

period 2, and that the annuity is actuarially fair, so that if the agent spends X on an annuity in period 1, the present discounted value of the income flows he receives in periods 2 and 3 will sum to X . Show that the period 1 agent can use an annuity to implement his preferred, full-commitment allocation, and solve for the optimal allocation of savings between annuities and other assets in period 1.

- (c) Would your answer to part (b) change if agents could borrow against future income?

Q2
Halt. w. wage

Question 2. Suppose that firms in the economy are subject to idiosyncratic technology shocks and that there are frictions to reallocating labor across production sites. For simplicity, suppose this is modeled with the following assumptions. There is a unit mass of consumer-workers distributed over two types of production sites. Each operating production site has one worker. All newly created production sites yield output Y^H . All existing sites are subject to an adverse productivity shock that reduces their productivity to Y^L where $Y^H > Y^L$. Let the fraction of high productivity sites be given by H_t . Each period a fraction σ_t of the high productivity sites suffer adverse shocks that cause them to revert to a low productivity status (where σ_t is random variable that is potentially serially correlated). Let the cost of creating a new site be represented by worker mobility costs. In particular, assume that it takes one period to reallocate a worker from one production site (during this period the reallocating worker is "unemployed" and cannot produce). Let preferences for the representative household be given by:

Unit Mass
Number =
fraction

$$\sum_{t=0}^{\infty} \beta^t A_t U(C_t)$$

Aggregate shock demand shock

where $\beta < 1$ is the discount factor, A_t is a (common) taste shock (potentially serially correlated), and C_t is consumption. Initially assume that households can completely pool against idiosyncratic risk and that all product and factor markets perfectly clear so that the model can be solved as a social planner/representative agent problem where the social planner maximizes utility subject to the constraints:

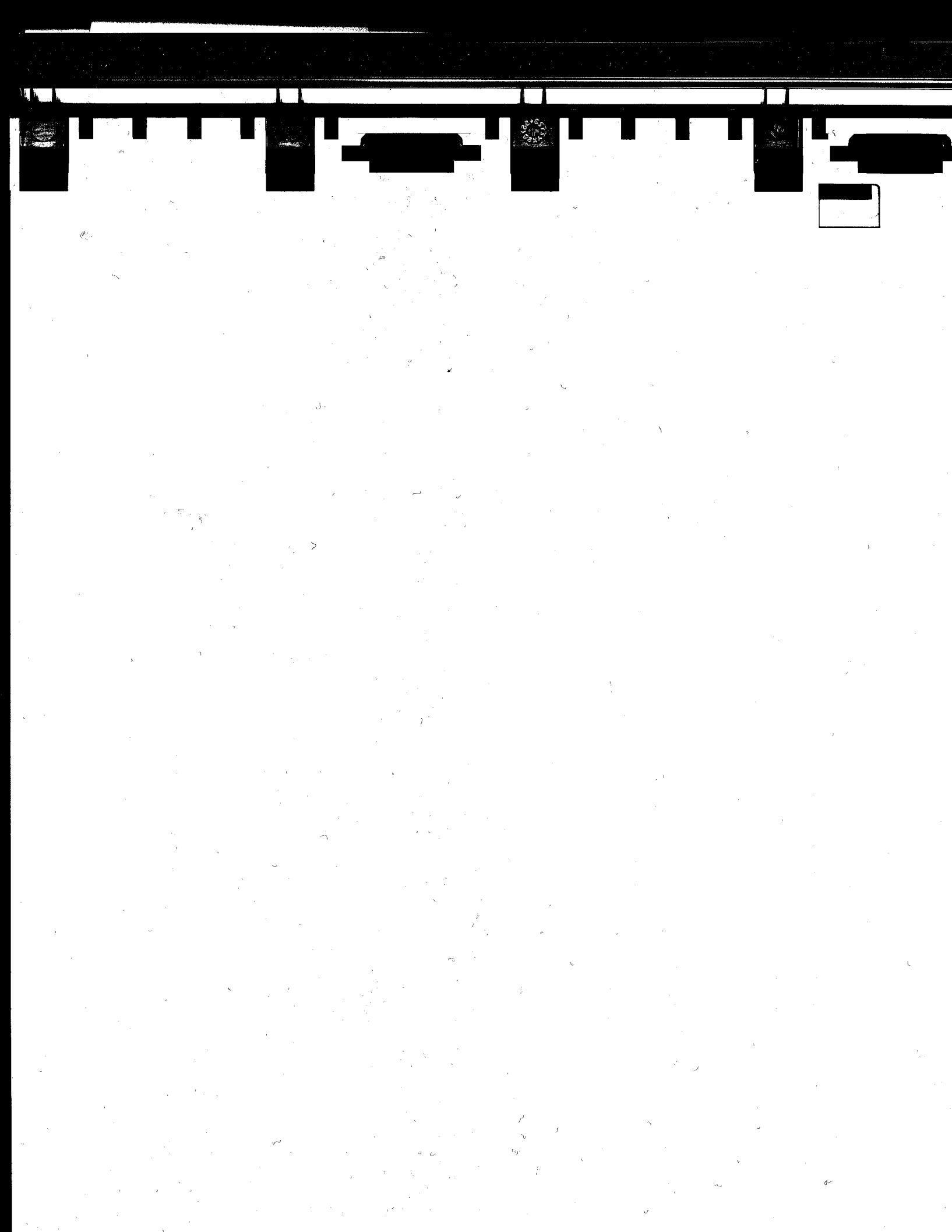
$$C_t = (1 - \sigma_t) H_t Y^H + [1 - H_t + \sigma_t H_t] (1 - \theta_t) Y^L$$

$$H_{t+1} = (1 - \sigma_t) H_t + [1 - H_t + \sigma_t H_t] \theta_t$$

in a decentralized version it would be the matching workers.

where θ_t is the fraction of low productivity sites that the social planner chooses to shut down in order to create new high productivity sites in the subsequent period. Please answer the following questions:

- (i) Set this up as a dynamic programming problem. Write down the Bellman equation and derive the Euler Equation.



- (ii) Use the model to analyze how the pace of job creation and destruction will vary over the business cycle. How does the serial correlation of σ_t affect your answer?
- (iii) Suppose there are barriers to job destruction (e.g. a firing tax). How would you model this? What impact would such barriers have on aggregate consumption, unemployment, and productivity? Use the model to analyze and discuss these issues.
- (iv) Discuss the impact of assuming that workers can pool idiosyncratic risk. If workers could not pool idiosyncratic risk, how might that change your answer to question (iii).

Question 3. Consider a world where individuals differ in their income and where the government provides public education at the same level to all individuals who choose to become educated.

- a) If all costs of education were covered by the government, financed by a proportional tax on income, show how the public provision of education could act like a transfer from rich to poor. Show how the level of education would be determined in a median voter model.
- b) Now, suppose that education requires a private input as well. Under what conditions could government provision of education act like a reverse transfer, that is, from poor to rich? Demonstrate, when the level of education is exogenous.
- c) Show how this could arise endogenously in a majority voting system, when both the tax rate and the level of education are endogenous.

Question 4. Consider a closed economy where

- the government runs a constant real fiscal deficit g , $g > 0$, from 0 to T , $0 < T < \infty$;
- moreover, the government announces, and everybody believes, that the fiscal deficit will become zero starting at time T .

Analyze in terms of a micro-founded monetary model the equilibria that would emerge in the following alternative scenarios:

- i. The fiscal deficit is financed by issuing government bonds.
- ii. The fiscal deficit is financed by issuing high-powered money.

Can these equilibria be Pareto-ranked? Discuss.