 by 15.7 and 16.1 percentage points, respectively (with the declines concentrated around the 2001 and the 2008-2009 recessions). The employer-to-employer, nonemployment-to-employment, and employment-to-nonemployment transition rates also exhibited significant cyclicality, but almost no long-term decline (falling only 0.7, 1.3, and 1.8 percentage points, respectively, between 1994 and 2014). We document that the significant differences in the long-term trends of these various measures is due to the inclusion of short-duration and secondary jobs in the calculation of the hire and separation rates.

4.1 Worker reallocation rates in W-2 wage and salary records

Figure 2 shows that the hire and separation rates of CPS-linked W-2 wage and salary jobs followed the familiar "stair-step" pattern noted by Hyatt and Spletzer (2013): after rising steadily during the 1990s, these rates fell sharply around the 2001 recession, stabilized briefly in the mid-2000s before falling again during the 2007-2009 recession.[17] At the end of our time series, hire and

ing between these different legal forms of organization, recent exceptions include Choi (2017) and Azoulay et al. (2018).

[17]The hire and separation rates that we report in Figure 2 range from 41% to 69%. These hire and separation rates are much higher than most published series because our series are calculated on an annual basis, whereas 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. The hire and separation rates calculated from universe-level W-2 data also evidence a sharp cyclical decline during the 2007-2009 recession. The W-2 based hire and separation from the universe-level files are

separation rates still had yet to recover to the levels observed during the 1990s. In 2015, the hire (separation) rate remained 13.9 (13.7) percentage points below the average hire (separation) rate from 1991-2000 of 64.5% (63.7%).

The evolution of the employer-to-employer, nonemployment-to-employment, and employment-to-nonemployment transition rates for our two data sources are shown in Figure 3.[18] Results for the CPS-DER, shown in Figure 3(a), indicate that the employer-to-employer transition rate exhibited substantial cyclical declines around the 2001 and 2007-2009 recessions. It had recovered to 14.0% by 2015 - matching the average employer-to-employer transition rate between 1991-2000. The transition rates into and out of nonemployment also evolved cyclically. During expansions, the rate of nonemployment-to-employment transitions exceeded that of employment-to-nonemployment transitions, and so employment increased. During recessions, this patterns reversed as the employment-to-nonemployment transition rate surged. By 2015, both the employment-to-nonemployment and the nonemployment-to-employment transition rates were 1.5 percentage points below their 1991-2000 averages of 11.1% and 12.4% respectively.[19]

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. In particular, 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.

[18] In Appendix Figure B.3, we compare the these transition rates 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.

[19] Figure 3(b) shows that the transition rates in the universe-level W-2 data were somewhat higher than for the CPS-linked W-2 data. Transition rates evolved similarly in the shorter time series of universe-level W-2 data, shown in Figure 3(b). In 2006, the employer-to-employer transition rate calculated from universe-level administrative records was 16.2%. The rate then fell to 12.0% in 2009, and recovered to 15.3% in 2014. In 2006, transitions out of nonemployment were 13.7% of average W-2 employment, while transitions into nonemployment were 11.9%. In the 2007-2009 recession, these rates reversed, as the employment-to-nonemployment transition rate reached 14.1% in 2009, when the nonemployment-to-employment transition rate was only 11.3%. In the years that followed, the nonemployment-to-employment rate recovered, and was 12.7% in 2014, when the employment-to-nonemployment rate was 11.8%. For example the employer-to-employer transition rate calculated from universe-level administrative records was 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.

4.2 Declining prevalence of secondary and short-duration jobs

The disparity between the large secular decline in hire and separation rates versus the order of magnitude smaller decline in the dominant employer-based measures of worker reallocation (employer-to-employer, nonemployment-to-employment, and employment-to-nonemployment transitions) indicates that the decline in labor reallocation rates has concentrated among jobs that provided secondary income or were short in duration. The hire and separation rates capture transitions into and out of all wage and salary jobs. The dominant employer-based measures of worker reallocation, on the other hand, capture only transitions to or from an individual's dominant employer as of the start of the year. Thus, these dominant employer-based measures of worker reallocation omit both: (1) coincident, but lower earning jobs ("secondary jobs"), and (2) jobs that start and end within the same calendar year ("short-duration jobs"). As formalized by Hyatt and Spletzer (2013), the residual between the hire and separation rates and these dominant employer-based measures are precisely these secondary and short-duration jobs.

As further evidence regarding the importance of declining short-duration jobs in explaining the differing long-term labor reallocation trends, we compare two alternative measures of the employer-to-employer transition rate: one, computed from the CPS-linked W-2 records, and the other derived from these same survey respondents' answers to the multiple non-overlapping employer question in 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." Previous studies have aggregated the survey responses to this question to understand the long-run trends and cyclical dynamics of the employer-to-employer transition rate (see Farber (1999), Stewart (2007), Hyatt (2015), Molloy et al. (2016), and Molloy, Smith, and Wozniak (2017), and Hyatt et al. (2018)).

These two alternative measures of the employer-to-employer transition rate exhibit striking differences over the period from 1990 to 2015. Figure 4 shows that the employer-to-employer transition rate calculated from CPS-linked W-2 records increased during the expansion between the 1990-1991 and 2001 recessions, whereas the rate calculated from survey responses was relatively stable.[20] Furthermore, the precipitous decline in employer-to-employer transitions among CPS ASEC survey respondents that starts in 2001 is less severe and more cyclical in the W-2 records

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

matched to these same survey respondents. Lastly, only the employer-to-employer transition rate calculated using the CPS ASEC responses remains depressed relative to its 1991-2000 average.

The differing long-term trends of these two measures of the employer-to-employer transition rate provide further evidence of the importance of declines in short-duration jobs. The employer-to-employer transition rate derived from CPS-linked W-2 data only identifies transitions where the start-of-year dominant employer of an individual changed from one year to the next. The CPS ASEC provides a more expansive measure of employer-to-employer transitions since it includes job transitions where one or more of the jobs starts and stops within the calendar year (both measures ignore multiple simultaneous jobs). Thus, the fact that only the employer-to-employer transition rate measured using the CPS ASEC responses exhibits a long-term decline is indicative that this decline is driven by a decline in short-duration jobs.[21]

Hyatt and Spletzer (2013) and Pries and Rogerson (2019) previously showed the importance of short-duration jobs for labor market fluidity using the Quarterly Workforce Indicators. Hyatt and Spletzer (2017) explored this further using the Longitudinal Employer-Household Dynamics microdata which underlie those measures. Hall and Schulhofer-Wohl (2018) made a similar argument using data from the Current Population Survey. Our analysis of W-2 data reinforces these findings regarding the central importance of the decline in short-duration jobs for understanding the trend decline in labor market fluidity.

5 Incorporating business owners into labor reallocation

In order to assess the implications of excluding business income recipients from measures of labor market fluidity, this section compares the standard measures of labor reallocation described in Section 4 to those same measures but with receipt of business income treated as though it were a wage and salary job. To the extent that business income receipt captures labor conducted by

[21] An alternative explanation for this discrepancy is survey effects, which is consistent with the unusual properties that the CPS ASEC series displays during the 1990s, as well as its feature that measured reallocation rates declined more in the 2001 recession than the much more severe 2007-2009 recession. Kaplan and Schulhofer-Wohl (2012) attribute 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.

the recipient on behalf of the owned business, this allows us to measure the effect of using more inclusive definitions of labor reallocation.[22]

5.1 Entry and exit from business income receipt

Figure 5(a) uses the CPS-linked income records to show three facts which indicate that incorporating business income receipt into our measures of hire and separation rates should result in series that are lower in magnitude, exhibit less cyclicality, and have less of a trend decline. First, prior to the 2007-2009 recession, the wage and salary hire and separation rates were consistently higher than business income entry and exit rates - with this difference peaking at 24.8 percentage points immediately prior to the 2001 recession. Second, business income entry and exit rates were less cyclical than wage and salary hire and separation rates.[23] And third, business income entry and exit rates did not show evidence of trend declines - with the entry rate virtually unchanged from 45.9% in 1991 to 44.6% in 2016, and the exit rate growing slightly from 42.9% in 1990 to 46.7% in 2015.

