Appendix for

The Effects of Biased Labor Market Expectations on Consumption, Wealth Inequality, and Welfare

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A Descriptive statistics and calculation of subjective and actual probabilities

A.1 Subjective probabilities

We use the "Labor Market Module" of the Survey of Consumer Expectations (SCE). This supplement is conducted every four months. The question of interest was first introduced into the survey in July 2014; thus, our dataset covers the period from July 2014 until July 2021, which is the date with the most recent available data (as of writing). We consider the sample of individuals aged 25 to 60 year, who report not to be enrolled in school or college. We define individuals as employed, if they report as their current employment status either "Working full-time", "Working part-time", or "sick or other leave". Unemployed individuals are those who report to be (i) "temporarily laid off", or (ii) "not working, but would like to work" and who state that they have "done something in the last 4 weeks to look for work". Lastly, individuals are defined as non-participants if they report to be "Permanently disabled or unable to work", "Retiree or early retiree", "Student, at school or in training", or "Homemaker". In addition, we classify individuals as non-participants if they report that they would like to work but haven't searched for employment during the last 4 weeks. Note that the question about the past job search is only available every four months as part of the Labor Market Module. We exclude all observations for which we cannot determine the labor market status.

Table 18 reports the number of observations in the sample for different demographic groups and labor market states. The first two columns represent the sub-sample of individuals for which we have information about the individual actual labor transitions. Columns three and four represent the sample of individuals from which we compute the subjective expectations.

A.2 Actual probabilities

The actual transition probabilities are computed from CPS data on individual labor market transitions. The CPS is a monthly, nationally representative survey of around 60,000 households. It is conducted by the Bureau of Labor Statistics and its primary purpose is to evaluate

	SCE				CPS	
	Actual		Subjective			
	Obs	%-share	Obs	%-share	Obs	%-share
Men	3825	49.47	7484	48.64	2239187	49.11
Women	3923	50.53	7848	51.36	2412481	50.89
25–29	976	12.06	1974	12.65	624372	14.99
30–39	2161	26.74	4313	26.85	1328182	28.74
40–49	2224	29.15	4368	29.04	1279999	27.23
50–54	1163	15.74	2317	15.58	695650	14.38
55–59	1226	16.31	2363	15.88	723465	14.66
≤HS	747	31.65	1540	32.20	1670995	36.17
C	2338	29.33	4735	29.98	1262748	26.59
≥Bachelor	4665	39.03	9053	37.81	1717925	37.25
White	6386	81.45	12606	81.46	3717800	76.53
Non-white	1364	18.55	2729	18.54	933868	23.47
Single	2606	33.57	5165	33.62	1871030	41.21
Married	5144	66.43	10170	66.38	2780638	58.79
<30,000	1092	21.05	2160	20.68	874819	18.83
30,000–49,000	1172	16.30	2361	16.83	792592	17.16
50,000–99,000	2845	32.40	5542	32.21	1551909	32.83
≥100,000	2625	30.25	5238	30.28	1432348	31.18
E	6641	81.96	13124	81.98	3592887	76.96
U	250	3.36	520	3.74	152635	3.52
N	859	14.68	1691	14.28	906146	19.52

Sample: Individuals with age 25-60 years, non-school or -college; Period: 07/2014-07/2021. Obs: Number of observations. %-share: Population shares in sample.

Table 18: Descriptive statistics for subjective and actual transition rates

the current state of the U.S. labor market. Every individual in the CPS is interviewed for 4 successive months and, after a break of 8 months, it is interviewed again for 4 months. This structure implies that we can directly observe 1–3 months as well as, 9–15 months labor market transition rates. To stay as close as possible to the SCE, we consider the same sample restrictions and period of time. That is, we consider individuals who are 25-60 years old, who are not enrolled in school or college, and who are not a member of the armed forces. We use waves from July 2014 to July 2021. The last two columns of Table 18 report the characteristics of the CPS-sample for different demographic groups. We compute the average m-month transition rate as the share of individuals who report to be in state s in one month and in state s' m months later. We use the CPS-survey weights to aggregate the individual observations. To obtain the 4-months transition probabilities, we interpolate linearly between the values for the 4-months, and the 9-months transition probabilities.

Both, the SCE and the CPS are designed to be nationally representative. However, Table 18 documents a number of differences in the composition of both samples. For example, the share of married individuals is higher in the SCE. This can be explained by the fact that respondents in the SCE are asked whether they are married or live together, whereas in the CPS the legal status of the respondent matters. Furthermore, individuals in the SCE are, on average, slightly older, better educated, and more likely to be employed than out of the labor force. The difference to the CPS could be due to the survey design of the SCE which requires respondents to have access to internet and to be able to fill out an online-questionnaire. A noteworthy feature of the SCE is that the labor market status is not considered in the construction of the sample weights. Consequently, there are notable differences between the SCE and the CPS in the joint distribution of age and education conditional on the labor market state. See Table 19 for an illustration of this discrepancy between the two datasets. To correct for these compositional differences, we use the CPS sample weights – listed in Table 19 – to re-normalize the weights from the SCE for each education-age-labor cell.

		SCE			CPS		
State		E	U	N	E	U	N
Age	Education						
25–29	≤HS	2.77	8.47	1.91	4.19	9.35	6.12
25–29	C	3.11	3.51	2.63	4.21	5.61	3.62
25–29	≥Bachelor	7.78	2.62	1.75	5.87	4.70	3.10
30–39	≤HS	7.22	12.61	8.17	8.54	13.64	12.12
30–39	C	7.32	8.51	5.77	7.59	8.73	6.37
30–39	≥Bachelor	13.81	7.07	4.01	12.97	7.37	7.05
40–49	≤HS	8.96	8.48	14.61	9.03	11.76	12.56
40–49	C	9.06	10.29	7.96	7.38	6.81	6.12
40–49	≥Bachelor	11.66	7.30	3.42	12.17	7.06	6.23
50–54	≤HS	5.32	3.84	8.64	5.02	5.82	8.69
50–54	C	5.21	6.86	6.43	3.96	3.57	3.99
50–54	≥Bachelor	4.81	4.28	2.14	5.78	3.73	3.21
55–59	≤HS	4.44	6.18	16.98	4.75	4.97	11.20
55–59	C	4.39	5.36	11.13	3.65	3.43	5.44
55–59	≥Bachelor	4.13	4.62	4.46	4.89	3.46	4.18
Total		100	100	100	100	100	100

Sample: Individuals with age 25-60 years, non-school or -college. Period: 07/2014-07/2021.

Table 19: Sample composition conditional on labor market state

The standard errors for the subjective transition probabilities – reported in the tables throughout the paper – are expressed as so-called linearized Taylor standard error and they are computed with the Stata command ”svy” (with ”pweights”). We use the same method to compute the standard errors for the actual 3-months and 9-month transition probabilities from the CPS. Then, we interpolate linearly between those two to obtain an approximation of the standard error for the 4-months transition probability.

	Subjective			Actual			Subjective − Actual		
Panel (a): CPS-weights									
	E	U	N	E	U	N	E	U	N
E	96.1	2.6	1.3	94.9	1.8	3.3	1.2	0.7	-2.0
	(0.15)	(0.10)	(0.09)	(0.03)	(0.02)	(0.02)	(0.15)	(0.10)	(0.09)
U	61.9	31.2	6.9	43.7	32.5	23.8	18.2	-1.4	-16.9
	(1.96)	(1.56)	(1.02)	(0.27)	(0.26)	(0.24)	(1.98)	(1.58)	(1.05)
N	10.9	13.6	75.5	11.1	3.4	85.6	-0.2	10.3	-10.1
	(0.77)	(0.86)	(1.28)	(0.07)	(0.04)	(0.08)	(0.77)	(0.86)	(1.28)
Panel (b): Survey-specific weights									
	Subjective			Actual			Subjective − Actual		
	E	U	N	E	U	N	E	U	N
E	96.2	2.5	1.3	94.9	1.8	3.3	1.3	0.7	-2.0
	(0.14)	(0.09)	(0.08)	(0.03)	(0.02)	(0.02)	(0.14)	(0.09)	(0.08)
U	61.1	32.5	6.4	43.7	32.5	23.8	17.4	0.0	-17.4
	(1.79)	(1.52)	(0.90)	(0.27)	(0.26)	(0.24)	(1.81)	(1.54)	(0.93)
N	10.3	12.9	76.7	11.1	3.4	85.6	-0.8	9.5	-8.9
	(0.70)	(0.73)	(1.13)	(0.07)	(0.04)	(0.08)	(0.70)	(0.73)	(1.13)

Sample: Individuals with age 25-60 years, non-school or -college; Period: 07/2014-07/2021. Source: SCE and CPS. Standard errors in parentheses. Panel (a): Observations from the SCE and CPS are both aggregated using sample weights from the CPS. Panel (b): Observations from the SCE (CPS) are aggregated using sample weights from the SCE (CPS).

Table 20: 4-Months subjective and actual transition probabilities (with survey-specific weights)

Panel (a): Actual transition probabilities calculated from CPS									
	Subjective			Actual			Subjective − Actual		
	E	U	N	E	U	N	E	U	N
E	96.1	2.6	1.3	94.9	1.8	3.3	1.2	0.7	-2.0
	(0.15)	(0.10)	(0.09)	(0.03)	(0.02)	(0.02)	(0.15)	(0.10)	(0.09)
U	61.9	31.2	6.9	43.7	32.5	23.8	18.2	-1.4	-16.9
	(1.96)	(1.56)	(1.02)	(0.27)	(0.26)	(0.24)	(1.98)	(1.58)	(1.05)
N	10.9	13.6	75.5	11.1	3.4	85.6	-0.2	10.3	-10.1
	(0.77)	(0.86)	(1.28)	(0.07)	(0.04)	(0.08)	(0.77)	(0.86)	(1.28)
Panel (b): Actual transition probabilities calculated from SCE									
	Subjective			Actual (SCE)			Subjective − Actual		
	E	U	N	E	U	N	E	U	N
E	96.3	2.5	1.2	96.8	2.0	1.2	-0.6	0.5	0.0
	(0.19)	(0.12)	(0.11)	(0.32)	(0.24)	(0.22)	(0.37)	(0.27)	(0.25)
U	57.6	35.8	6.7	38.8	44.6	16.7	18.8	-8.8	-10.0
	(2.62)	(2.31)	(1.06)	(3.87)	(4.10)	(3.46)	(4.67)	(4.70)	(3.62)
N	10.6	12.8	76.6	7.0	2.7	90.3	3.6	10.1	-13.7
	(0.97)	(1.02)	(1.62)	(1.16)	(0.70)	(1.33)	(1.51)	(1.24)	(2.09)

Sample: Individuals with age 25-60 years, non-school or -college; Period: 07/2014-07/2021. Source: SCE and CPS. Standard errors in parentheses.

Table 21: 4-Months subjective and actual transition probabilities. (actual probabilities computed from CPS and SCE)

B Ability to process probabilities in SCE

The following three questions in the SCE ask the respondents to calculate and process probabilities

- **QNUM3**: *"In the BIG BUCKS LOTTERY, the chances of winning a $10.00 prize are 1%. What is your best guess about how many people would win a $10.00 prize if 1,000 people each buy a single ticket from BIG BUCKS?"*

- **QNUM5**: *"If the chance of getting a disease is 10 percent, how many people out of 1,000 would be expected to get the disease?"*

- **QNUM6**: *"The chance of getting a viral infection is 0.0005. Out of 10,000 people, about how many of them are expected to get infected?"*

The fraction of individuals in our sample who answer correctly is equal to: 83% for QNUM3, 90% for QNUM5, and 78% for QNUM6. We want to explore whether the bias in subjective expectations is significantly different for those individuals who are less able to deal with probabilities. To this end, we first split the sample into two groups: one group is composed of those individuals who gave an incorrect answer to at least one of the three control questions. The second group consists of the remaining 57% of individuals who answered all questions correctly.

