Optimal Taxation of Inheritance and Retirement Savings

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[Very Preliminary and Incomplete]

Abstract

We study how to jointly design the optimal tax system on the inherited wealth and the retirement savings in an economy where the motives for the retirement savings and the bequests are overlapping. If the retirement savings can serve for both a precautionary saving against the uncertain life cycle and a bequest to the children, the optimal tax system should consider the interaction of the two functions. When the parents are heterogeneous in their earning ability, mortality, and altruism, the correlation of these characteristics and the planner's preferences for redistribution are the key determinant of the sign and shape of the tax system.

Keywords: Optimal Taxation, Inheritance, Retirement Savings
JEL Classification: E21, D64, H21

1 Introduction

Optimal level of taxation on inherited wealth has been a highly controversial issue for both policy makers and economists. The main debate centers around the equity versus and efficiency trade-off, and the efficiency cost of the inheritance taxation hinges on the nature of a bequest motive — whether the bequest is mainly motivated by the parent's altruism or accident due to death. Unfortunately there is little consensus about that and the empirical evidences are conflicting.[1] Most of the papers in optimal taxation literature take just one motivation of the bequest — altruism, accidental bequest, or exchange (strategic bequest) — and find a theoretical justification of the inheritance tax or subsidy based on the specific motivation (e.g., Farhi and Werning (2010), Farhi and Werning (2013), Canta and Cremer (2017)).

In reality, however, the accidental bequest and altruistic bequest are overlapping in the presence of the uncertainty in life-cycle, thus the two motives cannot be clearly distinguished. Parent's retirement saving can simultaneously serve both a precautionary savings against living for a long time or a health shock and a bequest to children if the parents die early or live healthy. That is, the parents value the bequest and have an altruistic motive of bequest, but this motive is operative in only some states of the world. This overlapping motive of bequest was first pointed out by Dynan, Skinner, and Zeldes (2002) and recently Lockwood (2014) has shown that this overlapping bequest motives can explain retiree's puzzling decisions on saving and insurance. In this paper, we study the optimal inheritance taxation in the economy where the two motives of the bequest are overlapping due to the uncertainty in life-cycle.

When the savings can serve for both the precautionary retirement saving and the bequest, we need to design the optimal taxation/subsidy on the inheritance and the retirement savings jointly. This is because an inheritance tax affects the decision of the savings and the asset level accumulated for the self insurance against living long. At the same time, a tax on the retiree's asset income has also indirect impact on the bequest decision. Thus, we investigate the optimal tax system for inheritance and retirement savings together. We provide a contribution to both the optimal bequest taxation literature and to the literature on the optimal retirement savings. Previous papers on retirement savings often have focused on the incomplete (or no) annuity market and argued for the subsidy to the retirement savings to compensate for the lack of the annuity market (e.g., Hosseini and

[1] See the papers discussed in the introduction of Laitner and Juster (1996) and Laitner and Juster (1996)'s own findings using the TIAA-CREF data.

Shourideh (2016)). In the presence of contingent bequest motive, however, the lack of annuity is less costly and thus there is less need for the retirement subsidy.

We consider an economy in which parents are heterogeneous in their earning ability, mortality and altruism. As in Hosseini and Shourideh (2016), based on the empirical evidences (e.g., Cristia (2009) and Waldron (2013)), we assume that a parent with higher earning ability has a relatively lower mortality, implying a positive correlation between the earnings ability and the probability of living long (or a negative correlation between earnings ability and the probability of leaving bequest). Parents are also heterogeneous in the degree of altruism, and we allow the correlation between the earnings ability and altruism to be either negative or positive. For the quantitative analysis, we plan to calibrate the parameters governing the altruism to match the level of bequest for different earning groups.

Our first goal is to study the constrained efficient allocations and derive their implications for the marginal tax rates on the bequest and the retirement savings. We extend canonical Mirrleesian tax model by adding a saving decision with uncertainty in life-span. Since the earning ability is private information, there is a standard equity-efficiency trade off, where the government's/planner's preferences for redistribution determine the value of the equity. We capture these preferences with the Pareto weight for each ability type. Moreover, because of the correlation between the earning ability and the mortality and the correlation between the earning ability and the altruism, the government/planner also has redistribution motives across the asset inequality after the retirement and the bequest inequality. The optimal inheritance distortions and asset distortions crucially depend on both the planner's preferences for the redistribution and the correlations.

