Recessions and Occupational Match Quality: The Role of Age, Gender, and Education

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ABSTRACT: People lose jobs during economic recessions. This paper mainly looks at the implicit productivity loss of job displacement. We explore changes in match quality as a potential mechanism; that is, individuals who are displaced by recessions may be reemployed in jobs for which they are more mismatched during times of high unemployment. Using NLSY79 and NLSY97 data, we explore how workers' match qualities change over the lifecycle. We further explore the role age, education, gender, and labor market experience during the recessions.

I. Background

The effect of recessions on job mismatch has taken second stage to investigation of other themes and consequences of cyclical conditions. A notable exception is Sahin et al. (2014) who examine how the mismatch between vacancies and job seekers translates into higher unemployment by lowering the aggregate job finding rate. The authors report that sectoral mismatch (across counties, two-digit industries, and three-digit occupations) explains approximately one-third of the rise in the U.S. unemployment rate around the Great Recession, namely between 2006 and end-2009. Further, the authors argue that the problem of mismatch – again, searching for jobs in the wrong sectors – is nontrivial for higher-skill workers. To complicate matters, however, Hotchkiss et al. (2014) report that an increased schooling share among 25- to 54-year-old labor force leavers in the aftermath of the Great Recession is not to be viewed as a need to realign skills as it did not characterize those most adversely impacted by that recession. Rather, it is attributed to a cyclical decline in labor market opportunity costs. In short, evidence supporting mismatch is not only indirect and sparse, but also mixed.

Study of recession effects has often tended to focus on the situation confronting young workers. The longer term consequences for the earnings of graduates of interruptions in the initial process of career progression have received much attention (e.g. Kahn, 2010), at the same time as other research has suggested that low-educated workers may be even more seriously at risk from recessions (Hoynes et al., 2012). The most recent study by Schwandt and von Wachter (2018), in examining the persistence of these effects among all young workers who entered the U.S. labor market over 1976-2015, finds evidence of a continuing reduction in earnings, employment, and wages from entry during recessions that lasts for at least 10 years. These losses are shown to be larger for the least advantaged labor market entrants – high school dropouts and nonwhites – plus high school graduates. But, as the authors admit, the sources remain opaque. They make mention of a reduction in employer quality in the case of college graduates, noting that employment fluctuations are more pronounced at higher-paying employers leading to cyclical downgrading. However, not only the sources but also the periodicity of disadvantage of these 'unlucky cohorts' is at issue.

Job mismatch has also figured lightly in gender analyses of the impact of recession. Most research has focused on the emerging absence of a gender gap in unemployment since the early 1980s (as well as upon differences between men and women in respect of the flows between

unemployment and inactivity that also appear to have disappeared.) What we do see is an unequal effect on male unemployment over the cycle: the *mancession* phenomenon. At issue is whether this process advantages women? It would do so were there greater gender occupational equality over the cycle. The *buffer argument* is that occupational inequality grows as men are protected by a buffer stock of women who are shed, the first to go. The *segmentation argument* is that occupational equality improves as men are the first to lose employment given that the recession hits particular sectors and occupations (i.e. the cyclically sensitive industries and occupations). In addition, any *substitution* of cheaper women (from the lower tier) for males (in the upper tier) may also occur, perhaps more in the recovery stage, and again improve female occupational equality. One predominant strand of research suggests that on net the buffer effect seems to dominate, such that periods of economic decline interrupt a trend toward decreasing occupational segregation. (e.g. Bansak et al., 2012). On this view, recessions have no gender silver lining; that is, they impede rather than facilitate the gender integration of occupations.[1]

Direct examination of match quality is confined to the most recent additions to the literature on job matching and wage growth, although the two formative studies confine their attention to male workers (see Guvenen et al. 2018; Lise and Postel-Vinay 2016). However, in the tradition of these studies, Addison et al. (2018) measure occupational mismatch based on the discrepancy between the portfolio of skills required by an occupation and the array of abilities possessed by the worker for learning those skills while seeking to quantify the portion of the gender wage gap that may be attributed of the disparities in match quality. Using data from the 1979 and 1997 cohorts of the National Longitudinal Survey of Youth, they report distinct gender differences in match quality and changes in match quality over the course of a career. They also show that a substantial portion of the gender wage gap stems from match quality differences among the college educated. College-educated females are significantly more mismatched than males. Cohort effects are also visible in the data: college-educated males of the younger cohort are worse off in terms of match quality compared to the older cohort, even as the new generation of women is doing better on average.

This brief sketch of the research literature serves to illustrate the disparate nature of work on job matching and its consequences. In the following we seek to borrow from a range of

[1] For research on the responsiveness of gender wage differences to the cycle, see Elsby et al. (2016).

developments in this literature with a view to integrating the role of the cycle, age, gender, and education.

II. Data and Measurement Issues

Data Sources and Sample Construction

Our main data sets consist of the 1979 and 1997 cohorts of the National Longitudinal Survey of Youth, namely the NLSY79 and the NLSY97. The former provides a nationally representative panel of data for the cohort of individuals aged 14 to 22 years in 1979, and the latter for youths aged 12 to 17 years in 1997. Both cohorts were initially interviewed annually – the NLSY79 until 1994 and the NLSY97 until 2011 – but are now followed biennially. We restrict our sample to the core samples of both surveys, thereby excluding the military as well as the oversample of Hispanic, black, and low-income youth. We studied both samples from their initial years on until the last year of survey available to us (2013 for NLSY97 sample and 2014 for the NLSY79 sample).

As we are interested in the changes in individuals' employment status and occupational match quality (measurement of which will be explained in the next section) centered around the recessions in our sample period, we have three event windows for the NLSY79 cohort and two event windows for the NLSY97 cohort. The first recession experienced by the NLSY79 cohort was that from July 1990 through March 1991. During this recession this cohort comprises 22 to 34-year-olds. During the second recession, which began in March 2001 and lasted through November 2001, members of the cohort are 10 years older. The last recession experienced by this cohort now aged 42 to 52 years was the Great Recession, December 2007 through June 2009. The NLSY 97 cohort, on the other hand, experienced only the latter two recessions during the survey period, during the first (second) of which they were aged 18 to 20 years (24 to 28 years), and as such still at the beginning of their careers.

We first tracked changes in individuals' skills mismatch and residual wages before, during, and after the three recessions to determine whether there are any substantial match quality costs associated with recessions and if we can discern from the earnings data any evidence of wage effects stemming from these match quality shocks. We then investigated whether individual match quality changes are impacted by the employment experience before and during the recession or whether match quality influences the employment experience of the individual before, during and after the recession. We group individuals according to their employment experience over the six-month interval leading up to the recession and lasting until the end of the recession. We then document their employment over the 24 months before the recession and follow them for 24 months after the recession to understand employment/unemployment and job transitions during and after recessions and the mismatch implications of these transitions. For our mismatch and wage effects regression analysis, we track individuals from 6 months before to up to 12 months after each recession.