Then, we calculate the subjective probabilities for each group and compare them to the actual probabilities to assess the bias in expectations. For the actual probabilities we consider two cases. In the first case, we use – as in the baseline – the transition probabilities calculated from the CPS. In the second case, we account for the fact that the two groups of individuals could in principle differ in terms of the actual transition probabilities. Thus, we calculate the actual probabilities from the SCE. Hence, in this second case, the subjective and the actual probabilities for both groups are calculated from the same sample of individuals. Table 22 shows the results.

Actual probabilities calculated from CPS									
	Subjective			Actual (CPS)			Subjective − Actual		
	E	U	N	E	U	N	E	U	N
Panel (a): Wrong answer to at least one control question									
E	94.8	3.2	2.0	94.9	1.8	3.3	-0.1	1.4	-1.3
	(0.32)	(0.20)	(0.17)	(0.03)	(0.02)	(0.02)	(0.32)	(0.20)	(0.18)
U	61.6	30.0	8.5	43.7	32.5	23.8	17.9	-2.6	-15.3
	(2.87)	(2.18)	(1.52)	(0.27)	(0.26)	(0.24)	(2.88)	(2.20)	(1.54)
N	10.6	14.1	75.3	11.1	3.4	85.6	-0.5	10.8	-10.3
	(1.05)	(1.26)	(1.81)	(0.07)	(0.04)	(0.08)	(1.06)	(1.26)	(1.81)
Panel (b): All control questions answered correctly									
E	97.0	2.2	0.9	94.9	1.8	3.3	2.1	0.3	-2.4
	(0.13)	(0.09)	(0.08)	(0.03)	(0.02)	(0.02)	(0.13)	(0.09)	(0.08)
U	62.5	33.1	4.4	43.7	32.5	23.8	18.8	0.6	-19.4
	(2.12)	(1.96)	(0.86)	(0.27)	(0.26)	(0.24)	(2.14)	(1.98)	(0.89)
N	11.3	12.9	75.8	11.1	3.4	85.6	0.2	9.6	-9.8
	(1.12)	(1.08)	(1.78)	(0.07)	(0.04)	(0.08)	(1.12)	(1.08)	(1.78)
Actual probabilities calculated from SCE									
	Subjective			Actual (SCE)			Subjective − Actual		
	E	U	N	E	U	N	E	U	N
Panel (c): Wrong answer to at least one control question									
E	94.8	3.1	2.1	95.1	3.0	1.9	-0.3	0.1	0.2
	(0.43)	(0.26)	(0.25)	(0.69)	(0.54)	(0.45)	(0.81)	(0.60)	(0.52)
U	56.0	36.2	7.8	34.0	48.2	17.8	22.0	-12.0	-10.0
	(3.91)	(3.41)	(1.52)	(5.17)	(5.71)	(4.63)	(6.49)	(6.66)	(4.87)
N	10.7	14.1	75.1	8.0	3.4	88.6	2.8	10.7	-13.5
	(1.31)	(1.53)	(2.27)	(1.81)	(1.17)	(2.09)	(2.24)	(1.93)	(3.09)
Panel (d): All control questions answered correctly									
E	97.1	2.1	0.8	97.8	1.3	0.9	-0.7	0.8	-0.1
	(0.15)	(0.10)	(0.09)	(0.32)	(0.23)	(0.23)	(0.35)	(0.25)	(0.25)
U	60.1	35.2	4.8	46.4	38.7	14.8	13.6	-3.6	-10.1
	(2.73)	(2.48)	(1.21)	(5.49)	(5.21)	(5.13)	(6.13)	(5.77)	(5.27)
N	10.3	11.0	78.7	5.8	1.8	92.4	4.6	9.2	-13.7
	(1.46)	(1.22)	(2.27)	(1.23)	(0.52)	(1.33)	(1.91)	(1.32)	(2.63)

Sample: Individuals with age 25-60 years, non-school or -college; Period: 07/2014-07/2021. Source: SCE and CPS. Standard errors in parentheses.

Table 22: 4-months subjective and actual transition probabilities (control questions)

C Results from the Survey of Economic Expectations

The Survey of Economic Expectations (SEE) was conducted as national telephone survey by the University of Wisconsin Survey Center (UWSC) during the period from 1994-2002. The purpose of the SEE was to elicit probabilistic expectations of significant personal events. For example, respondents were asked to report expectations for crime victimization, health insurance, employment, and income. In addition, in some waves, respondents were asked about returns on mutual-fund investments and about their future Social Security benefits. See Dominitz and Manski (2020) for an introduction into the SEE. We consider the sample of individuals with 25-60 years of age. The survey question of interest to us asks employed respondent to report their expectations of future job loss. The specific survey question reads: *"I would like you to think about your employment prospects over the next 12 months. What do you think is the PERCENT CHANCE that you will lose your job during the next 12 months?"*. For the period 1994-2002, the average value of the subjective (12-months) probability of job loss is 14.6%.

As before, we measure the bias in expectations by comparing the subjective probabilities with the actual probabilities. As in the baseline, we use the CPS to compute the actual transition probabilities (the SEE does not have a panel dimension). According to our interpretation, the survey question in the SEE asks respondents about their expectation of an involuntary layoff and not a voluntary quit. Identifying involuntary layoffs in the CPS is challenging because individuals are not asked about the reason of the job separation. Thus, we use as an indicator whether and for how long individuals move into unemployment after a job separation. The underlying idea is as follows. First, workers who get fired move to unemployment rather than leave the labor force. This allows us to distinguish involuntary job separations from voluntary quits, which are followed by a transition out of the labor force. Second, the duration of the spell of unemployment after a separation likely depends on the reason of separation. Voluntary quits, which are induced by a job-to-job transition likely result in no, or only short spells of unemployment, while involuntary layoffs likely results in longer spells.

We use the Annual Social and Economic Supplement to the CPS (ASEC) for the period from 1994-2003 and we apply the same sample restrictions than in the SEE. The ASEC is conducted every 12 months. This allows us to calculate the actual probability of job loss for the same 12-months horizon, for which we calculate the subjective probability from the SEE. More concretely, we calculate the actual probability as the share of individuals who are employed in period t and who report to have experienced at least x weeks of unemployment in the period t and $t + 12$ months. We consider different values of $x \in \{1, 3, 5, 10\}$ to account for more or less stringent definitions of job loss. For the case of $x = 1$, the sample likely contains also observations of job-to-job transitions, whereas individuals who have experienced $x = 10$ weeks and more in unemployment are likely to be displaced workers. Table 23 reports the results for the subjective probability of job loss and the actual probability for the different cases.

		94-02	1994	1996	1997	1998	1999	2000	2001	2002
Probability of job loss (in %)										
Actual (CPS)	$x = 1$	30.0	38.1	30.6	28.1	26.0	25.2	24.6	33.6	33.5
	$x = 3$	28.7	36.8	29.1	27.0	24.5	24.2	23.3	32.2	32.4
	$x = 5$	24.2	31.6	24.6	22.4	20.4	20.0	19.1	28.2	27.7
	$x = 10$	18.3	24.0	19.2	16.4	15.0	14.8	13.7	21.3	22.2
Subjective (SEE)		14.6	15.1	13.8	14.0	13.7	13.0	12.9	13.5	18.8

Sample: Individuals with age 25-60 years; Period: 1994-2002. Source: SEE and CPS.

Table 23: 12-Months subjective and actual probability of job loss

D Expectation bias for different demographic groups

	Subjective			Actual			Subjective − Actual		
	E	U	N	E	U	N	E	U	N
High school or less									
E	95.31	2.90	1.79	92.96	2.55	4.49	2.36	0.35	-2.70
	(0.40)	(0.26)	(0.22)	(0.05)	(0.03)	(0.04)	(0.41)	(0.26)	(0.23)
U	64.01	26.91	9.08	41.23	31.80	26.97	22.78	-4.89	-17.89
	(3.84)	(2.89)	(2.03)	(0.40)	(0.38)	(0.36)	(3.86)	(2.92)	(2.06)
N	11.03	13.95	75.02	9.45	3.15	87.41	1.58	10.81	-12.39
	(1.37)	(1.55)	(2.32)	(0.09)	(0.06)	(0.11)	(1.38)	(1.55)	(2.32)
Some college									
E	95.94	2.49	1.57	94.71	1.92	3.38	1.23	0.58	-1.81
	(0.22)	(0.14)	(0.15)	(0.05)	(0.03)	(0.04)	(0.23)	(0.14)	(0.16)
U	63.14	32.12	4.75	43.52	33.16	23.33	19.62	-1.04	-18.58
	(2.41)	(2.13)	(1.17)	(0.52)	(0.49)	(0.44)	(2.46)	(2.19)	(1.25)
N	10.45	14.04	75.51	11.51	3.80	84.69	-1.06	10.24	-9.18
	(0.82)	(0.98)	(1.40)	(0.14)	(0.09)	(0.16)	(0.83)	(0.98)	(1.41)
College or higher									
E	96.84	2.36	0.80	96.48	1.21	2.32	0.36	1.15	-1.52
	(0.11)	(0.08)	(0.07)	(0.03)	(0.02)	(0.03)	(0.12)	(0.08)	(0.07)
U	56.98	37.49	5.53	48.08	33.15	18.77	8.90	4.34	-13.24
	(2.06)	(1.95)	(0.94)	(0.54)	(0.52)	(0.43)	(2.13)	(2.02)	(1.03)
N	11.17	12.51	76.32	14.08	3.33	82.59	-2.91	9.18	-6.27
	(1.03)	(0.98)	(1.54)	(0.16)	(0.09)	(0.18)	(1.04)	(0.99)	(1.55)

Sample: Individuals with age 25-60 years, non-school or -college; Period: 07/2014-07/2021. Source: SCE and CPS. Standard errors in parentheses.

Table 24: 4-Months subjective and actual transition probabilities (by education)

	Subjective			Actual			Subjective − Actual		
	E	U	N	E	U	N	E	U	N
				Men					
E	96.28	2.49	1.23	95.75	1.84	2.41	0.53	0.65	-1.18
	(0.19)	(0.12)	(0.12)	(0.03)	(0.02)	(0.02)	(0.20)	(0.12)	(0.12)
U	64.63	31.94	3.43	45.01	34.92	20.07	19.62	-2.98	-16.64
	(2.87)	(2.71)	(0.85)	(0.39)	(0.37)	(0.31)	(2.90)	(2.74)	(0.91)
N	12.73	15.17	72.10	13.20	4.46	82.34	-0.47	10.71	-10.24
	(1.59)	(1.53)	(2.45)	(0.14)	(0.09)	(0.16)	(1.60)	(1.53)	(2.45)
				Women					
E	95.95	2.64	1.41	93.92	1.80	4.28	2.03	0.84	-2.87
	(0.23)	(0.15)	(0.13)	(0.04)	(0.02)	(0.03)	(0.23)	(0.16)	(0.13)
U	60.17	30.65	9.17	42.23	29.94	27.83	17.94	0.71	-18.65
	(2.58)	(1.88)	(1.51)	(0.39)	(0.37)	(0.35)	(2.61)	(1.91)	(1.55)
N	10.18	13.01	76.80	10.12	2.85	87.03	0.07	10.16	-10.23
	(0.85)	(1.03)	(1.49)	(0.08)	(0.05)	(0.09)	(0.86)	(1.03)	(1.49)

Sample: Individuals with age 25-60 years, non-school or -college; Period: 07/2014-07/2021. Source: SCE and CPS. Standard errors in parentheses.

