Federal Reserve Bank of Minneapolis
Research Department Staff Report 462

September 2011

Heterogeneity and Tests of Risk Sharing: Internet Appendix*

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ABSTRACT

This appendix contains seven sections. Section A reports results from running regressions of labor earnings on GDP using data from the PSID, for comparison with the results using HRS data in the body of the paper. Section B examines the relationship between family income, aggregate shocks, and risk preferences in the PSID. Section C gives technical details on the Markov Chain Monte Carlo estimation employed in table 1 of the paper and reports the complete parameter estimates for the regressions summarized in that table. Section D reports results when the relationship between earnings and aggregate shocks is estimated with individual-specific coefficients rather than common coefficients for each risk-tolerance group. Section E reports results comparable to table 1 of the paper and table D.1 of this appendix using only Social Security covered earnings instead of the combination of Social Security and W-2 earnings. Section F reports robustness checks for tables 2 and 3 of the paper under alternative definitions of the household and the consumption and income variables. Section G reports robustness checks for tables 2 and 3 under an alternative definition of the leisure variable.

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A An experiment with labor earnings and aggregate shocks in the PSID

I investigate how top-coding in the HRS data affects my results on the relationship between income and aggregate shocks by estimating the Mincer equation with GDP on data from the Panel Study of Income Dynamics, where top-coding is minimal. I study the labor earnings of male heads of household in the 1968 to 1997 waves of the PSID. To make the analysis as comparable as possible to the HRS results, I restrict the sample to men born in 1924 through 1947, the birth cohorts that the HRS covers. I drop observations where the worker's reported age on the annual PSID file differs by more than one year from the worker's age calculated from the reported birth year in the last file where the worker appears. As with the HRS, I drop workers who have fewer than five nonzero earnings observations. I deflate earnings by the Consumer Price Index. Table A.1 gives summary statistics.

I estimate the model by ordinary least squares using data in levels and in differences. If cointegration of GDP and earnings generates spurious results, the estimates in differences — which cannot be calculated for the HRS due to top-coding — should differ from the estimates in levels. I also create a dataset where I top-code all earnings observations above the 70th percentile of earnings in a given year and estimate a tobit model on this dataset. These results should be similar to the OLS estimates if the tobit model adequately accounts for top-coding.

I weight the workers in two ways. One, I weight each worker by the degrees of freedom in his wage regression, since these degrees of freedom are inversely proportional to the variance of the coefficient estimates for the worker. Two, I multiply the degrees of freedom by the worker's permanent income, calculated as the exponential of the worker's mean log income. The second set of weights cannot be constructed in the HRS due to top-coding.

Table A.2 shows the results for the PSID data. OLS coefficients in levels, OLS coefficients in differences, and tobit coefficients are similar, and all of the unweighted coefficient estimates are similar to the estimates obtained for the HRS. These findings suggest that the HRS results would not have changed much if it had been possible to estimate the model in differences and if there had been no top-coding. Also, the GDP coefficient in the PSID is much larger than one when workers are weighted by regression degrees of freedom, but statistically indistinguishable from one when workers are reweighted by permanent income. These findings support the hypothesis that the HRS coefficients exceed one because the HRS analysis weights workers by regression degrees of freedom rather than by permanent income.

Table A.1: Summary statistics for PSID labor earnings sample.

Variable	mean	s.d.
Variables that are constant for each worker		
Age in 1992	55.0	7.21
Observations on worker	17.8	7.51
Permanent income[a]	23,421	15,985
Variables that change over time		
Age	42.8	8.97
Annual labor income[b]	27,270	24,368
Log(annual income)[b]	9.97	0.76
Number of men	2,002	
Number of observations	35,687	

Male heads of household in PSID born in 1924 through 1947 with at least five nonzero annual labor earnings observations in 1968 through 1997 survey waves. See appendix A of the main paper for additional sample restrictions. [a]Calculated as exponential of time series mean of worker's log income. [b]Deflated by CPI; 1982–1984 dollars.

Table A.2: Regressions of log(real annual labor income) on GDP, male household heads ages 23–61 in PSID.

	(1)	(2)	(3)	(4)
	A. Individual OLS regressions in levels			
coefficient on	2.062	1.374	1.342	1.160
log(GDP)	(0.383)	(0.123)	(0.184)	(0.126)
workers	2,002	2,002	2,002	2,002
	B. Individual OLS regressions in differences			
coefficient on	1.793	1.343	1.388	1.099
log(GDP)	(0.280)	(0.122)	(0.153)	(0.112)
workers	2,002	2,002	2,002	2,002
	C. Individual tobit regressions in levels			
coefficient on	2.210	1.473	1.430	1.121
log(GDP)	(0.501)	(0.264)	(0.345)	(0.322)
workers	1,588	1,588	1,588	1,588
	D. Pooled regressions in differences			
coefficient on	1.314	-	1.090	
log(GDP)	(0.168)	-	(0.197)	
observations	35,687	-	35,687	
workers	2,002	-	2,002	
R-squared	0.005	-	0.006	
weights	None	degrees of freedom	permanent income	perm. inc. * d.f.

Panels A, B, and C show means of coefficients from worker-by-worker regressions of log income (deflated by the CPI) on log GDP (per capita, chained 2000 dollars), with the standard error of the mean in parentheses. Estimates in levels include age and age squared as controls; estimates in differences include age as a control. Panel D shows coefficients from regressions pooling the data on all workers, with heteroskedasticity-robust standard errors adjusted for clustering by year in parentheses; a time trend is included as a control. In panel C, the highest 30 percent of earnings observations in each year were top-coded at the 70th percentile of observed earnings before running the regressions, and workers were dropped if the tobit estimation did not converge.

B Family income, aggregate shocks, and risk preferences in the PSID

This section estimates the elasticity of family income growth to aggregate shocks as a function of risk preferences, using data from the PSID. The PSID data have two advantages. First, top-coding is minimal, so I can difference the data across years. Second, I can examine family income rather than individual labor income; it is valuable to examine family income because this variable is the one I use to measure idiosyncratic shocks in my risk-sharing tests. However, the number of households with risk preference data in the PSID is substantially smaller than the number of workers with risk preference data in the HRS, so my estimates here are much less precise than the estimates using HRS data in the body of the paper. (The sample size would be even smaller if I used individual workers' incomes and preferences.)

The specification I estimate is

$$\Delta \log X_{it} = \pi_{0j} + \pi_{1j} \Delta \log (PCE_t) + \nu_{ijt}, \tag{B.1}$$

where X_{it} is real family money income per adult equivalent as defined in the body of the paper; PCE_t is real, per capita aggregate personal consumption expenditures from the National Income and Product Accounts; and j = low, high indexes risk-tolerance groups. In some specifications, I also control for a time trend with a risk-tolerance-specific coefficient, which is equivalent to controlling for a quadratic trend when the data are in levels.

I measure risk tolerance with the PSID's 1996 supplemental questions on this topic. Only the household's actual respondent (typically the head or spouse) answered the questions, and then only if the respondent was employed at the time. The questions are worded similarly to those in the HRS, and I classify respondents as having high or low risk tolerance according to the same rule as I use in the HRS. I assign to each household the risk tolerance of its 1996 respondent and drop households where no one answered the 1996 risk-tolerance questions. In all other respects, my sample for this analysis is the same as my sample for the risk-sharing tests in section 6 of the paper.

Table B.1 shows the results. The elasticity of family income to aggregate PCE is higher for households with higher risk tolerance. The magnitude of the difference is similar to the difference that I found using earnings data in the HRS; however, the difference here is not statistically significant because the standard errors are quite large. The difference between the groups is robust to controlling for risk-tolerance-specific trends and to using GDP instead of PCE as the aggregate variable. However, if I use aggregate wages and salaries as the aggregate variable, the elasticity is slightly higher for the low-risk-tolerance group (and, as in the other specifications, the difference is not statistically significant).

Table B.1: Pooled regressions of family income growth on growth in aggregate variables in the PSID.

Aggregate variable:	Personal consumption[a]		GDP[a]		Wages/salaries[b]	
	Risk tolerance		Risk tolerance		Risk tolerance	
	low	high	low	high	low	high
			A. No controls for trend			
coefficient on	1.268	1.500	1.205	1.380	1.260	1.200
Δlog(aggregate shock)	(0.347)	(0.377)	(0.310)	(0.336)	(0.359)	(0.296)
			B. With controls for trend			
coefficient on	1.274	1.490	1.206	1.376	1.261	1.215
Δlog(aggregate shock)	(0.351)	(0.377)	(0.311)	(0.335)	(0.354)	(0.298)
observations	10,416	9,456	10,416	9,456	10,416	9,456
households	1,364	1,327	1,364	1,327	1,364	1,327

High-risk-tolerance individuals are those who prefer a job with a fifty-fifty chance of doubling income or of cutting it by 20 percent to a job that pays the respondent's current income for certain. Dependent variable is the first difference of the log of real family money income per adult equivalent, as defined in appendix A of the paper. Standard errors (in parentheses) are clustered by PSID primary sampling units. [a]Per capita, chained 2000 dollars. [b]Per capita, deflated by GDP deflator for personal consumption.

