Downward Occupational Mobility within Firms

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Abstract

I measure the frequency of occupational mobility in nationally representative survey data and find over 30% of occupational changes occur within firms. In contrast to the conventional wisdom that downward job mobility is rare, I find at least 18% of occupational changes within firms are to lower-quality jobs. Moreover, I find contemporaneous and persistent earnings losses associated with downward occupational mobility. I find substantial variation in the frequency of downward internal mobility by occupation, with between 47 and 57% of managerial occupation changers moving to lower quality jobs. These results are consistent with theories of firm learning and job assignment, and suggest that, in contrast to the Peter Principle, some firms may correct mistakes in assignment by moving workers to lower quality positions.

1 Introduction

Job movements within and between firms are known to be an important source of earnings growth and career advancement. A worker's career progression is typically seen as linear, with moves leading to wage growth (see for instance Shaw (1984) and Topel and Ward (1992)). The classic paper on internal labor markets, George Baker, Gibbs, and Holmström

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(1994), examined worker flows between positions in a particular white-collar firm and found that worker movements were almost universally upward. This led, in part, to the conventional wisdom that demotions are rare, which has been a source for fundamental theoretical work explaining promotion dynamics inside firms, including Gibbons and Waldman (1999) and Lazear (2004). However other data sources[1] have found higher demotion rates using personnel records from different firms. Thus the extent of upward and downward mobility may be sensitive to idiosyncratic human-resource practices at the firm level.

Instead of using personnel records for an individual firm, I use nationally representative survey data from the Current Population Survey (CPS) and the National Longitudinal Survey of Youth 1997 (NLSY97) to measure the frequency and quality of occupational changes inside firms. In order to assess whether moves are to higher- or lower-quality jobs, I construct explicit occupational quality rankings using OES wage data and O*NET occupational characteristics. Across all measures, I find that moves to lower-quality occupations are relatively frequent, comprising over 18% of occupational changes within firms. Many of these changes represent movements up and down a management hierarchy; for instance, two of the most common movements in both samples are movements from "Retail Salesperson" to "First-Line Supervisors/Managers of Retail Sales Workers" and back again.

I find contemporaneous and persistent earnings losses for young workers in the NLSY97 who experience negative occupational mobility: 26% of those making negative occupational moves have an immediate nominal wage cut, compared with 11% of those making positive occupational moves. 2 years after the mobility event, log wages are 21% lower for observationally similar workers who experienced negative occupational mobility compared with those who experienced positive mobility, this effect fades to 12% after 5 years.

The lifecycle dynamics of internal occupational mobility are consistent with both models firm-learning and human capital acquisition. Young workers have the highest frequency of mobility, which falls monotonically with age, consistent with firm-learning. On the other

[1] see Frederiksen, Kriechel, and Lange (2013) for a comparison across several datasets.

hand, when workers are young, the most frequent type of movement is to higher-skill occupations, while for workers at the end of the career, movements become predominantly downward. This is consistent with human capital acquisition at the beginning of the career, and either the depreciation of skills or changing worker preferences over tasks as retirement nears.

I find substantial variation by occupation in the frequency of negative occupational changes. In both the CPS and the NLSY97, workers in management positions are substantially more likely to make downward moves compared with other occupations. In particular, in the CPS 11% of workers changing occupations who begin in a management position move up and 57% move down, while in the NLSY97, 18% of management workers changing occupations move to higher-quality occupations, and 46% move to lower-quality occupations.

These results suggest that, in contrast to the popular idea of the "Peter Principle", by which workers will be promoted into a position beyond their competence level and then remain, many firms appear to be willing to move workers downward out of jobs. This is consistent with models of firm-learning, in which the firm cannot perfectly predict a worker's proficiency in a position without observing the worker in the position. However, the wage results indicate that this process may lead to substantial earnings losses for these workers. Although it is beyond the scope of this paper to disentangle whether or not these occupational changes are voluntary, I show that workers who experience downward movements have an increase in exit rates in the next year, suggesting some of these moves may be involuntary.

2 Theoretical Framework

The literature on task assignment provides a clean framework for understanding occupational mobility within firms.[2]. Briefly, each worker possesses a bundle of skills, which map to different expected levels of productivity depending on to which job the worker is assigned. In order to maximize output, firms assign workers to the task in which they will be most

[2]See the Lazear and Oyer chapter "Personnel Economics" in (Gibbons & Roberts, 2013) for a survey.

productive, although this assignment may be constrained by the distribution of jobs in the firm's hierarchy.

However, a worker's optimal task assignment may change over his career. First, if the worker acquires new skills on the job, he may improve his productivity in other tasks in the job enough to change optimal assignment. Such movements should be associated with wage growth and movement up a skills-hierarchy, and we would expect to see these movements occur most frequently at the beginning of a worker's career. In the reverse, if human capital depreciates over time, optimal task assignment may move down a skills-hierarchy at the end of a worker's career. Thus, the human capital model would predict more frequent upward mobility at the beginning of the career, which transitions into more frequent downward mobility at the end of the career.

Alternatively, if firms have incomplete information about workers' abilities, the optimal assignment of workers can change as information is revealed. In principle, this could lead to moves up or down the skill-hierarchy, depending on whether the firm learns the worker is more or less skilled than the firm's initial belief. As the firm gains information over time, the rate of learning should slow, leading to a reduced frequency of mobility over the tenure at the firm.

The likelihood of reassigning a worker based on learning also depends on the precision of the information: if the firm's prior is very close to the true ability of the worker, it is unlikely that new information will push the worker across the boundary of optimal assignment to a new job. This precision can be affected by how similar jobs are in a skills-hierarchy. If a worker was previously in a job that provides little information about the next position into which he may be promoted, the firm may be more likely to make mistakes in assignment.

This may especially be an issue with workers moving into management positions. Managing workers who perform a particular task typically requires skills in the task as well as managerial skills. Although the firm may have good information about the workers' performance in the particular task, the best worker may not be the best manager. This is the

essence of the original idea of the Peter Principle: workers are promoted until they are not good enough to be promoted any further, but then stay put.

This leads to the broader question: if the firm get bad news, why might it choose not to move the worker back to his previous position? In Gibbons and Waldman (1999), the worker continues to accumulate human capital, thus the firm would have to receive a very negative signal to push the worker back over the ability threshold to the lower-skill position. Lazear (2004) shows how firms can take into account the mean-reversion that occurs after selection on a noisy signal by implementing a more stringent promotion threshold. Thus, even if performance declines after promotion, the majority of workers will remain above the ability threshold.

In addition, firms may choose to fire workers rather than moving them down the skills-hierarchy. This could be because of issues of morale: downward movements may harm the relationship between the worker and firm, which can in turn affect his job performance and the performance of those around him. Alternatively, the firm may be using the skills-hierarchy to identify workers for higher-skill positions. In this case, bad news about a worker means he is less likely to be a candidate for the higher-skill position than a new hire, so the firm should fire him and hire someone new.

Finally, assignment may change over time due to non-productive reasons. In particular, a worker's preferences may change over time. Workers' desire to take on demanding job assignments may wane toward the end of the career. In addition, tasks may be experience goods, so a worker may not have a good idea about whether or not he likes a certain type of job without trying the assignment. Thus, movements down the skills-hierarchy may be mutually decided, chosen by the firm, or chosen by the worker.

We can use these alternative theories to derive predictions about wages. For workers making moves up the skills-hierarchy, we would expect wages to rise. Not only is the worker in a job that pays more on average, he also continues to accumulate human capital, which can also lead to wage growth. On the other hand, if a worker moves down the skills-hierarchy,

wage predictions are more ambiguous. If the firm received bad news about his ability, that would revise down his expected productivity, which should lead to lower wages. On the other hand, if he is still accumulating human capital, that could offset some of the decline in expected productivity. In addition, if the firm is concerned with morale, it may choose not to cut wages at the time of job change, which could be possible if there are labor market frictions that allow firms to pay less than the expected marginal productivity of labor. Thus, although we would expect wages to grow less for workers who experience moves down the skills-hierarchy compared to non-movers and upward-movers, the absolute sign of wage changes is ambiguous.