Both NLSY cohorts are aging cohorts and are not necessarily nationally representative of the labor force at any given year[2] but they are long panels over which we can study the life cycle effects of recessions. In addition to its long panel nature, use of the NLSY has two other advantages. The first is that it effectively tracks workers' actual labor market experience, allowing us to correct for any measurement error in the conventional imputed measure based on age and education (i.e. age – schooling – 5). The second is that it allows us to control for ability (and skills of the individuals across several dimensions), using the Armed Services Vocational Aptitude Battery (ASVAB) test scores. Such measures are unavailable in otherwise similar panel data sets. We use the age-adjusted percentile scores of respondents on the subtests of the ASVAB as the basis of our

[2] Although they are nationally representative of the age cohorts sampled at the beginning year of each survey.

individual skill measures (see the next subsection).

Although labor market activity has been recorded in great detail in both surveys since their inception, occupations and industries are not coded consistently across each wave of either survey. We mapped all available NLSY79 and NLSY97 occupation codes using the guidelines developed by Dorn (2009) so as to be able to exploit the full extent of the data panel available. We identify match quality at the occupation level. The next section describes how we construct this measure.

Measuring Match Quality

Determination of worker skill endowments and occupational skill requirements

We define individual workers' skill mismatch as the discrepancy between their premarket skill levels and the requirements of the occupations in which they are employed. In linking the skill supply side (viz. workers' endowments) with the demand side (occupational requirements), we exploit the tools developed by the ASVAB Career Exploration Program. This program is administered by the Department of Defense (DoD) with a view to helping ASVAB participants identify and explore suitable career possibilities in the private, public, or military sectors. Both NLSY surveys conducted the ASVAB tests around their inception; specifically, for the first round of the NLSY97 and the second year of the NLSY79. All NLSY79 respondents and about 80 percent of the NLSY97 sample participated in the computer adaptive test of the Armed Services Vocational Aptitude Battery (CAT-ASVAB).[3]

We consider four composite skill endowment measures: Mathematical, Verbal, Science/ Technological/Mechanical (STM), and Social. In the cases of the first three composites, for all those in the NLSY samples with valid test scores we constructed measures using percentile ranks

[3] For details of the administration of the ASVAB and CAT-ASVAB tests, the reader is referred to the NLSY79 and NLSY97 web pages: respectively, https://www.nlsinfo.org/content/cohorts/nlsy79/topical-guide/education/aptitude-achievement-intelligence-scores and https://www.nlsinfo.org/content/cohorts/nlsy97/topical-guide/education/administration-cat-asvab-0.

on select ASVAB subtests. Specifically, for the verbal skills composite we used the percentile scores on *Word Knowledge* and *Paragraph Comprehension*, for mathematical skills the scores on *Arithmetic Reasoning* and *Mathematical Knowledge*, and for STM skills the scores on *General Science*, *Mechanical Comprehension*, and *Electronics Information* using the weights provided by the NLS staff.[4] We then converted these composite scores to percentile ranks, which range between 0 and 1 (that is, from 0 to 100 percent, where, for example, 0.75 refers to the 75th percentile).[5]

For the construction of the remaining endowment measure – social skills – we follow a strategy that combines the methods used by Deming (2017a) and Guvenen et al. (2018). We use two questions from the NLSY79 survey (specifically, the third round of the survey in 1981) where respondents are asked to report on their then current sociability and (retrospective) sociability at age 6 along with their rank on the Rotter Locus of Control Scale and the Rosenberg Self-Esteem Scale.[6] The NLSY97 does not ask these sociability questions nor does it collect data on the Rotter and Rottenberg Scales. Instead, respondents are asked a series of questions to determine personality traits (Big 5 Personality Factors). Following Deming (2017a), we use two questions on *extroversion* and two questions on *conscientiousness* to construct a social skill rank comparable to the NLSY79 cohort's measure. We downloaded the standardized measurements from Deming's

[4] We thank Steve McClaskie and other NLS program staff for their help in providing us with the weights and for assisting us with the program that creates the weighted composites. This program also adjusts the raw scores by age within 3-month birth cohorts.

[5] This approach is similar to that used by Guvenen et al. (2018) other than for the inclusion of STM scores. There is no consensus in the literature as to the construction of the ability measures. Although almost all studies utilize ASVAB test scores, they select different ability dimensions or different subtests for measurement of these dimensions. Our results were robust to variation in measurement, such as the exclusion of STM skills by Guvenen et al. (2018) and the restriction of ASVAB measured abilities to *cognitive*, *manual* and *social* by Lise and Postel-Vinay (2016) who analyze mismatch by separate ability dimensions and eschew use of an aggregate measure.

[6] The Rosenberg Self-Esteem Scale is a measure of self-worth while the Rotter-Locus of Control Scale is designed to measure the extent to which individuals believe they exercise control over their lives (the predominance of self-determination over chance or fate). For the NLSY79 cohort, tests of these two endowments were administered in 1979 and 1980, respectively.

(2017b) data file, and then converted the scores to percentile ranks for each cohort of NLSY respondents.[7]

In our analysis, every occupation is defined by the combination of knowledge, skill, and abilities (KSAs) it requires. We use the O*NET database to determine the requirements of each occupation.[8] For each of the ASVAB subtest scores used as components of the first three skill endowments, there is a corresponding knowledge, skill, or ability that is associated with a task performed or a worker quality required in that occupation. The DoD has a mapping between ASVAB subtests and knowledge, ability, and skill measures in O*NET which they utilize to assign military personnel. The mapping is also used by others, such as high school counselors, to recommend careers to ASVAB-participating high school students. Our match quality measure is based on the ranking comparison strategy that is used by these groups. This mapping is provided in Addison, et al. (2018). However, there is no social skill component to these DoD assignments. Again following Guvenen et al. (2018) and Deming (2017a), therefore, we constructed the occupational requirements of social skills using the following descriptors *Social Perceptiveness*, *Coordination*, *Persuasion*, *Negotiation*, *Instructing*, and *Service Orientation* taken from the O*NET database. We use the previously described occupational code mapping strategy for merging O*NET occupational characteristics with the NLSY data.

[7] Deming (2017a) uses two additional questions on high school participation in clubs and sports for his analysis of 1979 cohort data. For cohort differences, he switches to a two-question measure. As noted, we only use two sociability questions for the NLSY79 which is consistent with his cohort analysis. The literature displays multiple ways of measuring social skill or abilities. In Guvenen et al. (2018), for example, the social skill endowment is measured using the Rotter Locus of Control Scale and the Rosenberg Self-Esteem Scale. These authors refer to the measure as indicating social ability, whereas Deming (2017a) uses the label *non-cognitive skills*. Deming in fact uses the sociability questions for the NLSY79 cohort and extraversion measures for the NLSY97 cohort as his social skills measure. Again, our results were robust to alternative measures using either of these definitions.

