README for "Estimating Discount Functions with Consumption Choices over the Lifecycle"[1]

Overview

This package provides Matlab and Stata code to produce the results in the article.

Data Availability and Provenance Statements

- Survey of Consumer Finances (SCF)
  - The SCF data is downloaded directly in the code. Data can also be manually downloaded from https://www.federalreserve.gov/econres/scfindex.htm
  - For replication, please see the important note on dataset updates below.
- Panel Study of Income Dynamics (PSID)
  - The PSID data can be downloaded from https://simba.isr.umich.edu/Zips/ZipMain.aspx. An account must be created to access the data. Download the Main Study Family files from 1982-1991, the Cross-year Individual file, and the Parent Identification file.
  - The PSID state codes can be found in https://psidonline.isr.umich.edu/data/Documentation/PSIDStateCodes.pdf.
  - Our replication package provides a scrambled pseudo-data set.
    - Our pseudo-data set maintains the same set of variable names as the original data set, but redraws each variable randomly and then keeps only the first 10 observations.
    - For replication, please see the important note on dataset updates below.
- IPUMS USA
  - The IPUMS USA data can be downloaded from https://usa.ipums.org/usa-action/variables/group. An account must be created to access the data. Select the following samples for download: 2001-2014 ACS, 2000 5%, 1990 5% state, 1980 5% state. Select the following harmonized variables and name the resulting file as usa_00003.dta.
    - Household. Technical: YEAR, SERIAL, HHWT, HHTYPE, CLUSTER. Geographic: STATEFIP. Group quarters: GQ. Economic characteristics: FARM, HHINCOME. Household composition: NFAMS, NCOUPLES.
    - Person. Technical: PERNUM, PERWT. Family interrelationship: FAMSIZE, NCHILD, SPLOC, SPRULE. Demographic: RELATE, SEX, AGE. Education: SCHOOL, EDUC. Work: EMPSTAT, CLASSWKR. Income: FTOTINC, INCBUS, INCBUS00, INCFARM.
  - Our replication package provides a scrambled pseudo-data set.

[1] We are very grateful to Santiago Medina Pizarro for outstanding assistance in producing this replication package.

        - Our pseudo-data set maintains the same set of variable names as the original data set, but redraws each variable randomly and then keeps only the first 10 observations.
        - For replication, please see the important note on dataset updates below.
- Federal Reserve Economic Data (FRED)
    - Data can be obtained from https://fred.stlouisfed.org/. Copies are provided as part of this archive for replication purposes. The specific series used in each of the provided files are:
        - CPIAUCSL.xls: CPIAUCSL (monthly).
        - national_unemployment.xls: UNRATENSA (annual).
        - census9_unemployment.xls: CNEWURN, CMATURN, CSATURN, CESCURN, CWSCURN, CENCURN, CWNCURN, CMTNURN, CPACURN (annual each).
        - ReturnCalculations_FRED.xls: AAA (monthly), TERMCBCCALLNS (monthly), CPIAUCSL_PCA (monthly), TTLHH (annual).
- Bureau of Labor Statistics (BLS)
    - The BLS unemployment data can be obtained from https://data.bls.gov/cgi-bin/dsrv?la#. We use statewide data for all states for the period 1976-2015. The specific series we download are: 03 unemployment rate, 04 unemployment, 05 employment, and 06 labor force (each series seasonally and non-seasonally adjusted). A copy is provided as part of this archive for replication purposes.
    - The BLS state codes can be found in https://download.bls.gov/pub/time.series/sm/sm.state.
- NBER Taxsim
    - The NBER Taxsim data is downloaded directly in the code. This data contains information about the income-tax liabilities of SCF households. Data can also be manually downloaded from https://taxsim.nber.org/to-taxsim/scf27-32/byhousehold/dta
- Social Security Administration (SSA)
    - Data on historical death probabilities for males and females was downloaded from the SSA. Data can be downloaded from https://www.ssa.gov/oact/HistEst/Death/2023/DeathProbabilities2023.html. A copy is provided as part of this archive for replication purposes.
- American Bankruptcy Institute (ABI)
    - Data on US Consumer Bankruptcies comes from the following document from the American Bankruptcy Institute: https://abi-org.s3.amazonaws.com/Newsroom/Bankruptcy_Statistics/Total-Business-Consumer1980-Present.pdf. A copy of the yearly time-series is provided for replication purposes as a data column in the file ReturnCalculations_manual.csv.
- **IMPORTANT NOTE ON DATASET UPDATES**
    - Data from the SCF, PSID, IPUMS USA, and BLS has all been updated since our data was originally downloaded. *Accordingly, users should expect that the first- and second-stage estimates reported in our paper will deviate slightly from those subsequently calculated using prevailing data.*