Table 25: 4-Months subjective and actual transition probabilities (by gender)

	Subjective			Actual			Subjective - Actual		
	E	U	N	E	U	N	E	U	N
25 − 29									
E	95.77	2.83	1.40	93.50	2.34	4.16	2.26	0.49	-2.76
	(0.42)	(0.29)	(0.22)	(0.08)	(0.05)	(0.06)	(0.43)	(0.30)	(0.23)
U	69.94	22.26	7.80	43.58	31.38	25.04	26.36	-9.12	-17.24
	(4.53)	(3.00)	(2.54)	(0.66)	(0.62)	(0.57)	(4.57)	(3.07)	(2.60)
N	9.03	15.20	75.77	16.36	5.74	77.89	-7.33	9.46	-2.12
	(1.84)	(3.43)	(4.51)	(0.25)	(0.16)	(0.28)	(1.86)	(3.43)	(4.52)
30 − 39									
E	96.10	2.58	1.32	94.90	1.91	3.20	1.21	0.68	-1.88
	(0.27)	(0.17)	(0.16)	(0.05)	(0.03)	(0.04)	(0.27)	(0.18)	(0.16)
U	67.46	26.13	6.41	44.98	31.93	23.09	22.48	-5.80	-16.68
	(3.07)	(2.48)	(2.16)	(0.51)	(0.48)	(0.43)	(3.11)	(2.52)	(2.20)
N	14.40	14.18	71.42	13.05	3.94	83.01	1.36	10.24	-11.59
	(2.08)	(2.01)	(3.06)	(0.15)	(0.09)	(0.17)	(2.08)	(2.01)	(3.06)
40 − 49									
E	96.33	2.62	1.05	95.52	1.67	2.81	0.81	0.95	-1.75
	(0.27)	(0.17)	(0.15)	(0.04)	(0.03)	(0.03)	(0.28)	(0.17)	(0.16)
U	54.99	36.53	8.48	44.65	32.14	23.21	10.34	4.39	-14.73
	(3.80)	(2.83)	(2.01)	(0.53)	(0.51)	(0.45)	(3.84)	(2.87)	(2.07)
N	13.20	16.47	70.34	11.16	3.15	85.69	2.04	13.32	-15.35
	(1.40)	(1.37)	(2.26)	(0.14)	(0.08)	(0.16)	(1.41)	(1.38)	(2.26)
50 − 54									
E	96.59	2.19	1.22	95.37	1.57	3.06	1.22	0.61	-1.83
	(0.29)	(0.18)	(0.18)	(0.06)	(0.04)	(0.05)	(0.30)	(0.18)	(0.19)
U	59.14	34.69	6.17	41.86	34.97	23.17	17.28	-0.28	-17.00
	(5.97)	(4.70)	(2.11)	(0.72)	(0.71)	(0.62)	(6.01)	(4.75)	(2.20)
N	8.53	13.39	78.09	8.90	2.59	88.50	-0.38	10.79	-10.42
	(1.50)	(2.04)	(2.97)	(0.16)	(0.09)	(0.18)	(1.51)	(2.04)	(2.97)
55 − 59									
E	95.55	2.55	1.90	94.46	1.68	3.86	1.08	0.87	-1.95
	(0.50)	(0.33)	(0.32)	(0.07)	(0.04)	(0.06)	(0.50)	(0.33)	(0.32)
U	52.75	42.99	4.26	40.23	34.24	25.53	12.52	8.75	-21.27
	(4.93)	(4.95)	(1.21)	(0.76)	(0.74)	(0.68)	(4.99)	(5.00)	(1.39)
N	6.89	8.77	84.33	6.79	1.93	91.28	0.10	6.85	-6.94
	(1.07)	(1.07)	(1.63)	(0.12)	(0.07)	(0.14)	(1.08)	(1.07)	(1.64)

Sample: Individuals with age 25-60 years, non-school or -college; Period: 07/2014-07/2021. Source: SCE and CPS. Standard errors in parentheses.

Table 26: 4-Months subjective and actual transition probabilities (by age)

	Subjective			Actual			Subjective − Actual		
	E	U	N	E	U	N	E	U	N
2014									
E	95.31 (0.48)	3.24 (0.34)	1.45 (0.23)	95.22 (0.08)	1.68 (0.05)	3.11 (0.06)	0.09 (0.48)	1.57 (0.34)	-1.66 (0.24)
U	55.97 (5.52)	38.24 (4.42)	5.79 (1.64)	39.26 (0.81)	35.59 (0.81)	25.14 (0.73)	16.70 (5.58)	2.65 (4.49)	-19.35 (1.79)
N	6.94 (1.44)	14.35 (2.51)	78.71 (3.24)	10.28 (0.22)	3.59 (0.14)	86.12 (0.25)	-3.35 (1.45)	10.76 (2.51)	-7.41 (3.25)
2015									
E	95.88 (0.45)	2.50 (0.25)	1.62 (0.27)	95.12 (0.06)	1.64 (0.04)	3.24 (0.05)	0.76 (0.46)	0.86 (0.25)	-1.62 (0.28)
U	54.69 (5.01)	39.08 (4.19)	6.23 (2.45)	40.70 (0.67)	34.51 (0.66)	24.79 (0.59)	13.99 (5.06)	4.57 (4.24)	-18.56 (2.52)
N	9.78 (2.61)	15.75 (2.64)	74.47 (3.46)	10.69 (0.17)	3.41 (0.10)	85.90 (0.20)	-0.91 (2.62)	12.34 (2.64)	-11.43 (3.47)
2016									
E	96.07 (0.43)	2.84 (0.35)	1.09 (0.19)	95.20 (0.06)	1.59 (0.04)	3.21 (0.05)	0.87 (0.43)	1.25 (0.35)	-2.13 (0.19)
U	65.75 (5.06)	32.09 (4.91)	2.16 (0.84)	42.13 (0.70)	33.14 (0.68)	24.74 (0.61)	23.62 (5.11)	-1.04 (4.96)	-22.58 (1.04)
N	11.19 (2.24)	14.59 (2.33)	74.22 (3.42)	10.86 (0.18)	3.30 (0.10)	85.84 (0.20)	0.33 (2.24)	11.29 (2.34)	-11.62 (3.43)
2017									
E	96.40 (0.43)	2.25 (0.24)	1.35 (0.31)	95.30 (0.06)	1.49 (0.04)	3.22 (0.05)	1.11 (0.43)	0.76 (0.24)	-1.87 (0.31)
U	65.45 (4.72)	28.90 (3.77)	5.65 (2.43)	44.83 (0.76)	30.40 (0.71)	24.77 (0.66)	20.62 (4.78)	-1.50 (3.84)	-19.12 (2.52)
N	14.98 (1.88)	16.84 (2.66)	68.18 (3.63)	11.28 (0.19)	2.78 (0.10)	85.94 (0.20)	3.70 (1.89)	14.06 (2.66)	-17.76 (3.64)

Sample: Individuals with age 25-60 years, non-school or -college; Period: 07/2014-07/2021. Source: SCE and CPS. Standard errors in parentheses.

Table 27: 4-Months subjective and actual transition probabilities (by year)

	Subjective			Actual			Subjective − Actual		
	E	U	N	E	U	N	E	U	N
2018									
E	96.31	2.33	1.36	95.48	1.32	3.19	0.82	1.01	-1.83
	(0.42)	(0.27)	(0.22)	(0.06)	(0.03)	(0.05)	(0.42)	(0.27)	(0.23)
U	64.21	25.99	9.80	44.31	29.78	25.92	19.90	-3.78	-16.11
	(6.07)	(3.66)	(3.71)	(0.81)	(0.75)	(0.72)	(6.13)	(3.73)	(3.78)
N	11.33	10.03	78.64	11.03	2.56	86.40	0.30	7.47	-7.77
	(2.11)	(1.30)	(2.84)	(0.19)	(0.10)	(0.21)	(2.12)	(1.31)	(2.85)
2019									
E	96.84	1.95	1.20	94.88	1.77	3.35	1.96	0.18	-2.15
	(0.32)	(0.19)	(0.19)	(0.07)	(0.04)	(0.05)	(0.33)	(0.19)	(0.20)
U	63.52	23.09	13.39	44.53	28.97	26.49	18.99	-5.88	-13.11
	(6.73)	(4.48)	(6.08)	(0.87)	(0.81)	(0.78)	(6.78)	(4.55)	(6.13)
N	11.89	15.37	72.74	11.18	2.76	86.06	0.71	12.61	-13.32
	(1.90)	(2.69)	(3.43)	(0.20)	(0.11)	(0.22)	(1.92)	(2.69)	(3.43)
2020									
E	95.55	3.47	0.98	92.87	3.55	3.58	2.68	-0.08	-2.60
	(0.34)	(0.26)	(0.18)	(0.09)	(0.07)	(0.06)	(0.36)	(0.27)	(0.19)
U	59.80	30.72	9.49	47.26	33.18	19.56	12.53	-2.46	-10.07
	(5.06)	(3.83)	(2.40)	(0.68)	(0.64)	(0.54)	(5.11)	(3.89)	(2.46)
N	7.56	11.50	80.94	11.42	4.67	83.91	-3.87	6.83	-2.97
	(1.74)	(2.04)	(3.53)	(0.22)	(0.16)	(0.26)	(1.76)	(2.05)	(3.54)
2021									
E	96.31	2.08	1.60	95.24	1.39	3.37	1.07	0.69	-1.76
	(0.50)	(0.25)	(0.35)	(0.09)	(0.05)	(0.08)	(0.51)	(0.25)	(0.36)
U	70.62	26.33	3.05	43.13	33.63	23.24	27.49	-7.30	-20.19
	(4.25)	(3.76)	(1.12)	(0.91)	(0.88)	(0.79)	(4.35)	(3.87)	(1.38)
N	12.62	9.53	77.86	12.01	4.22	83.78	0.61	5.31	-5.92
	(3.30)	(2.19)	(4.65)	(0.28)	(0.18)	(0.32)	(3.32)	(2.20)	(4.66)

Sample: Individuals with age 25-60 years, non-school or -college; Period: 07/2014-07/2021. Source: SCE and CPS. Standard errors in parentheses.