Our benchmark assumes that the planner only cares for the utility of parents and cares for the children only indirectly through the altruism of parents. We show that if the planner's Pareto weight is decreasing in ability, implying strong preferences for redistribution, then the negative correlation between the earnings ability and the mortality implies that the planner should subsidize the inheritance implicitly (negative bequest wedge) — even without putting a direct Pareto weight for children — and the planner should implicitly tax the asset return (positive asset wedge). Under the decreasing Pareto weight assumption, however, the implication of the correlation between the altruism and the earning ability can lead to a wide range of results: a positive correlation implies that the optimal inheritance distortion should be positive (tax on the inheritance), while the negative correlation implies that the optimal inheritance distortion should be negative (subsidy on the inheritance). The intuition of the latter result — the implications of the correlation between altruism and ability — is consistent with the result in Farhi and Werning (2013). If the planner's Pareto weight is increasing in ability, then we get the reverse implications for both results.

Thus, in order to determine the sign and shape of the inheritance taxation and asset taxation, we need to carefully set the planner's preferences and the relationship among the earnings ability, mortality, and altruism. We plan to carry out careful quantitative investigation by carefully calibrating the model to the data.

Literature Review

[List of papers that need to be discussed:]

- Farhi and Werning (2010) and Farhi and Werning (2013)
- Pavoni and Yazici (2017)
- Laitner and Juster (1996)
- Lockwood (2014)
- Hosseini and Shourideh (2016)

2 The Model: Two Period Economy

In this section, we use a simple two period economy to provide a theoretical analysis of optimal taxation on bequest and retirement savings.

There are two generations, parents born at $t = 1$ and children born at $t = 2$. A continuum of parents live for at most two periods. Upon birth, each parent draws a type $\theta \in \Theta$ from a continuous distribution $F(\theta)$ that has density $f(\theta)$. This type determines various characteristics of the individual: 1. θ determines labor productivity, 2. θ also determines the mortality risk which is captured by the survival probability at $t = 2$, $P(\theta)$, 3. It also determines the degree of altruism toward his or her child, $\gamma(\theta)$. For the theoretical analysis, we do not make assumptions on the shape of functions $P(\theta)$ and $\gamma(\theta)$. Later, in the quantitative analysis, they will be determined to match the empirical correlation between the earnings productivity and the mortality, and the correlation between the productivity and the (estimated) altruism.

At $t = 1$, parents first learn their type θ and then provide $l(\theta)$ units of work effort to produce efficiency units of labor $y(\theta) = \theta \cdot l(\theta)$. The utility of the parent with productivity θ is given by

$$U(c_1, c_2, c_c, y; \theta) \quad = \quad u(c_1) - \psi\left(\frac{y}{\theta}\right) + P(\theta)u(c_2) + (1 - P(\theta))\gamma(\theta)V_c(c_c),$$

where the flow utility from parent's consumption $u(\cdot)$ and the child's utility $V_c(\cdot)$ are strictly concave and the disutility of parent's working $\psi(\cdot)$ is strictly convex.

We can consider period one as young and period two as old. As in Dynan, Skinner, and Zeldes (2002), in the presence of uncertainty in mortality, parents' savings in period $t = 1$ serve both purposes of a precautionary life-cycle savings and a bequest. Parents save against future risk of living a long time after retirement (or incurring very high health expenditures later in life), which happens with probability $P(\theta)$. In the event they do not survive (which happens with probability $1 - P(\theta)$), however, bequests are given to their children, and the parents value the bequest. Thus, in this model, the parents have an altruistic bequest motive, but the motive is operative only in the dead state. This implies that the precautionary savings motive for the life-cycle after retirement and the bequest motives are overlapping and cannot be clearly distinguished, and thus optimal tax system on the bequest and retirement savings should be designed together.