[8] We are using the 2007 version of the O*NET database, after Hirsch and Manzella (2015). We are indebted to Barry Hirsch for kindly providing us with these data. Original O*NET data grouped occupations using Standard Occupational Classification (SOC) codes. Hirsch and Manzella (2015) mapped these codes to COC 2002 codes. We once again used Dorn's (2009) mapping to link the O*NET data on occupational KSAs to individual occupations in the NLSY data.

Even though the measure of skill endowments we use is superior to the unidimensional measures of the previous literature, it has the limitation that worker endowments are measured pre-labor market and do not evolve over time. For example, endowments do not change with learning by doing and professional education is not a component of the skill endowment set. Our favored interpretation would be that this skill measure is more about the potential of the worker – potential to learn and potential to build the set of skills required by any given occupation – than it is about his or her contemporaneous skills. Again, it would be preferable to have formal contemporaneous endowment measures (as well as measures of occupational requirements that evolve over time). However, since we are interested in relative realizations of the matches by gender, our mismatch measure may be less vulnerable to these measurement limitations if skills do not differentially evolve by gender. In any event, we will indirectly tackle some of these measurement issues, such as learning by doing, in our estimations.

Mismatch

The extent of skill-mismatch is measured as the absolute value of the differences between the percentile-rank scores of an individual's skill endowments and the percentile-rank scores of skills required in that individual's occupation.[9] Specifically, let A_{ij} represent individual i's percentile-rank-scores in the ASVAB test for skill j (where j denotes mathematical, verbal, scientific/technical/mechanical skills, and social skills). Recall that A_{ij} does not vary by year or an individual's occupation. Let R_{ijc} denote individual i's O*NET occupational requirements for skill j in occupation c. The degree of skill mismatch for individual i for skill j in occupation c is

[9] We also used an alternative measure based on cosine similarity between vectors of skill endowments and skill requirements for robustness checks. Our results proved robust both to the use of this alternative measure as well as to measures using only three of the four KSAs (namely, math, verbal, and social), as in Guvenen et al. (2018).

calculated as

$$q_{ijc} = |A_{ij} - R_{ijc}|,$$

such that the lower the value of the sum of q's over all 4 dimensions, or aggregate mismatch, the better the skills are matched. In our empirical application, this aggregate mismatch measure is our main outcome variable. In generating this measure, we used equal weights for all skills. Our results were not sensitive to alternative weighting schemes. For ease of interpretation of the coefficient estimates, we rescaled this measure to have a standard deviation of one.

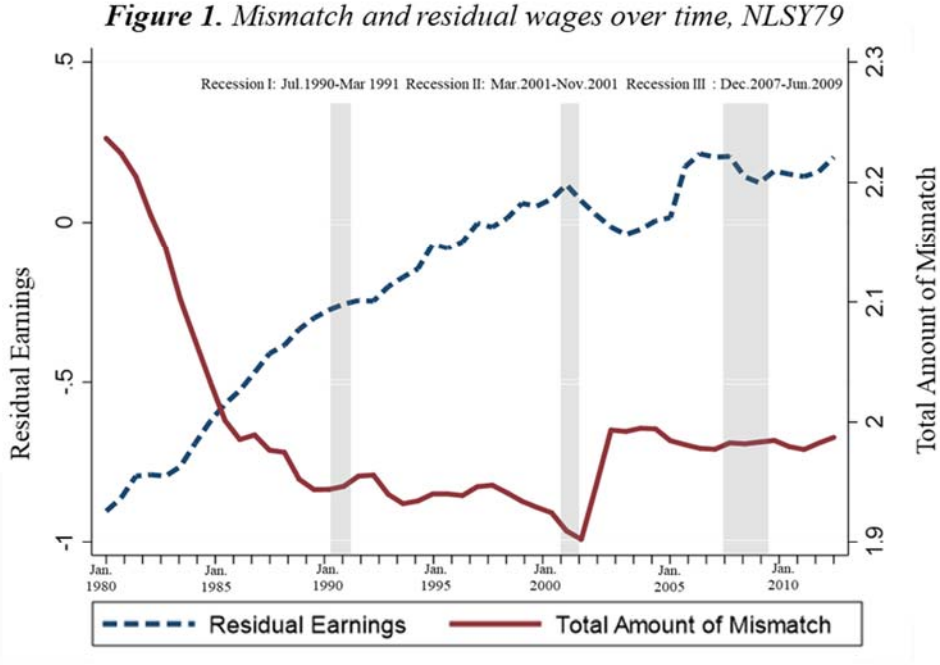
In what follows, our focus is mainly upon the overall size of mismatch. However, we will also consider the direction of mismatch for some analysis and look at the prevalence of over qualification, that is, having a higher endowment of knowledge and skill than necessary to perform the task requirements of the occupation.

III. Results

Recessions, Mismatch, and Earnings over the Life Cycle

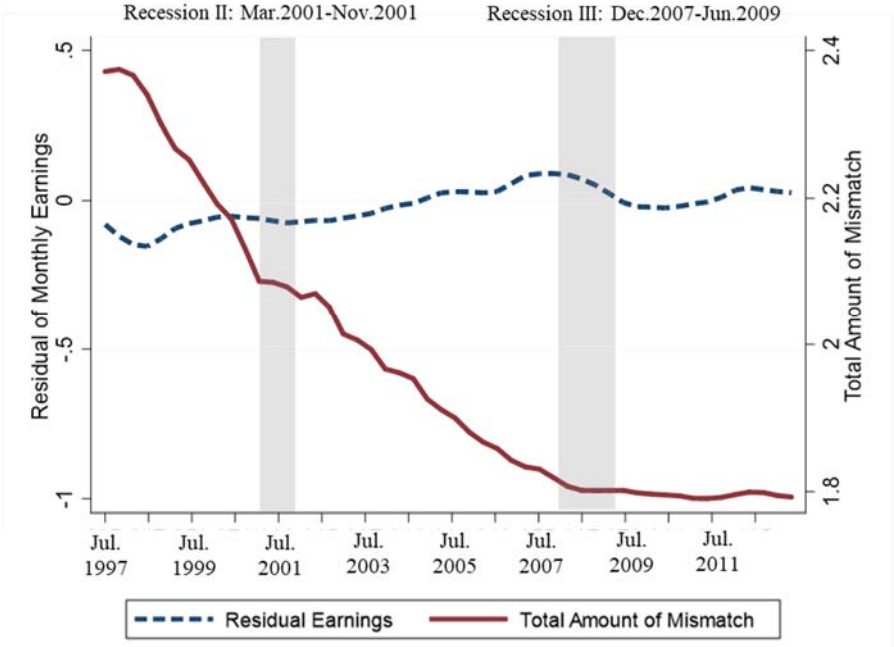
Figure 1 shows the changes of average mismatch and monthly wage residuals over time for NLSY79 individuals. Generally, the average total amount of mismatch decreases over time as one's career develops. We observe a rise in the amount of mismatch in the wake of economic recessions, especially Recession II in the early 2000s after which the average amount of mismatch plateaued when NLSY79 workers were in their mid-career stages. The implication is that economic recession can have a pronounced and long-lasting negative effect on a mid-career worker's occupational match quality. Moreover, we can observe that a rise in the amount of mismatch is generally accompanied by a fall in the wage residuals, suggesting that the wage loss after economic recession could be attributable to the rise in skill mismatch.

