

## Welfare Aspects of Estate and Gift Taxes in Life Cycle Economies\*

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*We study the welfare implications of lowering estate and gift taxes in an overlapping generations model, wherein heterogeneous agents face uncertain lifetimes and leave both accidental bequests and voluntary gifts to their children. According to the findings from the Survey of Consumer Finances, we consider inter vivos giving made by a working parent while receiving bequests from his parent(s). We conduct numerical experiments by changing tax rates and exemption levels in closed and small open economy settings. By adjusting unified tax rates, we discuss the theoretical implications of optimal gift and estate tax rates on improving aggregate capital stock and expected lifetime utility. The welfare gains from higher and broader tax rate changes are measurable and significant in a model with revenue neutrality using an alternative tax rule of capital gain taxes, thereby leading to the possibility that these taxes can effectively provide additional resources for the government to level up disadvantaged populations.*

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## I. Introduction

It is an open question whether estate taxes are welfare increasing or reducing on a systemic basis. Some commentators argue that higher estate and wealth taxes can efficiently meet government funding needs and tackle inequality (e.g., Kopczuk, 2013), while others argue that such policies are harmful to economic growth by reducing incentives to innovate and create wealth (e.g., Foster and Patrick, 1996; Johnson and Eller, 1998), even ignoring the philosophical objections to the confiscation of private property and free alienability of assets. Knowing whether such intergenerational transfers are intentional or not is critical in determining the implications of different estate and gift tax rates. Opponents of estate taxes argue that if inheritances are taxed, then the rich will be incentivized toward over-consumption, thereby lowering the pool of funds available for investment. However, supporters believe that these levies can increase without a significant decline in utility to the (usually) wealthy who pay them and even promote the welfare of those individuals who are not blessed with “picking” such fortunate parents. Overall, the effects of different estate and gift tax rules can be analyzed precisely in a model economy in which an agent leaves wealth or transfers income to his/her adult children voluntarily at a point during his/her lifetime.

In this study, we analyze the tax effects within a general equilibrium framework by incorporating voluntary gifts through and up to the last period of the modeled lifetimes. Voluntary gifts have not been considered in the literature (e.g., Cagetti and De Nardi, 2008) on intergenerational transfers, which focuses on the role of bequests in measuring wealth inequality and aggregate welfare. Individuals are ex-ante identical in the sense that they share the same utility functions and the same discount rate and that they face the same stochastic labor earnings. They are ex-post heterogeneous because they deal with different realizations of exogenous shocks and face stochastic employment opportunities and uncertain lifetimes. If one is living in a parenting period, then s/he can make transfers to his/her children, and the chance to make intergenerational transfers is stochastic.

To analyze these effects, we introduce an overlapping generations model in general equilibrium similar to the models of Nishiyama (2002) and Cagetti and De Nardi (2009). However, their assumption that inter vivos gifts are only provided by a retired parent challenges the experience of anyone who has raised children. By contrast, our model reflects the recent trends in intergenerational transfer as published in the Survey of Consumer Finances (SCF), which provides data on bequests, along with inter vivos gifts given by parents with an average age of 45 years, to adult children. We define “giving” as transfers from parents to their adult children that exclude the child rearing expenses for minors. We also model both intentional and accidental bequests transferred to some parent-aged households, who are also considering gifts to their children. Our research question focuses on

the implications of this triple-generational interaction in accelerating wealth accumulation and inequality. In searching for answers to this question, we simulate changes in estate and gift tax rules in both closed and small open economy models and conduct analyses on the impact of the changes in expected welfare, wealth, and wealth distribution in a steady-state equilibrium, with our models comparing different estate and gift tax rates and exemption rules.

Numerical results show that given fixed exemption rules, the expected aggregate utility decreases along with gift and estate tax rates. The tax repeal leads to a loss in welfare with a lower capital stock in a closed economy. Tax changes are revenue neutral in our model economy. In each experiment in a closed and small open economy, we focus on the role of the estate and gift tax rates in determining a consumer's long-run savings behavior either with capital income tax rates adjustments or with lump-sum tax rates adjustments.

As estate and gift tax rates decrease in our model, the average household in the model economy allocates fewer resources to its long-term savings in preparation for gifts. Accordingly, lower national wealth and output can change the factor prices and social security benefits. We discuss the welfare aspects of estate and gift tax rules related to using a more robust estate tax to help solve chronic tax and social security deficits, in which the tax rates (including capital gains and interest) are adjusted to keep the government budget balanced. When the budget is balanced in a closed economy, non-zero estate and gift tax rules become welfare enhancing because this policy is considered the optimal taxation rule in a second-best economy, only losing out to a system without taxation as discussed in Chamley (1986) and Judd (1985).

Our results also show that wealth and income inequality with low estate and gift tax rates increases but only slightly in comparison with allowing these transfers to pass untaxed. These do not appear to be taxes that are capable of substantially reducing the Gini coefficient, at least working alone. One possible explanation for this small change is found in Feiveson and Sabelhaus (2018). According to their observations on inheritance and inter vivos gift receipts on income and wealth from the SCF data, intergenerational transfers are often made between family members in similar income or wealth classes. If very wealthy parents are mostly giving to reasonably well-off children, then the Gini coefficient should not change drastically. Therefore, the real issue here has more to do with the Gini coefficient's limitations at capturing real progress toward reducing inequality than the efficacy of these taxes.