3 Methodology

This paper draws on complementary evidence from two sources: monthly Current Population Survey (CPS) data and annual National Labor Survey of Youth 1997 (NLSY97) data. The monthly survey design of the CPS allows for high frequency observation of reported occupational change, however the short sampling frame (a maximum of 4 months) prevents the observation of longer term relationships between internal occupational mobility and workers' careers. Thus I also use the NLSY97, which provides data on the first 17 years of the careers of a cohort of young workers who entered the labor market in the late 1990s. I describe each data source in turn.

3.1 Measuring Occupational Mobility in the CPS

The first data source is monthly CPS survey data from January 1994 through May 2014. The CPS is a large national survey of U.S. households, which provides cross-sectional data for measuring national employment statistics. Although its primary purpose is as a cross-sectional dataset, the CPS is in fact designed as a panel, in which each household is

surveyed multiple times, thus I can follow individuals across pairs of months.[3] 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 any measurement of mobility between employers.[4] With the major survey re-design 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. Table A.1 shows summary statistics for key variables.

Although dependent coding was introduced for workers remaining at the same firm, individuals that change firms are reverted to independent coding, contributing to much higher frequency of occupational mobility for firm changers. In particular, the survey is designed as follows. Employed workers who were surveyed in the previous month are first asked if they changed firms, then asked if their "usual activities and duties" have changed since the previous month. If they report their activities have not changed, they are read their occupation from the previous month, and asked if this is an accurate description of their current job. If the respondent indicates they have changed employers (or an answer is missing), or if it is the first month of the survey, he is instead asked open-ended questions (e.g., "What kind of work do you do, that is, what is your occupation?") to solicit enough information that the coders will be able to classify the worker's occupation.[5] Such open ended questioning leads to much higher rates of measured mobility than dependent coding, leading to higher rates of measured occupational change based on the worker's mobility between firms.

This can be seen explicitly in Table 1. The most general measure of occupational mobility is whether the coded occupation changes between months. In the first column, I show that 3.3% of individuals who were employed in a given month have changed occupations by the

[3]To match individuals across months, I use a procedure developed by Madrian and Lefgren (1999) using administrative IDs, and confirm matches using sex, race, and age.

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

[5]See (*Current Population Survey Design and Methodology, Technical Paper 66*, 2006) for more details on the survey design.

Table 1: Employer and Occupational Mobility

	(1)	(2)	(3)	(4)	(5)
Employer Change	59.07***				
	(0.115)				
Missing Emp. Chg. Var.	9.645***				
	(0.0470)				
Constant	3.259***	1.330***	0.477***	0.378***	8.304***
	(0.00634)	(0.00422)	(0.00254)	(0.00415)	(0.115)
N	10460134	10460134	9569887	2813313	70444
R-sq	0.000	0.257	0.000	0.000	0.000
Sample	All Emp.	All Emp.	All Emp.	Two months of occ.	NLSY97
Mobility Def.	Occ chg.	Occ chg.	Activities chg.	Activities chg.	Activities chg.

Robust standard errors in parentheses, * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Specifications are weighted using CPS final weights or NLSY97 cross-sectional weights. Columns (1) and (2) define occupation change as a change in the coded occupation and capture occupational mobility both within and between firms. Columns (3) and (4) only include occupational changes with a coincident reported change in usual activities, these questions are only asked of firm-stayers. Column (4) only includes individuals who were employed in the same firm and occupation for two consecutive months. Column (4) uses NLSY97 data, where occupational changers are defined as individuals reporting an occupational change with a coincident change in reported occupation, at the annual frequency.

next month. In the second column, I separate out mobility by whether or not the worker changed employers or did not answer the question. Here we see that occupational mobility rates are about 60.4% upon changing firms, and about 1.3% for firm-stayers. However, for individuals with missing data, 9.6% change occupations each month. Since only about 3% of individuals change firms each month, the majority of the individuals with missing data are likely firm-stayers.

Since the dependent coding procedure first asks workers if their usual duties and activities have changed, we can refine our measure of internal occupational mobility to only include workers who change occupations and positively affirm their job activities changed. Column (3) implements this refinement, and shows this cuts the measured mobility by almost 2/3. Finally, in Column (4) I restrict the sample to individuals who I can match over four consecutive months and are employed in the same firm and the same occupation for the first two months in the sample. I then look at the rate of internal occupational mobility for individuals between the second and third month. Here we see the rate of mobility is relatively stable, falling from 0.48% to 0.38% changing occupations per month. Thus, I estimate between 0.38% and 1.3% of workers change occupations within firms each month. Since the rates

of mobility are similar for the two month and four month samples (Columns (3) and (4) in Table 1 respectively), for the rest of the paper use the two-month sample for more precision.

We can compare these mobility estimates to the literature. In a recent paper, Moscarini and Thomsson (2007) use CPS data to estimate firm and occupation mobility. Although this was not the driver of their paper, they do report the co-incidence of occupational mobility and employer mobility, from which we can derive the rate of within-firm and between-firm occupational mobility.[6] Within-firms, they find 1.26% change occupations and between firms these authors find 64% change occupations. Sample differences include conditioning on being employed in both months, corrections for possible spurious mobility, and exclusion of women.

Table 2: Distribution of Occupational Mobility by Employer Mobility

New employer:	145,027 (44%)
Same employer:	126,980 (38%)
Missing data:	61,169 (18%)

It is worth emphasizing that a significant portion of occupational mobility occurs within firms. Table 2 shows that 44% of individuals changing occupations did so at the time of changing employers, while 38% did so within firms and the balance (18%) were missing employer change data. Moreover, the share changing occupations within firms is likely even larger. First, the independent coding of firm-movers likely inflates the rate of occupational mobility. Second, since the rate of mobility between firms is relatively low (less than 3% per month), the vast majority of individuals with missing employer mobility data are likely firm stayers. Thus, within-firm occupational mobility comprises at least 38%, and as much as 55% of aggregate occupational mobility statistics.

3.2 Measuring Occupational Mobility in the NLSY97

In contrast to the CPS, the NLSY97 survey was explicitly constructed as a longitudinal survey, following a set of approximately 9,000 individuals born between 1980 and 1984 as

[6]For these calculations, the authors exclude workers with missing employer change responses.

they began their working lives in 1997. The survey is currently available through 2013, consisting of 16 rounds of data. The NLSY97 is an annual survey, in which respondents retrospectively report on their employment and other activities over the previous year. This leads to somewhat different measurements of occupational mobility compared with the CPS, as I will discuss in more detail below. Table A.2 shows summary statistics for key variables.

The NLSY97 utilizes dependent coding similar to the CPS, thus if the respondent reports working for an employer from a previous year, he will be read his previous response and asked if the occupation has changed. If he indicates that the occupation has changed, he will be asked to describe his occupation, which will then be coded into a three-digit census occupation. However, there are several differences between the two samples. First, if the respondent changed occupations multiple times between surveys, the survey only captures a single occupational change. Second, if a worker is employed for less than 3 months, he is not asked about the occupation at the end of the job. Third, the retrospective nature of the survey may lead the individual to forget occupation changes, especially for jobs that ended before the survey was conducted. Finally, the CPS is a nationally representative survey of households each month, while the NLSY97 is a nationally representative survey of individuals born between 1980 and 1984, thus the CPS is able to capture mobility dynamics for workers across ages and years.

Column (5) of Table 1 shows the average annual mobility rate in the NLSY97 data. 8.3% of employed workers change occupations each year. This can be compared to the monthly estimate from the CPS, which can be annualized as between 4.5% and 14.5% probability of at least one occupation change over the course of the year. Thus the two surveys offer consistent rates of occupational mobility within firms.