Figure 1. *Mismatch and residual wages over time, NLSY79*



Notes: We obtained the residuals by regressing the natural log of workers' monthly nominal earnings on individual characteristics (gender, race, years of schooling, marital status, and average percentile ranks of skill endowments), occupational-specific characteristics (occupational tenure and its quadratic form, average percentile ranks of occupational skill requirements, weekly working hours, and the female employment rate in the current occupation, and one-digit occupation and industry groups), as well as the national unemployment rate.

Figure 2. *Mismatch and residual wages over time, NLSY97*



Note: *See Notes to Figure 1*

Figure 2 shows the course of average mismatch and monthly wage residuals over time for NLSY97 individuals. Recall that these individuals were young and at early career stages at the time of economic recessions. Evidently, their occupational match quality is not significantly altered, implying that younger persons' match quality trajectories are not materially affected by economic recession.

We next consider match quality within a time frame linked to each recession, conditioning on employment status of the workers. Specifically, we group the respondents according to their labor market experience during the interval comprising the six-months leading up to the recession and the recession itself. The three (two) recessions appropriate to the NLSY79 (NLSY97) cohort are as described earlier. Figure 3 provides five graphs capturing the mismatch experience per recession for each cohort. In each graph there are three groups of workers. The first group is made up of those individuals who have at some point during the specified period became unemployed (for more than a month) or who left the labor force. The second group comprises those individuals who have ever changed jobs at some point during the specified period. The third group are individuals who have not changed jobs over the interval even if they may have held a different job prior to and/or subsequent to this window. Figure 4 repeats the same exercise to trace the changes in the amount of over-qualification, namely skill endowments that exceed the skill requirements of the occupation.

Figure 3. Mismatch by employment status during recession, NLSY79 and NLSY 97

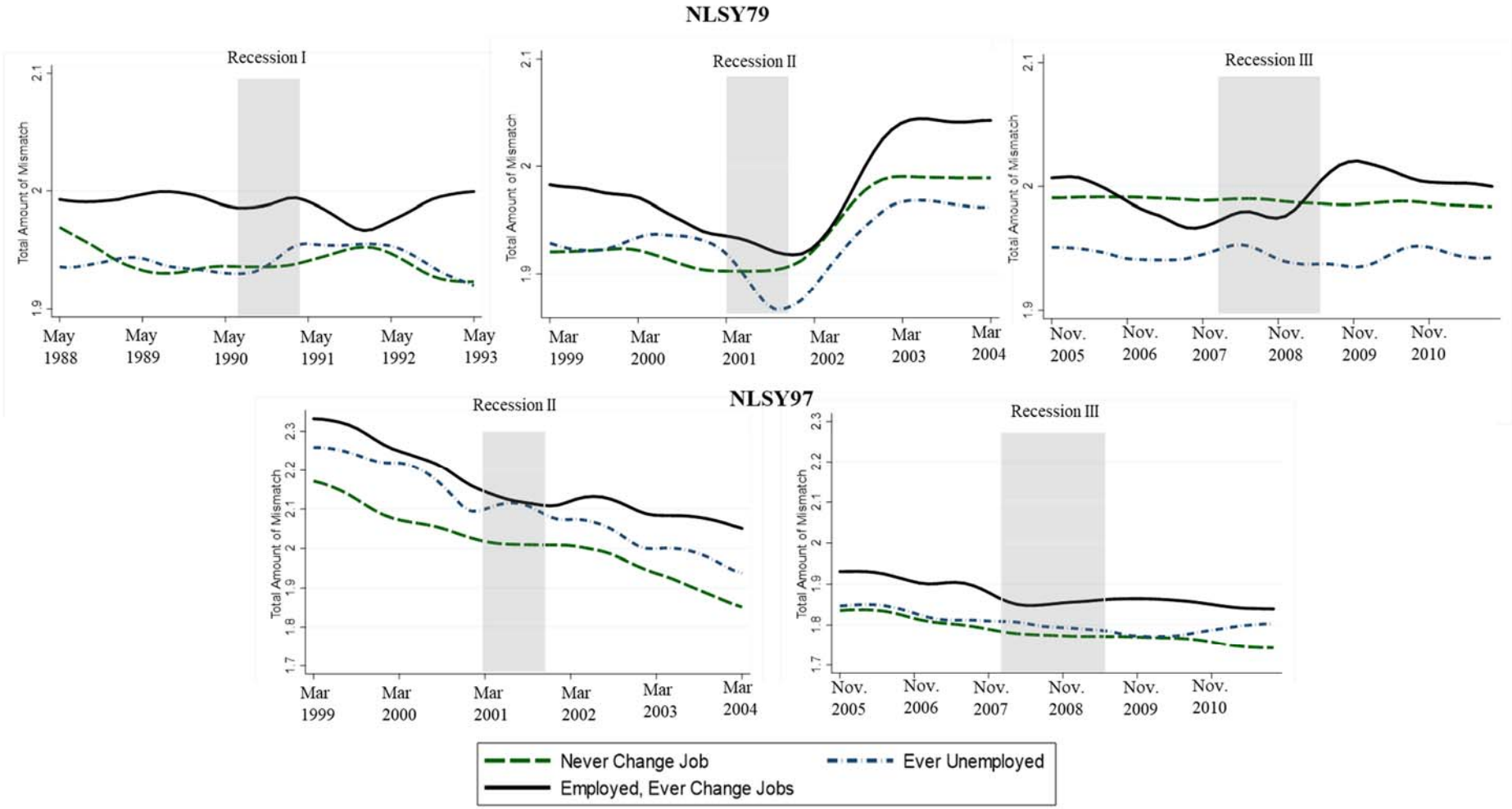
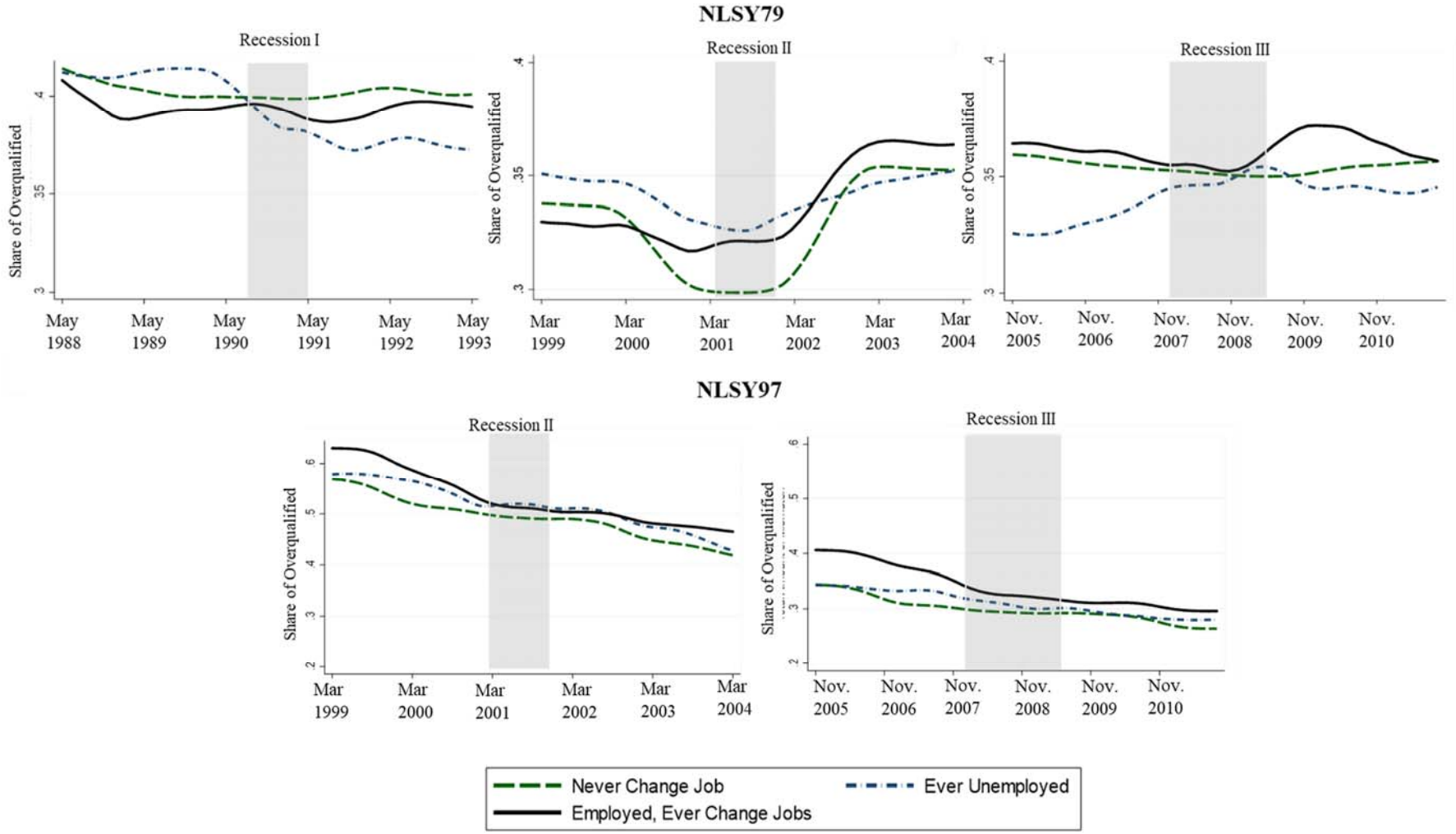