Dataset List

Data file (ParameterAndMoments\...)	**Source**	**Provided**
IPUMS\data\CPIAUCSL.xls	FRED	Yes
IPUMS\data\usa_00003.dta	IPUMS USA	Pseudo-data set only (see download details above)
PSID\data\CPIAUCSL.xls	FRED	Yes
PSID\data\blsstatecodes.txt	BLS	Yes
PSID\data\stateuerates_all.csv	BLS	Yes
PSID\data\psidstatecodes.txt	PSID	Yes
PSID\data\fam1982.dta - PSID\data\fam1991.dta	PSID	Pseudo-data set only (see download details above)
PSID\data\ind2015er.dta	PSID	Pseudo-data set only
PSID\data\pid15.dta	PSID	Pseudo-data set only
SCF\data\SCFData\ *(various 1995-2013 data sets)*	SCF	Code will download
SCF\data\NBERTaxsim\ *(various 1995-2013 data sets)*	NBER	Code will download
SCF\data\national_unemployment.xls	FRED	Yes
SCF\data\census9_unemployment.xls	FRED	Yes
SCF\data\CPIAUCSL.xls	FRED	Yes
DeathProbs\data\DeathProbsE_F_Hist_TR2023.csv	SSA	Yes
DeathProbs\data\DeathProbsE_F_Hist_TR2023.xlsx	SSA	Yes
DeathProbs\data\DeathProbsE_M_Hist_TR2023.csv	SSA	Yes
DeathProbs\data\DeathProbsE_M_Hist_TR2023.xlsx	SSA	Yes
InterestRateCalibration\ReturnCalculations_FRED.xls	FRED	Yes
InterestRateCalibration\ReturnCalculations_manual.csv	ABI and Census Bureau	Yes

Computational Requirements

The Matlab and Stata code used to generate the results in the article are uploaded to the repository.

Software Requirements

- Matlab (code was run on the Harvard FASRC Cluster)
- Stata (code was run with Stata 18 MP)

Memory and Runtime Requirements

- Stata: This code was run on a laptop with 16GB of RAM.
    - Census/ACS data processing and analysis: ~20 minutes
    - PSID data processing and analysis: ~30 minutes
    - SCF data processing and analysis (without data download): ~30 minutes
- Matlab:
    - Because estimation and standard-error calculation requires many iterations of the underlying model, estimation was run on the Harvard FAS Research Computing Environment.
    - On a laptop with 16GB of RAM:
        - Producing a single simulation of the model using the solution parameters takes ~ 10 minutes.

Description of Matlab and Stata Programs

[Empirics] Run ParameterAndMoments/main.do in Stata. This code executes multiple Stata do-files that estimate the first-stage parameters and second-stage moments. It will run the following do-files in the presented order:

- Census/ACS code (*dataset not provided*):
    1. ParameterAndMoments/IPUMS/code/1_census_demographics.do. This code processes the IPUMS USA data, restricts it to the sample of interest, and saves it as ParameterAndMoments/IPUMS/data/census_demographics_${educationGroup}.dta. It then obtains first-stage parameters of household demographics for the equations governing the number of dependent adults and children in the household.
- PSID code (*dataset not provided*):
    1. ParameterAndMoments/PSID/code/1_mergepsid.do. This code joins the PSID data from multiple waves and merges it with other databases from BLS and FRED. It saves the output data as ParameterAndMoments/IPUMS/data/analysispsid.dta.
    2. ParameterAndMoments/PSID/code/2_builddata.do. This code uses the processed PSID dataset and defines income and demographic variables. It saves the output data as ParameterAndMoments/IPUMS/data/psid_clean.dta.
    3. ParameterAndMoments/PSID/code/3_firststageregs_bs.do. This code uses the previous dataset, imposes sample restrictions, and estimates the first-stage parameters of the income process. It also bootstraps the results and stores the residuals of the income process. It saves the output in the folder ParameterAndMoments/PSID/output.
    4. ParameterAndMoments/PSID/code/4_averageUnemp.do. This code calculates the unemployment rate for each education group (to be used in the typical-household adjustment in the SCF code). It saves the output as ParameterAndMoments/PSID/output/averageUnemp.log.
- SCF code
    1. ParameterAndMoments/SCF/code/1_scf_download.do. This code downloads the required SCF datasets and saves them in the folder ParameterAndMoments/SCF/data/SCFData. It also downloads the NBER Taxsim datasets and saves them in the folder ParameterAndMoments/SCF/data/NBERTaxsim. It then merges all the SCF and NBER Taxsim databases. It saves the output as ParameterAndMoments/SCF/data/SCFData/scfallyears_merged.dta.
    2. ParameterAndMoments/SCF/code/2_buildmoments.do. This code uses the previous dataset and adds demographic, income, credit card, and wealth variables that will be used to calculate the second-stage moments. It saves the output as ParameterAndMoments/SCF/data/SCFData/scfallyears_withmoments.dta.

3. ParameterAndMoments/SCF/code/3_scfanalysis_withCondMoments_bs.do. This code uses the previous database to construct the second-stage credit card and wealth moments with the typical-household adjustment. It also calculates their standard errors. It saves the output in the folder ParameterAndMoments/SCF/output.
4. ParameterAndMoments/SCF/code/4_initialwealth.do. This code uses the database scfallyears_withmoments.dta to calculate initial wealth measures to be seeded into the lifecycle model. It saves the output in the folder ParameterAndMoments/SCF/output.
5. ParameterAndMoments/SCF/code/5_examinecredlimits.do. This code uses the database scfallyears_withmoments.dta to estimate the first-stage parameters of the credit limit equation. It also calculates their standard errors. It saves the output in the folder ParameterAndMoments/SCF/output.
6. Note: the SCF code assumes that the data file alpha_bootstrap.csv already exists. We provide it as part of this package, and it can also be produced by running the code ParameterAndMoments/SCF/code/generateAlphaBootstrap.m.

[Empirics; Clean Up] Run the following Matlab files to finish the empirical estimation.

- Run ParameterAndMoments/main.m in Matlab. This code estimates the parameters of the first-stage AR(1) process that governs the residuals of the income process. Then, it calculates the VCV of the first-stage parameters and of the second-stage moments. Finally, it exports all estimates and their VCVs to Matlab data files. It saves the output in the folder LifecycleSimulation/input/. This code executes the following separate Matlab m-files to perform the described actions.
    1. ParameterAndMoments/PSID/code/calcVCV_FirstStage.m. This file estimates the parameters of the first-stage AR(1) process that governs the residuals of the income process. It also calculates the VCV of the first-stage parameters of the income process.
    2. ParameterAndMoments/PSID/code/resallfe.m. This file estimates the parameters of the AR(1) process.
    3. ParameterAndMoments/SCF/code/calcVCV_SecondStage.m. This file calculates the VCV of the first-stage parameters of the credit limit process. It also calculates the VCV of the second-stage moments.
- Run ParameterAndMoments/InterestRateCalibration/Rcalculations.m. This file uses the data inside ParameterAndMoments/InterestRateCalibration to calculate the values of R and Rcc that are used in the model.

[Model] Run LifecycleSimulation/code/EDFbatch_baseline.m. This code allows the user to solve the lifecycle model under the baseline assumptions and to specify alternative ones. To solve the model, this code executes the following separate Matlab m-files.

- LifecycleSimulation/code/main/FirstStageParams.m. This code imports the first-stage parameter estimates and their VCV matrices, stored in the folder LifecycleSimulation/input/. It also uses the SSA historical death probabilities to calculate survival rates from ages 20 to 90.