Using the universe-level business income records, we find that the rate of business income entry and exit differed substantially by legal form of organization, but the acyclicality of entry and exit was common to all legal forms of organization. Figure 5(b) shows that sole proprietor businesses had entry and exit rates between 38% and 52%, whereas the business income entry and exit rates for partnerships and S corporations were two to four times lower (ranging from 9% to 19%).[24] These findings indicate that using the universe-level records to identify business income receipt should further dampen the magnitude and cyclicality of the more expansive measures of the hire

[22]This is the antecedent upon which the interpretation of our exercise depends. If many business income recipients are performing labor, such as gig workers, then it makes sense to include them in a labor reallocation measure. If they rather take no active role in the business other than providing investment or capital, then it makes less sense to include them. It is likely that the income of sole proprietors is more indicative of labor than that of the owners of partnerships or S corporations.

[23]The business income entry rates increased around the 2001 recession, from 44.7% to 47.0%, while the exit rate was flat. In contrast, from 2000 to 2002, the wage and salary hire rate declined from 69.5% to 55.4% and the separation rate declined from 69.0% to 56.5%. Business income entry and exit responded in a similarly mild fashion to the 2007-2009 recession. The business income entry and exit rates fell from 2006 to 2010 by 5.0 and 2.7 percentage points respectively, whereas the hire and separation rates fell by 11.9 and 11.6 percentage points over the same period.

[24]Goetz et al. (2017) present the results of an early version of such an estimation strategy. The entry and exit rates for business income for sole proprietors are broadly consistent with, but somewhat lower than, the entry and exit rates calculated for Schedule SE filers from the CPS-linked sample. Only sole proprietors earning more than $400 from the business are required to file a Schedule SE.

and separation rates since S corporation business owners, who have the lowest entry and exit rates, are omitted from the CPS-linked business income records.

5.2 Hire and separation rates

We now include business income recipients when we calculate hire and separation rates. For comparison, we also show hire and separation rates using W-2 data alone. Figure 6(a) shows results using the CPS-DER. Because was business income recipients constituted only 6% to 9% of consecutive year employment in the CPS-linked records, the more inclusive hire and separation series mimic those created using only W-2 records of wage and salary income.[25]

Because business income entry and exit rates were lower than wage and salary hire and separation rates up until the 2007-2009 recession, the combined hire and separation rates tended to be lower than the W-2 hire and separation rates. The differences between the combined versus the W-2 only hire and separation rates were largest in the 1990s, peaking in 2000 at 1.8 percentage points. As the wage and salary hire and separation rates fell during and failed to recover after the 2001 and the 2007-2009 recessions, the relative acyclicality of the business income entry and exit rates caused the gap between the combined and W-2 only hire and separation rates to shrink - such that from 2008 onward the difference never exceeded 0.6 percentage points.[26]

Including business income receipt in the calculation of hire and separation rates also dampens the measured decline from 1990 to 2016, since the large gap observed in the 1990s between the business income entry and exit rates versus the W-2 hire and separation rates had largely disappeared by 2009. This dampening effect was largest for the separation rate - with the separation rate calculated using both business income and wage and salary income falling 1.2 percentage points less from 1990 to 2015 relative to the separation rate calculated using only wage and salary records (the combined separation rate fell 13.0 percentage points, whereas the wage and salary separation

[25] For 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.

[26] At the start of the time series in 1991, the hire rate was 56.8% using W-2 records alone, and 56.0% when business income recipients were included. This difference reached 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 was 1 percentage point or less, and for 2008 onward these were 0.6 percentage points or less, and hire and separation rates using W-2 data alone were 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 were approximately equal to the business income entry and exit rates.

rate fell 14.2 percentage points over this period). The combined hire rate, on the other hand, fell by 5.3 percentage points from 1991 to 2016, which was 0.2 percentage points less than the 5.5 percentage point decline in the hire rate measured using only wage and salary income.

The universe-level dataset shows that including business income entrants and exits in hire and separation rates results in both a more substantial lowering of the hire and separation rates and smaller cyclical fluctuations in these labor reallocation measures. Hire rates were 2.7 to 6.5 percentage points lower, and separation rates 0.5 to 5.3 percentage points lower, when including business income recipients from the universe-level records.

Given the universe-level business income records start in 2007, we can compare these labor reallocation series in 2008 and 2010 in order to assess how sourcing the business income records from the universe-level dataset (which include a broader set of business income recipients) affects the measured cyclical declines in hires and separations. For both hires and separations, using the universe-level records accentuates the cyclical dampening effect of including business income recipients in these measures of labor reallocation. According to the universe-level records, including business income entrants results in a 17% smaller decline in the hire rate from 2008 to 2010, whereas the CPS-linked records indicate that including business income recipients only dampens the fall in the hire rate by 5.5%.[27] The difference between the universe-level and CPS-linked business income records in their cyclical dampening effect is much smaller for the separation rate. Including universe-level business income exits in the separation rate results in a 6.5% smaller cyclical decline in separations from 2008 to 2010 relative to the separation rate measured using only wage and salary records. Using the CPS-linked business income exits generates a 4.5% smaller decline in the combined separation rate from 2008 to 2010 relative to the wage and salary separation rate.[28]

[27]The hire rate declined from 2008 to 2010 by 7.9 percentage points using universe-level W-2 income alone (from 55.4% to 47.5%), and by 6.6 percentage points when including universe-level business income recipients (from 51.1% to 44.5%. The CPS-linked income records indicate that the hire rate calculated using only W-2 income declined by 5.5 percentage points from 2008 to 2010, whereas the combined hire rate fell by 5.2 percentage points.

[28]The separation rate declined from 2008 to 2010 by 11.0 percentage points using universe-level W-2 income alone (from 57.7% to 46.7%), and by 10.3 percentage points when including universe-level business income recipients (from 53.0% to 42.7%. The CPS-linked income records indicate that the separation rate calculated using only W-2 income declined by 8.8 percentage points from 2008 to 2010, whereas the combined separation rate fell by 8.4 percentage points.

5.3 Employer-to-employer and nonemployment transitions

In Figure 7, we consider how including business income can affect the employer-to-employer transition rate, as well as the rate at which workers transition into and out of nonemployment. We find that including business income has little effect on these reallocation rates.

The employer-to-employer transition rate evolved in a basically identical manner whether we include or exclude the self-employed, as shown in Figure 7(a). In any given year 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 were at most 0.2 percentage points.[29] As a result, the long-term evolution of the employer-to-employer transition rates including and excluding business income recipients are also virtually identical. Both series increase by about 2.0% from 1991 to 2015.

There are 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) was the largest in the time series. This large increase was also coincident with a redesign of the CPS survey methodology, and thus 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 declines were virtually identical, as measured by our two methods: 0.7 percentage points using W-2 data alone, and 0.6 percentage points including business income recipients.

