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Careers within Firms: Occupational Mobility over the Life Cycle

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ABSTRACT

With falling labor market dynamism in the United States, opportunities within firms take on increasing importance in young workers' career progression. Developing a variety of occupational ranking metrics, I show that occupational mobility within firms follows a standard life cycle pattern in which the frequency, distance, and wage return from mobility falls with age. However, when upward and downward mobility are considered separately, the average magnitude of directional mobility increases through middle age. I find that wage growth for young workers deteriorated substantially in the first decade of the 2000s, primarily driven by a reduction in wage growth within firms. Encouragingly, wage growth has improved markedly for young workers since 2012.

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Abstract

With falling labor market dynamism in the United States, opportunities within firms take on increasing importance in young workers' career progression. Developing a variety of occupational ranking metrics, I show that occupational mobility within firms follows a standard life cycle pattern in which the frequency, distance, and wage return from mobility falls with age. However, when upward and downward mobility are considered separately, the average magnitude of directional mobility increases through middle age. I find that wage growth for young workers deteriorated substantially in the first decade of the 2000s, primarily driven by a reduction in wage growth within firms. Encouragingly, wage growth has improved markedly for young workers since 2012.

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In the classic paper, Topel and Ward (1992) document that mobility between employers can account for one-third of wage growth for men in the first 10 years of their careers. Coupled with the fact that wage growth diminishes rapidly after this critical period,it is clear mobility between employers plays an important role in lifetime earnings.[1] In recent years, however, the U.S. economy has become remarkably less dynamic.[2] Employer mobility has plummeted by approximately 30 percent between 1995 and 2016.[3] Concerningly, in Forsythe (2017) I find that the reduction in hiring during the Great Recession was primarily concentrated among workers in the first 10 years of their careers, the same workers Topel and Ward (1992) identified as having the most to gain from such mobility.

With career opportunities waning between firms, career development and wage growth within firms take on greater importance. Thus, in this paper I focus on life cycle career dynamics within firms. In previous work (Forsythe 2018), I find that wage growth is closely tied to the direction of occupational mobility. In this paper, I develop a variety of occupational ranking metrics and investigate how mobility rates and wage returns to mobility within the firm vary over the life cycle, using data from the monthly Current Population Survey (CPS) and the tenure supplement. I then investigate how such mobility has changed over the last two decades.

Similar to mobility between employers, I find that occupational mobility within firms declines over the life cycle. In addition, I find that the average change in occupational quality declines with age. While young workers make substantial gains in occupational quality upon changing occupations, this falls steadily with worker age until age 50, at which point the average occupational change is to a lower-quality occupation. These patterns hold across a variety of ranking metrics, using occupational wages, task-based measures, and occupational ratings for required education or experience.

These average changes mask important differences in the types of occupational moves

[1] See, for instance, Murphy and Welch (1992) and more recently Manning and Swaffield (2008).
[2] See, for instance, Hyatt and Spletzer (2013, 2016).
[3] See Figure 5.

individuals make over the life cycle. The magnitude of changes in occupational rank is U-shaped over the life cycle, with young workers making the smallest distance of moves up and down, and magnitudes flattening through midcareer and then shrinking again after age 60. However these life cycle differences are not reflected in wage growth: young workers experience the largest wage changes with up and down mobility, despite making moves of the smallest magnitude.

The fact that workers experience downward mobility throughout their careers indicates that career-development is substantially more nonlinear than evidenced in aggregate wage growth. Such moves are associated with reduced wage growth on average, with many individuals experiencing real wage losses. Wage growth is fastest for individuals who move to higher-ranked occupations, which holds for workers in all stages of the life cycle.

In the second part of the paper, I examine trends in mobility and wage growth over the past two decades. I find that average wage growth for young workers has fallen precipitously since the mid-1990s, while wage growth for midcareer workers has varied little over this time period. The bulk of the reduction in wage growth for young workers is because of reduced wage growth within firms. I find that the returns to upward mobility for young workers within the firm fell by 8 percentage points after 2006, while average returns to downward mobility fell by 5 percentage points.

Although I find total occupational mobility has fallen since 1995, this is primarily because of a secular decline in mobility between firms, which is associated with much higher rates of occupational change than we see for individuals remaining within employers. Rates of internal mobility do exhibit a negative trend break around 2002 but have been roughly flat from 2005 to 2016. In addition, I do not find any systematic variation over time in the direction of mobility (either within or between firms), or the magnitude of occupational change, which could explain the deterioration in returns to mobility within firms.

Thus, while falling labor market dynamism does not appear to extend to job mobility within firms, the deterioration in wage returns within firms leads to another margin by which

labor market conditions worsened for young workers throughout the 2000s.

Related Literature

Since early work by Shaw (1984), the literature on occupational mobility and tenure has expanded rapidly. Work by Kambourov and Manovskii (2009) documents the substantial role of occupational tenure on earnings, arguing occupational tenure can explain more of earnings growth than industry or employer tenure. This relationship has been confirmed in other settings, including Denmark (Groes 2010) and Sweden (Kwon and Meyersson Milgrom 2014).

On the other hand, another body of literature has documented substantial wage returns from occupational mobility. In previous work (Forsythe 2018), I show that wage growth from occupational mobility depends on the direction of mobility: individuals who move to higher-quality occupations experience substantially faster wage growth than occupational-stayers, while those who move to lower-quality occupations experience substantially slower wage growth than stayers. Other papers have shown the importance of this directionality of mobility, in particular, Groes, Kircher, and Manovskii (2013), who document similar patterns of upward and downward mobility using Danish administrative data, and Frederiksen, Halliday, and Koch (2016), who use the same Danish data to find that wage returns match the direction of mobility for moves in and out of management.

Several recent papers have bridged these two perspectives by emphasizing the role of task-specific human capital. By situating occupations in Euclidean space based on detailed information of occupational tasks, Poletaev and Robinson (2008) and Gathmann and Schönberg (2010) find that this distance is an important determinant of wage losses and growth based on involuntary and voluntary mobility, respectively. Most similar to this paper, Robinson (2018) augments his previous work on distance with measures of direction. Although the primary focus of the paper is on displaced workers, Robinson (2018) finds that the average

direction of moves for all workers becomes more negative in the second half of the career. This is consistent with what I find for internal movers; however, I will show that this average masks important differences in the magnitude of upward and downward moves over the life cycle.

By focusing on occupational movements within firms, this paper relates to a large literature in personnel economics on careers and job mobility within employers. The two classic citations, Baker, Gibbs, and Holmström (1994a,b), reveal many patterns about wage and promotion dynamics within firms; however, the firm studied in these papers was somewhat unique in the fact that it did not use demotions. Other studies using data from different firms reveal a wide variety of practices. See Frederiksen, Lange, and Kriechel (2017), who harmonize several personnel data sets. Further, some of the earliest work on occupational mobility within firms — for example, Gitelman (1966) — found substantial rates of upward and downward occupational mobility in a watch company in the second half of the 19th century.

Finally, this paper relates to the literature on how job mobility and wage growth vary over the life cycle. As referenced in the introduction, Topel and Ward (1992) is the classic citation; however, others have documented that mobility rates fall over the life cycle, including a series of earlier papers beginning with Bartel (1980) and Borjas (1981). Manning and Swaffield (2008) find that life cycle job mobility patterns are similar for male and female workers in the United Kingdom. Most closely, McCue (1996) shows that promotion rates fall over the life cycle and wages rise faster with promotion.

Methodology

I use monthly CPS survey data from January 1994 through October 2016. The CPS is a large national survey of U.S. households, which provides cross-sectional data for national employment statistics. The CPS is conducted as a panel, in which each household is surveyed

up to eight times, thus allowing measurement of labor market mobility. Before 1994, the CPS used independent coding — that is, each month the survey treated respondents as new participants. This led to a great deal of noise in the coding of occupations and industries, and did not allow one to distinguish between firm-stayers and firm-changers.[4] With the major survey redesign in 1994, individuals were asked if they still worked for the same employer and if their duties and activities had changed, allowing a cleaner observation of occupational mobility, but only for individuals remaining within the same employer.

The CPS is structured as a rotating panel, wherein each household is surveyed for four consecutive months, takes an eight-month break, and then is surveyed for four more months. This allows researchers to match individuals across pairs of months and observe labor market changes. In particular, I use a procedure developed by Madrian and Lefgren (1999) to match individuals using administrative IDs and confirm matches using sex, race, and age. As the fifth month of the survey returns to independent coding, there is only mobility information for six pairs of months for each individual.

In my specifications, I restrict the sample to individuals employed in the first month with nonallocated occupation codes. I exclude month pairs spanning January 2003 and January 2011, the times at which the CPS changed occupational coding systems. The final sample includes 11.6 million observations. The first three columns of Table A.1 in Appendix A provide summary statistics.

Although the matched monthly sample provides a large sample for observing occupational mobility within firms, the CPS only collects wage data during survey months four and eight, which are not linked via dependent coding. This makes it impossible to determine if the individual was employed in the same firm at both points in time. In order to measure wage changes with occupational mobility, I follow a procedure I developed in previous work (Forsythe 2018), which uses the Tenure Supplement to determine if the worker was employed at the same firm during both wage observations. The main limitation of this approach is

[4]See Moscarini and Thomsson (2007) for a detailed exploration of this problem.

that it restricts the sample size, since the tenure supplement is only conducted one month every two years.[5] The second half of Table A.1 provides summary statistics for this sample.

Measuring Occupational Mobility

In order to measure occupational mobility within firms, I utilize the dependent coding discussed in the previous section. In particular, once individuals have affirmed that they have not changed employers, they are asked, "Have the usual activities and duties of your job changed since last month?" If yes, then the enumerator asks open-ended questions to elicit a description of the job, which is then assigned to a particular occupation by trained coders. Thus, I define internal occupational mobility in the monthly sample to be individuals who report that their duties have changed and are coded to a new occupation from the previous month.

This leads to substantially lower rates of occupational mobility than I measure in the annual match, which is based on independent coding. In this case, between the two survey months, the CPS enumerator asks the respondent to describe their job without reference to the previous response. For individuals in this sample, I define occupational mobility as changing occupational codes between survey months. This is the same methodology that I use to construct occupational mobility for individuals who change firms, since the CPS does not use dependent coding for any between-firm movements. Table A.2 shows how rates of occupational mobility differ across the two samples.

Measuring Occupational Quality

In order to categorize movements within firms, I construct several occupational quality indices. I use two sources: median occupational wages from the Occupational Employment Statistics (OES) survey, and occupational characteristics from the O*NET database.

To construct the OES wage index, I follow the methodology of Acemoglu (1999). The

[5]Specifically, in February in 1998 and 2000, and in January in even years from 2002 and 2016.

OES surveys over a million establishments every three years. I use 2005 median hourly wages, which were collected between 2002 and 2005 and are reported using the 2000 SOC occupational codes. I use census crosswalks to assign each occupation in the CPS to one of these codes. These OES indices range from $6.60 to $80.25.

For the second set of quality metrics, I use occupational characteristics from O*NET (National Center for O*NET Development 2014). O*NET is a database developed by the U.S. Department of Labor to provide detailed information on over 900 occupations. The occupational data are provided by skilled human resources professionals and include information on the abilities and skills needed to succeed; the tasks performed; and the required education, experience, and training. In total there are 277 of these occupational descriptors, which are summarized in Table A.3.

