Real Earnings Growth in the U.S. 1994-2014: Job Stayers, Job-to-Job Flows, and Nonemployment *

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Abstract

In the U.S. in the late 1990s, there was a sudden, long-lasting upward shift in real wage and salary compensation per worker in the U.S. labor market, and little growth in the following decade and a half. In this paper, we provide a compositional analysis that distinguishes between three channels for earnings growth: job stayers, workers undergoing job-to-job flows, and workers transitioning between employment and nonemployment. To do so, we use a unique dataset of matched employer-employee data that permits the measurement of earnings changes for different employment types. We find modest cyclical earnings changes for job stayers, job switchers, and net nonemployment. There also was a large increase in the earnings of long-tenure job stayers during the late 1990s. Our data permit measurement of whether these changes come from hours or wages. We find that job-to-job flows have a strong role to play in increases in hours worked. Stayer earnings growth dominates growth in hourly wages. We also find that earnings and wage growth of those with short job tenure is less cyclical than longer-tenure job stayers.

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1 Introduction

It has long been known that labor compensation from wage and salary payments is procyclical (Kydland and Prescott, 1990). Our goal is to link the cyclicality of earnings more broadly to job transitions, and specifically to differentiate between earnings growth due to employment change (job-to-job and through nonemployment) and growth due to on-the-job earnings. There is already some limited evidence that job-to-job earnings changes are an important determinant of earnings growth, both in trend and at the cyclical level. For example, recent studies such as Faberman and Justiaino (2015), Molloy et al. (2016), and Hyatt and Spletzer (2016) have considered the fact that both earnings growth and job-to-job transition rates for the U.S. exhibit declining trends from the 1990s to the present, and have highlighted the role that job-to-job transitions may have in determining earnings.

In this paper, we address the labor market sources of earnings growth. Specifically, we measure how the average earnings level in the U.S. evolves, treating job stayers, job-to-job transitioners, and workers moving out from and into nonemployment separately. We use a unique matched employer-employee dataset and can therefore exactly identify the average earnings level and the workers who contribute to this earnings level. We also propose and implement an accounting method that separates the separate influences of these different labor market transitions. Our findings indicate that earnings increases in the late 1990s come from higher earnings for job stayers, whose earnings changes exhibit considerable changes over this time period. By contrast, job-to-job flows have a modest, procyclical contribution to earnings increases.

In this paper, we take an accounting approach to the relationship between earnings and labor market transitions, and help to understand the particular role of worker movements between employers relative to movements into and out of nonemployment. We use a unique dataset that allows us to measure the earnings changes associated with different types of labor market transitions. Specifically, we consider job-to-job transitions, job stayers, and workers moving into and out of employment. The universe-level nature of the dataset allows us to have a panel where earnings observations are included for all workers. We can therefore obtain both an average earnings series and decompose that series into its earnings change components. We do so by proposing a simple method of accounting for changes in an average as a sum of its components. Because we calculate our decomposition on universe-level administrative data, we

do not have to worry about attrition or changes in sampling: all changes to the components exactly recover changes in the average, and there is no residual.

We show that the unusual earnings growth that the U.S. labor market exhibited during the late 1990s is accounted for primarily by earnings changes associated with flows into and from nonemployment. By contrast, we find that there was a sudden one-time increase in the earnings of job stayers during the 1990s, and that the earnings changes associated with job-to-job transitions does not by itself account for the surge in earnings in the late 1990s, despite accounting for a substantial amount of earnings growth from 1994-2014. We show this finding is robust to using wages, rather than earnings, and in both levels and logs. We expand upon the work of Daly and Hobijn (2016), finding that movements into and out of nonemployment bring down *average* earnings, and that this dampening effect was considerably lower in the wake of the 2007-2009 recession.

There has been a growing interest in the relationship between job-to-job transitions and earnings growth.[1] Faberman and Justiaino (2015) document the relationship between job switching and wage growth, and find that both are quite procyclical, and that their movements are highly correlated. The authors argue that the closeness of the timing of these changes is suggestive evidence that a higher job-to-job transition rate creates competitive pressure in the labor market, increasing earnings. In addition to this indirect evidence, the recent work of Daly and Hobijn (2016) and Karahan et al. (2016) take a more direct approach to accounting for earnings increases. Daly and Hobijn pay particular attention to the relative contributions of transitions into and from employment, that is, those who leave or enter nonemployment. They call these flow the "extensive margin" and find that, because those leaving nonemployment earn much less than those who enter nonemployment, and because employment in the U.S. has been increasing in recent decades, this extensive margin has a dampening effect on wages that is lessens during recesssions.

Our evidence can help interpret previous findings concerning the contribution of job-to-job flows to earnings growth. Devereux and Hart (2006) report that job stayer wages are more cyclical than for those undergoing a within-firm or across-firm job change. Distinctions are made between new hire wages and other wage changes. Our analysis suggests that a critical

[1]Bils (1985) is one of the first studies that documents wage differentials between job-stayers and new hires. See Swanson (2007) and Kudlyak (2010) for a summary of early references.

distinction must be made between workers moving into a out of nonemployment and those who are moving between employers. Although employer-to-employer transitions account for one-third to one-half of all hires, the average earnings associated with nonemployment hires and separations are quite divergent. The earnings of those separating to nonemployment and those entering nonemployment are very different, which the double-digit earnings increases that workers experience when undergoing a job-to-job transition are modest by comparison. Job stayers dominate the series and so account for some share of wage growth because of their share, while earnings changes for job stayers tend to be quite modest.

This paper proceeds as follows. In the next section, we describe the data sources employed, with emphasis on the LEHD data. We next describe the trends in earnings for the U.S. for the years 1994-2014. Then follows a description of the components of transitions that we consider. Then, there is an accounting exercise to understand the relationship between the components and earnings in the U.S. Subsequent sections explore alternative decompositions and the difference between log earnings and levels, as well as the contribution of hours and wages. A brief conclusion follows.

2 Data

2.1 Longitudinal Employer-Household Dynamics

The data come from the infrastucture files maintained by teh U.S. Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) program. These data are described in Abowd et al. (2009). The data consist of total quarterly earnings reported by employers, who in turn provide these data to the U.S. Census Bureau as part of the Local Employment Dynamics federal-state partnership. All tabulations are done on a consistent set of LEHD states with data available from 1994-2014.

We make use of a recent enhancement that integrated job-to-job flows into the LEHD data. These follow the definitions in Hyatt et al. (2014). Jobs are included if they are dominant among consecutive quarter jobs. That is, only jobs that span two quarters are included. It can therefore be inferred that the individual was employed at the time when the two quarters meet, say, on the first day of the subsequent quarter. Among these consecutive quarter jobs,

the maximal earnings job is selected. If that maximal earnings employer changes, we call this a job-to-job transition. Job-to-job transitions include those where the worker receives wage and salary compensation from both the previous and subsequent employer in the same quarter, called within-quarter job-to-job flows, and those in which the last quarter of earnings from the previous employer immediately precedes the first quarter in which earnings are paid from the subsequent employer, these are called adjacent-quarter job-to-job flows. These job-to-job transitions exclude spurious identifier changes as identified using the methodology outlined in Abowd et al. (2009) and Benedetto et al. (2007), as implemented as described in Hyatt et al. (2014).

2.2 Definition of Earnings

We use a full quarter earnings concept that underlies the published LEHD average earning series, see Abowd et al. (2009). That is, we tabulate earnings when they are available for jobs where a worker is employed at the same employer for three quarters. We lack data on hours worked, and therefore cannot calculate worker wages. The LEHD data also lack start and end dates. When earnings are available for three quarter, it can be inferred that the worker was likely to have been employed at that employer at the beginning and end of the middle quarter, and therefore we can, with appropriate caution, interpret the total earnings in the middle quarter, as a workers quarterly earnings rate.

However, it is not straightforward to attach full-quarter earnings to LEHD job-to-job transitions. LEHD full quarter earnings are obtained when a job spans three quarters, while job-to-job transitions as in Hyatt et al. (2014) are calculated on the set of jobs that are dominant among consecutive quarter jobs, so in order to be counted as a job-to-job transition a worker only needs to be employed for two quarters. The dominant among consecutive quarter jobs framework was employed in order to represent (roughly) point-in-time employment: if a worker has earnings from an employer in two consecutive quarters, then with some high likelihood that worker had a stable employment relationship with the employer at the beginning of that quarter.

If a worker is employed at a particular employer for two consecutive quarters, then that job may or may not last for a total of three quarters. In some cases, the job spans four quarters and so full-quarter earnings are observed both in the previous and subsequent quarter of the

consecutive quarter pair. We therefore adopt what seems a natural approach to attaching a quarterly earnings rate to jobs that are dominant among consecutive quarter jobs. If only one quarter of the consecutive quarter pair in which a worker in employed at a job that is dominant among consecutive quarter jobs has full-quarter earnings, that quarterly earnings rate is associated with that job. If both quarters have such earnings, then both are used and the earnings rate that is associated with that consecutive quarter job is the average of the two. This corresponds to the definitions of full-quarter earnings for job-to-job flows specified in Hyatt et al. (2014), and includes earnings concepts for job stayers and transitions into and from nonemployment.

2.3 Comparability of LEHD Earnings to Other U.S. Data on Earnings and Wages

Figure 1 shows the trend in earnings from the LEHD data, which we decompose, along with several other data series. The data series we compare these are the median weekly earnings of full-time workers from the Current Population Survey (multiplied by 13 to create a quarterly measure), the average wage earnings for manufacturing workers who are paid by the hour, and the per-employee costs from the Employer Costs of Employee Compensation Survey, both the wage and salary component, as well as total compensation including benefits. We also include the Average Weekly Wage series created as part of the Quarterly Census of Employment and Wages, which is similar to the LEHD full-quarter earnings series.

As shown in many previous studies, earnings in the U.S. are procyclical. There are notable differences among different earnings series, yet all of the series share the common feature of increasing over time, with the greatest increases during the 1990s.[2] Furthermore, all series show more substantial increases in the last few years of the 1990s than at any point in the time series.

The LEHD data imply higher levels of wage and salary compensation than other series (the Employer Costs of Employee Compensation include benefits such as health insurance and are therefore higher on a per-worker bases) and also have a larger increase in the late 1990s than other series. The Average Weekly Wage series is the most simialr to the LEHD earnings series,

[2]These substantial differences have been noted by Abraham, Spletzer, and Stewart (1998), as well as Champagne, Kurmann, and Stewart (2016). Differences between different earnings and wage series can generally be attributed to differences in data sources and tabulation strategies.

and this is likely due to the nature of the source data. Both are universe-level employer-reported total earnings calculated from administrative records. The main difference is that the Average Weekly Wage series is the employer-reported total wage and salary payments divided by total employer-reported employment, while the LEHD series is a job-level tabulation that averages the earnings of all jobs that span three consecutive quarters.

