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The taxation of life annuities under adverse selection

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ABSTRACT

This paper studies how annuities should be taxed in a Mirrlees-type model in the presence of adverse selection and a positive link between income and longevity. The government is able to address the adverse selection problem by implementing a progressive marginal tax rate on annuities. This amounts to subsidizing small annuities (purchased by low incomes) and taxing large annuities (purchased by high incomes). Numerical simulations suggest that the taxation is significant and becomes more pronounced as annuitants get older.

1. Introduction

Concerns about the future of public pension systems have led many governments to promote the development of private life annuity products by means of tax incentives. Whitehouse (1999) shows that most developed countries exempt from income tax either the contributions during the accumulation period or the benefits during the payout phase. Antolin et al. (2004) find that the first option is the most common in 17 OECD countries. Both options alter the post-tax rate of return to annuities, albeit in a different way. As individuals generally pay a lower marginal income tax rate when retired than during their working life, a tax-deferral policy tends to push up the rate of return. Yet observed tax treatments are difficult to assess on the grounds of economic principles.

These tax exemptions raise a number of important policy issues which are more broadly related to the debate on the taxation of savings. Should the government tax or subsidize returns to annuities? Should the taxation be progressive in order to redistribute income? Considering that developed economies already achieve redistributive goals through personal income tax, can a tax on annuities play any complementary role? Regarding savings, the literature generally concludes that taxation should be avoided. This statement can be traced back to the influential paper by Atkinson and Stiglitz (1976). They show that indirect taxation is unnecessary when a government can use a non-linear income tax and utility functions are weakly separable between goods and leisure. In particular, the redistribution objective is better achieved by an income tax alone. Since a tax on savings is equivalent to a commodity tax which varies over the life cycle of the agent, this finding extends to the taxation of savings as well.

Few studies exist however which look at whether this result applies to life annuities. Private annuity markets are indeed a distinct segment of the capital market. The return involves the expected mortality rate of the annuitants. Since this is generally not observed by insurance companies, it leads to an adverse selection problem. Moreover, average longevity tends to increase with income (see, for example, Deaton and Paxson, 2001). Both of these elements are grounds for analyzing annuity taxation separately.

This paper studies how annuities should be taxed in a model à la Mirrlees (1971) with a continuum of skills, one working period and a number of retirement periods. It presents two arguments in favor of taxation of life annuities. First, the taxation should address the adverse selection problem affecting the annuity market. Indeed, the fact that it is impossible to extract or process information on individual mortality rates leads insurance companies to offer a common rate of return to all their customers. Compared with a first best economy, it follows that the market price for annuities is too high for short-lived agents and too low for long-lived individuals. Given

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these circumstances, the government could restore actuarial fairness by setting a corrective tax schedule for annuities.

A second argument for annuity taxation comes from redistribution purposes. It relies on the fact that, as the rich are more likely to reach old age, they benefit from a longer flow of annuities on average. A government could then reduce life cycle inequalities by taxing annuities insofar as they signal consumption by high incomes.

The first argument considered in isolation implies a progressive taxation of annuities. The second line of reasoning (annuities as luxury goods) is shown to produce a positive yet regressive tax schedule. The model cannot therefore determine whether the overall effect leads to a progressive or a regressive tax. Next, I turn to a calibrated version of the model. Numerical results show that the marginal tax rate increases with annuity size to offset inequality in survival rates. This amounts to subsidizing small annuities (purchased by low incomes) and taxing large annuities (purchased by high incomes). Moreover, the progressivity of the tax schedule increases as annuitants get older, since the rich derive greater expected utility from annuities consumed in very old age than annuities consumed at the beginning of retirement.

This is not the first model to address the issue of annuity taxation. Sheshinski (2006) applies the theory of optimum commodity taxation to the pricing of annuities and shows that, under utilitarianism and symmetric information, a negative correlation between survival probabilities and incomes leads to the subsidization of individuals with high survival probabilities. The results are, however, less clear-cut with adverse selection and a positive correlation between survival probabilities and incomes, which are two central assumptions of this paper. Saez (2002) introduces labor supply and unobservable productivities in a two-period model. He assumes that the discount rate is positively correlated with skills. As a higher discount rate has the same effect on future marginal utility as a longer life expectancy, his rationale for taxing savings is similar to the luxury goods argument presented in this paper for the taxation of annuities. Contrary to Saez, Brunner and Pech (2008) explicitly focus on the annuity market in a model with two types of productivity and a single retirement period. They find that annuities consumed by the most productive agents should be taxed. This result is corroborated by the present model in a more general framework. The existence of a continuum of workers and several retirement periods allow additional issues to be addressed, such as the optimal shape of the tax schedule and how it changes with the retiree age. The model also provides quantitative insights into the extent of tax progressivity.

