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Intergenerational transfers, asset management and tax avoidance

Ryo Ogawa
Osaka Prefectural Government Institute for Advanced Industry Development

Abstract

Taxpayers are considerably interested in tax planning for intergenerational transfers (inter vivos gifts and bequests) that minimize the payment of taxes. Nordblom and Ohlsson (2006) demonstrated that (1) altruistic parents avoid tax payment by changing the timing of transfers when inter vivos gifts are taxed differently from bequests and (2) tax avoidance ceases to exist if bequests and gifts from the same donor are jointly taxed. This paper aims to demonstrate that if the wealth management/investment behavior of the parent is taken into consideration, tax avoidance will persist even when gifts and bequests are jointly taxed. This is because parents dislike missing an opportunity to gain investment returns from the payment of taxes on gifts that exceed the exemption level.

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1. Introduction

Generally, taxpayers dislike paying substantial taxes and take advantage of the loopholes that exist in the tax law. In particular, affluent people are considerably interested in tax planning for intergenerational transfers (inter vivos gifts and bequests) that minimize the payment of taxes[1]. Thus, it has been an important challenge for economists and policy makers to design a wealth transfer tax system that can reduce tax avoidance.

Nordblom and Ohlsson (2006) theoretically studied the effect of inheritance/estate and gift taxes on parent's behavior with regard to intra-family transfers[2]. Firstly, they demonstrated that altruistic parents avoid tax payment by changing the timing of transfers when inter vivos gifts are taxed differently from bequests[3]. Secondly, they revealed that tax avoidance ceases to exist if bequests and gifts from the same donor are jointly taxed.

However, Nordblom and Ohlsson ignored the possibility of the asset management/investment behavior of parents. Affluent people have a keen interest in investment returns; they attempt to avoid tax payment as much as possible[4]. Stiglitz (1999) noted the two major principles of tax avoidance: the first is the postponement of taxes (that is, taking advantage of the time value of money), and the second is tax arbitrage (that is, taking advantage of the differences in tax treatment and rates). Although tax avoidance is primarily a result of both these principles, Nordblom and Ohlsson focused on tax avoidance related to the second principle.

This paper aims to demonstrate that if we take into consideration the wealth management/investment behavior of a parent, tax avoidance will be exhibited even when gifts and bequests are jointly taxed. The crucial element here is the existence of the returns on gift tax. In other words, suppose that a parent transfers inter vivos which exceed the gift tax

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[1] Schmalbeck (2001) noted the various methods employed to avoid wealth transfer taxes in the US.

[2] Cremer and Pestieau (2006) discussed whether differential taxation of gifts and bequests is consistent with social optimality.

[3] Nordblom and Ohlsson argued that this behavior of tax avoidance is supported by the following empirical literatures: Arrondel and Laferrere (2001), Page (2003), Bernheim et al. (2004), Joulfaian (2004, 2005) and Klevmarken (2004). Nordblom and Ohlsson also refer to Poterba (2001) who demonstrated that parents do not fully take advantage of gift tax exemption.

[4] See, for example, Auerbach et al. (2000) that empirically studies the lock-in effect of the capital gains tax, using panel data.

exemption level, a gift tax is paid at the time; the tax paid is deducted later from the estate/inheritance tax paid at the time of bequest through a system of joint transfer taxation. When this occurs, the parent foregoes the opportunity to obtain investment income from the gift tax. This is because the tax-deduction at the time of bequest is equal to the amount of tax paid, and the possibility of tax investment is not considered.

This paper addresses the abovementioned problem in the following manner. Section 2 presents a model of altruistic transfer behavior under the joint taxation system of gifts and bequests. We mainly follow the model setting of Nordblom and Ohlsson. Subsection 2.1 extends the economy and tax system considered in Nordblom and Ohlsson, and Subsection 2.2 explains the maximizing behavior and its conditions. Section 3 demonstrates that the tax avoidance behavior persists under the joint transfer taxation system. Subsection 3.1 observes the parent's optimal behavior under the joint taxation system, termed 'continuous collection'. Subsection 3.2 confirms our main argument that tax avoidance behavior survives under the joint taxation system. Subsection 3.3 outlines the other joint taxation system known as 'collection at death' and confirms no tax-avoidance. Finally, Section 4 concludes the paper.

