

The Risk of Investing in College under Alternative Bankruptcy Regime

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A Technical Appendix

A.1 Computational Procedure

1. Using backward induction, I solve for the optimal decision rules for each education choice. For all three education paths, these choices include optimal time allocation for human capital/work and savings. In addition, on the college path I solve for the optimal repaying decisions. Also, I solve for these optimal choices for the period after college separately for college graduates and college dropouts, then account for the risk of dropping out from college at the end of period 4 and compute the optimal choices during college periods; finally, at the beginning of period 1 I compute the optimal loan amount for college students. To calculate the optimal decision rules, I set a grid on learning ability, initial human capital, and initial assets (a, h, x) and compute life-cycle profiles of human capital, hours, and earnings from these grid points.
2. Given the optimal decision rules, I compute the stream of earnings for the two education groups from the model using appropriate parameters values. I also solve for optimal college enrollment for every (a, h, x) combination in the state space.
3. I choose the initial distribution of the state variable to best replicate the properties of U.S. data documented in the paper. I find the parameter vector, $\gamma = (\mu_a, \sigma_a, \mu_h, \sigma_h, \rho)$, that characterizes the joint initial distribution for high school agents so as to minimize the distance between the model and the data (CPS) statistics for earnings mean, dispersion, and skewness. To recover the joint (a,h) distribution for high-school graduates, I use the earnings for the two education groups and the optimal enrollment decision computed in step 2 and the exogenous initial assets distribution.
4. I simulate the economy and find the correlation between assets and ability and human capital to deliver enrollment and completion rates across income groups consistent with empirical findings.

A.2 Description of Codes

There are several codes to solve the model and deliver the results in the paper.¹ Most of the codes are written in C and some of them in Matlab. They are grouped in 3 categories: 1) codes that deliver the main results in the paper and the distribution of initial characteristics together with necessary auxiliary codes (in Matlab); 2) codes that are used to solve for the no college path, which deliver the earnings profiles for the no college group to be used in the codes in part 1 (in C); and 3) codes that are used to solve for the college path, which deliver the earnings profiles for the college group to be used in the codes in part 1 (in C).

A.2.1 Codes for the initial distribution and the main results in the paper (in Matlab)

This part describes the use of the following codes: *main_enrollment.m*, *distributing_step3_colnocol.m*, *simulation_default.m*, *simulation_earnings.m*. These codes use the following auxiliary codes: *Markov.m*, *chooserandom.m*, *objfct.m* (used for finding the joint distribution of (a,h), *Prob-compl.m* (computes the probability to complete college), *Earnings_proc.m* and *Rates_proc.m* (deliver the stochastic process for earnings and interest rates).

1. All the codes in this section are run from *main_enrollment.m*. This code also solves for the optimal enrollment decision.
2. The code *distribfind_step3_colnocol.m* delivers the joint distribution of ability and human capital together with the fit of the model relative to the data earnings statistics presented in the paper in Section 3.3. This represents step 3 in the computation algorithm described previously. This code uses simulated earnings profiles for agents in the model that are delivered using codes on both the college and the no college paths presented separately below. It also uses the earnings statistics (mean, skewness, and gini) from the CPS data for high school graduates, *data_ALL_CPS2.mat* (attached). The code needs the *objfct.m* file.
3. The code *simulation_default.m* pins down the correlation between assets and ability and human capital in the benchmark economy in step 4 in the computation algorithm. This codes delivers the following results presented in the paper: college enrollment and completion percentages by initial characteristics (human capital, ability, and assets) in the benchmark economy and in the reorganization regime; the analysis of the implications of alternative specification of the correlations between initial characteristics; averages of hu-

¹Codes are available upon request.

man capital and ability by the three education groups in both economies; default rates and characteristics of defaulters vs non-defaulters in the two bankruptcy regimes.

4. The code *simulation_earnings.m* delivers earnings profiles for the three education groups in the benchmark economy and in the reorganization system and the code *simulation_default* delivers life-cycle earnings of defaulters versus non-defaulters in the two economies. It also delivers the earnings profiles of defaulters vs non-defaulters and college graduates vs dropouts.

To run this part, intermediary steps are needed (steps 1 and 2 in the computation algorithm). The codes needed for these two steps are described below for each path.