Rich young households generally receive considerable amounts of wealth from their families, and reducing these transfers can increase aggregate welfare. In our model, the total amount of gifts and bequests is relatively inelastic to changes in taxes and determined by parental assets. Thus, if the taxes on these transfers increase, then the total value of assets received by the donee children may decline, whereas the resources available to the public not blessed with a wealthy hereditary bloodline will increase. Increasing this form of taxation can reduce inequality,

especially in its most pernicious form of huge transfers to subsequent generations who took no part in wealth creation and gain fortunes solely through stochastic transfers, more commonly known as luck. The recipients of these by-definition unearned transfers have no moral right to them and cannot claim to control them due to greater abilities. In sum, to address inequalities in wealth and income derived from transfers, greater taxes on gifts and bequests is an eminently reasonable place to start.

The rest of this paper is organized as follows. We review the literature in Section 2. We present our theoretical model in Section 3. We discuss model parameter calibration issues in Section 4. We summarize the baseline results from a model economy in Section 5 and discuss the various implications of wealth inequality and welfare resulting from policy experiments according to changes in estate and gift tax rules. We summarize our findings and provide directions for future research in Section 6.

## II. Literature Review

Our study is motivated by the works of Auerbach et al. (1983), Atkinson and Sandmo (1980), and İmrohoroglu (1998) on the welfare implications of the capital/saving tax and that of Fuster et al. (2003) on the social security reform. In Fuster et al. (2007), the dynastic utility function is introduced into an overlapping generations model to see if the reform has different implications from the previous model by modelling children's consumption in their parents' utility function.

Unlike previous studies on the outcomes of transfers from the young to the old, such as in the pay-as-you-go social security system, we discuss the welfare implications of the financial transfers from the aged to the youthful. For those wealthy people who strongly desire to leave substantial assets to their children, high estate taxes may push them to earn and save more money to ensure that their heirs remain rich even after taxes, thus leaving behind a legacy of improving the lifestyles of their children. Evidence shows that wealthy people try to evade high estate taxes, with Bakija and Slemrod (2004) showing that the federal estate tax returns from high tax states are lower than expected. If people change their US state residency to avoid estate tax at the state level, then they can also change their citizenships to avoid a (hypothetically) much higher federal estate tax and consequently maintain their output and welfare. However, such argument is purely a conjecture at this point.

The US estate tax in its modern form was initially enacted in 1916 (Jacobson and Johnson, 2007). Except during the Great Depression and Second World War, the US estate tax never raised a significant percentage of federal revenue and only contributed somewhere between 1% to 3%. In recent years, there has been a

movement to reduce the tax even further. The latest estate tax reform, the Tax Cuts and Jobs Act of 2017, doubles the federal estate tax exemption an individual can leave from \$5.6 million to \$11.2 million, allowing a married couple to pass \$22.4 million tax free. This act also raises the amount that wealthy people can leave directly to later generations without paying the generation-skipping tax. Though the higher limits are set to expire in 2025, it leaves a window for wealthy people to avoid taxes permanently by transferring their assets to dynastic trusts. Moreover, any current tax rate sets a baseline from which future renewals are negotiated, which serves as a strong anchoring point that should have a profound influence on future rates. In 2018, the Urban Brookings Tax Policy Center estimated that only about 4,000 estate tax returns would be filed that year.<sup>1</sup>

Given that any estate tax is ineffective without a corresponding gift tax, this research gap seems ripe for exploration. Bequests have been the most studied form of transfers in explaining the welfare implications of tax reforms, which could change the costs of delaying consumption until retirement. Although inter vivos giving is a common transfer type that can be made repeatedly and at appropriate times, it has been neglected in the related theoretical analysis because of findings showing that only few households participate in this form of giving (e.g., Tomes, 1988; Bernheim, et al., 2004).

In fact, most data, including estate/gift tax files, cannot capture all gifts that are made in various forms and divided into small amounts. From the SCF published from 2001 to 2016, we find that 22% of the entire sample received transfers from non-household members. Meanwhile, about 19% of the sample report having received bequests that are usually, but not necessarily, made by parents. From the data, 4.2% of the respondents reported themselves as gift-recipients. Most gifts are made by parents (3.2%), and half are made to recipients younger than 45 years. The limited access to microdata on some gifts does not mean that a parent's gift is nonexistent or negligible. According to Feiveson and Sabelhaus (2018), the total amount of annual inheritances and inter vivos transfers reached about \$350 billion (in 2016 dollars) per year from 1995 to 2016. Their magnitude in the wealth transfer process is also substantial. However, only few studies have cross-checked SCF bequests data with IRS disclosures for validity and reliability. This comparison will establish the efficacy of our simulations using SCF data on gifts and bequests as a new technique to precisely model changing gift and estate taxes and their effects on average welfare.

Furthermore, if bequests are intentional and reflect either altruism (Becker, 1974; Barro, 1974) or a strategic interplay between family members (Bernheim et al., 1985; Perozek, 1998), then they can be altered through inter vivos giving. However, what has been neglected thus far is modeling both gift and estate taxes; gift taxes have not

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<sup>1</sup> <https://www.taxpolicycenter.org/briefing-book/who-pays-estate-tax>

been fully integrated into this type of analysis (Heer, 2001) yet were partially modelled in Nishiyama (2002) and Cagetti and De Nardi (2009), where gifts were only provided by a retired parent. This assumption challenges the experience of anyone who raised children and comes in conflict with the arguments of other scholars. Hurd et al. (2011) also modeled these gifts and found that inter vivos transfers peaked at age 51 in terms of frequency and amount. Therefore, adding depth and greater realism to the work of Nishiyama (2002) should allow for and improve the holistic study of these transfers.

