The Decline in Lifetime Earnings Mobility in the U.S.: Evidence from Survey-Linked Administrative Data

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Abstract

Rising inequality has sparked concern about the potential for falling lifetime earnings mobility. We use survey-linked administrative data from the Survey of Income and Program Participation to examine trends in lifetime earnings mobility since 1981. These unique data allow us to produce the first estimates of lifetime earnings mobility from administrative earnings covering the period of rising cross-sectional inequality and, most importantly, across gender and education subgroups. We find that lifetime earnings mobility has declined since the early 1980s as inequality has increased. One striking feature is the decline in upward mobility among middle-class workers across the distribution of educational attainment. We find that the likelihood of moving to the top deciles of the earnings distribution for workers who start their career in the middle of the earnings distribution has declined by approximately 20% since the early 1980s. The largest declines in mobility are for women and college-educated workers which is partially explained by rising beginning-career earnings though we note a rise in persistence in the bottom of the earnings distribution as well.

Overall wage inequality has risen dramatically since the 1970s.[1] The increase in wage inequality and subsequent polarization of the wage distribution is the result of both increasing wage gaps between education, experience, and occupational subgroups, and an increase in residual wage inequality. Although relative contributions are debated, it is generally agreed that the rise in wage

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[1]This literature is quite large. See Berman, Bound, and Griliches (1994); Bound and Johnson (1992); Katz and Murphy (1992) for key analyses documenting the initial rise in wage inequality, and Autor, Katz, and Kearney (2008); DiNardo, Fortin, and Lemieux (1996); Gottschalk and Danziger (2005); Lemieux (2006a) for literatures documenting the continued rise in inequality and resulting polarization.

inequality is due to a combination of increasing returns to education and skill on the one hand (Autor, Katz, and Kearney, 2008; Juhn, Murphy, and Pierce, 1993; Katz and Murphy, 1992), and demographic and institutional shifts on the other (Card and DiNardo, 2002; DiNardo, Fortin, and Lemieux, 1996; Lemieux, 2006a). Rising wage inequality has translated into rising income inequality, particularly at the top of the income distribution (Piketty and Saez, 2003). Much of what we know about inequality, however, comes from evidence about the cross-section; comparatively little is known about how cross-sectional inequality translates into longer-run labor market outcomes including earnings mobility over a working life.[2]

The small literature on trends in lifetime earnings mobility suggests that mobility increased between the 1950s and 1970s but has remained constant or increased slightly since the 1970s (Acs and Zimmerman, 2008; Auten and Gee, 2009; Kopczuk, Saez, and Song, 2010). In other words, despite the fact that the distance between ranks in the earnings distribution has widened over the last 30 years, overall earnings growth was fast enough that mobility between ranks remained unchanged. Perhaps the best evidence on trends in lifetime earnings mobility is from Kopczuk, Saez, and Song (2010) who use administrative data to show that show lifetime earnings mobility increased overall between 1950 and 1980. However, overall declines in mobility mask substantial gender heterogeneity; earnings mobility for men and women moved in opposite directions during this period, with declining mobility for men being offset by increasing mobility for women. Despite the importance of educational attainment to the evolution of earnings over a working life and the changes over time in educational attainment overall and by gender, Acs and Zimmerman (2008) provide the only evidence for trends over time in mobility by educational attainment, though they only consider the role of education in moving into and out of the bottom earnings quintile over a

[2]The partial exception to this is the literature which decomposes cross-sectional inequality into its transitory and permanent components (Baker and Solon, 2003; Haider, 2001; Moffitt and Gottschalk, 2012). This literature finds that about 50 percent of the rise in cross-sectional inequality through the early 2000s is due to rising inequality in permanent earnings. The literature on volatility, or the distribution of year-to-year changes in earnings, does use panel data, though its analytical approach treats the data as if it is a cross-gsection of income changes (Carr and Wiemers, 2016; Dahl, DeLeire, and Schwabish, 2011; Shin and Solon, 2011; Ziliak, Hardy, and Bollinger, 2011).

working lifetime.

This paper uses data from the Survey of Income and Program Participation (SIPP) linked to administrative earnings records to examine lifetime earnings mobility between 1981 and 2008 extending the current literature in two important dimensions. First, we estimate mobility measures covering all cohorts beginning in 1980 through the mid 1990s–extending Kopczuk, Saez, and Song (2010) by starting where they end. We are the first to compare lifetime earnings mobility among individuals who began their career before and after the dramatic increase in earnings inequality during the 1980s. Second, and perhaps even more importantly, because we use administrative data linked to survey data which contains educational attainment, we are also able to provide evidence on the changes over time in lifetime earnings mobility for different levels of educational attainment, something that is not possible with administrative data alone. Differences in mobility trends by education are of particular importance given the rise in returns to education and the changing gender composition of educational attainment (Golden, Katz, and Kuziemko, 2006). More generally, this analysis allows us to understand what the increase in the cross-sectional returns to schooling over time implies about longer-run relative labor market outcomes for workers with different levels of education.

Quite in contrast with the existing literature, our results show that increases in inequality since the 1980s have been coupled with declines in lifetime earnings mobility. Summary measures show that mobility has declined for men and women and for college-educated workers. Transition matrices also show declining mobility for workers with less education. Across all subgroups, declines in overall mobility over time are largely the result of a decreasing likelihood of moving from the middle to the top of the earnings distribution over a working lifetime. Declines in middle-class upward mobility are consistent with the polarization in job growth (Autor, Katz, and Kearney, 2008) and with rising inequality at the top of the earnings distribution (Piketty and Saez, 2003) and is particularly problematic in the presence of declining median wages. Our results suggest a trade-off between returns and mobility as at least part of the decline in mobility for college-educated

workers and for women can be explained by an increase in the likelihood of starting one's career at the top of the earnings distribution. However, we find a flattening of relative earnings trajectories over time for workers across the distribution of educational attainment. For college educated workers, declines in mobility may be accompanied by increases in lifetime earnings. However, for less-educated workers, the declines in mobility have taken the form of flatter relative earnings trajectories at lower part of the earnings distribution. When coupled with declining median wages, even modest declines in mobility for less-educated workers could imply large declines in lifetime earnings.

1 Brief Literature Review

The focus of this paper is on trends in lifetime earnings mobility. Mobility is neither a single concept nor a single measure.[3] Individuals may experience absolute earnings increases at the same time that their position in the earnings distribution declines; or they may experience highly variable earnings in the short run but little movement in either the level of earnings or their relative position in the long run. We consider measures of positional (or relative) mobility, asking whether the probability of moving rank in the earnings distribution over long time periods has changed over time. The sole focus on rank-based measures of lifetime earnings mobility allows us to consider whether moving up within the earnings distribution over one's life has become more difficult as inequality has increased.

The literature on lifetime earnings mobility examining changes in earnings over ten-year intervals or greater is small, perhaps because the data requirements are so extensive. Measuring lifetime earnings mobility requires panel data with large cross-sectional sample sizes that includes multiple cohorts over a long period of time, with little attrition. The existing work uses either administrative earnings records or the Panel Study of Income Dynamics (PSID) and suggests that overall, mobil-

[3] See Fields (2010) and Fields and Ok (1999) for a description of mobility concepts and measures.

ity has been stable or slightly increasing over time (Acs and Zimmerman, 2008; Auten and Gee, 2009; Auten, Gee, and Turner, 2013; Kopczuk, Saez, and Song, 2010) though Bradbury and Katz (2009) find some evidence of declining mobility. Existing work relies mostly on non-parametric measures of earnings mobility such as transition matrices, inequality indices, and rank correlations.

Auten and Gee (2009) and Auten, Gee, and Turner (2013) use a sample of tax filers and find no evidence of a change in relative lifetime mobility in income, showing that the widening of income gaps from growing income inequality were offset by increased absolute income mobility. Similarly, Acs and Zimmerman (2008) use the PSID and find no change in long-run family income mobility between the 1984 to 1994 and the 1994 to 2004 periods in both relative and absolute earnings. However, their analysis, which uses a combination of transition matrices and linear probability models, is focused exclusively on predicting movement into and out of the bottom quintile over two ten-year periods. Importantly, they note the importance of educational attainment in predicting upward mobility. Using very similar data from the PSID and an extensive battery of relative and absolute mobility measures, Bradbury and Katz (2009) find declines in long-run mobility in family income between 1968 and 2005. However, the declines that Bradbury and Katz (2009) find are mostly small and while mobility declines between 1968 and the late-1980s, mobility seems to have increased in recent decades. Despite the difference in interpretation by the authors, the findings of Acs and Zimmerman (2008) and Bradbury and Katz (2009) do not appear to be inconsistent with one another.

Most relevant to our work is Kopczuk, Saez, and Song (2010), who use Social Security Administration (SSA) earnings records with measures of relative mobility and find rising mobility for women and falling mobility for men over the period between the 1950s early 1980s. The SIPP data that we use begins in 1978, allowing us to extend their work. As we describe in Section 2.1, the SIPP administrative data are better equipped to address questions regarding population representativeness than either administrative or survey data alone because they are linked to a nationally-representative survey sample, but do not have the attrition or measurement error problems typically

associated with survey-based panel data. This latter point is critical for studies of mobility because the probability of attriting is likely correlated with mobility both because lower-income individuals are more likely to attrit and because attrition is associated with more unstable earnings (Fitzgerald, Gottschalk, and Moffitt, 1998; Schoeni and Wiemers, 2015). Relative to other administrative data, the SIPP data have the advantage of containing information on educational attainment, which our results show is crucial to understanding the contours of declining mobility.

It is worth noting that lifetime earnings mobility combines the effect of long-lived transitory earnings shocks and movement across the distribution of permanent earnings and thus intersects with the large body of literature on trends in transitory earnings instability and the distribution of permanent earnings (Haider, 2001; Moffitt and Gottschalk, 2012; Shin and Solon, 2011). The broad consensus in this literature is that there has been both a widening of the permanent component of earnings and an increase in transitory earnings instability since the 1970s (Carr and Wiemers, 2016; Haider, 2001; Moffitt and Gottschalk, 2012; Shin and Solon, 2011). However, as mentioned above, this literature does not address how these shocks accumulate, and thus does not directly inform earnings changes over longer time horizons.

2 Data and Methodology

2.1 Data

The data for this project come from the Survey of Income and Program Participation Gold Standard File (SIPP GSF). The SIPP is a nationally representative sample of the civilian noninstitutionalized population of the U.S. that began in 1984. There have been 14 SIPP panels since 1984 with each panel lasting between two and four years. Within panels the SIPP is longitudinal, but each panel draws a new nationally representative sample of 14,000 to 52,000 households. The SIPP GSF links *each individual* in a SIPP household in the 1984, and 1990 – 2008 SIPP panels to their IRS and

SSA earnings and benefits records through 2011.[4]

Earnings histories in the SIPP GSF come from the Summary Earnings Records (SER) and Detailed Earnings Records (DER), which are co-maintained by the SSA and the IRS. The SER includes FICA taxable earnings, so are capped at the FICA taxable maximum. The DER contains the balance of earnings. The sum of the two provides non-topcoded total earnings from 1978 to 2011, which include deferred and non-deferred earnings from all jobs and from self-employment but do not include under the table earnings not reported to the IRS. Prior to 1978, the dataset includes FICA taxable earnings back to 1951. If all earnings values are zero or missing, then the individual had zero earnings for that year.

Missing data can arise either because the SIPP survey participant refused to answer a specific demographic question or because the SIPP respondent could not be matched to administrative earnings or benefits data. The match rate for most panels is quite high. In the 1980's and 1990's panels, the match rate hovers around 80%. In 2001, the match rate dropped to 47% because many SIPP participants refused to provide social security numbers. Beginning with the 2004 panel, the match rate increased to around 90% because the Census Bureau changed its matching procedures removing the necessity to explicitly ask for social security numbers. While the public use SIPP has missing observations that are imputed using a hot-deck method, the Gold Standard File uses a substantially more sophisticated multiple imputation method to replace missing observations (see Abowd and Stinson (2013) for details). The Census Bureau advises against excluding imputed observations and we have thus included these observations. It is important to note that the low match rate in 2001 only affects individuals interviewed in the 2001 SIPP panel, it has no implications for the ability to follow individuals interviewed in other panels through the 2000s.