2. The Model

2.1. Economy and Tax System Considered in Nordblom and Ohlsson (2006)

This paper follows the model setting proposed by Nordblom and Ohlsson; they considered the following. A single parent and child live for two overlapping periods. It is supposed that the parent has an altruistic preference toward her child and can transfer her wealth to her child[5]. Further, they supposed that the altruistic parent has the following two-period utility function that considers the child's welfare:

$$U = u(c_{1p}) + \delta u(c_{2p}) + \alpha\left[u(c_{1k}) + \delta u(c_{2k})\right], \tag{1}$$

where c_{ij} denotes consumption by the parent ($j = p$) and the kid ($j = k$) in the respective

[5] See Becker (1974) and Barro (1974).

periods ($i = 1$ or 2); $\delta \in [0,1]$ denotes the time-discount factor[6], and $\alpha \in [0,1]$ denotes the discount factor for the child's utility (the degree of altruism). It is assumed that the within-period utility function, $u(c)$, is strictly concave and remains constant across periods and agents. The parent has exogenously given initial wealth, W, and does not work. The child has exogenously given human capital, h_k, and receives a wage income in proportion to it. The real wage rates are assumed to rise with time, that is, $w_{1k} < w_{2k}$. Moreover, Nordblom and Ohlsson assumed that the child cannot borrow or save, implying that the child has no ability to smooth inter-temporal consumption by himself.

However, the altruistic parent smoothes the child's inter-temporal consumption through inter vivos gifts and bequests, while she cannot invest in her child's education, thus the child has an exogenously given level of his human capital[7]. Nordblom and Ohlsson assumed that the parent is aware of the level of the child's human capital and wage rates and can opt for non-negative transfers of her wealth in order to smooth the child's consumption. More specifically, wealth transfer occurs in two time periods: inter vivos gifts given in the first period, $\gamma \geq 0$, and bequest left in the second period, $\beta \geq 0$. This implies that the parent determines how much to consume (c_{1p}), save (s) and gifts (γ) in the first period, taking into account the second period's consumption (c_{2p}) and bequest (β).

This model presented in this paper differs from Nordblom and Ohlsson's model only in one aspect: the parent can invest her wealth and obtain interest income on the investment. In other words, when s is saved, she has a principal and interest of $(1+r)s$, which is used as consumption and bequest in the second period.

Intergenerational transfers are taxed via the joint taxation system of inter vivos gifts and bequests, in which all previous gifts are included in the tax base along with the bequest. The joint transfer tax system is further classified by Nordblom and Ohlsson into two types based on its method of implementation[8]. Continuous collection, which is one of the

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6 To simplify an expression, Nordblom and Ohlsson assumed that the parent discounts future consumption with a zero percent subjective discount rate, that is, $\delta = 1$. However, we do not apply the simplification in accordance with the introduction of the interest rate, the reciprocal of which is the market rate of discount.

7 With regard to endogenous human capital acquired through education, see Becker and Tomes (1986).

8 See appendix in Nordblom and Ohlsson.

methods of implementation, is the central focus of this paper. Under this method, tax is collected at the time of each transfer.

The tax system is expressed in the following manner. Denoting the tax rate on gifts and bequest by τ[9], the tax exemption levels of gifts and bequests by $\bar{g}$ and $\bar{b}$, respectively, and the taxes on gifts and bequest by T_γ and T_β, respectively,

$$T_\gamma = \begin{cases} 0 & \textit{if } \gamma \le \bar{g} \\ \tau(\gamma - \bar{g}) & \textit{otherwise,} \end{cases} \tag{2}$$

$$T_\beta = \begin{cases} -T_\gamma & \textit{if } \gamma + \beta \le \bar{g} + \bar{b} \\ \tau\left[\gamma + \beta - (\bar{g} + \bar{b})\right] - T_\gamma & \textit{otherwise.} \end{cases} \tag{3}$$

Eq. (3) suggests that first, the unused gift tax exemption is carried over and applied to the total transfer and second, the gift tax is credited to the total tax on the transfer.