C Technical details and complete parameter estimates for table 1

The models estimated in table 1 are of the form

$$\log(earnings_{it}) = a_i + \pi_{1j} \log(aggregate_t) + \mathbf{x}_{it}' \mathbf{\Pi}_j + u_{jt} + e_{it},$$

where i indexes workers, $j \in \{low, high\}$ indexes risk-tolerance groups, and t indexes years.

I assume:

- The idiosyncratic errors e_{it} are i.i.d. normally distributed across individuals and dates with mean zero and variance $\sigma^2_{e,j}$. Define the precision of e_{it} to be $\tau_{e,j} = 1/\sigma^2_{e,j}$.
- The individual random effects a_i are i.i.d. normally distributed across individuals with mean zero and variance $\sigma^2_{a,j}$. Define $\tau_{a,j} = 1/\sigma^2_{a,j}$.
- The year random effects u_{jt} are i.i.d. normally distributed over years and across the two risk-tolerance groups with mean zero and variance $\sigma^2_{u,j}$. Define $\tau_{u,j} = 1/\sigma^2_{u,j}$. I include the year random effects in case the data are not independent across workers, in the spirit of reporting clustered standard errors in a frequentist framework. In practice, it turns out that the estimated variance of the year random effects is much smaller than that of the individual and idiosyncratic effects and that including year random effects has little influence on the results.

I adopt the following priors:

- Uniform (uninformative) prior for $\mathbf{\Pi}_j$ and π_{1j}.
- $\Gamma(1,1)$ prior for each of $\tau_{a,j}$, $\tau_{e,j}$, and $\tau_{u,j}$. Given the large number of observations, these priors have little influence on the results.

I follow algorithms 10 and 16 in Chib (2001) to obtain draws from the posterior distribution of $\{(\pi_{1j}, \mathbf{\Pi}_j, \tau_{a,j}, \tau_{e,j}, \tau_{u,j})\}_{j=low,high}$, accounting for the fact that earnings are censored at the Social Security taxable maximum. The algorithms employ Gibbs sampling. I run the Gibbs sampler for 2,000 iterations and discard results from the first 1,000 iterations, then report statistics for the remaining 1,000 iterations.

Table 1 contains six blocks of estimates, corresponding to two samples (all men, and white native-born men with a high school education) and three aggregate variables (GDP, personal consumption expenditures, and aggregate wages and salaries). The following six tables report the complete set of estimated parameters for each block. The time variable t is normalized as $year - 1951$.

Reference

Chib, Siddhartha. 2001. "Markov Chain Monte Carlo Methods: Computation and Inference." In *Handbook of Econometrics*, vol. 5, ed. James J. Heckman and Edward Leamer, 3569–649. Amsterdam: Elsevier.

Table C.1: Pooled random-intercept tobit regression of log(real annual earnings) on log(real GDP per capita), all men ages 23–61 in Health and Retirement Study (combined Social Security and W-2 earnings).

	posterior	risk tolerance		
coefficient	statistic	low	high	difference
log(aggregate)	mean	2.624	2.863	0.239
	s.d.	0.054	0.077	0.097
	2.5 percentile	2.521	2.718	0.047
	97.5 percentile	2.728	3.020	0.425
education	mean	0.076	0.082	0.007
	s.d.	0.004	0.005	0.007
	2.5 percentile	0.067	0.072	-0.007
	97.5 percentile	0.084	0.093	0.020
experience	mean	0.084	0.082	-0.002
	s.d.	0.003	0.004	0.004
	2.5 percentile	0.079	0.075	-0.010
	97.5 percentile	0.089	0.089	0.007
experience^2	mean	-0.001	-0.002	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.002	-0.002	0.000
	97.5 percentile	-0.001	-0.001	0.000
white	mean	0.451	0.370	-0.081
	s.d.	0.038	0.053	0.065
	2.5 percentile	0.379	0.271	-0.202
	97.5 percentile	0.527	0.479	0.054
immigrant	mean	0.009	0.145	0.136
	s.d.	0.058	0.075	0.095
	2.5 percentile	-0.104	0.000	-0.058
	97.5 percentile	0.129	0.297	0.316
veteran	mean	-0.027	0.028	0.055
	s.d.	0.031	0.042	0.052
	2.5 percentile	-0.087	-0.054	-0.044
	97.5 percentile	0.033	0.110	0.153
t	mean	-0.029	-0.032	-0.003
	s.d.	0.005	0.007	0.008
	2.5 percentile	-0.038	-0.044	-0.020
	97.5 percentile	-0.019	-0.019	0.013

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Table C.1: Pooled random-intercept tobit regression of log(real annual earnings) on log(real GDP per capita), all men ages 23–61 in Health and Retirement Study (combined Social Security and W-2 earnings).

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	posterior	risk tolerance		
coefficient	statistic	low	high	difference
t^2	mean	-0.001	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.001	-0.001	0.000
	97.5 percentile	-0.001	-0.001	0.000
constant	mean	-17.204	-19.461	-2.256
	s.d.	0.513	0.731	0.910
	2.5 percentile	-18.220	-20.909	-3.960
	97.5 percentile	-16.232	-18.068	-0.476
s.d.(e_{it})	mean	0.838	0.897	0.060
	s.d.	0.003	0.004	0.005
	2.5 percentile	0.832	0.890	0.051
	97.5 percentile	0.843	0.905	0.069
s.d.(u_{jt})	mean	0.201	0.246	0.045
	s.d.	0.024	0.032	0.041
	2.5 percentile	0.160	0.192	-0.035
	97.5 percentile	0.254	0.317	0.133
s.d.(a_i)	mean	0.665	0.720	0.055
	s.d.	0.011	0.014	0.018
	2.5 percentile	0.644	0.692	0.020
	97.5 percentile	0.688	0.749	0.089

Table C.2: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate personal consumption expenditure per capita), all men ages 23–61 in Health and Retirement Study (combined Social Security and W-2 earnings).

	posterior	risk tolerance		
coefficient	statistic	low	high	difference
log(aggregate)	mean	2.485	2.592	0.107
	s.d.	0.066	0.087	0.110
	2.5 percentile	2.353	2.418	-0.110
	97.5 percentile	2.615	2.748	0.328
education	mean	0.075	0.082	0.006
	s.d.	0.004	0.006	0.007
	2.5 percentile	0.067	0.071	-0.007
	97.5 percentile	0.084	0.094	0.021
experience	mean	0.083	0.081	-0.002
	s.d.	0.003	0.004	0.005
	2.5 percentile	0.077	0.074	-0.011
	97.5 percentile	0.088	0.088	0.007
experience^2	mean	-0.001	-0.002	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.002	-0.002	0.000
	97.5 percentile	-0.001	-0.001	0.000
white	mean	0.450	0.371	-0.079
	s.d.	0.038	0.053	0.066
	2.5 percentile	0.375	0.265	-0.209
	97.5 percentile	0.523	0.472	0.049
immigrant	mean	0.005	0.145	0.139
	s.d.	0.060	0.073	0.095
	2.5 percentile	-0.115	-0.004	-0.039
	97.5 percentile	0.121	0.281	0.328
veteran	mean	-0.025	0.030	0.055
	s.d.	0.033	0.043	0.054
	2.5 percentile	-0.086	-0.053	-0.053
	97.5 percentile	0.040	0.116	0.162
t	mean	-0.031	-0.032	-0.001
	s.d.	0.005	0.007	0.008
	2.5 percentile	-0.041	-0.045	-0.017
	97.5 percentile	-0.021	-0.019	0.016

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Table C.2: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate personal consumption expenditure per capita), all men ages 23–61 in Health and Retirement Study (combined Social Security and W-2 earnings).

