Online Appendix

Wage Cyclicality and Labor Market Sorting

Ana Figueiredo

1 Worker's abilities and Skill requirements

Below I provide the list of ASVAB test categories and O*NET descriptors used to obtain empirical measures of worker's abilities and skill requirements.

Worker's abilities The ASVAB components used to inform about math, verbal and technical skills are the following: arithmetic reasoning, mathematics knowledge, paragraph comprehension, word knowledge, mechanical comprehension, general science and electronics information. The verbal score is the first principle component of word knowledge and paragraph comprehension, the math score is the first principle component of math knowledge and arithmetic reasoning, and the technical score is the first component of mechanical comprehension, general science and electronics information.

Skill Requirements The set of 26 O*NET descriptors that are related to ASVAB categories includes: oral comprehension, written comprehension, deductive reasoning, inductive reasoning, information ordering, mathematical reasoning, number facility, reading comprehension, mathematics skill, science, technology design, equipment selection installation, operation and control, equipment maintenance, troubleshooting, repairing, computers and electronics, engineering and technology, building and construction, mechanical, mathematics knowledge, physics, chemistry, biology, English language. For the social dimension, I follow Guvenen et al. (2020) and use the following O*NET descriptors: social perceptiveness, coordination persuasion, negotiation instructing, service orientation) into a single dimension.

Mapping NLSY79 provides 3-digit Census occupation codes, while O*NET uses SOC codes. The latter is more detailed, thus for each 3-digit occupation code I take an unweighted average over all the SOC codes that map to the a given code in the census three-digit level occupation classification. Then, I use Dorn (2009) crosswalk to convert occupational codes to a time consistent classification system.

Table A.1: Skill Requirements

Major occupation	Percentile rank score (mean)			
	Math	Verbal	Social	Tech
Manag./Professional/Financial sales occs	70.6	74.1	62.5	66.4
Admin. support and Retail sales occs	34.0	33.6	38.2	23.2
Low-skill services occs	19.0	20.2	43.2	24.2
Precision production and Craft occs	51.0	42.8	20.1	66.2
Machine operators, Assemblers and Inspectors occs	30.8	24.3	6.7	52.3
Transp./Construction/Mechanics/Mining/Agric. occs	44.1	39.3	22.4	66.4

Note: The table reports the mean percentile rank across main occupation categories in the *occ*1990*dd* occupation system Dorn (2009). Source: NLSY79, O*NET and author's calculations.

Table A.2: Skill Requirements and Worker Abilities

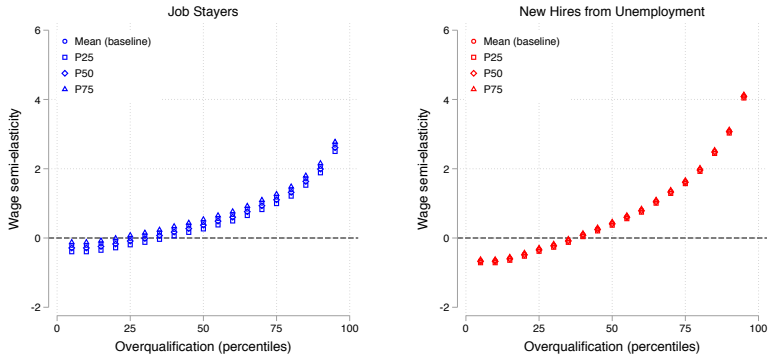
	Skill Requirements			
	Math	Verbal	Social	Tech
Worker's abilities				
Math	**0.40**	0.44	0.40	0.18
Verbal	0.34	**0.38**	0.39	0.11
Social	0.16	0.18	**0.21**	0.05
Technical	0.35	0.37	0.30	**0.20**

Note: This table reports the correlation between workers' abilities and the corresponding skill requirements in their current occupation. These are computed using worker-job pairs observed in the sample. Source: NLSY79, O*NET and author's calculations.

2 Overqualification vs. Underqualification

As workers can be overqualified in some skills and simultaneously underqualified in others, in the main analysis I compute the wage semi-elasticity along the overqualifiation distribution at the average level of underqualification, and the wage semi-elasticity along the underqualification distribution at the average level of overqualification. In doing so, I show that wage cyclicality is driven by overqualification. Figure B.1 shows that the same pattern emerges if the wage semi-elasticities is computed at different moments of the distribution of overqualification (Panel A) and underqualification (Panel B). Note that in Panel B, the level of the wage semi-elasticity has a parallel shift for higher percentiles of the overqualification distribution. This is because wage cyclicality increases with overqualification. The same pattern does not emerge in Panel A as wage cyclicality is orthogonal to underqualification.