We consider intentional transfers across generations with uncertain lifetimes and borrowing constraints by modeling bequests along with gifts that were made only after the age of 65. We try to precisely analyze the roles of both estate and gift tax rules in determining expected welfare according to one's joy of giving utility by adding inter vivos gifts made by parents, who are also facing stochastic shocks to income, to our analysis. Our model is based on two findings about intergenerational transfers from the SCF. First, older children receive greater transfers from their parents. The average age of a child who received a transfer was 49 years in 2001 and 53 years in 2016. Second, working parents are making transfers to their children. According to the SCF from 2001 to 2016, the average age of parents was 49 years (59 years) when they made a transfer to their children aged under 18 years (above 18 years). Thus, how previous scholars modeled gifts leaves room for the use of different techniques that can closely approximate actual giving patterns. We propose that these two trends have noteworthy implications in analyzing the welfare aspects of the estate and gift tax rules to redistribute the parent's resources to children while both generations are facing stochastic shocks to income.

### III. Model

In our model, we simulate the life of adults from their entry into the workforce at age 21 ( $j=1$ ) up to their retirement at 65 ( $j=45$ ) and their death at age 85 ( $j=65$ ). We construct a model that consists of overlapping generations of heterogeneous 65-period-lived individuals facing mortality risk, individual income risk, and borrowing constraints for living  $J=65$ .

#### 3.1. Preference

Individuals maximize the discounted expected lifetime utility of consumption and giving  $\{c_j, g_j\}_{j=1}^J$  in their separable utilities (Blinder, 1975) with constant relative-risk aversion coefficients  $\sigma$  and  $\eta$ , respectively.

$$\mathbb{E}_0 \sum_{j=1}^J \beta^{j-1} [\Pi_{k=1}^j \psi_k] \left[ \left( \frac{c_j^{1-\sigma}}{1-\sigma} \right) + I_{\Lambda_j} \Lambda_j \left( \frac{g_j^{1-\eta}}{1-\eta} \right) \right] \quad (1)$$

given  $\begin{cases} \Lambda_j > 0 & \text{for } j = 25, \dots, 65, \\ \Lambda_j = 0 & \text{otherwise.} \end{cases}$

where  $\beta$  is the subjective discount factor,  $\psi_k$  is the conditional survival probability from ages  $j-1$  to  $j$ ,  $J$  is the maximum possible life span, and  $\mathbb{E}_0$  is the expectations operator conditional on information at birth. The age gap between parents and children is set at 24 years based on the average gap between generations derived from the SCF.

The utility is based on  $g_j$  models joy of giving. Our utility from giving is the additive separable utility of the parent's concern about leaving gifts to his/her children. Let  $\Lambda_j$  denote a normalized weight on the utility from giving relative to the utility of consumption. Joy of giving is consistent with the data in helping explain that the consumption of parents and heirs is independent of the income distribution among them. This framework also reflects the imperfect substitution of the transfer of debt according to Andreoni (1989), who observed this impure altruistic<sup>2</sup> giving in his study of the warm-glow effect.<sup>3</sup> Impure altruistic giving occurs when the donor reaps substantial personal benefits from transferring a gift to the donee. Giving is usually assumed to be altruistic because value is passed from the giver to receiver, but in impure altruistic giving, the person transferring the property gains personal satisfaction from transferring his/her property to someone else, who is often someone she cares deeply about.

The SCFs allow us to impute cohorts, but precise gifts from one person to another are not captured in the survey data. Given that the giver is hardly identified in a precise way, we impose a stochastic giving chance through the function  $I_{\Lambda_j}$  to indicate a person who willingly offers gifts ( $I_{\Lambda_j} = 1$ , and  $I_{\Lambda_j} = 0$  otherwise). The evolution of the state  $I_{\Lambda_j} \in I_{\Lambda} = \{1, 0\}$  follows a first-order Markov process given the transition function for the giving state, the  $2 \times 2$  matrix  $\Pi(I'_{\Lambda}, I_{\Lambda}) = [\pi_{g',g}]$ , for  $g = 1, 0$  where  $\pi_{g',g} = \text{Prob}\{I'_{\Lambda_j} = g' | I_{\Lambda_j} = g\}$ .

<sup>2</sup> In Park (2019), a more flexible felicity function was introduced to explain altruistic preferences in habit persistence.

<sup>3</sup> Andreoni (1989) explained the warm glow effect where parents are unwilling to perfectly substitute the transfer for debt; hence, they keep some of their "wealth" for themselves. If people enjoy making gifts or bequests, then the warm-glow effects will always dominate altruism, and consumption will increase in the period when the debt is incurred or at the time of intergenerational transfer.

### 3.2. Household Income and Budget

At the beginning of each period until the retirement age  $j^* = 45$ , individuals receive a labor endowment given by inelastic labor supply  $\bar{h}$  and wage rate  $w$ . The employment state is denoted by  $l \in U = \{e, u\}$ , where  $e$  represents employed and  $u$  represents unemployed. The evolution of the state follows a first-order Markov process given the transition function for the employment state, a  $2 \times 2$  matrix  $\Pi(l', l) = [\pi_{k', k}]$ , for  $k', k = e, u$  where  $\pi_{k', k} = \text{Prob}\{l' = k' | l = k\}$ . Let  $\varepsilon_j$  denote an idiosyncratic labor efficiency shock of an age- $j$  agent. The efficiency index  $\varepsilon_j$  is normalized to have an average value of unity over working periods. Subsequently, an agent has a chance to work and expects earnings  $w_j^e = w\varepsilon_j$ . When an individual's  $l = u$ , s/he receives unemployment compensatory benefits  $w_j^u = \phi w_j^e$ , where  $\phi$  is the fixed replacement ratio.