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	posterior	risk tolerance		
coefficient	statistic	low	high	difference
t^2	mean	-0.001	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.001	-0.001	0.000
	97.5 percentile	-0.001	-0.001	0.000
constant	mean	-14.696	-15.664	-0.968
	s.d.	0.596	0.791	1.000
	2.5 percentile	-15.858	-17.065	-2.934
	97.5 percentile	-13.541	-14.065	1.040
s.d.(e_{it})	mean	0.837	0.897	0.060
	s.d.	0.003	0.004	0.005
	2.5 percentile	0.832	0.889	0.050
	97.5 percentile	0.843	0.905	0.070
s.d.(u_{jt})	mean	0.205	0.249	0.043
	s.d.	0.024	0.030	0.039
	2.5 percentile	0.164	0.196	-0.033
	97.5 percentile	0.259	0.312	0.122
s.d.(a_i)	mean	0.664	0.719	0.054
	s.d.	0.011	0.015	0.018
	2.5 percentile	0.644	0.690	0.017
	97.5 percentile	0.685	0.749	0.092

Table C.3: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate wages and salaries per capita), all men ages 23–61 in Health and Retirement Study (combined Social Security and W-2 earnings).

	posterior	risk tolerance		
coefficient	statistic	low	high	difference
log(aggregate)	mean	2.266	2.578	0.312
	s.d.	0.049	0.070	0.087
	2.5 percentile	2.170	2.434	0.143
	97.5 percentile	2.358	2.716	0.485
education	mean	0.076	0.083	0.007
	s.d.	0.004	0.006	0.007
	2.5 percentile	0.068	0.073	-0.007
	97.5 percentile	0.084	0.094	0.021
experience	mean	0.083	0.081	-0.002
	s.d.	0.002	0.002	0.003
	2.5 percentile	0.079	0.077	-0.007
	97.5 percentile	0.086	0.086	0.004
experience^2	mean	-0.001	-0.002	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.002	-0.002	0.000
	97.5 percentile	-0.001	-0.001	0.000
white	mean	0.452	0.371	-0.081
	s.d.	0.037	0.052	0.062
	2.5 percentile	0.378	0.264	-0.199
	97.5 percentile	0.526	0.471	0.037
immigrant	mean	0.007	0.141	0.134
	s.d.	0.059	0.076	0.096
	2.5 percentile	-0.115	-0.003	-0.061
	97.5 percentile	0.126	0.290	0.310
veteran	mean	-0.026	0.027	0.053
	s.d.	0.029	0.043	0.051
	2.5 percentile	-0.079	-0.055	-0.044
	97.5 percentile	0.033	0.115	0.149
t	mean	-0.033	-0.041	-0.008
	s.d.	0.004	0.006	0.008
	2.5 percentile	-0.042	-0.054	-0.023
	97.5 percentile	-0.025	-0.029	0.007

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Table C.3: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate wages and salaries per capita), all men ages 23–61 in Health and Retirement Study (combined Social Security and W-2 earnings).

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	posterior	risk tolerance		
coefficient	statistic	low	high	difference
t^2	mean	0.000	0.000	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.001	-0.001	0.000
	97.5 percentile	0.000	0.000	0.000
constant	mean	-12.318	-15.027	-2.710
	s.d.	0.444	0.621	0.773
	2.5 percentile	-13.196	-16.235	-4.243
	97.5 percentile	-11.462	-13.737	-1.173
s.d.(e_{it})	mean	0.838	0.898	0.060
	s.d.	0.003	0.004	0.005
	2.5 percentile	0.832	0.891	0.050
	97.5 percentile	0.843	0.905	0.069
s.d.(u_{jt})	mean	0.197	0.242	0.045
	s.d.	0.023	0.033	0.040
	2.5 percentile	0.158	0.190	-0.028
	97.5 percentile	0.246	0.319	0.130
s.d.(a_i)	mean	0.666	0.723	0.057
	s.d.	0.011	0.015	0.019
	2.5 percentile	0.644	0.694	0.019
	97.5 percentile	0.688	0.753	0.092

Table C.4: Pooled random-intercept tobit regression of log(real annual earnings) on log(real GDP per capita), white, U.S.-born men ages 23–61 with exactly 12 years of education in Health and Retirement Study (combined Social Security and W-2 earnings).

	posterior	risk tolerance		
coefficient	statistic	low	high	difference
log(aggregate)	mean	2.474	2.861	0.387
	s.d.	0.101	0.149	0.184
	2.5 percentile	2.275	2.581	0.039
	97.5 percentile	2.662	3.158	0.753
experience	mean	0.066	0.062	-0.005
	s.d.	0.005	0.007	0.009
	2.5 percentile	0.057	0.048	-0.023
	97.5 percentile	0.076	0.077	0.013
experience^2	mean	-0.002	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.002	-0.002	0.000
	97.5 percentile	-0.001	-0.001	0.000
veteran	mean	-0.087	0.070	0.157
	s.d.	0.051	0.078	0.090
	2.5 percentile	-0.188	-0.085	-0.022
	97.5 percentile	0.016	0.223	0.333
t	mean	-0.014	-0.030	-0.016
	s.d.	0.009	0.012	0.015
	2.5 percentile	-0.031	-0.056	-0.047
	97.5 percentile	0.002	-0.007	0.013
t^2	mean	-0.001	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.001	-0.001	0.000
	97.5 percentile	-0.001	0.000	0.001
constant	mean	-14.234	-17.786	-3.553
	s.d.	0.956	1.398	1.735
	2.5 percentile	-16.067	-20.537	-7.045
	97.5 percentile	-12.376	-15.173	-0.248
s.d.(e_{it})	mean	0.780	0.801	0.021
	s.d.	0.005	0.007	0.009
	2.5 percentile	0.770	0.788	0.004
	97.5 percentile	0.790	0.816	0.038

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Table C.4: Pooled random-intercept tobit regression of log(real annual earnings) on log(real GDP per capita), white, U.S.-born men ages 23–61 with exactly 12 years of education in Health and Retirement Study (combined Social Security and W-2 earnings).

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	posterior	risk tolerance		
coefficient	statistic	low	high	difference
s.d.(u_{jt})	mean	0.204	0.222	0.019
	s.d.	0.025	0.034	0.042
	2.5 percentile	0.164	0.170	-0.060
	97.5 percentile	0.264	0.306	0.109
s.d.(a_i)	mean	0.642	0.640	-0.001
	s.d.	0.020	0.029	0.035
	2.5 percentile	0.602	0.582	-0.068
	97.5 percentile	0.683	0.697	0.067

Table C.5: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate personal consumption expenditure per capita), white, U.S.-born men ages 23–61 with exactly 12 years of education in Health and Retirement Study (combined Social Security and W-2 earnings).

	posterior	risk tolerance		
coefficient	statistic	low	high	difference
log(aggregate)	mean	2.356	2.541	0.185
	s.d.	0.134	0.195	0.238
	2.5 percentile	2.082	2.166	-0.265
	97.5 percentile	2.623	2.927	0.663
experience	mean	0.066	0.060	-0.005
	s.d.	0.005	0.008	0.010
	2.5 percentile	0.055	0.044	-0.025
	97.5 percentile	0.075	0.076	0.014
experience^2	mean	-0.002	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.002	-0.002	0.000
	97.5 percentile	-0.001	-0.001	0.001
veteran	mean	-0.088	0.068	0.156
	s.d.	0.053	0.080	0.094
	2.5 percentile	-0.193	-0.092	-0.026
	97.5 percentile	0.013	0.227	0.348
t	mean	-0.018	-0.030	-0.011
	s.d.	0.008	0.013	0.015
	2.5 percentile	-0.035	-0.057	-0.041
	97.5 percentile	-0.004	-0.005	0.020
t^2	mean	-0.001	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.001	-0.001	0.000
	97.5 percentile	-0.001	0.000	0.001
constant	mean	-11.969	-13.540	-1.571
	s.d.	1.222	1.784	2.190
	2.5 percentile	-14.380	-17.091	-5.923
	97.5 percentile	-9.509	-10.165	2.576
s.d.(e_{it})	mean	0.780	0.801	0.021
	s.d.	0.005	0.007	0.009
	2.5 percentile	0.771	0.787	0.004
	97.5 percentile	0.789	0.817	0.038

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Table C.5: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate personal consumption expenditure per capita), white, U.S.-born men ages 23–61 with exactly 12 years of education in Health and Retirement Study (combined Social Security and W-2 earnings).