In addition to the production, there is an endowment I of goods to each parent in period $t = 1$. Goods can be transferred between periods $t = 1$ and $t = 2$ with a savings technology with rate of return $R > 0$. An allocation is resource feasible if

$$\int c_1(\theta)dF(\theta) + \frac{1}{R}\int \{P(\theta)c_2(\theta) + (1 - P(\theta))c_c(\theta)\}\, dF(\theta) \leq \int y(\theta)dF(\theta) + I. \tag{1}$$

We assume that each parent's θ type is private information. We can restrict attention to direct mechanisms applying the revelation principle — parents report their type and receive allocation as a function of this report. An allocation is incentive compatible if

$$\begin{aligned} & u(c_1(\theta)) - \psi\left(\frac{y(\theta)}{\theta}\right) + P(\theta)u(c_2(\theta)) + (1 - P(\theta))\gamma(\theta)V_c(c_c(\theta)) \\ & \quad \geq u(c_1(\theta')) - \psi\left(\frac{y(\theta')}{\theta}\right) + P(\theta)u(c_2(\theta')) + (1 - P(\theta))\gamma(\theta)V_c(c_c(\theta')), \quad \forall \theta, \theta'. \end{aligned} \tag{2}$$

An allocation is incentive feasible if it satisfies the resource constraint (1) and the incentive compatibility constraint (2).

In the benchmark analysis, we assume that the social planner only cares for the utility of the parents and the utility of the children are valued by the planner only indirectly through the altruism of the parents. Later we will extend our analysis to the case where the social planner values the children's utility directly. We consider a weighted Utilitarian criterion:

$$\int \lambda(\theta)U(c_1, c_2, c_c, y; \theta)f(\theta)d\theta, \tag{3}$$

where $\lambda(\theta)$ is the weight on parents of type θ. We can interpret $\lambda(\theta)$ as the Pareto weight, and by varying weight $\lambda(\theta)$, we can trace out the Pareto frontier. Later, in the quantitative analysis, we will consider a class of Pareto weight function that can invert the U.S. policymakersâĂŹ taste for redistribution from the current US tax system.

We analyze optimal taxation following both a Mirrleesian approach and a Ramsey approach. Mirrleesian approach does not impose any restriction on the policy instruments of the government except that the type θ is private information. On the other hand, Ramsey approach will make a linear taxation assumption.

3 Main Result

We begin with the Mirrleesian approach. The social planner solves the following mechanism design problem of maximizing the social welfare function (3) subject to the resource constraint (1) and the incentive constraint (2).

As in the standard Mirrleesian taxation, if preferences satisfy single-crossing, then the incentive compatibility constraint (2) can be replaced by the envelope condition and the monotonicity condition. Then we can recast the planning problem as follows:

$$\max_{c_1,c_2,c_c,y,v} \quad \int \lambda(\theta)v(\theta)f(\theta)d\theta \tag{4}$$

$$s.t. \quad c_1(\theta) \text{ monotone increasing} \tag{5}$$

$$v(\theta) = u(c_1(\theta)) - \psi\left(\frac{y(\theta)}{\theta}\right) + P(\theta)u(c_2(\theta)) + (1-P(\theta))\gamma(\theta)V_c(c_c(\theta)) \tag{6}$$

$$\dot{v}(\theta) = \dot{P}(\theta)u(c_2(\theta)) - \dot{P}(\theta)\gamma(\theta)V_c(c_c(\theta)) + (1-P(\theta))\dot{\gamma}(\theta)V_c(c_c(\theta)) + \psi'\left(\frac{y(\theta)}{\theta}\right)\frac{y(\theta)}{\theta^2} \tag{7}$$

$$\int \left[c_1(\theta) + \frac{P(\theta)}{R}c_2(\theta) + \frac{1-P(\theta)}{R}c_c(\theta) - y(\theta)\right] f(\theta)d\theta \leq I. \tag{8}$$

The solution to the above planning problem is the optimal allocation. We first characterize the optimal allocation by analyzing the wedges implied by the solution. Then, we also discuss how to implement the optimal allocation using nonlinear tax system.

For most of the theoretical result, we assume that the correlation between earning ability (θ) and mortality ($1 - P(\theta)$) is negative — or the correlation between earning ability and living long is positive, which is based on the empirical evidences.