A retiree receives fixed social security benefits  $b$ , which is the fraction  $\theta$  of the average lifetime employed income such that

$$b = \begin{cases} 0, \\ \theta \frac{\sum_{j=1}^{j^*-1} w_j^e}{j^*-1}. \end{cases} \quad (2)$$

The agent's disposable income is given by

$$q_j = \begin{cases} (1 - \tau_s - \tau_u)w\varepsilon_j & \text{for } j = 1, \dots, 44 \text{ if } l = e; \\ \phi w\varepsilon_j & \text{for } j = 1, \dots, 44 \text{ if } l = u; \\ b & \text{for } j = 45, \dots, 65, \end{cases} \quad (3)$$

where  $\tau_s$  and  $\tau_u$  indicate the social security tax rates for unemployment insurance and pension contributions, respectively.

In addition to disposable income  $q_j$ , a  $j$ -year-old agent obtains after-tax capital income  $(1 + r(1 - \tau_k))a_{j-1}$  from saving  $a_{j-1}$  in  $j-1$  period given the market interest rate  $r$  and capital income tax rate  $\tau_k$ . In this economy, a private market for insurance against unemployment risk and annuities is missing, and individuals save  $a_j$  with the maximum borrowing of  $\bar{a}$  in each period such that

$$a_j \geq -\bar{a} \quad \forall j. \quad (4)$$

The assets of some agents who die before age  $J$  are redistributed as accidental bequests as suggested by Carroll (1997) and Palumbo (1999). The government distributes all accidental bequests equally among the surviving heirs in the amount  $\xi$  in a lump-sum fashion.



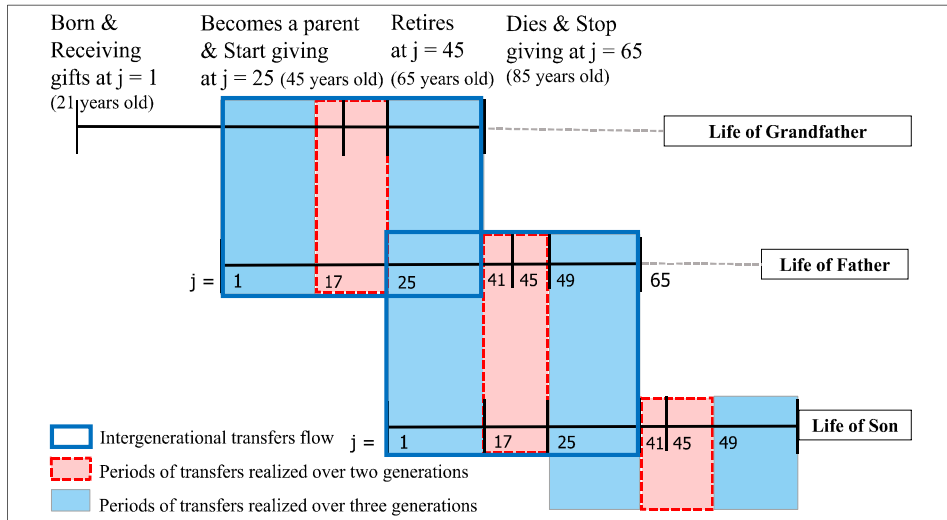
**[Figure 1]** Intergenerational Transfers Flow Chart

Figure 1 presents a timeline of the intergenerational transfers, including both inter vivos giving and bequests. The blue-thick lined box indicates the lifetime when a son would expect to receive transfers from parents. Given that parents start giving as soon as a son is born, a father would expect to receive transfers from his father (grandfather) while making transfers to his own son. In our model, we explain how this triple-generational interaction shapes wealth accumulation and distribution.

Given the total income in a period, a household chooses his/her asset holdings  $a_j$ , consumption  $c_j$ , and giving  $g_j$ . Capital gains are subject to the capital gains tax rate  $\tau_k$ , and  $g_j$  is subject to the gift tax rate  $\tau_g$  when it exceeds the exemption level  $g^\alpha$ . The budget constraints of the four groups are as follows:

$$c_j + a_j \leq \begin{cases} (1+r(1-\tau_k))a_{j-1} + q_j + \xi - I_{\Lambda_j}(1+\tau_g)\max(g_j - g^\alpha, 0) & \text{for } j = 42, \dots, 65 \\ (1+r(1-\tau_k))a_{j-1} + q_j + \xi + \hat{g}_j - I_{\Lambda_j}(1+\tau_g)\max(g_j - g^\alpha, 0) & \text{for } j = 25, \dots, 41, \\ (1+r(1-\tau_k))a_{j-1} + q_j + \xi + \hat{g}_j & \text{for } j = 1, \dots, 24 \text{ given } a_0, \end{cases} \quad (5)$$

Two main features of the model are i) the stochastic rule of making a gift in a utility function  $I_{\Lambda_j}$  and ii) the gift made by working parents aged between 25 and 44 years facing stochastic shocks to income. In equilibrium, the gift distribution must be consistent with the parents' behavior and characteristics, which are described by their survival rate, income efficiency, and future labor earnings conditioned on the parent's current earnings. We assume that the evolutionary processes of such variables are independent from children's survival rate and future labor earnings conditional on current earnings. A child cannot precisely identify the

amount of gifts and only know their expected value ( $\hat{g}_j$ ) from their parent-generation aged  $j+24$ .