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	posterior	risk tolerance		
coefficient	statistic	low	high	difference
s.d.(u_{jt})	mean	0.209	0.227	0.018
	s.d.	0.027	0.036	0.046
	2.5 percentile	0.166	0.176	-0.072
	97.5 percentile	0.270	0.323	0.120
s.d.(a_i)	mean	0.643	0.639	-0.004
	s.d.	0.019	0.028	0.035
	2.5 percentile	0.608	0.584	-0.073
	97.5 percentile	0.683	0.695	0.066

Table C.6: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate wages and salaries per capita), white, U.S.-born men ages 23–61 with exactly 12 years of education in Health and Retirement Study (combined Social Security and W-2 earnings).

	posterior	risk tolerance		
coefficient	statistic	low	high	difference
log(aggregate)	mean	2.125	2.445	0.319
	s.d.	0.091	0.139	0.166
	2.5 percentile	1.941	2.178	-0.019
	97.5 percentile	2.299	2.718	0.643
experience	mean	0.066	0.060	-0.006
	s.d.	0.003	0.005	0.006
	2.5 percentile	0.060	0.050	-0.018
	97.5 percentile	0.072	0.070	0.007
experience^2	mean	-0.002	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.002	-0.002	0.000
	97.5 percentile	-0.001	-0.001	0.000
veteran	mean	-0.090	0.064	0.153
	s.d.	0.049	0.074	0.087
	2.5 percentile	-0.182	-0.082	-0.019
	97.5 percentile	0.011	0.210	0.323
t	mean	-0.019	-0.035	-0.016
	s.d.	0.008	0.012	0.014
	2.5 percentile	-0.033	-0.058	-0.043
	97.5 percentile	-0.005	-0.012	0.012
t^2	mean	0.000	0.000	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.001	-0.001	0.000
	97.5 percentile	0.000	0.000	0.001
constant	mean	-9.505	-12.196	-2.691
	s.d.	0.821	1.225	1.468
	2.5 percentile	-11.088	-14.644	-5.588
	97.5 percentile	-7.846	-9.811	0.281
s.d.(e_{it})	mean	0.780	0.802	0.021
	s.d.	0.005	0.007	0.009
	2.5 percentile	0.771	0.788	0.005
	97.5 percentile	0.789	0.817	0.039

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Table C.6: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate wages and salaries per capita), white, U.S.-born men ages 23–61 with exactly 12 years of education in Health and Retirement Study (combined Social Security and W-2 earnings).

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	posterior	risk tolerance		
coefficient	statistic	low	high	difference
s.d.(u_{jt})	mean	0.207	0.223	0.016
	s.d.	0.028	0.034	0.045
	2.5 percentile	0.161	0.172	-0.070
	97.5 percentile	0.272	0.307	0.113
s.d.(a_i)	mean	0.645	0.643	-0.002
	s.d.	0.020	0.031	0.039
	2.5 percentile	0.607	0.583	-0.075
	97.5 percentile	0.687	0.709	0.082

D Allowing individual-specific coefficients in the income process

Equation (14) in the paper is misspecified if workers within a risk-tolerance group have different income processes. To see whether this misspecification biases my estimates, I estimate regressions in which the coefficients differ for each worker:

$$\log\left(earnings_{it}\right) = \pi_{0i} + \pi_{1i}\log\left(PCE_t\right) + \pi_{2i}experience_{it} + \pi_{3i}experience_{it}^2 + \nu_{it}. \tag{D.1}$$

In this specification, the individual-specific intercept π_{0i} absorbs all time-invariant individual characteristics such as education. Since a quadratic in experience is equivalent to a quadratic in time for any given worker, the experience variables now also account for common trends in GDP and earnings, or for differences in rates of time preference that affect job choice. I estimate these regressions by maximum likelihood one worker at a time, using a tobit model to account for censored earnings, and examine the relationship between the estimated parameters and risk preferences in the cross section of workers.

Table D.1 shows the means of the regression coefficients and of the variance of idiosyncratic errors in equation (D.1) for workers with high and low risk tolerance. Allowing the coefficients to vary across workers greatly reduces the precision of the results, but the point estimates tell the same story as the main results in the paper: High-risk-tolerance workers face more aggregate and idiosyncratic risk. The differences in point estimates persist when I use different aggregate variables and when I restrict the sample to white, native-born men with exactly 12 years of education.

Table D.1: Mean parameter estimates from individual tobit regressions of log(real annual earnings) on aggregate variables, men ages 23–61 in Health and Retirement Study.

Aggregate variable:	GDP[a]		Personal consumption[a]		Wages/salaries[b]	
	Risk tolerance		Risk tolerance		Risk tolerance	
Parameter	low	high	low	high	low	high
			A. All men			
coefficient on	1.651	2.034	1.607	1.867	1.320	1.707
log(aggregate shock)	(0.155)	(0.224)	(0.187)	(0.255)	(0.136)	(0.181)
test for difference	$t = 1.41$, $p = 0.08$		$t = 0.82$, $p = 0.21$		$t = 1.71$, $p = 0.04$	
standard deviation of	0.488	0.534	0.485	0.529	0.484	0.529
idiosyncratic error	(0.007)	(0.009)	(0.007)	(0.009)	(0.007)	(0.009)
test for difference	$t = 3.89$, $p = 0.00$		$t = 3.79$, $p = 0.00$		$t = 3.82$, $p = 0.00$	
workers	2,439	1,499	2,422	1,493	2,433	1,492
			B. White, U.S.-born men with exactly 12 years of education			
coefficient on	1.644	2.095	1.438	1.935	1.324	1.501
log(aggregate shock)	(0.277)	(0.414)	(0.323)	(0.479)	(0.230)	(0.345)
test for difference	$t = 0.91$, $p = 0.18$		$t = 0.86$, $p = 0.20$		$t = 0.43$, $p = 0.33$	
standard deviation of	0.434	0.470	0.429	0.468	0.429	0.470
idiosyncratic error	(0.013)	(0.019)	(0.012)	(0.019)	(0.013)	(0.019)
test for difference	$t = 1.61$, $p = 0.05$		$t = 1.71$, $p = 0.04$		$t = 1.80$, $p = 0.04$	
workers	715	330	714	328	714	328

Regressions also control for experience and experience squared. Workers were dropped if tobit estimation did not converge. Means weighted by number of uncensored observations on worker's earnings. Standard error of mean in parentheses. *P*-values are for test of null hypothesis that mean does not depend on risk tolerance, against alternative that mean is higher in high-risk-tolerance group. [a]Per capita, chained 2000 dollars. [b]Per capita, deflated by GDP deflator for personal consumption.

E Estimates using only Social Security earnings

Table 1 in the paper, and sections B and C of this appendix, report estimates of the relationship between preferences and income processes using income data that combine Social Security covered earnings in years before 1980 with W-2 earnings in 1980 and later years. The following tables repeat the analysis using Social Security covered earnings in all years. Table E.1 is equivalent to table 1 in the paper. Table E.2 is equivalent to table D.1 in this appendix. Tables E.3 to E.8 are equivalent to tables C.1 to C.6 in this appendix.

Discussion

The results using Social Security earnings are qualitatively similar to those using the combined earnings series and generally continue to support the hypothesis that more risk-tolerant people have incomes that carry more idiosyncratic and more aggregate risk.

There are a few exceptions. In table E.1, which estimates common coefficients for each risk-tolerance group, personal consumption expenditures have the same effect on the incomes of both groups if the sample is restricted to white, U.S.-born high school graduates. However, personal consumption expenditures have a larger effect on the more risk-tolerant group when considering all men or when estimating a different coefficient for each man (as in table E.2), and other aggregate variables have a larger effect on the more risk-tolerant group in all specifications. Also in table E.1, when the sample is restricted to white, U.S.-born high school graduates, both risk-tolerance groups appear to face the same idiosyncratic risk. However, idiosyncratic risk is larger for the more risk-tolerant group when we consider all men or when we estimate separate coefficients for each man. Finally, the coefficients on the aggregate variable are generally larger when using Social Security earnings than when using the combined earnings series.

Table E.1: Pooled random-intercept tobit regressions of log(real annual earnings) on aggregate variables, men ages 23–61 in Health and Retirement Study (Social Security earnings only).

Aggregate variable:	GDP[a]		Personal consumption[a]		Wages/salaries[b]	
	Risk tolerance		Risk tolerance		Risk tolerance	
Parameter	low	high	low	high	low	high
			A. All men			
coefficient on	2.781	3.018	2.524	2.607	2.478	2.676
log(aggregate shock)	(0.050)	(0.074)	(0.062)	(0.082)	(0.042)	(0.064)
95% CI for difference	$[0.062, 0.418]$		$[-0.110, 0.286]$		$[0.049, 0.343]$	
standard deviation of	0.814	0.895	0.814	0.895	0.814	0.895
idiosyncratic error	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)
95% CI for difference	$[0.072, 0.091]$		$[0.072, 0.090]$		$[0.072, 0.091]$	
observations	67,814	40,058	67,814	40,058	67,814	40,058
			B. White, U.S.-born men with exactly 12 years of education			
coefficient on	2.744	2.980	2.557	2.551	2.368	2.558
log(aggregate shock)	(0.096)	(0.140)	(0.116)	(0.168)	(0.086)	(0.129)
95% CI for difference	$[-0.092, 0.583]$		$[-0.412, 0.421]$		$[-0.111, 0.506]$	
standard deviation of	0.760	0.759	0.760	0.758	0.760	0.759
idiosyncratic error	(0.005)	(0.007)	(0.005)	(0.007)	(0.005)	(0.007)
95% CI for difference	$[-0.018, 0.016]$		$[-0.019, 0.015]$		$[-0.018, 0.015]$	
observations	21,837	9,911	21,837	9,911	21,837	9,911

Regressions also include individual and year random effects and control for experience, experience squared, time trend, time trend squared, and an indicator for veteran status. Regressions in panel A also include years of education and indicators for immigrants and whites. See tables E.3 to E.8 for estimated coefficients on controls. Table shows posterior means of parameters, with posterior standard deviations in parentheses. Figures in square brackets are 2.5th and 97.5th percentiles of the posterior distribution for the difference between low- and high-risk-tolerance groups. [a]Per capita, chained 2000 dollars. [b]Per capita, deflated by GDP deflator for personal consumption.