[4]This analysis was first performed using the SIPP Synthetic Beta (SSB) on the Synthetic Data Server housed at Cornell University which is funded by NSF Grant #SES-1042181. These data are public use and may be accessed by researchers outside secure Census facilities. For more information, visit https://www.census.gov/programs-surveys/sipp/methodology/sipp-synthetic-beta-data-product.html. Final results for this paper were obtained from a validation analysis conducted by Census Bureau staff using the SIPP Completed Gold Standard Files and the programs written by this author and originally run on the SSB. The validation analysis does not imply endorsement by the Census Bureau of any methods, results, opinions, or views presented in this paper.

In addition to the administrative earnings records, the SIPP GSF has basic demographic and human capital variables, marriage histories, fertility histories, as well as self-reported earnings and work hours from the SIPP survey. The complete administrative SSA and IRS earnings history is linked to every individual that is ever surveyed in any of the included SIPP panels. For example, if a 55 year old individual is surveyed in the 2004 panel, the SIPP GSF will include that individual's (non-topcoded) earnings from 1978 through 2004 *and* from 2005 through 2011, and their FICA taxable earnings back to 1951 or the beginning of the individual's work life. This applies both to people of working age in their SIPP panel and to children. Variables collected in the SIPP panels that are not linked to administrative data cover only the years of the individual's SIPP panel. Each SIPP panel is chosen to be nationally representative of the population at the time of the panel, with the exception of a small oversample of low-income households.

The SIPP GSF has some important advantages for understanding earnings mobility. Ideally, research on mobility would rely on datasets that have both long panels of individuals, large cross-sections, and demographic and human capital data. The SIPP GSF is the only dataset on the U.S. that we are aware of that has all three of these characteristics. The long panels provide the ability to describe changes in mobility through time, while the large cross-sections allow measurement of mobility within subgroups. The small number of papers on intragenerational mobility in the U.S. have either used administrative earnings data alone or the PSID. The PSID has the possibility of creating long panels, but once one selects for individuals with non-missing observations on earnings spaced far enough apart to cover an entire work life, the resulting sample typically does not have a large cross-section, and, because of following rules and differential attrition, it may not be population representative. In addition, the sample sizes are small enough that analyses of lifetime earnings mobility is only possible with using quintiles or quartiles and analyses of subgroups is not feasible. These are important drawbacks which make the demographic and human capital characteristics in the data less helpful analytically. Similar to the administrative data used in Kopczuk, Saez, and Song (2010) and Auten and Gee (2009), the SIPP GSF includes non-topcoded

earnings with little measurement error and no attrition bias. However, the SIPP GSF also has data on human capital, demographic, and labor supply characteristics and is representative of all individuals, both workers and non-workers. The inclusion of demographic and human capital characteristics is particularly important, and is arguably the single greatest advantage of this dataset over other administrative datasets. In addition, the fact that the data is nationally representative of both workers and non-workers creates an advantage over Kopczuk, Saez, and Song (2010), whose long time series of mobility from the early 1950s necessitated the use of workers in a subset of industries. The disadvantage of the SIPP GSF compared with the SSA data in Kopczuk, Saez, and Song (2010) is that the SIPP GSF does not contain the quarter in which the Social Security earnings cap was reached and so does not allow us to impute non-topcoded earnings prior to 1978. For this reason, we focus on the more recent period for which the data are not topcoded. Overall, the SIPP GSF allows for panel lengths similar to the those possible with the PSID, but with much larger cross-sections, and no attrition. Compared with the SIPP survey data, the SIPP GSF has the advantage of longer panels of administrative earnings with no attrition.

2.2 Sample and Earnings Measures

To best capture an individual's typical earnings early and late in life, we use a seven-year average of annual earnings centered on year t. To be included in the sample, an individual must be 25 to 59 years old during the entire seven-year period over which earnings are averaged. To reduce the impact of individuals with very marginal labor force attachment, average earnings over the seven-year period must be above a minimum threshold of one-fourth of a full-year full-time minimum wage in 2013 ($3770) indexed to inflation, and individuals must have positive earnings in year t. The sample includes data on well over 700,000 individuals, and has yearly cross-sectional samples ranging from 250,000 to 450,000 observations.

2.3 Mobility Measures

Lifetime earnings mobility is captured by estimating the relationship between the average earnings centered around year t and average earnings centered around year $t + 15$ for individuals with earnings in both t and $t + 15$. For example, if $t = 1981$ and an individual is 30 years old then we examine the relationship between average earnings for that individual between ages 27-33, and average earnings between ages 42-48. The choice of window length involves a tradeoff. The starting age of the sample cannot begin too early because it would include too many individuals who are still in school. Because of the role of education in starting earnings, these individuals have may artificially low initial earnings and thus inflated lifetime earnings growth. Further, the length of the window itself needs to be long enough to allow for movement across the earnings distribution, but increasing the length of the window means losing estimates of mobility for more recent years. A 15-year window balances these tensions. The combination of the 15-year window and limiting the sample to ages 25 to 59 means that initial earnings is estimated for individuals 28 to 44, while final earnings is for individuals 42 to 56.

The obvious drawback is that mobility between any two pairs of years will include in the starting window some individuals who are early in their working life and some who are at their peak earning age, while the ending window will include some individuals who are in their peak earnings age and some near the end of their working life. Because of the changing demographics of the labor force, the age distribution of the starting and ending window may change over time. To account for any changes in the age of our sample over time, in all that follows we apply least squares separately for each year to a regression of seven-year average log earnings on a quadratic in age and then use the residual as our measure of average earnings. This strategy has the added advantage of removing the mean effect of macroeconomic trends as well.

Rank-based measures of mobility require individuals to be placed in an earnings distribution. There are two obvious choices of earnings distribution: the distribution of age-adjusted seven-year average earnings of individuals in year t who have earnings in both t and $(t + 15)$ with average

earnings in t above the minimum threshold, or the distribution of age-adjusted seven-year average earnings of all individuals with average earnings above the minimum threshold in year t. The former choice is akin to a "cohort" analysis where individuals are ranked against others in their cohort. The latter choice implies that individual in the cohort are ranked against the entire working population in a given year. We use the latter, placing individuals in the distribution of age-adjusted seven-year average earnings for everyone in the sample in year t – that is, the sample of individuals 25 to 59 with positive earnings in year t ($t + 15$) and with average earnings above the minimum threshold. We do so because we want to capture changes in inequality over time which happen within a cohort but also because younger, and better educated, workers join the labor force. When we analyze gender and education subgroups, individuals are placed in the overall age-adjusted average earnings distribution, rather than in the distribution for their subgroup. For each measure of mobility, bootstrap estimates of the sampling variability are provided. Resampling techniques allow us to account for the fact that we are simultaneously estimating two earnings distributions and the relationship between ranks, both of which contribute to the variability of a given estimate of mobility.

As a baseline measure of mobility, we use a rank-rank regression summary measure to describe time trends in lifetime earnings mobility between 1978 and 2011. The rank-rank regression concept comes from the literature on intergenerational mobility (Chetty et al., 2014), and is specified as:

$$rank_{i,t+T} = \beta_{0t} + \beta_{1t} rank_{it} + \epsilon_{it} \tag{1}$$

where β_{1t} measures positional mobility at time t and β_{0t} is a measure of absolute mobility in ranks. Individuals are first assigned the appropriate percentile rank. We then estimate equation 1 with OLS for each year for the pooled sample, and for gender and education subgroups. Rank-rank regressions provide a simple descriptive summary of the persistence of position in the earnings distribution across the entire earnings distribution. This is the first application of rank-rank regres-

sions to long-run mobility though Dahl, DeLeire, and Schwabish (2011) used a similar method in describing trends in earnings volatility. This method provide an important starting point in identifying general trends, but, as we show in Section 3.2, much of the detail about how exactly mobility is changing is lost using this method. We begin with the rank-rank method to show general trends and complement this with the more detailed non-parametric analysis in Section 3.2.

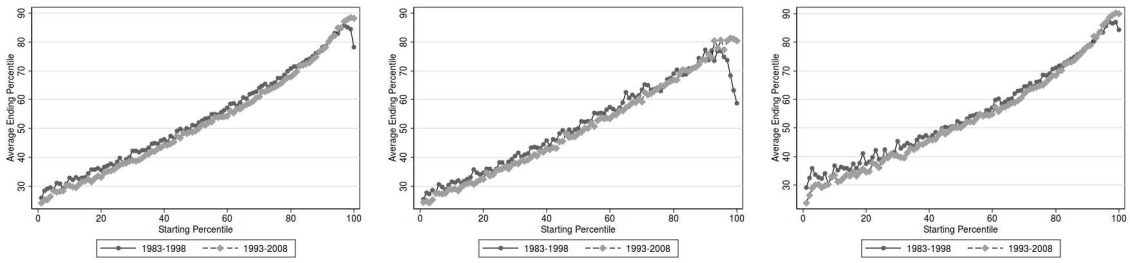
Rank-rank regressions rely on the assumption that the correlation between starting rank and average ending rank in the earnings distribution is constant across the distribution of starting earnings. If this is assumption is violated, than mobility at the average rank (as measured by the rank-rank regression) does not represent mobility at other points in the earnings distribution. Figure 1 plots the average percentile in year $t + 15$ by percentile in year t for $t = 1981$ and $t = 1993$ for the population overall, for men and women separately, and by educational attainment. Non-linearities in the relationship between starting and ending rank violate the assumptions of the rank-rank summary measure, as it demonstrates that the correlation between starting and ending rank varies with starting rank.

As Figure 1 shows, there are some non-linearities in the relationship between starting and ending rank for all groups. The correlation between the starting and ending rank of earnings is higher for men and college-educated workers who begin their career near the top of the earnings distribution. There are changes in the sign of the slope coefficient near the top of the starting earnings distribution for women and those with less than a college degree. These non-linearities are driven by the small numbers of women and the less well-educated with earnings near the very top of the distribution and have largely disappeared over time.

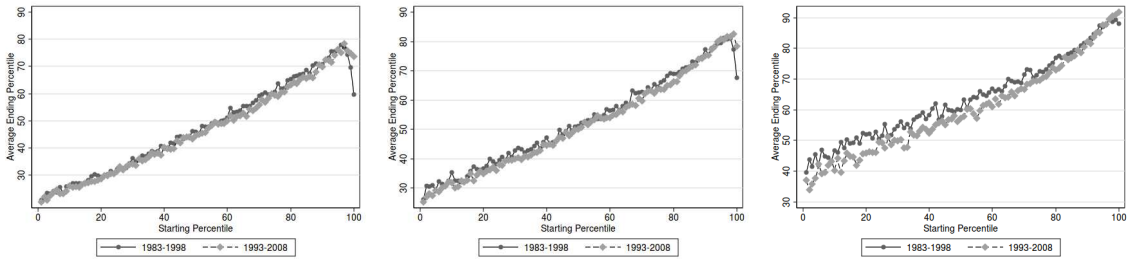
We use two non-parametric measures of mobility to complement the rank-rank measure. First, we examine the change over time in the probability of starting one's career in the bottom 40% of the earnings distribution and ending one's career in the top 20%. This measure is used in Kopczuk, Saez, and Song (2010) for an earlier period and so allows us to compare our results to theirs, albeit for a different sample. Second, we show full decile transition matrices for the sample overall and

Figure 1: Average Ending Rank by Starting Rank, Overall and by Gender and Education

(a) Scatter Plot: Overall (b) Scatter Plot: Women (c) Scatter Plot: Men



(d) Scatter Plot: High School (e) Scatter Plot: Some College (f) Scatter Plot: College



Notes: Sample includes individuals ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t and $t + 15$. Age-adjusted average earnings is defined as the residuals from a regression of the seven-year average earnings centered around year t on a quadratic in age separately for each year. Earnings percentiles for subgroups are assigned according to percentiles in the overall sample. Graphs are labelled using year t.

for each subgroup. As we note above, we view these non-parametric measures, particularly the decile transition matrices, as crucial to understanding the contours of changes in mobility over time. The transition matrices in particular allow us to understand where in the distribution of early career earnings mobility has declined and whether this varies by subgroup.