The optimization problem is determined recursively given a beginning-of-period asset holding  $a$ . The pre-determined inter vivos giving  $\hat{g}$ , employment status  $l$ , and giving chance  $I_{\lambda_j}$  define the constraint set of an age- $j$  agent  $\Omega_j(a, \hat{g}, l, I_{\lambda_j}) \in R_+^4$  as all pairs  $(c_j, g_j, a_j)$ , satisfying

$$c_j \geq 0, \quad (6)$$

$$g_j \geq 0 \quad (7)$$

Constraints (2), (3), and (5) and a borrowing-constraint (4) are also satisfied. The agent's utility maximization problem can be represented as an optimal stationary Markov plan that always exists. Let  $V_j(a, \hat{g}, l, I_{\lambda_j})$  be the value of the objective function of an age- $j$ , which is defined as the solution to the dynamic program

$$V_j(a, \hat{g}, l, I_{\lambda_j}) = \max_{\{c, a', g\} \in \Omega_j} [U(c, g) + \beta \psi_{j+1} \mathbb{E} V_{j+1}(a', \hat{g}', l', I'_{\lambda_j})], \text{ for } j=1, \dots, J, \quad (8)$$

subject to (2). In (7),  $\mathbb{E}$  is an expectation operator defined by the distribution of the stochastic employment state  $l'$  conditional on  $l$  and by giving-decision  $I'_{\lambda_j}$  conditional on  $I_{\lambda_j}$ .

### 3.3. Firm

In the general equilibrium, a representative firm produces a final good,  $Y$ , in a Cobb–Douglas production function  $F(\cdot)$  with a capital share of output  $\alpha$ :

$$Y = AF(K, L) = AK^\alpha L^{1-\alpha} \quad (9)$$

where  $A$  is a technology parameter, and  $K$  and  $L$  are the aggregate values of factors, capital, and labor inputs. The profit-maximizing firm determines the real return to capital net depreciation,  $\delta$ , and real wages according to the first-order conditions as follows:

$$r = AF_K(K, L) - \delta = \alpha AK^{\alpha-1} L^{1-\alpha} - \delta \quad (10)$$

$$w = AK_L(K, L) = (1-\alpha)AK^\alpha L^{-\alpha} \quad (11)$$

The population grows at an exogenous constant rate  $n$ , and the aggregate output growth rate is given by  $gr$ . Referring to the steady-state behavior of capital in İmrohoroglu et al. (1998), given a balanced growth path in which the capital-

to-output ratio is fixed, the output per capita grows at  $f = gr - n$  without aggregate uncertainty. To guarantee the dynamically efficient growth path of the economy, the interest rate  $r$  is always larger than  $f$ .

### 3.3.1. Closed Economy

In a closed economy, the factor markets are clear. Therefore, GDP, which is similar to gross national product, is determined by

$$Y = F(K, L) = (r + \delta)(W_p + W_g) + wL, \quad (12)$$

where  $W_p$  and  $W_g$  denote total private and government wealth, respectively. For simplicity, we assume that the government's fixed capital is as productive as private fixed capital. As assumed in Nishiyama and Smetters (2014), the capital income from the government's fixed capital is assumed to be zero in the National Income Product Accounts. Thus, only depreciation  $\delta K_g$  is included in GDP in the computation of fixed capital. The gross domestic national product is

$$Y = F(K, L) - rK_g = (r + \delta)K_p + \delta K_g + wL. \quad (13)$$

### 3.3.2. Small Open Economy

In a small open economy, international capital flows are assumed to ensure that the capital-labor ratio is determined by the world interest rate that is attained in the economy. Thus, factor prices  $r$  and  $w$  are fixed at baseline levels. In an equilibrium, the domestic capital stock  $K_D$  and labor supply  $L$  are determined to satisfy the firm's profit maximizing conditions, that is,

$$F_K(K_D, L) = r + \delta, \quad F_L(K_D, L) = w. \quad (14)$$

GDP  $Y_D$  and gross national product  $Y$  are determined by

$$Y_D = F(K_D, L) = (r + \delta)K_D + wL, \quad (15)$$

$$Y = (r + \delta)(W_p + W_g) + wL, \quad (16)$$

respectively, and the debt held by foreign countries is defined by

$$W_F = K_D - (W_p + W_g). \quad (17)$$

### 3.4. Stationary Equilibrium

The stationary equilibrium is described by Sargent (1987) and Stokey (1989) according to a recursive representation of the agent's problem, in which individual asset holdings fall on discrete grid points  $A = \{d_1, d_2, \dots, d_m\}$ . At a point in time, individuals are heterogeneous in their age  $j$  and state  $s$ . Let  $s = (a, \hat{g}, l, I_{\Lambda_j}) \in S = A \times G \times U \times I_{\Lambda}$  where  $G \subset R^+$ ,  $U = \{e, u\}$  and  $I_{\Lambda} = \{0, 1\}$ . For each  $S \in \mathbf{S}(\mathbf{X})$ , where  $S(X)$  is the Borel  $\sigma$ -algebra on  $\mathbf{S}$ , let  $\lambda_j(a, \hat{g}, l, I_{\Lambda_j})$  denote the probability measure of  $j$ -aged individuals of type  $s = (a, \hat{g}, l, I_{\Lambda_j}) \in \mathbf{S}$  defined on subsets of the state space as a proportion of all age  $j$  individuals. A time-invariant age structure of the population can be found by the time-invariant survival probabilities  $\psi_j$  and the population growth rate  $n$ . The fraction  $\mu_j$  for  $j = 1, \dots, J$  defines the share of age- $j$  individuals in the population, in which  $\mu_{j+1} = [\frac{\psi_{j+1}}{(1+n)}]\mu_j$ . The sum of fractions  $\sum_{j=1}^J \mu_{j+1}$  is given by 1.