Since each occupation has hundreds of scores, I use methodology similar to Poletaev and Robinson (2008) and Robinson (2018), using principal component analysis (PCA) to condense these variables into indices. This methodology takes advantage of the fact that many of the variables are correlated: for instance, occupations that require workers to have a high level of written expression also require a high level of written comprehension. PCA is a procedure to construct linear combinations of variables that explain the most variation in the data.

The first index I construct I call the Occupational Quality Index. To create it, I include variables classified as worker ability and worker skills in the database. These include variables such as oral comprehension, stamina, and memorization. The variables that are weighted highest in this index are written expression, reading comprehension, judgment, and decision making. This factor is very similar to the largest factor identified in Poletaev and Robinson (2008). Occupations that receive high scores include physicists, CEOs, neurologists, and judges. Occupations that receive low scores include fallers, mine shuttle car operators, dishwashers, and meatpackers. I normalize the index to range from 0 to 100. See Table A.4 for more details on the variables and occupations.

For the second index, I summarize management-relevant variables in the O*NET database to capture mobility that is closer to movements up and down a traditional promotion hierarchy. I include such variables as leadership, resource management skills, and decision-making skills. Table A.5 lists all included variables. The variables that are most important to this index include coaching and developing others, motivating subordinates, and management of personnel resources. CEOs receive the highest management score, while other high-scoring occupations include education administrators and frontline supervisors. Occupations that receive low management scores include farmworkers, telemarketers, and food prep workers. I call this the Management Index and again normalize it to be between 0 and 100. See Table A.6 for more details on the variables and occupations.

In addition, I use three measures of occupational quality directly from O*NET: required experience, required education, and required training. I normalize these measures to be in terms of years required. In total, this gives me six occupational quality metrics.

Life Cycle Patterns of Mobility within Firms

In this section, I focus on establishing a set of facts about how occupational mobility within firms changes over the life cycle. I begin by examining how the rates of occupational mobility within firms using the monthly matched CPS sample. I then turn to measuring the distance of mobility, using a variety of ranking measures to show how the type of moves made differ over the life cycle. Finally, I turn to the annual CPS sample to examine how wage growth differs by the type of occupational mobility, and how these patterns change with worker age.

Rate of Occupational Mobility

The first set of results focuses on how the rate of occupational mobility varies over the life cycle. In Figure 1, we see that the rate of mobility rises rapidly in the early 20s, peaking

at age 23, then steadily falls over rest of the career. Nonetheless, even well into the 60s we see that workers change occupations at a rate of between 0.2 and 0.3 percent per month, which translates to an annual rate of at least one occupational move for between 2.3 and 3.5 percent of retirement age workers per year.

In Table 1, I separate workers into five age bins: under 30, 30–40, 40–50, 50–60, and 60 and above. In Column (1) we see the binned version of Figure 1, with the rate of occupational mobility falling steadily over the life cycle. In the next two columns, I separate workers into bins for those with less than a college degree (Column [2]) and those with at least a college degree (Column [3]). If college provides specialized training, it may allow workers to enter directly into their preferred occupation, reducing occupational mobility. On the other hand, if college-educated workers are more likely to be promoted, we might see higher rates of job mobility. In fact, although we see similar rates of mobility for workers under 30 (0.52 percent per month), college-educated workers have lower rates of mobility than non-college-educated workers for each age bin. Nonetheless, these differences are not large enough to be statistically distinct. In Columns (4) and (5) we see that female workers have lower rates of job mobility early in the career (up to age 40), but higher rates of mobility in the latter years of their careers. Since mobility rates for workers across education and gender categories are quite similar, I will group all workers together to focus on variation by age.

Next I turn to measures of the magnitude of mobility for occupational changers inside the firm. In Figure 2, I show the average change in OES wage score for occupational changers inside the firm by five-year age bins. Similar to what we see in the figure for the rate of occupational mobility, the quality change in occupational mobility rises in the early 20s then falls steadily. While workers in their early 20s on average move to occupations with $1.60 higher median wages, by age 40 the average wage change upon moving has deteriorated to zero. Above age 50 the point estimates are consistently negative but not statistically distinct from zero.

In Table 2, I show that the basic pattern from Figure 2 holds for both college-educated

and non-college-educated workers across a variety of occupational distance measures. In particular, I show the average distance of occupational change using the OES wage score, the two O*NET quality scores, and the O*NET provided job requirements measures (required education, required experience, and required on-the-job training). The OES wage score is measured in terms of dollars; the three O*NET constructed scores are measured in terms of percentiles in the quality distribution; meanwhile the O*NET requirement measures are in terms of years of required education, experience, or training. To compare across education and age bins, I construct three age bins (under 30, 30–60, and 60+) and show results separately for college graduates and those without college degrees.

Here we see remarkably consistent results across the occupational distance measures. Young workers without college degrees on average gain the most from occupational mobility, moving to jobs with $1.41 higher median wages, which have one-fifth of a year of additional required education and one-fourth of a year of additional required experience. These workers move about 1 percentile up the quality index. Although young workers with college degrees have smaller gains across all measures, they still move to occupations that pay $1.28 higher median wages and with half a percentile increase in the cognitive quality index. They earn smaller but positive and statistically significant improvements across all other dimensions.

For both educational groups, returns to mobility fall in the middle career years. Returns for midcareer workers are smaller than those for young workers but are primarily positive and significant. For workers over 60, the returns are primarily negative. Across all measures, those without college degrees have larger gains in the midcareer years than college-educated workers; however, estimates for those over 60 are noisier and less consistent. On balance, it appears that college-educated workers gain less in occupational ranking from mobility than those without college degrees.

In Tables A.7 and A.8 I separate the tables for female and male workers, respectively. Here we see that young and midcareer female workers appear to see larger improvements in job quality than male workers. However, late-career female workers without college degrees move

to substantially lower-quality occupations on average, while equivalent males have positive but nonsignificant changes in occupational quality. For both male and female late-career workers, the point estimates for the average change in occupational quality are negative but not significant.

These patterns are consistent with results in Robinson (2018), who finds that on average, younger workers (age 20–40) make larger magnitude moves than older workers (age 40–60), although there are some differences across samples and genders. Although I focus on a single rank of occupations, Robinson (2018) also uses additional vectors, which allows him to investigate how mobility changes based on four measures: analytic (equivalent to my quality index), fine motor skills, strength, and visual skills. Here he finds that the changes in the skill portfolio tend to be smaller in magnitude for older workers across the measures, although there is some evidence of increases in visual skills.

So far I have shown that both mobility rates and the distance of occupational change fall over the life cycle. In Figure 3, I plot the change in OES score by age for upward (A) and downward (B) movers. Here we see that, although the average distance of moves falls over the life cycle, this masks increasing magnitudes of upward and downward movements into the midcareer. For workers moving to higher-ranked occupations, the average magnitude of the change increases through age 30, at which point it flattens for most of the career, falling in the early 60s. For workers moving to lower-ranked occupations, the average change in mobility falls rapidly through age 30, at which point it continues to fall more slowly until the late 60s, at which point the estimates become quite noisy. Thus, even though on average the change in occupational quality continues to fall with age, this masks a growing volatility of occupational mobility.

Thus, in this section I have demonstrated that occupational mobility within firms follows similar patterns to other types of life cycle mobility, with falling mobility rates with age and falling average magnitudes of changes. Nonetheless, even workers nearing retirement age have substantial rates of occupational mobility and move both up and down in ranking. In

fact, although midcareer and older workers are the least likely to change occupations within the firm, conditional on moving they make larger magnitude changes, both up and down. In the next section, I examine whether wage growth is consistent with the magnitude of occupational changes.

Wage Returns to Mobility over the Life Cycle

I next examine how wage growth changes over the life cycle based on the direction of occupational mobility. As discussed earlier in the Methodology section, the matched monthly CPS data I use in the previous section to measure occupational mobility inside the firm cannot be used to measure wage changes. Instead, I use the annual matched sample, which allows for the observation of mobility within employers but has the limitation of being a much smaller sample size, with substantial spurious occupational mobility because of occupational coding procedures.

Although this spurious mobility inflates the measured rates of occupational mobility, for the purposes of measuring wage changes with occupational mobility, this will serve to attenuate wage returns to mobility. This is because most individuals do not change occupations each year, thus the measured wage returns to occupational mobility combine the true occupational changers with occupation-stayers who are incorrectly coded as mobile. I will show that wage returns from occupational staying fall squarely in between wage growth from downward occupational changes and wage growth for upward occupational changes. Thus, measurement error will attenuate wage changes from occupational mobility toward the modest wage growth earned by individuals who do not change occupations.

In this section, I run a series of linear regressions in which I regress the annual change in the real log hourly wage (in January 1994 dollars) on indicators for mobility. I include controls for race (nonwhite indicator), gender, education (seven categories), a cubic in age, and year. By focusing on the change in wages, I remove any time-invariant differences in wages, but there still may be differences in wage growth between demographic groups. These

controls will help remove some of these differences between groups; however, in practice results are quite similar with and without these controls. I report robust standard errors.

I begin by examining some basic facts about how wage growth varies with occupational mobility on average, before examining heterogeneity by age. In Table 3, I show how wage growth differs based on occupational mobility. Column (1) has no controls, while Column (2) has controls for worker characteristics (other than age), and Column (3) includes cubic controls for worker age. In Panel A, I show how average real annual wage growth differs based on the worker mobility. Here we see that workers who change occupations see wage growth that is 0.4 percent faster than occupation stayers, who experience real wage growth of 2.7 percent; however, these differences are not statistically significant. In Panel B, I show how these changes in wages differ based on the direction of mobility. Here we see that individuals who move to higher-ranked occupations experience wage growth that is about 4 percentage points faster than those who stay in the same occupation, while those who move to lower-ranked occupations see wage growth that is about 3 percentage points slower than occupation stayers. These estimates are quite consistent with and without controls. Thus, while average wage growth for occupational movers is indistinguishable from wage growth for occupation stayers, this masks substantial heterogeneity in wage growth based on the direction of mobility.

I next investigate how the returns to occupational mobility differ based on the distance of occupational change. In Table 4, I regress the change in wages on the change in log OES wage score. I again separate the specifications between upward and downward mobility. For each \$1.00 change in median OES score for occupational movers, upward movers see wage growth of \$0.12, while downward movers see wage losses of \$0.08. Thus, although we do see substantial difference in the magnitude of wage growth based on the direction of occupational mobility, wages evolve substantially slower than the change in the occupational rank. Further, wages exhibit some degree of downward rigidity, in which downward changes are dampened.

Now I want to examine how the returns to occupational mobility vary by age. In Table 5, I now separate the specifications by 10-year age bins. Recall from the previous section that young workers have higher rates of occupational mobility and are relatively more likely to move to higher-quality occupations, but the magnitude of occupational change up and down grows over the life cycle. From the mean of the omitted category, we see that average wage growth for occupational stayers is largest for young workers, who gain 4.6 percent in real wages compared to 2.3 percent for those in their 30s, and 3.1 percent for those in their 40s. Wage growth drops dramatically after age 50, with growth rates of 1.5 percent for those in their 50s and 0.2 percent for those 60 and above. In Panel A, we again see small and insignificant differences in wage growth between occupational changers and stayers. In Panel B, I separate the occupational movers into upward and downward mobility. Again, the small and insignificant wage growth associated with occupational mobility masks substantial heterogeneity by the direction of mobility. For young workers under 30, the return to upward mobility is 6 percent faster wage growth than for occupational stayers, for total wage growth of over 10 percent. On the other hand, for young downward movers, wages grow 6.6 percent slower than for individuals who do not change occupations.