3.3 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 OES surveys over a million establishments every three years. Each establishment reports the number of employees in each detailed occupation, as well as their wages. 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. O*NET is a database developed by the U.S. Department of Labor to provide detailed information on over 900 occupations. The occupational data is provided by skilled human resources professionals and includes information on the abilities and skills needed to succeed, the tasks performed, the required education, experience, and training, among other information. In total there are 277 of these occupational descriptors. These are summarized in Appendix Table A.3.

Since each occupation has hundreds of scores, I use principal component analysis (PCA) to condense these variables into quality 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 O*NET Quality Score. To create it, I include variables classified as worker ability and worker skills in the database. These include variables ranging from oral comprehension to stamina to memorization. The variables that are weighted highest in this index are written expression, reading comprehension, judgment and decision-making. 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 zero to one

hundred. See Appendix Table A.4 for more details on the variables and occupations.

For the second index, I explicitly construct a variable using management-related variables in the O*NET database. I include such variables as leadership, resource management skills, decision-making skills, and so forth. Appendix Table A.5 shows a list of all variables included in the index. I then use PCA to create a single index based on these 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, other high scoring occupations include education administrators, and front-line supervisors. Occupations that receive low management scores include farmworkers, telemarketers, and food prep workers. I call this index the Management Score, and again normalize it to be between zero and one hundred. See Appendix Table A.6 for more details on the variables and occupations.

4 Results

As a preliminary examination of occupational changes, Table A.9 in the Appendix shows the most frequent internal occupational moves recorded in the CPS, and the associated changes in occupational quality across three dimensions: OES score, O*NET quality score, and Management score. In all but four of these 26 most frequently observed changes, all three occupational quality indices have the same sign, which is consistent with what we will see throughout the results: the indices are remarkably consistent. 11 of these occupational changes are coded as movements to lower-quality jobs, while 12 are coded to moves to higher-quality jobs. Many of the moves are between a non-management occupation and the lowest level of management above the occupation: for instance, moves between 'Medical and Health Services Managers' and 'Registered Nurses'. This is in part because the most frequent moves are going to be influenced by the most frequent occupations, which are those at the bottom of the management hierarchy.

Finally, although many of the moves are explicitly moves up and down a management hierarchy, others are between related non-managerial jobs along a skills hierarchy. For instance, bilateral movements between 'Nursing Aides', 'Licensed Practical Nurses', and 'Registered Nurses' occur relatively frequently. These three occupations form a clear non-managerial skills hierarchy, and differences in compensation between the three occupations is consistent with this ranking. Teaching occupations also show a skill and compensation hierarchy, with 'Secondary School Teachers' both earning more and receiving higher skills rankings than 'Elementary and Middle School Teachers'.

Thus, the observed changes in occupational mobility inside firms is consistent with the idea of ranked moves up and down a job ladder, with many moves representing explicit moves up or a managerial hierarchy, and other moves more consistent with a skills hierarchy.

4.1 The Quality of Internal Occupational Changes

Now we turn to the change in the quality of occupational moves. Table 3 shows the share of workers changing occupations inside the firm in the CPS sample who move to higher- or lower-quality occupations, based on various definitions. The first 3 rows show the share moving to higher-quality occupations based on OES, O*NET and O*NET Management indices respectively. All three show similar shares of workers making positive moves each month: between 52% and 54%, depending on the definition of occupational mobility.

In the fourth and fifth rows of Table 3, the definition of positive (and negative) change is restricted to individuals who make positive (or negative) changes on all three quality indices at the same time. This reduces the frequency of positive mobility to about 36%, and the frequency of negative mobility to about 29%. These results indicate that approximately 1/3 of individuals changing occupations are moving to unambiguously higher-quality occupations, a little more than 1/3 move to occupations that are ambiguously ranked, and a little less than 1/3 move to occupations that are unambiguously lower-quality occupations.

The bottom panel of table 3 shows this exercise repeated for the NLSY97 sample. In

Table 3: Quality of Occupational Changes

	Estimate	SE	N
CPS:			
Positive OES Change	52.63***	(0.267)	46184
Positive O*NET Change	53.10***	(0.266)	46184
Positive O*NET Management Change	53.48***	(0.266)	46184
Positive Change on all 3 Measure	35.54***	(0.256)	46184
Negative Change on all 3 Measures	29.02***	(0.242)	46184
NLSY97:			
Positive OES Change	66.68***	(0.697)	5380
Positive O*NET Change	65.73***	(0.704)	5380
Positive O*NET Management Change	66.02***	(0.701)	5380
Positive Change on all 3 Measure	50.08***	(0.742)	5380
Negative Change on all 3 Measures	18.79***	(0.575)	5380

Robust standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Specifications in the top panel are weighted using CPS final weights, specifications in the bottom panel are weighted using NLSY97 cross-sectional weights. Sample includes individual who report an occupational change within the firm. Dependent variable is whether or not the individual made a positive or negative occupational change, according to the row's definition. See Section 3.3 for definitions of OES, O*NET, and O*NET Management Scores.

general, the NLSY97 sample is more likely to make upward moves and less likely to make downward moves compared with the CPS sample. This is most likely due to demographic differences, we will later see that rates of upward mobility vary substantially with age (see Table 8). Nonetheless, we still see 18.8% of occupational changers in the NLSY97 move to lower-quality jobs, based on the 'all-three' measure.

4.2 Contemporaneous Changes with Occupational Mobility

Although I've shown that at least 18% of occupational changes inside the firm are to lower-quality occupations, one question is whether or not these moves look like demotions by other metrics. In this section, I use NLSY97 data to examine contemporaneous wage changes, and measures of job satisfaction and on-the-job search to see how these metrics vary with occupational changes inside the firm.

In Table 4, we see that 26% of workers who make negative occupational changes experience negative nominal wage growth, compared with 11% of workers who make positive occupational changes. That is, individuals making negative occupational changes are more

than twice as likely to have wage cuts than those who make positive movements. In addition, we see that 19% of negative occupational movers have wage cuts of over 5%, while only 8% of positive occupational changers have such negative wage changes. Table 4 also shows that one-fifth of individuals who do not change occupations report nominally rigid wages, which is higher than the rates for all types of occupation changers.

One surprising result from the wage table is that 47% of individuals who do not change occupations report positive wage growth, with 34% reporting wage growth above 5%. These numbers are even higher for negative occupation changers: 59% report positive wage growth and 45% report growth above 5%. These rates are smaller than what we see for those making positive occupational moves (68% and 59%, respectively), but are still quite large. There are several possible explanations. First, self-reported wage data is very noisy, so measuring changes between two noisily variables can overstate changes. Second, it could be due to miscoding of occupations, if some of these individuals measured as negative moves actually were considered positive moves by the firm. Finally, if the negative movement was optimal from the perspective of the firm, we would expect worker productivity to rise despite the downward movement, which could be reflected in wage growth.

In Table 5, I classify individuals who report disliking their job "somewhat" or "very much" as having negative job satisfaction, and those reporting liking their job "fairly well" or "very much" as having positive job satisfaction, omitting the neutral "think it is okay" choice. In columns (1) and (2), we see that individuals who made positive or indeterminate occupational changes are significantly less likely to report negative job satisfaction and are significantly more likely to report positive job satisfaction, compared with those who did not change occupations. For individuals who made negative occupational changes, the point estimates are much smaller, however, and are too noisy to distinguish from either the positive movers or the non-movers.