**Definition of Stationary Equilibrium:** Given a set of time-invariant fiscal policy arrangements  $\{\tau_s, \tau_u, \tau_k, \tau_g\}$ , a stationary equilibrium is a collection of value functions, individual policy functions  $\{c_j : A \times G \times U \times I_{\Lambda} \rightarrow R^+, a'_j : A \times G \times U \times I_{\Lambda} \rightarrow A, g_i : A \times G \times U \times I_{\Lambda} \rightarrow R^+\}$ , age-dependent yet time-invariant measures of age types  $\lambda_j(a, \hat{g}, l, I_{\Lambda_j})$  for each age  $j = 1, \dots, J$ , relative prices of labor and capital  $\{w, r\}$  for a representative firm, and a lump-sum transfer  $\xi$  such that when individuals solve the problem described above, the government budget constraint is satisfied, and the goods market is cleared. The following conditions hold in equilibrium:

- The collection of age-dependent, time-invariant measures  $\lambda_j(a, \hat{g}, l, I_{\Lambda_j})$  for  $j = 1, \dots, J-1$  satisfies

$$\lambda_{j+1}(a', \hat{g}', l', I'_{\Lambda}) = \sum_a \sum_{\hat{g}} \sum_l \sum_{I_{\Lambda}} \Pi(l', l) \Pi(I'_{\Lambda}, I_{\Lambda}) \lambda_j(a, \hat{g}, l, I_{\Lambda}), \quad (18)$$

where the initial measure of agents at  $j=1$  and  $\lambda_1$  is given.

- Aggregate behavior is consistent with individual behavior for total private wealth  $W_p$

$$W_p = \sum_j \sum_a \sum_{\hat{g}} \sum_l \sum_{I_{\Lambda}} \mu_j \lambda_j(a, \hat{g}, l, I_{\Lambda}) a_{j-1}(a, \hat{g}, l, I_{\Lambda}), \quad (19)$$

given the initial asset holding distribution  $a_0$ . The national wealth  $K$  is equal to the sum of private and government capital stocks in a closed economy

such that

$$K = W_p + W_g. \quad (20)$$

- A child-household receives a gift  $\hat{g}_j$  for  $j=1, \dots, 41$ , which is pre-determined by the expected amount of parent-households' (at age  $j+24$ ) optimal choices of  $g_{j+24}$ , such as

$$\hat{g}_j = \frac{\sum_a \sum_{\hat{g}} \sum_l \sum_{I_\Lambda} \mu_{j+24} \lambda_{j+24}(a, \hat{g}, l, I_\Lambda) g_{j+24}(a, \hat{g}, l, I_\Lambda)}{\sum_a \sum_{\hat{g}} \sum_l \sum_{I_\Lambda} \mu_j \lambda_j(a, \hat{g}, l, I_\Lambda)} \quad (21)$$

Thus, the total gift  $G$  is defined by

$$G = \sum_{j=25}^J \sum_a \sum_{\hat{g}} \sum_l \sum_{I_\Lambda} \mu_j \lambda_j(a, \hat{g}, l, I_\Lambda) g_j(a, \hat{g}, l, I_\Lambda). \quad (22)$$

- The total labor supply is consistent with the sum of fixed labor supply such that

$$L = \sum_j^{j^*} \sum_a \sum_{\hat{g}} \sum_l \sum_{I_\Lambda} \mu_j \lambda_j(a, \hat{g}, l = e, I_\Lambda) \varepsilon_j. \quad (23)$$

- Factor prices  $\{w, r\}$  solve the firm's profit-maximizing problem by satisfying conditions (10) and (11) given in a closed and small open economy, respectively.
- Given factor prices  $\{w, r\}$ , government policies  $\{\theta, \phi, \tau_s, \tau_u, \tau_k, \tau_g\}$ , and the equally distributed lump-sum transfer  $\xi$ , the individual policy functions  $c_j(a, \hat{g}, l, I_\Lambda), a'_j(a, \hat{g}, l, I_\Lambda), g_j(a, l, \hat{g}, I_\Lambda)$  solve the individual dynamic problem (8).
- The commodity market clears such that

$$C_p = \sum_j \sum_a \sum_{\hat{g}} \sum_l \sum_{I_\Lambda} \mu_j \lambda_j(a, \hat{g}, l, I_\Lambda) c_j(a, \hat{g}, l, I_\Lambda). \quad (24)$$

- The social security system is self-financing such that

$$\tau_s = \frac{\sum_{j=j^*}^J \sum_a \sum_{\hat{g}} \sum_{I_\Lambda} \mu_j \lambda_j(a, \hat{g}, \cdot, I_\Lambda) b}{\sum_{j=1}^{j^*-1} \sum_a \sum_{\hat{g}} \sum_{I_\Lambda} \mu_i \lambda_j(a, \hat{g}, l = e, I_\Lambda) w \varepsilon_j} . \quad (25)$$

- The unemployment benefits program is self-financing such that

$$\tau_u = \frac{\sum_{j=1}^{j^*-1} \sum_a \sum_{\hat{g}} \sum_{I_\Lambda} \mu_j \lambda_j(a, \hat{g}, l = u, I_\Lambda) \phi w \varepsilon_j}{\sum_{j=1}^{j^*-1} \sum_a \sum_{\hat{g}} \sum_{I_\Lambda} \mu_i \lambda_j(a, \hat{g}, l = e, I_\Lambda) w \varepsilon_j} . \quad (26)$$