- LifecycleSimulation/code/main/SecondStageMoments.m. This code imports the second-stage moment estimates and their VCV matrices, stored in the folder LifecycleSimulation/input/.
- LifecycleSimulation/code/main/LifecycleSim.m. This code simulates the lifecycle model, i.e. it calculates simulated moments of consumption-saving decisions for a certain combination of first-stage parameters, preference parameters (beta, delta, rho), and other assumptions. This code executes the following separate Matlab m-files to perform the described actions:
    1. LifecycleSimulation/code/main/LifecycleSim_BackwardInduct.m. This code performs backward induction to derive policy rules.
    2. LifecycleSimulation/code/main/LifecycleSim_ForwardIter.m. This code simulates multiple labor income profiles and uses the policy functions calculated in the previous code to simulate the corresponding consumption-saving profiles.
- LifecycleSimulation/code/main/MSMfunction.m. This code performs the Method of Simulated Moments (MSM) to estimate the preference parameters (beta, delta, rho) and their standard errors, for a certain combination of first-stage and second-stage parameters, and other assumptions. To do so, it executes the code LifecycleSimulation/code/main/LifecycleSim.m. multiple times.

Instructions to Replicators

Empirics and corresponding Stata code.

- The code is set up so that running "ParameterAndMoments/main.do" will produce (most of) our first-stage parameters and second-stage moments for the high-school education group.[2]
    - As discussed above, we do not provide the PSID or IPUMS data. This data must be downloaded before main.do can be fully run.
    - See text above for a description of the relevant codes that are called by main.do.
    - As described above, to wrap up the empirical estimation, end by running:
        i. ParameterAndMoments/main.m
        ii. ParameterAndMoments/InterestRateCalibration/Rcalculations.m
- To produce first-stage parameters and second-stage moments for other education groups (Appendix Table F3), the global "educationgroup" can be changed:
    - (1 = completed high school, 2 = some high school, 3 = completed college).

[2] For researchers who want to extend our PSID analysis, note that the way our winsorization procedure was implemented inadvertently included a minor level of household double-counting. We examined robustness, and found that this affects income by an average of only $72/year. We also reestimated our model under this reestimated income process, which resulted in comparable benchmark estimates of (beta, delta, rho) = (0.5308, 0.9890, 1.9129). For researchers who want to use our code but do not want to double-count households, we recommend adding the command "sort id year" between lines 291 and 292 of the code 3_firststageregs_bs.do.

Structural model and corresponding Matlab code.

Instructions Part 1: Basic Replication of Lifecycle Simulations

- The code is set up so that running "LifecycleSimulation/code/EDFbatch_baseline.m" will produce the benchmark Present Bias case in Table 3.
    - The simulated moments reported in the bottom half of Table 3 are stored in the variable "LifecycleOut.simMoments".
    - To also calculate standard errors (which requires additional runtime since the model must be re-solved for each parameter perturbation), change "msm_estimation = 0" to "msm_estimation = 1" in line 111.
- Similarly, the code is set up so that running "LifecycleSimulation/code/EDFbatch_baseline_exp.m" will produce the benchmark Exponential case in Table 3.
- **A Note on Rounding**
    - When transcribing the output from our model into the tables in the paper, we often rounded the model output to 5 digits, and then rounded that output again to generate the numbers in the paper's tables. This occasionally leads to minor deviations relative to rounding the raw model output directly.

Instructions Part 2: Basic Replication of Figures

- "LifecycleSimulation/code/EDFbatch_grid.m" computes a 3D grid of lifecycle simulation results on ranges of values for beta, delta, and rho. Computation was done on the Harvard FAS Research Computing Environment. After parallelizing the runs across multiple cores, the results are aggregated back to form a grid and saved as "LifecycleSimulation/output/simulations/EDFgridsearch_All.mat".
- To produce Figure 1, run "LifecycleSimulation/code/EDFout_figure1.m".
- To produce Figure 2, run "LifecycleSimulation/code/EDFout_figure2.m".
    - For Appendix Figure 4, use the output from the exponential run instead.
- To produce Figure 3, run "LifecycleSimulation/code/EDFout_figure3.m".