The LEHD data is a universe-level dataset of employment in unemployment insurance taxable wage and salary payments. We can therefore explore an exact decomposition of these data, where we can compare all workers who contribute to average earnings at any point in time, and distinguish between workers earnings transitions and their employment transitions.

3 Accounting for Earnings Changes

Each quarter, the composition of employees who have full-quarter earnings changes somewhat. Job-stayers always have full-quarter earnings observed both at the beginning and end of the quarter, and workers undergoing job-to-job transitions often have full-quarter earnings observed at the employer where they worked at the beginning of a quarter, and for the employer where they were employed at the end of the quarter. Some job-to-job transitions are between jobs that do not last three consecutive quarters, for these cases full-quarter earnings are not observed. Furthermore, workers entering employment from nonemployment (and so employed at the end of a quarter) have no earnings observed while in nonemployment, and workers exiting employment into nonemployment (that is, employed at the beginning of a quarter but not at its end) only have earnings observed for the beginning of a quarter.

In what follows, we present a simple method for accounting for changes in average earnings as a function of its components. These components will be the objects of interest in the subsequent sections. We can begin simply with how average earnings evolve from the beginning of a quarter to its end. The change in average earnings for a quarter t can be written as

$$\Delta \bar{w}_t = \bar{w}_t^E - \bar{w}_t^B$$

where $\bar{w}_t$ is the change in average earnings from its average at the beginning of the quarter $\bar{w}_t^B$ to its average at the end of the quarter $\bar{w}_t^E$. Note that, because we are using universe-

level administrative records, $\bar{w}_t^B = \bar{w}_{t-1}^E$ by construction, that is, the average earnings at the beginning of the next quarter is the average earnings at the end of the previous quarter.

Now, we can rewrite the average as a function of the numerator and denominator, where the numerator is total earnings paid in a quarter and the denominator is the number of jobs to which these earnings can be attached. In other words,

$$\bar{w}_t^E - \bar{w}_t^B = \frac{W_t^E}{L_t^E} - \frac{W_t^B}{L_t^B}$$

where L_t^B and L_t^E are the number of employees employed at the beginning and end of quarter t, respectively, to which a quarterly earnings rate can be attached, and $W_t^E = \sum w_{it}^E$ is the sum of these quarterly earnings rates at the end of the quarter and W_t^B its beginning-of-quarter analogue.

Now, we introduce some additional notation. Job stayers JS_t are employed at the same job (more specifically, hold the same job that is dominant among consecutive quarter jobs) at the beginning and end of a quarter. Such workers are employed for at least three quarters. In the case that a worker is employed for exactly three quarters, the worker has $w_{it}^E = w_{it}^B$ by construction (and is only a stayer during quarter t). If the job lasts for four or more quarters, then the earnings will evolve according to the definitions given above: if only one quarter of the consecutive quarter pair in which a worker in employed at a job that is dominant among consecutive quarter jobs has full-quarter earnings, that quarterly earnings rate is associated with that job. If both quarters have such earnings, then both are used and the earnings rate that is associated with that consecutive quarter job is the average of the two.

Next, consider those who undergo an employment transition. Workers who undergo a job-to-job flow that is "within-quarter" (that is, the hire and separation both occur in quarter t). Let them be of four types. First, in the idea case, a job switcher will be employed at (different) jobs that span at least three quarters at both the beginning and end of the quarter, call the count of such jobs WQ_t^{FF}. Then, workers may be employed at jobs that are dominant among consecutive quarter jobs but, where one of those jobs may be missing. Let the count of such jobs be WQ_t^{MF} for those who transition from a job that only lasts two quarters into one that lasts for three or more quarters, and WQ_t^{FM} those who transition from a job that has lasted three or more quarters into one that lasts for only two. Finally, let WQ_t^{MM} count the number of workers

who move between jobs that last for exactly two quarters each, and so never have full-quarter earnings attached, and therefore will never contribute to an average quarterly earnings rate.

There is another type of employment transition that we will consider, an adjacent-quarter job-to-job flow if the quarter of the separation immediately precedes the quarter of hire. Without loss of generality, we will date adjacent-quarter job-to-job transitions on the basis of the quarter in which the worker is hired.[3] And similarly, we can define those who transition between adjacent-quarter jobs where both jobs are full-quarter as AQ_t^{FF}, those where only the subsequent job is full-quarter as AQ_t^{MF}, where only the previous job is full-quarter as AQ_t^{FM}, and where neither the previous or subsequent job lasts a full quarter AQ_t^{MM}.

The residual from the stayers and job-to-job transitions as defined above is the constitutes those workers who were employed at consecutive-quarter jobs at the beginning or end of a quarter, but who were moving into or out of nonemployment of a particular form. In particular, the residual from these definitions is the set of workers who were employed at no job that was dominant among consecutive quarter jobs at either the beginning or the end of that quarter.[4] For "entrants", that is, workers moving from nonemployment into employment, this quarter immediately precedes the quarter t at the end of which the worker is consecutive-quarter employed, and for "exiters", workers moving from employment into nonemployment, the quarter of nonemployment is the one that follows the one in which the worker was employed at the beginning of the quarter. Let the count of "entrants" into jobs that have full-quarter earnings (i.e., have three quarters of earnings) be denoted NE_t and the "exiters" from full-quarter jobs be denoted EN_t.

Now, armed with these comprehensive and mutually-exclusive categories, we can write the employment count for the beginning and end of quarter t as follows. Employment with a quarterly earnings rate attached at the beginning of the quarter is

$$L_t^B = JS_t + WQ_t^{FF} + WQ_t^{FM} + AQ_t^{FF} + AQ_t^{FM} + EN_t,$$

[3]This technically means that the next quarter's hires into adjacent-quarter dominant jobs are associated with the previous quarter's job separations.

[4]In other words, the for any job that provides a worker earnings in quarter t, the worker did not receive any earnings for that job in either quarter $t-1$ or $t+1$. The additional restriction that there cannot be any employer that spans wither the beginning or end of the quarter is due to the fact that workers who have exactly one pair of quarters that have no employer that provides earnings in each are classified as "adjacent-quarter" job-to-job transitions.

and at the end of the quarter it is

$$L_t^E = JS_t + WQ_t^F F + WQ_t^{MF} + AQ_t^{FF} + AQ_t^{MF} + NE_t,$$

and so the growth in employment is

$$L_t^E - L_t^B = WQ_t^{MF} - WQ_t^{FM} + AQ_t^{MF} - AQ_t^{FM} + NE_t - EN_t.$$

At this point, we can propose a measure that is each components contribution to the change in the average. Let the sum of the full-quarter earnings rates for any category be written as $W_t^{T,C}$ where $T \in \{B, E\}$ and $C \in \{JS, WQ^{FF}, WQ^{FM}, WQ^{MF}, AQ^{FF}, AQ^{FM}, AQ^{MF}, NE, EN\}$. We propose that the portion of the average that is associated with the change in the component is naturally written as the contribution of that component to the average, multiplied by its average earnings. In other words, we can write average earnings at the beginning of a quarter as

$$w_t^B = \sum_{C \in \{JS, WQ^{FF}, WQ^{FM}, AQ^{FF}, AQ^{FM}, EN\}} \left(\frac{W_t^{T,C}}{C_t}\right)\left(\frac{C_t}{L_t^B}\right),$$

and at its end as

$$w_t^E = \sum_{C \in \{JS, WQ^{FF}, WQ^{MF}, AQ^{FF}, AQ^{MF}, NE\}} \left(\frac{W_t^{T,C}}{C_t}\right)\left(\frac{C_t}{L_t^E}\right).$$

So we can write the change in average earnings as the sum of four components, which we group in square brackets (and too conserve space, we will let the C_t terms cancel naturally and otherwise group terms):

$$\begin{aligned} \bar{w}_t^E - \bar{w}_t^B = &\left[\frac{W_t^{E,JS}}{L_t^E} - \frac{W_t^{B,JS}}{L_t^B}\right] + \left[\frac{W_t^{E,NE}}{L_t^E} - \frac{W_t^{B,EN}}{L_t^B}\right] + \\ &\left[\frac{W_t^{E,WQ^{FF}} + W_t^{E,WQ^{MF}}}{L_t^E} - \frac{W_t^{B,WQ^{FF}} + W_t^{B,WQ^{FM}}}{L_t^B}\right] + \\ &\left[\frac{W_t^{E,AQ^{FF}} + W_t^{E,AQ^{MF}}}{L_t^E} - \frac{W_t^{B,AQ^{FF}} + W_t^{B,AQ^{FM}}}{L_t^B}\right]. \end{aligned} \tag{1}$$

Thus, we have one approach to decomposing the change in average earnings into the sum of its components. The terms in square brackets capture the change in the average that can be associated with job stayers, net nonemployment, within-quarter job-to-job flows, and adjance-quarter job-to-job flows, respectively. In our primary exposition our results, we combine the within-quarter and adjacent-quarter job-to-job transitions and present the results for one category of job-to-job flows, although later we consider the contribution of these different components.

Note that three categories of employment contribute both to the earnings average at the beginning and end of the quarter. These are the categories for which full-quarter earnings are observed for the job held at the beginning and end of the quarter: JS_t, $WQ_t^F F$, and $AQ_t^F F$. But they do not contribute to the average at the beginning and end of the quarter at the same rate. For example, job stayers contribute JS_t/L_t^B at the beginning of a quarter but JS_t/L_t^E at its end. Because in a typical quarter in the U.S., employment grows, this implies that usually $L_t^B < L_t^E$ and so the share of employment that job stayers in a particular quarter is lower at the end of the quarter than at its beginning, something that we will refer to in this paper as the diluting effect of employment on workers for whom full-quarter earnings are observed throughout the quarter.