Panel A. Overqualification



Panel B. Underqualification

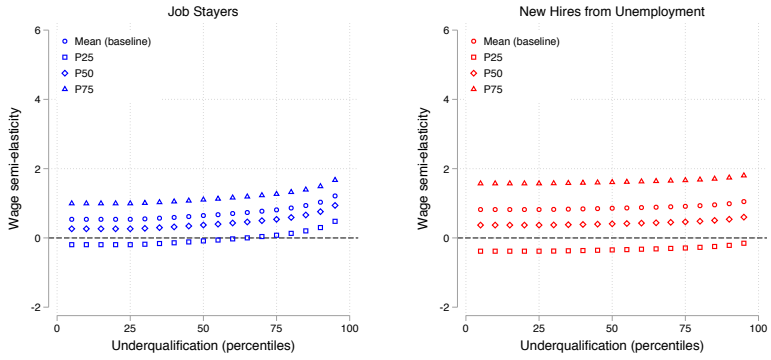


FIGURE B.1: WAGE CYCLICALITY: OVER- VS. UNDERQUALIFICATION

Notes: Each graph displays the % wage change in response to a 1pp drop in the unemployment rate. Panel A plots the wage semi-elasticity along the overqualification distribution, computed at different moments of the underqualification distribution. Panel B plots the wage semi-elasticity along the underqualification distribution, computed at different moments of the underqualification distribution. Wage semi-elasticities are computed using estimates displayed in column 5 of Table 2 in the main paper. Sample includes all worker-job matches between 1979 and 2016 in a sub-sample of NLSY79.

3 Results Robustness to Alternative Specifications

This section replicates columns 3 to 5 of Table 2 in the paper under the following alternative specifications:

- Different definitions of new hires: $(i) > 3$ months: I recode jobless spells shorter than 3 months as job switchers as these may be instead job-changers taking a short break; (ii) $recalls$: I exclude workers that return to their previous employer from the pool of new hires.
- Additional controls: (i) occupation skill requirements,(ii) occupational tenure (cubic polynomial) and (iii) cumulative past mismatch as in Guvenen et al. (2020).
- Alternative measures of skill mismatch and economic conditions: (i) weighted mismatch: I use skill-specific weights to compute skill mismatch. Weights correspond to the factor loadings from the first principal component, normalized to sum to one, as in Guvenen et al. (2020): (verbal, math, technical, social) = (0.32, 0.33, 0.31, 0.05); (ii) I use as a measure of economic conditions the regional unemployment rate:

Wage-unemployment semi-elasticities plotted in Figure 3 in the main article are computed based on estimates reported in columns 2, 3, 5, 6, 7 and 9 of Tables C.1-C.3.

Table C.1: Robstness Check: Different Definitions of New Hires

Dependent variable: Log real hourly wage

	> 3 months			Recalls		
	(1)	(2)	(3)	(4)	(5)	(6)
U_t	−0.702***	0.507	0.430	−0.732***	0.482	0.408
	(0.211)	(0.479)	(0.480)	(0.210)	(0.478)	(0.479)
$U_t \cdot EE'_{i,t}$	−1.386***	−1.710**	−2.042**	−1.832***	−1.823*	−2.283**
	(0.381)	(0.817)	(0.805)	(0.456)	(0.992)	(0.974)
$U_t \cdot UE_{i,t}$	−0.965	2.210	0.980	−0.964*	0.679	−0.335
	(0.650)	(1.385)	(1.414)	(0.521)	(1.136)	(1.150)
$m_{i,t}$	−0.0014***	0.002		−0.0015***	0.002	
	(0.0005)	(0.001)		(0.0005)	(0.001)	
$U_t \cdot m_{i,t}$		−0.044***			−0.045***	
		(0.016)			(0.016)	
$U_t \cdot m_{i,t} \cdot EE'_{i,t}$		0.013				
		(0.023)				
$U_t \cdot m_{i,t} \cdot UE_{i,t}$		−0.095**			−0.048	
		(0.042)			(0.033)	
$U_t \cdot m^+_{i,t}$			−0.058***			−0.058***
			(0.016)			(0.016)
$U_t \cdot m^+_{i,t} \cdot EE'_{i,t}$			0.035			0.022
			(0.024)			(0.030)
$U_t \cdot m^+_{i,t} \cdot UE_{i,t}$			−0.076*			−0.025
			(0.044)			(0.034)
$U_t \cdot m^-_{i,t}$			−0.017			−0.017
			(0.020)			(0.020)
$U_t \cdot m^-_{i,t} \cdot EE'_{i,t}$			0.025			0.035
			(0.030)			(0.036)
$U_t \cdot m^-_{i,t} \cdot UE_{i,t}$			0.013			0.031
			(0.055)			(0.044)
Observations	381394	381394	381394	381394	381394	381394
Adjusted R^2	0.649	0.650	0.650	0.650	0.650	0.650