3.1 Optimal Wedges

3.1.1 Intertempral Wedge

Given an allocation (c_1, c_2, c_c, y) and a type θ, we define the intertemporal wedge

$$\tau_{inter}(\theta) = 1 - \frac{u'(c_1(\theta))}{R[P(\theta)u'(c_2(\theta)) + (1 - P(\theta))\gamma(\theta)V_c'(c_c(\theta))]}.$$

Note that this intertemporal distortion is the combining the bequest distortion and the asset distortion, but the sign of this intertemporal distortion is still very instructive for the optimal level of saving and this wedge is directly comparable to the ones in the canonical dynamic Mirrleesian literature. Next proposition shows that the well known inverse Euler equation holds when there is heterogeneity in mortality but no heterogeneity in altruism.

Proposition 1. *Suppose that $\gamma(\theta) = 1$ for all θ and (c_1, c_2, c_c, y) solves the planning problem. Then the inverse Euler equation holds:*

$$\frac{P(\theta)}{Ru'(c_2(\theta))} + \frac{1 - P(\theta)}{R\gamma(\theta)V_c'(c_c(\theta))} = \frac{1}{u'(c_1(\theta))}, \quad \forall \theta \in \Theta. \tag{9}$$

By applying the Jensen's inequality to (9), we get the following inequality :

$$u'(c_1(\theta)) \leq P(\theta)Ru'(c_2(\theta)) + (1 - P(\theta))RV_c'(c_c(\theta)), \quad \forall \theta \in \Theta.$$

This implies that

Corollary 2. *Suppose that $\gamma(\theta) = 1$ and $\dot{P}(\theta) > 0$ for all θ. Then*

$$\tau_{inter}(\theta) \geq 0, \quad \forall \theta \in \Theta.$$

Note that the inequality holds for any Pareto weight function $\lambda(\theta)$. We also note that the strict inequality holds as long as $u'(c_2(\theta)) \neq V_c'(c_c(\theta))$. In sum, the intertemporal wedge is positive, as long as the the constrained efficient allocation does not achieve the perfect insurance. Whether the solution of the planning problem achieves the perfect insurance or not does depend on the Pareto weight function $\lambda(\theta)$, and we investigate this below.

As in the Dynamic Mirrleesian tax literature, the positive intertemporal wedge result is to provide better insurance which is the first order benefit at the second-order cost of reducing the consumption smoothing. The insurance benefit in this economy, however is not the insurance against the future productivity uncertainty, but against the life-cycle uncertainty — the mortality risk.

On the other hand, in the presence of the heterogeneity in altruism, the inverse Euler equation does not hold any more. The direction of the inverse Euler inequality does depend on the Pareto weight function $\lambda(\theta)$ and the correlation between earnings ability and altruism.

Proposition 3. *Suppose that (c_1, c_2, c_c, y) solves the planning problem.*

1. *Suppose that $\lambda(\theta)$ is decreasing. If $\dot{\gamma}(\theta) > (<)0$,*
$$\frac{P(\theta)}{Ru'(c_2(\theta))} + \frac{1 - P(\theta)}{R\gamma(\theta)V_c'(c_c(\theta))} < (>) \frac{1}{u'(c_1(\theta))}.$$
2. *Suppose that $\lambda(\theta)$ is increasing. If $\dot{\gamma}(\theta) > (<)0$,*
$$\frac{P(\theta)}{Ru'(c_2(\theta))} + \frac{1 - P(\theta)}{R\gamma(\theta)V_c'(c_c(\theta))} > (<) \frac{1}{u'(c_1(\theta))}.$$

This inequality is because the planner has additional preferences over the bequest heterogeneity. For example, if the planner has a strong redistribution preference over θ with decreasing $\lambda(\theta)$ and the correlation between the earning ability and altruism is positive (with $\dot{\gamma}(\theta) > 0$), the government also has a redistribution preference over the bequest and want to redistribute from the high bequest motive person to low bequest motive person, which is additional motive of distorting the saving downward.

In general, this positive intertemporal distortion implies that there is need to tax the return of savings. However, it does not mean that both the bequest distortion and the retirement saving distortion should be positive. To see the implication of each distortion, we now investigate the ex post wedges.