Figure 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 was 0.4 to 1.2 percentage points higher for the population of

[29] In 1991, the employer-to-employer transition rate including (excluding) the self-employed was 12.0% (11.9%). Through the 1990s, the employer-to-employer transition rates increased, reaching 15.7% (15.5%) in 2000, and, following the 2001 recession, declined to 12.7% (12.7%) in 2002. In the expansion that followed the 2001 recession, this increased to 13.9% (13.9%) in 2006, and during the 2007-2009 recession reached a low of 10.1% (10.3%) in 2009. In the expansion that followed, the employer-to-employer transition rate reached 14.0% (13.9%).

wage and salary employees and business income recipients. 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 Figure 7(b). Again, the rates are similar whether including or excluding business income recipients. In the CPS-DER, transition rates including only wage and salary employment to nonemployment were consistently higher than those same transition rates that include business income recipients, by 0.1 to 0.5 percentage points. Such evidence may highlight the fact that 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 were almost always higher than those that include them, by as much as 0.6 percentage points (the exception is 2009, when they were 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. As described in Section 4.2, 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 business income. The results are similar to those in Figure 6. Secondary and short duration jobs followed a "stair-step" pattern, declining in the 2001 recession, stabilizing between 2002 and 2006, and then declining again during the 2007-2009 recession. Such jobs appear to have driven the stair-step pattern in aggregate hires and separations, consistent with the findings of Hyatt and Spletzer (2017).[30] Including business income recipients in the calculation of secondary and short-duration hires and separations lowers these labor reallocation rates by nearly a percentage point in the 1990s, but by only 0.2 to 0.3 percentage points in more recent years. This differential shows that the inclusion of business income recipients 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 business income entry and exit rates were stable over time, and, during the 1990s much lower than wage and salary hire and separation rates, their inclusion lowers the total measured decline in the hire (separation) rate by 1.3 (1.4) percentage points. The inclusion of business income receipt therefore offsets 8.3% (8.7%) of the decline in the hire (sepa-

[30]Excluding the self-employed (i.e., using W-2 data alone), the hires (separations) associated with secondary and short duration jobs increased from 56.8% (57.5%) in 1991 to 69.5% (69.0%) in 2001, then declined to 53.9% (53.8%) in 2003. They then increased to 57.9% (56.4%) in 2005, before they fell to 41.1% (44.3%) in 2009, and then increased to 50.6% (50.0%) in 2015. These rates were broadly similar for the population including the self-employed, especially in the more recent years.

ration) rate. The inclusion of business income receipt 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 (only offsetting 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 business income receipt offsets the measured declines in hire and separation rates. Inclusion of business income receipt 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. Secondary and short-duration business income receipt have become more prevalent 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

The preceding section provided evidence that broadening our employment definition to include business income receipt has somewhat different impacts over time on labor market flows depending on whether the business income is the workers' primary or secondary source of earnings. In this section, we follow workers as they flow between wage and salary work and business income receipt to further refine our understanding of the economic significance of these flows.

We first explore to what extent business income receipt displaces workers' wage and salary jobs; as well as how this has changed over time. In some cases, business income receipt may indicate workers have switched their labor activity from wage and salary jobs to self-employment — resulting in workers having fewer wage and salary jobs in years when they receive business income. Alternatively, when engaging in self-employment work, workers may tend to retain their

existing jobs while expanding into new sources of earnings. Understanding the extent to which business income receipt displaces wage and salary jobs helps to evaluate whether self-employment primarily improves labor allocation (as workers are better matched to their best job) or if self-employment also expands the intensive margin of individuals' labor activity. Furthermore, the degree to which business income receipt displaces wage and salary income may have changed over time. In particular, the rise in non-standard work opportunities may have facilitated new economic activity in addition to improving the allocational efficiency of the labor market.

When evaluating the economic implications of including business income receipt in measures of labor reallocation another important consideration is whether the transition from wage and salary income to self-employment represents efficiency-enhancing labor reallocation. For instance, if the transition occurs because a company has elected to change the legal structure of the employment agreement with a worker from being a wage and salary employee to being a self-employed contractor, then this transition does not improve the allocational efficiency of the labor market. In order to better understand whether the labor reallocation associated with business income receipt is efficiency enhancing, we explore to what extent the self-employment activity takes place within the same broad industry sector as the wage and salary job(s). For example, if the employment impact of ridesharing platforms is largely to encourage wage and salary taxi drivers to switch to being self-employed drivers on the ridesharing platforms, then these changes may be thought of as within-industry reclassification rather than efficiency-enhancing labor reallocation. If, instead, business income receipt tends to diversify the industry composition of the work performed by an individual, then the self-employment activity is more likely to represent efficiency-enhancing labor reallocation.

6.1 Displacement versus expansion

To examine the degree of displacement of wage and salary jobs by business income receipt, 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 wage and salary jobs held at a given time. If movement into self-employment represents an expansion of the intensity of individuals' labor activity, then we would expect less than a one-for-one fall in wage and salary

jobs.[31]

Results are shown in Tables 3 and 4. Table 3 contains simple point estimates from a bivariate regression of the number of jobs held by 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 performed both with and without worker-specific fixed effects. In any given year, the typical worker received earnings from about one and a half employers if they received only wage and salary income. All estimates suggest that self-employment income displaced 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 intensity of labor activity among the self-employed population.

In Table 4 we add to our regression model an interaction term indicating whether a worker's self-employment earnings are dominant, i.e. the self-employment earnings are greater than the worker's 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 received 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 received self-employment earnings at all, the net effect of such work on the worker's wage and salary job count was slightly negative in most of our specifications, suggesting 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 displaced 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, the

[31] Our data do not permit us to observe workers holding more than one self-employment job in any given year. Instead, we can observe only the presence and amount of total combined self-employment earnings. Thus, it is possible that business income reported on an individual's 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 proprietor 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.

self-employment activity tends to expand the intensity of labor activity. When, however, workers earn more from self-employment, the self-employment activity is more likely to displace wage and salary jobs.

Has the relationship between business income receipt and wage and salary work changed over time? To address this question, we estimate a regression specification in which we allow for the effect of the presence of business income to vary by year. Separately by year, we estimate the effects of business income receipt, as well as the business income being the individual's dominant source of income. Results of this specification are presented in Figure 9. If the business income was a person's dominant source of income, then business income receipt is associated with about eight-tenths fewer wage and salary jobs. This is consistent with the results of Table 4, and did not vary much over time. A more substantial change occurred in the relationship between business income receipt and the number of wage and salary jobs if the business income was the individual's secondary source of income. In the 1990s, secondary self-employment income was associated with 0.085 to 0.136 fewer wage and salary jobs. But in the years that followed the 2007-2009 recession, the presence of secondary self-employment income was associated with a reduction of only 0.032 to 0.039 fewer wage and salary jobs. These results indicate that secondary income from self-employment never displaced a substantial number of wage and salary jobs and that this small degree of substitution has lessened over time.

6.2 Within versus across industry reallocation

We now explore the extent to which self-employment is associated with individuals working in a more diverse set of sectors (indicating that self-employment is more likely to represent efficiency-enhancing labor reallocation). Specifically, we assess the extent to which business income receipt displaces wage and salary jobs where the outcome variables are both the total number of jobs held during the year (wage and salary plus self-employment) and total number of unique North American Industry Classification System (NAICS) supersectors in which the person worked in the year. The key explanatory variables are variables indicating whether the person is receiving business income and whether the business income is the person's dominant (highest) source of earnings in the year. We have NAICS supersector information for the years 2002-2015, so we

run regressions on this subsample of the CPS ASEC respondents with wage and salary earnings or self-employment earnings in the CPS-DER. The linked dataset includes individuals who are age 16 or older at the time of the CPS survey and who have received a Protected Identification Key (PIK). Individuals are included in this sample for all years 2002-2015 in which they are age 16+ and have (1) wage and salary earnings with at least one job with non-missing NAICS code in Business Register, or (2) self-employment earnings with non-missing NAICS supersector.

Table 5 shows results where we pool primary and secondary self-employment income together. Overall, the presence of self-employment income is associated with 0.431 to 0.444 additional industries worked. Table 6 distinguishes between whether self-employment provided a person's primary or secondary source of income. Secondary self-employment income is associated with 0.384 to 0.392 more total industries. When self-employment was a person's dominant source of income, it added 0.508 $(= 0.392 + 0.116)$ to 0.547 $(= 0.384 + 0.163)$ additional industries. Because the set of individuals for whom industry is observed is a subset of the broader population, Tables 5 and 6 also include total job counts as a dependent variable. Results for total jobs worked for this subset are similar to those for the broader population as shown in Tables 3 and 4.