Corresponding to these suggestions, the after-tax inter vivos gifts that the child receives (g) is given by

$$g = \gamma - T_\gamma, \tag{4}$$

and the after-tax bequest that the child inherits in the second period (b) is given by

$$b = \beta - T_\beta. \tag{5}$$

The second method of implementation is known as collection at death. Under this method, tax on transfers (gifts and bequests) is collected only at the time of death of the parent. In other words, T_γ and T_β under the joint taxation system employing collection at death are given as follows:

$$T_\gamma = 0, \tag{2'}$$

$$T_\beta = \begin{cases} 0 & \textit{if } \gamma + \beta \le \bar{g} + \bar{b} \\ \tau\left[\gamma + \beta - (\bar{g} + \bar{b})\right] & \textit{otherwise.} \end{cases} \tag{3'}$$

2.2. Behavior of Agents

As explained above, only the parent has a maximizing opportunity, stated as follows:

[9] In particular, the tax rates are the same for both gifts and bequests.

$$\max_{\{s,\gamma\ge 0,\beta\ge 0\}} \quad U = u(W-s-\gamma)+\delta u((1+r)s-\beta)+\alpha[u(w_{1k}h_k+g)+\delta u(w_{2k}h_k+b)]. \qquad (6)$$

Note that the only difference between this and the corresponding problem in Nordblom and Ohlsson[10] is that there appears to be an interest rate on the saving in (6). Maximizing (6) yields the following first-order conditions (FOCs):

$$s: \qquad \frac{\partial U}{\partial s} = u'_{1p} - \delta(1+r)u'_{2p} = 0, \qquad (7a)$$

$$\gamma: \qquad \frac{\partial U}{\partial \gamma} = -u'_{1p} + \alpha u'_{1k}\frac{\partial g}{\partial \gamma} + \alpha\delta\, u'_{2k}\frac{\partial b}{\partial \gamma} \le 0, \quad \gamma \ge 0, \ \frac{\partial U}{\partial \gamma}\gamma = 0, \qquad (7b)$$

$$\beta: \qquad \frac{\partial U}{\partial \beta} = -u'_{2p} + \alpha u'_{2k}\frac{\partial b}{\partial \beta} \le 0, \qquad \beta \ge 0, \ \frac{\partial U}{\partial \beta}\beta = 0. \qquad (7c)$$

Eq. (7a) implies that the saving should be chosen such that the parent's marginal utility of consumption in the first period equals to that in the second, weighted by $\delta(1+r)$. Eqs. (7b) and (7c) present the conditions for gifts and bequests. They more or less imply that if in any period the child has a higher weighted marginal utility of consumption than does the parent, it would result in a non-negative transfer. It should be noted that derivatives $\partial g/\partial \gamma$, $\partial b/\partial \gamma$ and $\partial b/\partial \beta$ (or $\partial T_\gamma/\partial \gamma$, $\partial T_\beta/\partial \gamma$ and $\partial T_\beta/\partial \beta$) change their values at $\gamma = \bar{g}$ or $\gamma + \beta = \bar{g} + \bar{b}$, as understood from (2) and (3). These details play an important role in determining the tax avoidance behavior of parents under the joint transfer taxation system, as will be observed in the following section.

3. Asset Management and Tax Avoidance under the Joint Transfer Taxation System

Nordblom and Ohlsson stated that altruistic parents avoid taxes by changing the timing of transfers when inter vivos gifts and bequests are taxed differently; however, this tendency ceases to exist if they are jointly taxed. The purpose of this paper, as mentioned above, is to demonstrate that the joint transfer taxation system cannot completely eliminate tax avoidance if the parent's behavior with regard to the management/investment of assets is taken into

[10] See Eq. (6) in Nordblom and Ohlsson.

consideration. This avoidance appears under the joint transfer taxation system when it employs the continuous collection method of implementation, in which taxes are collected at the time of receiving the gifts and bequests. On the other hand, avoidance does not appear if tax is collected only at the time of death. We elucidate further on these methods of implementation in the following subsections.