Table 28: 4-Months subjective and actual transition probabilities (by year)

	Subjective			Actual			Subjective − Actual		
	E	U	N	E	U	N	E	U	N
Less than $30,000									
E	90.43	5.68	3.89	90.53	3.65	5.82	-0.10	2.03	-1.93
	(0.72)	(0.47)	(0.41)	(0.10)	(0.06)	(0.08)	(0.73)	(0.47)	(0.41)
U	62.04	30.52	7.44	38.09	34.46	27.45	23.95	-3.94	-20.00
	(2.92)	(2.39)	(1.63)	(0.43)	(0.43)	(0.40)	(2.95)	(2.43)	(1.68)
N	10.36	16.70	72.94	9.27	3.72	87.02	1.09	12.99	-14.08
	(1.18)	(1.38)	(2.04)	(0.11)	(0.07)	(0.13)	(1.19)	(1.39)	(2.04)
$30,000 − $49,000									
E	96.17	2.55	1.28	93.53	2.32	4.15	2.63	0.23	-2.87
	(0.31)	(0.21)	(0.20)	(0.07)	(0.04)	(0.06)	(0.32)	(0.21)	(0.21)
U	60.22	33.65	6.12	43.76	32.57	23.67	16.46	1.09	-17.55
	(4.74)	(3.58)	(2.02)	(0.61)	(0.59)	(0.52)	(4.78)	(3.63)	(2.09)
N	12.18	11.60	76.22	11.20	3.35	85.45	0.98	8.25	-9.23
	(2.09)	(2.28)	(3.30)	(0.16)	(0.10)	(0.19)	(2.10)	(2.28)	(3.31)
$50,000 − $99,000									
E	97.17	1.98	0.85	95.25	1.67	3.07	1.91	0.31	-2.22
	(0.18)	(0.13)	(0.12)	(0.04)	(0.02)	(0.03)	(0.19)	(0.13)	(0.12)
U	61.63	31.66	6.71	48.23	30.58	21.18	13.40	1.07	-14.47
	(3.34)	(2.44)	(2.06)	(0.55)	(0.51)	(0.45)	(3.38)	(2.49)	(2.11)
N	11.74	10.88	77.38	12.85	3.36	83.79	-1.11	7.51	-6.41
	(1.44)	(1.51)	(2.40)	(0.15)	(0.09)	(0.17)	(1.45)	(1.51)	(2.40)
More than $100,000									
E	97.42	1.84	0.74	96.60	1.13	2.27	0.82	0.72	-1.53
	(0.15)	(0.10)	(0.09)	(0.03)	(0.02)	(0.03)	(0.16)	(0.10)	(0.10)
U	66.06	27.51	6.42	48.92	31.26	19.82	17.14	-3.74	-13.40
	(4.57)	(3.91)	(1.83)	(0.70)	(0.65)	(0.57)	(4.62)	(3.97)	(1.92)
N	9.92	9.31	80.78	12.13	2.61	85.26	-2.21	6.69	-4.48
	(1.45)	(1.25)	(2.16)	(0.17)	(0.09)	(0.19)	(1.46)	(1.25)	(2.17)

Sample: Individuals with age 25-60 years, non-school or -college; Period: 07/2014-07/2021. Source: SCE and CPS. Standard errors in parentheses. Household income: total annual pre-tax income of all household members (older than 15 years), from all sources including employment, business, farm or rent, pensions, financial assets, government transfers and benefits.

Table 29: 4-Months subjective and actual transition probabilities (by household income)

E Bunching and rounding

The first approach aims to identify individuals who habitually respond to expectation questions by only using probabilities of 0%, 50%, or 100%, for example, due to naïveté, ambiguity or pure ignorance. Such responses are supposedly uninformative, hence we want to remove them from the sample. In doing so, we follow Manski and Molinari (2010) who suggest to analyze response patterns of individuals across questions in order to identify specific types of respondents. Accordingly, we consider the responses to five additional expectation questions - three from the *Core survey* and two from the *Labor Market Survey*. These questions include: *"What do you think is the percent chance that 12 months from now: ... (1) the unemployment rate in the U.S. will be higher than it is now? (2) the average interest rate on saving accounts will be higher than it is now? (3) stock prices in the U.S. stock market will be higher than they are now? Thinking about work in general and not just your present job (if you currently work), what do you think is the percent chance that you will be working full-time after you reach: ...(4) age 62? (5) age 67?"* We classify the responses of survey participants as non-informative if they respond to all of these questions (as well as the three main questions used in our baseline analysis) by using only the values 0%, 50%, or 100%. This applies to a small but non-negligible number of 254 observations. After dropping these observations, we perform the multinomial probit regression and find that the results for the bias are very similar to the baseline results (see Table 30).

	EE	EU	EN	UE	UU	UN	NE	NU	NN
High school or less	2.86	0.12	-2.98	24.87	-4.82	-20.05	2.04	10.07	-12.11
	(0.37)	(0.24)	(0.21)	(3.32)	(2.51)	(1.66)	(1.31)	(1.44)	(2.11)
Some college	1.47	0.41	-1.88	19.78	0.12	-19.90	-0.10	10.31	-10.22
	(0.22)	(0.13)	(0.15)	(2.30)	(2.02)	(1.18)	(0.84)	(0.98)	(1.39)
College and higher	0.14	1.41	-1.55	11.10	4.26	-15.37	-1.70	11.02	-9.32
	(0.14)	(0.10)	(0.08)	(2.26)	(2.06)	(1.06)	(1.23)	(1.21)	(1.83)

Table 30: Conditional expectation bias (drop 0, 50,100 rounders)

The second approach is based on the study of Dominitz and Manski (2011) who note that *"The pervasiveness of rounding suggests that we should interpret [the survey response] as providing an interval rather than point measure of [a person's] subjective probability, the interval depending on the response given"*.[1] We follow their strategy and define for each reported subjective transition probability an interval that the person's response represents. Clearly, the extent of rounding performed by the respondent is unknown. However, Dominitz and Manski (2011) emphasize that individuals tend to provide rather precise responses at the extremes (close to 0% and 100%) and otherwise tend to round their responses to the nearest 5 or 10, with more pronounced rounding around 50%. Based on this notion, they further assume that *"persons reporting a value [] that ends in a 0 other than 50 are rounding no more than to the nearest 10, those reporting a value ending in a 5 are rounding to no more than the nearest 5, and those reporting other values are rounding to no more than the nearest 1"*.[2] These considerations give

[1] See Dominitz and Manski (2011) p. 365.
[2] See Dominitz and Manski (2011) p. 365.

rise to the following set of intervals, where r represents a given survey response: $r = 0 \Rightarrow [0, 5]$, $r = 50 \Rightarrow [40, 60]$, $r = 100 \Rightarrow [95, 100]$, r end in a 0, but $r \neq 0, 50, 100 \Rightarrow [r-5, r+5]$, r end in a 5 $\Rightarrow [r-3, r+3]$, otherwise: $\Rightarrow [r-1, r+1]$.

We use these intervals and the predicted actual transition probability for each individual to re-compute the expectation bias. Specifically, if the predicted actual transition probability for a given respondent is inside the interval that is defined by the respondent's reported subjective probability, then we assign a value of zero for the bias. Any value within the interval can correspond to the person's true subjective probability, thus, we cannot exclude the possibility that the bias is actually equal to zero. If instead the predicted actual value is outside the interval, then we compute the bias as the difference between the prediction and the mid point of the interval. After these calculations, we run the probit regression and find that the results for the bias are very similar to the baseline results (see Table 31).

	EE	EU	EN	UE	UU	UN	NE	NU	NN
High school or less	0.69	1.71	-0.45	23.65	-4.28	-18.50	3.56	11.80	-13.38
	(0.33)	(0.21)	(0.19)	(3.30)	(2.42)	(1.54)	(1.25)	(1.39)	(2.06)
Some college	-0.73	1.77	0.51	19.03	0.02	-17.76	1.10	11.57	-10.50
	(0.21)	(0.13)	(0.14)	(2.24)	(1.94)	(1.11)	(0.77)	(0.91)	(1.30)
College and higher	-1.76	2.32	0.50	10.14	4.61	-13.45	-0.45	12.35	-9.93
	(0.13)	(0.10)	(0.08)	(2.19)	(1.98)	(0.98)	(1.16)	(1.15)	(1.74)

Table 31: Conditional expectation bias (with intervals)

F Additional tables

	EE	EU	EN	UE	UU	UN	NE	NU	NN
High school or less	5.01	-2.46	-2.56	24.78	-4.86	-19.92	-1.58	12.85	-11.27
	(0.32)	(0.21)	(0.19)	(3.39)	(2.33)	(2.00)	(1.93)	(1.79)	(2.66)
Some college	3.73	-1.67	-2.06	17.18	1.15	-18.32	-1.83	10.75	-8.92
	(0.18)	(0.11)	(0.12)	(2.81)	(2.33)	(1.57)	(1.35)	(1.36)	(1.96)
College and higher	1.03	0.39	-1.42	10.43	4.88	-15.31	-4.72	9.59	-4.87
	(0.12)	(0.09)	(0.06)	(2.89)	(2.46)	(1.42)	(2.00)	(1.71)	(2.69)

Table 32: Conditional expectation bias (controlling for labor market duration)

	EE	EU	EN	UE	UU	UN	NE	NU	NN
High school or less (25-34)	5.4	-0.8	-4.6	30.8	-11.6	-19.2	3.6	14.5	-18.1
	(0.66)	(0.47)	(0.31)	(5.62)	(3.74)	(3.49)	(4.49)	(4.65)	(6.77)
High school or less (35-60)	2.1	0.4	-2.5	21.2	-1.0	-20.3	1.6	9.3	-10.9
	(0.44)	(0.29)	(0.26)	(4.49)	(3.49)	(1.93)	(1.32)	(1.39)	(2.15)
Some college (25-34)	2.0	0.0	-2.0	23.3	-6.2	-17.1	-2.6	12.9	-10.3
	(0.52)	(0.31)	(0.37)	(4.60)	(3.64)	(3.09)	(1.69)	(2.14)	(3.01)
Some college (35-60)	1.2	0.6	-1.9	18.8	2.2	-21.0	-0.1	8.7	-8.5
	(0.23)	(0.15)	(0.15)	(2.63)	(2.45)	(0.79)	(0.96)	(1.03)	(1.51)
College and higher (25-34)	0.3	1.3	-1.6	12.2	1.0	-13.2	-6.0	8.7	-2.8
	(0.22)	(0.16)	(0.14)	(3.94)	(3.68)	(2.08)	(2.47)	(1.89)	(3.23)
College and higher (35-60)	0.0	1.5	-1.5	10.0	6.3	-16.3	-0.4	12.0	-11.7
	(0.16)	(0.12)	(0.09)	(2.70)	(2.41)	(1.15)	(1.25)	(1.38)	(2.02)
High school or less (25-44)	3.6	-0.2	-3.4	32.4	-11.7	-20.7	2.6	12.0	-14.6
	(0.46)	(0.31)	(0.26)	(4.07)	(3.07)	(2.08)	(2.49)	(2.54)	(3.75)
High school or less (45-60)	2.1	0.5	-2.6	14.7	3.9	-18.6	1.4	8.9	-10.2
	(0.58)	(0.37)	(0.34)	(5.84)	(4.65)	(2.58)	(1.46)	(1.50)	(2.44)
Some college (25-44)	1.5	0.4	-1.9	22.9	-2.7	-20.2	-1.5	10.5	-9.0
	(0.31)	(0.19)	(0.21)	(3.04)	(2.64)	(1.73)	(1.27)	(1.47)	(2.11)
Some college (45-60)	1.4	0.5	-1.9	16.1	2.9	-19.0	-0.1	9.3	-9.1
	(0.30)	(0.19)	(0.21)	(3.38)	(3.18)	(1.11)	(0.99)	(1.20)	(1.69)
College and higher (25-44)	0.2	1.4	-1.6	13.6	0.4	-14.1	-2.6	10.7	-8.1
	(0.16)	(0.12)	(0.09)	(2.92)	(2.62)	(1.53)	(1.90)	(1.69)	(2.65)
College and higher (45-60)	0.1	1.4	-1.4	7.2	9.8	-17.0	-1.0	11.4	-10.4
	(0.21)	(0.15)	(0.13)	(3.28)	(3.00)	(1.23)	(1.32)	(1.48)	(2.20)