In Column (3) of Table 5, I look at the percent of individuals who report searching on-the-job at the first interview after an occupational change (or lack of change). Here

Table 4: Contemporaneous Wage Changes with Occupational Change

	(1) >5% Inc.	(2) Pos. Chg	(3) No Chg.	(4) Neg. Chg	(5) >5% Dec.
Positive Occ. Changers	25.26***	20.82***	-12.37***	-7.723***	-5.244***
	(1.005)	(0.963)	(0.570)	(0.683)	(0.617)
Indeterm. Occ. Changer	22.58***	23.07***	-8.924***	-3.734***	-2.784***
	(1.331)	(1.227)	(0.868)	(0.962)	(0.834)
Negative Occ. Changers	10.72***	11.81***	-9.420***	7.051***	5.979***
	(1.699)	(1.675)	(1.087)	(1.477)	(1.332)
Constant	34.07***	47.45***	20.72***	18.52***	13.35***
	(0.203)	(0.213)	(0.173)	(0.166)	(0.145)
N	70444	70444	70444	70444	70444
R-sq	0.017	0.013	0.006	0.002	0.002

Robust standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Data source: NLSY97, weighted using NLSY97 cross-sectional weights. Occupational changers are defined as individuals reporting an occupational change with reported occupations changing. Dependent variable is the percent of individuals with a wage change of the magnitude specified. Independent variable is whether or not the individual made a positive or negative occupational change in all three quality score simultaneously (OES, O*NET and O*NET Management). See Section 3.3 for definitions of OES, O*NET, and O*NET Management Scores. Omitted category is workers who remain at the firm without any occupational change.

we see that individuals who made positive or indeterminate occupational changes are are significantly less likely to report job-search activities, compared with those who did not change occupations. For individuals who made negative occupational changes, the point estimate is approximately zero, however again the estimate is too noisy to distinguish from either the positive movers or the non-movers.

Thus, across both job satisfaction and search behavior, we see that individuals who make positive and indeterminate occupational moves appear to be consistent with a promotion or desired job-transition: these individuals are happier with their jobs and less inclined to leave. For individuals who made negative occupational changes, the point estimates suggest they are similar to those who had no occupational change, however the estimates are too noisy to distinguish statistically.

The next question is whether or not the individuals who make negative occupational moves are more likely to leave the firm. We can see this in the short-term using the CPS data, and in the longer term using the NLSY97 data. In the short-term, we can see if individuals who had negative occupational changes are more likely to move to a new employer in the

Table 5: Job Satisfaction and On-the-Job Search Behavior with Mobility

	(1) Neg. Satisfaction	(2) Positive Satisfaction	(3) Job Search
Positive Occ. Changers	-2.973***	8.574***	-2.118+
	(0.605)	(0.933)	(1.231)
Indeterm. Occ. Changer	-3.484***	8.294***	-4.182**
	(0.744)	(1.220)	(1.613)
Negative Occ. Changers	-1.610	2.312	-0.0105
	(1.026)	(1.636)	(2.142)
Constant	11.61***	62.68***	33.79***
	(0.140)	(0.212)	(0.269)
N	66684	66684	39208
R-sq	0.001	0.002	0.000

Robust standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Data source: NLSY97, weighted using NLSY97 cross-sectional weights. Occupational changers are defined as individuals reporting an occupational change with reported occupations changing. In Columns (1) and (2), the dependent variable is the share reporting the top two of a 5 point job satisfaction score, and the bottom two, respectively. In Column (3), the dependent variable is the share reporting searching on-the-job. The independent variable is whether or not the individual made a positive or negative occupational change in all three quality score simultaneously (OES, O*NET and O*NET Management). See Section 3.3 for definitions of OES, O*NET, and O*NET Management Scores. Omitted category is workers who remain at the firm without any occupational change.

following month. To do so, I restrict the sample to individuals who can be matched for four consecutive months in the CPS (either months-in-sample 1 to 4 or months-in-sample 5 to 8) and are employed at the same firm for the first two months in the same occupation.

Table 6 shows the relative employer-to-employer mobility rate following a pair of months of potential occupational mobility. Here we see that individuals who experience a negative occupational change are about 40% more likely to leave the firm for a new firm in the month following this change compared with those who have a positive occupational change. Column (2) of table 6 shows a similar pattern in the NLSY97, but with smaller magnitude. Thus, inasmuch as individuals are able to find a new employer immediately, the rate of mobility between firms spikes for individuals experiencing negative job changes.

4.3 Longer-term Wages Following Occupational Mobility

Next we want to see if there is a relationship between occupational changes within the firm and longer-term wages. In particular, we can see if there are systematic differences between

Table 6: Rate of Movement to New Employer After Occupational Change inside the Firm

	(1)	(2)
	Exit Next Month	Exit Next Year
Positive Occ. Changers	0.520+	6.450***
	(0.270)	(0.853)
Indeterm. Occ. Changer	0.989***	6.964***
	(0.305)	(1.128)
Negative Occ. Changers	1.540***	9.575***
	(0.379)	(1.485)
Constant	1.803***	16.41***
	(0.009)	(0.159)
N	2866667	70444
R-sq	0.000	0.003
Sample	CPS	NLSY97

Robust standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Column (1) uses CPS data, and is weighted using CPS final weights. Sample is restricted for individuals who matched four consecutive months in the CPS (either months-in-sample 1 to 4 or months-in-sample 5 to 8) and are employed at the same firm for the first two months in the same occupation. Column (2) uses NLSY97 data weighted using cross-sectional weights, and reports the percentage leaving the firm in the year following the occupational movement. For both specifications, negative occupation changers are defined as individuals who have negative changes in occupation quality on all three indices (OES, O*NET, O*NET Management), indeterminate occupation changers are those who have a mix of negative and positive changes on the three indices, and positive occupation changers are those with positive changes on all three indices. The omitted category is individuals who did not change occupations.

wages 1 year, 2 years, and 5 years after the mobility event, compared with individuals who do not change occupations. These estimates include controls for the wage and occupational quality of the job preceding the possible occupational change. Thus the estimates provide a comparison of wages based on a positive, negative, indeterminate occupational move versus no occupational change, conditional on initial occupation quality. As occupational mobility is not exogenous, the proper interpretation is the relationship between occupational mobility and future wages rather than a causal estimate.

For the preferred specifications, I include controls for the log wage and occupational quality before the mobility event. In addition, I topcode wages at $100 per hour, which affects less than 0.05% of the sample. In the Appendix, I include a detailed discussions of alternative controls and alternative wage transformations. Finally, I restrict the sample to a balanced panel, that has at least 6 years of observation (1 year before potential mobility event through 5 years after).

Table 7: Log Wages with Mobility

	(1) 1 yr. log wage	(2) 2 yr. log wage	(3) 5 yr. log wage
Positive Occ. Changers	0.0894***	0.0876***	0.0794***
	(0.0155)	(0.0146)	(0.0176)
Indeterm. Occ. Changer	0.0152	0.00958	-0.00177
	(0.0215)	(0.0200)	(0.0213)
Negative Occ. Changers	-0.0903***	-0.124***	-0.0444+
	(0.0263)	(0.0286)	(0.0263)
Log prev occ. Qual.	0.310***	0.320***	0.300***
	(0.0135)	(0.0132)	(0.0133)
log prev wage, censored	0.392***	0.339***	0.253***
	(0.0144)	(0.0130)	(0.0113)
Constant	0.704***	0.880***	1.341***
	(0.0248)	(0.0256)	(0.0287)
N	25792	25792	25792
R-sq	0.258	0.219	0.134

Robust standard errors in parentheses. $^{+}$ $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Data source: NLSY97, weighted using cross-sectional weights, restricted to workers with five years of wage data. Occupational changers are defined as individuals reporting an occupational change with reported occupations changing. The dependent variable is log hourly wages 1, 2, and 5 years after an internal mobility event, where wages are topcoded at $100 per hour. The independent variable is whether or not the individual made a positive or negative occupational change in all three quality score simultaneously (OES, O*NET and O*NET Management). See Section 3.3 for definitions of OES, O*NET, and O*NET Management Scores. Omitted category is workers who remain at the firm without any occupational change.

Column (1) of Table 7 shows that one year after the mobility event, individuals who make positive occupational changes receive wages that are 8.9% higher than those who had no occupational change in the previous year, while individuals who made negative moves receive wages that are 9% lower than those with no occupational change. Thus, in net, we see that individuals who make positive occupational changes have wages that are 17.9% higher than those who make negative changes, controlling for occupational quality and wages before the move.