3.1. Optimal Behavior under the Continuous Collection Joint Transfer Taxation System

To determine the optimal behavior, let us first consider the continuous collection joint transfer taxation system where tax is collected at the time of receiving the gifts and bequests. Note that under this system, the partial derivatives in the FOCs (7b) and (7c) take the following values, depending on the optimal values of γ and β.

1. $\partial g/\partial\gamma$ in (7b)

$$\frac{\partial g}{\partial \gamma}=\begin{cases}1 & if\ \gamma\le\overline{g}\\ 1-\tau & if\ \gamma>\overline{g}\end{cases} \tag{8}$$

2. $\partial b/\partial\beta$ in (7c)

$$\frac{\partial b}{\partial \beta}=\begin{cases}1 & if\ \gamma+\beta\le\overline{g}+\overline{b}\\ 1-\tau & if\ \gamma+\beta>\overline{g}+\overline{b}\end{cases} \tag{9}$$

3. $\partial b/\partial\gamma$ in (7b)

$$\frac{\partial b}{\partial \gamma}=\begin{cases}0 & if\ \gamma\le\overline{g}\ and\ \gamma+\beta\le\overline{g}+\overline{b}\\ -\tau & if\ \gamma\le\overline{g}\ and\ \gamma+\beta>\overline{g}+\overline{b}\\ \tau & if\ \gamma>\overline{g}\ and\ \gamma+\beta\le\overline{g}+\overline{b}\\ 0 & if\ \gamma>\overline{g}\ and\ \gamma+\beta>\overline{g}+\overline{b}\end{cases} \tag{10}$$

Considering these partial derivatives, the explicit forms of the FOCs (7b) and (7c) are summarized in Table I. Moreover, we note that $\partial g/\partial\gamma$, $\partial b/\partial\beta$ and $\partial b/\partial\gamma$ change their values at $\gamma=\overline{g}$ or $\gamma+\beta=\overline{g}+\overline{b}$. This implies that there exist further cases where γ is restricted to $\overline{g}$ (or $\gamma+\beta$ to $\overline{g}+\overline{b}$), where $\partial U/\partial\gamma>0$ at $\gamma=\overline{g}$ but $\partial U/\partial\gamma<0$ at $\gamma>\overline{g}$ (or $\partial U/\partial\beta>0$ at $\gamma+\beta=\overline{g}+\overline{b}$ but $\partial U/\partial\beta<0$ at $\gamma+\beta>\overline{g}+\overline{b}$). These possibilities are also summarized in Table I.

3.2. Tax Avoidance under the Continuous Collection Joint Transfer Taxation System

This paper attempts to determine whether there occurs a case in which the parent optimally chooses a gift larger than the tax-exemption level and no bequest in the absence of taxation ($\gamma^* > \bar{g}$ and $\beta^* = 0$, where γ^* and β^* denote the optimal gift and bequest in the absence of taxation, respectively), but chooses a gift that is not larger than the tax-exemption level and leaves some bequest instead under the joint transfer taxation system employing continuous collection ($\gamma^{**} = \bar{g}$ and $\beta^{**} > 0$, where γ^{**} and β^{**} denote the optimal gift and bequest under the joint transfer taxation system employing continuous collection, respectively).

To illustrate this possibility, first, let us suppose the abovementioned case, that is, $\gamma^* > \bar{g}$ and $\beta^* = 0$ in the absence of tax. Note then that this implies that $\partial U/\partial\gamma = -u'_{1p} + \alpha u'_{1k} > 0$ (that is, $u'_{1p} < \alpha u'_{1k}$) at the point $\gamma = \bar{g}$ and $\beta = 0$. Further, this implies that the parent increases the gifts to a point where $u'_{1p} = \alpha u'_{1k}$ holds, that is, $\gamma = \gamma^* > \bar{g}$, by supposition.

Second, let us consider that the joint transfer taxation system employing continuous collection is introduced. Then, (7b) has the following three different forms (see Table I), depending on the values of γ and β.