To address the contribution of this dilution to these components whose employment count is the same at the beginning and end of the quarter by construction, we can do an additional calculation that captures the effect of the change in average earnings versus the change in the share. For these components, the fraction of employment associated with a component C_t, where $C \in \{JS, WQ^{FF}, AQ^F F\}$ changes from $S_B = C_t/L_t^B$ to $S_E = C_t/L_t^E$, and average earnings changes from $\bar{w}_t^{B,C} = W_t^{B,C}/C_t$ to $\bar{w}_t^(E,C) = W_t^{B,C}/C_t$. As defined above, the change associated with that transition is

$$\bar{w}_t^{E,C} S_E - \bar{w}_t^{B,C} S_B.$$

Now, we can re-arrange terms. Note that:

$$\bar{w}_t^{E,C} S_E - \bar{w}_t^{B,C} S_B = \bar{w}_t^{E,C}(S_E - S_B) - (\bar{w}_t^{E,C} - \bar{w}_t^{B,C}) S_B = S_E(\bar{w}_t^{E,C} - \bar{w}_t^{B,C}) - (S_E - S_B)\bar{w}_t^{B,C}.$$

Therefore, we can rewrite the difference as the average of these two equivalent expressions:

$$\bar{w}_t^{E,C} S_E - \bar{w}_t^{B,C} S_B = (S_E - S_B)(\frac{\bar{w}_t^{E,C} + \bar{w}_t^{B,C}}{2}) + (\bar{w}_t^{E,C} - \bar{w}_t^{B,C})(\frac{S_E + S_B}{2}) \quad (2)$$

We will call the first term the contribution of the change in the share the "dilution" effect (the earnings associated with that transition type in the quarter are diluted by the change in the share, despite the fact that the employment count does not change between the beginning and end of the quarter) and the latter term the contribution of the change in the average earnings (which is adjusted by its average share). This decomposition has especially interesting patterns for job stayers, which we explore below.

4 Earnings of Job Stayers and Job Transitioners

This decomposition method allows us to decompose changes in average earnings into the contributions of separate components. Figure 2 shows the evolution of average earnings in our dataset. The overall change in average real quarterly earnings was, on average, around $38, but there is considerable heterogeneity in its level over time. From 1994 to 1995, average real earnings declined (and so the average change was negative). In later years, average real earnings only declines around and especially after economic downturns: average real earnings declines from 2000 to 2002, and also from 2008 to 2010. In the late stages of economic expansions, average earnings is quite high: average earnings growth exceeds $100 per quarter during 2005 and into 2006, and is especially high during the late 1990s, when, as described above, there is a level shift upwards in most wage and earnings series for the U.S. Average quarterly earnings growth exceeds $100 during 1998 and 1999, and during 1999 surges in excess of $250. The small decline during the year 2000 and during 2001 and 2002 only partly eroded this upward shift in the average earnings series, and so average earnings is consistently higher during the 2000s than during the mid 1990s.

Figure 2 also contains the contribution to the average earnings by source using the decomposition grouping from equation (1) above, with within-quarter and adjacent-quarter job-to-job flows grouped into a single job-to-job flows category. Job stayers constitute in excess of 80% of employment both at the beginning and end of every quarter, and so despite having small changes in earnings overall, have a very strong relationship with the average earnings series,

and contribute, on average, $54 to average earnings (this is positive and in excess of the overall rate of change in average earnings because net nonemployment flows have persistent negative contribution to the average earnings series). The contribution of job stayers closely tracks overall earnings growth, especially during the late stages of economic expansions. The surge in average earnings overall during the 1999 is almost perfectly matched with the contribution of stayers to the average, and also is quite close during the years 2005 and 2006. During and after economic downturns, however, the job stayer contribution to earnings growth does not track overall growth quite so closely.

There are two other components of average earnings presented in Figure 2, job-to-job flows and the net contribution of entry to and exit from employment into nonemployment. The job-to-job flows contribution appears modest and procyclical throughout the time series, although it is associated with an average quarterly change of $31, and so is on average rather close to the average change in earnings overall. During the late 1990s, and again during 2005 and 2006, job-to-job flows contributed in excess of $40 per quarter to average earnings. During and after business cycle downturns, job-to-job flows contribute less than $20 to average earnings growth, and during the year 2009 contributed less than $10 to average earnings growth. The contribution of nonemployment is more procyclical but is persistently negative, subtracting around $44 from earnings. The reason that the net contribution of nonemployment is negative rather than positive (recall that the number of employment entrants exceeds the number of employment exiters because the number of employed is increasing) because those leaving employment to nonemployment tend to earn much more than those entering employment from nonemployment, see Daly and Hobijn (2016). During expansions, the net contribution of nonemployment can be close to zero, while during downturns downward changes in average earnings associated with the net contribution of nonemployment can exceed $100 in magnitude.

4.1 Short vs. Long Tenure Job Stayers

Job stayers, as we have defined them, account for more than 80% of employment at the beginning and end of each quarter. Yet, it is known from studies such as Altonji and Shakotko (1987), Abraham and Farber (1987), and Topel (1991) that earnings evolve rapidly at the start of the job and then more slowly afterwards: in other words, there are concave returns to tenure.

This suggests that the earnings growth of relatively low tenure workers may be something that one would want to classify with job-to-job flows and entrants from nonemployment rather than with longer-tenure stayers.

We therefore decompose the contribution of stayers into that which comes from long-tenure vs. short tenure job stayers. Long-tenure job-stayers are ones that have had the same job as dominant among any consecutive quarter jobs for eight or more quarters, while the remainder have had the same dominant source of earnings for fewer than eight quarters. Overall, about 40% of jobs are short tenure, and this fraction has declined during the 2000s in the U.S. economy, see Hyatt and Spletzer (2015). Short tenure jobs contribute slightly less to average earnings growth compared to longer-tenure jobs, providing $28 vs. $33 dollars in earnings in the years 1995-2014.[5]

The relative contribution of so-defined long- and short-tenure job stayers is shown in Figure 3. The contribution of short-tenure job stayers is somewhat like that of job-to-job flows: consistently positive, and without a large amount of variation. By contrast, the real earnings of job stayers increases more during expansions, and is negative during business cycle contractions. Furthermore, the sudden shift in the earnings of job stayers during the years 1998 and 1999 is more associated with longer-tenure job stayers, rather than short-tenure stayers, although job stayers with less than two years of job tenure also show a small spike in the year 1999.

4.2 Job-to-Job Flows

As documented by Hyatt and McEntarfer (2012) and Hyatt and Spletzer (2013), job-to-job transitions are procyclical with a trend decline since the late 1990s. The contribution of job-to-job flows is further examined in Figure 4. Specifically, four components are examined, following the job-to-job flow components of the decomposition in equation (1), we plot each of the four terms in curly brackets below

$$\frac{W_t^{E,WQ^{FF}} - W_t^{B,WQ^{FF}}}{L_t^E} + \frac{W_t^{E,WQ^{MF}} - W_t^{B,WQ^{FM}}}{L_t^B} + \frac{W_t^{E,AQ^{FF}} - W_t^{B,AQ^{FF}}}{L_t^E} + \frac{W_t^{E,AQ^{MF}} - W_t^{B,AQ^{FM}}}{L_t^B}$$

[5]It takes two years of longitudinal data to determine whether a worker has had the same dominant employer for more than two years, and so our time series starts in 1996 rather than 1994.

which are defined to be the contribution of within-quarter transitions between jobs that both last for three quarters (and so full-quarter earnings are observed), the net contribution of within-quarter flows for which only one job lasts for three quarters, and two corresponding terms for adjacent-quarter job-to-job flows.

All job-to-job flow components have a procyclical contribution to earnings. Within-quarter job-to-job flows account for nearly all of the net contribution of job-to-job flows to the evolution of average earnings, while the contribution of adjacent-quarter job-to-job flows is close to zero. The contribution of full-quarter to full-quarter job-to-job flows is analogous to the accounting exercise for the earnings changes from job change proposed by Topel and Ward (1992), with the major difference being sample selection criteria. Whereas Topel and Ward (1992) established that earnings changes from job change account for about one-third of the earnings growth for young male workers, we find a surprising correspondence in its aggregate contribution: among all workers employed at stable jobs at the beginning and end of any given quarter, earnings growth from job change accounts for roughly one-quarter of this growth.

It is also noteworthy that the contribution of job-to-job flows that are between jobs that each last for three quarters, which are about half of all job-to-job transitions, accounts for the same magnitude of earnings growth as movements between jobs, where one of them only has reported earnings for exactly two quarters. The positive contribution of net movements into and from such jobs is positive because the earnings for movers into more stable jobs tend to be higher than those leaving stable jobs into shorter ones: about \$6,200 vs. \$5,500, respectively.

4.3 Movements between Employment and Nonemployment

Now, we consider the role that net movement between employment and nonemployment has on the evolution of average earnings in the LEHD data. Recall that the contribution of nonemployment in the account method in equation (1) is

$$\frac{W_t^{E,NE}}{L_t^E} - \frac{W_t^{B,EN}}{L_t^B}$$

and the former term for employment entrants contributes something positive to the change in average earnings, while the latter term for employment exiters contributes something negative. On average, exiters earn more than entrants, about \$8,300 vs. \$7,000, respectively, and this

difference dominates the fact that entrants generally outnumber entrants, and so the change in overall earnings that can be attributed to nonemployment is negative, and so exiters detract $367 from average earnings while entrants contribute only $320.

Because the level difference of each of these nonemployment series from zero dominates the variation in the series, we normalize each of these series by subtracting its average, and present a similarly normalized series for the net contribution of nonemployment in Figure 5. Overall, both the movements out of and into nonemployment have contributions that are quite procyclical. The nonemployment-to-employment series contributes more to the change in the average in the aftermath of the 2007-2009 recession, while the nonemployment-to-employment series declines by more around the 2001 recession.

4.4 Aggregate Growth and Detrending

Because we have done an exact decomposition of the average earnings series, we can consider sum of the differences, which recovers the average earnings series. We can also account for the cumulative effect of different components, which we show in Figure 6. By construction, the cumulative change in average earnings is the same as the LEHD average earnings series in Figure 1, with the exception that cumulative changes start at zero at the beginning of the time series, and so there is a level difference that is equal to the initial condition of earnings at around ten thousand dollars per quarter in 1993. Because job stayers and job-to-job transitions typically have a positive contribution to average earnings, they both have cumulative contributions that are eventually well above the cumulative average earnings series, and for a similar reason the cumulative contribution of net nonemployment flows goes off in a negative direction. In this rendering of the data, it is easier to see that despite the fact that the contribution of job-to-job flows to average earnings has considerably less variation over time than the earnings changes associated with job stayers, the contribution of job-to-job flows is roughly two-thirds that of job stayers during the time period we analyze, and that much of the difference in the cumulative effect can be attributed to a one-time rise in average earnings that job stayers contributed during the years 1998 and 1999.

To further consider the variation in cumulative effects, we detrend the series using an H-P

filter.[6] We present the cumulative deviation from the H-P trend in Figure 7. Because the H-P trends of each subcomponent does not add perfectly to the H-P detrended sum, we present the sum of the respective components, it is virtually identical to the cumulative deviation of average earnings from its H-P trend. This method of presenting the data highlights the fact that the contribution of nonemployment was persistently above its trend during the 1990s, and so was not subtracting as much from average earnings as it did during the 2000s. It also highlights the fact that the contribution of nonemployment was very negative during the early 2000s, and its deviation was only negated by the end of the 2001-2007 economic expansion. This rendering also highlights the suddenness of the surge in average earnings in the years 1998 and 1999.