Table 33: Conditional expectation bias (by education and age)

		EE	EU	EN	UE	UU	UN	NE	NU	NN
	Expansion	2.6	0.4	-3.0	22.9	-2.1	-20.8	1.8	11.7	-13.5
		(0.40)	(0.27)	(0.22)	(3.75)	(3.01)	(1.97)	(1.42)	(1.75)	(2.36)
High school or less	Recession	10.8	-5.2	-5.6	41.2	-18.5	-22.6	0.6	3.3	-3.9
		(1.63)	(1.39)	(0.60)	(14.40)	(7.75)	(7.29)	(4.59)	(4.18)	(8.45)
	Recovery	2.6	0.0	-2.6	36.6	-13.7	-23.0	3.0	6.3	-9.2
		(1.05)	(0.48)	(0.77)	(8.54)	(6.83)	(2.20)	(3.51)	(3.25)	(5.93)
	Expansion	1.1	0.6	-1.7	23.9	-1.4	-22.5	0.2	10.3	-10.5
		(0.25)	(0.15)	(0.18)	(2.76)	(2.43)	(1.14)	(1.0)	(1.04)	(1.53)
Some college	Recession	6.2	-3.5	-2.7	19.8	-9.1	-10.7	-2.8	6.6	-3.7
		(1.01)	(0.66)	(0.54)	(6.08)	(8.81)	(7.81)	(2.01)	(3.27)	(4.29)
	Recovery	1.3	1.3	-2.7	16.9	0.6	-17.5	-2.6	10.3	-7.7
		(0.46)	(0.41)	(0.17)	(4.72)	(3.79)	(2.91)	(1.85)	(2.62)	(3.57)
	Expansion	0.1	1.4	-1.6	11.3	5.4	-16.7	-1.6	11.4	-9.8
		(0.15)	(0.11)	(0.09)	(2.67)	(2.49)	(1.00)	(1.40)	(1.34)	(2.03)
College	Recession	2.8	-0.7	-2.1	33.6	-19.1	-14.5	-0.3	15.3	-15.0
		(0.54)	(0.46)	(0.31)	(11.01)	(8.60)	(9.06)	(3.91)	(5.25)	(7.03)
	Recovery	-0.6	1.9	-1.3	5.2	5.5	-10.7	-5.2	7.4	-2.2
		(0.28)	(0.20)	(0.19)	(3.76)	(3.33)	(1.92)	(2.01)	(1.90)	(3.08)

Table 34: Conditional expectation bias during expansion, recession and recovery

	EE	EU	EN	UE	UU	UN	NE	NU	NN
High school or less ($u_t > \bar{u}$)	2.8 (0.56)	0.5 (0.39)	-3.2 (0.30)	20.1 (5.93)	-3.4 (4.75)	-16.7 (2.49)	4.2 (2.45)	14.7 (2.46)	-18.9 (3.78)
High school or less ($u_t < \bar{u}$)	3.1 (0.53)	-0.2 (0.31)	-2.9 (0.33)	28.3 (4.23)	-6.0 (3.21)	-22.3 (2.06)	0.0 (1.54)	7.1 (1.87)	-7.1 (2.66)
Some college ($u_t > \bar{u}$)	1.0 (0.40)	1.0 (0.28)	-2.0 (0.23)	17.1 (3.79)	0.7 (3.14)	-17.8 (2.01)	-1.0 (1.47)	11.6 (1.77)	-10.6 (2.44)
Some college ($u_t < \bar{u}$)	1.8 (0.28)	0.1 (0.16)	-1.9 (0.20)	22.3 (3.06)	-0.9 (2.78)	-21.4 (1.57)	0.0 (1.13)	9.1 (1.33)	-9.2 (1.93)
College and higher ($u_t > \bar{u}$)	-0.3 (0.23)	1.8 (0.16)	-1.5 (0.14)	6.2 (3.70)	8.0 (3.12)	-14.2 (1.80)	-4.5 (1.53)	13.4 (1.91)	-8.9 (2.68)
College and higher ($u_t < \bar{u}$)	0.4 (0.20)	1.1 (0.14)	-1.5 (0.12)	14.1 (3.15)	1.9 (2.88)	-16.1 (1.50)	-0.4 (1.67)	9.3 (1.43)	-9.0 (2.23)

$u_t < \bar{u}$ ($u_t > \bar{u}$): Sample of respondents who reside in a state where the unemployment rate is below (above) trend.

Table 35: Conditional expectation bias and state-unemployment rate (within states)

	EE	EU	EN	UE	UU	UN	NE	NU	NN
All ($u_t > \bar{u}$)	1.7 (0.20)	0.6 (0.13)	-2.3 (0.11)	18.7 (2.32)	-1.3 (1.76)	-17.4 (1.27)	0.7 (1.13)	10.3 (1.08)	-11.0 (1.66)
All ($u_t < \bar{u}$)	1.0 (0.22)	0.8 (0.14)	-1.8 (0.15)	20.3 (2.58)	-0.7 (2.28)	-19.6 (1.05)	-0.1 (0.92)	10.1 (1.29)	-9.9 (1.77)
High school or less ($u_t > \bar{u}$)	3.4 (0.52)	0.0 (0.36)	-3.4 (0.25)	21.3 (4.30)	-4.7 (3.13)	-16.6 (2.46)	3.7 (2.06)	9.5 (1.83)	-13.2 (2.88)
High school or less ($u_t < \bar{u}$)	2.2 (0.59)	0.3 (0.36)	-2.4 (0.40)	28.7 (5.19)	-3.7 (4.57)	-25.0 (1.64)	-0.6 (1.51)	10.8 (2.41)	-10.2 (3.24)
Some college ($u_t > \bar{u}$)	2.0 (0.30)	0.2 (0.16)	-2.1 (0.22)	23.7 (3.01)	-3.1 (2.72)	-20.6 (1.21)	-1.5 (1.02)	9.4 (1.19)	-7.9 (1.72)
Some college ($u_t < \bar{u}$)	0.9 (0.33)	0.7 (0.22)	-1.7 (0.21)	17.1 (3.74)	1.3 (3.16)	-18.3 (2.18)	1.1 (1.43)	10.6 (1.62)	-11.7 (2.31)
College and higher ($u_t > \bar{u}$)	0.2 (0.19)	1.3 (0.13)	-1.6 (0.12)	9.8 (2.96)	6.1 (2.76)	-15.9 (1.34)	-3.4 (1.43)	13.3 (1.79)	-9.9 (2.49)
College and higher ($u_t < \bar{u}$)	0.2 (0.18)	1.3 (0.13)	-1.5 (0.11)	11.4 (3.36)	2.3 (2.98)	-13.7 (1.71)	-0.6 (1.79)	8.2 (1.29)	-7.5 (2.35)

$u_t < \bar{u}$ ($u_t > \bar{u}$): Sample of respondents who reside in a state where the unemployment rate is below (above) the aggregate unemployment rate

Table 36: Conditional expectation bias and state-unemployment rate (across states)

G Additional model features

G.1 Government

Government budget balance requires the following condition to hold:

$$\tau \sum_h \sum_z P_h \Pi_h(z) \left[P_h(e) wzh + P_h(u) b(z,h) \right] = \underbrace{\sum_h \sum_z P_h P_h(u) \Pi_h(z) b(z,h)}_{\text{Unemployment benefits}} + \underbrace{\sum_h \sum_z P_h P_h(n) \Pi(z) T}_{\text{Welfare benefits}} \tag{1}$$

We use the definitions of $b(z,h)$ and T and rewrite this expression to obtain the budget balancing tax rate

$$\tau = \frac{\sum_h \sum_z P_h \Pi(z) \Big(P_h(u) \rho_u zh + P_h(n) \rho_n \bar{z} \bar{h} \Big)}{\sum_h \sum_z P_h \Pi(z) zh \Big(P_h(e) + P_h(u) \rho_u \Big)},$$

which is equal to total benefits (for UI and welfare) divided by total before-tax labor income (worker's earnings and unemployment income).

The budget constraint of the social security program is:

$$\Pi_R \sum_h P_h b_{ss}(h) = \tau_{ss} \Pi_W \sum_h P_h P_h(e) wh \sum_z \Pi(z) z \tag{2}$$

Using the definition of $b_{ss}(h)$, we can express the social security tax rate as:

$$\tau_{ss} = \rho_{ss} \cdot \frac{\Pi_R}{\Pi_W} \cdot \frac{\sum_h \sum_z P_h h \Pi(z) z}{\sum_h \sum_z P_h P_h(e) h \Pi(z) z}$$

G.2 Recursive competitive equilibrium

Definition 1 *The recursive competitive equilibrium in the model economy is defined as a collection of value functions (W^W, W^R), policy functions (c, a'), factor prices (r, w), and taxes (τ, τ_{ss}) such that*

- *given factor prices and taxes, the value functions are the solution to the individuals' optimization problem stated in Equations (1) and (2) and (c, a') are the optimal policy functions for consumption and next period's assets.*
- *the factor prices satisfy the firm's optimality conditions*
- *the government budget constraints in (1) and (2) are satisfied*
- *markets clear*

$$N = \Pi_W \sum_h P_h P_h(e) \sum_z \Pi(z) hz$$

$$K = \int a d\Phi$$

We assume a veil of ignorance to exist, implying that individuals have an incomplete model of the macroeconomy. That is, they do not know the equilibrium mapping between primitives and the aggregate state. If individuals knew the expectations of all others, they could infer that there is a discrepancy between the actual and the subjective probability distribution because the aggregate variables are not consistent with how the individuals perceive the economy.

H Input to calibration

H.1 CPS Welfare Benefits

We use data from the 2015–2021 waves of the March supplement of the CPS. In this supplement, individuals report their income from various sources during the preceding 12 months. Aggregate welfare income is computed as total annual income reported by welfare recipients. It includes income from public assistance, survivor's and disability benefits, worker's compensation (due to job-related injury or illness), educational assistance, child support, veteran's benefits, and income or assistance from other sources. The sample of welfare recipients includes non-retired individuals (aged 25-60 years) who did not work nor searched for a job in the preceding 12 months and who did not received wage, or business income, or income related to retirement. Aggregate annual labor earnings are computed from the sample of individuals who worked full-time, and were formally employed for the whole year, and who did not received any income from self-employment or retirement. We define total labor earnings as wage and salary income. Average welfare (labor) income is computed as aggregate welfare (labor) income divided by the number of welfare recipients (workers).