For midcareer and older occupational changers, wage growth is between 1 and 3 percentage points slower than for individuals who do not change occupations, while for upward occupational changers it is between 2 and 3 percentage points faster. Thus, although we see in Figure 3 that the distance of occupational changes grows over the life cycle, this is not reflected in realized wage growth for midcareer and older workers.

Discussion

In this section, I document several new facts about occupational mobility within firms over the life cycle. Mobility is especially important for early-career workers: young workers have the highest rates of internal occupational mobility, are the most likely to move to higher-quality occupations, and garner the largest wage gains from upward mobility. However,

throughout the life cycle we see substantial rates of downward mobility, which is associated with diminished real wage growth for workers of all ages.

One surprising result is the fact that the wage gains from upward mobility diminish over the life cycle, despite the fact that midcareer and older workers who move up are more likely to make larger magnitude moves. Such a pattern can be rationalized by models of firm-learning, such as Farber and Gibbons (1996), in which information early in the career leads to larger revisions of the firm's belief about the worker's ability, while updates later in the career have a smaller impact.

Nonetheless, despite real wage growth on average, careers within firms are substantially more volatile than evident from what we see in aggregated wage growth. Many workers move to lower-ranked occupations, and have diminished wage growth or even wage losses upon doing so. Although the frequency of occupational mobility diminishes with age, downward occupational mobility is present for workers of all age. However, for young workers, these results indicate that there are substantial opportunities for career progression within the firm. In the next section I will investigate if these opportunities within firms were able to provide a reliable source of wage growth for young workers who found fewer opportunities between firms over the past two decades.

Trends in Mobility

As discussed in the introduction, there is a growing body of evidence of decreasing dynamism in the U.S. economy (e.g., Hyatt and Spletzer [2013]). This is of particular concern for young workers, since mobility between firms has been shown to be an important source of wage progression. In the previous section, I document that this pattern plays out within the firm as well, with upward mobility associated with wage growth for all workers but especially for young workers. In this section, I investigate how these dynamics have changed over the last two decades, and compare within- and between-firm movements.

I begin by examining how occupational mobility has changed since the mid-1990s. In Figure 4 I plot the share of individuals employed in a given month that report in the following month that their usual duties and activities have changed but have the same employer, or report both changing employers and changing occupations. In the top graph in Figure 4, we see that occupational mobility has been falling since 1995. From a high of 2.9 percent of employed workers changing occupations each month, by 2016 the rate fell to 2.0 percent. This secular decline in occupational mobility appears to be especially pronounced during recessionary periods, demarcated in gray. Although declining occupational mobility is consistent with other forms of falling dynamism in the 2000s, this is a break from previous decades, which experienced rising occupational mobility (Kambourov and Manovskii 2008).

In the bottom graph of Figure 4, I separate the monthly occupational mobility into within-firm and between-firm movers. Here we see that the primary source of falling occupational mobility over the past two decades is a reduction in between-firm movers. In fact, although such mobility declines in conjunction with the two recessionary periods, we see stronger evidence that the pattern anticipates the recessions. On the other hand, occupational mobility within the firm appears to be relatively stable, with a negative trend break around 2002. Although this could be a cyclical response, the fact that we see no variation in occupational mobility within firms during the Great Recession suggests that the drop in the early 2000s may be unrelated to the business cycle.

Since the declining occupational mobility can be traced to between-firm movements, in Figure 5 I examine how rates of mobility between employers has changed over the same time period. In the top graph, I show that the pattern follows a similar pattern to the occupational mobility between firms, suggesting that the primary source of the falling rate of occupational mobility between firms is mechanically due to the reduction in the frequency of mobility between firms. Indeed, the share of individuals changing firms that report an occupational change has remained constant at near 60 percent through the sample period.

In the bottom graph in Figure 5, I separate employer mobility by worker age. Here

we see that almost all of the reduction in mobility between firms is due to workers under age 30. For midcareer workers (aged 30–60), as well as older workers (60+), we see lower rates of employer mobility that decline modestly. These results indicate that the decreasing dynamism of the U.S. economy primarily affects young workers, the very workers who have the most to gain from mobility.

Finally, in Appendix Figures A.1 and A.2, I show that the average change in OES score for occupational changers is relatively stable over this time period and certainly is not declining. Thus, although the rates of occupational mobility have been changing over this time period, deteriorating magnitudes of moves cannot explain negative changes in wages. In the rest of this section, I examine how the wage returns to different types of mobility have evolved over this time period.

Comparing Returns to Mobility within and between Firms

Before examining the trends in wage gains for workers over the life cycle, it is worth first comparing the wage gains and losses from occupational mobility within firms with those for individuals changing firms. In Table 6 I reproduce Table 5, but now I combine the three middle age categories (30–60) for power.[6] In Panel A, we see that wage growth may be a bit higher on average for individuals who change firms; however, the estimates are too noisy to reject that wage growth is the same. The point estimates are larger for young workers, suggesting they may have more to gain from between-firm movements, and are negative for workers over 60.

These estimates for wage growth for between-firm movements are somewhat smaller than other estimates from the literature. For instance, Topel and Ward (1992) find quarterly wage growth of 12 percent for firm-changers compared with 1.75 percent for firm-stayers. One difference may be that these annual wage observations may mask periods of nonemployment for between-firm movers. Indeed, in Forsythe (2018) I use a similar methodology but separate

[6]The point estimates for the disaggregated regressions are all similar but less precise.

firm-changers between individuals who lost their jobs (e.g., displaced workers) and those who did not. In this case, nondisplaced workers had 3 percent faster wage growth than firm-stayers, for a total wage growth of 6 percent.

In Panel B of Table 6, I separate wages by up or down occupational mobility and then by firm mobility interacted with the direction of occupational mobility. Here we see that the point estimates for upward and downward occupational mobility are very similar to those we see in Table 5. When I separate the wage gains for firm-changers by the type of occupational mobility, we now see a more striking pattern. Individuals who move to higher-ranked occupations when changing firms now have wage gains that are over 7 percentage points larger than upward occupational movers within the firm, for a total wage growth of 14 percent. This pattern is especially strong for young workers, who find a total wage growth for upward moves between firms of 18 percent.

For individuals who move to lower-ranked occupations at new firms, wage growth is slower than for downward movers within-firms: 3.6 percentage points slower for all workers, for a total wage loss of 4.3 percentage points. Although the point estimates are not significant for the individual age groups, we can see that the magnitudes are smallest for young workers, suggesting that the penalty for downward movements between firms grows over the life cycle.

Thus, although average wage growth may be higher for between-firm movers, it depends on the direction of mobility, with downward-movers between firms experiencing larger losses. For young workers, upward occupational moves between firms offer substantially faster wage growth than similar moves within the firm. Thus, even if young workers are able to replace falling between-firm mobility with additional mobility inside firms, it is unlikely to offer the same magnitude of wage growth, leading to lower wage growth over time. I measure this directly in the next section.

Changing Returns to Mobility over Time

Now that we have seen how wage growth differs by age and mobility, let's return to wage changes over time. Although we see earlier in this section that the falling rates of occupational mobility are primarily driven mechanically by falling rates of mobility between firms, in this section I investigate whether the returns to mobility over the time period. As before, I use the tenure sample, which allows measurement of wage growth within and between firms, but restricts the sample to one month per year in alternating years. Since the sample size is small and noisy, I do not include confidence intervals on this set of graphs. Although there is not enough power to discern annual changes, in the accompanying tables I show that many of the trends in point estimates are supported statistically by a test for differences in wage growth between groups of years.

I begin with Figure 6, in which I compare average wage growth per year for young (<30) and midcareer (30–60) workers, regardless of employer mobility. Here we see that wage growth is higher for young workers until the depth of the Great Recession in 2010, falling from a high of 8–10 percent annually to a low of 0.1 percent in 2012. Wage growth for young workers began recovering in 2014, and by 2016 was up to 6 percent, still substantially below the peak in the early 2000s. On the other hand, real annual wage growth for midcareer workers has remained relatively stable over this time period, ranging from 2.5 to 3.5 percent in the early 2000s. Mid-career wage growth fell to a series low in 2004 and 2006, with growth around 1 percent, but has improved since then to a series high of 6 percent in 2016. Thus, the fall in real wage growth from the early 2000s through 2012 was concentrated in young workers, with both young and midcareer workers experiencing substantial wage growth in the most recent year of data.

In Panel A of Table 7 I test whether wages are lower in the second half of the sample (after 2006) for young workers (in Column [1]) and midcareer workers (in Column [2]). Consistent with Figure 6, wage growth is 4 percentage points slower for young workers after 2006, which is a 50 percent reduction in wage growth between the mid-1990s to mid-2000s. On the other

hand, midcareer workers show no change in average wages over the time period. In Panel B of Table 7, I test whether wage growth is slower during recessionary years.[7] Here we see negative point estimates, suggesting wage growth may have slowed, but the standard errors are too large to be conclusive.

In Figure 7, I separate this wage growth into within-firm and between-firm wage changes, to determine the source of wage losses for young workers. I again compare wage changes for young and midcareer workers. The top graph of Figure 7 shows wage growth within firms. Here we see that midcareer workers exhibit little cyclical or secular variation, receiving relatively consistent 2 percent wage growth across the time period, with an increase in wage growth after 2014. On the other hand, for young workers we see a strong secular decline in wage growth over the time period, with wage growth falling from a high of around 8 percent per year to around 5 percent in the mid-2000s, and falling to a nadir of -0.2 percent in 2010. Since 2010, average wage growth within firms for young workers has recovered to around 5 percent. Although young workers have faster wage growth than midcareer workers for most of the time period, from 2010 to 2014 their wage growth within the firm fell below that for midcareer workers. By 2016 both groups experienced an acceleration of wage growth, with near identical point estimates.

The reduction of wage growth for young workers around the two recessionary periods suggests a cyclical response. However, in Columns (3) and (4) of Table 7, I show that I am unable to reject that wage growth is the same for young workers during recessionary and nonrecessionary periods. Nonetheless, in Panel A, I show there is a statistically significant drop in wage growth for young workers in the second half of the sample period, which is consistent with the trend in Figure 7. For midcareer workers, there is no statistically significant change in wage growth either over the time period or during the recessionary periods.

In the bottom graph of Figure 7, I show wage growth for individuals moving between

[7] Specifically, 2001–2002, 2007–2008, 2009–2010, and 2011–2012.

firms. Young workers who move between firms exhibit relatively high wage growth until the Great Recession, at which point wage growth plummets from around 10 to −5 percent. Nonetheless, in Column (5) of Table 7, we see the series is too noisy to detect a statistically significant recessionary reduction in wage growth. For midcareer workers who move between firms, we see some evidence of a fall in the return to mobility during the Great Recession. Nonetheless, in Table 7, I show that wages are too imprecise to show any statistically distinct patterns.

Thus, at the same time as opportunities for mobility between firm fell for young workers, we see that wage growth plummeted for young workers. Further, this reduction in wage growth was primarily driven by falling wage growth within firms. Although we see a sharp decline in wage growth for young workers changing firms in the depth of the Great Recession, this was short lived and wage growth between firms for young workers quickly returned to prerecessionary levels.