Columns (2) and (3) show the persistence of these results: after 2 years the increase in wages remains similar (8.8% higher than non-movers), and after 5 years the increase in wages falls slightly to 7.9%. For those making negative moves, the decrease in wages grows in the second year (-12.4%), but reduces substantially in magnitude to -4.4% after 5 years. Nonetheless, even five years later, we see individual who made positive occupational changes

inside the firm earn 12.4% more than those who made a negative occupational change in the firm, after controlling for wages and occupational quality before the move.

Thus, these negative occupational changes inside the firm are associated with long-term earnings losses, compared with both non-occupational changers and those who make positive occupational changes.

4.4 Heterogeneity in Mobility

So far I have shown that downward occupational mobility comprises a non-negligible share of occupational mobility within firms and is associated with persistent earnings losses. Next I turn to characteristics that may shine a light on the causes of mobility: age, establishment size, and occupation. In the Appendix, I show variation in mobility across a variety of other measures (race, gender, education, and industry).

It is well-established that mobility between firms declines with age (cf. Topel and Ward (1992)). Column (1) of Table 8 shows the rate of occupational mobility within firm also is declining with age. This is consistent with human capital accumulation and firm learning, in which human capital investments and signals about ability accumulates early in the career, leading to early movements that reduce in frequency later in the career.

Columns (2) and (3) of Table 8 shows how the share of occupational movers going to a positive or negative new occupation with in the firm varies with the worker age. Here we see that 39% of the internal occupational changes for workers under the age of 20 are to higher quality occupations, a rate that steadily falls with age, to a low of 29% for individuals over the age of 50. In contrast, the share of workers under 20 moving to lower-quality occupations is the lowest for all age groups, at 26% of moves to lower-quality jobs, a rate that rises monotonically with age to a high of 33% for individuals over the age of 50.

Thus, although the rate of occupational mobility falls with age, the composition of mobility also changes dramatically. Young workers are much more likely to move up, although over a quarter of moves are still to lower-quality occupations. Workers toward the end of

their careers (over 50) have higher rates of downward mobility, but again, over 25% of occupational moves are to higher-quality jobs. Therefore, it appears that there may be two offsetting trends in occupational mobility: for early career workers, more frequent occupational change that is more likely to be to higher-quality occupations, while for later career workers, the frequency of mobility falls, and the share of downward moves outweighs upward moves. Such movements are consistent with an intentional scaling-back for workers later in their careers.

Table 8: Frequency and Quality of Moves by Age

	(1)	(2)	(3)
	Freq. Mob.	Positive Occ. Chg.	Negative Occ. Chg.
Under 20	0.226***	10.64***	-7.199***
	(0.00832)	(1.074)	(1.089)
20 to 30	0.161***	7.283***	-4.924***
	(0.00810)	(1.084)	(1.104)
30 to 40	0.104***	4.885***	-2.778*
	(0.00781)	(1.086)	(1.115)
40 to 50	0.0649***	4.405***	-1.038
	(0.00804)	(1.139)	(1.172)
Constant	0.304***	28.71***	33.21***
	(0.00641)	(0.956)	(0.996)
N	10460134	46184	46184
R-sq	0.000	0.004	0.003

Robust standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. All specifications are weighted using CPS final weights. In Column (1), the sample is defined as all workers employed, and occupational change is defined as those who report an occupational change within the firm according according to the following definition: change in the coded occupation with a with a coincident reported change in usual activities. Columns (2) and (3) are restricted to those with occupational change as defined in Column (1), and the dependent variable is whether or not the individual made a positive or negative occupational change in all three quality score simultaneously (OES, O*NET and O*NET Management). See Section 3.3 for definitions of OES, O*NET, and O*NET Management Scores. Omitted category is individuals over 50.

Establishment size information is collected in the NLSY97 survey but not the CPS survey, so the estimates with establishment size are not representative across the lifecycle. In Column 1 of Table 9 shows that the rate of mobility rises steadily with establishment size, with the largest establishments reporting internal occupational movements in 12% of matches reported each year. In Columns 2 and 3, we see that the rate of upward mobility falls with establishment size, while the rate of downward mobility rises. Thus, it appears that individuals who are at large establishments are both more likely to change occupations and,

upon changing, less likely to move up, compared with individuals at smaller firms. Although this could be driven in part by differences in establishment size by industry, Table A.12 in the Appendix shows there is little statistically significant variation in internal mobility by industry.

Table 9: Frequency and Quality of Moves by Establishment Size

	(1) Freq. Mob.	(2) Positive Occ. Chg.	(3) Negative Occ. Chg.
Size btwn. 25 and 100	3.087***	-2.411	3.233*
	(0.328)	(2.018)	(1.519)
Size btwn 100 and 500	5.475***	-9.238***	4.006*
	(0.403)	(2.097)	(1.607)
Size over 500	5.400***	-14.80***	6.766**
	(0.518)	(2.507)	(2.061)
Constant	6.745***	55.01***	15.81***
	(0.183)	(1.394)	(1.009)
N	52900	4734	4734
R-sq	0.006	0.011	0.003

Robust standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.Data source: NLSY97, weighted using cross-sectional weights. In Column (1), occupational changers are defined as individuals reporting an occupational change with a coincident change in reported occupation. Columns (2) and (3) are restricted to those with occupational change as defined in Column (1), and the dependent variable is whether or not the individual made a positive or negative occupational change in all three quality score simultaneously (OES, O*NET and O*NET Management). See Section 3.3 for definitions of OES, O*NET, and O*NET Management Scores. Omitted category is establishments with fewer than 25 employees.

Table 10 shows how mobility rates vary by initial occupation. Here we see that Production Occupations and Office and Administrative Support Occupations appear to have the highest rates of occupational mobility, while Service Occupations, Professional Occupations, and Construction occupations have some of the lowest rates of occupational mobility.

When we look at the quality of occupational mobility, one striking pattern stands out: workers in Management Occupations have substantially higher rates of downward mobility than any other occupation. In particular, 11% of workers in management occupations who change jobs within the firm move to higher quality jobs, while 57% move to lower quality jobs. These results are not driven by any one quality measure, disaggregated quality results show similar mobility rates across all three indices (about 20-25% moving up and 70-75% moving down).

Table 10: Frequency and Quality of Moves by Occupation

	(1) Freq. Mob.	(2) Positive Occ. Chg.	(3) Negative Occ. Chg.
Management, Business, and Financial Occs.	0.0846***	-39.32***	39.65***
	(0.00808)	(0.843)	(0.861)
Professional and Related Occs.	-0.0154*	-21.36***	16.81***
	(0.00709)	(0.939)	(0.833)
Sales and Related Occs.	0.0541***	-6.869***	9.111***
	(0.00870)	(1.081)	(0.906)
Office and Admin. Support Occs.	0.209***	-6.011***	3.114***
	(0.00901)	(0.958)	(0.751)
Farming, Fishing, and Forestry Occs.	-0.00579	-1.770	-4.497
	(0.0245)	(3.359)	(2.305)
Construction and Extraction Occs.	-0.00542	-11.33***	11.23***
	(0.0106)	(1.425)	(1.276)
Installation, Maintenance, and Repair Occs.	0.0971***	-16.68***	10.52***
	(0.0137)	(1.476)	(1.346)
Production Occs.	0.183***	-17.94***	4.532***
	(0.0112)	(1.104)	(0.921)
Transport and Material Moving Occs.	0.0635***	-2.341	-10.17***
	(0.0109)	(1.312)	(0.804)
Constant	0.370***	50.27***	17.55***
	(0.00540)	(0.730)	(0.559)
N	10460134	46184	46184
R-sq	0.000	0.073	0.096

Robust standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. All specifications are weighted using CPS final weights. In Column (1), the sample is defined as all workers employed, and occupational change is defined as those who report an occupational change within the firm according according to the following definition: change in the coded occupation with a with a coincident reported change in usual activities, and both months of the survey to be collected by the individual to count as an occupational change. Columns (2) and (3) are restricted to those with occupational change as defined in Column (1), and the dependent variable is whether or not the individual made a positive or negative occupational change in each of the three quality score simultaneously (OES, O*NET and O*NET Management). See Section 3.3 for definitions of OES, O*NET, and O*NET Management Scores. Omitted category is Service Occupations.