Figure 4. Overqualification by employment status during recession, NLSY79 and NLSY 97



The main conclusions to be from these figures are five-fold. First, recessions do not have a strong negative correlation with match quality over the early career stages. Second, recessions have the largest negative correlation with match quality during the mid-career years. Third, individuals who change jobs during recessions are more likely to record worse match quality during and after the recession. Fourth, individuals who transition from employment to employment during the window leading to recession and during its course have lower match quality both before and after that window than do individuals who stay in the same jobs throughout the window. Finally, the relationship between recessions and match quality is weaker for the younger cohort.

A possible cause for concern is that the composition of workers who contribute to the mismatch measure changes over time, such that the residual wage is not a reliable way to fully capture the effect of recessions and changes in mismatch. We address this concern in two ways: first, by comparing the unemployment rate in the NLSY data sets with the monthly national unemployment rate announced by the U.S. Bureau of Labor Statistics (BLS); and, second, by constructing transition matrices for employment status during and after the recessions by the pre-recession employment status of the survey respondents for each recession.

Figure 5. Unemployment rates over the sample period, cohort level and national

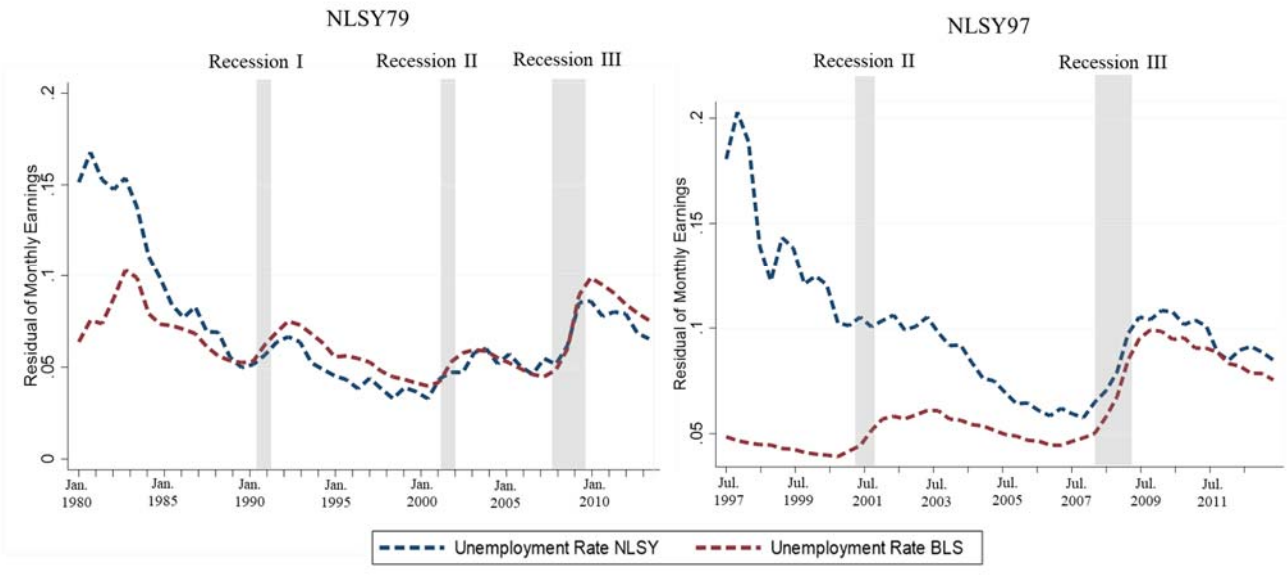


Figure 5 compares the monthly national unemployment rates for the working-age population with the calculated monthly unemployment rates for both NLSY cohorts. The latter unemployment rates are obtained by dividing the number of individuals unemployed in a particular month by the sum of employed and unemployed individuals. For young workers aged less than 30 years in both cohorts, although the unemployment rate is much higher than the national unemployment rate for the working-age population as a whole, the magnitude is quite close to the national unemployment rate for workers of that age in the corresponding period. For workers aged above 30 years in both cohorts, the calculated unemployment rate is in line with the BLS unemployment rate. These results suggest that workers' employment status in the NLSY data sets is nationally representative.