3 Results

3.1 Rank-Rank Regression Measures of Mobility

Figure 2 shows the slope coefficient of the rank-rank regression for t, starting year, between 1981 and 1993 overall in 2(a), separately for men and women in 2(b) and by educational attainment in 2(c). Shaded regions represent bootstrapped 95% confidence intervals. Overall, the correlation between one's rank in time t and the same individual's rank in time $t + 15$ has grown over time

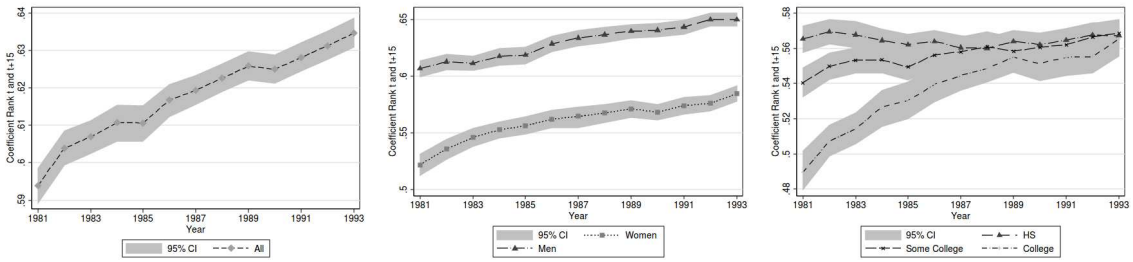
indicating a fall in lifetime mobility during the period. The fall in mobility is evident for both men and women and largest for individuals with a college degree. The overall slope is 0.59 in 1981 increasing to 0.63 in 1993, a nearly 10% increase. These differences are statistically significant. The correlation between rank at the beginning and end of a working lifetime increased for both men and women by a similar amount–about 5 percentiles between 1981 and 1993–though women have a lower correlation in rank in the earnings distribution over the life cycle than men, indicating higher mobility.

The trends in the correlation between rank in the earnings distribution over a working lifetime differ sharply by educational attainment. For individuals with less than a high school degree, the correlation in rank over a working lifetime has increased slightly, though changes over time are not statistically significant. However, despite the rapid increase in the average cross-sectional returns to schooling over the 1980s, relative lifetime earnings mobility for college-educated workers declined. The correlation between starting and ending rank in the earnings distribution has increased substantially from 0.49 in 1981 to 0.56 in 1993–an increase of almost 15%. These differences are statistically significant. The pattern of the decline in mobility suggests that mobility for the college educated declined in the 1980s, leveled off in the early 1990s, perhaps beginning to decline again after 1992. By 1993, college-educated workers no longer have greater positional lifetime earnings mobility than those with less education, rather positional earnings mobility across the three education groups is similar.

Figure 3 shows the intercept of the rank-rank regression between 1981 and 1993 overall in 3(a), separately for men and women in 3(b) and by educational attainment in 3(c). Shaded regions represent 95% confidence intervals. The intercept represents the average increase in ranks over a working lifetime. Overall the intercept of the rank-rank regression has declined from 22.7 to 19.2, meaning that on average, individuals can expect to rise about 3.5 fewer percentile ranks by the end of their career in 1993 relative to 1981. The differences are statistically significant. Figure 3(b) shows that women experience a higher average increase in rank over a working lifetime than men

Figure 2: Age-Adjusted Coefficient of Rank-Rank Regression, Overall and by Gender and Education

(a) Overall (b) Gender (c) Education

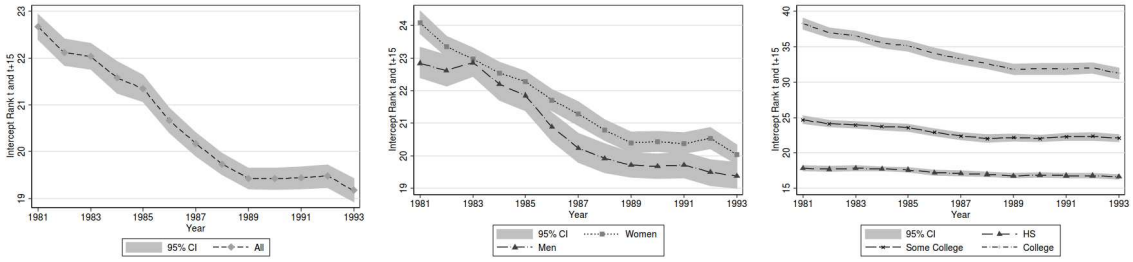


Notes: Sample includes individuals ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t and $t + 15$. Age-adjusted average earnings is defined as the residuals from a regression of the seven-year average earnings centered around year t on a quadratic in age separately for each year. Earnings percentiles for subgroups are assigned according to percentiles in the overall sample. Graphs are labelled using year t. Bootstrapped 95% confidence intervals are shown in gray.

but that the average increase is declining for both men and women over time. Similarly Figure 3(c) shows that individuals with higher levels of schooling experience higher average increases in rank over a working lifetime but that this is declining over time, particularly for college graduates.

Figure 3: Age-Adjusted Intercept of Rank-Rank Regression, Overall and by Gender and Education

(a) Overall (b) Gender (c) Education



Notes: Sample includes individuals ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t and $t + 15$. Age-adjusted average earnings is defined as the residuals from a regression of the seven-year average earnings centered around year t on a quadratic in age separately for each year. Earnings percentiles for subgroups are assigned according to percentiles in the overall sample. Graphs are labelled using year t. Bootstrapped 95% confidence intervals are shown in gray.

Based on a rank-rank summary measure of mobility, mobility has declined over the last two decades. The increase in the slope coefficient in the rank-rank regression over time combined with the decrease in the intercept suggests that not only does one's place in the initial earnings distribution matter more today than in the past, but that on average, individuals are experiencing fewer gains in rank over a working lifetime. Though for some groups the declines in mobility

are small, these trends are an important departure from Kopczuk, Saez, and Song (2010) whose work covered an earlier period and showed that mobility was declining for men but increasing sufficiently for women so that overall mobility was increasing. In this later period, both men and women are experiencing declining mobility. Though, as we will show in Section 3.2, the way in which mobility has declined for women is quite different than for men.

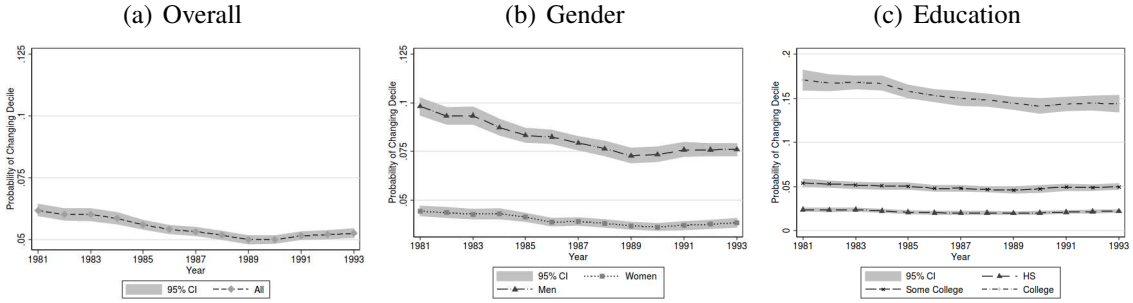
3.2 Non-Parametric Measures of Mobility

The results from the rank-rank regressions show an overall decline in mobility. However, to understand the contours of declining mobility, we complement the trends in the rank-rank summary measure of mobility with two non-parametric measures: changes over time in the probability of moving from the bottom 40% of the earnings distribution to the top 20% and full decile transition matrices. Figure 4 shows the change over time in the probability of starting one's career in the bottom 40% of the earnings distribution and ending one's career in the top 20%. Since the 1980s, the probability of moving from below the 40th to above the 80th percentile of the earnings distribution fell by 1 percentage point from 6% to 5%. The decline in the probability of upward mobility was larger for men than women though mobility also declined for women. Changes overall and for men and women separately are statistically significant. We also see statistically significant declines in mobility for workers with a college degree. For these workers, mobility fell by 2 percentage points between 1981 and 1993. Figure 4 shows flat mobility trends for workers with less than a college degree.

The same measure is used in Kopczuk, Saez, and Song (2010) for an earlier period and so allows us to compare our results to theirs, albeit for a different sample. Kopczuk, Saez, and Song (2010) show that during the middle part of the century the probability of upward mobility was rising and that the rise was due entirely to rising mobility among women. In contrast to the earlier period, the results here show that mobility has been falling in the latter decades of the 20th century when inequality was rising rapidly, and that both men and women have experienced declines in

mobility over time. We note that Kopczuk, Saez, and Song (2010) find a slight downturn in mobility in the late-1970s for both men and women, with a level comparable to what is found here in 1981.

Figure 4: Probability of Moving from below 40th percentile to above the 80th percentile, Overall and by Gender and Education



Notes: Sample includes all men and women ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Age-adjusted average earnings is defined as the residuals from a regression of the seven-year average earnings centered around year t on a quadratic in age separately for each year. The probability for each 15-year period is labelled by starting year. Bootstrapped 95% confidence intervals are shown in grey.

Decile transition matrices are the most detailed nonparametric measure that we use. Transition matrices confirm the declines in mobility that we document above but also provide some important insights about where in the distribution of early-career earnings declines in mobility have been most prevalent. We report complete decile transition matrices for the 1981 - 1996 period and the 1993 - 2008 period overall, for men and women separately, and separately by educational attainment in Appendix Tables A1 - A12 and the trace of the transition matrix, a simple way of summarizing overall persistence, for the 1981 - 1996 and 1993 - 2008 periods overall and by subgroup in Appendix Table A13. Because the changes in the matrices over time are hard to digest, in Tables 1 - 6 we show the percent change between the 1981 - 1996 period and the 1993 - 2008 period in the likelihood of ending in each decile conditional on beginning one's career in a given decile. In Tables 1 - 6, statistically significant increases between the two periods are denoted by stars and statistically significant declines are denoted by daggers.

We will highlight the patterns of changing mobility that are consistent overall and across subgroups by discussing patterns in Table 1 before highlighting differences between the subgroups.

Table 1: Percent Change in Transition Probabilities, 1981 - 1996 Period to 1993 - 2008 Period, Overall

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	9.46*	8.37*	5.28	−3.27	−16.38†	−15.21†	−15.56	−21.11†	−6.61	−7.45
2	10.06*	6.89	5.82	7.00	−3.07	−16.65†	−17.92†	−24.19†	−12.25	−26.60†
3	9.54*	6.83	2.52	7.07	0.49	−9.97	−12.88†	−14.84†	−12.20	−15.25
4	10.43	5.77	9.93*	7.50*	6.69	−2.86	−18.36†	−15.47†	−18.75†	−19.17†
5	7.70	1.22	3.59	6.28	11.04*	2.46	−5.35	−9.49	−18.85†	−20.44†
6	5.77	1.59	1.11	8.19	12.12*	11.04*	−1.77	−8.68†	−16.26†	−24.57†
7	15.85	7.37	10.66	6.20	11.60*	11.80*	8.65*	−5.34	−19.48†	−25.75†
8	23.42*	10.29	1.91	5.26	7.29	7.76	6.03	7.34*	−7.98†	−23.92†
9	18.16	18.45	11.56	−0.22	5.06	−5.32	1.79	0.50	8.46*	−13.01†
10	2.89	−19.14	−15.70	−11.99	−15.22	−12.20	−12.85	−10.71	−7.10†	8.58*

Notes: Sample includes individuals ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t and $t + 15$. Bootstrapped 95% confidence intervals are shown in brackets. Deciles are determined using the full sample.

The patterns of changing mobility show some remarkable consistencies. First, the above diagonal elements are generally negative, indicating a decline over time in upward mobility over one's career, and the below diagonal elements are generally positive, indicating an increase over time in downward mobility. The only below diagonal elements that are nearly always negative is for the top earnings decile, that is, the probability of falling in rank over a career conditional on starting in the top decile has declined over time.