Finally, I want to further disaggregate wage growth by the direction of occupational mobility. In graph (a) of Figure 8, I show how wages change for individuals moving to lower-ranked occupations within the firm. Here we see that young workers in particular experience increasingly negative wage changes with downward occupational mobility: until 2002, the average wage change with downward mobility was positive but after 2002 it crossed to negative. In Table 8, I show that wage changes after 2006 are on average 5 percentage points smaller for young workers. We see a similar pattern for midcareer workers, but with a smaller magnitude reduction in wage growth of about 4 percentage points, with midcareer workers experiencing wage growth that is about 1 percentage point larger than young workers making negative moves. Thus, although we see earlier that young workers experienced larger losses from downward moves within the firm than midcareer workers, this appears to be driven by trends in the aftermath of the Great Recession.

In graph (b) of Figure 8, I examine wage growth for individuals moving to higher-ranked occupations within the firm. Recall from the previous section that young workers experienced

substantially faster wage growth from upward moves within the firm than midcareer and older workers. When we examine how this has evolved over time, we see a much larger secular decline in wage growth for young workers who move to higher-ranked occupations within the firm. From a high of 19 percent in 2000, wage growth for young upward movers fell precipitously to a low of 1 percent in 2012. Wage growth for midcareer individuals followed a less extreme pattern, falling from 9 percent in 2000 to 1 percent in 2008; however, only young workers have statistically distinct wages in the second half of the sample.

In graphs (c) and (d) of Figure 8, I turn to individuals changing occupations when also moving between firms. In graph (c), we see that wage changes for downward occupational changers between firms is largely constant over time; however, both young and midcareer workers experience a large drop in wages in 2010, to -17 percent for midcareer workers and -42 percent for young workers. However, for both types of workers, I am unable to detect a statistically significant change in wages over time or during the recessionary periods.

Finally, in graph (d), we see wages for upward movers between firms are relatively stable over the time period, but spike in 2016. This is enough to lead to positive point estimates for the second half of the period in Table 8, but not statistically significant at the 5 percent level. Here we see higher wage gains for young workers compared with midcareer workers, which is consistent with the larger average returns to upward mobility we see in the previous section.

Discussion

Instead of improving opportunities for young workers within firms, in this section we see that young workers' wage growth fell substantially from the mid-90s through 2014. Although dynamism of mobility between firms contributes to the aggregate reduction in wage growth, much of the fall is due to changing returns to upward and downward mobility within the firm. This means that not only are young workers substantially less likely to change employers since the early 1990s, but average wage growth within the firm has also plummeted. For

midcareer workers, we do not see the same patterns.

Thus, there are two distinct patterns occurring within and between firms. For workers moving between firms, we see falling dynamism, which primarily impacts young workers, but no substantial variation in the returns to mobility. On the other hand, within firms, we see less in the way of changing dynamism, but substantial reduction in the returns to mobility for young workers specifically. Nonetheless, these patterns could be related if worsening outside options deteriorates the bargaining power for young workers, leading to reduced wage growth within the firm.

Although I find that the direction and magnitude of mobility are important indicators for the wage outcomes for workers changing occupations, there are crucial differences between wages and magnitude of occupational change. In this section, we see that the returns to upward mobility fall for young workers, despite no decline in the magnitude of occupational moves (see Appendix Figure A.1). Similarly, in the section titled "Wage Returns to Mobility over the Life Cycle," we see that young workers receive larger wage gains than midcareer workers for similar-magnitude occupational changes.

Conclusions

In this paper, I have shown that internal occupational mobility is an important source of wage growth, especially for young workers. Although average wage changes with occupational mobility decline over the life cycle, this masks substantial variation in wage outcomes depending on the change in rank of the occupational quality. Across a wide variety of metrics, individuals who move to higher-ranked occupations experience faster wage growth than occupational stayers, and individuals who move to lower-ranked occupations experience slower wage growth. While upward occupational mobility can help individuals build their career, a substantial fraction move to lower-ranked occupations, leading to significant wage volatility over individuals' careers.

When I examine wage growth with mobility from 1996 through 2016, I find that wage growth for young workers declined substantially between 1996 and 2012. This was largely due to changing returns to occupational mobility inside the firm, especially for individuals moving to higher-ranked occupations. Midcareer workers and workers moving between firms experienced little of the same decline. Thus, in the first decade of the 2000s, young workers were hit by falling mobility between firms, reduced hiring, and diminished wage growth within the firm.

The fact that wage growth has ticked up in the past couple of years offers some possibility for optimism that young workers' fortunes may be improving. However, from the literature on the permanent effects of graduating during recessions (e.g., Kahn [2010]; Oreopoulos, von Wachter, and Heisz [2012]), labor market conditions at the beginning of an individual career can have long-term effects on earnings. Even as the economy continues to improve we may see long-lasting scars for the workers who came of age in the beginning of this century.

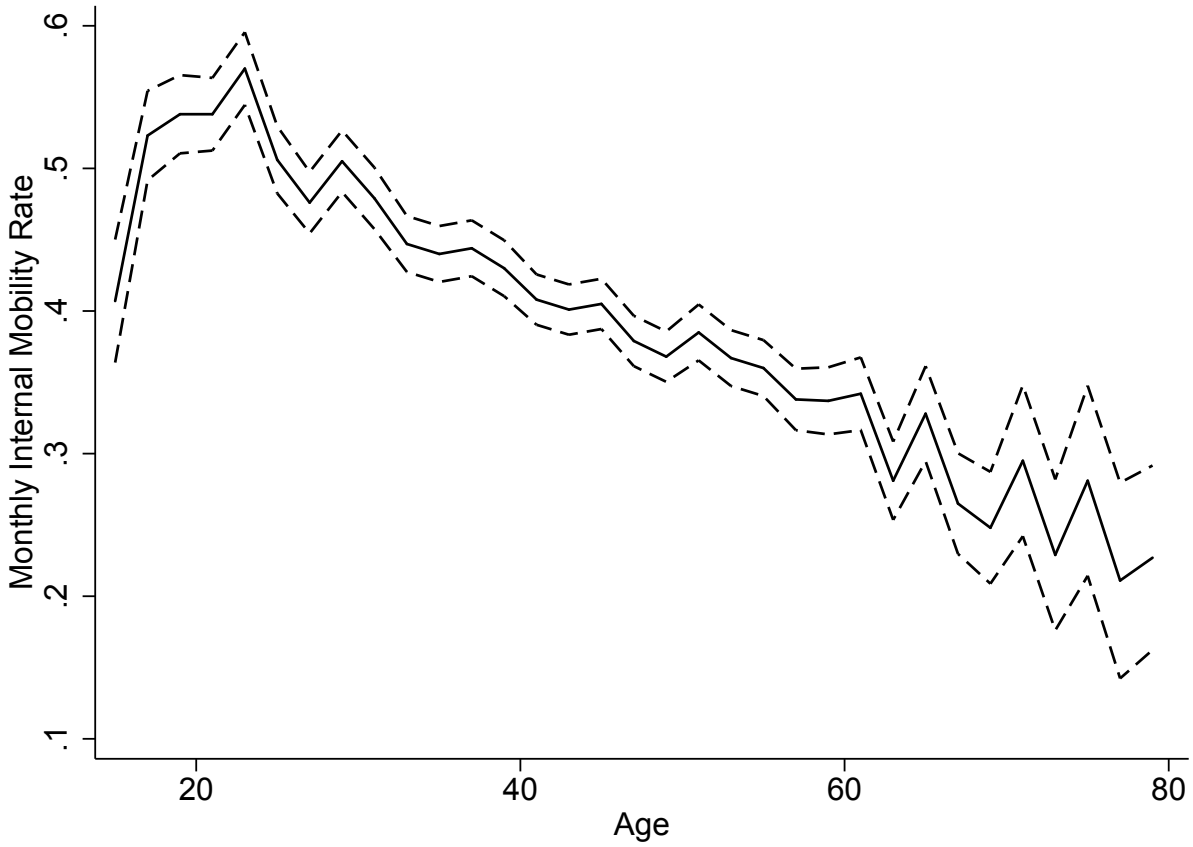

Figure 1: Share of employed individuals who change occupations within the firm each month. Dashed lines represent 95 percent confidence intervals. Source: monthly CPS sample.

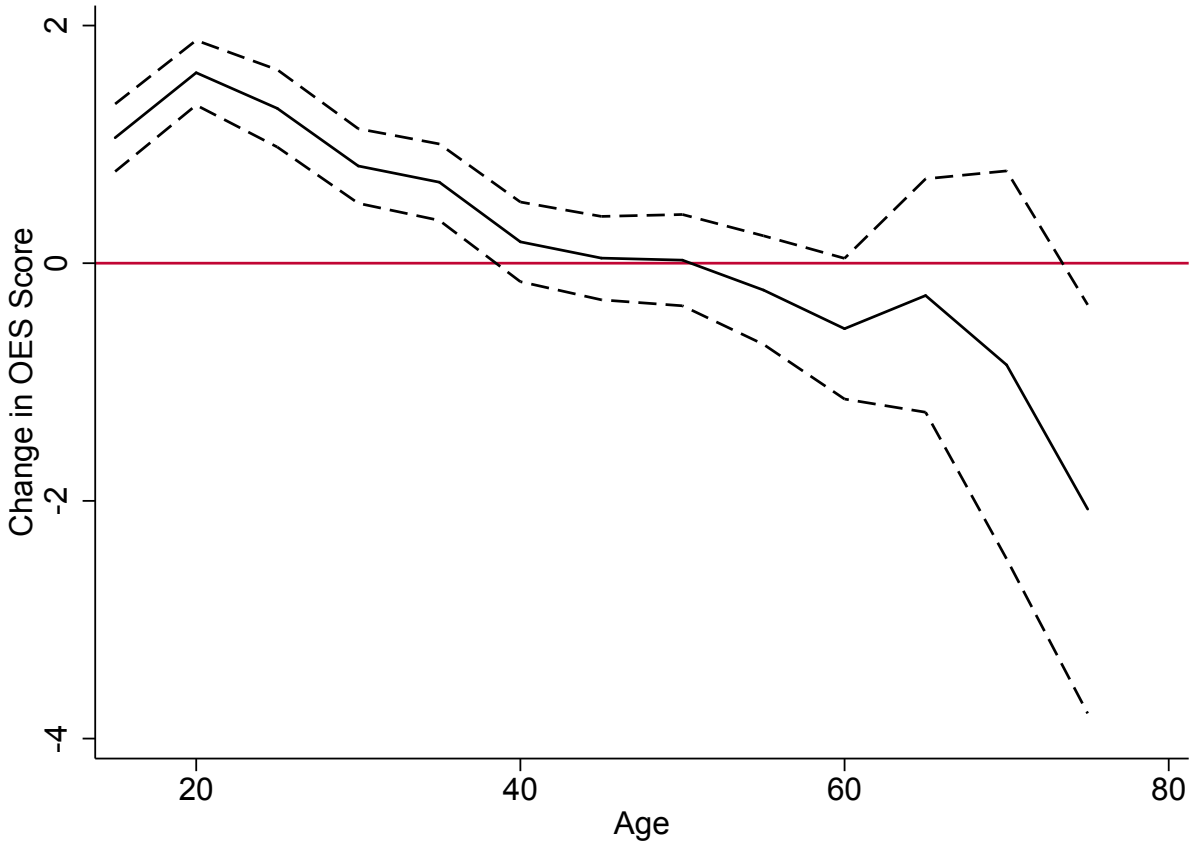

Figure 2: Average change in OES score by five year age bins for within-firm occupational movers. Dashed lines represent 95 percent confidence intervals. Source: monthly CPS sample.

