extends this work to allow for mobility across borders. Alesina, Spolaore, and Wacziarg (1997) discuss the evidence relating the size of government to country size. Persson and Tabellini (1996b) study the determinants of risk sharing and redistribution among regions when the threat of secession (or opting out of the risk-sharing contract) determines regional bargaining power. Bordignon and Brusco (1999) ask why most political constitutions do not explicitly allow for secession, emphasizing contractual incompleteness and the distinction between ex ante and ex post optimality.

Finally, a huge literature discusses how exogenous economic policy affects unemployment. For recent surveys see Bertola 1999, Nickell and Layard 1999, and Mortensen and Pissarides 1998. Research on what mechanisms determine the economic policies that have an impact on the labor market, however, is much more scant. The model of voting over unemployment insurance in section 6.4 draws on Wright 1986. One can extend the model, allowing for individual-specific unemployment risk, as in Persson and Tabellini 1996a. The model can also be extended to allow self-insurance through borrowing and lending, as in Hassler and Rodriguez Mora 1999, or to allow feedback effects from unemployment insurance to equilibrium unemployment, as in Hassler et al. 1998. Saint-Paul (1993, 1996, 1999) has studied the political conflict between insiders and outsiders and politics of labor market regulations, and he also discusses the political feasibility of alternative reforms.

6.7 Problems

1. The Meltzer-Richard model

Consider an economy in which a proportional tax on labor income is used to finance lump sum transfers to the citizens. Individual i's preferences over consumption, c, and leisure, x, are described by

$$w^i = c^i - a(b - x^i)^2.$$

The private budget constraint is $c^i = (1-\tau)l^i + f$, and the government budget constraint is $f = \tau l$. The individual is also subject to a time constraint $1 + e^i = l^i + x^i$. The individual productivity parameters e^i are distributed by a density function linearly decreasing from 2 at $e^i = 0$ to 0 at $e^i = 1$.

a. Compute each individual's labor supply as well as the total labor supply, given the tax rate. Compute the equilibrium tax level.

b. Assume that only citizens with incomes above 0.05 are allowed to vote, which excludes approximately 10% of the lowest-income earners from the electorate. Compute the new equilibrium tax rate.

c. Now suppose that 10% of the citizens of each income level were to retire and thus be moved to productivity $e^i = 0$. Compute the new equilibrium tax rate.

d. Finally, assume that tax collection is costly, and that of any unit of taxes collected, a fraction $1 - \theta$ would be used to pay for the administration of tax collection. Compute the new equilibrium tax rate.

2. Pensions

Consider the model of section 6.2. There are three generations: young, middle-aged, and old. The population grows at rate n. The government finances a pension scheme with lump sum transfers f to the old generation with a proportional tax, τ, on labor. The government budget constraint is

$$f = \tau l^{iY}(1+n)^2 + \tau l^{iM}(1+n).$$

The subjective discount rate β equals the real interest rate ρ, and all individuals may save assets at the real interest rate. A young individual i's lifetime utility from the pension scheme is

$$w^{iY} = U(c^{iY}) + \frac{1}{1+\beta}U(c^{iM}) + \frac{1}{(1+\beta)^2}c^{iO} + V(x^{iY}) + \frac{1}{1+\beta}V(x^{iM}),$$

and a young individual's intertemporal budget constraint is

$$c^{iY} + \frac{c^{iM}}{1+\beta} + \frac{c^{iO}}{(1+\beta)^2} = l^{iY}(1-\tau) + \frac{l^{iM}(1-\tau)}{1+\beta} + \frac{f}{(1+\beta)^2}.$$

a. Solve for the individual's optimal consumption path and labor supply.

b. What is the total present value of the pension scheme to a young person of productivity e^i? What is the pension scheme's net value to a young person of average productivity? How much larger is the net present value of an individual of productivity $e^m < e$ relative to that of an individual of average productivity? Describe how these two values relate to redistribution between and within generations. Write down the equation describing the tax rate preferred by a young individual with productivity e^i and relate the terms in this expression to the above discussion.

c. Suppose that productivity is higher for middle-aged individuals than for young individuals. In particular, a young individual with productivity e^{iY} will achieve productivity

$$e^{iM} = e^{iY} + \frac{(1+n)(2+n)}{2+\beta}[L(\tau^i) + \tau L(\tau^i)]$$

when middle aged (τ^i is the tax rate preferred by the individual with productivity e^{iY}).