Table E.2: Mean parameter estimates from individual tobit regressions of log(real annual earnings) on aggregate variables, men ages 23–61 in Health and Retirement Study (Social Security earnings only).

Aggregate variable:	GDP[a]		Personal consumption[a]		Wages/salaries[b]	
	Risk tolerance		Risk tolerance		Risk tolerance	
Parameter	low	high	low	high	low	high
			A. All men			
coefficient on	2.377	2.751	2.315	2.798	1.852	2.234
log(aggregate shock)	(0.156)	(0.225)	(0.190)	(0.260)	(0.134)	(0.191)
test for difference	$t = 1.37$, $p = 0.09$		$t = 1.50$, $p = 0.07$		$t = 1.64$, $p = 0.05$	
standard deviation of	0.484	0.546	0.482	0.542	0.482	0.542
idiosyncratic error	(0.007)	(0.010)	(0.007)	(0.010)	(0.007)	(0.010)
test for difference	$t = 5.18$, $p = 0.00$		$t = 4.99$, $p = 0.00$		$t = 4.97$, $p = 0.00$	
workers	2,234	1,354	2,224	1,355	2,226	1,343
			B. White, U.S.-born men with exactly 12 years of education			
coefficient on	2.528	2.855	2.651	2.773	1.852	2.111
log(aggregate shock)	(0.280)	(0.392)	(0.353)	(0.434)	(0.238)	(0.331)
test for difference	$t = 0.68$, $p = 0.25$		$t = 0.22$, $p = 0.41$		$t = 0.64$, $p = 0.26$	
standard deviation of	0.440	0.465	0.437	0.464	0.437	0.464
idiosyncratic error	(0.013)	(0.018)	(0.013)	(0.018)	(0.013)	(0.018)
test for difference	$t = 1.14$, $p = 0.13$		$t = 1.25$, $p = 0.11$		$t = 1.24$, $p = 0.11$	
workers	658	311	658	307	661	309

Regressions also control for experience and experience squared. Workers were dropped if tobit estimation did not converge. Means weighted by number of uncensored observations on worker's earnings. Standard error of mean in parentheses. *P*-values are for test of null hypothesis that mean does not depend on risk tolerance, against alternative that mean is higher in high-risk-tolerance group. [a]Per capita, chained 2000 dollars. [b]Per capita, deflated by GDP deflator for personal consumption.

Table E.3: Pooled random-intercept tobit regression of log(real annual earnings) on log(real GDP per capita), all men ages 23–61 in Health and Retirement Study (Social Security earnings only).

	posterior	risk tolerance		
coefficient	statistic	low	high	difference
log(aggregate)	mean	2.781	3.018	0.237
	s.d.	0.050	0.074	0.089
	2.5 percentile	2.682	2.872	0.062
	97.5 percentile	2.879	3.168	0.418
education	mean	0.044	0.055	0.012
	s.d.	0.005	0.007	0.008
	2.5 percentile	0.034	0.042	-0.004
	97.5 percentile	0.054	0.068	0.029
experience	mean	0.067	0.069	0.002
	s.d.	0.003	0.004	0.005
	2.5 percentile	0.062	0.062	-0.007
	97.5 percentile	0.072	0.077	0.012
experience^2	mean	-0.001	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.001	-0.002	0.000
	97.5 percentile	-0.001	-0.001	0.000
white	mean	0.485	0.355	-0.130
	s.d.	0.045	0.060	0.072
	2.5 percentile	0.398	0.236	-0.270
	97.5 percentile	0.576	0.469	0.008
immigrant	mean	0.036	0.192	0.157
	s.d.	0.069	0.084	0.108
	2.5 percentile	-0.102	0.028	-0.045
	97.5 percentile	0.173	0.352	0.378
veteran	mean	-0.023	0.040	0.063
	s.d.	0.037	0.050	0.063
	2.5 percentile	-0.096	-0.052	-0.055
	97.5 percentile	0.048	0.140	0.190
t	mean	-0.030	-0.036	-0.006
	s.d.	0.006	0.007	0.009
	2.5 percentile	-0.041	-0.050	-0.024
	97.5 percentile	-0.019	-0.020	0.013

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Table E.3: Pooled random-intercept tobit regression of log(real annual earnings) on log(real GDP per capita), all men ages 23–61 in Health and Retirement Study (Social Security earnings only).

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	posterior	risk tolerance		
coefficient	statistic	low	high	difference
t^2	mean	-0.001	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.001	-0.001	0.000
	97.5 percentile	-0.001	-0.001	0.000
constant	mean	-18.291	-20.551	-2.260
	s.d.	0.483	0.680	0.831
	2.5 percentile	-19.235	-21.882	-3.899
	97.5 percentile	-17.337	-19.237	-0.614
s.d.(e_{it})	mean	0.814	0.895	0.081
	s.d.	0.003	0.004	0.005
	2.5 percentile	0.809	0.887	0.072
	97.5 percentile	0.819	0.903	0.091
s.d.(u_{jt})	mean	0.221	0.254	0.033
	s.d.	0.027	0.033	0.044
	2.5 percentile	0.175	0.200	-0.050
	97.5 percentile	0.280	0.332	0.126
s.d.(a_i)	mean	0.774	0.803	0.030
	s.d.	0.013	0.017	0.021
	2.5 percentile	0.748	0.771	-0.011
	97.5 percentile	0.797	0.836	0.072

Table E.4: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate personal consumption expenditure per capita), all men ages 23–61 in Health and Retirement Study (Social Security earnings only).

	posterior	risk tolerance		
coefficient	statistic	low	high	difference
log(aggregate)	mean	2.524	2.607	0.083
	s.d.	0.062	0.082	0.100
	2.5 percentile	2.410	2.442	-0.110
	97.5 percentile	2.653	2.770	0.286
education	mean	0.043	0.054	0.011
	s.d.	0.005	0.006	0.008
	2.5 percentile	0.033	0.042	-0.005
	97.5 percentile	0.053	0.067	0.027
experience	mean	0.066	0.069	0.003
	s.d.	0.003	0.004	0.005
	2.5 percentile	0.060	0.060	-0.007
	97.5 percentile	0.072	0.077	0.013
experience^2	mean	-0.001	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.001	-0.002	0.000
	97.5 percentile	-0.001	-0.001	0.000
white	mean	0.484	0.355	-0.128
	s.d.	0.044	0.060	0.072
	2.5 percentile	0.399	0.239	-0.276
	97.5 percentile	0.573	0.470	0.014
immigrant	mean	0.030	0.189	0.159
	s.d.	0.074	0.084	0.111
	2.5 percentile	-0.114	0.030	-0.063
	97.5 percentile	0.180	0.360	0.374
veteran	mean	-0.024	0.040	0.064
	s.d.	0.036	0.051	0.063
	2.5 percentile	-0.092	-0.052	-0.056
	97.5 percentile	0.049	0.147	0.184
t	mean	-0.030	-0.032	-0.002
	s.d.	0.006	0.007	0.009
	2.5 percentile	-0.042	-0.047	-0.021
	97.5 percentile	-0.019	-0.018	0.015

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Table E.4: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate personal consumption expenditure per capita), all men ages 23–61 in Health and Retirement Study (Social Security earnings only).