5 Earnings Changes and the Extensive Margin

In the previous section, we considered the contribution of job stayers, job-to-job flows, and nonemployment to the evolution of average earnings. We now consider subcomponents of each of these, in turn. For job stayers, we examine the contribution of high vs. low tenure workers and the role of dilution vs. earnings growth. For job-to-job flows, we consider the role of within-quarter vs. adjacent quarter flows, and the contribution of flows to and from jobs where earnings are observed for the previous or subsequent job, but not both. Finally, for nonemployment we consider the contribution of exiters vs. entrants.

5.1 Earnings Changes in Levels

We also consider the distinction between the earnings growth of job stayers and the contribution of the dilution effect, as given in equation (2) above. The dilution effect captures the fact that job stayers account for a lower amount of employment at the end of a quarter than at its beginning. We show the contribution of these two components in Figure 8. Because job stayers contribution to average earnings depends on how much net entry there is, the contribution of the change in share is generally negative. The exception is during business cycle contractions, when the employed population expands, and also when stayer earnings changes can be negative (since the contribution is a product of the two). By contrast, the change in stayer earnings is

[6] We have also detrended the series using a straight line. Results are qualitatively similar, although there is, by construbtion, considerably more deviation for a linear trend relative to a H-P trend.

persistently positive with the exception of 2008 and 2009 when stayer earnings drop slightly, on average. This further decomposition indicates that part of the job stayer contribution to average earnings growth during contractions and in the early stages of expansions is due to less employment growth rather than earnings increases of job stayers.

The earnings of job stayers are explored further in Figure 9. Here, job stayers are again broken up by job tenure into those that have worked at their jobs for two or more years relative to those that have been at their job for less than two full years. Here, we see that the earnings changes associated with workers with low and high job tenure are of the same magnitude. The earnings changes of longer tenure workers are more clearly cyclical, exceeding the earnings changes of short tenure workers somewhat during the expansion of the late 1990s, and falling well around the 2007-2009 recession.

5.2 Earnings Changes in Logs

We now turn to earnings changes in logs. Changes in log earnings have the appealing property of being approximately equal to percentage changes, which aids in the interpretation of these results. This decomposition exercise describes something closer to the changes in median earnings, as opposed to the previous exercise that accounts for changes in the average. A log transformation of earnings reduces the influence of very high earners. Results from this decomposition exercise are shown in Figure 10. Overall, the relative contributions of job stayers, job-to-job transitioners, and movements into and from nonemployment have similar cyclicality but are different in magnitude from the previous exercise in earnings levels. The job stayer contribution to earnings growth is most apparent in the late 1990s, when it provided 0.05% to 1% incrases in earnings. After the year 2000, job stayer growth is close to zero until the 2007-2009 recession, after which it is native. This implies that the average change in log earnings in the years 2007 and onward was actually negative. That the exercise in levels shows that stayers have increasing earnings in most of these quarters, this suggets that earnings growth was concentrated among the higher earners.

Job-to-job transitioner earnings growth accounts for much more of earnings growth in logs. Again, job-to-job flows contribute to earnings growth throughout the time period, and this earnings growth contribution is procyclical. The contribution of job-to-job flows to earnings

growth adds 0.2% to 0.7% to earnings each quarter, despite the fact that less than 10% of workers are engaged in job-to-job flows. This seeming discrepancy is because job-to-job transitioners generally have proportionate earnings very higher earnings changes, in the high single digits or low double digits. This earnings contribution approximately quantifies the frequencies and earnings changes of job-to-job flows.

The extensive margin, net flows into and from nonemployment, again has a strong negative contribution to earnings growth. This contribution is the most negative during the expansion years of the late 1990s, when employment growth was the most rapid, and contracted sharply during the 2007-2009 recession, and afterwards recovered. The contribution of nonemployment subtracts between 0.2% and 1% from earnings growth each quarter. Interestingly, in a typical quarter, earnings changes from job-to-job transitions are contributing slightly less than 0.5% to earnings, while nonemployment flows are subtracting slightly less than 0.5%. The magnitudes of both are also roughly procyclical, and so when net moves from nonemployment subtract less from earnings, job-to-job transitions contribute less. Because of this realtive balancing of these two factors, one might conclude that job stayers again drive the level shift in earnings growth during the late 1990s, but the overall amount of change in log earnings is smaller than the proportionate chanve in levels, so there is less growth to explain.

We can again examine the stayer category distinguishing between jobs of short and long tenure (again, less than two vs. two or more years), as shown in Figure 11. As opposed to the evidence in levels, where short tenure and long tenure jobs contribute roughly equally to earnings growth, in logs, shorter tenure jobs dominate the contribution of job stayers to earnings growth. Throughout the time series, short tenure jobs contribute roughly 0.3% more to earnings than do jobs of longer tenure. Short tenure jobs contribute to earnings growth throughout the time series, while longer tenure jobs only contribute to earnings growth during the 1990s. After that, longer tenure jobs have roughly zero contribution to earnings growth, with the exception of the 2007-2009 recession and the years that follow, when earnings changes are negative for longer-tenure job stayers.

6 Hours and Wages

Our previous decomposition is done on jobs with full-quarter earnings, that is, quarterly earnings for jobs that span three consecutive quarters. However, not all jobs span three quarters, and so this decomposition does not include earnings for job-to-job transitioners where the jobs last for only one or two quarters due to the unavailability of job start end end dates.

Therefore, we supplement earnings information with the hours worked as reported by the employer. This allows us to consider the earnings per hour worked, which is an approximate measure of the hourly wage. By doing so, we can consider all jobs in the job-to-job flow universe. We are constrained in this effort because only three states have hours data available (see Kurmann, McEntarfer, and Spletzer (2014)), and so we have to rely on imputation for hours for most of our 11 state dataset.[7]

6.1 Hours

The evolution of hours worked is shown in Figure 12, which decomposes the changes in total hours worked per quarter into the changes for job stayers and job-to-job transitioners, as well as the net contribution from entrants from nonemployment. The late 1990s saw increases in the total number of hours worked, and the years that follow showed less growth in hours. Hours worked is also procyclcial, rising in expansionsm and slowing down during and after recessions.

Job-to-job flows contribute to increases in hours worked. Job-to-job transitions contribute an additional 1 to 3 hours to total hours worked on a quarterly basis, and this contirbution is procyclical. Given that full-time work in a quarter entails on the order of five hundred hours, these hours changes are modest in any quarter, but they can account for more of a change over time.

Job stayers, by contrast, tend to either have no net change in hours worked during expansions, and lost hours worked during and after contractions. Therefore, nearly all of the gains in hours that occur duirng expansions is accounted for by job-to-job flows alone. That is, hours losses during and after recessions are not followed by gains in hours worked by job stayers, instead, they recover via increases associated with job-to-job flows.

[7]Results for only the set of states where hours data are avialble are qualtiatively similar, but the imputed data is more representative of earnings changes in the U.S. This is because the imputation algorithm uses firm characteristics and employee demographic and job tenure information as covariates.

The general dampening effect that net nonemployment has on hours worked is smaller and even sometimes positive on hours worked. Net nonemployment has a positive contirbution just before the 2001 recession, as well as during the 2007-2009 recession. These time periods are both associated with showdowns in employment growth. Overall, the net contribution from nonemployment subtracts roughly a half hour from total hours worked, although there is substantial cyclcial variation. as well

Again, we turn our attention to differences in hours changes for stayers of short and long tenure, with results shown in Figure 13. Job tenure does not seem to matter much for changes in hours: the movements in hours worked track each other closely throughout the time series, with shorter tenure jobs often having slightly lesser reductions in hours compared with higher tenure jobs.

6.2 Wage Levels

While job-to-job transitioners dominate growth in hours, job stayers play much more of a role in changes in wages. This is shown in Figure 14, which applies the familiar decompostion of equation (2) to identify the separate impacts of the wage growth of stayters, job-to-job transitioners, and net nonemployment. Wage growth is procyclical, with strongest increases during the late 1990s, and contractions in the wake of the 2001 and 2007-2009 recessions.

Job stayers exhibit earnings growth that contributes to increases in wages throughout the time series, although the growth is storngest during contractions. This growth is in the range of 8 cents to 35 cents per hour on a quarterly basis. As shown in Figure 15, longer-tenure job stayters have a slightly larger impact on hourly wage increases than those workers with less job tenure.

Job-to-job flows generally contribute to earnings increases as well, but those incereaess are smaller, at 5 cents or less per quarter. The contribution of job-to-job flows to wage changes is also procyclical, and wage changes are slightly negative in the late stages and shortly after the 2001 and 2007-2009 recessions, because job-to-job transitioners are taking modest hourly wage cuts, on average, when the labor market is at its weakest.

The net contribution of nonemployment is again negative throughout the time series, but, again, there are countercyclical reductions in its magnitude. Although in most of the time

series, nonemployment subtracts 15 cents to 25 cents from wages, in the wake of the 2007-2009 recession, it subtracted as little a 7 cents per hour.

6.3 Log Wages

Similar results for wages hold when we take logs, although there is less of a dramatic increase in the log wage series compared to the increase in wage levels. Log wages incraeses in the late 1990s, and are mostly flat after the year 2000, as shown in Figure 16.

The wage increases of job stayers contribute to wage growth throughout the time series, although its contribution declines from the late 1990s, where job stayers contribute to 0.5% to 1% increases in earnings, through the expansion years of 2001 to 2007, and is less than 0.5% during and after the 2007-2009 recession, although earnings recover somewhat in 2013 and 2014. In Figure 17, we show that the increase in tenure for log wages comes slightly more from longer tenure job stayers than shorter tenure job stayers.

Wage changes for job-to-job flows have a modest, positive, procyclical contirbution to log wage growth, contributing between 0% to 0.2% to earnings growth each quarter. Like wage levels, the log wage increases are much lower than the log wage increases associated with job stayers.

Net movements from nonemployment have a negative impact on average log wages that, with the exception of the late 1990s, basically offsets the positive contribution of job stayer and job-to-job transitioner log wage growth. Log wage growth has a countercyclical dampening in magnitude, as fewer entrants enter and relatively high-earning layoffs contribute to earnings decreases. This extensive margin calculation is the closest in this paper to the extensive margin wage accounting exercise of Daly and Hobijn (2016), and the results are qualitatively similar but somewhat less cyclcial than their results indicate.[8]

[8]See Daly and Hobijn (2016), page 30, Figure 4, who calculate the extensive margin from the Current Population Survey, and find that this subtracts slightly more than 2% from wages on an annual basis. We find in the LEHD that the extensive margin never exceeds 1% on an annual basis during expansions. Instead of becoming slightly positive in the wake of the 2007-2009 recession, we find instead that the quarterly net subtraction reaches 0.4%.