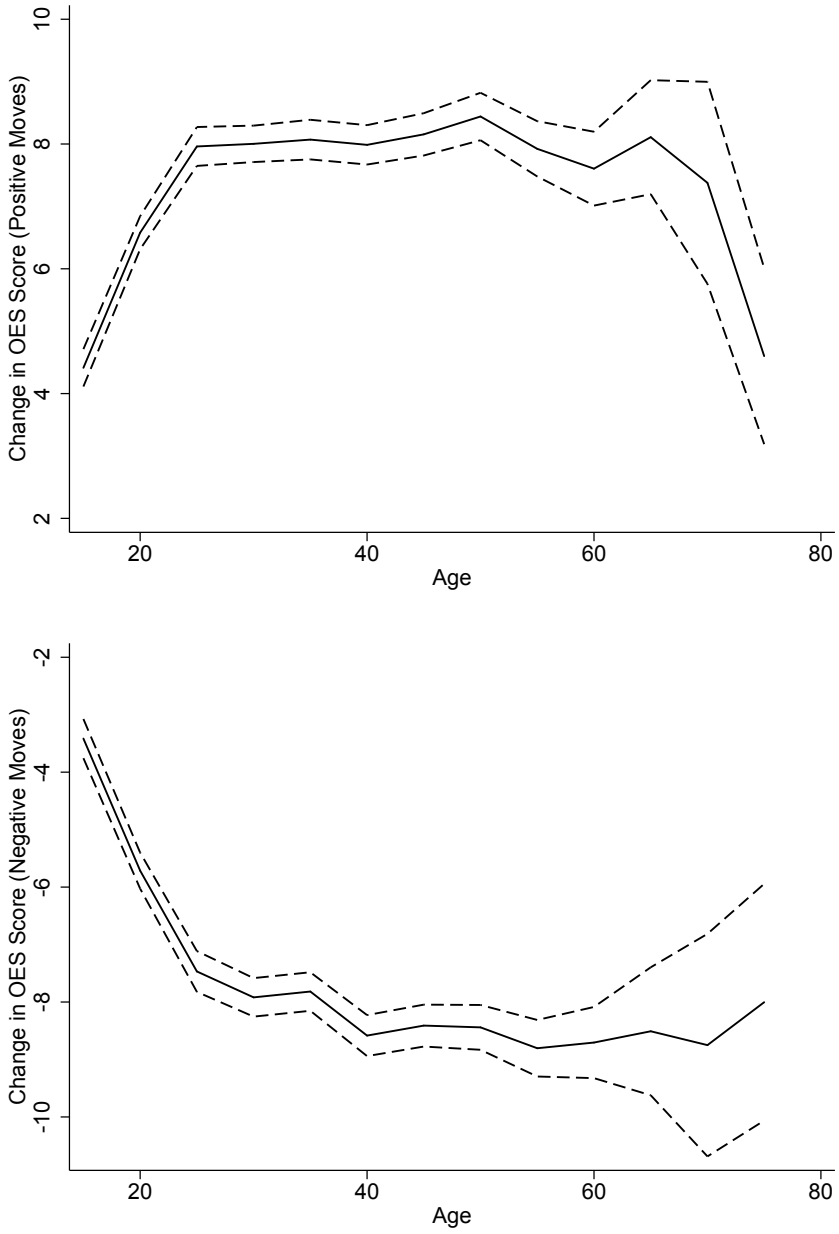

Figure 3: Average change in OES score for upward (top) and downward (bottom) occupational changers within the firm by five year age bins. Dashed lines represent 95 percent confidence intervals. Source: monthly CPS sample.

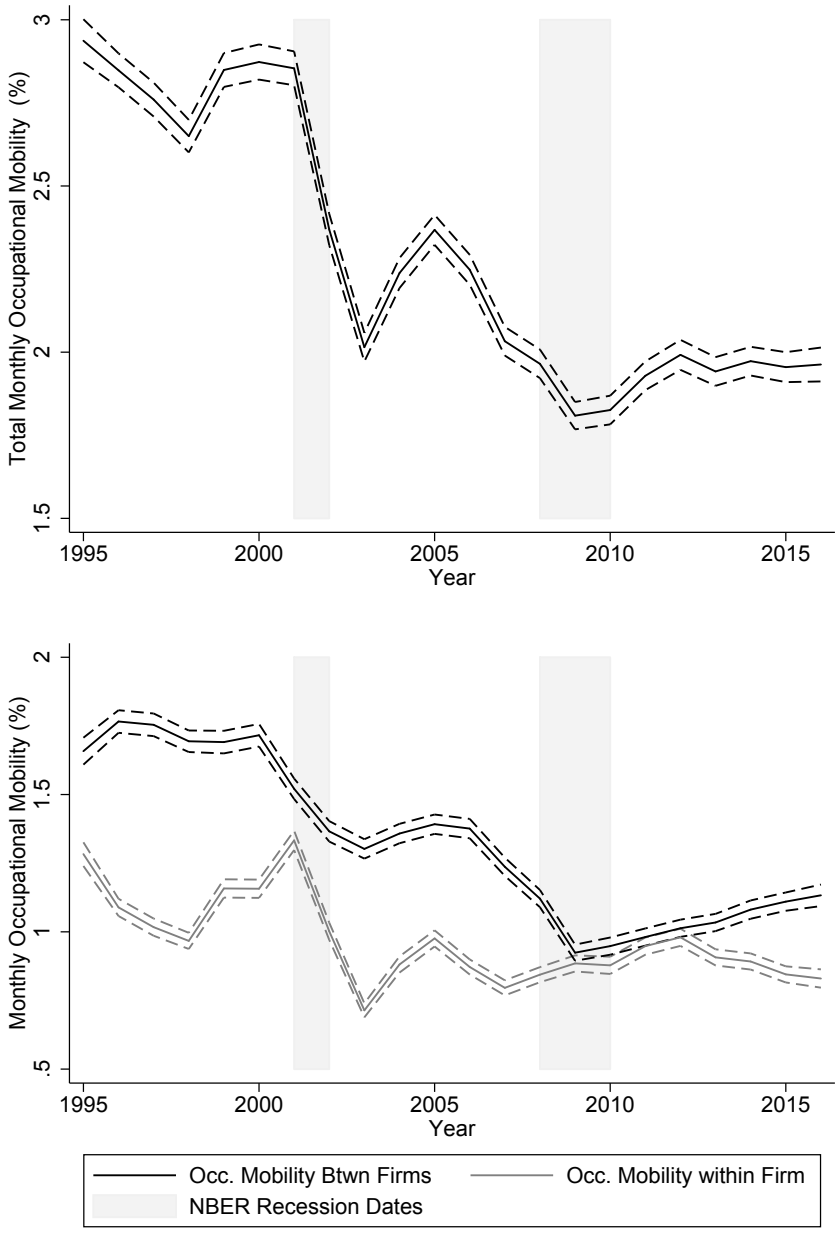

Figure 4: Occupational mobility by year, defined as 3-digit occupation changes between months for firm-changers and reported duties and activities changing for within-firm movers. Source: monthly CPS sample.

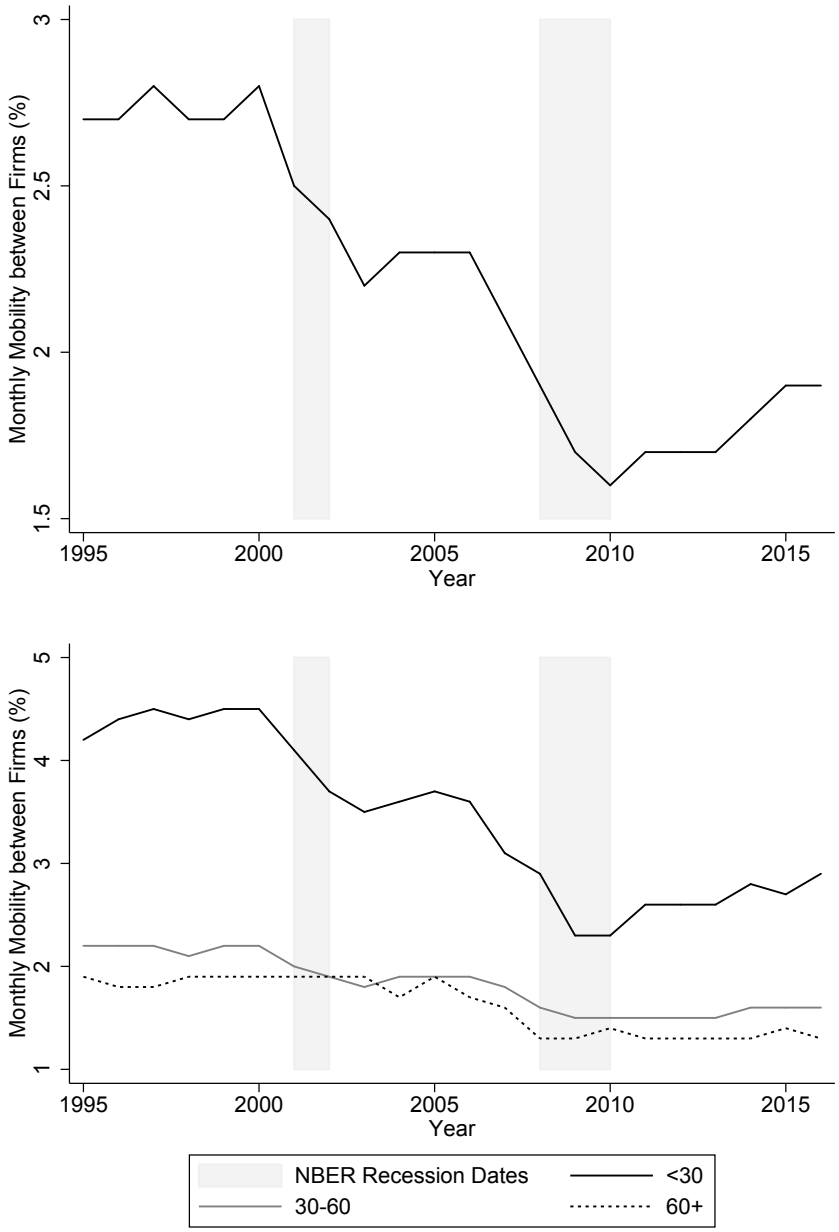

Figure 5: Mobility between firms, for all age groups (top) and disaggregated by age (bottom). Note: each year's standard error is less than 0.1 percent. Source: monthly CPS sample.