These findings suggest that self-employed individuals, whether self-employment is their dominant or secondary source of earnings, tend to work in new industries rather than the same industries as their wage and salary employment. More broadly, these findings provide further evidence that the observed rise in self-employment has led to reallocation of work (existing and new) across broad sectors of the economy and has been an important contributor to labor market fluidity.

7 Conclusion

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. We document this using a unique combination of survey and administrative records data that allow us to measure hires, separations, and employment of workers engaged in wage and salary work and those who receive business income. After documenting that nearly one-in-five income recipients in the U.S. received business income in 2014 and that this share has grown since 1990, we confirm that most business owners do not receive wage and salary payments and are therefore outside the

scope of published statistics on labor reallocation. We compare hire and separation rates using wage and salary employment alone with analogues that incorporate business income 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%).

Our regression analysis allows us 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 person's 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 the "gig economy" has provided more short duration jobs. Wage and salary employment is certainly still the largest part of the labor market, but labor reallocation increasingly involves self-employment.

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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	10.3%	7.9%	59.7%
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%	20.2%	78.5%

Notes: Authors' calculations of universe-level W-2, Schedule C, and Schedule K-1 records. Percentages indicate the relative frequency with 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%*
Employer-to-Employer	0.7	0.6	0.2	*23.8%*
Employment-to-Nonemployment	1.8	1.7	0.1	*4.1%*
Nonemployment-to-Employment	1.3	1.1	0.2	*15.6%*
Secondary / Short-Duration Hires	13.9	12.8	1.1	*7.4%*
Secondary / Short-Duration Separations.	13.8	12.6	1.2	*8.9%*

Notes: Authors' calculations of CPS-DER W-2 and Schedule SE records. The "Differences" and "Percent Offset" may not exactly correspond with the difference between the the "Decline in W-2" and "Decline in Schedule SE" columns due to rounding. 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***	1.490***			1.495***	1.490***		
	(0.000)	(0.001)			(0.000)	(0.001)		
Is SE	0.117***	0.567***	0.404***	0.748***	-0.883***	-0.757***	-0.596***	-0.313***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(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 CPS-DER W-2 and Schedule SE records, as well as universe-level W-2, Schedule C, and Schedule K-1 records. 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***	1.409***			1.420***	1.409***		
	(0.000)	(0.000)			(0.000)	(0.000)		
Ever SE	0.077***	0.081***			0.074***	0.081***		
	(0.001)	(0.001)			(0.000)	(0.001)		
Ever SE*Is SE	0.829***	1.251***	0.899***	1.805***	-0.143***	-0.088***	-0.101***	0.013***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Ever SE*Is SE*SE dom	-1.002***	-1.080***	-0.818***	-0.841***	-1.002***	-1.010***	-0.818***	-0.817***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(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 CPS-DER W-2 and Schedule SE records, as well as universe-level W-2, Schedule C, and Schedule K-1 data. See text for additional details.

Table 5: Regressions on self-employment

	Total Jobs		Total Industries	
Intercept	1.461***		1.258***	
	(0.000)		(0.000)	
Is SE	0.253***	0.612***	0.444***	0.431***
	(0.001)	(0.001)	(0.001)	(0.001)
Worker Fixed Effects	N	Y	N	Y
R^2	0.073	0.482	0.055	0.406

Notes: Authors' calculations of CPS-DER W-2 and Schedule SE records. See text for additional details.

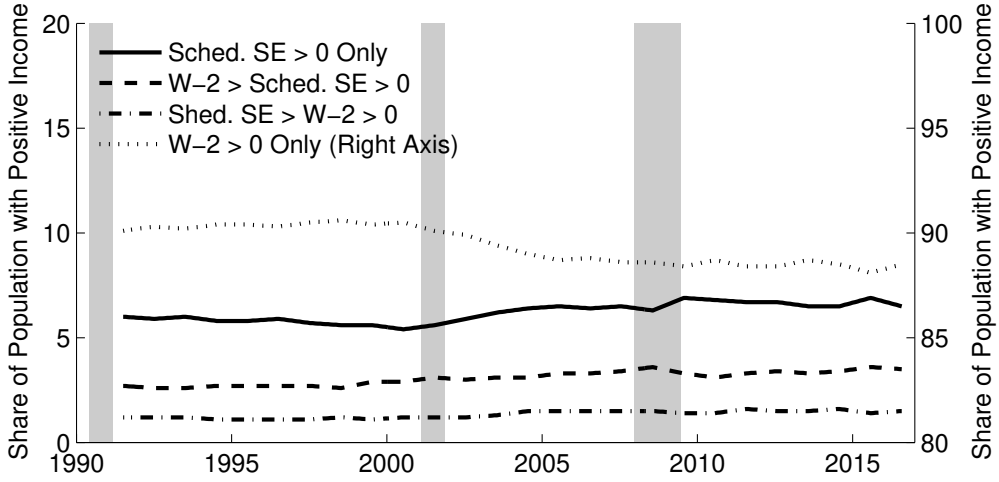
Table 6: Regressions on self-employment, dominant earnings

	Total Jobs		Total Industries	
Intercept	1.461***		1.258***	
	(0.000)		(0.000)	
Is SE	0.881***	0.915***	0.384***	0.392***
	(0.001)	(0.001)	(0.001)	(0.002)
Is SE*SE dom	-0.920***	-0.607***	0.163***	0.116***
	(0.001)	(0.001)	(0.002)	(0.002)
Worker Fixed Effects	N	Y	N	Y
R^2	0.015	0.479	0.053	0.407

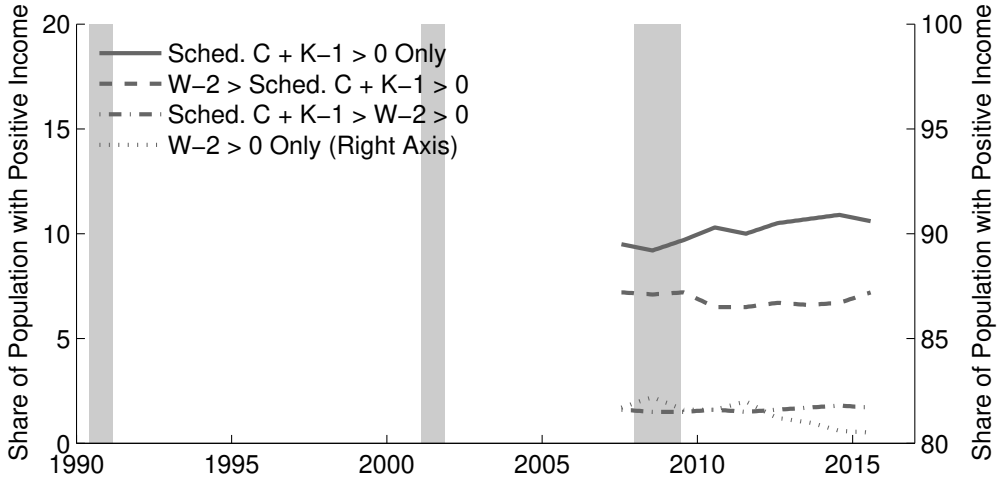
Notes: Authors' calculations of CPS-DER W-2 and Schedule SE records. See text for additional details.