7 Conclusion

This draft presents preliminary results on how earnings in the U.S. evolved from the years 1994-2014. Earnings growth is procyclical, and there is astonishing growth in earnings during the late 1990s. We propose an accounting method to distinguish between the contribution of job stayers, job-to-job flows, and movements into and from nonemployment. We find that all three components contribute to the cyclicality of earnings growth. However, the spike in earnings growth appears to be concentrated among job stayers, who received a one-time earnings increase in the late 1990s, and did not lose those earnings during the years that followed.

These results are consistent with previous findings that job stayer earnings movements have a critical role in the cyclicality of earnings growth, and indeed dominate the series. It also establishes that arguments about the decline in job-to-job flows leading to declining earnings growth via the accounting mechanism in Topel and Ward (1992) have some role in understanding earnings dynamics in the U.S. labor market. However, the last upswing in average earnings in the late 1990s is unlikely to find any explanation in the earnings growth from job change. The relatively high rate of job-to-job transitions may have led to the earnings growth of job stayers, but that is a question that is left for later studies.

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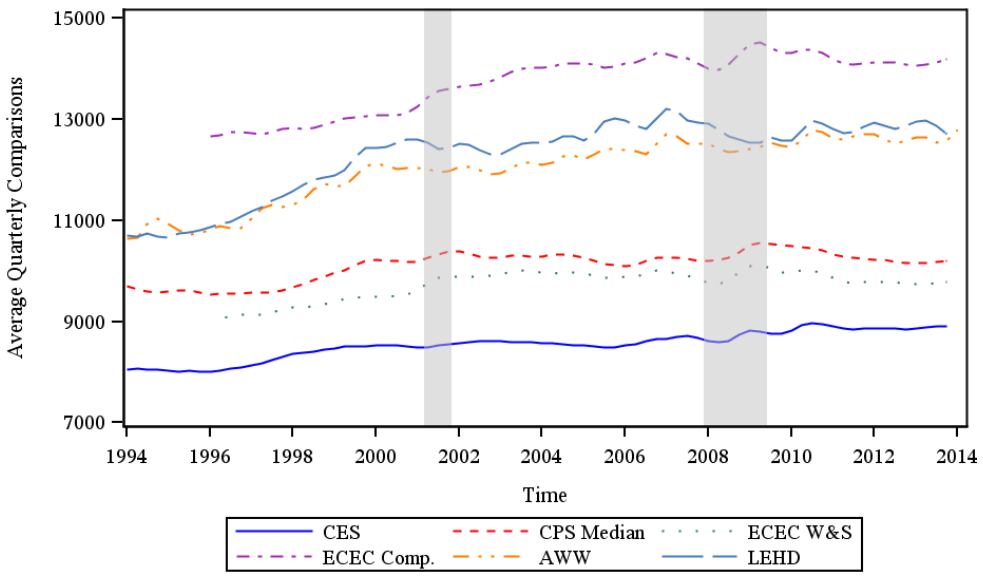
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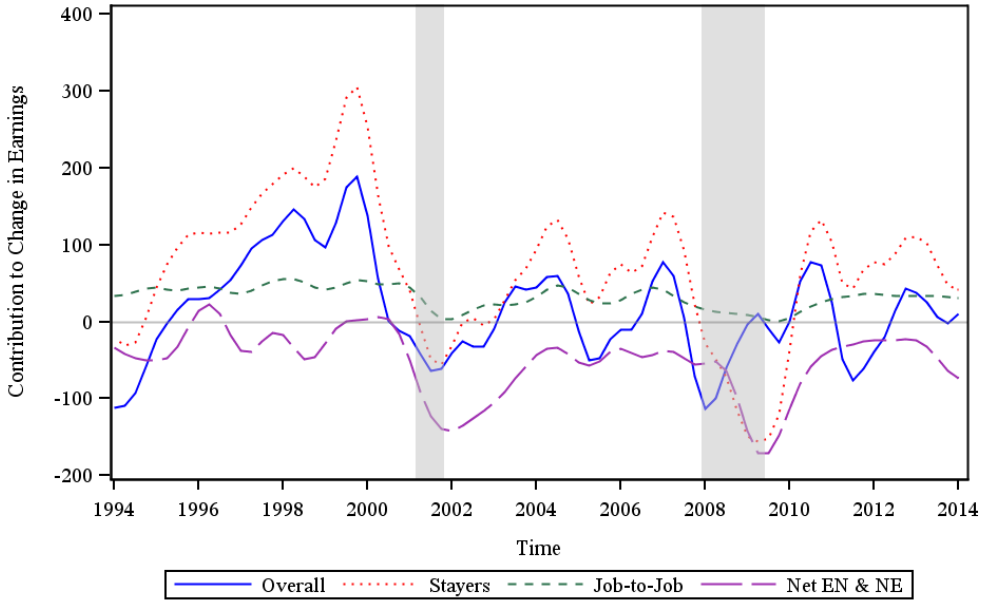
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Figure 1: Trends in Average Compensation in the U.S., 1993-2014



Notes: All values are 2014 constant dollars, seasonally adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
CES indicates the current employment statistics average weekly earnings for nonsupervisory employees, multiplied by 13.
CPS Median indicates the median weekly earnings for full-time employees, multiplied by 13.
ECEC W&S indicates per-employee wage and salary compensation from the Employer Costs of Employee Compensation Survey.
ECEC Comp. indicates total wage, salary, and benefit compensation per employee from the Employer Costs of Employee Compensation Survey.
AWW indicates the average weekly wages for all paid employees in the private sector, multiplied by 13.
LEHD indicates the average quarterly earnings of those workers employed for three consecutive quarters in a consistent set of LEHD states.

Figure 2: Change in Average Earnings and Contribution by Component



Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
Overall indicates the total change in earnings within a quarter.
Stayers the component attributable to job stayers.
Job-to-Job the component attributable to those changing employers.
Net EN & NE the component attributable to those entering and exiting nonemployment.

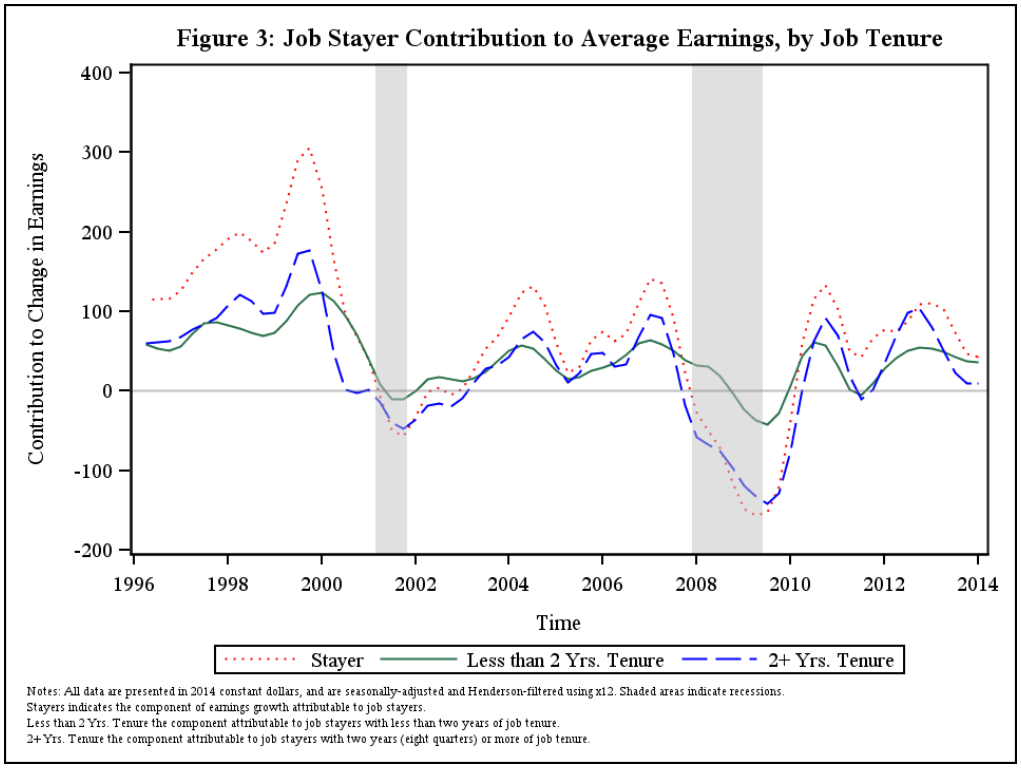
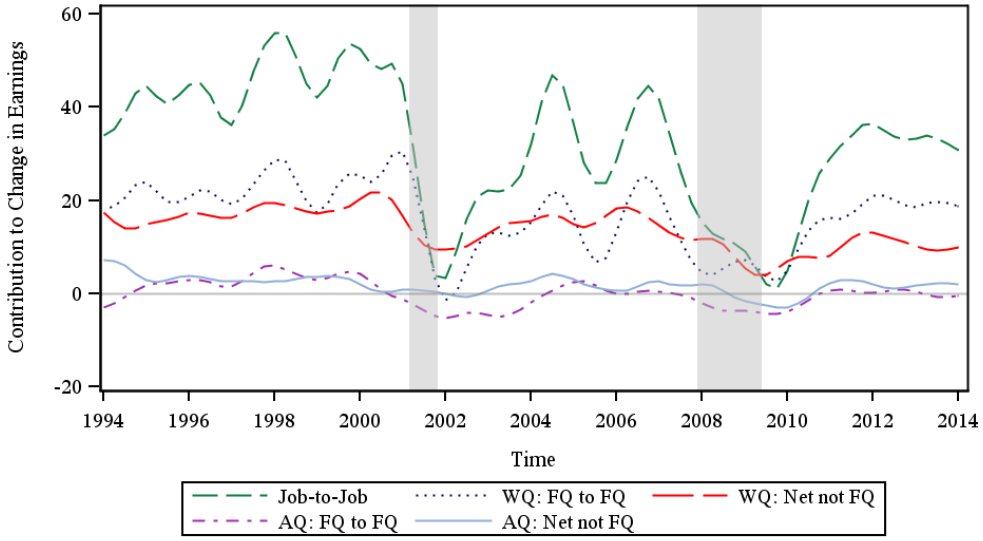
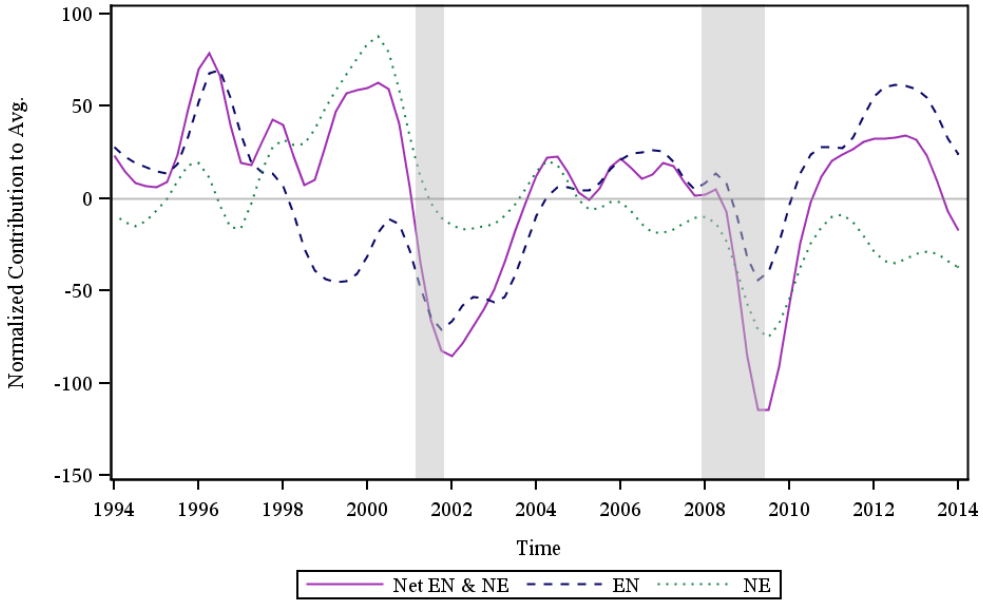