Second, overall and for each subgroup, there has been a decline in the probability of ending one's career in the top 20% of the earnings distribution conditional on beginning one's career in the middle deciles (decile 4 - 7). These declines are relatively large, representing a decline of about 20% in the probability of reaching each of the top two deciles of the earnings distribution conditional on starting one's career in the middle of the earnings distribution. For example, between 1981 and 1996, 11.39% of individuals starting their career in the fifth decile finished their career in the top two deciles. Between 1993 and 2008, this probability declined to 9.17%. Declines in the probability of reaching the top two deciles are even larger conditional on starting in the 7th decile, going from 23.14% between 1981 and 1996, to 18.06% between 1993 and 2008. In contrast to the

rank-rank regressions and Figure 4, Tables 4 and 5 show that mobility from the middle to the top of the earnings distribution has declined over time even for workers with less than a college degree. Finally in results not shown here, the same results broadly hold for gender by education groups, so trends by education are not driven my differing rates of mobility for men and women combined with differing trends in educational attainment.

Table 2: Percent Change in Transition Probabilities, 1981 - 1996 Period to 1993 - 2008 Period, Women

	Ending Decile									
Starting Decile	1	2	3	4	5	6	7	8	9	10
1	9.71*	7.61	5.81	−1.67	−17.44†	−19.83†	−10.21	−22.35†	−14.18	−10.93
2	8.27	6.33	8.68	6.40	−2.12	−18.02†	−20.63†	−31.14†	−14.80	−23.85
3	7.94	6.68	4.58	5.69	2.83	−16.45†	−18.00†	−10.98	−5.21	−17.68
4	10.50	9.21	10.54	7.60	4.78	−4.06	−22.23†	−20.46†	−22.90†	−4.65
5	14.17	8.42	−1.73	2.95	14.49*	2.23	−7.36	−9.63	−27.24†	−24.27
6	15.42	−2.97	3.56	16.96*	9.00	16.28*	−4.59	−11.04	−25.77†	−25.86†
7	16.04	17.69	5.03	3.79	8.80	7.41	8.11	−5.09	−19.68†	−19.62†
8	5.61	11.76	3.81	11.03	12.35	−11.71	1.42	1.89	4.15	−19.79†
9	18.00	33.02	1.90	−2.94	−7.30	7.90	−15.69	−12.19	11.60	−2.95
10	−26.82	−42.92†	−46.96†	−34.20	−33.78†	−30.59	−18.31	−0.87	−5.68	37.10*

Notes: Sample includes all women ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Bootstrapped 95% confidence intervals are shown in brackets. Deciles are determined using the full sample.

Table 3: Percent Change in Transition Probabilities, 1981 - 1996 Period to 1993 - 2008 Period, Men

	Ending Decile									
Starting Decile	1	2	3	4	5	6	7	8	9	10
1	7.74	15.70	10.43	−5.91	−9.09	−2.36	−31.98†	−25.15	−10.40	−21.43
2	13.91*	9.91	2.04	11.68	−3.47	−14.83	−15.57	−13.92	−17.82	−36.65†
3	11.95	7.28	0.11	13.25	−1.79	0.88	−5.78	−21.86†	−22.61†	−19.28
4	10.79	1.49	9.18	7.95	10.67	−1.06	−13.58†	−10.40	−16.27	−29.17†
5	0.21	−5.26	8.97	9.48	7.67	2.37	−3.49	−9.05	−11.66	−16.94
6	−2.73	4.96	−0.50	2.54	14.75*	6.83	−0.07	−7.29	−8.63	−22.19†
7	10.91	−1.22	13.00	8.15	14.18*	15.12*	8.73*	−6.26	−19.76†	−25.60†
8	23.66	5.19	−0.34	3.49	7.21	17.57*	8.10*	9.32*	−12.98†	−23.37†
9	3.03	5.93	9.90	−1.62	8.11	−9.73	7.48	4.65	7.43*	−12.90†
10	0.37	−21.31	−11.31	−12.32	−15.91	−11.92	−15.90†	−13.85†	−7.27†	8.50*

Notes: Sample includes all men ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Bootstrapped 95% confidence intervals are shown in brackets. Deciles are determined using the full sample.

Some other patterns apply only to certain subgroups. Tables 1, 2, 3 and 6 show that overall,

Table 4: Percent Change in Transition Probabilities, 1981 - 1996 Period to 1993 - 2008 Period, High School or Less

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	2.90	4.24	3.26	−2.44	−17.81†	−13.44	−18.29	3.53	44.79	18.02
2	8.63	0.47	0.67	5.13	−3.21	−23.03†	−1.50	−29.03	4.37	−26.15
3	2.47	−1.73	0.20	3.72	1.89	1.42	−3.12	−12.07	−21.28	−19.17
4	1.57	0.47	7.81	4.58	0.53	−0.83	−17.79†	−11.84	−5.06	−25.15
5	0.79	7.81	−0.45	5.88	8.22	−5.13	−8.36	−10.66	−14.02	−13.36
6	−6.62	2.63	−0.90	9.22	7.56	7.88	−5.31	−8.74	−20.61†	−19.32
7	19.40	3.20	8.26	15.35	8.60	10.47	1.12	−16.11†	−23.10†	−27.67
8	3.61	3.75	−4.82	22.18	14.67	17.10*	5.91	−3.79	−21.60†	−21.04
9	14.66	6.10	16.24	7.22	21.11	−2.50	12.13	6.79	−5.47	−30.22†
10	4.69	−11.24	−18.34	−10.56	12.40	−0.10	−4.84	4.01	0.09	1.88

Notes: Sample includes all individuals with a high school degree or less ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Bootstrapped 95% confidence intervals are shown in brackets. Deciles are determined using the full sample.

Table 5: Percent Change in Transition Probabilities, 1981 - 1996 Period to 1993 - 2008 Period, Some College

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	12.53	9.56	−0.25	−3.80	−15.07	−14.14	−10.90	−15.59	−5.92	17.36
2	6.89	5.68	6.17	3.27	−6.34	−12.01	−19.27	−7.08	4.70	−10.30
3	9.53	18.53*	2.00	7.54	−1.82	−17.81†	−15.08	−15.06	−5.51	1.11
4	9.94	1.31	6.79	7.72	12.69	−3.43	−14.77	−17.25	−24.36†	−10.87
5	9.00	−10.54	9.70	3.82	10.92	2.45	−5.02	−12.22	−10.34	−14.76
6	2.34	−11.74	3.03	7.29	11.74	6.04	−0.93	−8.26	−8.51	−15.91
7	5.55	15.23	15.51	−1.53	14.53	14.09*	2.80	−7.41	−18.16†	−22.03†
8	34.34*	25.32	−6.52	−5.93	4.31	7.64	10.20	11.82*	−14.09†	−28.45†
9	29.47	12.02	13.61	−7.07	−0.10	−8.08	4.21	6.22	6.26	−18.41†
10	−0.68	−12.35	−21.91	8.70	−21.15	−10.91	−1.43	−3.21	8.55	1.27

Notes: Sample includes all individuals with some college ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Bootstrapped 95% confidence intervals are shown in brackets. Deciles are determined using the full sample.

for men and women, and for college-educated workers, there has been a decline over time in the likelihood of large upward movements across the earnings distribution over a working lifetime, particularly for those who start their career near the bottom of the earnings distribution. For example, Table 1 shows that there was a 21.1% decline over time in the probability of ending one's career in the 8th decile of the earnings distribution conditional on starting one's career in the bottom decile. There was a corresponding increase of 9.46% and 8.37% in the probability of ending one's career

Table 6: Percent Change in Transition Probabilities, 1981 - 1996 Period to 1993 - 2008 Period, College +

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	27.19*	16.00	35.52*	−6.47	−13.40	−15.47	−9.26	−28.16†	−16.88	−14.22
2	11.04	45.80*	28.38	18.04	7.93	−11.18	−21.87†	−25.85†	−20.21	−25.62
3	30.82*	18.11	18.71	19.63	2.94	−13.47	−16.38	−14.21	−11.07	−14.68
4	35.16*	33.07*	18.11	31.22*	15.72	−5.13	−20.72†	−17.07	−16.02	−20.35
5	24.55	−0.61	4.54	10.44	20.53	25.97*	4.14	−5.66	−27.99†	−24.60†
6	40.68*	14.60	−0.98	6.51	31.90*	29.70*	7.78	−8.26	−19.59†	−33.15†
7	35.94	3.51	8.64	2.28	14.73	17.85	34.35*	8.15	−20.82†	−30.99†
8	40.72	12.71	30.35	1.32	8.44	−1.49	7.89	18.62*	2.33	−28.98†
9	17.19	53.59*	17.43	3.42	1.68	−0.71	−6.32	−5.81	17.83*	−12.39†
10	34.36	−10.28	16.33	−9.23	−6.88	−8.79	−10.34	−10.53	−12.71†	4.47*

Notes: Sample includes all individuals with a college degree ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Bootstrapped 95% confidence intervals are shown in brackets. Deciles are determined using the full sample.

in the bottom two deciles. A similar pattern is seen for men and women and for college-educated workers though not for workers with less than a college degree.

Finally, Tables 3 and 6 show that for men and college-educated workers, there has been a decline in small movements in rank for those who begin their career near the top of the distribution. For men, the probability of ending one's career in the top decile conditional on starting one's career in the top decile increased by 8.5% over time while the probability of ending one's career in the 8th or 9th deciles conditional on starting one's career in the top decile declined by 13.85% and 7.27%, respectively.

4 Rising Inequality and Declining Mobility

This paper exploits new administrative-linked survey data to examine trends in lifetime earnings mobility over the period of rapidly rising wage inequality and to provide the first evidence on differential trends in lifetime earnings mobility by educational attainment. Though increasing through much of the 20th century, we show that intragenerational mobility has been declining since the early 1980s across a variety of rank-based measures. There is evidence of declining

mobility in every subgroup, including college-educated workers and women. A full understanding of how rising earnings inequality is linked to declining earnings mobility is beyond the scope of this paper, however we highlight some important links between inequality and mobility trends. In particular, lifetime earnings mobility as it is represented her is shaped by both between group and residual inequality. As mentioned, the substantial literature on wage inequality shows that wage inequality has risen between education and experience groups, and that residual inequality has also increased (DiNardo, Fortin, and Lemieux, 1996; Lemieux, 2006a, 2008). In the mid-1990s wage polarization emerged, with employment growth at the top and bottom of the wage distribution and losses in the middle (Autor, Katz, and Kearney, 2008). Finally, income inequality is increasing most rapidly at the top of the income distribution Piketty and Saez (2003).

Most straightforwardly, mobility may decline as inequality increases because, as the rungs of the earnings ladder grow farther apart, it becomes harder to move from rung to rung. This implies that whatever rung you start your career at has become increasingly important for how high you are able to climb over a working lifetime. Figure 1 shows an increase in the diagonal elements of the transition matrix throughout the distribution of early-career earnings, which is one possible consequence of a general widening of the earnings distribution. In addition, we highlight that mobility to the top two deciles of the earnings distribution has declined quite dramatically, which is consistent with higher rates of growth in inequality at the top of the distribution.

However, rising inequality is not the whole story. That lifetime earnings mobility has declined for college graduates and women since the 1980s is somewhat surprising given the increases over time in the cross-sectional returns to schooling and in the increase in labor force attachment and educational attainment of women. While we are limited by the use of administrative data in understanding the full set of characteristics that are associated with declining mobility, we are able to consider whether rank-based mobility declines for women and the college educated are the result of workers starting their career at higher parts of the earnings distribution and having more flat earning trajectories over a working life. That is, mobility may be declining for women and

college-educated workers because these individuals are more likely to be "stuck" at the top of the earnings distribution than in the past.

To examine the role of starting rank in upward mobility, Table 7 shows the average starting and ending rank overall and for each subgroup in the 1981 - 1996 and 1993 - 2008 periods with 95% confidence intervals in brackets. Consistent with increases in educational attainment and stronger labor force attachment among women, we see that declines in mobility among women have occurred in part because women are starting their career at a higher point in the earnings distribution. The average starting rank for women in 1981 was 38.62 compared to 44.24 in 1993. Though women are starting their career at higher ranks in the earnings distribution, they are finishing their career only about 1 percentile higher in 2008 than in 1996. For the college educated, the average rank of early-career earnings increased from 63.38 to 66.39. However, the average rank of ending-career earnings went from 69.50 to 68.39, a small but statistically significant decline. For college graduates, mobility is declining both because college graduates start their career at a higher rank *and* end their career at a lower rank in the earnings distribution than in the past, though changes over time in the starting rank are larger than changes in the ending rank. The welfare implications of declining mobility for women and college-educated workers may actually be positive as increases in starting rank coupled with a flatter relative earnings trajectory may imply higher lifetime earnings and starting at a higher rank may improve the ability to smooth consumption over a working lifetime.