Figure 1: Shares of the population with income in a calendar year, by income source

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

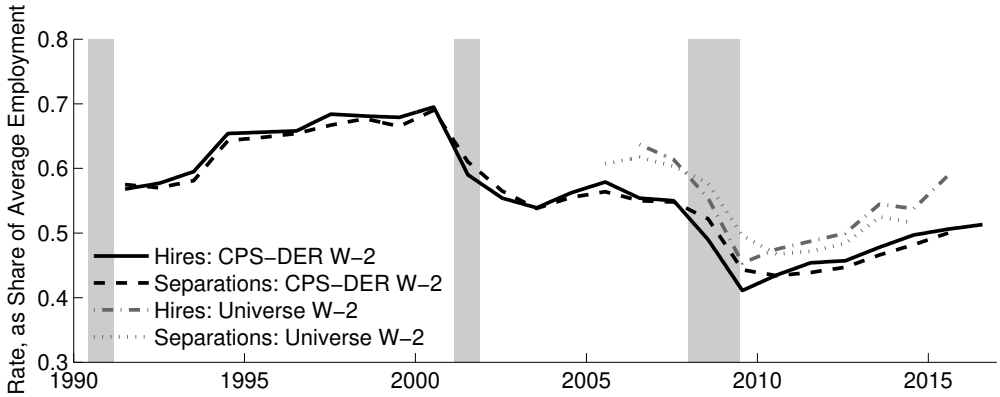


(b) Universe W-2 and Schedules C and K-1



Notes: Authors' calculations of the CPS-DER W-2 and Schedule SE records. , as well as universe-level W-2, Schedule C, and Schedule K-1 records. Schedule C covers sole proprietors, and K-1 covers partnership and S corporation income. Wage and salary income comes from W-2 records. See text for additional details.

Figure 2: Hire and separation rates: wage and salary (W-2) employment

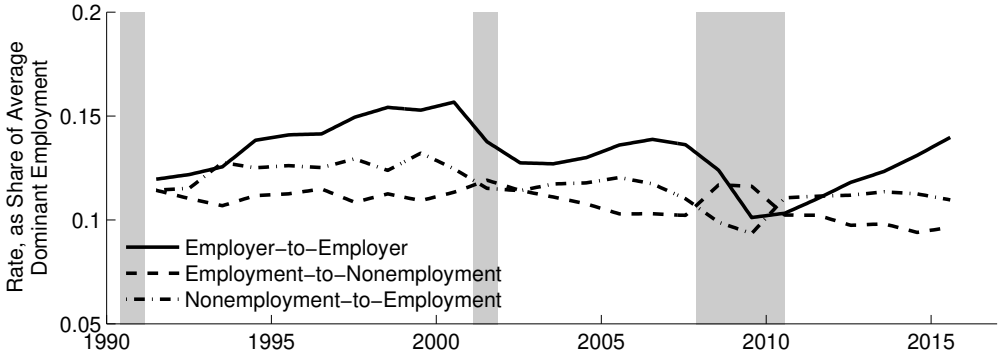


Notes: Authors' calculations of CPS-DER W-2 records, as well as universe-level W-2 records. The denominator for all rates is the average of employment at the beginning and end of the year. See text for additional details.

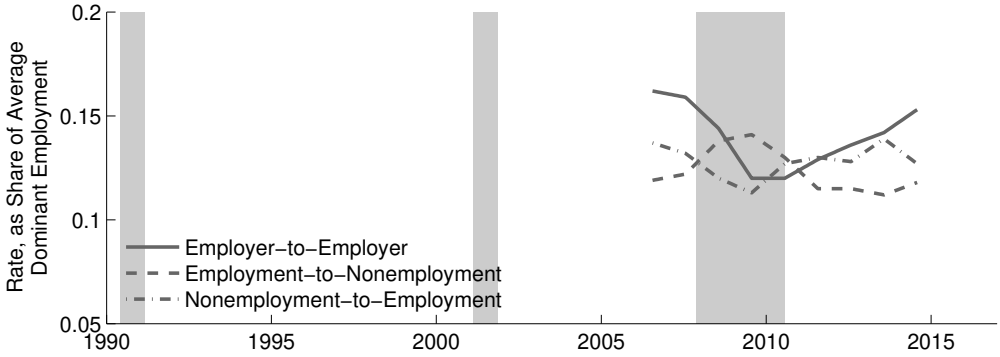
Figure 3: Employer-to-employer and nonemployment transitions:

wage and salary (W-2) employment

(a) CPS-DER W-2

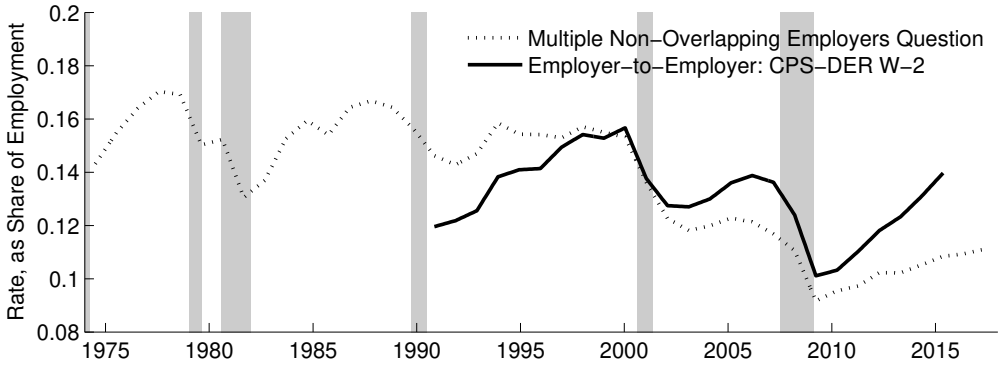


(b) Universe W-2



Notes: Authors' calculations of CPS-DER 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 4: CPS ASEC: multiple non-overlapping employers question vs. administrative records

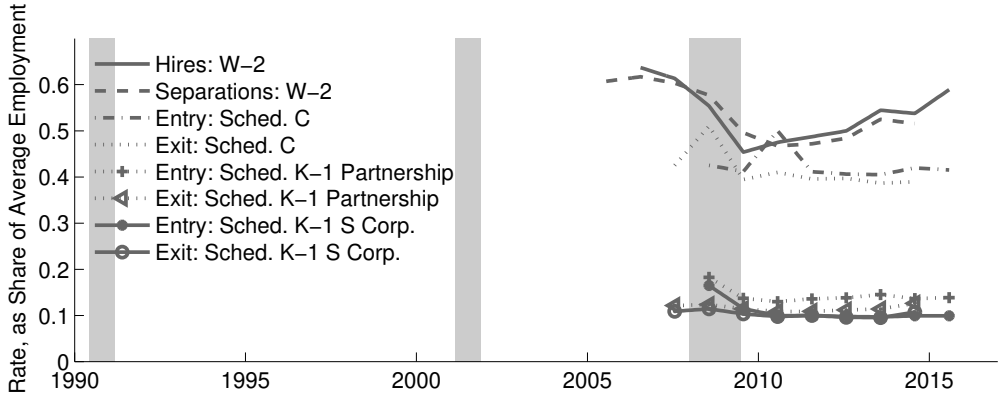


Notes: Authors' calculations of hires and separations using CPS ASEC respondents who report multiple non-overlapping jobs in the prior year, as well as CPS-DER W-2 records. For the CPS ASEC responses, the denominator is those who were in scope of the multiple non-overlapping employers question. For the 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 5: Hire and separation rates vs. business income entry and exit rates

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

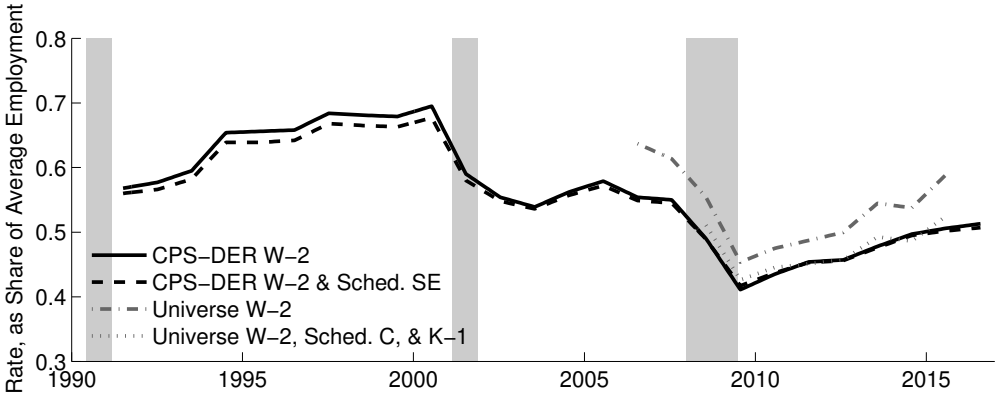
(b) Universe W-2 and Schedules C and K-1