Case I: $$\frac{\partial U(\gamma^{**},\beta^{**})}{\partial\gamma} = -u'_{1p} + (1-\tau)\alpha u'_{1k} + \tau\alpha\delta u'_{2k} = 0 \quad (\gamma^{**} > \bar{g},\ \gamma^{**} + \beta^{**} \le \bar{g} + \bar{b}) \qquad (11)$$

Case II: $$\frac{\partial U(\gamma^{**},\beta^{**})}{\partial\gamma} = -u'_{1p} + \alpha u'_{1k} \ge 0 \quad (\gamma^{**} = \bar{g}, \gamma^{**} + \beta^{**} \le \bar{g} + \bar{b}) \qquad (12)$$

Case III: $$\frac{\partial U(\gamma^{**},\beta^{**})}{\partial\gamma} = -u'_{1p} + \alpha u'_{1k} \le 0 \quad (\gamma^{**} \le \bar{g}, \gamma^{**} + \beta^{**} \le \bar{g} + \bar{b}) \qquad (13)$$

Note that we consider only the cases presented in the first row of Table I, since this satisfies our present purpose.

Case I represents a situation where the parent will continue to give a gift even when she has to pay a tax on it. Such a case may appear when the values of τ and r are sufficiently low and the following relation is satisfied: $u'_{1p} = \alpha(1-\tau)u'_{1k} + \alpha\delta\tau u'_{2k} > \alpha\delta(1+r)u'_{2k}$. This relation implies that the parent gains higher marginal utility by giving a gift with tax deduction rather than saving/investing the same amount and leaving bequest[11].

Case II represents a situation which is the main concern in this paper. In this situation, tax avoidance appears even under the joint transfer taxation system. Now, let us restrict Case II to the following in which $-u'_{1p} + \alpha u'_{1k} > 0$ at $\gamma = \gamma^{**}$, which implies that a gift to a child has a higher marginal utility than that if the parent had consumed it herself. Then, it should be noted that the tax functions will change their values as noted in Section 3.1; thus, the following holds

$$\frac{\partial U(\gamma,\beta)}{\partial \gamma} = -u'_{1p} + (1-\tau)\alpha u'_{1k} + \tau\,\alpha\delta\,u'_{2k} < 0 \qquad (\gamma > \bar{g} = \gamma^{**},\ \ \gamma + \beta \le \bar{g} + \bar{b}). \tag{14}$$

Further, suppose $\beta^{**} > 0$. Then, (7) through (10) implies that $u'_{1p} = \alpha\delta(1+r)u'_{2k} > \alpha(1-\tau)u'_{1k} + \alpha\delta\,\tau\,u'_{2k}$. This relation suggests that the parent has a higher marginal utility when saving/investing and leaving bequest (LHS of the inequality) than when she gives a gift above the tax-exemption level (RHS). In other words, if all relations hold, the parent does not give inter vivos gifts larger than the tax-exemption level and chooses the amount which exceeds the exemption level to be left as bequest, that is, $\gamma^{**} = \bar{g}$ and $\beta^{**} > 0$ are optimal for the parent. However, as supposed at the beginning of this section, a gift over $\bar{g}$ is optimal without taxation. This suggests that tax avoidance occurs. Reviewing the above inequality, we may state that such a case appears when both τ and r are sufficiently high. In particular, note that the existence of interest rate plays a crucial role in the abovementioned argument. If the interest rate (r) ceases to exist from (7) through (10), then $\alpha\,u'_{1k} > u'_{1p} = \delta\,u'_{2p} = \alpha\delta\,u'_{2k}$, i.e. $u'_{1k} > \delta\,u'_{2k}$. Subsequently, (14) with $r = 0$ will never hold.

Lastly, Case III possibly contradicts the supposition that the parent optimally

[11] More specifically, the respective terms imply the following, assuming $\gamma > \bar{g}$ and $\gamma + \beta \le \bar{g} + \bar{b}$. The first term on the LHS ($\alpha(1-\tau)u'_{1k}$) denotes the marginal utility obtained by her child when consuming the after-tax gift ($1-\tau$) in the first period, and the second term ($\alpha\delta\,\tau\,u'_{2k}$) denotes the marginal utility of her child when consuming the gift-tax credit (τ) in the second period. On the other hand, the term on the RHS ($\alpha\delta(1+r)u'_{2k}$) denotes the marginal utility of her child when consuming the bequest obtained from saving/investment of the same amount.

chooses a gift larger than the tax-exemption level in the absence of taxation, and we may dismiss the case. Summarizing the abovementioned arguments, the conditions in which tax avoidance does or does not appear are presented in Table II.