Therefore, the share of young voters with productivity lower than e^{iY} equals the share of young voters with productivity lower than

$$e^{iY} + \frac{(1+n)(2+n)}{2+\beta}[L(\tau) + \tau L(\tau)].$$

The distribution of productivities is $F(e^{iY})$ for the young.

Show how the share of young and middle-aged voters who support higher taxes in equilibrium depends on n. Discuss how large a share of the young and middle-aged voters will support higher taxes in equilibrium when $n = 0$ and when n becomes very large.

d. Suppose that voting rights are extended to a generation of very young individuals who have no labor income and receive no pension transfers. These individuals will be young in the next period and know what their productivity parameters will be. Find the tax rate that an individual with productivity e^{iY} in this group would prefer. Describe how the productivity of the new median voter will differ from the productivity of the median voter before the extension of voting rights. Discuss the equilibrium tax rate.

e. Suppose that voting rights are curtailed to exclude people with very low incomes. The people excluded from the franchise exist in equal proportion among the young, middle-aged, and old. Describe how the equilibrium tax rate would change. Discuss the relation to within- and between-generations redistribution.

3. Pensions and probabilistic voting

Consider again the setup of section 6.2. There are three generations: young, middle-aged, and old. The population grows at rate n. The government finances a pension scheme with lump sum transfers f to the old generation with a proportional tax on labor, τ. The government budget constraint is

$$f = \sum_{iY} \tau l^{iY}(1+n)^2 + \sum_{iM} \tau l^{iM}(1+n).$$

The subjective discount rate, β, equals the real interest rate ρ, and all individuals may save assets at the real interest rate. The lifetime utility of a pension scheme to a young individual is

$$w^{iY} = U(c^{iY}) + \frac{1}{1+\beta}U(c^{iM}) + \frac{1}{(1+\beta)^2}c^{iO} + V(x^{iY}) + \frac{1}{1+\beta}V(x^{iM}),$$

and a young individual's intertemporal budget constraint is

$$c^{iY} + \frac{c^{iM}}{1+\rho} + \frac{c^{iO}}{(1+\rho)^2} = l^{iY}(1-\tau) + \frac{l^{iM}(1-\tau)}{1+\rho} + \frac{f}{(1+\rho)^2}.$$

There are two political candidates, A and B, who try to maximize votes by choosing an election platform consisting of a tax to finance the pension scheme. Individual i receives utility σ^i from other policies if candidate B is elected. The preference parameter, σ^i, is uniformly and symmetrically distributed around zero with densities f^Y, f^M, and f^O, for the young, middle-aged, and old, respectively. The individuals choose labor and their consumption path given the tax rate. $W^{iY}(\tau)$ denotes a young individual's utility of tax rate, given optimal savings and labor decisions.

a. Suppose that there is a vote on the pension system in every period and that there is no commitment. Write the equation determining the equilibrium level of pensions. Compare this with the equilibrium level of pensions in the median-voter model.

b. Suppose that there is commitment, so that an enacted pension scheme will remain in place forever. Write the equation determining the equilibrium tax rate.

4. Unemployment insurance

Consider the model of section 6.4.1. Individuals maximize lifetime utility of consumption over an infinite horizon:

$$V^J = \mathsf{E}_0\left[\sum_{t=0}^{\infty} \beta^t U(c_t^I) \mid I = J \text{ at } t = 0\right], \quad I, J \in \{E, U\},$$

where β is a subjective discount factor, and the E and U superscripts denote the state of being employed or unemployed, respectively. If employed, individuals consume their real wage, net of taxes, $l(1-\tau)$. In each period, a currently employed individual becomes unemployed with probability φ, whereas a currently unemployed individual becomes employed with probability ϑ.

a. Assume that $U(c) = \ln(c)$. Compute the equilibrium tax and benefit size.

b. Discuss how the tax rate and the unemployment benefit depend on firing rates and hiring rates.

c. Show that an increase in both firing and hiring rates, keeping unemployment constant, will increase the unemployment benefit. Discuss the results.

5. Unemployment insurance with multiple equilibria

This problem is based on Hassler and Rodriguez Mora 1999. Unemployment insurance may be more valuable when the expected unemployment spells are long. Individuals may, for example, have precautionary savings that are depleted if the spells are long. To model this idea in an analytically simple fashion, assume that a fired worker receives a severance