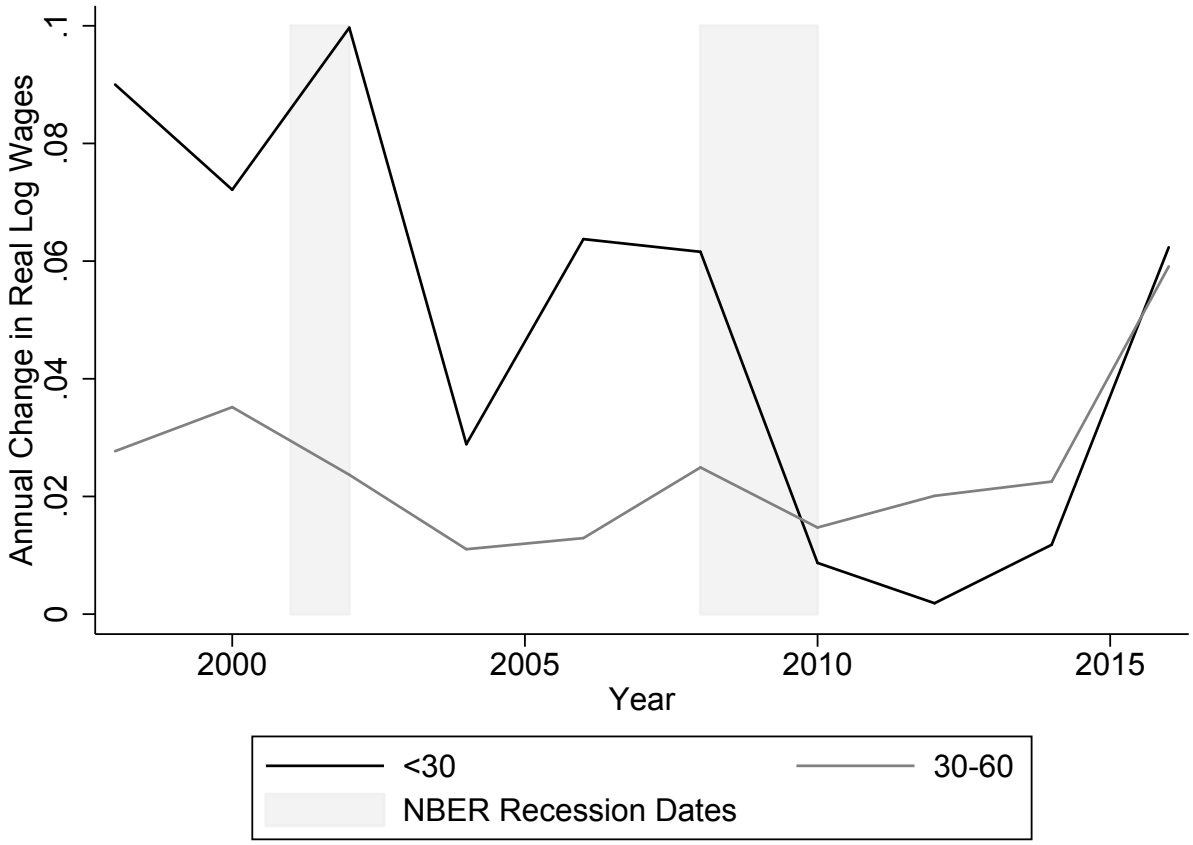

Figure 6: Annual real log hourly wage changes for employed young and midcareer workers. Source: annual CPS sample.

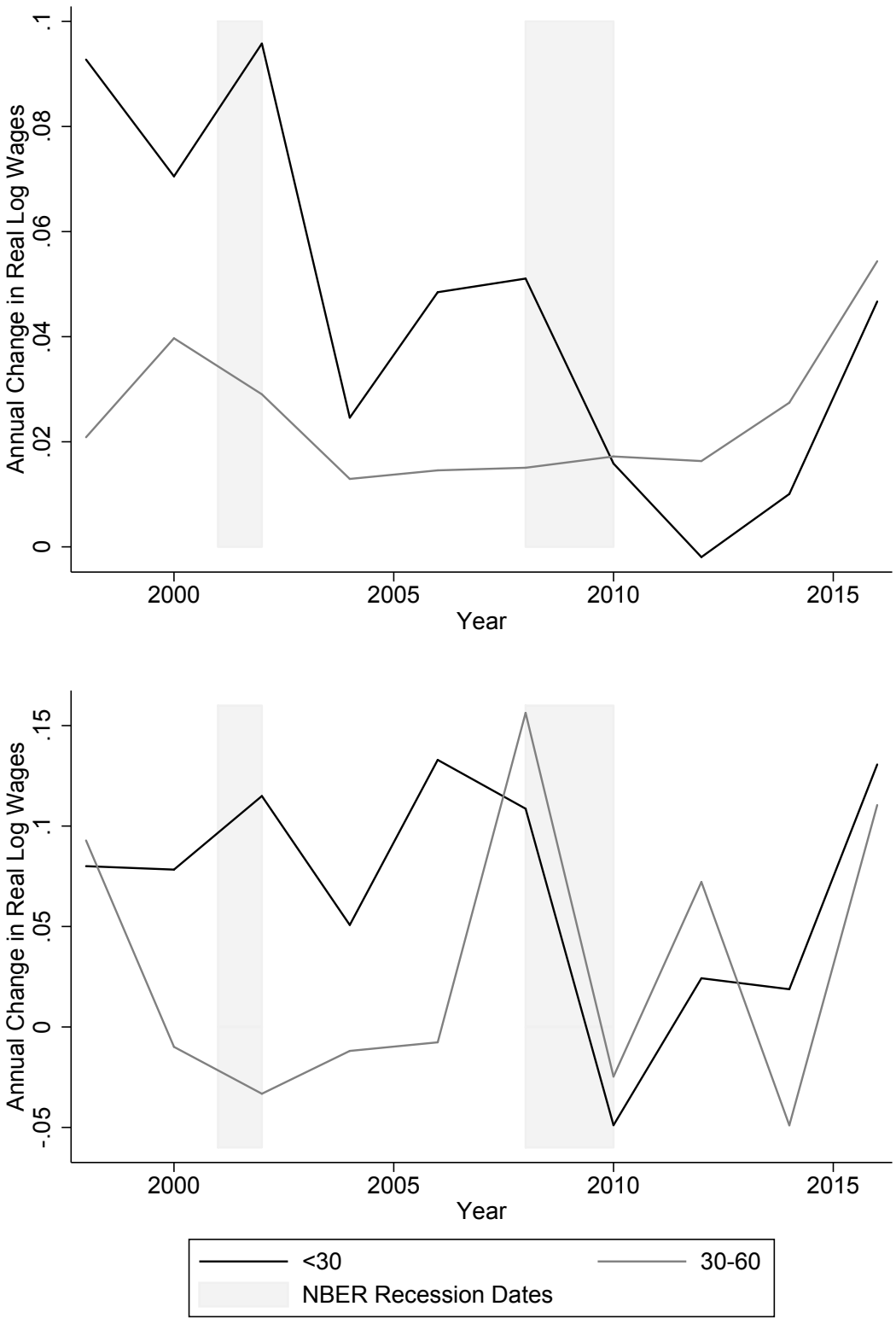

Figure 7: Annual real log hourly wage changes for employed young and midcareer workers who stay within the same firm (top) or move between firms (bottom). Source: annual CPS sample.

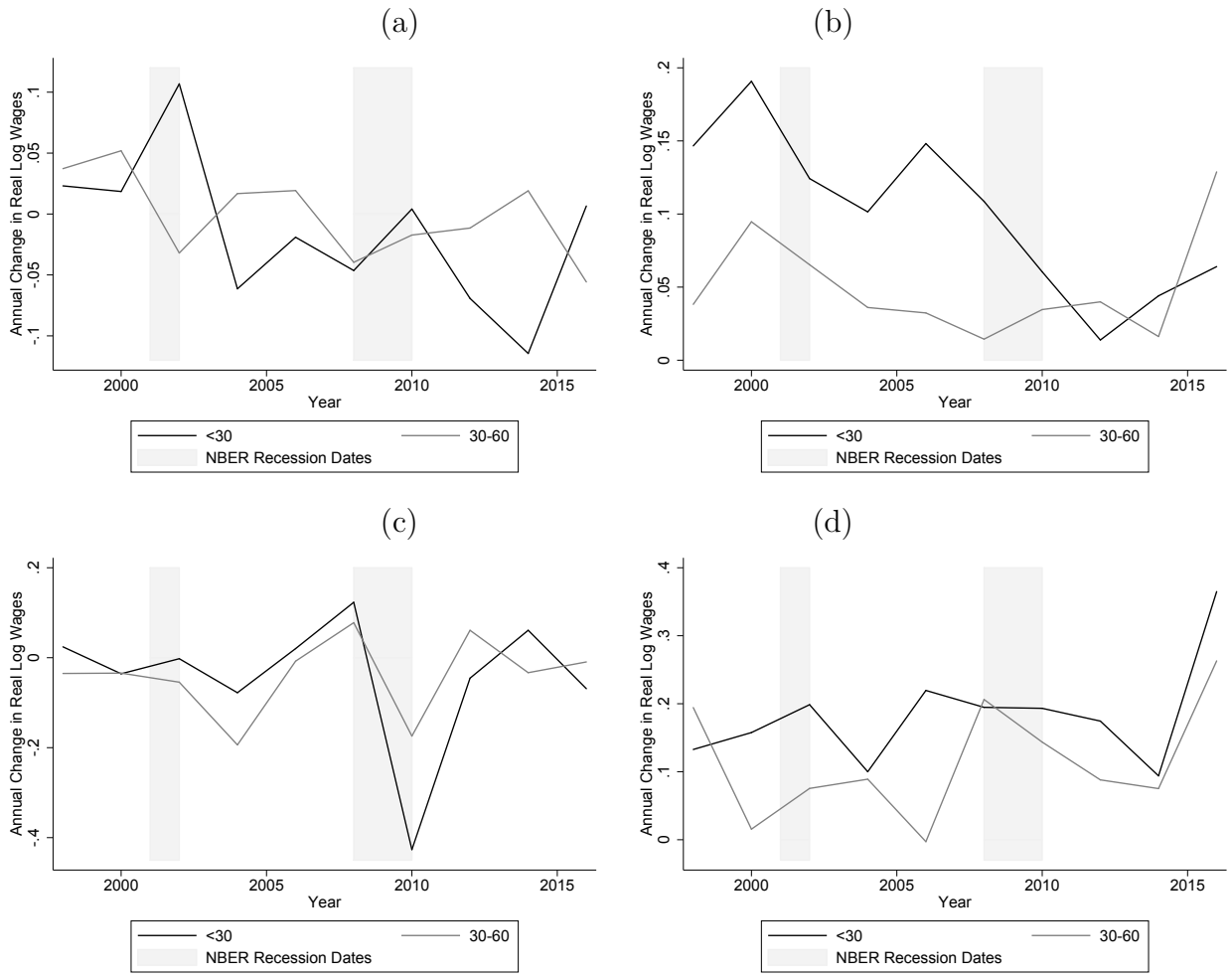

Figure 8: Annual real log hourly wage changes for employed young and midcareer workers separated by: (a) Downward moves within firms, (b) upward moves within firms, (c) downward moves between firms, and (d) upward moves between firms. Source: annual CPS sample.