H.2 Conversion from 4-months to 3-months frequency

We implement the following approach to convert the 4-months subjective transition probabilities into 3-months transition probabilities. Let by p_h^{4m} denote the 4-months transition probability matrix for skill group h. The matrix has dimension 3×3. We assume that labor market transitions follow a Markov Chain with monthly transition probabilities. Thus, the four months transition matrix, p_h^{4m}, is identical to the (unobserved) 1-month transition matrix multiplied four times with itself. Let by p_h^{1m} denote the 1-month transition matrix. We obtain p_h^{1m} by solving the following 9-dimensional system of equations:

$$vec\left[\left(p_h^{1m}\right)^4 - p_h^{4m}\right] = 0$$

where *"vec"* vectorizes the 3x3 array inside the square brackets. Lastly, we obtain the 3-months transition probabilities as $(p_h^{1m})^3$. The values of the 3-months subjective and actual transition probabilities are given by:

$$\widehat{p}_{h_L} = \begin{pmatrix} 96.17 & 2.47 & 1.36 \\ 55.47 & 36.51 & 8.02 \\ 7.08 & 12.57 & 80.35 \end{pmatrix} \quad \widehat{p}_{h_M} = \begin{pmatrix} 96.70 & 2.09 & 1.21 \\ 53.81 & 42.14 & 4.05 \\ 6.71 & 12.41 & 80.88 \end{pmatrix} \quad \widehat{p}_{h_H} = \begin{pmatrix} 97.43 & 1.96 & 0.60 \\ 47.77 & 47.48 & 4.75 \\ 7.61 & 10.86 & 81.53 \end{pmatrix}$$

$$p_{h_L} = \begin{pmatrix} 93.26 & 2.47 & 4.27 \\ 39.26 & 33.60 & 27.14 \\ 8.65 & 3.15 & 88.21 \end{pmatrix} \quad p_{h_M} = \begin{pmatrix} 94.99 & 1.84 & 3.17 \\ 41.16 & 35.34 & 23.50 \\ 10.40 & 3.84 & 85.76 \end{pmatrix} \quad p_{h_H} = \begin{pmatrix} 96.65 & 1.14 & 2.20 \\ 45.28 & 35.84 & 18.87 \\ 12.96 & 3.35 & 83.69 \end{pmatrix}$$

I PSID: Life cycle path of income, consumption and wealth

We follow KMP and construct the measures of income, consumption and wealth as follows. Pre-tax income is constructed by adding, for each household and from all members, income from assets, earnings, and net profits from farm or business (ER71330, ER71398), transfers (ER71391, ER71419), and social security (ER71420, ER71422, ER71424). The codes in brackets refer to the variable name in the 2017 wave of the PSID.

Consumption expenditures includes expenditures on cars and other vehicles purchases, food at home and away (ER71487), clothing and apparel (ER71525), child care (ER71516), health care (ER71517), housing including rent and imputed rental services for owners (ER71491), utilities and transportation expenses (ER71503), education (ER71515), trips and recreation (ER71527, ER71526), electronics and IT equipment (ER71522). Imputed rents for home owners were computing using the value of main residence (ER66031) times an interest rate of 4%.

Net worth is defined as the value of households' assets minus debt. Assets include the value of farms and businesses (ER71429), checking and saving accounts (ER71435), stocks or bonds (ER71445), real estates (ER71481,ER71439) , vehicles (ER71447), individual retirement accounts (ER71455), other assets (ER71451). Debt include the value of debt on real estate and farms or businesses (ER71431, ER71441), student loans (ER71463), medical debt (ER71467), credit card debt (ER71459), legal debt (ER71471) and other debt (ER71475, ER71479)

All observations are aggregated using sample weights.

J Computational algorithm

The numerical computation of the general equilibrium involves the following sequence of steps:

1. Specify a grid for individual assets, a.
2. Discretize the idiosyncratic productivity shocks as described below.
3. Use the labor market transition probabilities to compute the total labor supply in efficiency units and the mass of agents in each labor market state. Use these quantities to compute the budget-balancing tax rates.
4. Guess the equilibrium interest rate r.
5. Use the first-order conditions of the firm to compute the equilibrium wage w.
6. Use the endogenous grid point method to solve the optimization problem of working-age individuals and retirees.
7. Use the eigenvector method to solve for the cross-sectional distribution Φ.

8. Compute the implied equilibrium aggregate capital stock and the interest rate r'.
9. If r' is sufficiently close to r, stop. Otherwise, update r using the bisection algorithm and continue with step 5.

We use the Tauchen-method (Tauchen 1986) with three grid points and the Rouwenhorst-method (Kopecky and Suen 2010) with 7 grid points to discretize, respectively, the transitory component and the permanent component of the stochastic productivity process. Together with the three labor market states and the retirement state, this yields a Markov chain with $7 \times 3 \times 3 + 1 = 64$ states. In the endogenous grid point method, we use a grid for assets with 301 exponentially spaced points to cover the range $[0, 10, 000]$. When computing the stationary distribution Φ, we interpolate the policy functions linearly on a finer grid of 1,000 points. In the last step of the iteration, we extend this grid to 5,000 points. Note that we exploit the sparsity of the transition matrix to speed up the code, as we need to repeatedly solve for the largest eigenvector of a $64, 000 \times 64, 000$ or $320, 000 \times 320, 000$ matrix for each h-type.

K Growth of earnings, household income and household consumption

K.1 Actual growth

For the calculations, we use observations on household heads (aged 25-60 years) taken from the SRC sample of the 2013-2019 waves of the PSID. Our measure of consumption expenditures comprises of the annual household expenditures on all expenditure categories reported in the PSID. This includes expenditures on food (variable code in the 2019-wave: ER77513), housing (ER77520), transportation (ER77539), education (ER77562), child care (ER77564), health care (ER77566), clothing (ER77581), vacation trips (ER77583), and recreation (ER77585). Total household income (ER77448) includes the annual taxable income, transfers and social security receipts of all family members. Earnings (ER77315) consist of the head's annual wage and salary income, as well as bonuses, overtime payments, tips, commissions and other labor income (but not farm income and the labor portion of business income). We follow Guvenen (2009) and exclude observations of earnings for which the reported annual hours (ER77255) are below 520 (10h/week), or above 5110 (14h/day), and the implied hourly wage is below half of the federal minimum wage rate of 7.25$.

All nominal variables are deflated by the CPI (CPIAUCSL) taken from the FRED database of the Federal Reserve Bank of St. Louis.[3] Household income and expenditures are converted into per-capita terms by applying a standard equivalence scale. According to this scale, the total effective number of household members is given by the weighted sum of adult household members and children, where the first household member aged 14 years and over is assigned a weight of 1, each additional household member aged 14 years and over is assigned a weight 0.5, and each child who is under 14 years old is assigned a weight of 0.3. As before, we define low-skilled individuals as those with 0-12 grades of school completed, medium-skilled as those with at least

[3]See FRED (2024) for data availability.

a high-shool degree but no college degree, and high-skilled as those with at least a college degree.

To correct for outliers, we trim the data by excluding observations for which the level (growth rate) of earnings, income, or expenditures is above the 90^{th} (95^{th}) percentile and below the 10^{th} (5^{th}) percentile of the distribution of the respective variable. Moreover, we exclude observations with negative reported income, earnings or expenditures. We convert the 2-year growth rate of earnings, income and expenditures into annual growth (for income and expenditures) using the formula $(1+g_{2y})^{\frac{1}{2}}-1$, and into 4-months growth (for earnings) using $(1+g_{2y})^{\frac{1}{6}}-1$.

Lastly, we use sample weights to compute average growth rates.

K.2 Expected growth

To compute the expected growth rates in the SCE, we use our baseline sample but do not impose that the expectations regarding labor market transitions are reported. This allows us to also include the answer to the monthly core survey at times where the Labor Market Module is not available. Additionally, in the baseline sample we rely on the Labor Market Module to assign non-employed workers to U or N. Hence, we collapse all non-employed workers (but with non-missing information) into a single group. Every month, individuals are asked about their expected annual earnings growth conditional that they keep their current job (Q23v2part2), about their expected annual growth of household income (Q25v2part2), and about their expected annual growth of household consumption expenditure (Q26v2part2). To compute the expected 4 months growth rate regarding annual earnings, we use question L3 (OO2e2) asking currently employed respondents about their current (expected annual earnings in 4 months). Contrary to the questions before, the latter two are part of the Labor Market Module.
All these nominal growth rates are deflated using the reported inflation expectations (Q9): To do so, we follow Armantier et al. (2016) and use the provided estimated mean based on the assigned probabilities to each bin of potential future inflation rates. For the 4 month growth rate, we compute the implied 4 month expected inflation rate using the previous formula. Then, we compute the median inflation rate for each considered group and for each variable separately to account for the fact that not all respondents see or answer all questions.
We further restrict the sample and exclude employed respondents earnings less than 15,080 USD. Additionally, to be able to deflate all expected growth rates, we require individuals to state their expected inflation rate. Finally, to account for outliers, we consider only those observations which fall into the 10^{th} (5^{th}) and 90^{th} (95^{th}) percentile for each variable, conditional on having answered it.
Lastly, we then estimate the means and medians of the deflated variables. In this step, as well as when we compute the median inflation expectation, we use sample weights. Similar to our baseline procedure, we re-weight the weights supplied by the SCE to match the share of each age and education cell in each labor market state of the corresponding sample from which the actual growth rates are computed.

L Robustness analysis

L.1 Model with endogenous labor supply

In Section IV, we extend the baseline model by introducing an endogenous labor supply choice of employed individuals. This modification affects the following parts of the baseline model.

Preferences and assets:
We assume that each period individuals have one unit of disposable time, which they can allocate to working and leisure. Preferences are described by a CRRA utility function over current consumption and leisure:

$$u(c, \bar{l} - l) = \frac{c^{1-\sigma_c} - 1}{1 - \sigma_c} + A\frac{(1-l)^{1-\sigma_l} - 1}{1 - \sigma_l}$$

where $1 - l$ is leisure, and $\sigma_c, \sigma_l > 0$, $A > 0$.

Optimization problem of the working-age individual:
A working-age individual with assets a, human capital h, labor market state s, and productivity z, chooses consumption, labor l, and next period's assets to solve:

$$\begin{aligned} W_W(a,h,s,z) = \max\nolimits_{c,a',l} u(c, 1-l) \quad & +\beta\theta \textstyle\sum_{s'}\sum_{z'} \widehat{p}_h(s'|s)\pi_h(z'|z) W_W(a',h,s',z') \\ & +\beta(1-\theta)W_R(a',h) \end{aligned} \tag{3}$$

subject to

$$c + a' = (1 + r - \delta)a + y(a,h,s,z) \qquad \text{and} \qquad a' \geq \underline{a} \qquad \text{and} \qquad 0 \leq l \leq 1$$

Let by $l(a,h,z)$ denote the optimal policy function for labor. Earnings, y, depend on the individual's labor market state:

$$y(a,h,s,z) = \begin{cases} (1 - \tau - \tau_{ss}) \cdot w \cdot z \cdot h \cdot l(a,h,z) & s = \text{employed} \\ (1-\tau) \cdot b(h,z) & s = \text{unemployed} \\ T & s = \text{not in the labor force} \end{cases}$$

When employed, a worker with human capital h and productivity z earns $z \cdot h \cdot w \cdot l$, where w is the wage per efficiency unit of labor and $z \cdot h \cdot l$ is the worker's labor supply in efficiency units. Unemployed workers receive benefits $b(h,z)$, which are a constant fraction ρ_u of the individual's potential wage earnings, that is given by $b(h,z) = \rho_u z \cdot h \cdot w \cdot \bar{l}$, where $\bar{l}(h,z)$ is the average labor supply by individuals with (h,z). Individuals who are not in the labor force receive welfare transfers, denoted by T. We model T as a constant fraction $\rho_n \in [0,1]$ of average labor earnings per worker in the economy. Average labor earnings are computed as $\frac{\int wzhl(a,h,z) 1_{s=e} d\Phi(a,h,z,s)}{\int 1_{s=e} d\Phi(a,h,z,s)}$, which is the wage per efficiency unit of labor times the efficiency labor per employed worker.