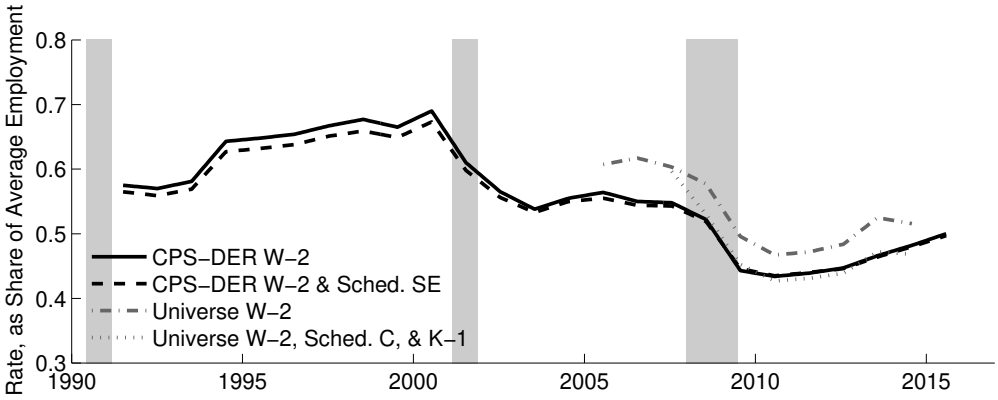
Notes: Authors' calculations of CPS-DER W-2 and Schedule SE records, as well as universe-level W-2, Schedule C, and Schedule K-1 records. Entry indicates zero business income in the previous year and positive business income in the current year. Exit indicates positive business income in the current year but zero business income in the subsequent year. Denominators for each rate are 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

(a) Hires



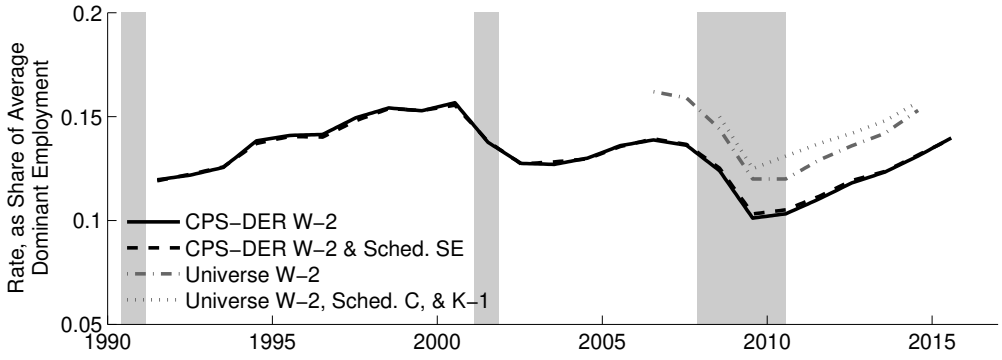
(b) Separations



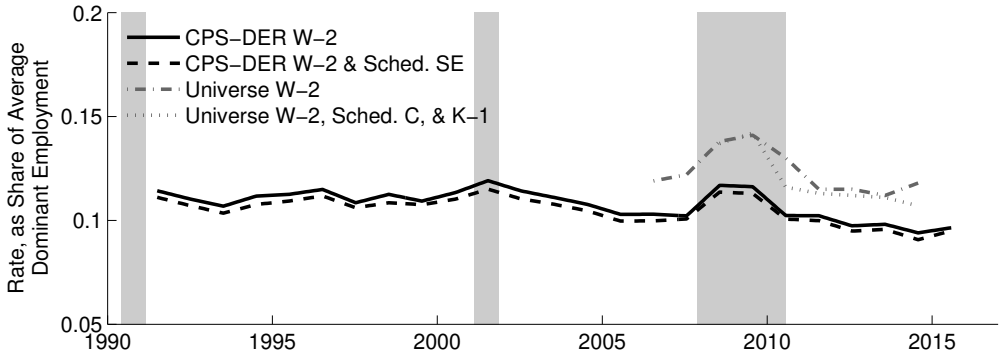
Notes: Authors' calculations of CPS-DER W-2 and Schedule SE records, as well as universe-level W-2, Schedule C, and Schedule K-1 records. See text for additional details.

Figure 7: Wage and salary vs. all employer-to-employer Transitions

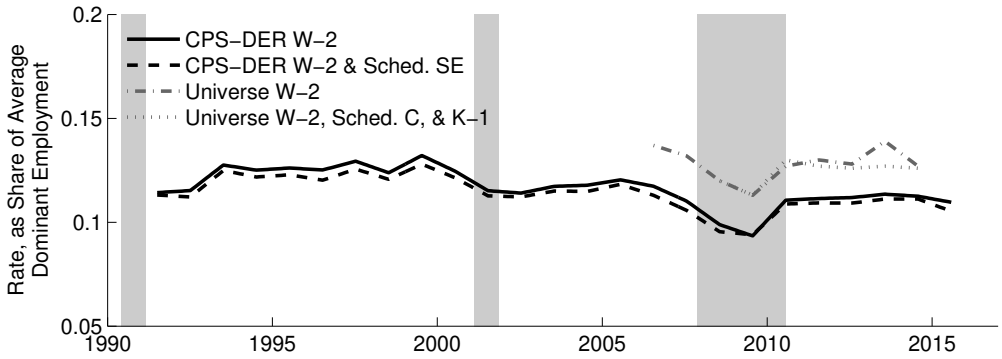
(a) Employer-to-employer



(b) Employment-to-nonemployment



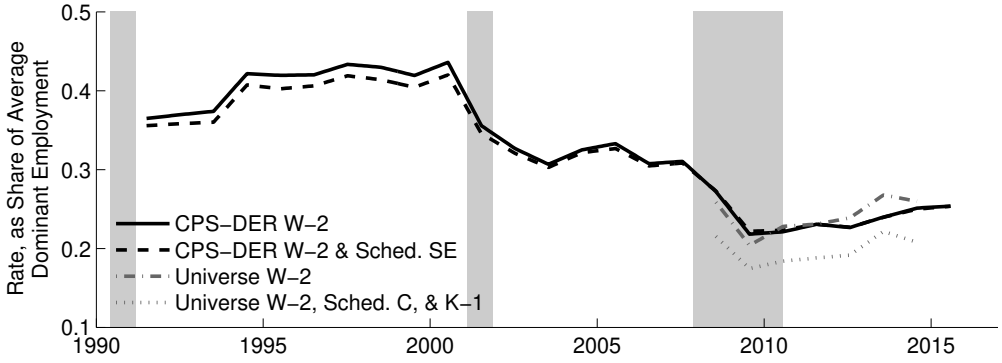
(c) Nonemployment-to-employment



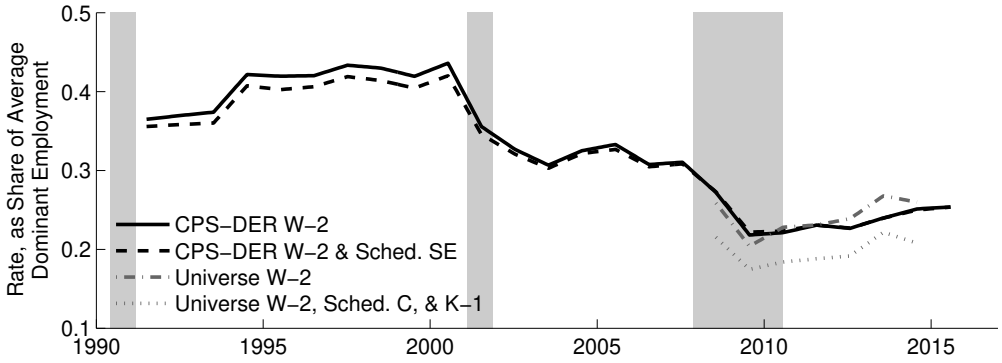
Notes: Authors' calculations of CPS-DER W-2 and Schedule SE records, as well as universe-level W-2, Schedule C, and Schedule K-1 records. See text for additional details.