No other occupation exhibits such a high rate of downward occupational mobility. Professional occupations and construction and installation also have higher than average rates of downward mobility (34%, 29%, and 28% respectively), while service occupations and transportation occupations have the lowest rate of downward mobility (7% and 18% respectively). In the Appendix, Table A.13 shows similar mobility patterns by occupation in the NLSY97, in particular,we see 18% of management workers move to higher-quality occupations, compared with 46% moving to lower-quality occupations, thus corroborating the exceptionally high rates of downward mobility for workers in managerial occupations.

4.5 Mobility of Management Workers

Since workers in management occupations have substantially more frequent downward occupational mobility than workers in other occupations, in this section I focus on the previous movements of individuals who make occupational moves. Panel A of Table 11 shows this joint distribution for workers who were in management right before the current move, and Panel B shows the joint distribution for workers who were in non-management positions. Here we see that for management workers, a much larger fraction of negative occupational moves are due to workers who were previously promoted (36%) compared with non-management workers (17%). Thus, although the predominant source of downward moves for both types of occupations is individuals for whom this is their first occupational change within the firm, demoted management workers are more likely to have previously been promoted within the firm.

These results suggest that firms may be more uncertain about workers' ability in managerial positions compared to other types of jobs. This is consistent with two-dimensional learning: it may be difficult to assess a worker's managerial ability until observed on-the-job. This is the heart of the "Peter Principle" idea, that performance in the previous position is especially poor at predicting performance in the promoted position, which is typically applied to managerial hierarchies. However, the frequency of downward mobility for managerial workers suggests that firms may correct these failed assignments more frequently than previously believed.

5 Conclusions

In this paper, I use nationally representative survey data to measure the frequency and quality of occupational changes inside firms. I find that moves to lower-quality occupations are relatively frequent, comprising over 18% of occupational changes within firms. I find contemporaneous and persistent earnings losses for young workers in the NLSY97 who expe-

Table 11: Distribution of Moves by Previous Move

Panel A: Management Occupations					
Current Move	First Move	Prev. Neg.	Prev. Indet.	Prev Pos.	Total
Neg. Move	134	2	15	84	235
	(57.02%)	(0.85%)	(6.38%)	(35.74%)	(100.00%)
Indet Move	93	4	23	45	165
	(56.36%)	(2.42%)	(13.94%)	(27.27%)	(100.00%)
Pos. Move	50	7	10	22	89
	(56.18%)	(7.87%)	(11.24%)	(24.72%)	(100.00%)
Total	277	13	48	151	489
	(56.65%)	(2.66%)	(9.82%)	(30.88%)	(100.00%)
Panel B: Non-Management Occupations					
Current Move	First Move	Prev. Neg.	Prev. Indet.	Prev Pos.	Total
Neg. Move	965	23	65	211	1,264
	(76.34%)	(1.82%)	(5.14%)	(16.69%)	(100.00%)
Indet. Move	1,822	46	177	115	2,160
	(84.35%)	(2.13%)	(8.19%)	(5.32%)	(100.00%)
Pos. Move	2,552	189	158	127	3,026
	(84.34%)	(6.25%)	(5.22%)	(4.20%)	(100.00%)
Total	5,339	258	400	453	6,450
	(82.78%)	(4.00%)	(6.20%)	(7.02%)	(100.00%)

rience negative occupational mobility. Finally, I find support for both models of firm-learning and human capital acquisition in driving the occupational mobility of workers inside the firm.

These results show that firms do move workers to lower-quality positions, in contrast to the previous literature which suggested that downward mobility is rare. Workers who are moved downward show a substantial slowing of earnings growth compared with non-movers and upward movers, which can persist for at least five years. These results have implications for how we understand earnings growth. First, returns to tenure and experience can be very different depending on a worker's mobility: workers who receive serial promotions have much steeper earnings profiles compared with those who experience demotion, thus estimates of returns to tenure or experience that do not take into account job assignment will be aggregating very different trends. In addition, these results indicate that internal occupational mobility can lead to significant heterogeneity in earnings growth between otherwise similar workers, which persist even if the worker leaves the firm. Thus, a firm's choice about job assignment can have substantial impact on a worker's career. It remains an open question how these decisions are made, and whether or not they are equitable or efficient.

Appendix

This Appendix consists of four parts. First, I show summary statistics for the main variables utilize. Second, I provide additional tables explaining the construction of the occupational quality indices. Third, I provide additional information about the wage regressions. Finally, I include additional mobility results by sub-groups.

Table A.1: Data Description CPS

	All Employed	Occ. Changers	Pos. Occ. Changers	Neg. Occ. Changers
Age	41.17	38.81	37.75	39.95
	13.57	13.16	12.93	13.12
Yrs. Ed.	13.61	13.50	13.48	13.56
	2.75	2.57	2.39	2.50
Female	0.48	0.49	0.50	0.50
	0.50	0.50	0.50	0.50
Nonwhite	0.14	0.14	0.14	0.14
	0.35	0.34	0.34	0.35
log wage	2.44	2.38	2.40	2.39
	0.52	0.51	0.49	0.51
OES Index	19.26	18.52	14.24	24.12
	11.00	10.17	6.32	11.80
O*NET Qual. Index	45.70	44.87	37.93	55.54
	20.63	20.38	17.42	18.35
Mgmt Index	45.16	43.99	35.50	56.44
	19.22	19.33	14.61	18.75
N	10,460,134	46,184	16,335	13,472

Standard errors in parentheses. Weighted using final weights. Log wages sample sizes are 1/4 of the full sample, since wage information is only collected in the last month of the survey wave.

Table A.3 shows the O*NET variables included in the O*NET quality index and Table A.4 shows which variables are most and least heavily weighted in the index, and which occupations rate highest and lowest in the index.

Table A.2: Data Description NLSY97

	All Employed	Occ. Changers	Pos. Occ. Changers	Neg. Occ. Changers
Age	24.34	24.74	24.67	24.94
	(4.14)	(4.10)	(4.03)	(4.03)
Female	0.49	0.50	0.51	0.57
	(0.50)	(0.50)	(0.50)	(0.50)
Nonwhite	0.25	0.23	0.24	0.24
	(0.43)	(0.42)	(0.43)	(0.43)
Job Duration	2.30	3.07	3.08	3.19
	(0.00)	(2.33)	(2.32)	(2.47)
Establishment Size	307	414	387	400
	(1922)	(2201)	(2343)	(1395)
log wage	2.36	2.46	2.46	2.41
	(0.69)	(0.62)	(0.57)	(0.70)
OES Index	15.04	14.86	11.99	20.13
	(8.21)	(7.98)	(5.01)	(9.99)
O*NET Qual. Index	39.85	40.13	34.51	53.25
	(18.93)	(19.32)	(16.34)	(17.00)
Mgmt Index	38.13	37.66	31.12	51.47
	(17.03)	(17.57)	(13.18)	(18.43)
N	70444	5668	3000	1027

Standard errors in parentheses, weighted using cross-sectional weights.

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.6 shows which variables are most and least heavily weighted in the management index, and which occupations rate highest and lowest in the management index.

Wage Estimates

There are two main issues with measuring longer-term wages. First, wage data in the NLSY97 is relatively noisy, with some hourly wage data of multiple hundreds of dollars per hour. Estimates do appear to be sensitive to these outliers, so for most specifications, I topcode wages at $100 per hour. Estimates are not sensitive to top-coding versus censoring, which I show in column (5) of Table A.7. In practice, there are only 430 observations (¡ 0.3%) that are subject to this topcoding or censoring.