Note: $NH_{i,t}$, $EE'_{i,t}$ and $UE_{i,t}$, respectively, equal one for new hires, switchers and new hires from unemployment. $m_{i,t}$, $m^+_{i,t}$ and $m^-_{i,t}$ correspond to skill mismatch, over- and underqualification in the current job, respectively. Coefficients and standard errors on U_t multiplied by 100. All columns control for a quadratic polynomial in age and job tenure, education, time trend, month and individual fixed effects, and one-digit level occupation and industry interacted with year. Standard errors are clustered at the individual level. Sample includes all worker-job matches between 1979 and 2016 in a sub-sample of NLSY79. *** p<0.01, ** p< 0.05 and * p<0.1

Table C.2: Robstness Check: Additional Controls

Dependent variable: Log real hourly wage

	Occ. Req.			Occ. Tenure			Cum. Mismatch		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
U_t	−0.739***	0.402	0.376	−0.779***	0.401	0.331	−0.728***	0.475	0.406
	(0.210)	(0.476)	(0.478)	(0.210)	(0.474)	(0.475)	(0.210)	(0.476)	(0.476)
$U_t \cdot EE'_{i,t}$	−1.819***	−1.873*	−2.297**	−1.924***	−1.920*	−2.376**	−1.785***	−1.798*	−2.185**
	(0.456)	(0.992)	(0.976)	(0.458)	(0.993)	(0.971)	(0.454)	(0.987)	(0.969)
$U_t \cdot UE_{i,t}$	−0.725	1.086	0.290	−0.825*	1.252	0.348	−0.673	1.123	0.296
	(0.462)	(1.155)	(1.174)	(0.458)	(1.147)	(1.164)	(0.459)	(1.155)	(1.169)
$m_{i,t}$	−0.0012**	0.001		−0.0013***	0.002		−0.0015***	0.001	
	(0.0005)	(0.001)		(0.0005)	(0.001)		(0.0005)	(0.001)	
$U_t \cdot m_{i,t}$		−0.042***			−0.043***			−0.044***	
		(0.016)			(0.015)			(0.015)	
$U_t \cdot m_{i,t} \cdot EE'_{i,t}$		0.004			0.002			0.003	
		(0.029)			(0.028)			(0.028)	
$U_t \cdot m_{i,t} \cdot UE_{i,t}$		−0.055*			−0.064**			−0.055*	
		(0.033)			(0.032)			(0.033)	
$U_t \cdot m^+_{i,t}$			−0.057***			−0.056***			−0.055***
			(0.016)			(0.016)			(0.016)
$U_t \cdot m^+_{i,t} \cdot EE'_{i,t}$			0.022			0.021			0.023
			(0.030)			(0.030)			(0.030)
$U_t \cdot m^+_{i,t} \cdot UE_{i,t}$			−0.036			−0.042			−0.034
			(0.034)			(0.033)			(0.033)
$U_t \cdot m^-_{i,t}$			−0.016			−0.017			−0.021
			(0.020)			(0.020)			(0.020)
$U_t \cdot m^-_{i,t} \cdot EE'_{i,t}$			0.034			0.035			0.025
			(0.036)			(0.035)			(0.036)
$U_t \cdot m^-_{i,t} \cdot UE_{i,t}$			0.012			0.006			0.007
			(0.043)			(0.042)			(0.043)
Observations	381394	381394	381394	381394	381394	381394	381394	381394	381394
Adjusted R^2	0.650	0.650	0.651	0.653	0.653	0.653	0.650	0.650	0.651