Figure 8: Wage and salary vs. all secondary and short duration job hires and separation

(a) Hires

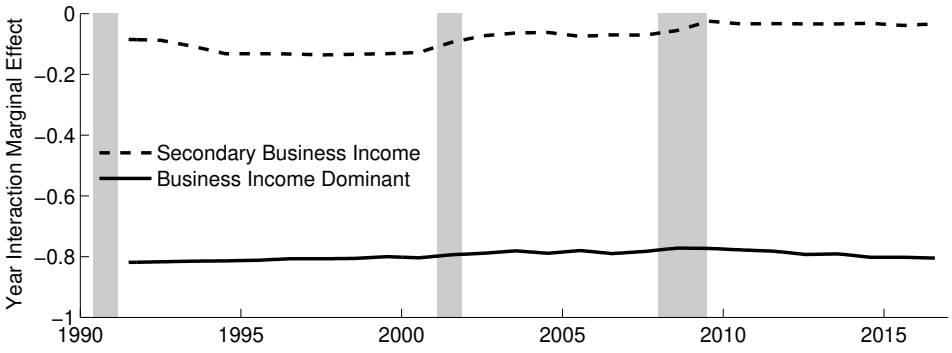


(b) Separations



Notes: Authors' calculations of CPS-DER W-2 and Schedule SE records, as well as universe-level W-2, Schedule C, and Schedule K-1 records. See text for additional details.

Figure 9: Regression point estimates over time



Notes: Authors' calculations of CPS-DER W-2 and Schedule SE records. Plots show point estimates from a regression with the number of wage and salary jobs worked in a given year. Specifically, the year interactions for primary and secondary income from self-employment in a given calendar year. 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). 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 denominators. 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 Time series

We here describe the results of additional empirical exercises that assess our analysis datasets.

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 increased steadily from 13.0 million in 1996 to 18.3 million in 2007, then declined to 17.3 million 2010, just after the 2007-2009 recession. In later years, it increased to 19.6 million in 2014 and fell 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. There were 16.7 million Schedule SE filers in 2007, and this number fell to 15.1 million in 2009, and then increased to 18.9 million in 2015. These total Schedule SE files are similar to the DER. The largest difference was about 15% in 2009, other years were different by less than 10%. The overall 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 was much larger than those who file a Schedule SE. 29.6 million reported such income in 2007, and this declined to 28.3 million in 2009, and then increased to 33.9 million in 2010. Overall, 55% to 57% of those who reported income from a sole proprietor or partnership business filed 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 were 33.3 million business income

recipients in 2007. This declined to 32.1 million in 2009, then increased 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 ranged from 3.6 to 3.8 million.

B.1.2 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 ENPersist 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 down-

loaded 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 micro-data. 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).

Figure B.2(a) shows the results for hires, while B.2(b) shows the results for separations. In 1993, the hire (separation) rate from the CPS-DER was 59.5% (58.1%). The QWI had a much higher hire (separation) rate of 102.1% (99%). In other words, total hires and separations in 1993 in the QWI were roughly the same as total employment, while in the W-2 data they were closer to three-fifths of employment. In 1996, the hire (separation) rate using aggregates of monthly CPS data was 80.9% (78.7%), which was 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 was the lowest at 47.2% (48.8%), that of the CPS-DER was higher at 59.0% (61.0%), the aggregates of CPS monthly data had a yet higher rate of 80.6% (81.7%), and the QWI was again highest at 100.9% (100.7%). All available data show that separations exceeded 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 were consistently between the JOLTS and the monthly CPS. In 2006, the lowest hire (separation) rate was the JOLTS at 47.6% (46.0%), the CPS-DER had higher number at 55.4% (55.0%), the universe-level W-2 records had a rate of 63.7% (61.7%), the CPS monthly aggregates had a rate of 77.9% (75.7%), and the QWI had a rate of 94.2% (90.1%). At the end of the 2007-2009 recession, hires reached 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 reached a local minimum in every series in 2010 except the aggregates of CPS microdata. In 2010, separations were 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 continued 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 was 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 increased in the expansion that followed the 2007-2009 recession. The exception is the aggregates of CPS monthly data, in which the hire (separation) rate was 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 Figure B.3(a). In 1996, the CPS-DER W-2 records show that the annual employer-to-employer transition rate was 14.1%, while the sum of the monthly hazard rates from Fallick and Fleishman (2004) were 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 was 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 had 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 was 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 Figure 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 indicate that the employment-to-nonemployment transition rate was 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 had rate of 10.3%, the universe-level administrative records had 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 had a rate of 9.4%, the universe-level administrative records had 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 Figure B.3(c), also exhibit considerable level differences. In 1991, CPS-DER W-2 records had 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 was 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 was 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 was 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%.

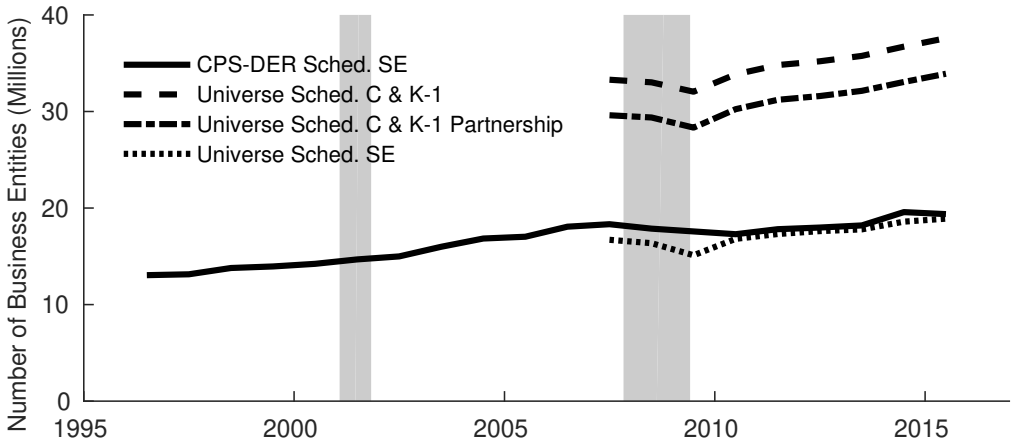
Our new nonemployment-to-employment measures from W-2 have lower correlations with

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 were 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) declined to 7.1% (6.5%) in 2000, and then surged to 8.1% (7.5%) in 2005. Thereafter, the share of employment accounted for by Schedule SE filers was flat, and in 2016 Schedule SE files were 8.2% of employment and 7.5% of dominant employment.