The second issue is the choice of appropriate controls. Columns (1) through (4) of Table A.7 show how estimates of 2 year log wages are influenced by the inclusion of different controls. Columns (1) and (2) show how, without controlling for initial occupational quality, it looks like there is no relationship between negative occupational changes and future wages. However once initial occupational quality is included in Column (3), we see a strong negative relationship. Column (4) shows the preferred specification, which is also included in Table 7. Finally, Column (5) shows the results using censored wages rather than topcoded wages, which yields similar results to the preferred specification.

The inclusion of initial occupational quality is important because the distribution of movements to higher- and lower-quality jobs is contingent on the quality of the worker's

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

initial position. Most starkly, if you are in the lowest ranked occupation, it is impossible to move to lower quality jobs. Table A.8 shows the distribution of moves by the quality of the occupation in the previous year. Here we see that for workers in jobs that had 2005 OES median wages below $10 per hour, 5.7% made positive moves while only 0.6% made negative moves. At the other extreme, workers in occupations with median wages above $20 per hour, 1.5% made positive moves, while 3.5% made negative moves. Thus, wage regressions without controls for OES quality will overstate the wage effect of downward occupational changes.

Additional Mobility Results

Table A.10 shows a U-shaped pattern of the rate of mobility and the share of upward mobility, with individuals with some college and a college degree moving the most frequently. Table A.11 shows how mobility rates vary by worker race and gender, which show white women have higher rates of occupational mobility than white men, but otherwise few significant patterns. Table A.12 shows how mobility rates and quality vary by major industry.

Column (1) of Table A.13 shows the relative rates of occupational mobility by major occupation from the NLSY97 data, which we can compare with what we saw from the CPS

Table A.7: Log Wages with Mobility

	(1)	(2)	(3)	(4)	(5)
	Log wage	Log wage	Log wage	Log wage	Log wage, censored
Positive Occ. Changers	0.0344*	0.0377**	0.118***	0.0934***	0.101***
	(0.0152)	(0.0144)	(0.0150)	(0.0143)	(0.0141)
Indeterm. Occ. Changer	0.0382+	0.00708	-0.0142	-0.00752	-0.00000355
	(0.0222)	(0.0193)	(0.0197)	(0.0186)	(0.0185)
Negative Occ. Changers	0.0323	-0.0113	-0.161***	-0.102***	-0.108***
	(0.0278)	(0.0251)	(0.0253)	(0.0244)	(0.0238)
Log prev wage, topcoded		0.474***		0.365***	
		(0.00943)		(0.0100)	
Log prev occ. Qual.			0.603***	0.344***	0.372***
			(0.00777)	(0.0105)	(0.0102)
log prev wage, censored					0.320***
					(0.00962)
Constant	2.471***	1.416***	0.950***	0.783***	0.799***
	(0.00342)	(0.0222)	(0.0199)	(0.0192)	(0.0191)
N	50701	45589	46931	45422	45044
R-sq	0.000	0.221	0.156	0.260	0.256

Robust standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Data source: NLSY97, weighted using cross-sectional weights. Occupational changers are defined as individuals reporting an occupational change with reported occupations changing. The dependent variable is wages 2 years after an internal mobility event. The independent variable is whether or not the individual made a positive or negative occupational change in all three quality score simultaneously (OES, O*NET and O*NET Management). See Section 3.3 for definitions of OES, O*NET, and O*NET Management Scores. Omitted category is workers who remain at the firm without any occupational change.

data. Similarly to the CPS, we see Production Occupations and Office and Administrative Support Occupations have the highest rates of internal occupational mobility, while Service Occupations, Professional Occupations, and Construction Occupations have some of the lowest rates. However, we see much lower rates of occupational mobility for Farming, fishing, and forestry Occupations compared with the CPS, however this occupational category is small and imprecisely measured. Overall, the relative rates of mobility are consistent between the two datasets.

Next, we see whether the NLSY97 matches the pattern of mobility quality by occupation from the CPS. Columns (2) and (3) of A.13 shows the results. Consistent with the CPS, we see Management Occupations have the lowest rate of upward mobility and the highest rate of downward mobility of any of the major occupations. In particular, we see 17.63% of management workers move to higher-quality occupations, compared with 46.87% moving

Table A.8: Distribution of Mobility with OES Quality of Initial Job

	Under \$10	\$10 − \$15	\$15 − \$20	Over \$20	Total
Pos. Move	1,624	865	334	177	3,000
	5.74%	4.49%	3.04%	1.49%	4.26%
Indet. Move	474	548	223	396	1,641
	1.67%	2.85%	2.03%	3.33%	2.33%
Neg. Move	156	203	247	421	1,027
	0.55%	1.05%	2.25%	3.54%	1.46%
No Move	26,051	17,644	10,196	10,885	64,776
	92.04%	91.61%	92.69%	91.63%	91.95%

to lower quality occupations. We can compare this to the CPS result: 10% of management workers moving up and 57% of these movers moving down.

Other patterns are similar: service occupations have above average rates of upward and below average rates of downward mobility, and production and professional occupations have below average upward mobility. Thus, in net, the patterns of mobility look very similar across occupations between the two surveys.

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Table A.9: Most Frequent Internal Occupational Moves

Initial Occ.	New Occ.	Frequency	Change OES	Change O*NET	Change Mgmt
First-Line Supervisors/Managers of Office and Admin. Support Worker	Secretaries and Administrative Assistants	9	-5.03	-0.16	-0.36
Secretaries and Administrative Assistants	Word Processors and Typists	9	-1.40	-0.19	-0.16
Receptionists and Information Clerks	Secretaries and Administrative Assistants	9	4.70	0.07	0.09
Computer Programmers	Computer Scientists and Systems Analysts	9	4.60	0.04	0.11
Medical and Health Services Managers	Registered Nurses	9	-7.23	-0.18	-0.34
Laborers and Freight, Stock, and Material Movers, Hand	Stock Clerks and Order Fillers	9	-0.25	0.22	0.13
Retail Salespersons	Cashiers	9	-0.47	-0.12	-0.14
Nursing, Psychiatric, and Home Health Aides	Personal and Home Care Aides	9	-1.78	-0.04	-0.12
First-Line Supervisors/Managers of Food Prep. and Serving Workers	Food Service Managers	9	7.36	0.04	0.18
Food Preparation Workers	Cooks	9	0.71	0.11	0.14
Stock Clerks and Order Fillers	Laborers and Freight, Stock, and Material Movers, Hand	10	0.25	-0.18	-0.08
Accountants and Auditors	Bookkeeping, Accounting, and Auditing Clerks	10	-10.92	-0.12	-0.11
Licensed Practical and Licensed Vocational Nurses	Nursing, Psychiatric, and Home Health Aides	10	-6.82	-0.10	-0.24
Preschool and Kindergarten Teachers	Elementary and Middle School Teachers	10	5.80	0.10	0.12
Cooks	First-Line Supervisors/Managers of Food Prep. and Serving Workers	10	3.62	0.20	0.20
Licensed Practical and Licensed Vocational Nurses	Registered Nurses	11	9.34	0.10	-0.05
Registered Nurses	Medical and Health Services Managers	12	7.23	0.18	0.34
Bookkeeping, Accounting, and Auditing Clerks	Accountants and Auditors	13	10.92	0.12	0.11
First-Line Supervisors/Managers of Retail Sales Workers	Managers, All Other	15	22.27	0.10	0.13
Special Education Teachers	Elementary and Middle School Teachers	16	-0.71	-0.05	0.00
Managers, All Other	First-Line Supervisors/Managers of Retail Sales Workers	19	-22.27	-0.10	-0.13
First-Line Supervisors/Managers of Retail Sales Workers	Retail Salespersons	19	-6.59	-0.12	-0.24
Cashiers	First-Line Supervisors/Managers of Retail Sales Workers	24	7.06	0.24	0.38
Elementary and Middle School Teachers	Secondary School Teachers	26	1.16	0.01	0.06
Retail Salespersons	First-Line Supervisors/Managers of Retail Sales Workers	28	6.59	0.12	0.24
Secondary School Teachers	Elementary and Middle School Teachers	29	-1.16	-0.01	-0.06

Most frequent internal occupation changes from the CPS sample, based on individuals who were continuously employed at the same firm for two months in the same occupation and then changed to a new occupation in the third month. The last three columns represent the raw change in the quality score between the initial and new occupation, based on the OES, O*NET Quality and the O*NET Management scores respectively, as defined in Section 3.3.