Notes: $NH_{i,t}$, $EE'_{i,t}$ and $UE_{i,t}$, respectively, equal one for new hires, switchers and new hires from unemployment. $m_{i,t}$, $m^+_{i,t}$ and $m^-_{i,t}$ correspond to skill mismatch, over- and underqualification in the current job, respectively. Coefficients and standard errors on U_t multiplied by 100. All columns control for a quadratic polynomial in age and job tenure, education, time trend, month and individual fixed effects, and one-digit level occupation and industry interacted with year. Standard errors are clustered at the individual level. Sample includes all worker-job matches between 1979 and 2016 in a sub-sample of NLSY79. *** p<0.01, ** p< 0.05 and * p<0.1

Table C.3: Robstness Check: Weighted Mismatch & Regional Unemployment

Dependent variable: Log real hourly wage

	Weighted Mis.			Regional Unemp.		
	(1)	(2)	(3)	(4)	(5)	(6)
U_t	−0.736***	0.092	0.045	−0.864*	0.382	0.249
	(0.211)	(0.404)	(0.403)	(0.475)	(0.645)	(0.645)
$U_t \cdot EE'_{i,t}$	−1.827***	−1.484*	−1.771**	−1.314***	−1.043	−1.303
	(0.456)	(0.865)	(0.843)	(0.424)	(0.925)	(0.923)
$U_t \cdot UE_{i,t}$	−0.714	0.854	0.009	−0.315	1.076	0.666
	(0.462)	(0.978)	(0.996)	(0.438)	(1.012)	(1.050)
$m_{i,t}$	−0.001**	0.001		−0.0013***	0.002	
	(0.0004)	(0.001)		(0.0005)	(0.001)	
$U_t \cdot m_{i,t}$		−0.031**			−0.044***	
		(0.013)			(0.015)	
$U_t \cdot m_{i,t} \cdot EE'_{i,t}$		−0.010			−0.005	
		(0.025)			(0.028)	
$U_t \cdot m_{i,t} \cdot UE_{i,t}$		−0.048*			−0.038	
		(0.027)			(0.029)	
$U_t \cdot m^+_{i,t}$			−0.041***			−0.057***
			(0.015)			(0.015)
$U_t \cdot m^+_{i,t} \cdot EE'_{i,t}$			0.001			0.010
			(0.029)			(0.029)
$U_t \cdot m^+_{i,t} \cdot UE_{i,t}$			−0.033			−0.018
			(0.029)			(0.029)
$U_t \cdot m^-_{i,t}$			−0.005			−0.004
			(0.016)			(0.019)
$U_t \cdot m^-_{i,t} \cdot EE'_{i,t}$			0.008			0.008
			(0.030)			(0.036)
$U_t \cdot m^-_{i,t} \cdot UE_{i,t}$			0.010			−0.024
			(0.036)			(0.045)
Observations	381394	381394	381394	257147	257147	257147
Adjusted R^2	0.649	0.650	0.650	0.636	0.637	0.637

Note: $NH_{i,t}$, $EE'_{i,t}$ and $UE_{i,t}$, respectively, equal one for new hires, switchers and new hires from unemployment. $m_{i,t}$, $m^+_{i,t}$ and $m^-_{i,t}$ correspond to skill mismatch, over- and underqualification in the current job, respectively. Coefficients and standard errors on U_t multiplied by 100. All columns control for a quadratic polynomial in age and job tenure, education, time trend, month and individual fixed effects, and one-digit level occupation and industry interacted with year. Standard errors are clustered at the individual level. Sample includes all worker-job matches between 1979 and 2016 in a sub-sample of NLSY79. *** p<0.01, ** p< 0.05 and * p<0.1