3.1.2 Retirement Saving Wedge and Bequest Wedge

The intertemporal wedge defined above is capturing ex ante distortions. We now define two ex post intertemporal distortions, the retirement savings wedge and the bequest wedge. Given an allocation (c_1, c_2, c_c, y) and a type θ, we define the ex post retirement savings wedge

$$t_a(\theta) = 1 - \frac{u'(c_1)}{Ru'(c_2)}$$

and the ex post bequest wedge

$$t_b(\theta) = 1 - \frac{u'(c_1)}{R\gamma(\theta)V_c'(c_c)}.$$

These ex post wedges can be understood as the implicit tax on the return to retirement saving when surviving and the the implicit tax on the inheritance when parents are dying.

Next proposition shows that in the absence of heterogeneity in altruism, the two ex post wedges always have the opposite sings.

Proposition 4. *Suppose that $\gamma(\theta) = 1$ and $\dot{P}(\theta) > 0$ for all θ. Suppose that (c_1, c_2, c_c, y) solves the planning problem. Then*

1. *if $\lambda(\theta)$ is decreasing,*

$$t_a(\theta) > 0 \quad \text{and} \quad t_b(\theta) < 0, \quad \forall \theta \in \Theta \text{ and}$$

2. *if $\lambda(\theta)$ is increasing,*

$$t_a(\theta) < 0 \quad \text{and} \quad t_b(\theta) > 0, \quad \forall \theta \in \Theta.$$

This proposition shows that when the planner has a strong preferences for redistribution (with decreasing $\lambda(\theta)$), then the planner wants to tax the return of the retirement saving and subsidize the inheritance. The planner who has strong redistribution preferences over the earning ability θ wants to redistribute from the people who live long to people who bequest early because there is positive correlation between the earning ability and the survival probability. This redistribution can be done by implicitly taxing the return of retirement saving and implicitly subsidizing the inheritance because the tax on the retirement saving is the tax contingent on the survival, while the inheritance subsidy is the subsidy contingent on the death. If the planner has a weak preferences for redistribution (with increasing $\lambda(\theta)$, then the sign of distortions are the opposite exactly due to the opposite reason.

Previous studies found the economic reason for either taxing or subsidizing the bequest from the positive externality of bequest when the government puts a direct Pareto weight for children in addition to indirect valuation through altruism (Farhi and Werning (2010))[2] — which is rationale for subsidy — or from the heterogeneous altruism and the planner's preferences across the altruism (Farhi and Werning (2013)) — which can generate rationales for both subsidy and tax. We show

[2]Farhi and Werning (2010) showed that if the planner does not put a direct Pareto weight for children and value the children's utility only indirectly through the altruism of the parents, then there is no need to distort the bequest decision.

that the correlation between the earning ability and mortality could be another reason for either taxing or subsidizing bequest.

Another remark is that in the world where the saving can serve for both the precautionary life-cycle function and the bequest function, the asset taxes and the inheritance taxes should be considered together. Proposition 4 shows that the implication for these two distortions are the opposite in this economy with contingent bequest motive.

In the presence of heterogeneity in altruism, the result is more involved. The result for the ex post retirement savings distortion does not change even if we include the heterogeneity in altruism. The ex post bequest distortion, however, can have an additional term which has the implications opposite to the ones implied by the heterogeneity in mortality. This can be see from the first order condition of the Hamiltonian:

$$t_b(\theta) = \frac{1}{\eta f(\theta)} \left[\frac{\dot{P}(\theta)}{1-P(\theta)} - \frac{\dot{\gamma}(\theta)}{\gamma} \right] \mu(\theta) u'(c_1(\theta)), \tag{10}$$

where $\eta > 0$ is the multiplier associated with the resource feasibility constraint and $\mu(\theta)$ is the costate associated with (7). If the Pareto weight function $\lambda(\theta)$ is decreasing, the sign of the costate $\mu(\theta)$ is negative, and then the additional term in the ex post bequest wedge due to the heterogeneity in altruism is positive (negative) when $\dot{\gamma}(\theta) > 0$ ($\dot{\gamma}(\theta) < 0$). Thus positive correlation between earnings ability and altruism ($\dot{\gamma}(\theta) > 0$) has an implication toward taxing the inheritance.

Ex post wedges can be interpreted as the tax imposed on the return of state contingent assets. These ex post wedges are helpful for understanding the mechanisms of the intertemporal distortion, but these wedges are hypothetical, since we do not allow state contingent asset holdings against the uncertainty of the life cycle. To interpret the retirement saving wedges and the bequest wedges as the taxes imposed on the existing asset in this economy — state non-contingent bond, we now define new wedges.