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	posterior	risk tolerance		
coefficient	statistic	low	high	difference
t^2	mean	-0.001	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.001	-0.001	0.000
	97.5 percentile	-0.001	-0.001	0.000
constant	mean	-14.644	-15.426	-0.782
	s.d.	0.566	0.748	0.916
	2.5 percentile	-15.799	-16.959	-2.669
	97.5 percentile	-13.589	-13.962	1.004
s.d.(e_{it})	mean	0.814	0.895	0.081
	s.d.	0.003	0.004	0.005
	2.5 percentile	0.808	0.888	0.072
	97.5 percentile	0.819	0.903	0.090
s.d.(u_{jt})	mean	0.225	0.255	0.030
	s.d.	0.026	0.034	0.042
	2.5 percentile	0.180	0.200	-0.047
	97.5 percentile	0.282	0.332	0.119
s.d.(a_i)	mean	0.773	0.803	0.030
	s.d.	0.012	0.017	0.021
	2.5 percentile	0.749	0.771	-0.012
	97.5 percentile	0.797	0.837	0.071

Table E.5: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate wages and salaries per capita), all men ages 23–61 in Health and Retirement Study (Social Security earnings only).

	posterior	risk tolerance		
coefficient	statistic	low	high	difference
log(aggregate)	mean	2.478	2.676	0.198
	s.d.	0.042	0.064	0.076
	2.5 percentile	2.392	2.555	0.049
	97.5 percentile	2.556	2.800	0.343
education	mean	0.044	0.056	0.012
	s.d.	0.005	0.006	0.008
	2.5 percentile	0.034	0.045	-0.004
	97.5 percentile	0.055	0.068	0.028
experience	mean	0.066	0.069	0.003
	s.d.	0.002	0.003	0.003
	2.5 percentile	0.063	0.064	-0.004
	97.5 percentile	0.070	0.074	0.009
experience^2	mean	-0.001	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.001	-0.002	0.000
	97.5 percentile	-0.001	-0.001	0.000
white	mean	0.487	0.354	-0.132
	s.d.	0.044	0.060	0.077
	2.5 percentile	0.398	0.234	-0.283
	97.5 percentile	0.571	0.474	0.020
immigrant	mean	0.031	0.192	0.161
	s.d.	0.071	0.089	0.115
	2.5 percentile	-0.106	0.015	-0.065
	97.5 percentile	0.171	0.362	0.392
veteran	mean	-0.024	0.040	0.064
	s.d.	0.037	0.049	0.061
	2.5 percentile	-0.098	-0.057	-0.050
	97.5 percentile	0.046	0.137	0.184
t	mean	-0.035	-0.041	-0.005
	s.d.	0.005	0.007	0.008
	2.5 percentile	-0.045	-0.054	-0.022
	97.5 percentile	-0.025	-0.027	0.011

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Table E.5: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate wages and salaries per capita), all men ages 23–61 in Health and Retirement Study (Social Security earnings only).

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	posterior	risk tolerance		
coefficient	statistic	low	high	difference
t^2	mean	0.000	0.000	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.001	-0.001	0.000
	97.5 percentile	0.000	0.000	0.000
constant	mean	-13.788	-15.562	-1.774
	s.d.	0.383	0.571	0.678
	2.5 percentile	-14.528	-16.728	-3.041
	97.5 percentile	-12.989	-14.443	-0.434
s.d.(e_{it})	mean	0.814	0.895	0.082
	s.d.	0.003	0.004	0.005
	2.5 percentile	0.809	0.887	0.072
	97.5 percentile	0.819	0.903	0.091
s.d.(u_{jt})	mean	0.208	0.241	0.032
	s.d.	0.026	0.033	0.041
	2.5 percentile	0.166	0.188	-0.046
	97.5 percentile	0.265	0.314	0.120
s.d.(a_i)	mean	0.776	0.806	0.030
	s.d.	0.013	0.017	0.022
	2.5 percentile	0.751	0.775	-0.012
	97.5 percentile	0.802	0.840	0.071

Table E.6: Pooled random-intercept tobit regression of log(real annual earnings) on log(real GDP per capita), white, U.S.-born men ages 23–61 with exactly 12 years of education in Health and Retirement Study (Social Security earnings only).

	posterior	risk tolerance		
coefficient	statistic	low	high	difference
log(aggregate)	mean	2.744	2.980	0.236
	s.d.	0.096	0.140	0.169
	2.5 percentile	2.546	2.719	-0.092
	97.5 percentile	2.933	3.259	0.583
experience	mean	0.060	0.053	-0.007
	s.d.	0.005	0.007	0.009
	2.5 percentile	0.050	0.038	-0.024
	97.5 percentile	0.069	0.068	0.010
experience^2	mean	-0.001	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.002	-0.002	0.000
	97.5 percentile	-0.001	-0.001	0.000
veteran	mean	-0.094	0.008	0.102
	s.d.	0.061	0.087	0.104
	2.5 percentile	-0.210	-0.158	-0.097
	97.5 percentile	0.022	0.176	0.309
t	mean	-0.021	-0.037	-0.016
	s.d.	0.009	0.014	0.017
	2.5 percentile	-0.038	-0.064	-0.047
	97.5 percentile	-0.004	-0.009	0.017
t^2	mean	-0.001	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.001	-0.001	0.000
	97.5 percentile	-0.001	0.000	0.001
constant	mean	-16.774	-18.811	-2.037
	s.d.	0.907	1.318	1.605
	2.5 percentile	-18.575	-21.432	-5.155
	97.5 percentile	-14.907	-16.416	1.117
s.d.(e_{it})	mean	0.760	0.759	-0.001
	s.d.	0.005	0.007	0.009
	2.5 percentile	0.751	0.745	-0.018
	97.5 percentile	0.770	0.773	0.016

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Table E.6: Pooled random-intercept tobit regression of log(real annual earnings) on log(real GDP per capita), white, U.S.-born men ages 23–61 with exactly 12 years of education in Health and Retirement Study (Social Security earnings only).

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	posterior	risk tolerance		
coefficient	statistic	low	high	difference
s.d.(u_{jt})	mean	0.220	0.253	0.033
	s.d.	0.030	0.043	0.055
	2.5 percentile	0.174	0.190	-0.069
	97.5 percentile	0.289	0.367	0.151
s.d.(a_i)	mean	0.739	0.710	-0.028
	s.d.	0.024	0.032	0.039
	2.5 percentile	0.691	0.651	-0.100
	97.5 percentile	0.785	0.775	0.044

Table E.7: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate personal consumption expenditure per capita), white, U.S.-born men ages 23–61 with exactly 12 years of education in Health and Retirement Study (Social Security earnings only).

	posterior	risk tolerance		
coefficient	statistic	low	high	difference
log(aggregate)	mean	2.557	2.551	-0.006
	s.d.	0.116	0.168	0.207
	2.5 percentile	2.314	2.238	-0.412
	97.5 percentile	2.781	2.880	0.421
experience	mean	0.059	0.052	-0.007
	s.d.	0.005	0.008	0.009
	2.5 percentile	0.048	0.036	-0.025
	97.5 percentile	0.069	0.067	0.011
experience^2	mean	-0.001	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.002	-0.002	0.000
	97.5 percentile	-0.001	-0.001	0.000
veteran	mean	-0.093	0.010	0.103
	s.d.	0.062	0.087	0.106
	2.5 percentile	-0.217	-0.168	-0.110
	97.5 percentile	0.028	0.184	0.315
t	mean	-0.023	-0.031	-0.008
	s.d.	0.009	0.014	0.016
	2.5 percentile	-0.041	-0.058	-0.040
	97.5 percentile	-0.005	-0.004	0.023
t^2	mean	-0.001	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.001	-0.001	0.000
	97.5 percentile	0.000	0.000	0.001
constant	mean	-13.784	-13.591	0.193
	s.d.	1.070	1.527	1.892
	2.5 percentile	-15.833	-16.537	-3.749
	97.5 percentile	-11.584	-10.701	3.856
s.d.(e_{it})	mean	0.760	0.758	-0.002
	s.d.	0.005	0.007	0.009
	2.5 percentile	0.750	0.744	-0.019
	97.5 percentile	0.770	0.772	0.015
s.d.(u_{jt})	mean	0.223	0.251	0.028

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Table E.7: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate personal consumption expenditure per capita), white, U.S.-born men ages 23–61 with exactly 12 years of education in Health and Retirement Study (Social Security earnings only).