4 Results Robustness to Sample Selection

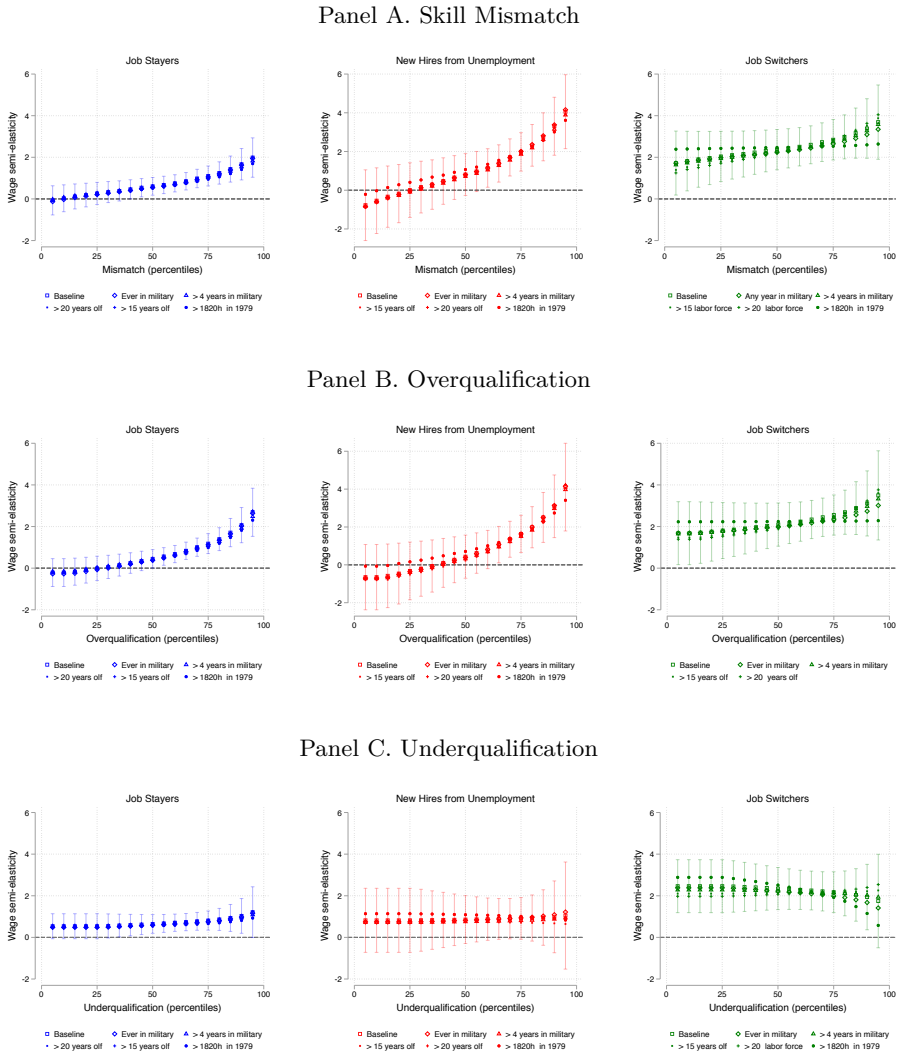


FIGURE D.1: HETEROGENEITY IN WAGE CYCLICALITY: SENSITIVITY TO SAMPLE SELECTION

Note: This figure replicates Figure 2 in the main article. Each graph plots the % wage change in response to a 1pp drop in the unemployment rate along the skill mismatch (Panel A), overqualification (Panel B) and underqualification (Panel C) distribution for each worker type. Panel B plots the wage semi-elasticity along the overqualifiation distribution, computed at the average level of the underqualification. Panel C plots the wage semi-elasticity along the underqualification distribution, computed at the average level of overqualification. Each series in the graphs corresponds to estimates of the wage-unemployment semi-elasticity when the respective criteria is imposed, instead of what is described in the main paper. Solid lines are 95% confidence intervals. Sample includes all worker-job matches between 1979 and 2016 in a sub-sample of NLSY79.

5 Job separation: Recessions vs. Booms

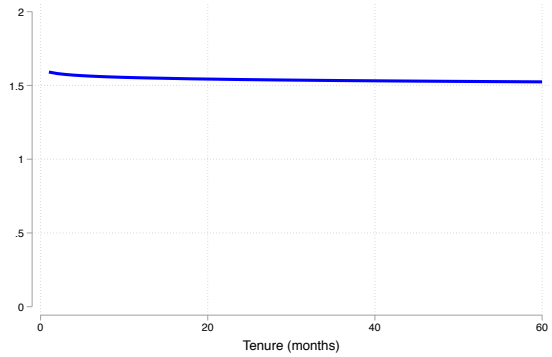


FIGURE E.1: RATIO OF EU HAZARD IN RECESSIONS RELATIVE TO EXPANSTIONS

Note: The graph displays the ratio of the separation hazard into unemployment in recessions relative to booms. A recession is defined as months in which the unemployment rate is above 6.5%. EU hazard computed from a complementary log model that controls for skill mismatch, age (cubic) at the start of the spell, occupational tenure, and indicator variables for education, race, one-digit industry, one-digit occupation and month fixed effects. The baseline hazard is parameterized as $\ln(\tau)$, where τ is tenure in months. Sample includes all worker-job matches between 1979 and 2016 in a sub-sample of NLSY79.