A.2.2 No college path codes (in C)

This part describes the use of the following 3 codes: *main_nc.c*, *hchoice_step1_nc.c*, and *earnings_step2_nc.c*. The functions used in these codes are declared in header-files (.h) and written in the .c files. Also the parameters used in this part are declared in *parameters.h* and some extra functions are defined in *mathematics.c*, *extrafunctions.c* and *matlabextra.c*; the last one saves and loads Matlab data files .mat

1. All the codes in this section are run from *main_nc.c*.
2. The code *hchoice_step1_nc.c* solves for the optimal decision rules on the no college path on the grid of learning ability, initial human capital, and initial assets (a, h, x). This is part of step 1 in the computation algorithm.
3. The file *earnings_step2_nc.c* computes life-cycle profiles of human capital, hours, and earnings from the grid points for an extracted number of points in the initial grids. This is part of the step 2 in the computation algorithm. This code delivers the earnings for the no college group used in *distribfind_step3_colnocol.m* and *main_enrollment.m*.

A.2.3 College path codes (in C)

This part describes the use of the following codes: *main_cg.m*, *hchoice_step1_pp_cg.c*, *hchoice_step1_pp_cd.c*, *Rep_cg.c*, *Rep_cd.c*, *DEF_R_cg.c*, *DEF_L_cg.m*, *DEF_R_cd.c*, *DEF_L_cd.c*, *hchoice_step1_R_cg.c*, *hchoice_step1_R_cd.c*, *hchoice_step1_L_cg.c*, *hchoice_step1_L_cd.c*, *hchoice_step1_college.c*, and *dhchoice_step1_5.c*, *earnings_step2_c.c*, and *earnings_step2_L.c.c*. As before, functions used in these codes are declared in headerfiles (.h) and written in the .c files. Also the parameters used in this part are declared in *parameters.h* and some extra functions are defined in *mathematics.c*, *extrafunctions.c* and *matlabextra.c*; the last one saves and loads Matlab data files .mat

1. All the codes in this section are run from *main_cg.c*
2. The codes *hchoice_step1_pp_cg.c*, *hchoice_step1_pp_cd.c*, *Rep_cg.c*, *Rep_cd.c*, *DEF_R_cg.c*, *DEF_L_cg.c*, *DEF_R_cd.c*, *DEF_L_cd.c*, *hchoice_step1_R_cg.c*, *hchoice_step1_R_cd.c*, *hchoice_step1_L_cg.c*, *hchoice_step1_L_cd.c*, *hchoice_step1.c*, and *dhchoice_step1_5.c*. solve for the optimal decision rules on the college path on the grid of learning ability, initial human capital, and initial assets (a, h, x) for both college graduates and dropouts. This is part of step 1 in the computation algorithm, which involves several sub steps:
 - (a) for post-payment I use *hchoice_step1_pp_cg.c* and *hchoice_step1_pp_cd.c* for the two education groups.
 - (b) for payment periods during post-college I solve for each repayment status, each education group under both regimes: *Rep_cg.c*, *Rep_cd.c*, *DEF_R_cg.c*, *DEF_L_cg.c*, *DEF_R_cd.c*, *DEF_L_cd.c*.
 - (c) given decision rules for each repayment status, I aggregate the results and choose the optimal repayment status as long as the agent does not choose to default using *hchoice_step1_L_cg.c* and *hchoice_step1_L_cd.c* for the liquidation system (the benchmark economy) and using *hchoice_step1_R_cg.c* and *hchoice_step1_R_cd.c* for reorganization for college graduates and dropouts respectively.
 - (d) for the college period, optimal choices are computed in *hchoice_step1_college.c*, except for the first period, which is done separately in *dhchoice_step1_5.c*. The former code incorporates the risk of failing from college and the latter also computes the loan amount given for the grid points. Note that both these codes can be adjusted to deliver the debt and the relevant choices associated with that debt level, in both bankruptcy environments (instructions on this are included in the file).
 - An important observation is that all these codes are run in parallel for a restricted set of ability levels to economize on time.
3. The files *earnings_step2_R.c.m* and *earnings_step2_L.c.m* compute life-cycle profiles of human capital, hours, and earnings from the grid points for an extracted number of points in the initial grids for the benchmark economy (liquidation) and for reorganization system, respectively. This is part of the step 2 in the computation algorithm. This code delivers the earnings for the college group used in *distribfind_step3_colnocol.m* and *main_enrollment.m*.