Table 1 presents the transition matrices for workers' employment status during and after the recessions, conditioning on their pre-recession employment status. The 'before recession' window is set as the 24 months before the corresponding recession and the 'after recession' period covers the 24-month interval subsequent to that recession. Part-time and full-time worker status in each period is determined by the status that was observed for more than one-half of the period. Ever-unemployed status obtains if the person experienced an unemployment spell of at least one month's duration. Two main findings emerge from the table. First of all, the very striking Recession II effect on mismatch observed earlier, as well as the lack of big changes in mismatch during Great Recession or for the NLSY9 cohort, are not due to changes in composition of the cohort or to changes in their employment status. However, compared with the other recessions, we see that a smaller share of them experienced unemployment spells during Recession II, so that the need to avoid unemployment may be leading to worse matches. Second of all, the NLSY97

cohort has much lower labor market attachment compared with the older cohort; that is, a higher share works part-time and this may be a driver making for a lower recession impact on mismatch.

Table 1: Employment/Unemployment Transitions and Recession Timeline, NLSY79 and NLSY97

			NLSY79					
		Before	During			After		
	# of Obs.		FT	PT	UNEMP	FT	PT	UNEMP
Recession I	808	PT	0.20	0.41	0.39	0.22	0.35	0.42
	6495	FT	0.70	0.02	0.28	0.68	0.03	0.29
			FT	PT	UNEMP	FT	PT	UNEMP
Recession II	749	PT	0.06	0.80	0.13	0.10	0.75	0.15
	5584	FT	0.91	0.01	0.08	0.89	0.01	0.10
			FT	PT	UNEMP	FT	PT	UNEMP
Recession III	522	PT	0.40	0.37	0.23	0.45	0.35	0.20
	5077	FT	0.74	0.07	0.19	0.74	0.08	0.18
			NLSY97					
		Before	During			After		
			FT	PT	UNEMP	FT	PT	UNEMP
Recession II	2150	PT	0.16	0.53	0.32	0.22	0.47	0.31
	1374	FT	0.68	0.09	0.24	0.63	0.12	0.25
			FT	PT	UNEMP	FT	PT	UNEMP
Recession III	2224	PT	0.59	0.14	0.28	0.61	0.17	0.22
	3374	FT	0.57	0.11	0.32	0.59	0.14	0.27

Notes: FT (Full time employed) is defined as individuals who have been employed throughout the period of observation and who work full time for more than 50% of the period. (2) PT (Part-time employed) is defined as individuals who have been employed throughout the period of observation and who work part-time for more than 50% of the period. (3) UNEMP (Ever unemployed) is defined as individuals who have ever been unemployed or out of labor force for one month throughout the period of observation.

Next, utilizing the monthly panel data, we estimate models of mismatch and earnings in which we seek to unravel the timeline of mismatch and wage effects. The first three columns of Table 2 report the mismatch estimates and the last three columns report the regression results for nominal monthly log earnings. In all specifications, the vector of control variables include individual characteristics (gender, race, years of schooling, marital status, and average percentile ranks of skill endowments), occupational-specific characteristics (occupational tenure and its quadratic form, average percentile ranks of occupational skill requirements, weekly working hours,

the female employment rate in the current occupation, and in one-digit occupational and industrial groups), together with the monthly national unemployment rate.

Observe that mismatch significantly increases throughout the post-recession period for the midcareer workers (viz. NLSY79-After Recession II), even after controlling for worker and

Table 2: Mismatch and Log Earnings over the Recession Timeline, Panel Data FE Estimates, NLSY79

	Mismatch			Log Earnings		
	Recession I	Recession II	Recession III	Recession I	Recession II	Recession III
6 months before the recession	0.007	-0.004	-0.006	-0.022**	-0.005	-0.015**
	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
5 months before the recession	0.012+	-0.007	-0.007	-0.020**	-0.006	-0.012*
	(0.006)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)
4 months before the recession	0.010+	-0.007+	-0.006	-0.015**	-0.002	-0.010*
	(0.006)	(0.004)	(0.005)	(0.005)	(0.003)	(0.004)
3 months before the recession	0.011+	-0.004	-0.005	-0.020**	-0.001	-0.014**
	(0.006)	(0.003)	(0.005)	(0.005)	(0.002)	(0.004)
2 months before the recession	0.010+	-0.006*	-0.005	-0.018**	-0.004	-0.017**
	(0.006)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)
1 month before the recession	0.010+	-0.001	-0.004	-0.014**	0.000	-0.018**
	(0.005)	(0.002)	(0.004)	(0.004)	(0.001)	(0.004)
1 month after the recession	0.011**	-0.000	0.005+	-0.007**	-0.006**	-0.011**
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)
2 months after the recession	0.012**	0.003	0.002	-0.009**	-0.000	-0.010**
	(0.004)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
3 months after the recession	0.017**	0.008*	0.002	-0.005	0.002	-0.011**
	(0.006)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)
4 months after the recession	0.011	0.014**	0.001	0.021**	-0.003	-0.013**
	(0.009)	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)
5 months after the recession	0.007	0.024**	0.002	0.029**	-0.004	-0.013**
	(0.011)	(0.005)	(0.004)	(0.007)	(0.005)	(0.004)
6 months after the recession	-0.005	0.030**	0.002	0.037**	-0.005	-0.012**
	(0.011)	(0.006)	(0.004)	(0.007)	(0.006)	(0.004)
7 months after the recession	-0.005	0.025**	0.004	0.035**	-0.019*	-0.002
	(0.012)	(0.007)	(0.006)	(0.007)	(0.008)	(0.005)
8 months after the recession	-0.002	0.036**	0.011+	0.037**	-0.026*	0.017**
	(0.012)	(0.008)	(0.007)	(0.008)	(0.011)	(0.006)
9 months after the recession	-0.001	0.044**	0.008	0.029**	-0.047**	0.028**
	(0.014)	(0.008)	(0.008)	(0.009)	(0.013)	(0.006)
10 months after the recession	0.004	0.048**	0.010	0.027**	-0.056**	0.034**
	(0.014)	(0.009)	(0.008)	(0.009)	(0.014)	(0.007)
11 months after the recession	0.005	0.054**	0.009	0.024**	-0.064**	0.037**
	(0.014)	(0.009)	(0.008)	(0.009)	(0.014)	(0.007)
12 months after the recession	0.005	0.058**	0.008	0.021*	-0.067**	0.035**
	(0.014)	(0.009)	(0.008)	(0.009)	(0.014)	(0.007)
Observations	179,956	155,270	193,620	173,987	150,075	185,616
Number of individuals	9,030	6,921	6,379	8,879	6,791	6,265

Notes: (1) In all specifications, we control for individual characteristics (gender, race, years of schooling, marital status, average percentile ranks of skill endowments), weekly working hours, occupational-specific characteristics (occupational tenure and its quadratic form, average percentile ranks of occupational skill requirements, and the female employment rate in the current occupation, and one-digit occupation and industry group) as well as the national unemployment rate. (2) The excluded period is period during the recessions. (3) Standard errors in parentheses are clustered at the individual level. ** p<0.01, * p<0.05, + p<0.1.

occupation characteristics. In the early career recession (Recession I) recovery in terms of mismatch and earnings change is rapid. For its part, the Great Recession seems to have arrived while the NLSY79 cohort was still recovering from the mid-career recession they had earlier experienced.