Figure 3: Job Stayer Contribution to Average Earnings, by Job Tenure
Contribution to Change in Earnings
400
300
200
100
0
-100
-200
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
Time
Stayer
Less than 2 Yrs. Tenure
2+ Yrs. Tenure
Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
Stayers indicates the component of earnings growth attributable to job stayers.
Less than 2 Yrs. Tenure the component attributable to job stayers with less than two years of job tenure.
2+ Yrs. Tenure the component attributable to job stayers with two years (eight quarters) or more of job tenure.

Figure 4: Job-to-Job Flow Contribution to Average Earnings, by Sub-Component



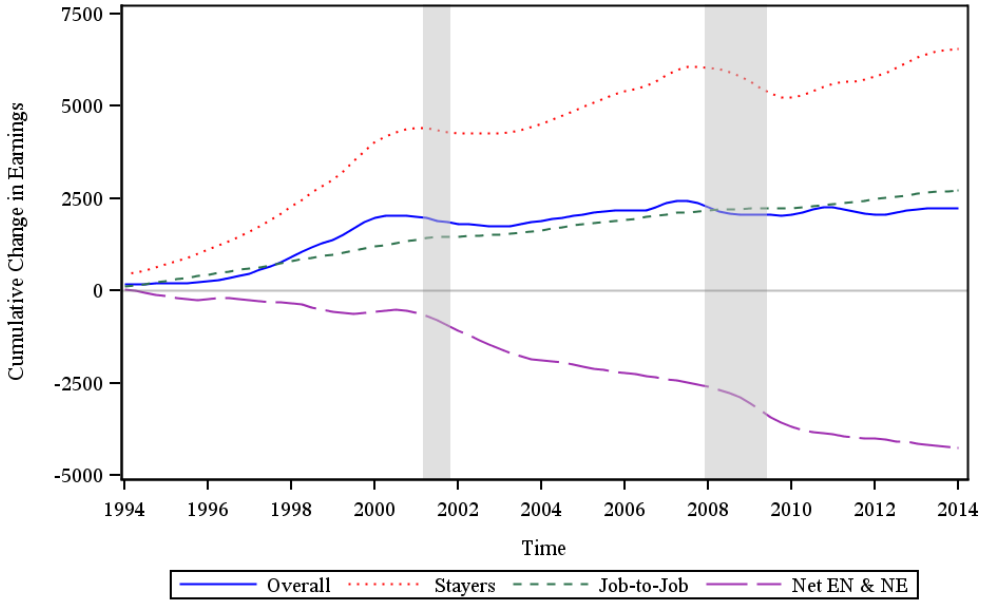
Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
Job-to-Job indicates the change in average earnings attributable to those changing employers
WQ: FQ to FQ the component attributable to those workers moving between employers where the employment lasts more than three quarters at the previous and subsequent employer and the separation and hire occur in the same quarter
WQ: Net not FQ the component attributable to movement into and out of jobs that do not last a full-quarter and where the separation and hire occur in the same quarter
AQ: FQ to FQ the component attributable to those workers moving between employers where the employment lasts more than three quarters at the previous and subsequent employer and where the hire occurs in the quarter immediately following the quart of job separation
AQ: Net not FQ the component attributable to movement into and out of jobs that do not last a full-quarter and where the hire occurs in the quarter immediately following the quarter of job separation

Figure 5: Net Nonemployment, Normalized, by Entrants vs. Exiters



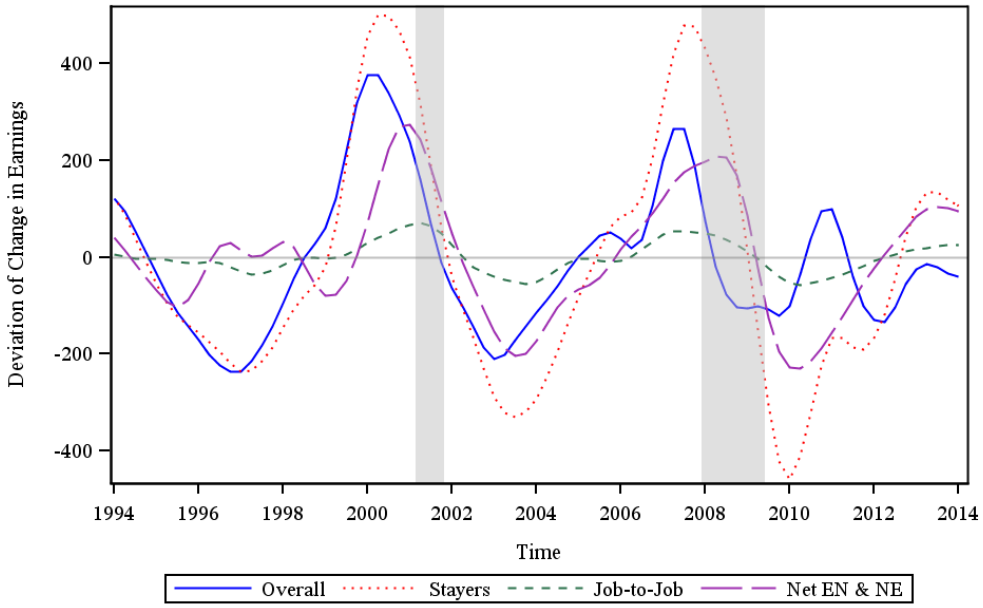
Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
All series are normalized by extracting the average contribution attributable to each component (i.e. the mean of each series presented is zero).
Net EN & NE indicates the normalized component of average earnings attributable to those entering and exiting nonemployment.
NE those entering employment from nonemployment.
EN those entering nonemployment from employment.

Figure 6: Cumulative Change in Average Earnings and Contribution by Component



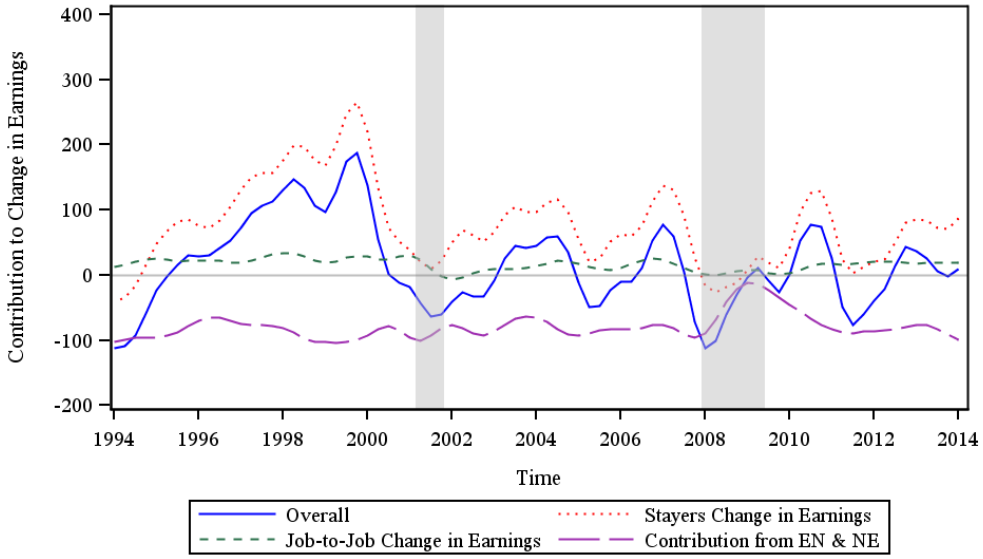
Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
Overall indicates the total change in earnings within a quarter.
Stayers the component attributable to job stayers.
Job-to-Job the component attributable to those changing employers.
Net EN & NE the component attributable to those entering and exiting nonemployment.

Figure 7: Deviation of Change in Average Earnings from H-P Trend, by Component



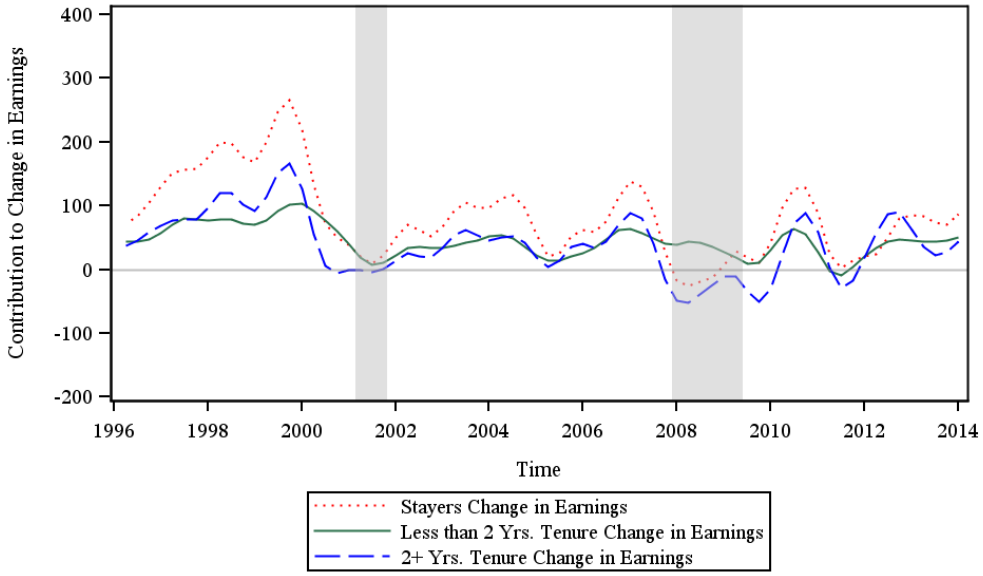
Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
Overall indicates the total change in earnings within a quarter.
Stayers the component attributable to job stayers.
Job-to-Job the component attributable to those changing employers.
Net EN & NE the component attributable to those entering and exiting nonemployment.