The abovementioned argument has been summarized in the following proposition:

Proposition: In a situation where $\alpha u'_{1k} > u'_p = \alpha\delta(1+r)u'_{2k} > \alpha(1-\tau)u'_{1k} + \alpha\delta\tau u'_{2k}$, there is an infinite marginal excess burden per additional yen of the transfer tax revenue collected.

3.3. Joint Transfer Taxation System Employing the Collection at Death Method of Implementation

Finally, we discuss the joint transfer taxation system where collection is made only at the time of bequest known as collection at death. Under this system, the parent does not need to pay tax at the time of giving the gift. It implies that the parent is free to determine the amount of the gift regardless of the tax on it; thus, tax avoidance behavior is not exhibited under the collection at death joint transfer taxation system.

4. Concluding Remarks

This paper demonstrates that altruistic parents can avoid tax payment by changing the timing of transfers even when bequests and gifts from the same donor are jointly taxed. We explicitly deal with the parent's asset management/investment that was ignored by Nordblom and Ohlsson. Under the joint transfer taxation system employing both methods of implementation—taxation at the time when gifts are given and at the time of death—the previously paid gift taxes are credited at the time of inheritance. The amount of credit, however, does not include the interest income. In other words, this implies that the parent must forego an opportunity to gain income from the investment of the gift tax payment, when they choose to give an inter vivos gift that exceeds the gift tax exemption level.

Further, we suggest that tax avoidance behavior is not exhibited under the joint transfer taxation system where tax is collected only at the time of death. This is because under this system, the parent need not pay any tax at the time of giving the gift. In fact, this system is followed by Ireland and the UK. This collection system, however, may involve the risk of taxpayers not being able to pay their taxes because of the irrational consumption of most of their wealth in advance. Thus, the joint taxation system that employs the continuous collection method is advantageous in that it offers smooth tax administration. This aspect entails further discussion.

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Table I: Explicit Forms of the FOCs (7b) and (7c) under the Continuous Collection Joint Transfer Taxation System