Finally, lifetime earnings for the 1993 to 2008 cohort evolved at the same that as employment growth became increasingly polarized. One likely implication of the polarization of employment growth is a decline in the likelihood of large upward movements for workers who begin their career with earnings below the median–for example if there is no well-defined career path across the region of low employment growth. The transition matrices show evidence of such a pattern. Autor, Katz, and Kearney (2008) show that between 1990 and 2000, employment growth is slowest between the 50th and 80th percentile of the occupational skill distribution. The transition matrices

Table 7: Starting and Ending Rank, Overall and by Gender and Education

	Starting Rank		Ending Rank	
	1981	1993	1996	2008
Everyone	53.16	53.36	54.86	53.30
	[53.07,53.25]	[53.27,53.45]	[54.72,54.98]	[53.20,53.40]
Women	38.62	44.25	45.07	46.43
	[38.45,38.80]	[44.09,44.41]	[44.82,45.31]	[46.24,46.61]
Men	63.83	61.07	62.03	59.12
	[63.69,63.97]	[60.94,61.20]	[61.88,62.18]	[58.93,59.30]
High School	46.19	44.15	44.82	42.40
	[45.98,46.40]	[43.96,44.33]	[44.61,45.05]	[42.22,42.58]
Some College	52.29	51.88	53.69	51.93
	[52.07,52.52]	[51.68,52.08]	[53.41,53.93]	[51.71,52.15]
College	63.38	66.39	69.50	68.39
	[63.14,63.62]	[66.15,66.68]	[69.27,69.74]	[68.15,68.63]

Notes: Sample includes all individuals ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Earnings ranks for education and gender subgroups are assigned using the full sample. Bootstrapped 95% confidence intervals are shown in brackets.

shows an increase in the probability of churning around the bottom, and middle of the earnings distribution over a working life and a decline in larger movements, particularly to the 6th, 7th, and 8th deciles. While evident across all subgroups, this decline in the likelihood of large relative earnings for those starting their career with earnings below the median is particularly notable for college graduates which is one possible outcome of increasing residual inequality, particularly among those with higher levels of schooling (Lemieux, 2006b).

Though absolute lifetime earnings is not the focus of this paper, the decline in mobility that we document has been accompanied by declines of about $3,000 in median starting earnings. This, combined with relatively stable median ending-career earnings, implies falling lifetime earnings for individuals starting at or below the median, though as highlighted above, the increased persistence at the top of the earnings distribution implies increased lifetime earnings for this group. These data could be used to calculate total lifetime earnings and lifetime earnings trajectories which would allow for a more detailed analysis of the welfare impacts changes in relative mobility. This is a fruitful avenue for further research.

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A Appendix

Table A1: Decile Transition Matrices, Full Sample, 1981

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	23.87	19.61	15.96	12.30	9.52	6.68	4.62	3.73	2.16	1.56
	[23.09,24.67]	[18.89,20.35]	[15.23,16.69]	[11.72,12.87]	[9.01,10.06]	[6.18,7.14]	[4.15,5.04]	[3.40,4.07]	[1.82,2.47]	[1.24,1.87]
2	17.35	17.86	16.50	13.52	10.55	8.43	6.06	4.53	2.86	2.34
	[16.73,17.97]	[17.21,18.55]	[15.86,17.13]	[12.91,14.13]	[10.03,11.08]	[7.98,8.88]	[5.60,6.52]	[4.14,4.93]	[2.56,3.15]	[2.09,2.62]
3	11.85	14.07	16.62	15.25	12.79	9.78	7.46	5.50	3.87	2.81
	[11.32,12.39]	[13.50,14.67]	[16.01,17.23]	[14.65,15.81]	[12.24,13.32]	[9.24,10.27]	[6.99,7.93]	[5.09,5.89]	[3.56,4.18]	[2.44,3.21]
4	8.61	10.71	13.03	15.49	14.25	12.09	9.99	7.29	5.21	3.33
	[8.15,9.10]	[10.17,11.24]	[12.49,13.56]	[14.95,16.07]	[13.69,14.83]	[11.54,12.67]	[9.51,10.48]	[6.79,7.80]	[4.83,5.59]	[3.04,3.64]
5	6.35	7.98	10.23	13.01	14.79	14.61	12.34	9.29	6.82	4.57
	[5.94,6.78]	[7.55,8.41]	[9.69,10.76]	[12.51,13.54]	[14.23,15.33]	[14.02,15.19]	[11.84,12.87]	[8.84,9.73]	[6.42,7.21]	[4.21,4.92]
6	5.13	5.80	7.67	9.71	12.63	14.88	15.32	13.32	9.71	5.84
	[4.76,5.51]	[5.41,6.18]	[7.24,8.06]	[9.22,10.21]	[12.11,13.17]	[14.34,15.44]	[14.79,15.87]	[12.75,13.85]	[9.27,10.18]	[5.46,6.19]
7	3.68	4.60	5.60	7.30	9.22	13.08	16.16	17.21	14.31	8.84
	[3.34,4.01]	[4.26,4.93]	[5.23,5.94]	[6.89,7.70]	[8.73,9.69]	[12.54,13.64]	[15.59,16.74]	[16.62,17.77]	[13.73,14.91]	[8.40,9.26]
8	2.71	3.26	4.18	5.04	6.46	9.67	14.89	19.74	20.47	13.58
	[2.42,3.02]	[2.98,3.55]	[3.86,4.52]	[4.68,5.43]	[6.10,6.84]	[9.18,10.15]	[14.37,15.44]	[19.12,20.33]	[19.89,21.03]	[12.90,14.18]
9	2.03	2.32	2.70	3.74	4.30	6.44	9.56	17.32	25.52	26.08
	[1.82,2.24]	[2.07,2.56]	[2.45,2.93]	[3.45,4.06]	[3.99,4.63]	[6.06,6.84]	[9.12,9.97]	[16.77,17.88]	[24.88,26.16]	[25.45,26.70]
10	1.68	1.99	2.02	2.39	2.97	3.57	4.89	8.12	18.42	53.95
	[1.47,1.91]	[1.74,2.23]	[1.77,2.26]	[2.10,2.73]	[2.70,3.25]	[3.24,3.91]	[4.52,5.27]	[7.64,8.57]	[17.82,19.03]	[53.22,54.71]

Notes: Sample includes all men and women ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Bootstrapped 95% confidence intervals are shown in brackets.

Table A2: Decile Transition Matrices, Full Sample, 1993

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	26.13	21.25	16.80	11.89	7.96	5.66	3.90	2.94	2.01	1.45
	[25.37,26.83]	[20.60,21.95]	[16.21,17.41]	[11.36,12.41]	[7.49,8.44]	[5.29,6.06]	[3.51,4.26]	[2.65,3.27]	[1.77,2.24]	[1.22,1.67]
2	19.10	19.09	17.46	14.47	10.22	7.03	4.97	3.43	2.51	1.72
	[18.49,19.73]	[18.54,19.66]	[16.90,18.02]	[13.93,15.01]	[9.77,10.66]	[6.66,7.44]	[4.58,5.37]	[3.16,3.70]	[2.25,2.77]	[1.33,2.02]
3	12.98	15.03	17.03	16.33	12.86	8.80	6.50	4.68	3.40	2.38
	[12.45,13.53]	[14.54,15.54]	[16.50,17.58]	[15.81,16.87]	[12.40,13.30]	[8.37,9.25]	[6.13,6.88]	[4.37,4.99]	[3.08,3.72]	[2.12,2.63]
4	9.51	11.33	14.32	16.65	15.20	11.75	8.16	6.16	4.23	2.69
	[9.09,9.95]	[10.87,11.79]	[13.81,14.79]	[16.15,17.16]	[14.73,15.71]	[11.29,12.21]	[7.74,8.57]	[5.81,6.52]	[3.94,4.53]	[2.46,2.94]
5	6.84	8.08	10.59	13.83	16.42	14.97	11.68	8.41	5.53	3.64
	[6.49,7.20]	[7.72,8.44]	[10.20,10.99]	[13.38,14.31]	[15.87,16.92]	[14.40,15.51]	[11.26,12.11]	[8.00,8.85]	[5.19,5.88]	[3.30,3.95]
6	5.43	5.90	7.75	10.50	14.16	16.52	15.05	12.16	8.13	4.40
	[5.14,5.74]	[5.59,6.22]	[7.39,8.11]	[10.08,10.92]	[13.71,14.60]	[15.99,17.01]	[14.52,15.57]	[11.70,12.61]	[7.77,8.50]	[4.13,4.71]
7	4.26	4.94	6.20	7.75	10.29	14.63	17.56	16.29	11.52	6.56
	[3.99,4.53]	[4.65,5.23]	[5.84,6.55]	[7.40,8.13]	[9.90,10.72]	[14.13,15.15]	[17.06,18.05]	[15.80,16.80]	[11.07,11.95]	[6.23,6.89]
8	3.34	3.60	4.26	5.30	6.93	10.42	15.79	21.19	18.83	10.33
	[3.11,3.58]	[3.30,3.89]	[3.99,4.55]	[5.02,5.60]	[6.56,7.28]	[9.98,10.86]	[15.33,16.26]	[20.68,21.73]	[18.32,19.40]	[9.90,10.80]
9	2.40	2.74	3.01	3.74	4.52	6.10	9.73	17.41	27.68	22.68
	[2.17,2.61]	[2.51,2.98]	[2.78,3.23]	[3.48,4.02]	[4.26,4.80]	[5.74,6.46]	[9.33,10.13]	[16.96,17.85]	[27.06,28.29]	[22.08,23.32]
10	1.73	1.61	1.70	2.10	2.52	3.14	4.26	7.25	17.11	58.58
	[1.54,1.92]	[1.42,1.80]	[1.51,1.89]	[1.90,2.31]	[2.28,2.76]	[2.83,3.43]	[3.98,4.55]	[6.88,7.69]	[16.58,17.65]	[57.84,59.29]

Notes: Sample includes all men and women ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Bootstrapped 95% confidence intervals are shown in brackets.