Figure 8: Contribution to Average Earnings: Earnings Growth vs. Dilution through Employment Growth



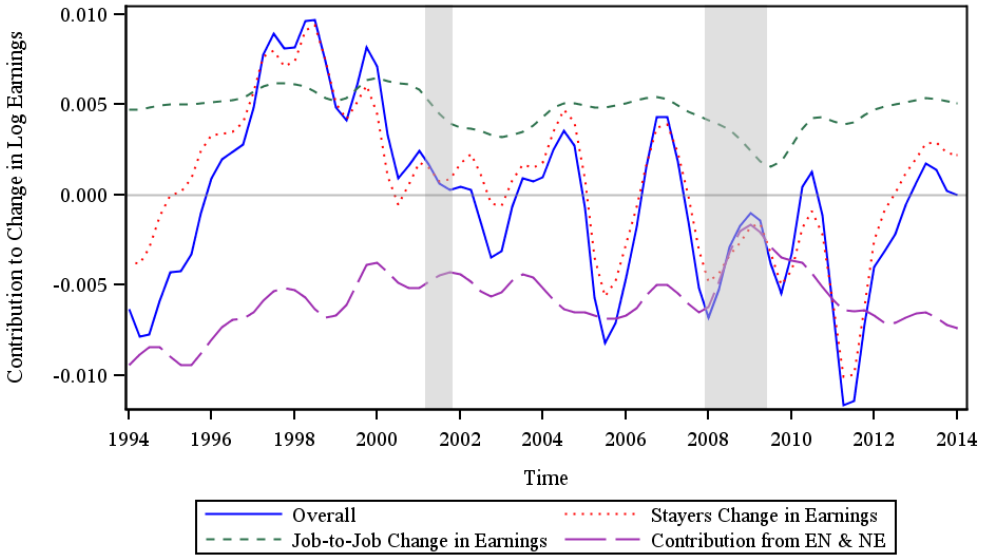
Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
Overall indicates the total change in earnings within a quarter.
Stayers Change in Earnings the component attributable to the change in earnings for job stayers multiplied by the average share of job stayers.
Job-to-Job Change in Earnings the component attributable to the change in earnings for those changing employers multiplied by the average share of those changing employers.
Contribution from EN & NE indicates the sum of the component attributable to the difference in earnings between those entering and those exiting nonemployment multiplied by the average share of those entering and exiting nonemployment and the change in share of employment where earnings are observable multipled by average earnings for that quarter.

Figure 9: Job Stayer Contribution to Average Earnings, by Job Tenure: Earnings Growth vs. Dilution through Employment Growth



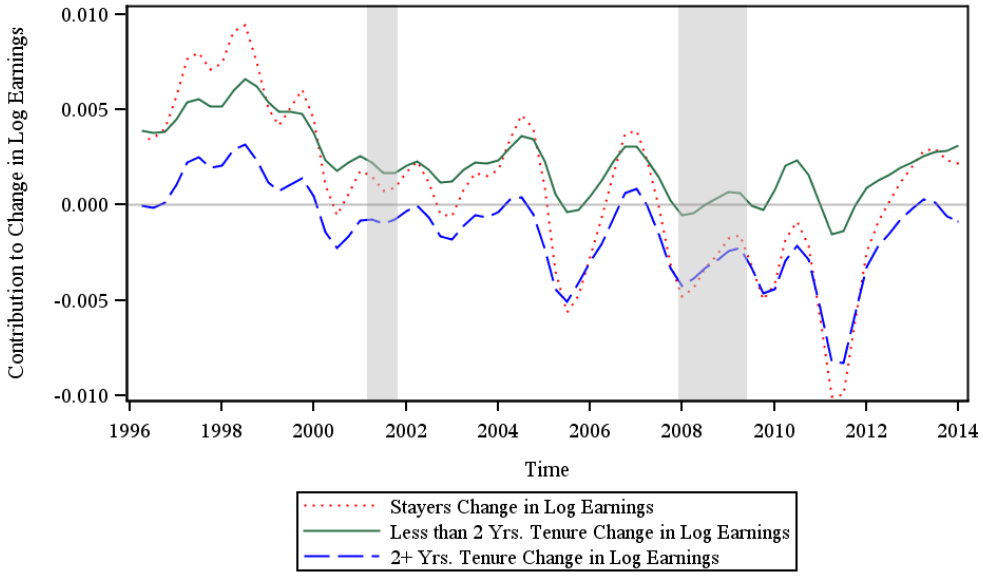
Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
Stayers Change in Earnings indicates the component of the total change in earnings within a quarter attributable to the change in earnings for job stayers multiplied by the average share of job stayers.
Less than 2 Yrs. Tenure the component attributable to job stayers with less than two years of job tenure.
2+ Yrs. Tenure the component attributable to job stayers with two years (eight quarters) or more of job tenure.

Figure 10: Contribution to Average Log Earnings: Log Earnings Growth vs. Dilution through Employment Growth



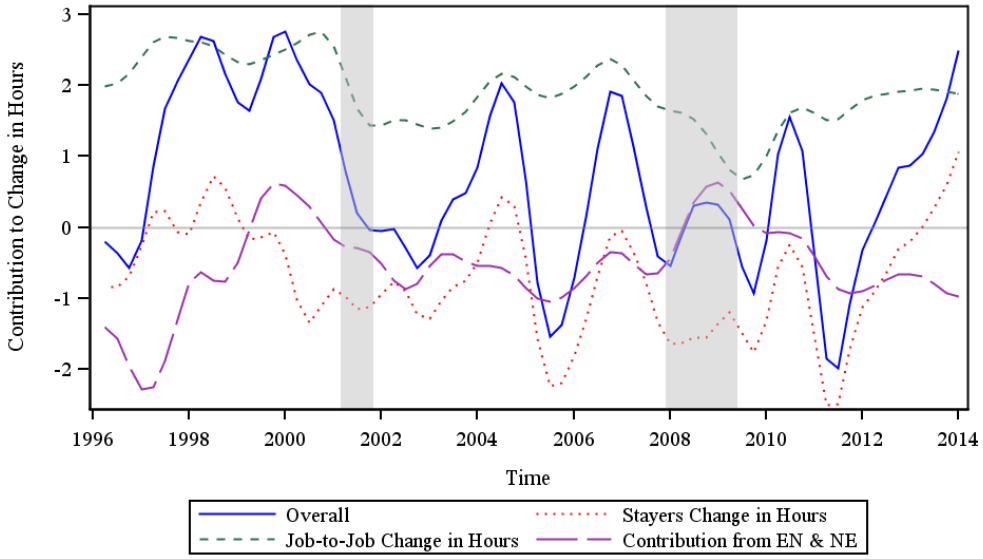
Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
Overall indicates the total change in earnings within a quarter.
Stayers Change in Earnings the component attributable to the change in log earnings for job stayers multiplied by the average share of job stayers.
Job-to-Job Change in Earnings the component attributable to the change in log earnings for those changing employers multiplied by the average share of those changing employers.
Contribution from EN & NE indicates the sum of the component attributable to the difference in log earnings between those entering and those exiting nonemployment multiplied by the average share of those entering and exiting nonemployment and the change in share of employment where earnings are observable multipled by average earnings for that quarter.

Figure 11: Job Stayer Contribution to Average Log Earnings, by Job Tenure: Log Earnings Growth vs. Dilution through Employment Growth



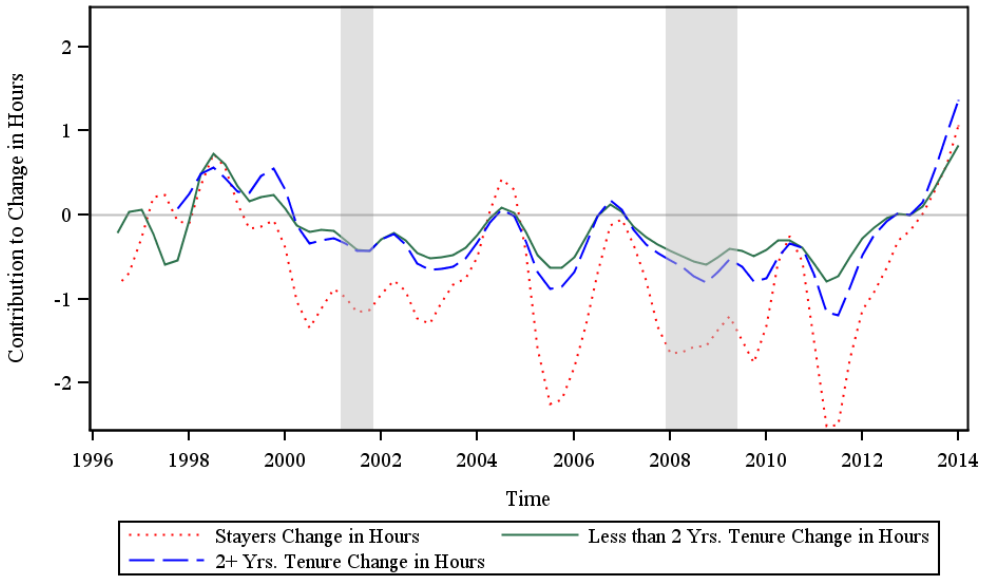
Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
Stayers Change in Earnings indicates the component of the total change in earnings within a quarter attributable to the change in earnings for job stayers multiplied by the average share of job stayers.
Less than 2 Yrs. Tenure the component attributable to job stayers with less than two years of job tenure.
2+ Yrs. Tenure the component attributable to job stayers with two years (eight quarters) or more of job tenure.