Are Recessions Mancessions?

In Table 3 we next explore whether there are gender differences in the way recessions are experienced over and above cohort and career stage differences. The table documents employment transitions separately by gender for each recession for the NLSY79 cohort. We do not see any striking differences by gender in the probability of transitioning between jobs and unemployment.

Table 3: Employment/Unemployment Transitions and Recession Timeline, Gender Differences, NLSY79

Females								
	# of Obs	Before	During			After		
			FT	PT	UNEMP	FT	PT	UNEMP
Recession II	588	PT	0.04	0.80	0.15	0.07	0.77	0.16
	2422	FT	0.91	0.01	0.08	0.88	0.02	0.09
			FT	PT	UNEMP	FT	PT	UNEMP
Recession III	426	PT	0.39	0.40	0.20	0.42	0.38	0.19
	2287	FT	0.70	0.10	0.20	0.71	0.11	0.19
Males								
		Before	During			After		
			FT	PT	UNEMP	FT	PT	UNEMP
Recession II	161	PT	0.14	0.79	0.07	0.20	0.67	0.12
	3162	FT	0.92	0.00	0.08	0.89	0.01	0.10
			FT	PT	UNEMP	FT	PT	UNEMP
Recession III	96	PT	0.45	0.23	0.32	0.55	0.23	0.22
	2790	FT	0.77	0.04	0.19	0.77	0.05	0.18

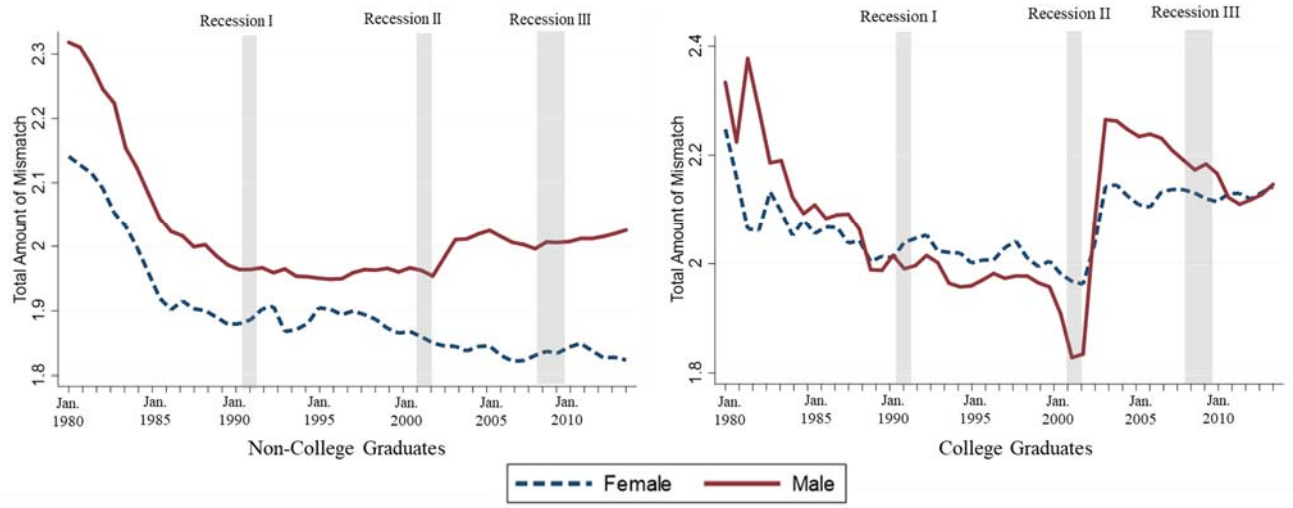
Note: See Notes to Table 1.

Females are more likely to work part-time, and they experienced greater unemployment during the second recession if they were employed part-time prior to that recession. For their part, males are more likely to transition to a full-time job during and after recessions if they were employed part-

time pre-recession.

Figure 6 charts mismatch over the life cycle not only by gender but also by education.

Figure 6: Changes of mismatch by gender and education (NLSY79)



Among the college educated, both genders experience a sharp increase in mismatch following Recession II. For both genders the best matched workers remain employed during this recession (note the dip in average mismatch during the recession) with increasingly worse matches occurring in the aftermath of recession. Among the non-college educated, males are much worse off than their female counterparts; that is, females in this educational group did not experience increases in mismatch. This particular gender difference might suggest that, at the low end of the market, male occupations (in, say, construction) are much more cyclical.

Tables 4 and 5 estimate the changes in mismatch by gender over the recession timelines for non-college graduates and college graduates, respectively. All specifications include the same control variables as employed in Table 2. From Table 4 it is apparent that non-college educated females are scarcely affected by the economic recessions in terms of match quality, while non-college educated males experience a significant drop in match quality after the second recession.

Table 4: Mismatch over the Recession Timelines for Non-College Graduates, by Gender, Panel Data FE Estimates, NLSY79