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	posterior	risk tolerance		
coefficient	statistic	low	high	difference
	s.d.	0.031	0.037	0.047
	2.5 percentile	0.172	0.193	-0.061
	97.5 percentile	0.293	0.334	0.133
s.d.(a_i)	mean	0.738	0.708	-0.030
	s.d.	0.023	0.031	0.038
	2.5 percentile	0.698	0.650	-0.103
	97.5 percentile	0.784	0.773	0.049

Table E.8: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate wages and salaries per capita), white, U.S.-born men ages 23–61 with exactly 12 years of education in Health and Retirement Study (Social Security earnings only).

	posterior	risk tolerance		
coefficient	statistic	low	high	difference
log(aggregate)	mean	2.368	2.558	0.190
	s.d.	0.086	0.129	0.159
	2.5 percentile	2.202	2.316	-0.111
	97.5 percentile	2.536	2.822	0.506
experience	mean	0.058	0.051	-0.007
	s.d.	0.003	0.005	0.006
	2.5 percentile	0.051	0.041	-0.020
	97.5 percentile	0.065	0.061	0.005
experience^2	mean	-0.001	-0.001	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.002	-0.002	0.000
	97.5 percentile	-0.001	-0.001	0.000
veteran	mean	-0.094	0.010	0.104
	s.d.	0.059	0.082	0.100
	2.5 percentile	-0.216	-0.156	-0.092
	97.5 percentile	0.023	0.166	0.297
t	mean	-0.022	-0.038	-0.015
	s.d.	0.009	0.012	0.015
	2.5 percentile	-0.040	-0.062	-0.045
	97.5 percentile	-0.006	-0.014	0.013
t^2	mean	0.000	0.000	0.000
	s.d.	0.000	0.000	0.000
	2.5 percentile	-0.001	-0.001	0.000
	97.5 percentile	0.000	0.000	0.001
constant	mean	-11.662	-13.150	-1.488
	s.d.	0.775	1.159	1.443
	2.5 percentile	-13.180	-15.527	-4.384
	97.5 percentile	-10.107	-11.012	1.337
s.d.(e_{it})	mean	0.760	0.759	-0.001
	s.d.	0.005	0.007	0.009
	2.5 percentile	0.750	0.745	-0.018
	97.5 percentile	0.769	0.773	0.015

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Table E.8: Pooled random-intercept tobit regression of log(real annual earnings) on log(real aggregate wages and salaries per capita), white, U.S.-born men ages 23–61 with exactly 12 years of education in Health and Retirement Study (Social Security earnings only).

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	posterior	risk tolerance		
coefficient	statistic	low	high	difference
s.d.(u_{jt})	mean	0.215	0.244	0.029
	s.d.	0.030	0.040	0.048
	2.5 percentile	0.168	0.186	-0.065
	97.5 percentile	0.282	0.340	0.134
s.d.(a_i)	mean	0.740	0.710	-0.029
	s.d.	0.023	0.030	0.038
	2.5 percentile	0.697	0.655	-0.107
	97.5 percentile	0.785	0.770	0.047

F Alternative definitions of consumption and households

This section examines how the results of the risk-sharing tests in tables 2 and 3 change when I:

- Use total income and consumption instead of per-adult-equivalent income and consumption.
- Define a new household only when the head or spouse changes, instead of when any household member changes.

Table F.1 gives summary statistics for all variables and for both definitions of a household. Table F.2 reports results parallel to table 2 for four combinations of variables and household definitions: total variables, head/spouse change; total variables, any change; adult-equivalent variables, head/spouse change; and adult-equivalent variables, any change (as in table 2). In all cases, allowing heterogeneity reduces the coefficient on income; the reduction is statistically significant except when I examine adult-equivalent variables and define a new household only when the head or spouse changes. Regardless of assumptions about preferences, using total income and consumption or defining a new household only when the head or spouse changes tends to raise the coefficient on income relative to that reported in table 2.

Tables F.3 and F.4 report results parallel to table 3 for the four combinations of variables and household definitions. The overidentifying restrictions are frequently rejected in the models that assume common preferences, suggesting that these models are misspecified. (However, the overidentifying restrictions are not rejected for the baseline case of adult-equivalent variables and a new household when any household member changes, as reported in table 3.) The overidentifying restrictions are never rejected when heterogeneity in both risk and time preferences is allowed. Allowing heterogeneity in time preferences affects the coefficient on income more than allowing heterogeneity in risk preferences. Depending on the definition of a household, the adjustment for household size and whether I allow nonseparability between consumption and leisure, the elasticity of consumption with respect to income ranges from 0.195 to 0.545 when I assume common preferences. The elasticity ranges from -0.013 to 0.141 when I allow heterogeneity in time preferences, from 0.072 to 0.524 when I allow heterogeneity in risk preferences, and from -0.086 to 0.163 when I allow heterogeneity in both time and risk preferences. There is no clear pattern in how allowing nonseparability between consumption and leisure affects the results. Defining a new household if any household member changes tends to reduce the coefficient on income.

Table F.1: Summary statistics for PSID consumption and income sample.

	New household definition			
	New head/spouse		Any change	
Variable	mean	s.d.	mean	s.d.
annual food consumption[a]	4026	2300	3840	2271
log(annual food consumption)[a]	8.14	0.59	8.09	0.61
adult equivalent food consumption[a,b]	2139	1183	2200	1206
log(adult equivalent food consumption)[a,b]	7.55	0.49	7.58	0.49
annual income net of transfers[c]	33542	32910	32053	33103
log(annual income net of transfers)[c]	10.09	0.98	10.03	0.98
adult equivalent annual income net of transfers[b,c]	17952	18700	18357	19695
log(adult equivalent annual income net of transfers)[b,c]	9.50	0.92	9.52	0.90
head's annual hours not at work	7036	1050	7150	1092
log(head's annual hours not at work)	8.85	0.15	8.86	0.15
Observations	60,820		42,740	
Households	5,677		5,489	
Years of data per household:				
mean	10.7		7.8	
minimum	4		4	
25th percentile	6		5	
median	8		7	
75th percentile	14		9	
maximum	22		22	

PSID core sample households with data on head's work hours, family money income, and food consumption in at least four consecutive years. [a]Deflated by food and beverages component of CPI; 1982–1984 dollars. [b]See equivalence scale in table A.3 of the main paper; scaled so adjustment factor is 1 for a man age 21 to 35 living alone. [c]Deflated by CPI.

Table F.2: Factor model estimates of the effect of income on consumption after controlling for aggregate shocks.

	log(consumption)							
	New household definition							
	New head/spouse				Any change			
	A. Total consumption data							
log(income)	0.305	0.150	0.147	0.148	0.199	0.132	0.106	0.100
95% CI	(0.261, 0.345)	(0.116, 0.187)	(0.115, 0.184)	(0.098, 0.193)	(0.160, 0.225)	(0.077, 0.187)	0.057, 0.144)	(0.021, 0.128)
95% CI for diff. from common prefs.	-	(-0.203, -0.129)	(-0.194, -0.129)	(-0.198, -0.120)	-	(-0.103, -0.019)	(-0.122, -0.063)	(-0.150, -0.056)
	B. Per adult equivalent consumption data							
log(income)	0.151	0.141	0.141	0.144	0.161	0.129	0.105	0.092
95% CI	(0.121, 0.190)	(0.108, 0.177)	(0.112, 0.179)	(0.107, 0.178)	(0.119, 0.193)	(0.073, 0.184)	(0.056, 0.144)	(0.005, 0.115)
95% CI for diff. from common prefs.	-	(-0.042, 0.022)	(-0.038, 0.026)	(-0.048, 0.031)	-	(-0.067, 0.010)	(-0.082, -0.028)	(-0.129, -0.033)
Heterogeneity:								
risk aversion	no	yes	no	yes	no	yes	no	yes
time preference	no	no	yes	yes	no	no	yes	yes

Equal-tailed 95% confidence intervals are computed using 79 bootstrap samples. To allow for correlation across households and over time within each of the 119 PSID primary sampling units, the bootstrap samples are constructed by drawing PSUs with replacement from the original sample.

Table F.3: GMM estimates of the effect of income on consumption after controlling for aggregate shocks, if a new household is defined when the head or spouse changes.

	log(consumption)							
	A. Total consumption data							
log(income)	0.339	0.545	0.046	0.141	0.203	0.524	0.105	0.066
	(0.018)	(0.036)	(0.021)	(0.044)	(0.036)	(0.056)	(0.027)	(0.045)
log(leisure)	-	0.324	-	0.0427	-	0.393	-	-0.057
		(0.004)		(0.003)		(0.006)		(0.003)
Test of overidentifying restrictions:								
χ^2	56.9	37.2	42.0	53.3	37.5	50.8	39.6	35.8
d.f.	31	30	31	30	31	30	31	30
p	0.003	0.170	0.090	0.005	0.197	0.010	0.139	0.215
	B. Per adult equivalent consumption data							
log(income)	0.275	0.195	0.025	-0.001	0.397	0.470	0.097	0.163
	(0.019)	(0.037)	(0.023)	(0.046)	(0.053)	(0.063)	(0.027)	(0.050)
log(leisure)	-	-0.112	-	0.036	-	0.352	-	0.123
		(0.003)		(0.003)		(0.004)		(0.003)
Test of overidentifying restrictions:								
χ^2	41.0	43.8	31.9	29.3	46.4	46.5	38.0	33.4
d.f.	31	30	31	30	31	30	31	30
p	0.108	0.050	0.420	0.504	0.038	0.028	0.182	0.307
Heterogeneous risk preference	no	no	no	no	yes	yes	yes	yes
Heterogeneous time preference	no	no	yes	yes	no	no	yes	yes

Standard errors (in parentheses) and test statistics are robust to heteroskedasticity and to correlation across households and over time within each of the 119 PSID primary sampling units.