Table A3: Decile Transition Matrices, Women, 1981

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	23.67	20.25	16.66	12.49	9.84	6.70	4.22	3.41	1.73	1.04
	[22.72,24.60]	[19.39,21.08]	[15.82,17.52]	[11.83,13.12]	[9.25,10.45]	[6.18,7.24]	[3.81,4.65]	[3.03,3.80]	[1.43,2.01]	[0.79,1.38]
2	17.45	18.33	17.03	14.13	10.80	8.31	5.79	4.38	2.20	1.58
	[16.66,18.30]	[17.49,19.18]	[16.28,17.83]	[13.42,14.87]	[10.18,11.45]	[7.73,8.89]	[5.27,6.31]	[3.94,4.82]	[1.91,2.51]	[1.30,1.84]
3	11.85	14.15	17.05	16.53	13.42	9.95	7.36	4.82	2.94	1.93
	[11.20,12.55]	[13.41,14.88]	[16.27,17.76]	[15.79,17.26]	[12.72,14.09]	[9.34,10.59]	[6.76,7.95]	[4.39,5.30]	[2.61,3.29]	[1.51,2.34]
4	8.93	10.50	13.04	16.23	15.44	12.37	9.98	6.93	4.41	2.17
	[8.28,9.56]	[9.77,11.29]	[12.29,13.76]	[15.46,16.99]	[14.63,16.31]	[11.65,13.18]	[9.32,10.63]	[6.34,7.56]	[3.97,4.86]	[1.82,2.50]
5	6.71	7.76	11.02	13.34	14.80	15.21	12.73	8.85	6.03	3.54
	[5.94,7.44]	[7.18,8.38]	[10.30,11.71]	[12.60,14.07]	[13.94,15.63]	[14.37,16.06]	[11.97,13.54]	[8.23,9.51]	[5.44,6.59]	[3.06,4.00]
6	5.27	6.05	7.49	9.15	12.46	14.88	16.30	14.10	9.62	4.68
	[4.63,5.94]	[5.39,6.79]	[6.80,8.14]	[8.44,9.93]	[11.66,13.30]	[14.03,15.76]	[15.39,17.19]	[13.21,14.97]	[8.92,10.32]	[4.05,5.29]
7	4.23	4.74	6.01	7.23	9.02	12.98	16.35	17.72	14.60	7.12
	[3.70,4.78]	[4.13,5.36]	[5.39,6.61]	[6.55,7.98]	[8.24,9.84]	[12.04,13.98]	[15.39,17.28]	[16.70,18.72]	[13.65,15.61]	[6.36,7.86]
8	4.12	3.78	4.39	4.79	5.82	10.27	15.19	20.65	19.38	11.60
	[3.46,4.82]	[3.13,4.48]	[3.79,5.05]	[4.15,5.46]	[5.06,6.60]	[9.28,11.21]	[14.11,16.37]	[19.38,21.85]	[18.06,20.70]	[10.58,12.60]
9	3.17	2.80	3.46	4.22	4.80	6.23	10.50	18.38	25.29	21.16
	[2.37,3.95]	[2.09,3.53]	[2.75,4.16]	[3.48,5.03]	[3.89,5.71]	[5.34,7.14]	[9.30,11.76]	[16.91,19.82]	[23.61,26.99]	[19.63,22.56]
10	4.34	5.30	4.90	4.75	5.41	5.87	6.90	8.40	18.13	36.00
	[3.35,5.36]	[4.14,6.56]	[3.82,6.09]	[3.33,6.15]	[4.22,6.67]	[4.58,7.28]	[5.56,8.31]	[6.98,10.01]	[16.22,20.19]	[33.78,38.40]

Notes: Sample includes all women ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Earnings deciles are assigned using the full sample. Bootstrapped 95% confidence intervals are shown in brackets.

Table A4: Decile Transition Matrices, Women, 1993

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	25.96	21.79	17.63	12.28	8.12	5.37	3.79	2.65	1.48	0.93
	[24.99,26.91]	[20.95,22.65]	[16.87,18.36]	[11.67,12.92]	[7.56,8.70]	[4.95,5.82]	[3.37,4.21]	[2.29,2.98]	[1.26,1.73]	[0.72,1.12]
2	18.89	19.49	18.51	15.04	10.57	6.82	4.59	3.02	1.87	1.20
	[18.13,19.73]	[18.79,20.21]	[17.80,19.19]	[14.38,15.76]	[10.01,11.17]	[6.28,7.35]	[4.16,5.05]	[2.69,3.34]	[1.62,2.16]	[0.87,1.49]
3	12.79	15.09	17.83	17.47	13.80	8.31	6.03	4.30	2.79	1.59
	[12.15,13.40]	[14.46,15.74]	[17.13,18.56]	[16.79,18.15]	[13.15,14.46]	[7.75,8.86]	[5.58,6.50]	[3.92,4.67]	[2.39,3.18]	[1.27,1.89]
4	9.86	11.47	14.41	17.46	16.18	11.87	7.76	5.51	3.40	2.06
	[9.26,10.45]	[10.86,12.06]	[13.72,15.15]	[16.79,18.16]	[15.50,16.87]	[11.31,12.44]	[7.22,8.29]	[5.05,5.98]	[3.01,3.82]	[1.76,2.37]
5	7.67	8.42	10.83	13.73	16.95	15.55	11.80	8.00	4.39	2.68
	[7.08,8.22]	[7.89,8.96]	[10.28,11.43]	[13.09,14.40]	[16.26,17.66]	[14.87,16.27]	[11.14,12.49]	[7.33,8.70]	[3.97,4.82]	[2.26,3.12]
6	6.09	5.87	7.75	10.70	13.58	17.30	15.55	12.55	7.14	3.47
	[5.59,6.61]	[5.40,6.34]	[7.21,8.28]	[10.09,11.33]	[12.92,14.24]	[16.45,18.11]	[14.76,16.30]	[11.84,13.24]	[6.64,7.66]	[3.05,3.92]
7	4.91	5.58	6.31	7.51	9.81	13.95	17.67	16.82	11.73	5.72
	[4.45,5.38]	[5.10,6.09]	[5.79,6.82]	[6.92,8.09]	[9.22,10.45]	[13.13,14.78]	[16.89,18.52]	[16.02,17.61]	[11.03,12.38]	[5.20,6.23]
8	4.35	4.23	4.56	5.32	6.54	9.07	15.41	21.04	20.18	9.31
	[3.89,4.80]	[3.72,4.72]	[4.11,5.06]	[4.85,5.82]	[5.91,7.09]	[8.38,9.80]	[14.62,16.22]	[20.03,22.00]	[19.26,21.21]	[8.63,10.04]
9	3.74	3.72	3.53	4.09	4.45	6.72	8.85	16.14	28.22	20.53
	[3.17,4.29]	[3.23,4.24]	[3.09,3.97]	[3.59,4.63]	[3.86,5.01]	[6.05,7.37]	[8.15,9.59]	[15.27,16.96]	[26.97,29.45]	[19.43,21.63]
10	3.17	3.03	2.60	3.13	3.58	4.07	5.64	8.33	17.10	49.35
	[2.66,3.74]	[2.41,3.63]	[2.09,3.14]	[2.47,3.83]	[2.98,4.21]	[3.33,4.85]	[4.95,6.39]	[7.29,9.38]	[15.88,18.37]	[47.53,51.11]

Notes: Sample includes all women ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Earnings deciles are assigned using the full sample. Bootstrapped 95% confidence intervals are shown in brackets.

Table A5: Decile Transition Matrices, Men, 1981

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	24.66	17.14	13.22	11.56	8.29	6.58	6.15	4.98	3.81	3.60
	[22.93,26.42]	[15.44,18.97]	[11.82,14.63]	[10.22,12.95]	[7.12,9.42]	[5.55,7.64]	[4.90,7.58]	[4.05,5.95]	[2.98,4.63]	[2.68,4.65]
2	17.10	16.68	15.16	11.99	9.91	8.72	6.74	4.91	4.53	4.27
	[15.95,18.23]	[15.55,17.88]	[13.86,16.46]	[10.96,12.95]	[8.93,10.85]	[7.82,9.62]	[5.84,7.67]	[4.21,5.66]	[3.83,5.24]	[3.57,5.07]
3	11.86	13.93	15.82	12.91	11.63	9.45	7.64	6.73	5.59	4.44
	[10.84,12.82]	[12.91,15.01]	[14.80,16.91]	[11.87,13.97]	[10.77,12.57]	[8.64,10.27]	[6.85,8.44]	[6.03,7.56]	[4.92,6.23]	[3.80,5.12]
4	8.19	10.99	13.01	14.50	12.64	11.72	10.00	7.77	6.28	4.90
	[7.43,8.98]	[10.20,11.81]	[12.23,13.80]	[13.59,15.39]	[11.81,13.48]	[10.86,12.56]	[9.27,10.75]	[7.06,8.47]	[5.67,6.89]	[4.38,5.43]
5	6.03	8.17	9.51	12.72	14.78	14.07	11.99	9.69	7.53	5.51
	[5.48,6.56]	[7.57,8.77]	[8.77,10.25]	[11.99,13.48]	[14.02,15.56]	[13.33,14.81]	[11.29,12.72]	[9.05,10.37]	[6.93,8.15]	[4.98,6.03]
6	5.03	5.64	7.79	10.09	12.74	14.88	14.66	12.78	9.77	6.62
	[4.54,5.53]	[5.15,6.12]	[7.23,8.33]	[9.47,10.70]	[12.06,13.45]	[14.17,15.59]	[13.98,15.39]	[12.09,13.49]	[9.19,10.38]	[6.13,7.11]
7	3.42	4.53	5.41	7.33	9.32	13.13	16.08	16.98	14.18	9.63
	[3.01,3.82]	[4.14,4.95]	[4.97,5.83]	[6.85,7.78]	[8.70,9.91]	[12.49,13.80]	[15.41,16.76]	[16.29,17.64]	[13.51,14.85]	[8.98,10.20]
8	2.26	3.10	4.12	5.11	6.66	9.49	14.80	19.45	20.81	14.20
	[2.00,2.54]	[2.79,3.41]	[3.71,4.52]	[4.67,5.55]	[6.22,7.12]	[8.94,10.05]	[14.21,15.39]	[18.75,20.18]	[20.17,21.40]	[13.43,14.92]
9	1.81	2.22	2.55	3.65	4.20	6.48	9.38	17.12	25.56	27.03
	[1.57,2.05]	[1.98,2.50]	[2.29,2.81]	[3.31,4.00]	[3.87,4.55]	[6.09,6.92]	[8.93,9.84]	[16.49,17.73]	[24.84,26.27]	[26.33,27.76]
10	1.34	1.57	1.65	2.09	2.66	3.28	4.63	8.09	18.46	56.25
	[1.11,1.59]	[1.36,1.77]	[1.41,1.89]	[1.81,2.41]	[2.37,2.93]	[2.97,3.60]	[4.25,5.00]	[7.57,8.60]	[17.81,19.11]	[55.41,57.09]

Notes: Sample includes all men ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Earnings deciles are assigned using the full sample. Bootstrapped 95% confidence intervals are shown in brackets.

Table A6: Decile Transition Matrices, Men, 1993

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	26.57	19.83	14.60	10.88	7.53	6.43	4.19	3.73	3.42	2.83
	[25.07,27.97]	[18.46,21.25]	[13.49,15.72]	[9.86,11.93]	[6.73,8.40]	[5.65,7.20]	[3.50,4.87]	[2.97,4.88]	[2.87,3.99]	[2.23,3.42]
2	19.48	18.33	15.47	13.39	9.56	7.42	5.69	4.23	3.72	2.71
	[18.55,20.44]	[17.39,19.25]	[14.42,16.52]	[12.60,14.25]	[8.82,10.31]	[6.71,8.16]	[5.00,6.38]	[3.71,4.75]	[3.20,4.26]	[2.12,3.23]
3	13.27	14.94	15.84	14.62	11.42	9.54	7.20	5.26	4.33	3.58
	[12.41,14.21]	[14.10,15.84]	[14.93,16.71]	[13.82,15.40]	[10.61,12.25]	[8.85,10.25]	[6.60,7.83]	[4.70,5.85]	[3.89,4.81]	[3.13,4.09]
4	9.07	11.15	14.20	15.65	13.99	11.59	8.64	6.96	5.26	3.47
	[8.52,9.69]	[10.48,11.87]	[13.48,14.94]	[14.89,16.44]	[13.28,14.73]	[10.84,12.32]	[8.05,9.23]	[6.41,7.55]	[4.76,5.72]	[3.11,3.85]
5	6.04	7.74	10.36	13.92	15.91	14.40	11.57	8.82	6.65	4.58
	[5.52,6.57]	[7.23,8.26]	[9.80,10.95]	[13.27,14.55]	[15.21,16.63]	[13.61,15.14]	[10.93,12.22]	[8.22,9.38]	[6.14,7.16]	[4.13,5.06]
6	4.90	5.92	7.75	10.34	14.62	15.89	14.65	11.85	8.93	5.15
	[4.51,5.29]	[5.48,6.34]	[7.25,8.24]	[9.75,10.98]	[13.95,15.22]	[15.25,16.55]	[13.97,15.35]	[11.27,12.45]	[8.43,9.46]	[4.69,5.72]
7	3.79	4.48	6.11	7.93	10.64	15.11	17.48	15.91	11.38	7.16
	[3.48,4.12]	[4.12,4.85]	[5.66,6.59]	[7.49,8.39]	[10.10,11.19]	[14.44,15.77]	[16.81,18.16]	[15.32,16.55]	[10.80,11.98]	[6.66,7.66]
8	2.80	3.26	4.10	5.29	7.14	11.15	16.00	21.27	18.11	10.88
	[2.53,3.07]	[2.92,3.59]	[3.79,4.44]	[4.93,5.67]	[6.68,7.60]	[10.61,11.70]	[15.43,16.59]	[20.64,21.94]	[17.52,18.66]	[10.33,11.48]
9	1.86	2.36	2.80	3.59	4.54	5.85	10.08	17.91	27.46	23.54
	[1.64,2.11]	[2.10,2.60]	[2.55,3.05]	[3.28,3.90]	[4.24,4.88]	[5.48,6.23]	[9.58,10.55]	[17.33,18.47]	[26.77,28.15]	[22.81,24.30]
10	1.35	1.23	1.46	1.83	2.24	2.89	3.89	6.97	17.12	61.03
	[1.15,1.55]	[1.05,1.41]	[1.28,1.67]	[1.61,2.07]	[1.98,2.50]	[2.56,3.25]	[3.59,4.23]	[6.60,7.40]	[16.53,17.72]	[60.07,61.93]

Notes: Sample includes all men ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Earnings deciles are assigned using the full sample. Bootstrapped 95% confidence intervals are shown in brackets.