- The lump-sum distribution of accidental bequests is distributed equally by  $\xi$  such that

$$\xi = \frac{\sum_j \sum_a \sum_{\hat{g}} \sum_l \sum_{I_\Lambda} \mu_j \lambda_j(a, \hat{g}, l, I_\Lambda) (1 - \psi_{j+1}) a_j(a, \hat{g}, l, I_\Lambda)}{\sum_j \sum_a \sum_{\hat{g}} \sum_l \sum_{I_\Lambda} \mu_j \lambda_j(a, \hat{g}, l, I_\Lambda)} . \quad (27)$$

- The law of motion of the government's net worth  $W_g$  is

$$W'_g = \frac{1}{(1+n)} [(1+r)W_g + T - C_g] , \quad (28)$$

where  $C_g$  is the government's spending, and  $T$  the total tax collected by

$$T = T_k + T_g . \quad (29)$$

A government collects revenues from capital income  $T_k$  and gift taxes  $T_g$ , such as

$$T_k = \tau_k r K , \quad (30)$$

$$T_g = \tau_g G , \quad (31)$$

where  $\tau_k$  and  $\tau_g$  indicate the capital gains and gift tax rates, respectively.

- The law of motion for capital follows

$$Y = C_p + C_g + (1+n)K' - (1-\delta)K , \quad (32)$$

in a closed economy or

$$Y = C_p + C_g + (1+n)(W_p + W_g) - (1-\delta)(W_p + W_g) \quad (33)$$

in a small open economy, where  $\delta$  is the depreciation rate.

## IV. Calibration

Most of the parameters in the model economy are evaluated to match the suggested features of an overlapping generational framework from previous literature. The sources of most parameters are specified in Table 1.

### 4.1. Preference and Aggregate Wealth Target

In the aggregate economy, the steady-state level of ratio of capital to output is set at 3 following Auerbach and Kotlikoff (1987). Following Cooley and Prescott (1995), we set the yearly depreciation rate of aggregate capital at 8%, which closely matches the figures reported in Laitner (2001) and Heer and Maussner (2004). The annual depreciation rate is calculated from the current-cost depreciation of fixed assets and consumer durables netting gross fixed capital formation (US Bureau of Economic Analysis [BEA], 2016). The production elasticity of capital  $\alpha$  is set to 0.4 following Prescott (1986), Cooley and Prescott (1995), and Rios-Rull (1996).

We use 2 as the relative risk aversion coefficient as was used in Nishiyama (2002), Fernández-Villaverde and Krueger (2004), and Heer and Maussner (2004). The ratio between the two risk aversion parameters, or the wealth elasticity of intergenerational transfer  $\frac{\sigma}{\eta}$ , is set to 1 following Blinder (1976), who argued that the elasticity should be 1 when a homothetic utility function is maximized with the wealth of current and future generations as arguments. We estimate the discount rate by observing the ratio across consumption in each period from the Consumer Expenditure Survey (CEX) in the selected years matching those in the SCF. We use the method of Laitner (2001) for calibrating  $\beta$ , with the discount rate estimated at 0.978 and kept fixed across all periods.<sup>4</sup>

We calibrate worker's efficiency shocks and transition probabilities as suggested in İmrohoroglu et al. (1998) by using the relative earnings differences for age groups provided by the current population reports in 2016 (Semega et al., 2016). Additionally, the probability of the employed to remain employed in the next period is assumed to be 0.955. Thus, the employed have a 4.5% yearly chance to be unemployed, and the stochastic transition rule is equally applied for the currently

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<sup>4</sup> Some overlapping generation frameworks also suggest a discount rate of less than 1, such as 0.9375 in Fernández-Villaverde and Krueger (2004) and 0.9852 in Auerbach and Kotlikoff (1987) and Hubbard and Judd (1987).

unemployed. The conditional survival rate is obtained from the number of deaths and death rates by age recorded in national vital statistics reports from the Centers for Disease Control and Prevention (Xu et al., 2016). The annual population growth rate is assumed to be 0.7% based on the monthly labor review of 2017 (Alan et al., 2017). The annual growth rate of per capita output is set as 1.87% given the multiplicative constant in the production function  $A = 1.005$ . Some parameters, such as the replacement ratio  $\phi$  and conditional survival rate  $\Psi_j$  are calibrated to match statistics from the US Department of Labor in 2018 and the Current Population Survey (CPS) in 2016.<sup>5</sup> We set an exogenous borrowing constraint  $-\bar{a} = -0.9$  in equation (4).