Given an allocation (c_1, c_2, c_c, y) and a type θ, we define the retirement savings wedge $\tau_a(\theta)$ and the bequest wedge $\tau_b(\theta)$ as follows:

$$\begin{aligned}
\tau_a(\theta) &= \left(1 - \frac{1}{P(\theta)}\right) + \frac{1}{P(\theta)} \underbrace{\left\{1 - \frac{u'(c_1(\theta))}{Ru'(c_2(\theta))}\right\}}_{=t_a(\theta)} + (1-\tau_b(\theta)) \frac{1-P(\theta)}{P(\theta)} \frac{\gamma(\theta) V_c'(c_c(\theta))}{u'(c_2(\theta))} && (11) \\
\tau_b(\theta) &= \left(1 - \frac{1}{1-P(\theta)}\right) + \frac{1}{1-P(\theta)} \underbrace{\left\{1 - \frac{u'(c_1(\theta))}{R\gamma(\theta) V_c'(c_c(\theta))}\right\}}_{=t_b(\theta)} + (1-\tau_a(\theta)) \frac{P(\theta)}{1-P(\theta)} \frac{u'(c_2(\theta))}{\gamma(\theta) V_c'(c_c(\theta))} && (12)
\end{aligned}$$

We can understand the retirement savings wedge $\tau_a(\theta)$ as the tax imposed on the return of the non-contingent saving if the parents live long, while we can understand the bequest wedge $\tau_b(\theta)$ as the tax imposed on the return of the same non-contingent saving if the parents die early.

The retirement saving wedge (11) has three components. The first term $1-\frac{1}{P(\theta)}$, which is negative, is a component arising due to non-existence of annuity market. The second term $\frac{1}{P(\theta)}t_a(\theta)$ is the normalized ex post retirement saving wedge. The third term $(1-\tau_b(\theta))\frac{1-P(\theta)}{P(\theta)}\frac{\gamma(\theta)V_c'(c_c(\theta))}{u'(c_2(\theta))}$ captures the interaction of the asset and the inheritance due to overlapping functions of saving. Since the absence of annuity market is less costly in the presence of operating bequest motive in the state of early death, we need to adjust the subsidy. Moreover, since the tax on inheritance $\tau_b(\theta)$ is indirectly distorting the saving for the precautionary reason, we need to undo this distortion.

To better understand the retirement saving wedge, we can consider an economy without bequest motive (with $\gamma(\theta) = 0$ for all θ), which is typically considered in the literature on the retirement financing and the annuity. In such an economy the saving wedge is only composed of the first two terms in (11) because there is no interaction between the retirement saving and the inheritance. Hosseini and Shourideh (2016) argue that there should be a huge asset subsidy using the model without bequest motive, because the first component — subsidy to complete the annuity market — dominates the second component in their quantitative analysis. Our results show that when there is an overlapping motive of the retirement saving, the cost of the no annuity market is lower, and thus there is less need for the subsidy. In addition the interaction between asset tax and bequest tax is also important.

The three components of the bequest wedge (12) can be also interpreted in the similar way. The first term $1-\frac{1}{1-P(\theta)}$ is to complete the incomplete market, and the second term $\frac{1}{1-P(\theta)}t_b(\theta)$ is the normalized ex post bequest wedge. The third term $(1-\tau_a(\theta))\frac{P(\theta)}{1-P(\theta)}\frac{u'(c_2(\theta))}{\gamma(\theta)V_c'(c_c(\theta))}$ captures the interaction of the asset and the inheritance — adjustment of the subsidy due to less costly incomplete market and the compensation for the indirect distortion caused by the asset tax $\tau_a(\theta)$.

3.2 Nonlinear Taxation : Implementation

to be filled out

3.3 Linear Taxation

4 Quantitative Analysis

From the theoretical analysis with the simple two period model, we could see that in theory, various range of results are possible and the sign and the shape of the optimal tax system does depend on the calibration of the mortality and the altruism and the welfare criterion. We thus need to investigate these important determinant seriously to get the quantitative results.

[to be continued...]

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