Table A7: Decile Transition Matrices, High School or Less, 1981

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	28.85	23.28	17.78	12.08	8.19	4.58	2.62	1.47	0.70	0.45
	[27.76,29.97]	[22.30,24.34]	[16.78,18.82]	[11.21,12.89]	[7.51,8.94]	[4.05,5.11]	[2.12,3.14]	[1.17,1.79]	[0.47,0.94]	[0.23,0.72]
2	20.23	21.74	19.61	14.41	9.51	6.80	3.60	2.19	1.12	0.79
	[19.25,21.26]	[20.78,22.75]	[18.64,20.57]	[13.56,15.28]	[8.73,10.30]	[6.21,7.40]	[3.07,4.16]	[1.81,2.57]	[0.87,1.40]	[0.58,1.02]
3	14.14	17.89	20.40	17.62	12.18	7.40	4.63	2.95	1.74	1.05
	[13.32,15.07]	[16.92,18.94]	[19.40,21.43]	[16.66,18.58]	[11.35,13.01]	[6.72,8.17]	[4.04,5.24]	[2.55,3.37]	[1.41,2.06]	[0.80,1.32]
4	9.98	13.12	15.84	18.81	15.69	11.02	7.77	4.23	2.31	1.22
	[9.25,10.71]	[12.37,13.93]	[14.92,16.80]	[17.88,19.75]	[14.83,16.54]	[10.23,11.82]	[7.00,8.47]	[3.74,4.74]	[1.97,2.67]	[0.89,1.58]
5	7.47	8.88	12.59	16.10	17.16	15.94	10.76	6.18	3.32	1.60
	[6.83,8.10]	[8.21,9.59]	[11.78,13.45]	[15.30,16.97]	[16.23,18.10]	[15.02,16.90]	[10.03,11.51]	[5.60,6.81]	[2.86,3.80]	[1.27,1.92]
6	6.37	6.92	9.44	12.13	15.94	16.35	15.02	9.72	5.76	2.34
	[5.74,7.00]	[6.29,7.53]	[8.70,10.17]	[11.33,12.96]	[15.03,16.80]	[15.41,17.24]	[14.17,15.94]	[9.00,10.49]	[5.20,6.36]	[1.95,2.72]
7	4.17	5.78	7.10	8.74	11.38	16.07	17.76	15.74	9.33	3.94
	[3.62,4.79]	[5.19,6.40]	[6.41,7.75]	[8.04,9.48]	[10.59,12.19]	[15.15,17.02]	[16.77,18.69]	[14.84,16.70]	[8.56,10.09]	[3.47,4.46]
8	3.49	4.32	5.39	5.67	8.02	11.95	17.80	21.20	16.41	5.75
	[2.90,4.11]	[3.76,4.87]	[4.72,6.09]	[5.03,6.37]	[7.24,8.81]	[11.07,12.79]	[16.75,18.87]	[20.09,22.25]	[15.46,17.43]	[5.02,6.40]
9	2.41	3.30	3.78	4.72	5.78	8.65	12.68	20.63	24.43	13.62
	[1.95,2.92]	[2.82,3.86]	[3.22,4.38]	[4.03,5.44]	[5.07,6.49]	[7.71,9.54]	[11.73,13.65]	[19.43,21.83]	[23.13,25.71]	[12.70,14.61]
10	3.00	3.32	3.64	4.45	4.94	5.56	7.25	12.33	23.76	31.75
	[2.37,3.70]	[2.57,4.08]	[2.63,4.52]	[3.54,5.38]	[4.06,5.92]	[4.58,6.51]	[6.09,8.35]	[11.16,13.51]	[22.20,25.38]	[30.06,33.38]

Notes: Sample includes all individuals with a high school degree or less ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Earnings deciles are assigned using the full sample. Bootstrapped 95% confidence intervals are shown in brackets.

Table A8: Decile Transition Matrices, High School or Less, 1993

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	29.68	24.27	18.36	11.78	6.73	3.96	2.14	1.52	1.02	0.53
	[28.60,30.77]	[23.22,25.36]	[17.45,19.31]	[11.04,12.58]	[6.10,7.39]	[3.51,4.47]	[1.81,2.49]	[1.21,1.88]	[0.80,1.25]	[0.34,0.74]
2	21.98	21.84	19.74	15.15	9.20	5.23	3.55	1.55	1.17	0.59
	[21.09,22.81]	[20.95,22.76]	[18.78,20.67]	[14.31,16.00]	[8.59,9.84]	[4.74,5.74]	[3.12,3.99]	[1.23,1.86]	[0.94,1.44]	[0.42,0.76]
3	14.49	17.58	20.44	18.28	12.41	7.50	4.49	2.59	1.37	0.85
	[13.75,15.22]	[16.77,18.41]	[19.57,21.29]	[17.37,19.21]	[11.76,13.10]	[6.92,8.12]	[4.05,4.97]	[2.23,2.94]	[1.10,1.65]	[0.66,1.05]
4	10.14	13.18	17.08	19.67	15.78	10.93	6.39	3.73	2.19	0.91
	[9.47,10.77]	[12.40,13.97]	[16.25,17.87]	[18.89,20.55]	[15.04,16.50]	[10.22,11.64]	[5.86,6.94]	[3.32,4.17]	[1.87,2.51]	[0.71,1.12]
5	7.53	9.58	12.53	17.05	18.57	15.12	9.86	5.52	2.86	1.39
	[6.94,8.10]	[8.89,10.23]	[11.77,13.25]	[16.28,17.81]	[17.64,19.47]	[14.35,15.97]	[9.24,10.48]	[4.94,6.13]	[2.49,3.25]	[1.11,1.67]
6	5.95	7.10	9.35	13.24	17.14	17.64	14.22	8.87	4.58	1.89
	[5.41,6.50]	[6.49,7.76]	[8.63,10.03]	[12.39,14.11]	[16.26,18.04]	[16.76,18.48]	[13.38,15.06]	[8.17,9.59]	[4.07,5.12]	[1.60,2.20]
7	4.98	5.97	7.68	10.08	12.36	17.75	17.95	13.21	7.17	2.85
	[4.42,5.57]	[5.27,6.63]	[7.02,8.33]	[9.22,10.94]	[11.55,13.13]	[16.72,18.83]	[17.03,18.91]	[12.39,14.06]	[6.51,7.81]	[2.31,3.53]
8	3.61	4.48	5.13	6.93	9.20	13.99	18.85	20.39	12.87	4.54
	[3.16,4.11]	[3.85,5.10]	[4.54,5.72]	[6.20,7.69]	[8.40,10.06]	[13.13,14.90]	[17.82,19.77]	[19.39,21.41]	[12.00,13.75]	[3.98,5.13]
9	2.77	3.50	4.40	5.06	7.00	8.43	14.22	22.03	23.09	9.50
	[2.19,3.36]	[2.97,4.01]	[3.76,5.00]	[4.36,5.71]	[6.20,7.85]	[7.58,9.40]	[13.16,15.26]	[20.83,23.27]	[21.86,24.32]	[8.57,10.41]
10	3.14	2.95	2.98	3.98	5.55	5.55	6.90	12.82	23.78	32.35
	[2.30,4.10]	[2.22,3.81]	[2.19,3.79]	[2.92,5.00]	[4.49,6.69]	[4.59,6.59]	[5.58,8.19]	[11.18,14.50]	[22.01,25.57]	[30.01,34.75]

Notes: Sample includes all individuals with a high school degree or less ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Earnings deciles are assigned using the full sample. Bootstrapped 95% confidence intervals are shown in brackets.

Table A9: Decile Transition Matrices, Some College, 1981

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	21.47	17.93	16.30	13.32	10.77	7.77	5.19	4.03	2.17	1.07
	[19.73,23.01]	[16.50,19.32]	[15.03,17.62]	[12.21,14.41]	[9.76,11.79]	[6.66,8.87]	[4.46,5.91]	[3.36,4.69]	[1.64,2.74]	[0.75,1.42]
2	16.20	16.95	15.79	14.53	12.14	9.25	6.70	4.36	2.50	1.59
	[15.00,17.46]	[15.78,18.11]	[14.60,16.99]	[13.42,15.65]	[11.12,13.32]	[8.27,10.24]	[5.83,7.63]	[3.74,5.02]	[1.94,3.07]	[1.11,2.14]
3	10.73	11.87	15.74	15.30	14.56	11.81	8.59	5.59	3.75	2.05
	[9.77,11.66]	[10.90,12.84]	[14.54,16.91]	[14.17,16.47]	[13.39,15.76]	[10.73,12.93]	[7.75,9.46]	[4.87,6.38]	[3.15,4.37]	[1.38,2.77]
4	8.55	10.32	12.40	15.20	14.51	13.07	10.45	7.67	5.01	2.81
	[7.76,9.38]	[9.44,11.25]	[11.48,13.34]	[14.12,16.30]	[13.42,15.58]	[12.04,14.15]	[9.54,11.35]	[6.83,8.57]	[4.39,5.63]	[2.29,3.35]
5	5.97	8.59	9.44	12.61	15.17	14.98	13.45	10.18	6.42	3.19
	[5.30,6.61]	[7.90,9.27]	[8.42,10.46]	[11.69,13.56]	[14.21,16.17]	[14.08,15.90]	[12.54,14.42]	[9.30,11.09]	[5.74,7.18]	[2.66,3.74]
6	4.83	6.09	7.50	9.68	12.62	16.05	15.57	14.21	9.09	4.34
	[4.24,5.51]	[5.38,6.75]	[6.82,8.18]	[8.74,10.71]	[11.70,13.60]	[15.10,17.06]	[14.59,16.52]	[13.23,15.16]	[8.31,9.87]	[3.76,4.93]
7	3.93	4.33	5.25	8.00	9.51	13.09	17.65	17.83	13.67	6.74
	[3.33,4.51]	[3.72,4.93]	[4.65,5.92]	[7.20,8.78]	[8.64,10.46]	[12.09,14.12]	[16.63,18.68]	[16.84,18.82]	[12.65,14.69]	[6.05,7.46]
8	2.68	3.00	4.50	5.82	6.93	10.03	15.13	20.11	20.99	10.79
	[2.21,3.14]	[2.55,3.48]	[3.93,5.11]	[5.18,6.50]	[6.23,7.65]	[9.20,10.88]	[14.16,16.05]	[19.05,21.17]	[19.97,22.08]	[9.67,11.80]
9	2.19	2.53	2.89	4.15	4.84	6.94	10.23	18.85	26.89	20.49
	[1.79,2.61]	[2.10,3.00]	[2.41,3.37]	[3.54,4.75]	[4.19,5.50]	[6.24,7.74]	[9.38,11.09]	[17.83,19.92]	[25.62,28.21]	[19.28,21.64]
10	2.26	2.50	2.73	2.92	3.90	4.46	6.39	10.74	22.02	42.07
	[1.73,2.83]	[2.02,3.02]	[2.07,3.41]	[2.36,3.50]	[3.26,4.56]	[3.63,5.26]	[5.59,7.25]	[9.77,11.75]	[20.64,23.44]	[40.50,43.65]

Notes: Sample includes all individuals with some college ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Earnings deciles are assigned using the full sample. Bootstrapped 95% confidence intervals are shown in brackets.