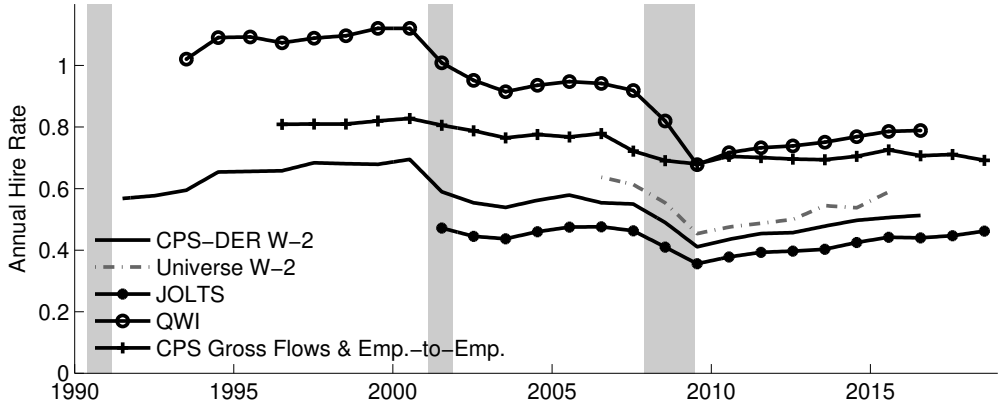
Figure B.1: Total number of administrative records self-employed (millions)



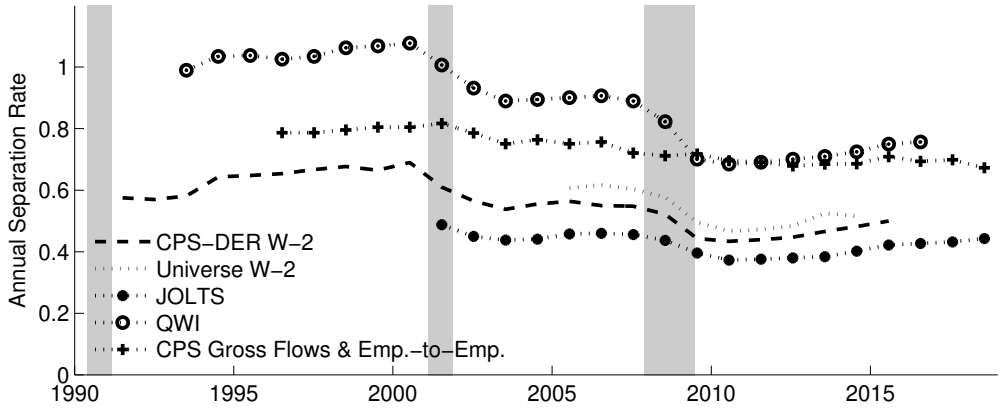
Notes: CPS-DER numbers from 1996-2010 are from Figure 1 of Abraham et al. (2018). Other totals are authors' calculations on CPS-DER Schedule SE records, as well as universe-level Schedule C and Schedule K-1 records.

Figure B.2: Annual hire and separation rates

(a) Hires



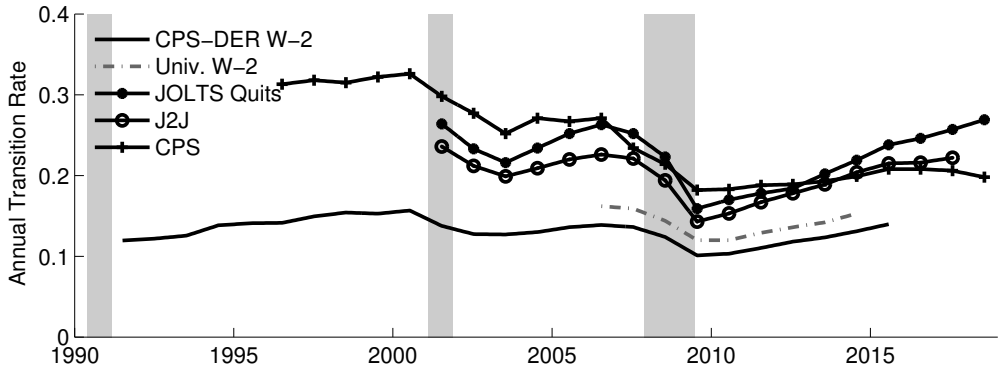
(b) Separations



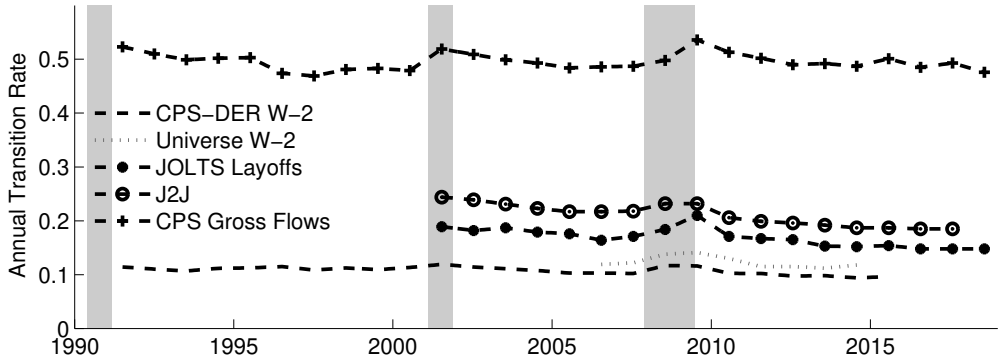
Notes: Authors' calculations of CPS-DER W-2 records, universe-level W-2 data, and published aggregates. The denominator for the W-2 rates is the average of employment at the beginning and end of the year. Job Openings and Labor Turnover Survey (JOLTS), Quarterly Workforce Indicators (QWI), and CPS Gross Flows and Employer-to-Employer Transitions series sum rates within a calendar year. See text for additional details.

Figure B.3: Annual transition rates

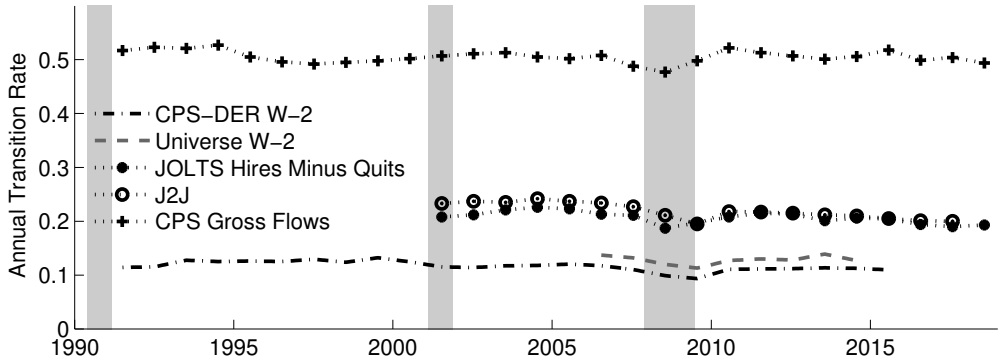
(a) Employer-to-employer



(b) Employment-to-nonemployment



(c) Nonemployment-to-employment



Notes: Authors' calculations of CPS-DER W-2 records, as universe-level W-2 records, and published aggregates. 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 of CPS-DER W-2 and Schedule SE records.

B.3 How frequently are business owners employees?

Table B.1 reports the relative frequency with which business owners are present in the Longitudinal Employer-Household Dynamics (LEHD) data. The LEHD data are derived from unemployment insurance (UI) wage and salary income 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 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 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 (UI)

	Schedule C Sole Proprietors	Form K-1 Partnerships	Form K-1 S Corps.
Share of owners:			
Owners of EIN firms in UI	7.3%	1.1%	39.4%
Owners of employer firms in UI	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 UI	7.8%	4.5%	48.6%
Any owners of employer firms in UI	13.6%	26.5%	83.0%
Any owners of employer firms, top 3	10.8%	22.4%	77.0%

Notes: Authors' calculation of LEHD administrative records and universe-level Schedule C and Schedule K-1 records. This table shows the frequency which businesses owners receive a unemployment insurance (UI) 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 UI 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.
W-2 Data			
Share of owners:			
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%
Share of firms:			
Any owners of employer firms in W-2	17.0%	26.9%	74.6%
Any owners of employer firms, top 3	14.6%	23.5%	71.1%
LEHD Data			
Share of owners:			
Owners of employer firms in UI	15.5%	13.8%	59.6%
Owners of employer firms, top 3	13.5%	11.3%	55.4%
Share of firms:			
Any owners of employer firms in UI	16.4%	27.2%	72.7%
Any owners of employer firms, top 3	14.2%	23.8%	69.3%

Notes: Authors' calculations of LEHD administrative records, as well as universe-level W-2, Schedule C, and Schedule K-1 records. Entries in the table indicate 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.