Table 1: Rate of Occupational Mobility within Firms by Age

	(1)	(2)	(3)	(4)	(5)
16–30	0.517***	0.517***	0.516***	0.504***	0.529***
	(0.005)	(0.006)	(0.011)	(0.007)	(0.007)
30–40	0.454***	0.464***	0.436***	0.451***	0.457***
	(0.005)	(0.006)	(0.008)	(0.007)	(0.006)
40–50	0.400***	0.414***	0.371***	0.410***	0.391***
	(0.004)	(0.005)	(0.007)	(0.006)	(0.006)
50–60	0.363***	0.365***	0.359***	0.375***	0.352***
	(0.005)	(0.006)	(0.008)	(0.007)	(0.006)
60 and up	0.298***	0.302***	0.290***	0.312***	0.287***
	(0.006)	(0.007)	(0.010)	(0.009)	(0.008)
Observations	11,646,593	8,057,201	3,589,392	5,566,369	6,080,224
R-squared	0.004	0.004	0.004	0.004	0.004
Sample	All	No College	College	Female	Male

Coefficients from regressions based on the CPS monthly sample. Sample restricted to individuals who were employed in the first month of the sample. Robust standard errors in parentheses: $^{+}$ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 2: Average Change in Occupational Quality Score for Movers by Age

	(1)	(2)	(3)	(4)	(5)	(6)
	Ch. OES	Ch. Qual.	Ch. Mgmt	Ch. Req. Ed.	Ch. Req. Exp.	Ch. Req. OTJ
<30, No Col.	1.407***	0.966***	0.044***	0.225***	0.256***	0.053***
	(0.093)	(0.057)	(0.002)	(0.016)	(0.016)	(0.007)
30–60, No Col.	0.423***	0.364***	0.014***	0.077***	0.096***	0.012*
	(0.081)	(0.043)	(0.002)	(0.012)	(0.013)	(0.006)
60+, No Col.	-0.551*	-0.097	-0.011*	-0.031	-0.047	-0.029+
	(0.248)	(0.132)	(0.005)	(0.037)	(0.039)	(0.015)
<30, Col.	1.278***	0.477***	0.032***	0.090+	0.165***	0.045***
	(0.272)	(0.108)	(0.005)	(0.046)	(0.038)	(0.013)
30–60, Col.	0.084	0.154**	0.013***	-0.039+	0.065**	0.005
	(0.151)	(0.054)	(0.002)	(0.021)	(0.020)	(0.007)
60+, Col.	-0.492	-0.224	-0.006	-0.014	-0.087	-0.020
	(0.527)	(0.176)	(0.008)	(0.069)	(0.065)	(0.023)
N	50,516	50,516	50,516	50,516	50,516	50,516
R-sq	0.005	0.010	0.013	0.005	0.008	0.002

Coefficients from regressions based on the CPS monthly sample. Sample restricted to individuals who changed occupations within the firm. Robust standard errors in parentheses: $^{+}$ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 3: Change in Wages within Firms

	(1)	(2)	(3)
Panel A: Occupational Mobility			
Occ. Change	0.00359	0.00428	0.00262
	(0.00647)	(0.00643)	(0.00643)
R-sq	0.000	0.002	0.003
Panel B: Direction of Mobility			
Neg. Occ. Chg.	-0.0335***	-0.0327***	-0.0337***
	(0.00810)	(0.00810)	(0.00810)
Pos. Occ. Chg	0.0376***	0.0382***	0.0361***
	(0.00805)	(0.00800)	(0.00799)
N	17513	17513	17513
R-sq	0.004	0.007	0.007
Mean of Omitted	0.0265	0.0265	0.0265
Non-Age Controls	No	Yes	Yes
Age Controls	No	No	Yes

Coefficients from regressions based on the CPS annual sample. Sample restricted to individuals who were employed in the same firm in both years. The dependent variable is the annual change in real log hourly wages. Robust standard errors in parentheses: $^{+}$ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Non-age controls include gender, race, education, and year. Age controls are a cubic polynomial in age.

Table 4: Change Wages by the Distance of Occupational Move

	(1)	(2)	(3)
Log OES Chg. If Upward Occ. Chg.	0.118***	0.118***	0.115***
	(0.0179)	(0.0178)	(0.0177)
Log OES Chg. If Downward Occ. Chg.	0.0810***	0.0799***	0.0805***
	(0.0175)	(0.0175)	(0.0175)
N	17513	17513	17513
R-sq	0.007	0.009	0.010
Mean of Omitted	0.0247	0.0247	0.0247
Non-Age Controls	No	Yes	Yes
Age Controls	No	No	Yes

Coefficients from regressions based on the CPS annual sample. Sample restricted to individuals who were employed in the same firm in both years. The dependent variable is the annual change in real log hourly wages. Robust standard errors in parentheses: $^{+}$ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Non-age controls include gender, race, education, and year.

Table 5: Change Wages with Occupational Mobility by Age

	(1)	(2)	(3)	(4)	(5)
	Panel A: Occupational Mobility				
Occ. Change	0.00357	0.000958	-0.00780	0.0119	0.0131
	(0.0136)	(0.0130)	(0.0133)	(0.0141)	(0.0201)
R-sq	0.012	0.003	0.004	0.007	0.022
	Panel B: Direction of Mobility				
Negative Occ. Chg.	-0.0658***	-0.0267	-0.0326*	-0.0102	-0.0271
	(0.0172)	(0.0166)	(0.0165)	(0.0179)	(0.0253)
Positive Occ. Chg.	0.0578***	0.0263+	0.0178	0.0329+	0.0512*
	(0.0167)	(0.0152)	(0.0172)	(0.0174)	(0.0260)
R-sq	0.027	0.005	0.006	0.009	0.027
N	3595	3785	4745	3809	1579
Controls	Yes	Yes	Yes	Yes	Yes
Mean of Omitted	0.0461	0.0233	0.0314	0.0151	0.00281
Sample	<30	30–40	40–50	50–60	60+

Coefficients from regressions based on the CPS annual sample. Sample restricted to individuals who were employed in the same firm in both years. The dependent variable is the annual change in real log hourly wages. Robust standard errors in parentheses: $^{+}$ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Non-age controls include gender, race, education, and year.

Table 6: Wage Changes with Occupational Mobility within and between Firms

	(1)	(2)	(3)	(4)
	Panel A: Firm Mobility			
New Firm	0.0167	0.0272	0.00494	-0.102+
	(0.0109)	(0.0171)	(0.0149)	(0.0612)
Mean of Omitted	0.0281	0.0445	0.0244	0.009
R-sq	0.003	0.012	0.002	0.023
	Panel B: Firm and Occ. Mobility			
Down Occ.	-0.0330***	-0.0584***	-0.0249*	-0.0252
	(0.00810)	(0.0164)	(0.00998)	(0.0253)
Up Occ.	0.0380***	0.0574***	0.0248*	0.0523*
	(0.00800)	(0.0161)	(0.00971)	(0.0261)
New Firm, Same Occ.	-0.00959	-0.0330	-0.00864	0.125
	(0.0184)	(0.0287)	(0.0251)	(0.0789)
New Firm, Down Occ.	-0.0363+	-0.0128	-0.0407	-0.199
	(0.0194)	(0.0306)	(0.0262)	(0.121)
New Firm, Up Occ.	0.0763***	0.0777**	0.0685**	-0.179+
	(0.0180)	(0.0271)	(0.0254)	(0.0926)
Mean of Omitted	0.0265	0.042	0.0246	0.00281
R-sq	0.011	0.035	0.006	0.036
N	19451	4772	13023	1656
Sample	All	<30	30–60	60+

Coefficients from regressions based on the CPS annual sample. The dependent variable is the annual change in real log hourly wages. Robust standard errors in parentheses: $^{+}$ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Control variables include gender, race, education level, and year.

Table 7: Testing Wage Changes over Time by Age

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Changes over Time					
After 2006	-0.0422***	0.00588	-0.0424**	0.00233	-0.0369	0.0505+
	(0.0122)	(0.00763)	(0.0131)	(0.00790)	(0.0318)	(0.0294)
Constant	0.0708***	0.0221***	0.0657***	0.0233***	0.0918***	0.00842
	(0.00778)	(0.00497)	(0.00858)	(0.00518)	(0.0183)	(0.0176)
	Panel B: Recessions					
Recession	-0.0122	-0.00664	-0.00987	-0.00837	-0.0175	0.0156
	(0.0126)	(0.00777)	(0.0134)	(0.00807)	(0.0358)	(0.0287)
Constant	0.0545***	0.0275***	0.0483***	0.0278***	0.0809***	0.0248
	(0.00760)	(0.00489)	(0.00848)	(0.00506)	(0.0170)	(0.0188)
N	4772	13023	3931	12003	841	1020
Age	<30	30–60	<30	30–60	<30	30–60
Sample	All	All	Within	Within	Btwn	Btwn

Coefficients from regressions based on the CPS annual sample. Robust standard errors in parentheses: $^{+}$ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 8: Testing Wage Changes by Direction of Mobility over Time by Age

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Changes over Time							
After 2007	-0.0558*	-0.0392*	-0.0841**	-0.00783	-0.0366	0.0483	0.0416	0.0834+
	(0.0280)	(0.0168)	(0.0277)	(0.0164)	(0.0554)	(0.0497)	(0.0471)	(0.0497)
Constant	0.0107	0.0188	0.140***	0.0525***	-0.00978	-0.0603+	0.163***	0.0813**
	(0.0173)	(0.0114)	(0.0175)	(0.0112)	(0.0280)	(0.0331)	(0.0303)	(0.0282)
	Panel B: Recessions							
Recession	0.0201	-0.0407*	-0.0347	-0.0166	-0.0547	0.0299	0.0151	0.00866
	(0.0284)	(0.0171)	(0.0275)	(0.0167)	(0.0676)	(0.0494)	(0.0541)	(0.0478)
Constant	-0.0257	0.0152	0.112***	0.0555***	-0.00883	-0.0510	0.176***	0.116***
	(0.0188)	(0.0109)	(0.0187)	(0.0107)	(0.0256)	(0.0329)	(0.0260)	(0.0314)
N	841	2456	1074	2587	287	366	379	342
Age	<30	30–60	<30	30–60	<30	30–60	<30	30–60
Sample	down	down	up	up	down	down	up	up
	Within	Within	Within	Within	Btwn	Btwn	Btwn	Btwn

Coefficients from regressions based on the CPS annual sample. Robust standard errors in parentheses: $^{+}$ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Samples split between individuals making negative (down) and positive (up) changes in OES score, either within or between firms.

Appendix A

This appendix consists of summary statistics (Tables A.1 and A.2), details about the source of the occupational ranking measures (Tables A.3 through A.6), and supplementary results.

Table A.1: Summary Statistics

	Monthly Sample			Annual Sample		
	Employed	Stayers	Internal Movers	Employed	Stayers	Internal Movers
Age	41.37	41.61	39.04	41.24	41.92	40.97
	[13.67]	[13.40]	[13.27]	[13.28]	[13.19]	[13.39]
Years of Education	13.65	13.7	13.7	12.75	12.75	12.67
	[2.76]	[2.75]	[2.75]	[2.12]	[2.15]	[2.10]
Potential Experience	21.73	21.91	19.51	22.49	23.17	22.31
	[13.62]	[13.39]	[13.18]	[13.39]	[13.30]	[13.48]
Female	0.48	0.48	0.49	0.53	0.53	0.51
	[0.50]	[0.50]	[0.50]	[0.50]	[0.50]	[0.50]
Non-White	0.15	0.14	0.14	0.15	0.15	0.16
	[0.35]	[0.35]	[0.35]	[0.07]	[0.07]	[0.07]
Period 1 OES Wage Index	2.83	2.84	2.79	2.26	2.27	2.26
	[0.50]	[0.50]	[0.49]	[0.47]	[0.47]	[0.45]
Period 2 Wage	2.19	2.2	2.16	2.26	2.27	2.26
	[0.50]	[0.50]	[0.48]	[0.47]	[0.47]	[0.45]
Annual Wage Change				0.026	0.025	0.028
				[0.36]	[0.35]	[0.35]
N	11,646,593	10,661,969	50,516	19,211	17,306	7,390
N (Wage)	1,983,727	1,890,100	10,153	19,211	17,306	7,390

Mean and standard deviations of key variables for the two samples.

Table A.2: Rates of Occupational Mobility

	Monthly Sample	Annual Sample
Occupational Mobility:	0.43%	56.6%
N	50,516	7,597
Total:	11,646,593	17,513

Sample restrictions include employed in both months, valid and nonallocated occupation in both months, and nonmissing employer change or tenure variables.