Instructions Part 3: Full Estimation of Benchmark Model (Section 4)

- As noted above, because estimation and standard-error calculation requires many iterations of the underlying model, estimation was run on the Harvard FAS Research Computing Environment.
    - We provide output for our estimates in the folder LifecycleSimulation/output/simulations.
    - We always start the MSM estimation from a variety of different starting points. The initial starting points reported in the code and in this readme (below) are the ones that converge to the point of best fit.
- As noted above, to estimate our Benchmark Present-Bias Case, run the file "LifecycleSimulation/code/EDFbatch_baseline.m" with "msm_estimation = 1" in line 111
    - The final parameters that the model converges to are stored in the variable "MSMout.optprefs".
    - The corresponding q value is stored in the variable "MSMout.optq".

- To estimate our Benchmark Exponential Case, run the file "LifecycleSimulation/code/EDFbatch_exp.m" with "msm_estimation = 1" in line 111

Instructions Part 4: Full Estimation of Robustness Cases (Section 5)

- To estimate the alternative specifications in Table 4:
  - Set the "moment_use" variable in lines 80-85 of the baseline code
  - Set "run_name" in line 114 and "p0" in line 133 to
    - Column 2: "table4_noborr1" / [0.54 0.981 1.90]
    - Column 3: "table4_noborr2" / [0.30 0.993 1.75]
    - Column 4: "table4_nowealth1" / [0.75 0.970 1.75]
    - Column 5: "table4_nowealth2" / [0.25 0.994 2.00]
    - Column 6: "table4_noborr12" / [0.53 0.982 2.25]
    - Column 7: "table4_nowealth12" / [0.54 0.981 1.90]
- To produce Tables D1 and D2:
  - Run the file "LifecycleSimulation/code/EDFout_AGSsensitivity.m"
- To estimate the alternative specifications in Table E1:
  - Set the last item of the "matchdbr" variable to 0 in line 140 of the baseline code
  - Set "run_name" in line 114 and "p0" in line 133 to
    - Column 1: "tableE1_rho0pt5" / [0.425 0.987 0.50]
      "tableE1_exp_rho0pt5" / [1.00 0.961 0.50]
    - Column 2: "tableE1_rho1" / [0.350 0.992 1.00]
      "tableE1_ exp_rho1" / [1.00 0.950 1.00]
    - Column 3: "tableE1_rho2" / [0.575 0.967 2.00]
      "tableE1_ exp_rho2" / [1.00 0.956 2.00]
    - Column 4: "tableE1_rho3" / [0.575 0.967 3.00]
      "tableE1_ exp_rho3" / [1.00 0.965 3.00]
- To estimate the alternative specifications in Table E2:
  - Set the "intrates" variable in line 52 of the baseline code
  - Set "run_name" in line 114 and "p0" in line 133 to
    - Column 2: "tableE2_R_low" / [0.675 0.978 1.20]
      "tableE2_exp_R_low" / [1.00 0.955 1.00]
    - Column 3: "tableE2_R_high" / [0.750 0.975 1.00]
      "tableE2_ exp_R_high" / [1.00 0.945 1.25]
    - Column 4: "tableE2_RCC_low" / [0.725 0.980 1.75]
      "tableE2_ exp_RCC_low" / [1.00 0.945 1.25]
    - Column 5: "tableE2_RCC_high" / [0.725 0.980 1.75]
      "tableE2_ exp_RCC_high" / [1.00 0.972 2.00]
    - Column 6: "tableE2_gamma_low" / [0.350 0.992 0.75]
      "tableE2_exp_gamma_low" / [1.00 0.940 2.10]
    - Column 7: "tableE2_gamma_high" / [0.575 0.967 2.25]
      "tableE2_ exp_gamma_high" / [1.00 0.967 1.05]
- To estimate the alternative specifications in Table E3:
  - Column 2:

        - Set “split_income_at_retirement = 1” in line 46
        - Set “run_name” in line 114 and “p0” in line 133 to
            - “tableE3_splitIncome” / [0.300 0.995 2.50]
              “tableE3_exp_splitIncome” / [1.00 0.969 1.30]
    - Column 3:
        - Set “income_var_multiplier = [2 2]” in line 47
        - Set “run_name” in line 114 and “p0” in line 133 to
            - “tableE3 _IncomeVar” / [0.375 0.989 2.25]
              “tableE3_exp_IncomeVar” / [1.00 0.965 1.15]
    - Column 4:
        - Set “income_auto9 = 1” in line 48
        - Set “run_name” in line 114 and “p0” in line 133 to
            - “tableE3 _psi9” / [0.375 0.989 2.25]
              “tableE3_exp_psi9” / [1.00 0.940 2.10]
    - Column 5:
        - Set “income_auto9revall = 1” in line 49
        - Set “run_name” in line 114 and “p0” in line 133 to
            - “tableE3 _psi9Full” / [0.550 0.989 1.30]
              “tableE3_exp_psi9Full” / [1.00 0.958 1.50]
- To estimate the alternative specifications in Table E4:
    - Column 2:
        - Set “zilliq = 1” in line 40
        - Set “run_name” in line 114 and “p0” in line 133 to
            - “tableE4_IlliqZ” / [0.675 0.978 1.20]
              “tableE4_exp_IlliqZ” / [1.00 0.958 1.50]
    - Column 3:
        - Set “sqrtscale = 1” in line 41
        - Set “run_name” in line 114 and “p0” in line 133 to
            - “tableE4_sqrtscale” / [0.550 0.989 1.30]
              “tableE4_exp_sqrtscale” / [1.00 0.960 1.65]
    - Column 4:
        - Set “alpha = 0.5*1.25” in line 39
        - Set “run_name” in line 114 and “p0” in line 133 to
            - “tableE4_beq125” / [0.550 0.989 1.30]
              “tableE4_exp_beq125” / [1.00 0.940 2.10]
    - Column 5:
        - Set “alpha = 0.5*0.75” in line 39
        - Set “run_name” in line 114 and “p0” in line 133 to
            - “tableE4_beq75” / [0.750 0.975 1.00]
              “tableE4_exp_beq75” / [1.00 0.965 1.15]
    - Column 6:
        - Set “mortalityn = 1” in line 42
        - Set “run_name” in line 114 and “p0” in line 133 to
            - “tableE4_pmort” / [0.750 0.975 1.00]

"tableE4_exp_pmort" / [1.00 0.970 1.40]

- Column 7:
  - Set "initwseed = 1" in line 43
  - Set "run_name" in line 114 and "p0" in line 133 to
    - "tableE4_noSeed" / [0.550 0.989 1.30]
      "tableE4_exp_noSeed" / [1.00 0.967 1.05]

- To estimate the alternative specifications in Table E5:
  - Set the "weighting" variable in line 92 of the baseline code
  - Set "run_name" in line 114 and "p0" in line 133 to
    - Column 2: "tableE5_Identity" / [0.525 0.988 1.80]
      "tableE5_exp_Identity" / [1.00 0.965 1.15]
    - Column 3: "tableE5_FullVCV" / [0.350 0.992 0.75]
      "tableE5_ exp_FullVCV" / [1.00 0.930 1.50]
    - Column 4: "tableE5_OptW" / [0.425 0.967 0.75]
      "tableE5_ exp_OptW" / [1.00 0.975 1.30]
- To estimate the alternative specifications in Table E6:
  - Set "intrates = KV" in line 52 of the baseline code
  - Set "run_name" in line 114, "p0" in line 133, and "kv_wgt" in line 74 to
    - Column 1: "tableE6_KV0" / [0.46 0.989 1.90] / 0
    - Column 2: "tableE6_KV25" / [0.40 0.991 1.25] / 0.25
    - Column 3: "tableE6_KV50" / [0.54 0.981 1.90] / 0.50
    - Column 4: "tableE6_KV75" / [0.55 0.980 0.80] / 0.75
    - Column 5: "tableE6_KV100" / [0.55 0.980 0.80] / 1
    - Column 6: "tableE6_KV100_exp" / [1.00 0.970 1.75] / 1
- To produce Appendix Figure 5, run "LifecycleSimulation/code/EDFout_figure5.m"
- To produce Appendix Figure 6, run "LifecycleSimulation/code/EDFout_figure6.m"
  - Note that the grids required for this figure are computed using "LifecycleSimulation/code/EDFbatch_grid.m" with interest rates calibrated differently. The grid outputs are stored in "LifecycleSimulation/simulations/figure6/".
- To estimate the alternative specifications in Table E7:
  - Set "intrates = R_gamma_expectation" in line 52 of the baseline code
  - Set "run_name" in line 114, "p0" in line 133, and "R_gamma_perceived" in line 70 to
    - Column 2: "tableE7_exp_70" / [1.00 0.937 2.00] / 1.07
    - Column 3: "tableE7_exp_100" / [1.00 0.965 1.15] / 1.10