The paper is organized as follows. Section 2 lays out the basic setup of the economy. Section 3 presents some properties of the income and annuity taxation system. The model's parameters are calibrated in Section 4 and quantitative results are presented. Section 5 concludes.

2. The model

Let us consider an economy with n periods and a continuum of consumers whose productivities (or skills) w are spread over the continuum $W=[\underline{w}, \overline{w}[$ according to the distribution function $F(.)$ and the density function $f(.)$. The first period is a working period during which agents choose their labor supply L. The remaining dates are retirement periods. Consumption $C=(c_1, c_2, \ldots, c_n)$ takes place at each date if the consumer survives until then. Let $\pi_i(w)>0$ denote the survival probability at age i of an individual w conditional on being alive at date 1. All agents are alive during the working period ($\pi_1(w)=1$). It is assumed to be an increasing function of productivity: $\pi_i'(w)\geq 0$, $i=2, \ldots, n$.

Individuals are characterized by a utility function $U(C, L, w)$, which takes a standard time separable form:

$$U(C,L,w) = \sum_{i=1}^{n} \beta^{i-1}\pi_i(w)u(c_i) + v(L) \tag{1}$$

where β is the discount factor, and u and v are respectively period utility and disutility of work with the usual concavity and continuity properties. The function is additively separable between consumption and leisure ($U_{Li}=0$, $i=1, \ldots, n$ where U_{Li} is the cross derivative between labor and consumption at date i), but not between consumption and skill since the latter affects survival probabilities ($U_{wi}>0$, $i=2, \ldots, n$ and $U_{w1}=0$).

The uncertainty of survival calls for the purchase of annuities that provide income when subscribers are still alive in exchange for their wealth upon death. For the sake of simplicity, there is no social security program providing a minimal annuity and the purchase of bonds is ruled out. Hence agents simply consume their after-tax annuity while retired.

Labor and annuities are taxed by way of separate non-linear schedules in an economy à la Mirrlees (1971). The key assumption is that the government cannot observe labor supply and wage rate separately. It is thus restricted to setting taxes as a function of earnings or annuities only. Let $T(wL)$ and $t_i(c_i)$ be respectively the earnings tax and the annuity tax at age i. Redistribution takes place in the model through a guaranteed income level equal to $-T(0)$ that is taxed away as earnings increase. Only the structure of commodity taxes, not their level, constitutes an independent policy instrument. Uniform commodity taxation can be replicated by an appropriate adjustment in the income tax schedule. The commodity taxation rate on the first period good is therefore set equal to zero: $t_1(c_1)=0\ \forall c_1$.

The functioning of the annuity market is affected by an adverse selection problem. Insurance companies cannot observe the expected longevity of each customer and are bound to offer the same rate of return to all annuitants. As a result, the price of future consumption is too high for agents with low life expectancy and too low for individuals with better longevity prospects. The annuity market equilibrium is defined as in Abel (1986) by assuming that insurers cannot offer different annuity rates of return based on quantities purchased. This assumption is realistic as savers can divide their savings between different insurers in the event of price discrimination. In addition, it is assumed that insurance companies offer separate contracts for each retirement period.

Let us define the (pooling) rate of return Q_i between date 1 and date i for a consumer still alive after i periods. In order to fund consumption c_i at age i, the insurance company collects the sum $(c_i+t_i(c_i))/Q_i$ from individual w during the working period and delivers the annuity $a_i=c_i+t_i(c_i)$ at age $i>1$. From the company's point of view, it is liable to pay out the expected sum $\pi_i(c_i+t_i(c_i))/R^{i-1}$ where R is one plus the safe rate of return. The zero profit condition in the insurance market with unobservable survival rates leads to the equality of the two expected cash flows for the entire market:

$$\int_W (c_i + t_i(c_i)) / Q_i dF(w) = \int_W (c_i + t_i(c_i))\pi_i / R^{i-1} dF(w)$$

This defines the price of annuities in a pooling equilibrium. It is the rate of return divided by the weighted average of the population's survival probabilities $E(\pi_i)$, the weights being the (equilibrium) demands for annuities:

$$Q_i = R^{i-1} / \frac{\int_W (c_i + t_i(c_i))\pi_i dF(w)}{\int_W (c_i + t_i(c_i)) dF(w)} = R^{i-1} / E(\pi_i) \tag{2}$$

Given market rates of return Q_i, the consumer's program is given by:

$$\max U(C, L, w)$$
$$\sum_{i=1}^{n} (c_i + t_i(c_i)) / Q_i = wL - T(wL)$$