Budget constraints of the government and the social security program:

$$\tau \int wzhl(a,h,z)1_{s=e} + b(h,z)1_{s=u} d\Phi(a,h,z,s) = \underbrace{\int b(h,z)1_{s=u} d\Phi(a,h,z,s)}_{\text{Unemployment benefits}} + \underbrace{\int T1_{s=n} d\Phi(a,h,z,s)}_{\text{Welfare benefits}} \tag{4}$$

$$\int b_{ss}(h)1_{s=r} d\Phi(a,h,z,s) = \tau_{ss} \int wzhl(a,h,z)1_{s=e} d\Phi(a,h,z,s) \tag{5}$$

In the calibration, we follow Marcet et al. (2007) and set $A = 2$ and $\sigma_c = \sigma_l = 1$. All other parameters and stochastic processes are as in the baseline model.

L.2 Model with young and prime-age workers

In Section IV, we extend the baseline model by splitting the work life of individuals into two age intervals: Young and prime-age. Each period, young individuals reach prime age with probability $1-\theta_1 = 0.0146$ and prime-age individuals retire with probability $1-\theta_2 = 0.0109$. As in the baseline model, individuals can expect 40 years of work life. The aging probabilities, (θ_1, θ_2), are chosen so that the length of each age interval as a proportion of total work life is the same as in the empirical analysis in Section I.C. In the extended model, we allow the subjective and actual transition probabilities for every skill group (low-, medium-, and high-skill) to vary with age. We compute these probabilities from SCE and CPS data as described in Section I.C. In the calibration of the quantitative model, we use the following quarterly values.

Young:

$$\widehat{p}_{h_L} = \begin{pmatrix} 96.08 & 2.73 & 1.19 \\ 64.87 & 27.10 & 8.03 \\ 8.42 & 15.84 & 75.74 \end{pmatrix} \quad \widehat{p}_{h_M} = \begin{pmatrix} 96.14 & 2.30 & 1.56 \\ 57.30 & 38.10 & 4.60 \\ 7.56 & 13.79 & 78.65 \end{pmatrix} \quad \widehat{p}_{h_H} = \begin{pmatrix} 97.45 & 1.98 & 0.57 \\ 53.66 & 41.49 & 4.85 \\ 7.73 & 8.53 & 83.74 \end{pmatrix}$$

$$p_{h_L} = \begin{pmatrix} 92.29 & 3.03 & 4.68 \\ 38.82 & 33.58 & 27.60 \\ 11.21 & 4.57 & 84.22 \end{pmatrix} \quad p_{h_M} = \begin{pmatrix} 94.33 & 2.10 & 3.57 \\ 42.71 & 34.01 & 23.28 \\ 13.46 & 5.13 & 81.40 \end{pmatrix} \quad p_{h_H} = \begin{pmatrix} 96.56 & 1.17 & 2.27 \\ 48.90 & 33.17 & 17.93 \\ 15.38 & 4.09 & 80.53 \end{pmatrix}$$

Prime-age:

$$\widehat{p}_{h_L} = \begin{pmatrix} 96.23 & 2.30 & 1.47 \\ 46.71 & 45.16 & 8.13 \\ 6.32 & 10.79 & 82.89 \end{pmatrix} \quad \widehat{p}_{h_M} = \begin{pmatrix} 97.14 & 1.93 & 0.93 \\ 50.34 & 46.17 & 3.49 \\ 6.19 & 11.51 & 82.30 \end{pmatrix} \quad \widehat{p}_{h_H} = \begin{pmatrix} 97.42 & 1.95 & 0.63 \\ 42.97 & 52.36 & 4.67 \\ 7.57 & 12.55 & 79.88 \end{pmatrix}$$

$$p_{h_L} = \begin{pmatrix} 93.93 & 2.08 & 3.99 \\ 39.73 & 33.62 & 26.65 \\ 7.18 & 2.33 & 90.49 \end{pmatrix} \quad p_{h_M} = \begin{pmatrix} 95.51 & 1.63 & 2.86 \\ 39.53 & 36.74 & 23.74 \\ 8.39 & 2.99 & 88.62 \end{pmatrix} \quad p_{h_H} = \begin{pmatrix} 96.73 & 1.12 & 2.15 \\ 42.13 & 38.18 & 19.69 \\ 11.13 & 2.79 & 86.08 \end{pmatrix}$$

In the extended model, we allow the deterministic part of labor productivity, h, for each skill group to vary with age. Specifically, we use the same data as in the baseline calibration to obtain the values of h. While in the baseline we computed h for each skill group, we now compute it for each skill/age group. We obtain the following values:

$$h(row = skill, column = age) = \begin{pmatrix} 1.0000 & 1.1137 \\ 1.2174 & 1.5253 \\ 1.6052 & 2.1716 \end{pmatrix}$$

All other parameter values can be taken directly from Table 7. In the extended model, total labor in efficiency units, N, is computed as the sum of all (young and prime-age) employed workers' effective labor supply. $\frac{\theta_1}{\theta_1+\theta_2}$ and $\frac{\theta_2}{\theta_1+\theta_2}$ denote the share of young and prime-age individuals in the workforce, respectively. The remainder of the model is as in the baseline.

L.3 Model with housing capital and mortgages

The baseline model is extended to allow for housing wealth and mortgage borrowing. We build on the housing model in Jeske, Krueger, and Mitman (2013) (henceforth JKM). In this model, households derive utility from nondurable consumption c and housing services x. Following JKM, we assume that individuals' preferences are given by

$$U(c, x) = \frac{(c^{\alpha_c} x^{1-\alpha_c})^{1-\sigma} - 1}{1 - \sigma}$$

with $0 < \alpha_c < 1$ and $\sigma > 0$. Individuals can invest in three types of assets, one-period bonds b', physical assets a', and perfectly divisible houses g'. Houses can be rented out and provide housing services. Moreover, houses are subject to idiosyncratic depreciation shocks denoted by δ_g. The distribution of depreciation shocks is a (truncated) generalized Pareto distribution with pdf

$$f_g(\delta_g) = \frac{1}{\sigma_{\delta_g}} \left(1 + \frac{\kappa(\delta_g - \underline{\delta}_g)}{\sigma_{\delta_g}}\right)^{-\frac{1}{\kappa}-1}$$

with $\delta_g \in [\underline{\delta}_g, 1]$ and $\underline{\delta}_g \leq 0$. F_g denotes the cdf of the distribution. Individuals can borrow against their housing wealth by taking on one-period mortgage debt m'. They can default on their mortgages in which case they lose their housing wealth (but keep the physical assets and bonds). In this setting, individuals' default decision depends only on the leverage ratio $\frac{m'}{g'}$. Specifically, an individual prefers to default iff $\delta_g > \delta_g^*(m', g') = 1 - \frac{m'}{g'}$.

A retired individual with physical assets a, housing wealth g, mortgages m, bonds b, human capital h, and idiosyncratic depreciation δ_g solves the following optimization problem:

$$W^R(a, g, m, b, \delta_g, h) = \max_{c,x,b',m',g',a'} \left\{ U(c, x) + \nu\beta \int_{\underline{\delta}_g}^{1} W^R(a', g', m', b', \delta_g', h) dF_g(\delta_g') \right\} \quad (6)$$

subject to

$$c+a'+xP_x+b'P_b+g'P_g-m'P_m(g',m') = (1+r-\delta)\frac{a}{\nu}+\frac{b}{\nu}+\max\{0,P_g(1-\delta_g)g-m\}\frac{1}{\nu}+g'P_x+b_{ss}(h)$$

where (P_b, P_x, P_g, P_m) denote the prices of bonds, housing services, houses, and mortgages. Houses can be rented out immediately after purchase, thus, g' generates rental income equal to $g'P_x$. While in the baseline model, we assumed that (physical) assets of the deceased individuals are redistributed among the retired survivors, we extend this assumption for tractability to include bonds, houses, and mortgage debt.

A working-age individual with physical assets a, houses g, mortgages m, bonds b, human capital h, labor market state s, productivity z, and idiosyncratic depreciation δ_g solves the following optimization problem:

$$\begin{aligned} W^W(a,g,m,b,\delta_g,h,s,z) = \max_{c,x,b',m',g',a'} \Bigg\{ & U(c,x) + \beta(1-\theta)\int_{\underline{\delta}_g}^{1} W^R(a',g',m',b',\delta_g',h)dF_g(\delta_g') \\ & + \beta\theta\sum_{s'}\sum_{z'}\hat{p}_h(s'|s)\pi_h(z'|z)\int_{\underline{\delta}_g}^{1} W^W(a',g',m',b',\delta_g',h,s',z')dF_g(\delta_g')\Bigg\} \end{aligned} \tag{7}$$

subject to

$$c+a'+xP_x+b'P_b+g'P_g-m'P_m(g',m') = (1+r-\delta)\frac{a}{\nu}+\frac{b}{\nu}+\max\{0,P_g(1-\delta_g)g-m\}\frac{1}{\nu}+g'P_x+y$$

There is a perfectly competitive construction sector in which a representative firm produces houses using the linear production technology $I = C_g$. I denotes new houses and C_g is the cost (in units of the final good). The problem of the firm is

$$\max_I P_g I - I \tag{8}$$

which implies an equilibrium price of houses equal to $P_g = 1$

There is a perfectly competitive banking sector in which banks issue bonds to finance mortgages. Banks compete on a loan-by-loan basis which implies that the price of a mortgage of size m' which is collateralized by housing capital equal to g' is given by

$$P_m(g',m') = \frac{P_b}{(1+r_w)}\left(F_g\left(\delta_g^*(m',g')\right) + \gamma\frac{g'}{m'}\int_{\delta_g^*(m',g')}^{1}(1-\delta')dF_g(\delta')\right) \tag{9}$$

where r_w is the percentage real resource cost of issuing mortgages to the bank, and $0 < \gamma \leq 1$ captures the fact that the bank only recovers a fraction of the value from the collateral when foreclosing.

The state space of the economy is described by a time-invariant cross-sectional distribution, Φ, of individuals across age $j \in \{W, R\}$, labor market status $s \in \{e, u, n\}$, labor productivity $z \in Z$, human capital $h \in \{h_L, h_M, h_H\}$, physical assets a, houses g, mortgages m, bonds b, and depreciation shock δ_g. In equilibrium, the rental market for housing services has to clear which implies that $\int g' d\Phi = \int x d\Phi$. Bond market clearing implies that $P_b \int b' d\Phi = (1 + r_w) \int P_m(g', m') m' d\Phi$. Goods market clearing implies that

$$K^\alpha L^{1-\alpha} = \int c d\Phi + I + \delta K + r_w \int P_m(g', m') m' d\Phi$$

where gross investment in the housing stock is given by

$$I = \int g' d\Phi + \int \left[\int_{\underline{\delta}_g}^{\delta_g^*(m',g')} g'(1 - \delta_g') dF_g(\delta_g') - \gamma \int_{\delta_g^*(m',g')}^{1} g'(1 - \delta_g') dF_g(\delta_g') \right] d\Phi$$

The remaining features of the model are as in the baseline.

Next, we describe the calibration of the extended model. The parameters for the life cycle (θ, ν), final goods production (δ, α), government policy $(\rho_{ss}, \rho_u, \rho_n)$, human capital (P_h, h), idiosyncratic productivity process $(\phi, \sigma_\eta^2, \sigma_\epsilon^2)$, actual transition probabilities $p_h(s'|s)$, and perceived transition probabilities $\widehat{p}_h(s'|s)$ are calibrated as in the baseline; see Table 7 for the parameter values. We take from JKM the values of the parameters related to the housing features in the model. This includes the parameters for the foreclosure technology ($\gamma = 0.78$), non-durable consumption ($\alpha_c = 0.8590$), mortgage administration fee ($r_w = 0.001$), as well as the parameters associated with the distribution of house price shocks ($\kappa = 0.7302, \sigma_{\delta_g} = 0.0078, \underline{\delta_g} = -0.0077$). Lastly, we calibrate the coefficient of relative risk aversion, σ, to match the median leverage ratio.