	Female			Male		
	Recession I	Recession II	Recession III	Recession I	Recession II	Recession III
6 months before the recession	0.004	-0.013	-0.002	0.006	0.001	-0.003
	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.007)
5 months before the recession	0.011	-0.010	-0.001	0.011	-0.007	-0.007
	(0.009)	(0.007)	(0.008)	(0.009)	(0.007)	(0.007)
4 months before the recession	0.012	-0.007	-0.001	0.006	-0.008	-0.007
	(0.009)	(0.006)	(0.007)	(0.008)	(0.006)	(0.006)
3 months before the recession	0.008	-0.001	0.005	0.009	-0.007+	-0.011+
	(0.008)	(0.004)	(0.007)	(0.008)	(0.004)	(0.006)
2 months before the recession	0.007	-0.004	0.006	0.008	-0.007	-0.010+
	(0.008)	(0.005)	(0.006)	(0.008)	(0.004)	(0.005)
1 month before the recession	0.012	0.002	0.004	0.005	-0.003	-0.006
	(0.008)	(0.002)	(0.006)	(0.008)	(0.003)	(0.005)
1 month after the recession	0.004	0.001	0.006+	0.015**	-0.002	0.003
	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)
2 months after the recession	0.004	0.004	0.003	0.016**	-0.000	0.001
	(0.007)	(0.005)	(0.004)	(0.006)	(0.003)	(0.004)
3 months after the recession	0.009	0.005	0.004	0.022**	0.009*	0.000
	(0.009)	(0.005)	(0.004)	(0.007)	(0.004)	(0.005)
4 months after the recession	-0.001	0.006	0.005	0.011	0.021**	-0.002
	(0.013)	(0.006)	(0.004)	(0.011)	(0.006)	(0.006)
5 months after the recession	-0.005	0.012+	0.006	0.012	0.032**	-0.001
	(0.016)	(0.007)	(0.005)	(0.014)	(0.007)	(0.006)
6 months after the recession	-0.011	0.005	0.006	-0.002	0.046**	-0.002
	(0.017)	(0.007)	(0.006)	(0.015)	(0.009)	(0.006)
7 months after the recession	-0.012	-0.003	0.009	-0.003	0.048**	0.001
	(0.018)	(0.010)	(0.008)	(0.016)	(0.009)	(0.008)
8 months after the recession	-0.007	0.008	0.010	0.002	0.061**	0.015
	(0.018)	(0.011)	(0.010)	(0.016)	(0.011)	(0.009)
9 months after the recession	-0.010	0.013	0.011	0.004	0.067**	0.008
	(0.021)	(0.012)	(0.011)	(0.018)	(0.012)	(0.011)
10 months after the recession	-0.004	0.014	0.012	0.006	0.072**	0.008
	(0.021)	(0.012)	(0.011)	(0.018)	(0.012)	(0.011)
11 months after the recession	-0.002	0.020	0.014	0.005	0.076**	0.006
	(0.022)	(0.013)	(0.011)	(0.019)	(0.013)	(0.011)
12 months after the recession	-0.001	0.025+	0.014	0.006	0.077**	0.003
	(0.022)	(0.013)	(0.012)	(0.019)	(0.014)	(0.012)
Observations	81,476	73,954	92,752	92,511	75,464	92,487
Number of individuals	4,315	3,389	3,138	4,564	3,385	3,122

Note: See Notes to Table 2.

Table 5: Mismatch over the Recession Timelines for College Graduates, by Gender, Panel Data FE Estimates, NLSY79

	Female			Male		
	Recession I	Recession II	Recession III	Recession I	Recession II	Recession III
6 months before the recession	0.008	-0.051**	0.001	-0.004	0.010	0.003
	(0.017)	(0.014)	(0.012)	(0.016)	(0.015)	(0.012)
5 months before the recession	0.014	-0.029*	0.007	0.001	0.003	-0.002
	(0.017)	(0.011)	(0.012)	(0.015)	(0.011)	(0.010)
4 months before the recession	0.014	-0.019*	0.003	0.001	-0.003	-0.002
	(0.017)	(0.009)	(0.012)	(0.015)	(0.010)	(0.010)
3 months before the recession	0.009	-0.001	0.010	-0.002	-0.009	-0.002
	(0.016)	(0.006)	(0.011)	(0.014)	(0.006)	(0.010)
2 months before the recession	0.006	-0.015+	0.010	0.006	-0.009	-0.001
	(0.015)	(0.008)	(0.011)	(0.014)	(0.007)	(0.009)
1 month before the recession	0.015	0.001	0.008	0.005	-0.008	-0.001
	(0.016)	(0.004)	(0.011)	(0.014)	(0.005)	(0.009)
1 month after the recession	0.007	0.006	0.011+	0.013	-0.000	0.002
	(0.006)	(0.011)	(0.006)	(0.009)	(0.004)	(0.006)
2 months after the recession	0.001	0.007	0.001	0.017	0.005	0.001
	(0.010)	(0.013)	(0.007)	(0.011)	(0.006)	(0.006)
3 months after the recession	0.007	0.008	-0.003	0.021	0.011	-0.001
	(0.014)	(0.014)	(0.008)	(0.013)	(0.007)	(0.008)
4 months after the recession	-0.034	0.012	-0.003	0.003	0.022**	-0.003
	(0.024)	(0.015)	(0.008)	(0.021)	(0.008)	(0.008)
5 months after the recession	-0.033	0.019	-0.001	0.001	0.034**	-0.002
	(0.028)	(0.017)	(0.008)	(0.027)	(0.011)	(0.008)
6 months after the recession	-0.034	0.019	0.007	-0.019	0.041**	-0.004
	(0.029)	(0.017)	(0.012)	(0.030)	(0.013)	(0.008)
7 months after the recession	-0.034	0.005	0.008	-0.019	0.045**	0.004
	(0.031)	(0.023)	(0.015)	(0.032)	(0.015)	(0.011)
8 months after the recession	-0.027	0.002	-0.008	-0.009	0.040*	0.011
	(0.032)	(0.027)	(0.019)	(0.032)	(0.018)	(0.013)
9 months after the recession	-0.031	0.002	0.002	-0.004	0.044*	-0.000
	(0.035)	(0.027)	(0.020)	(0.036)	(0.020)	(0.018)
10 months after the recession	-0.028	0.002	0.004	0.001	0.028	-0.000
	(0.036)	(0.027)	(0.021)	(0.037)	(0.020)	(0.018)
11 months after the recession	-0.025	0.007	0.005	0.014	0.033	-0.002
	(0.038)	(0.028)	(0.020)	(0.039)	(0.021)	(0.018)
12 months after the recession	-0.028	0.012	0.011	0.023	0.031	-0.009
	(0.038)	(0.030)	(0.021)	(0.039)	(0.021)	(0.019)
Observations	18,277	17,255	25,422	18,467	16,841	22,675
Number of individuals	924	779	844	866	721	715

Note: See Notes to Table 2.

For college educated individuals, female worker mismatch increases after the recessions, albeit not significantly so for most of the time. In the case of their male counterparts, however, the amount of mismatch increases dramatically after the second recession. Moreover, the recovery in their match quality is much slower after the second recession than the first. Taken together, Figure 6 and Tables 4 and 5 provide evidence indicating that economic recessions have a larger negative impact on men's labor market outcomes than those of women. Men at the mid-career stages experience a dramatic drop in occupational match quality after a recession, from which it takes a long time to recover. Highly educated men are no exception. These results suggest that men suffer greater losses from economic recessions than women not only in terms of employment opportunities but also in terms of match quality which may be referred to as the hidden toll of *"mancession"*.

IV. Conclusions

The literature is slim or non-existent on how the effect of recessions changes over the course of a workers' lifecycle. Moreover, the main index used to measure negative recessionary effects have been the unemployment rate which does not capture changes in match quality. In this paper, we provide evidence on how workers are affected by recessions at different points of their careers. We do this by comparing NLSY cohort across different recessionary periods as well as by comparing them to the younger NLSY cohort (NLSY97). In the process, we also explore the role of education and gender.

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