	$0 \le \gamma^{**} \le \bar{g}$	$\gamma^{**} = \bar{g}$	$\gamma^{**} > \bar{g}$
$0 \le \gamma^{**} + \beta^{**} \le \bar{g} + \bar{b}$	$\frac{\partial U^1}{\partial \gamma} = -u'_{1p} + \alpha u'_{1k} \le 0$, $\gamma \ge 0$, $\frac{\partial U^1}{\partial \gamma}\gamma = 0$. $\frac{\partial U^1}{\partial \beta} = -u'_{2p} + \alpha u'_{2k} \le 0$, $\beta \ge 0$, $\frac{\partial U^1}{\partial \beta}\beta = 0$.	$\frac{\partial U^1}{\partial \gamma} = -u'_{1p} + \alpha u'_{1k} \ge 0$, $\gamma - \bar{g} \le 0$, $\frac{\partial U^1}{\partial \gamma} \cdot (\gamma - \bar{g}) = 0$ $\frac{\partial U^1}{\partial \beta} = -u'_{2p} + \alpha u'_{2k} \le 0$, $\beta \ge 0$, $\frac{\partial U^1}{\partial \beta}\beta = 0$	$\frac{\partial U^3}{\partial \gamma} = -u'_{1p} + (1-\tau)\alpha u'_{1k} + \tau\alpha\delta u'_{2k} = 0$, $\frac{\partial U^3}{\partial \beta} = -u'_{2p} + \alpha u'_{2k} \le 0$, $\beta \ge 0$, $\frac{\partial U^3}{\partial \beta}\beta = 0$
$\gamma^{**} + \beta^{**} = \bar{g} + \bar{b}$	$\frac{\partial U^1}{\partial \gamma} = -u'_{1p} + \alpha u'_{1k} \le 0$, $\gamma \ge 0$, $\frac{\partial U^1}{\partial \gamma}\gamma = 0$ $\frac{\partial U^1}{\partial \beta} = -u'_{2p} + \alpha u'_{2k} \ge 0$, $\gamma + \beta - \bar{g} - \bar{b} \le 0$, $\frac{\partial U^2}{\partial \beta} \cdot (\gamma + \beta - \bar{g} - \bar{b}) = 0$	$\frac{\partial U^1}{\partial \gamma} = -u'_{1p} + \alpha u'_{1k} \ge 0$, $\gamma - \bar{g} \le 0$, $\frac{\partial U^1}{\partial \gamma} \cdot (\gamma - \bar{g}) = 0$ $\frac{\partial U^1}{\partial \beta} = -u'_{2p} + \alpha u'_{2k} \ge 0$, $\gamma + \beta - \bar{g} - \bar{b} \le 0$, $\frac{\partial U^2}{\partial \beta} \cdot (\gamma + \beta - \bar{g} - \bar{b}) = 0$	$\frac{\partial U^3}{\partial \gamma} = -u'_{1p} + (1-\tau)\alpha u'_{1k} + \tau\alpha\delta u'_{2k} = 0$, $\frac{\partial U^3}{\partial \beta} = -u'_{2p} + \alpha u'_{2k} \ge 0$, $\gamma + \beta - \bar{g} - \bar{b} \le 0$, $\frac{\partial U^3}{\partial \beta} \cdot (\gamma + \beta - \bar{g} - \bar{b}) = 0$
$\gamma^{**} + \beta^{**} > \bar{g} + \bar{b}$	$\frac{\partial U^2}{\partial \gamma} = -u'_{1p} + \alpha u'_{1k} - \tau\alpha\delta u'_{2k} \le 0$, $\gamma \ge 0$, $\frac{\partial U^2}{\partial \gamma}\gamma = 0$ $\frac{\partial U^2}{\partial \beta} = -u'_{2p} + (1-\tau)\alpha u'_{2k} = 0$	$\frac{\partial U^2}{\partial \gamma} = -u'_{1p} + \alpha u'_{1k} - \tau\alpha\delta u'_{2k} \ge 0$, $\gamma - \bar{g} \le 0$, $\frac{\partial U^2}{\partial \gamma} \cdot (\gamma - \bar{g}) = 0$ $\frac{\partial U^2}{\partial \beta} = -u'_{2p} + (1-\tau)\alpha u'_{2k} = 0$	$\frac{\partial U^4}{\partial \gamma} = -u'_{1p} + (1-\tau)\alpha u'_{1k} = 0$ $\frac{\partial U^4}{\partial \beta} = -u'_{2p} + (1-\tau)\alpha u'_{2k} = 0$

Note: $U = \begin{cases} U^1 & \text{if } \gamma \le \bar{g} \text{ and } \gamma + \beta \le \bar{g} + \bar{b} \\ U^2 & \text{if } \gamma \le \bar{g} \text{ and } \gamma + \beta > \bar{g} + \bar{b} \\ U^3 & \text{if } \gamma > \bar{g} \text{ and } \gamma + \beta \le \bar{g} + \bar{b} \\ U^4 & \text{if } \gamma > \bar{g} \text{ and } \gamma + \beta > \bar{g} + \bar{b} \end{cases}$

Table II: Cases where tax avoidance does or does not occur

No tax	Continuous collection joint transfer taxation system	
	No tax avoidance (Case I)	Tax avoidance (Case II)
$\bar{g} < \gamma^* \leq \bar{g} + \bar{b}$, $\beta^* = 0$	$\bar{g} < \gamma^{**} \leq \bar{g} + \bar{b}$, $\beta^{**} = 0$	$\gamma^{**} = \bar{g}$, $0 < \beta^{**} < \gamma^{**} + \beta^{**} \leq \bar{g} + \bar{b}$
$u'_p = \alpha u'_{1k} > \alpha\delta(1+r)u'_{2k}$	$u'_p = \alpha(1-\tau)u'_{1k} + \alpha\delta\tau u'_{2k} > \alpha\delta(1+r)u'_{2k}$	$u'_p = \alpha\delta(1+r)u'_{2k} > \alpha(1-\tau)u'_{1k} + \alpha\delta\tau u'_{2k}$

Note: $u'_p \equiv u'_{1p} = \delta(1+r)u'_{2p}$