L.4 Collapse U and N

When calibrating this version of the model, we can take most of the parameter values directly from Table 7. Only two sets of parameters have to be adjusted. The first set of parameters includes the labor market transition probability matrices $(p_h(s'|s), \widehat{p_h}(s'|s))$ which govern the transition between the two labor market states employment (E) and non-employment (nE). For each given skill group h, the 2×2 transition matrix (actual and subjective) can be computed directly from the 3×3 matrix used in the baseline, where the EE probability is as before and the new EnE probability is equal to 1–Pr(EE). Moreover, the nEE probability is computed as the population-weighted average of the UE and NE probabilities. This procedure yields the following transition matrices.

$$\widehat{p}_{h_L} = \begin{pmatrix} 96.35 & 3.65 \\ 17.79 & 82.21 \end{pmatrix} \quad \widehat{p}_{h_M} = \begin{pmatrix} 96.84 & 3.16 \\ 17.31 & 82.69 \end{pmatrix} \quad \widehat{p}_{h_H} = \begin{pmatrix} 97.54 & 2.46 \\ 19.73 & 80.27 \end{pmatrix}$$

$$p_{h_L} = \begin{pmatrix} 93.26 & 6.74 \\ 13.11 & 86.89 \end{pmatrix} \quad p_{h_M} = \begin{pmatrix} 94.99 & 5.01 \\ 15.68 & 84.32 \end{pmatrix} \quad p_{h_H} = \begin{pmatrix} 96.65 & 3.35 \\ 18.43 & 81.57 \end{pmatrix}$$

The second set of parameters to adjust are the policy parameters. In the baseline, we assume that unemployed workers receive a fraction ρ_u of their potential wage and inactive individuals receive a fraction ρ_n of the economy-wide average wage. In this version of the model with one state of non-employment, we assume that non-employed workers receive benefits which are equal to a fraction ρ_{un} of their potential wage. We compute the replacement rate ρ_{un} as the weighted average of ρ_U and ρ_n, where the weights are population shares of unemployed and inactive individuals. This procedure yields a value for ρ_{un} of 0.08.

L.5 Monthly frequency

Several parameter values depend on the model frequency. Hence, we adjust them, when we calibrate the model to a monthly frequency. This includes the labor market transition probabilities $(p_h(s'|s), \hat{p_h}(s'|s))$ which are transformed to monthly values as described in Appendix H.2. The monthly probability of retiring is set to $1-\theta = 0.0021$ so that individuals expect 40 years of work life as in the baseline calibration. The monthly probability of dying is set to $1-\nu = 0.0056$ so that retirees expect to spend 15 years in retirement. The value of the monthly depreciation rate is equal to 0.84% which implies a 2.5% quarterly depreciation rate. As in the baseline, the personal discount factor is calibrated so that the model generates a 4% annual net return. This implies a value of $\beta = 0.9962$. Lastly, the parameters of the stochastic labor productivity process are transformed to a monthly frequency following the procedure as described in KMP:

$$\phi = \widehat{\phi}^{\frac{1}{12}} \qquad \sigma_\epsilon^2 = \widehat{\sigma_\epsilon^2} \qquad \frac{\sigma_\eta^2}{1-\phi^2} = \frac{\widehat{\sigma_\eta^2}}{1-\widehat{\phi}^2}$$

where the "hat" denotes annual values as shown in Table 7. All other parameters are invariant to the model frequency.

M Stylized two-period model

The model economy is populated by a unit mass of risk averse individuals who live for two periods. In the first period, every individual is employed and receives deterministic income $0 < y_1 < \infty$. Income in the second period, y_2, depends on an individual's labor market state. With (true) probability $p > 0$, an individual is employed and receives income $y_2 = \bar{y}$. With (true) probability $1-p$ the individual has no job in the second period and receives income $y_2 = \underline{y} > 0$; where $\underline{y} < \bar{y}$. Individuals know the values of $\underline{y}$ and $\bar{y}$ but they have subjective expectations about the realizations of the labor market states. These subjective expectations are given by $(p+\Delta)$ and $(1-p-\Delta)$, respectively. Δ denotes the degree of the individual's bias in expectations and $\Delta > 0$ represents the case of over-optimism. Moreover, we assume that individuals start with zero initial assets but they can save part of their first-period income and consume it in the second period. The period budget constraints are

$$c_1 + k = y_1 \qquad\qquad c_2 = y_2 + rk$$

	Baseline		Housing		U&N		Monthly	
	w	w/o	w	w/o	w	w/o	w	w/o
Panel (a): Wealth quintiles								
$Q1$	0.3	0.9	2.1	2.5	0.6	1.0	0.3	1.0
$Q2$	2.0	3.9	6.6	7.6	2.6	3.6	2.0	3.9
$Q3$	5.9	8.9	12.3	13.5	6.8	8.2	5.9	8.9
$Q4$	16.8	19.4	21.9	22.6	17.4	18.8	16.7	19.4
$Q5$	75.1	66.9	57.1	53.9	72.7	68.4	75.1	66.8
Panel (b): Gini coefficient								
	0.72	0.64	0.53	0.50	0.69	0.65	0.72	0.64
Panel (c): Savings rate, in %								
L	27.9	36.5	33.4	42.6	28.7	34.7	27.9	36.6
M	31.0	34.6	35.1	42.0	31.8	33.3	31.0	34.7
H	33.0	32.9	36.5	41.7	32.8	32.0	33.1	33.0
Panel (d): Consumption smoothing								
b_{all}	0.10	0.07	0.07	0.05	0.08	0.07	0.01	0.01
Panel (e): Welfare, in %×100								
ϕ_L	5.3		11.9		2.1		5.4	
ϕ_M	3.5		11.9		1.2		3.5	
ϕ_H	2.6		11.9		1.1		2.6	

"Housing": Baseline model extended by housing wealth and mortgage debt. "U&N": Unemployment and non-participation combined in one state. "Monthly": Monthly frequency. "w" ("w/o"): Subjective expectations in the model are with (without) bias; "L","M","H": Low-, middle-, high-skilled. Panel (c): Average savings rate of working-age individuals. Panel (d): Coefficient estimate of b from $\Delta c_{it} = a + b \cdot \Delta y_{it} + e_{it}$. Panel (e): Consumption equivalent variation.

Table 37: Robustness analysis - additional results

where c_1 and c_2 denote period consumption, k is savings and r is the interest rate. Agents live for two periods, hence, they do not leave any capital for after their demise. Let $u(c)$ denote the agent's period utility function and assume that it satisfies the usual regularity and Inada conditions. We assume that there is a firm which - in the second period only - rents capital and produces output. All markets are competitive. Using the period budget constraints and assuming time-separable utility, we can formulate the agent's expected utility maximization problem

$$\max_{0 \leq k \leq y_1} u\big(y_1 - k\big) + \beta(p + \Delta)u\big(\bar{y} + rk\big) + \beta(1 - p - \Delta)u\big(\underline{y} + rk\big)$$

where $0 < \beta < 1$ is the personal discount factor. The associated Euler equation reads

$$\beta r\Big[(p + \Delta)u'(\bar{y} + rk) + (1 - p - \Delta)u'(\underline{y} + rk)\Big] = u'(y_1 - k)$$

A unique interior k with $0 < k < y_1$ exists iff $\beta r\big((p+\Delta)u'(\bar{y})+(1-p-\Delta)u'(\underline{y})\big) > u'\big(y_1\big)$. This condition holds and agents' savings are positive if, for example, the interest rate is sufficiently large relative to agents' impatience $r > 1/\beta$, or the bad realization of income $\underline{y}$ is sufficiently small which induces agents to self-insure. Next, we use the Euler equation to demonstrate how the optimal savings choice is affected by the bias in expectations Δ. To this end, we compute $\frac{dk}{d\Delta}$, keeping the interest rate r constant. After a few lines of algebra, we obtain

$$\frac{dk}{d\Delta} = \frac{u'(\underline{y}+rk) - u'(\bar{y}+rk)}{u''(y_1-k)/(\beta r) + r(p+\Delta)u''(\bar{y}+rk) + r(1-p-\Delta)u''(\underline{y}+rk)}$$

Since $\underline{y} < \bar{y}$, $u' > 0$ and $u'' < 0$, we obtain that $\frac{dk}{d\Delta} < 0$. This is a standard result in expected utility theory going back to the work by Bernoulli (1738) and Savage (1954). It says that over-optimism, represented by $\Delta > 0$, induces agents to build up less precautionary savings. An immediate implication is that over-optimistic agents - i.e. those who underestimate the probability of receiving a bad income realization - engage less in self-insurance and are more exposed to income fluctuations than rational agents (for whom $\Delta = 0$). This is reflected by the fact that the difference in second-period utilities between the good state and the bad state, $u(\bar{y}+rk) - u(\underline{y}+rk) > 0$ is increasing with Δ. Moreover, it is straightforward to show that, if an interior solution exists, consumption in the second period, c_2, and total lifetime consumption $(c_1 + c_2)$ decrease with Δ irrespective of the realization of income in the second period. That is, individuals with a positive bias in their subjective expectations enjoy a lower level of total consumption and of welfare as measured by the discounted sum of lifetime utility.

Next, we derive the implications for the equilibrium interest rate. For concreteness, we assume that a fraction $0 < \phi < 1$ of the population is over-optimistic and has $0 < \Delta < 1-p$, whereas the remaining fraction $(1-\phi)$ of the population has correct beliefs ($\Delta = 0$). Therefore, aggregate capital, K, in the economy is given by

$$K = (1-\phi)k^r + \phi k^o$$

where k^r and k^o are the capital holdings by the realist and the optimist individual, respectively. The result from above implies that $k^r > k^o$. Let $F(K)$ denote the production technology of the firm with $F'(K) > 0$ and $F''(K) < 0$. With competitive pricing, we obtain the usual interest rate rule $r = F'(K)$. To explore the aggregate effects of a bias in expectations, suppose that $\Delta = 0$ for both types of agents. An increase in Δ for the optimist leads to a reduction in k^o. This reduces aggregate capital K and leads to an increase in the interest rate r. A higher interest rate affects agents' savings choice. The sign of $\frac{dk}{dr}$ depends on the functional form of $u(\cdot)$. For example, with *log*-utility we get that $\frac{dk}{dr} > 0$, which implies that both types of agents save more and this partly offsets a lower capital choice of the optimist agent.

To sum up, our analysis reveals the following insights: First, over-optimistic agents hold fewer assets than rational agents; hence, a positive bias in expectations for some individuals per se leads to wealth inequality. Lower savings imply a lower aggregate capital stock and a higher equilibrium interest rate. Looking ahead to the full model, these results imply that wealthier individuals enjoy higher asset returns and, hence, they can benefit from the bias of the optimistic agents. This channel further amplifies aggregate wealth inequality. A similar effect materializes in the full model where wages are endogenous. A lower aggregate capital stock lowers the marginal product of labor and thereby depresses wages. This affects primarily the asset-poor individuals whose primary income source is labor earnings. Second, our findings imply that less self-insurance due to over-optimism impedes individual's ability to smooth consumption across states and over the life cycle.

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