Table F.4: GMM estimates of the effect of income on consumption after controlling for aggregate shocks, if a new household is defined when any family member changes.

	log(consumption)							
	A. Total consumption data							
log(income)	0.330	0.349	0.035	0.054	0.072	0.498	0.047	-0.070
	(0.023)	(0.037)	(0.025)	(0.053)	(0.032)	(0.083)	(0.031)	(0.066)
log(leisure)	-	0.053	-	0.125	-	0.648	-	-0.148
		(0.004)		(0.006)		(0.016)		(0.007)
Test of overidentifying restrictions:								
χ^2	59.7	48.8	23.4	42.3	50.3	40.2	31.8	32.1
d.f.	31	30	31	30	31	30	31	30
p	0.001	0.017	0.833	0.068	0.016	0.101	0.425	0.364
	B. Per adult equivalent consumption data							
log(income)	0.283	0.234	-0.001	-0.013	0.345	0.123	0.053	-0.086
	(0.023)	(0.041)	(0.026)	(0.055)	(0.047)	(0.076)	(0.029)	(0.068)
log(leisure)	-	-0.104	-	-0.079	-	0.083	-	-0.165
		(0.005)		(0.006)		(0.014)		(0.007)
Test of overidentifying restrictions:								
χ^2	26.1	37.5	27.4	35.4	35.6	29.0	37.6	30.3
d.f.	31	30	31	30	31	30	31	30
p	0.716	0.162	0.652	0.228	0.259	0.516	0.192	0.449
Heterogeneous risk preference	no	no	no	no	yes	yes	yes	yes
Heterogeneous time preference	no	no	yes	yes	no	no	yes	yes

Standard errors (in parentheses) and test statistics are robust to heteroskedasticity and to correlation across households and over time within each of the 119 PSID primary sampling units.

G An alternative definition of the leisure variable

In this section, I examine the robustness of the results to including the spouse's leisure time in calculating the leisure variable for couple-headed households. For single-headed households, the leisure variable is defined as before: 8,760 (the number of hours in a year) minus the head's hours worked. For couple-headed households, the leisure variable is defined as 17,520 (the number of hours for two people in a year) minus the head's and spouse's hours worked, all divided by two. This definition scales the leisure variable such that a couple-household in which both head and spouse work H hours has the same leisure as a single-headed household in which the head works H hours; in other words, it measures leisure per capita.

Table G.1 reports summary statistics for the new variable. Tables G.2, G.3, and G.4 report results parallel to tables F.2, F.3, and F.4 using the alternative definition of leisure.

Table G.1: Summary statistics for alternative leisure variable in PSID.

	New household definition			
	New head/spouse		Any change	
Variable	mean	s.d.	mean	s.d.
head, spouse annual hours not at work per capita	7389	841	7457	883
log(head, spouse annual hours not at work per capita)	8.90	0.11	8.91	0.12
Observations	60,820		42,740	
Households	5,677		5,489	

PSID core sample households with data on head's work hours, family money income, and food consumption in at least four consecutive years.

Table G.2: Factor model estimates of the effect of income on consumption after controlling for aggregate shocks, using alternative leisure variable.

	log(consumption)							
	New household definition							
	New head/spouse				Any change			
	A. Total consumption data							
log(income)	0.225	0.096	0.091	0.097	0.197	0.105	0.083	0.089
95% CI	(0.193, 0.249)	(0.063, 0.126)	(0.063, 0.121)	(0.056, 0.122)	(0.162, 0.223)	(0.063, 0.138)	0.045, 0.113)	(0.037, 0.118)
95% CI for diff. from common prefs.	-	(-0.158, -0.103)	(-0.161, -0.107)	(-0.162, -0.091)	-	(-0.122, -0.057)	(-0.140, -0.086)	(-0.144, -0.071)
	B. Per adult equivalent consumption data							
log(income)	0.128	0.105	0.104	0.113	0.142	0.097	0.081	0.087
95% CI	(0.101, 0.159)	(0.076, 0.130)	(0.077, 0.130)	(0.086, 0.140)	(0.106, 0.169)	(0.057, 0.130)	(0.046, 0.113)	(0.038, 0.108)
95% CI for diff. from common prefs.	-	(-0.044, 0.005)	(-0.042, -0.001)	(-0.044, 0.018)	-	(-0.071, -0.012)	(-0.087, -0.038)	(-0.094, -0.019)
Heterogeneity:								
risk aversion	no	yes	no	yes	no	yes	no	yes
time preference	no	no	yes	yes	no	no	yes	yes

Equal-tailed 95% confidence intervals are computed using 79 bootstrap samples. To allow for correlation across households and over time within each of the 119 PSID primary sampling units, the bootstrap samples are constructed by drawing PSUs with replacement from the original sample.

Table G.3: GMM estimates of the effect of income on consumption after controlling for aggregate shocks, if a new household is defined when the head or spouse changes, using alternative leisure variable.

	log(consumption)							
	A. Total consumption data							
log(income)	0.212	0.229	0.039	0.053	0.295	0.569	0.102	0.223
	(0.018)	(0.036)	(0.021)	(0.064)	(0.031)	(0.051)	(0.024)	(0.097)
log(leisure)	-	0.133	-	-0.148	-	0.807	-	0.277
		(0.008)		(0.016)		(0.012)		(0.038)
Test of overidentifying restrictions:								
χ^2	92.2	49.6	22.6	33.6	40.6	30.3	36.0	34.5
d.f.	31	30	31	30	31	30	31	30
p	0.000	0.014	0.865	0.296	0.117	0.451	0.245	0.262
	B. Per adult equivalent consumption data							
log(income)	0.197	0.126	-0.001	0.027	0.249	0.628	0.108	0.204
	(0.018)	(0.039)	(0.022)	(0.065)	(0.032)	(0.059)	(0.025)	(0.118)
log(leisure)	-	-0.194	-	-0.149	-	0.795	-	0.287
		(0.009)		(0.015)		(0.013)		(0.065)
Test of overidentifying restrictions:								
χ^2	26.7	39.4	20.9	21.9	37.1	32.4	36.8	31.1
d.f.	31	30	31	30	31	30	31	30
p	0.685	0.118	0.915	0.858	0.209	0.347	0.218	0.408
Heterogeneous risk preference	no	no	no	no	yes	yes	yes	yes
Heterogeneous time preference	no	no	yes	yes	no	no	yes	yes

Standard errors (in parentheses) and test statistics are robust to heteroskedasticity and to correlation across households and over time within each of the 119 PSID primary sampling units.

Table G.4: GMM estimates of the effect of income on consumption after controlling for aggregate shocks, if a new household is defined when any family member changes, using alternative leisure variable.

	log(consumption)							
	A. Total consumption data							
log(income)	0.229	0.285	0.042	0.013	0.218	0.616	0.092	0.341
	(0.019)	(0.042)	(0.026)	(0.058)	(0.034)	(0.094)	(0.029)	(0.156)
log(leisure)	-	0.113	-	-0.006	-	0.895	-	0.553
		(0.013)		(0.015)		(0.042)		(0.082)
Test of overidentifying restrictions:								
χ^2	66.7	53.4	21.3	33.1	57.5	30.0	28.5	21.9
d.f.	31	30	31	30	31	30	31	30
p	0.000	0.005	0.904	0.319	0.003	0.464	0.596	0.859
	B. Per adult equivalent consumption data							
log(income)	0.241	0.185	0.040	0.055	0.311	0.626	0.087	0.344
	(0.020)	(0.044)	(0.026)	(0.059)	(0.038)	(0.107)	(0.030)	(0.158)
log(leisure)	-	-0.187	-	-0.139	-	0.964	-	0.560
		(0.013)		(0.015)		(0.050)		(0.084)
Test of overidentifying restrictions:								
χ^2	22.5	30.1	24.9	33.9	45.7	28.3	28.4	22.1
d.f.	31	30	31	30	31	30	31	30
p	0.867	0.458	0.773	0.286	0.043	0.553	0.600	0.849
Heterogeneous risk preference	no	no	no	no	yes	yes	yes	yes
Heterogeneous time preference	no	no	yes	yes	no	no	yes	yes

Standard errors (in parentheses) and test statistics are robust to heteroskedasticity and to correlation across households and over time within each of the 119 PSID primary sampling units.