Table A10: Decile Transition Matrices, Some College, 1993

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	24.16	19.64	16.26	12.81	9.15	6.67	4.63	3.40	2.04	1.25
	[22.69,25.56]	[18.30,20.99]	[15.00,17.47]	[11.60,13.94]	[8.26,10.04]	[5.98,7.46]	[3.93,5.36]	[2.83,3.98]	[1.63,2.45]	[0.76,1.74]
2	17.31	17.91	16.76	15.00	11.37	8.14	5.41	4.05	2.62	1.43
	[16.27,18.39]	[16.88,18.92]	[15.63,17.85]	[14.08,15.95]	[10.50,12.26]	[7.37,8.93]	[4.69,6.06]	[3.47,4.62]	[2.22,3.04]	[0.85,1.91]
3	11.75	14.07	16.05	16.46	14.30	9.71	7.30	4.75	3.54	2.08
	[10.85,12.72]	[13.21,14.93]	[15.03,17.11]	[15.46,17.45]	[13.39,15.19]	[8.96,10.46]	[6.61,7.94]	[4.20,5.34]	[3.07,3.97]	[1.69,2.48]
4	9.40	10.46	13.24	16.38	16.35	12.62	8.91	6.35	3.79	2.51
	[8.55,10.32]	[9.65,11.25]	[12.37,14.12]	[15.42,17.42]	[15.51,17.19]	[11.75,13.46]	[8.19,9.67]	[5.75,6.94]	[3.31,4.27]	[2.09,2.91]
5	6.51	7.68	10.35	13.09	16.82	15.35	12.78	8.93	5.76	2.72
	[5.85,7.26]	[7.00,8.37]	[9.64,11.09]	[12.21,13.89]	[15.90,17.71]	[14.31,16.37]	[12.00,13.57]	[8.24,9.67]	[5.18,6.37]	[2.31,3.12]
6	4.95	5.37	7.73	10.39	14.10	17.02	15.43	13.04	8.32	3.65
	[4.45,5.43]	[4.85,5.90]	[7.08,8.36]	[9.70,11.10]	[13.24,14.93]	[16.16,17.92]	[14.56,16.34]	[12.22,13.93]	[7.67,8.97]	[3.21,4.14]
7	4.15	4.98	6.06	7.87	10.89	14.94	18.15	16.51	11.18	5.26
	[3.63,4.69]	[4.44,5.57]	[5.50,6.65]	[7.23,8.51]	[10.14,11.63]	[14.12,15.77]	[17.07,19.10]	[15.51,17.48]	[10.41,11.94]	[4.71,5.86]
8	3.60	3.76	4.21	5.47	7.23	10.80	16.68	22.49	18.04	7.72
	[3.15,4.03]	[3.30,4.26]	[3.76,4.71]	[4.98,5.99]	[6.63,7.86]	[10.04,11.56]	[15.86,17.54]	[21.39,23.56]	[17.14,18.98]	[7.00,8.48]
9	2.84	2.84	3.29	3.85	4.83	6.38	10.67	20.02	28.57	16.72
	[2.37,3.31]	[2.35,3.39]	[2.83,3.78]	[3.32,4.36]	[4.26,5.47]	[5.76,7.00]	[9.93,11.44]	[19.01,21.01]	[27.37,29.72]	[15.75,17.73]
10	2.24	2.20	2.13	3.18	3.07	3.98	6.30	10.40	23.90	42.61
	[1.80,2.70]	[1.77,2.64]	[1.63,2.63]	[2.60,3.76]	[2.49,3.65]	[3.34,4.63]	[5.59,7.04]	[9.41,11.33]	[22.56,25.39]	[41.11,44.12]

Notes: Sample includes all individuals with some college ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Earnings deciles are assigned using the full sample. Bootstrapped 95% confidence intervals are shown in brackets.

Table A11: Decile Transition Matrices, College + 1981

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	21.47	17.93	16.30	13.32	10.77	7.77	5.19	4.03	2.17	1.07
	[19.73,23.01]	[16.50,19.32]	[15.03,17.62]	[12.21,14.41]	[9.76,11.79]	[6.66,8.87]	[4.46,5.91]	[3.36,4.69]	[1.64,2.74]	[0.75,1.42]
2	16.20	16.95	15.79	14.53	12.14	9.25	6.70	4.36	2.50	1.59
	[15.00,17.46]	[15.78,18.11]	[14.60,16.99]	[13.42,15.65]	[11.12,13.32]	[8.27,10.24]	[5.83,7.63]	[3.74,5.02]	[1.94,3.07]	[1.11,2.14]
3	10.73	11.87	15.74	15.30	14.56	11.81	8.59	5.59	3.75	2.05
	[9.77,11.66]	[10.90,12.84]	[14.54,16.91]	[14.17,16.47]	[13.39,15.76]	[10.73,12.93]	[7.75,9.46]	[4.87,6.38]	[3.15,4.37]	[1.38,2.77]
4	8.55	10.32	12.40	15.20	14.51	13.07	10.45	7.67	5.01	2.81
	[7.76,9.38]	[9.44,11.25]	[11.48,13.34]	[14.12,16.30]	[13.42,15.58]	[12.04,14.15]	[9.54,11.35]	[6.83,8.57]	[4.39,5.63]	[2.29,3.35]
5	5.97	8.59	9.44	12.61	15.17	14.98	13.45	10.18	6.42	3.19
	[5.30,6.61]	[7.90,9.27]	[8.42,10.46]	[11.69,13.56]	[14.21,16.17]	[14.08,15.90]	[12.54,14.42]	[9.30,11.09]	[5.74,7.18]	[2.66,3.74]
6	4.83	6.09	7.50	9.68	12.62	16.05	15.57	14.21	9.09	4.34
	[4.24,5.51]	[5.38,6.75]	[6.82,8.18]	[8.74,10.71]	[11.70,13.60]	[15.10,17.06]	[14.59,16.52]	[13.23,15.16]	[8.31,9.87]	[3.76,4.93]
7	3.93	4.33	5.25	8.00	9.51	13.09	17.65	17.83	13.67	6.74
	[3.33,4.51]	[3.72,4.93]	[4.65,5.92]	[7.20,8.78]	[8.64,10.46]	[12.09,14.12]	[16.63,18.68]	[16.84,18.82]	[12.65,14.69]	[6.05,7.46]
8	2.68	3.00	4.50	5.82	6.93	10.03	15.13	20.11	20.99	10.79
	[2.21,3.14]	[2.55,3.48]	[3.93,5.11]	[5.18,6.50]	[6.23,7.65]	[9.20,10.88]	[14.16,16.05]	[19.05,21.17]	[19.97,22.08]	[9.67,11.80]
9	2.19	2.53	2.89	4.15	4.84	6.94	10.23	18.85	26.89	20.49
	[1.79,2.61]	[2.10,3.00]	[2.41,3.37]	[3.54,4.75]	[4.19,5.50]	[6.24,7.74]	[9.38,11.09]	[17.83,19.92]	[25.62,28.21]	[19.28,21.64]
10	2.26	2.50	2.73	2.92	3.90	4.46	6.39	10.74	22.02	42.07
	[1.73,2.83]	[2.02,3.02]	[2.07,3.41]	[2.36,3.50]	[3.26,4.56]	[3.63,5.26]	[5.59,7.25]	[9.77,11.75]	[20.64,23.44]	[40.50,43.65]

Notes: Sample includes all men and women with a college degree ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Age-adjusted average earnings is defined as the residuals from a regression of the seven-year average earnings centered around year t on a quadratic in age separately for each year. Bootstrapped 95% confidence intervals are shown in brackets.

Table A12: Decile Transition Matrices, College +, 1993

Starting Decile	Ending Decile 1	2	3	4	5	6	7	8	9	10
1	24.16	19.64	16.26	12.81	9.15	6.67	4.63	3.40	2.04	1.25
	[22.69,25.56]	[18.30,20.99]	[15.00,17.47]	[11.60,13.94]	[8.26,10.04]	[5.98,7.46]	[3.93,5.36]	[2.83,3.98]	[1.63,2.45]	[0.76,1.74]
2	17.31	17.91	16.76	15.00	11.37	8.14	5.41	4.05	2.62	1.43
	[16.27,18.39]	[16.88,18.92]	[15.63,17.85]	[14.08,15.95]	[10.50,12.26]	[7.37,8.93]	[4.69,6.06]	[3.47,4.62]	[2.22,3.04]	[0.85,1.91]
3	11.75	14.07	16.05	16.46	14.30	9.71	7.30	4.75	3.54	2.08
	[10.85,12.72]	[13.21,14.93]	[15.03,17.11]	[15.46,17.45]	[13.39,15.19]	[8.96,10.46]	[6.61,7.94]	[4.20,5.34]	[3.07,3.97]	[1.69,2.48]
4	9.40	10.46	13.24	16.38	16.35	12.62	8.91	6.35	3.79	2.51
	[8.55,10.32]	[9.65,11.25]	[12.37,14.12]	[15.42,17.42]	[15.51,17.19]	[11.75,13.46]	[8.19,9.67]	[5.75,6.94]	[3.31,4.27]	[2.09,2.91]
5	6.51	7.68	10.35	13.09	16.82	15.35	12.78	8.93	5.76	2.72
	[5.85,7.26]	[7.00,8.37]	[9.64,11.09]	[12.21,13.89]	[15.90,17.71]	[14.31,16.37]	[12.00,13.57]	[8.24,9.67]	[5.18,6.37]	[2.31,3.12]
6	4.95	5.37	7.73	10.39	14.10	17.02	15.43	13.04	8.32	3.65
	[4.45,5.43]	[4.85,5.90]	[7.08,8.36]	[9.70,11.10]	[13.24,14.93]	[16.16,17.92]	[14.56,16.34]	[12.22,13.93]	[7.67,8.97]	[3.21,4.14]
7	4.15	4.98	6.06	7.87	10.89	14.94	18.15	16.51	11.18	5.26
	[3.63,4.69]	[4.44,5.57]	[5.50,6.65]	[7.23,8.51]	[10.14,11.63]	[14.12,15.77]	[17.07,19.10]	[15.51,17.48]	[10.41,11.94]	[4.71,5.86]
8	3.60	3.76	4.21	5.47	7.23	10.80	16.68	22.49	18.04	7.72
	[3.15,4.03]	[3.30,4.26]	[3.76,4.71]	[4.98,5.99]	[6.63,7.86]	[10.04,11.56]	[15.86,17.54]	[21.39,23.56]	[17.14,18.98]	[7.00,8.48]
9	2.84	2.84	3.29	3.85	4.83	6.38	10.67	20.02	28.57	16.72
	[2.37,3.31]	[2.35,3.39]	[2.83,3.78]	[3.32,4.36]	[4.26,5.47]	[5.76,7.00]	[9.93,11.44]	[19.01,21.01]	[27.37,29.72]	[15.75,17.73]
10	2.24	2.20	2.13	3.18	3.07	3.98	6.30	10.40	23.90	42.61
	[1.80,2.70]	[1.77,2.64]	[1.63,2.63]	[2.60,3.76]	[2.49,3.65]	[3.34,4.63]	[5.59,7.04]	[9.41,11.33]	[22.56,25.39]	[41.11,44.12]

Notes: Sample includes all men and women with a college degree ages 25 to 59 ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t. Age-adjusted average earnings is defined as the residuals from a regression of the seven-year average earnings centered around year t on a quadratic in age separately for each year. Bootstrapped 95% confidence intervals are shown in brackets.

Table A13: Trace of Decile Transition Matrices 1981 - 1996 and 1993 - 2008, Overall and by Gender and Education

	1981 to 1996	1993 to 2008
Everyone	2.19	2.37
	[2.17,2.21]	[2.35,2.39]
Women	2.03	2.31
	[2.00,2.07]	[2.28,2.35]
Men	2.19	2.35
	[2.16,2.22]	[2.33,2.38]
High School	2.18	2.22
	[2.15,2.22]	[2.18,2.25]
Some College	2.07	2.20
	[2.03,2.11]	[2.17,2.24]
College	1.82	2.15
	[1.79,1.86]	[2.10,2.19]

Notes: Sample includes individuals ages 25 to 59 who have average earnings above the minimum threshold and positive earnings in year t and $t + 15$. Bootstrapped 95% confidence intervals are shown in brackets. Deciles are determined using the full sample.