Instructions Part 4: Full Estimation of Extension Cases (Section 6)

- To estimate the alternative specifications in Table F1:
  - "LifecycleSimulation/code/EDFbatch_tableF1.m" computes a 2D grid of lifecycle simulation results on ranges of values for delta and rho. Computation was done on the Harvard FAS Research Computing Environment. After parallelizing the runs across multiple cores, the results are aggregated back to form a grid and

saved as "LifecycleSimulation/output/simulations/tableF1/EDFbatch_tableF1_All.mat".
    - Then run "LifecycleSimulation/code/EDFout_heterogeneity.m"
- To estimate the alternative specifications in Table F2:
    - Set "setup.naif = 0" in line 35
    - Set the last item of the "matchdbr" variable to 0 in line 140 of the baseline code
    - Set "run_name" in line 114 and "p0" in line 133 to
        - Column 1: "tableF2_rho0pt5" / [0.750 0.975 0.50]
        - Column 2: "tableF2_rho1" / [0.600 0.990 1.00]
        - Column 3: "tableF2_rho2" / [0.500 0.973 2.00]
        - Column 4: "tableF2_rho3" / [0.750 0.975 3.00]
- To estimate the alternative specifications in Table F3:
    - Column 1:
        - Set "setup.educ = somehs" in line 23 of the baseline code
        - Set "run_name = tableF3_somehs" in line 114
        - Set "dchi = 1/10" in line 144[3]
        - Set "p0 = [0.575 0.967 2.25]" in line 133
    - Column 3:
        - Set "setup.educ = compco" in line 23 of the baseline code
        - Set "run_name = tableF3_compco" in line 114
        - Set "p0 = [0.600 0.990 1.60]" in line 133

[3] We use a smaller parameter perturbation value for the "somehs" group to maintain numerical stability.

Data References

American Bankruptcy Institute, Annual Business and Non-Business Filings by Year; https://abi-org.s3.amazonaws.com/Newsroom/Bankruptcy_Statistics/Total-Business-Consumer1980-Present.pdf.

Board of Governors of the Federal Reserve Board, Survey of Consumer Finances; https://www.federalreserve.gov/econres/scfindex.htm.

Board of Governors of the Federal Reserve System (US), Commercial Bank Interest Rate on Credit Card Plans, All Accounts [TERMCBCCALLNS], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/TERMCBCCALLNS.

Moody's, Moody's Seasoned Aaa Corporate Bond Yield [AAA], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/AAA.

National Bureau of Economic Research, Taxsim Supplement to the Survey of Consumer Finances; https://taxsim.nber.org/to-taxsim/scf27-32/.

Panel Study of Income Dynamics, public use dataset. Produced and distributed by the Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, MI.

Ruggles, S., J. T. Alexander, K. Genadek, R. Goeken, M. B. Schroeder, and M. Sobek. 2010. Integrated Public Use Microdata Series: Version 5.0. Minneapolis, MN: Minnesota Population Center.

Social Security Administration, Probabilities of Death; https://www.ssa.gov/oact/HistEst/Death/2023/DeathProbabilities2023.html.

U.S. Bureau of Labor Statistics, Consumer Price Index for All Urban Consumers: All Items in U.S. City Average [CPIAUCSL], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/CPIAUCSL.

U.S. Bureau of Labor Statistics, Unemployment Rate [UNRATENSA], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/UNRATENSA.

U.S. Bureau of Labor Statistics, Unemployment Rate in Each Census Division [see descriptors above], retrieved from FRED, Federal Reserve Bank of St. Louis.

U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics; https://data.bls.gov/cgi-bin/dsrv?la#.

U.S. Census Bureau, Total Households [TTLHH], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/TTLHH.