Figure 12: Contribution to Average Hours: Hours Growth vs. Dilution through Employment Growth



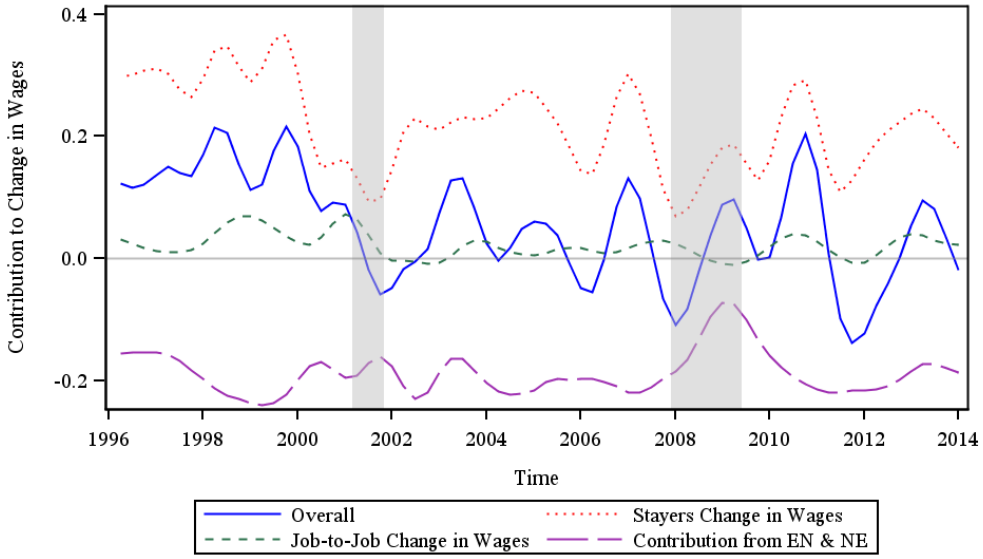
Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
Overall indicates the total change in hours within a quarter.
Stayers Change in Earnings the component attributable to the change in hours for job stayers multiplied by the average share of job stayers.
Job-to-Job Change in Earnings the component attributable to the change in hours for those changing employers multiplied by the average share of those changing employers.
Contribution from EN & NE indicates the sum of the component attributable to the difference in hours between those entering and those exiting nonemployment multiplied by the average share of those entering and exiting nonemployment and the change in share of employment where earnings are observable multipled by average earnings for that quarter.

Figure 13: Job Stayer Contribution to Average Hours, by Job Tenure: Hours Growth vs. Dilution through Employment Growth



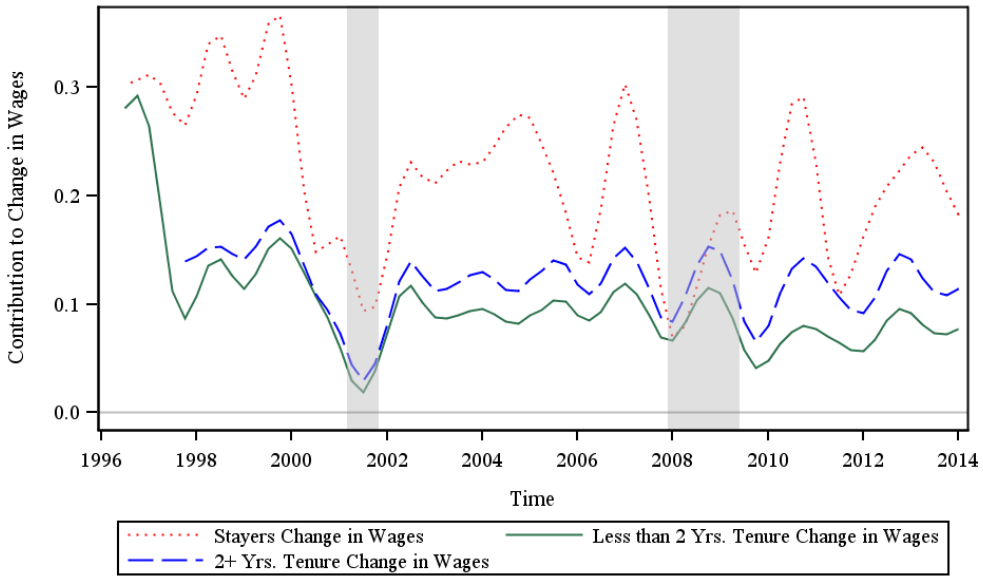
Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
Stayers Change in Earnings indicates the component of the total change in earnings within a quarter attributable to the change in earnings for job stayers multiplied by the average share of job stayers.
Less than 2 Yrs. Tenure the component attributable to job stayers with less than two years of job tenure.
2+ Yrs. Tenure the component attributable to job stayers with two years (eight quarters) or more of job tenure.

Figure 14: Contribution to Average Wages: Wages Growth vs. Dilution through Employment Growth



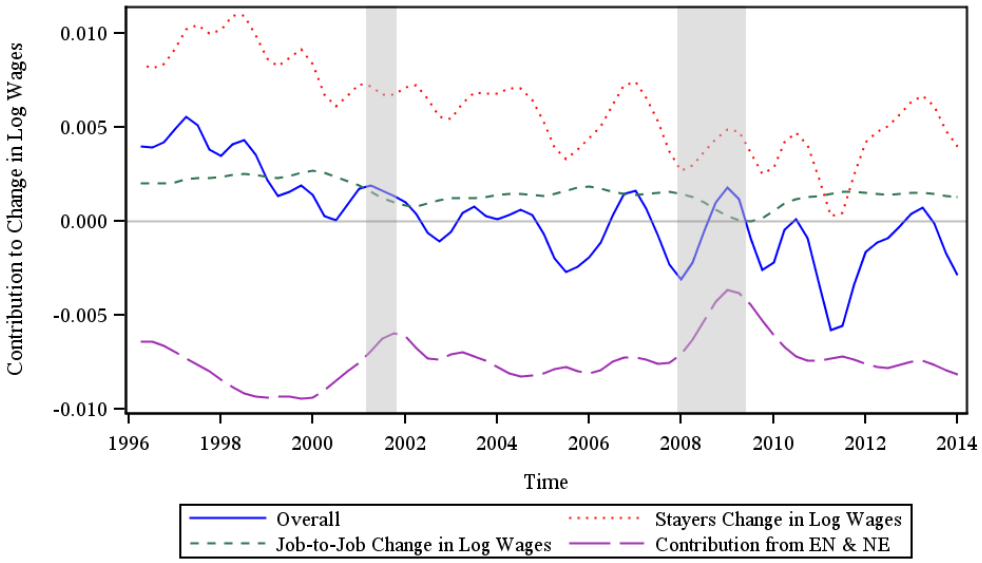
Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
Overall indicates the total change in wages within a quarter.
Stayers Change in Earnings the component attributable to the change in wages for job stayers multiplied by the average share of job stayers.
Job-to-Job Change in Earnings the component attributable to the change in wages for those changing employers multiplied by the average share of those changing employers.
Contribution from EN & NE indicates the sum of the component attributable to the difference in wages between those entering and those exiting nonemployment multiplied by the average share of those entering and exiting nonemployment and the change in share of employment where earnings are observable multipled by average earnings for that quarter.

Figure 15: Job Stayer Contribution to Average Wages, by Job Tenure: Wages Growth vs. Dilution through Employment Growth



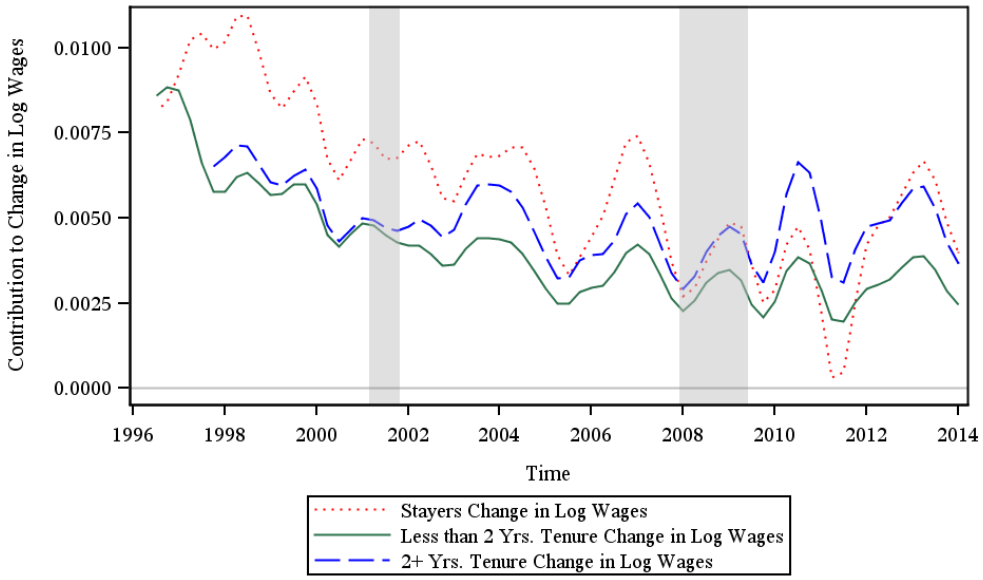
Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
Stayers Change in Earnings indicates the component of the total change in earnings within a quarter attributable to the change in earnings for job stayers multiplied by the average share of job stayers.
Less than 2 Yrs. Tenure the component attributable to job stayers with less than two years of job tenure.
2+ Yrs. Tenure the component attributable to job stayers with two years (eight quarters) or more of job tenure.

Figure 16: Contribution to Average Log Wages: Log Wages Growth vs. Dilution through Employment Growth



Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
Overall indicates the total change in log wages within a quarter.
Stayers Change in Earnings the component attributable to the change in log wages for job stayers multiplied by the average share of job stayers.
Job-to-Job Change in Earnings the component attributable to the change in log wages for those changing employers multiplied by the average share of those changing employers.
Contribution from EN & NE indicates the sum of the component attributable to the difference in log wages between those entering and those exiting nonemployment multiplied by the average share of those entering and exiting nonemployment and the change in share of employment where earnings are observable multipled by average earnings for that quarter.

Figure 17: Job Stayer Contribution to Average Log Wages, by Job Tenure: Log Wages Growth vs. Dilution through Employment Growth



Notes: All data are presented in 2014 constant dollars, and are seasonally-adjusted and Henderson-filtered using x12. Shaded areas indicate recessions.
Stayers Change in Earnings indicates the component of the total change in earnings within a quarter attributable to the change in earnings for job stayers multiplied by the average share of job stayers.
Less than 2 Yrs. Tenure the component attributable to job stayers with less than two years of job tenure.
2+ Yrs. Tenure the component attributable to job stayers with two years (eight quarters) or more of job tenure.