Table A.3: O*NET Variables in Quality Index (Summary)

1.A.1.a.1-4	Verbal Abilities
1.A.1.b.1-7	Idea Generation and Reasoning Abilities
1.A.1.c.1-2	Quantitative Abilities
1.A.1.d.1	Memorization
1.A.1.e.1-3	Perceptual Abilities
1.A.1.f.1-2	Spatial Abilities
1.A.1.g.1-2	Attentiveness
1.A.2.a.1-3	Fine Manipulative Abilities
1.A.2.b.1-4	Control Movement Abilities
1.A.2.c.1-3	Reaction Time and Speed Abilities
1.A.3.a.1-4	Physical Strength Abilities
1.A.3.b.1	Endurance: Stamina
1.A.3.c.1-4	Flexibility, Balance, and Coordination
1.A.4.a.1-7	Visual Abilities
1.A.4.b.1-5	Auditory and Speech Abilities
2.A.1.a-f	Skills: Content (Reading Comprehension, Mathematics, etc)
2.A.2.a-d	Skills: Process (Critical Thinking, Active Learning, etc)
2.B.1.a-i	Social Skills
2.B.3.a-m	Technical Skills
2.B.4.e-h	Systems Skills
2.B.5.a-d	Resource Management Skills

Table A.4: O*NET Quality Index

Largest Positive Weighted Variables:	Written Expression, Speaking Skills, Reading Comprehension, Critical Thinking, Judgment and Decision-Making
Largest Negative Weighted Variables:	Static Strength, Speed of Limb Movement, Stamina, Gross Body Coordination, Reaction Time
Occupations with Highest Score:	Physicists, CEOs, Preventative Medicine Physicians, Neurologists, Judges
Occupations with Lowest Score:	Fallers, Cleaners of Vehicles and Equipment, Mine Shuttle Car Operators, Dishwashers, Meat Packers

Table A.5: O*NET Variables in Management Index

1.B.1.e	Enterprising	Enterprising occupations frequently involve starting up and carrying out projects. These occupations can involve leading people and making many decisions. Sometimes they require risk taking and often deal with business.
1.B.2.a	Achievement	Occupations that satisfy this work value are results oriented and allow employees to use their strongest abilities, giving them a feeling of accomplishment. Corresponding needs are Ability Utilization and Achievement.
1.B.2.c	Recognition	Occupations that satisfy this work value offer advancement, potential for leadership, and are often considered prestigious. Corresponding needs are Advancement, Authority, Recognition and Social Status
1.C.2.b	Leadership	Job requires a willingness to lead, take charge, and offer opinions and direction.
2.B.4.e	Judgment and Decision-Making	Considering the relative costs and benefits of potential actions to choose the most appropriate one.
2.B.4.g	Systems Analysis	Determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes.
2.B.4.h	Systems Evaluation	Identifying measures or indicators of system performance and the actions needed to improve or correct performance, relative to the goals of the system.
2.B.5.a	Time Management	Managing one's own time and the time of others.
2.B.5.b	Management of Financial Resources	Determining how money will be spent to get the work done, and accounting for these expenditures.
2.B.5.c	Management of Material Resources	Obtaining and seeing to the appropriate use of equipment, facilities, and materials needed to do certain work.
2.B.5.d	Management of Personnel Resources	Motivating, developing, and directing people as they work, identifying the best people for the job.
2.C.1.a	Administration and Management	Knowledge of business and management principles involved in strategic planning, resource allocation, human resources modeling, leadership technique, production methods, and coordination of people and resources.
2.C.1.f	Personnel and Human Resources	Knowledge of principles and procedures for personnel recruitment, selection, training, compensation and benefits, labor relations and negotiation, and personnel information systems.
4.A.2.b.1	Making Decisions and Solving Problems	Analyzing information and evaluating results to choose the best solution and solve problems.
4.A.2.b.2	Thinking Creatively	Developing, designing, or creating new applications, ideas, relationships, systems, or products, including artistic contributions.
4.A.2.b.3	Updating and Using Relevant Knowledge	Keeping up-to-date technically and applying new knowledge to your job.
4.A.2.b.4	Developing Objectives and Strategies	Establishing long-range objectives and specifying the strategies and actions to achieve them.
4.A.2.b.5	Scheduling Work and Activities	Scheduling events, programs, and activities, as well as the work of others.
4.A.2.b.6	Organizing, Planning, and Prioritizing Work	Developing specific goals and plans to prioritize, organize, and accomplish your work.
4.A.4.b.1	Coordinating the Work and Activities of Others	Getting members of a group to work together to accomplish tasks
4.A.4.b.2	Developing and Building Teams	Encouraging and building mutual trust, respect, and cooperation among team members.
4.A.4.b.3	Training and Teaching Others	Identifying the educational needs of others, developing formal educational or training programs or classes, and teaching or instructing others.
4.A.4.b.4	Guiding, Directing, and Motivating Subordinates	Providing guidance and direction to subordinates, including setting performance standards and monitoring performance.
4.A.4.b.5	Coaching and Developing Others	Identifying the developmental needs of others and coaching, mentoring, or otherwise helping others to improve their knowledge or skills.
4.A.4.b.6	Provide Consultation and Advice to Others	Providing guidance and expert advice to management or other groups on technical, systems-, or process-related topics.
4.A.4.c.1	Performing Administrative Activities	Performing day-to-day administrative tasks such as maintaining information files and processing paperwork.
4.A.4.c.2	Staffing Organizational Units	Recruiting, interviewing, selecting, hiring, and promoting employees in an organization.
4.A.4.c.3	Monitoring and Controlling Resources	Monitoring and controlling resources and overseeing the spending of money.

Table A.6: O*NET Management Index

Largest (Positive) Weighted Variables:	Provide Consultation and Advice to Others; Scheduling Work and Activities; Guiding, Directing, and Motivating Subordinates; Systems Evaluation; Developing Objectives and Strategies
Smallest (Positive) Weighted Variables:	Occupational Interests: Enterprising; Training and Teaching Others; Performing Administrative Activities; Management of Material Resources; Knowledge of Personnel and Human Resources
Occupations with Highest Score:	CEOs, Education Administrators, Social and Community Service Managers, Medical and Health Services Managers, Program Directors
Occupations with Lowest Score:	Models, Graders and Sorters of Agricultural Products, Telemarketers, Dressing Room Attendants, Farmworkers

Table A.7: Average Change in Occupational Quality Score for Female Movers by Age

	(1)	(2)	(3)	(4)	(5)	(6)
	Ch. OES	Ch. Qual.	Ch. Mgmt	Ch. Req. Ed.	Ch. Req. Exp.	Ch. Req. OTJ
<30, No Col.	1.536***	0.811***	0.046***	0.238***	0.275***	0.065***
	(0.141)	(0.077)	(0.003)	(0.025)	(0.022)	(0.007)
30–60, No Col.	0.630***	0.378***	0.018***	0.090***	0.103***	0.014**
	(0.113)	(0.053)	(0.002)	(0.017)	(0.017)	(0.005)
60+, No Col.	-1.356***	-0.469**	-0.027***	-0.139**	-0.148**	-0.034*
	(0.352)	(0.161)	(0.007)	(0.051)	(0.048)	(0.015)
<30, Col.	1.303***	0.429**	0.031***	0.066	0.156**	0.039**
	(0.362)	(0.141)	(0.007)	(0.066)	(0.049)	(0.014)
30–60, Col.	0.183	0.157*	0.013***	-0.023	0.105***	0.016+
	(0.208)	(0.075)	(0.004)	(0.032)	(0.028)	(0.009)
60+, Col.	-0.643	-0.229	-0.006	-0.092	0.018	-0.027
	(0.687)	(0.243)	(0.011)	(0.110)	(0.094)	(0.031)
Observations	24,759	24,759	24,759	24,759	24,759	24,759
R-squared	0.008	0.010	0.015	0.006	0.011	0.005

Coefficients from regressions based on the CPS monthly sample. Sample restricted to female workers who changed occupations within the firm. Robust standard errors in parentheses: $^{+}$ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table A.8: Average Change in Occupational Quality Score for Male Movers by Age

	(1)	(2)	(3)	(4)	(5)	(6)
	Ch. OES	Ch. Qual.	Ch. Mgmt	Ch. Req. Ed.	Ch. Req. Exp.	Ch. Req. OTJ
<30, No Col.	1.297***	1.088***	0.043***	0.214***	0.236***	0.041***
	(0.123)	(0.082)	(0.003)	(0.020)	(0.023)	(0.010)
30–60, No Col.	0.220+	0.338***	0.010***	0.061***	0.085***	0.009
	(0.114)	(0.065)	(0.002)	(0.017)	(0.020)	(0.010)
60+, No Col.	0.247	0.250	0.005	0.073	0.053	-0.023
	(0.342)	(0.207)	(0.008)	(0.052)	(0.062)	(0.026)
<30, Col.	1.200**	0.494**	0.032***	0.098	0.173**	0.053*
	(0.403)	(0.163)	(0.007)	(0.063)	(0.058)	(0.022)
30–60, Col.	0.049	0.157*	0.013***	-0.045	0.028	-0.004
	(0.214)	(0.078)	(0.003)	(0.028)	(0.028)	(0.011)
60+, Col.	-0.437	-0.195	-0.006	0.050	-0.152+	-0.017
	(0.754)	(0.244)	(0.010)	(0.088)	(0.089)	(0.033)
N	26,300	26,300	26,300	26,300	26,300	26,300
R-sq	0.004	0.011	0.012	0.005	0.006	0.001

Coefficients from regressions based on the CPS monthly sample. Sample restricted to male workers who changed occupations within the firm. Robust standard errors in parentheses: $^{+}$ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

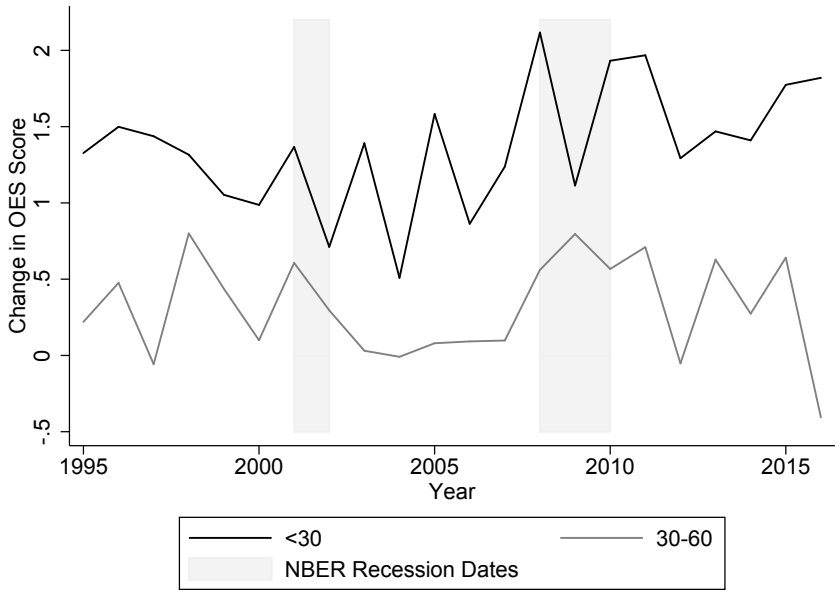

Figure A.1: Change in OES score for young and midcareer within-firm occupational changers. Source: monthly CPS sample.

Figure A.2: Change in OES score for young and midcareer between-firm occupational changers. Source: monthly CPS sample.

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