Table A.10: Frequency and Quality of Moves by Education

	(1) Freq. Mob.	(2) Positive Occ. Chg.	(3) Negative Occ. Chg.
No HS Degree	0.0845***	1.926	-3.079**
	(0.00943)	(1.124)	(1.095)
HS Degree	0.0750***	5.863***	-0.355
	(0.00764)	(0.968)	(0.950)
Some College	0.126***	7.696***	0.724
	(0.00782)	(0.960)	(0.944)
College Degree	0.0992***	6.894***	0.936
	(0.00830)	(1.019)	(0.997)
Constant	0.347***	29.82***	29.05***
	(0.00639)	(0.842)	(0.837)
N	10460134	46184	46184
R-sq	0.000	0.003	0.001

Robust standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. All specifications are weighted using CPS final weights. In Column (1), the sample is defined as all workers employed, and occupational change is defined as those who report an occupational change within the firm according according to the following definition: change in the coded occupation with a with a coincident reported change in usual activities. Columns (2) and (3) are restricted to those with occupational change as defined in Column (1), and the dependent variable is whether or not the individual made a positive or negative occupational change in all three quality score simultaneously (OES, O*NET and O*NET Management). See Section 3.3 for definitions of OES, O*NET, and O*NET Management Scores. Omitted category is individuals with advanced degrees.

Table A.11: Frequency and Quality of Occupational Mobility by Race and Gender

	(1) Freq. Mob.	(2) Pos. Chg.	(3) Neg. Chg.	(4) Freq. Mob.	(5) Pos. Chg.	(6) Neg. Chg.
White Women	0.0125*	1.516**	1.180*	1.254***	-4.529*	1.056
	(0.00504)	(0.551)	(0.519)	(0.311)	(2.069)	(1.671)
Nonwhite Women	-0.0273**	0.551	2.374*	0.435	-5.953*	-2.429
	(0.00877)	(1.025)	(0.987)	(0.341)	(2.354)	(1.842)
Nonwhite Men	-0.0157	-0.624	0.871	0.753*	-7.352***	-5.260**
	(0.00943)	(1.071)	(1.024)	(0.303)	(2.067)	(1.602)
Constant	0.434***	34.95***	28.30***	7.498***	55.34***	20.65***
	(0.00344)	(0.380)	(0.357)	(0.232)	(1.633)	(1.311)
N	10460134	46184	46184	70444	5379	5379
Sample	0.000	0.000	0.000	0.000	0.002	0.005
	CPS	CPS	CPS	NLSY97	NLSY97	NLSY97

Robust standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Columns (1) through (3) are weighted using CPS final weights, columns (4) through (6) are weighted using NLSY97 cross-sectional weights.. In Column (1), the sample is defined as all workers employed, and occupational change is defined as those who report an occupational change within the firm according according to the following definition: change in the coded occupation with a with a coincident reported change in usual activities, and both months of the survey to be collected by the individual to count as an occupational change. In Column (4), occupational changers are defined as individuals reporting an occupational change with a coincident change in reported occupation. Columns (3) through (6) are restricted to those with occupational change as defined in Columns (1) or (4), and the dependent variable is whether or not the individual made a positive or negative occupational change in all three quality score simultaneously (OES, O*NET and O*NET Management). See Section 3.3 for definitions of OES, O*NET, and O*NET Management Scores. Omitted category is white men.

Table A.12: Frequency and Quality of Moves by Industry

	(1) Freq. Mob.	(2) Positive Occ. Chg.	(3) Negative Occ. Chg.
Agriculture, Forestry, Fishing and Hunting	-0.0322*	0.00464	3.780
	(0.0162)	(2.719)	(2.633)
Mining	0.233***	-2.680	-3.183
	(0.0360)	(3.320)	(3.056)
Construction	0.0530***	0.0777	6.137***
	(0.0120)	(1.747)	(1.688)
Wholesale and Retail Trade	0.173***	4.343**	-1.242
	(0.0108)	(1.518)	(1.425)
Transportation and Utilities	0.0898***	0.652	0.690
	(0.0132)	(1.818)	(1.728)
Information	0.246***	0.871	1.645
	(0.0192)	(2.022)	(1.921)
Financial Activities	0.177***	0.692	1.426
	(0.0128)	(1.653)	(1.568)
Professional and Business Services	0.130***	-1.313	2.508
	(0.0114)	(1.583)	(1.511)
Leisure and Hospitality	0.0602***	1.912	3.716**
	(0.00991)	(1.502)	(1.425)
Other Services	0.156***	8.227***	-2.093
	(0.0121)	(1.643)	(1.523)
Public Administration	0.155***	-1.711	-0.667
	(0.0141)	(1.774)	(1.676)
Durable Goods	0.252***	-3.303*	-1.644
	(0.0128)	(1.580)	(1.495)
Nondurable Goods Manufacturing	0.238***	-1.013	-1.081
	(0.0146)	(1.711)	(1.609)
Constant	0.305***	34.31***	28.18***
	(0.00878)	(1.373)	(1.298)
N	10460134	46184	46184
	0.000	0.004	0.003

Robust standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. All specifications are weighted using CPS final weights. In Column (1), the sample is defined as all workers employed, and occupational change is defined as those who report an occupational change within the firm according according to the following definition: change in the coded occupation with a with a coincident reported change in usual activities, and both months of the survey to be collected by the individual to count as an occupational change. Columns (2) and (3) are restricted to those with occupational change as defined in Column (1), and the dependent variable is whether or not the individual made a positive or negative occupational change in all three quality score simultaneously (OES, O*NET and O*NET Management). See Section 3.3 for definitions of OES, O*NET, and O*NET Management Scores. Omitted category is health and education industries.

Table A.13: NLSY97 Frequency and Quality of Moves by Occupation

	(1) Freq. Mob.	(2) Positive Occ. Chg.	(3) Negative Occ. Chg.
Management, Business, and Financial Occs.	3.093***	-45.27***	34.77***
	(0.542)	(2.540)	(2.755)
Professional and Related Occs.	0.135	-30.86***	19.23***
	(0.355)	(2.510)	(2.058)
Sales and Related Occs.	1.841***	-1.237	3.944*
	(0.383)	(2.385)	(1.652)
Office and Admin. Support Occs.	4.915***	-11.92***	6.364***
	(0.421)	(2.241)	(1.580)
Farming, Fishing, and Forestry Occs.	-5.162***	-5.134	17.64
	(0.595)	(14.89)	(13.79)
Construction and Extraction Occs.	-1.686***	-2.810	1.062
	(0.466)	(4.163)	(2.690)
Installation, Maintenance, and Repair Occs.	-1.409*	-17.78***	2.474
	(0.603)	(5.371)	(3.623)
Production Occs.	4.345***	-26.66***	10.46***
	(0.668)	(3.255)	(2.612)
Transport and Material Moving Occs.	3.060***	-7.185*	-6.660***
	(0.560)	(3.097)	(1.423)
Constant	7.013***	63.54***	10.87***
	(0.220)	(1.559)	(0.995)
N	64774	5336	5336
R-sq	0.006	0.084	0.075

Robust standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Data source: NLSY97, weighted using cross-sectional weights. In Column (1), occupational changers are defined as individuals reporting an occupational change with a coincident change in reported occupation. Columns (2) and (3) are restricted to those with occupational change as defined in Column (1), and the dependent variable is whether or not the individual made a positive or negative occupational change in all three quality score simultaneously (OES, O*NET and O*NET Management). See Section 3.3 for definitions of OES, O*NET, and O*NET Management Scores. The omitted category is service occupations.