[Table 1] Summary of Parameters

Parameters		Values	Sources
Population growth rate	$n$	0.7 percent	Alan et al. (2017)
Technology constant	$A$	1.005	Imrohoroglu et al. (1999)
Discount rate	$\beta$	0.978	Auerbach and Kotlikoff (1987) and Hubbard and Judd (1987)
Production elasticity of capital	$\alpha$	0.4	Cooley and Prescott (1995)
Coefficient of relative risk aversion for consumption	$\sigma$	2	Nishiyama (2002) Fernández-Villaverde and Krueger (2004) Heer and Maussner (2004)
Coefficient of relative risk aversion for giving	$\eta$	2	Blinder (1976)
Transition matrix of giving	$\Pi(I'_\Lambda, I_\Lambda)$	$\begin{bmatrix} 0.8 & 0.2 \\ 0.2 & 0.8 \end{bmatrix}$	SCF 2001–2016
Rate of depreciation	$\delta$	4 percent	BEA (2016)
Replacement ratio	$\theta$ & $\phi$	0.4	US Department of Labor in 2018
Giving weight	$\Lambda$	10 percent	SCF 2001–2016, USDA (2011), and CEX 2007–2010
Stochastic giving chance	$I_\Lambda$	20 percent	SCF 2001–2016
Capital gains tax rate	$\tau_k$	25 percent	in text
Gift tax rate	$\tau_g$	12 percent	in text
Gift exemption rule	$g^\alpha$	1.0	in text
Efficiency scale	$\varepsilon_j$ for $j = 1, \dots, 44$		CPS 2016 (Semega et al., 2016)
Transition matrix of labor efficiency	$\Pi(l', l)$	$\begin{bmatrix} 0.955 & 0.045 \\ 0.045 & 0.955 \end{bmatrix}$	CPS 2016 (Semega et al., 2016)
Conditional survival rate	$\Psi_j$ for $j = 1, \dots, 65$		CDC report 2016 (Xu et al., 2016)

<sup>5</sup> Both the efficiency scale and conditional survival rate are available upon request.



## 4.2. Joy of Giving and Aggregate Gift Target

Table 1 also summarizes our estimates on the giving weight  $\Lambda_j$  and a stochastic giving chance  $I_\Lambda$ . To estimate the value of  $\Lambda_j$ , we consider two major types of intergenerational transfers, namely, (1) real estate and financial assets transfers and (2) cash transfers. In i), we consider the added value from real estate and financial assets, attributed by parent consumption units (CU) from two sources, namely, the stream of housing services and the flow of income from returns on financial assets. Financial assets mainly represent the ownership of an inherited or gifted business through dividend payments, royalties, and fixed income from bonds. Given that the annual flow of these stock values is important in estimating the size of gifts, they are transformed into a stream of implicit services by a typical hedonic regression such that

$$\ln(V_{i,t}) = \beta_i X_{i,t} + e_{i,t} \quad (34)$$

where  $V_{i,t}$  denotes the value of asset  $i$  at  $t$ . In (34),  $V_{i,t}$  is correlated with the traits  $X_{i,t}$  of an underlying asset with an error term  $e_{i,t}$ . The exemplary traits of housing include its value as a shelter, public services, and the operational values embedded in the value of a house. The stream of housing services is fully imputed in rental value  $R_{i,t}$  as a proportion of the cost of housing  $V_{i,t}$ , and the fraction  $C_t$  indicates the capitalization rate defined by annual net income over the cost or value of an asset at time  $t$  as noted in (35).

$$R_{i,t} = C_t V_{i,t} \quad (35)$$

Hedonic regression is represented in equation (36) as the vector  $\gamma_t$  of the estimated percentage of rent associated with individual housing traits, where  $u_{i,t}$  denotes the residual.

$$\ln(R_{i,t}) = \gamma_t X_{i,t} + u_{i,t} \quad (36)$$

To estimate the flow amount of assets contributed by independent parents relative to that of self-obtained assets, we compare the capitalization rates without identifying  $X_{i,t}$ s because the traits remain the same regardless of the origin of assets. The value  $C_t$  can be written as a function of  $X_{i,t}$  that includes the user-costs of assets, which in turn depends on mortgage rates, depreciation, and expected future value of properties. Subsequently, we assume that  $C_t = C_1$  for those who have paid for alimony or transfers to their children and  $C_t = C_2$  for those who have not paid for them. First, we estimate the market value of owned houses and other properties

for recipients and non-recipients from the SCF and find the net rental income from those assets. Second, we estimate the capitalization rate by  $C_i = R_{i,t} / V_{i,t}$  for  $i=1,2$  averaged over  $t=2001, \dots, 2016$ . Finally, the difference between  $C_1$  and  $C_2$  allows us to estimate the difference in the values of assets of the two groups.

The average capitalization rate of properties of those who have received no gifts or bequests from their parents is 1.71%, whereas the rate based on both inherited and self-obtained properties of recipients is 1.85%. Moreover, the donor-group (most often parents) can generate higher income from the same types of properties than the non-donor-group. The donor's rate is 2.37%, which is 1.38 times greater than that of the non-donor-group (1.72%). The capitalization rate based on housing and other real property is 10% higher among those who have received inter vivos transfers compared with those who have not received these transfers. Those who are wealthy enough to leave substantial bequests or gifts may transfer higher-quality assets to their beneficiaries, although this assumption warrants further study. However, given that business assets' capitalization rates (business/farm/professional income relative to the business asset) of self-made businesses are highly sensitive to the rate of a few outliers, we omit the value of business assets in our estimation. If a typical CU spends about 34% of its annual income on housing among all annual expenditures (in CEX surveys 2007–2010), a household who is willing to provide housing services to its children (both living at home and away) needs to spend an additional 3.5% compared with a household who is not supporting their progeny's living arrangements.

According to the data provided by recipients in the SCFs, if transfers are ever made in one's lifetime or at death, then the average amount is \$164,730. We normalize this amount by  $J$  to find that 2.7% of a household's annual income (\$92,959 on average) is saved as cash transfers for children. By aggregating i) realized and unrealized capital gains from real estate and funds produced by transferred assets, ii) education expenditures, and iii) cash transfers, we find that 11% of a household's annual income is committed as gifts and estates. We then set the stochastic giving chance  $I_A$  at 20% by referring to the 20% of the sample making transfers.

To calibrate the benchmark estate and gift tax rates and exemption rules, we use statistics from the aggregate gift tax amounts documented by the US government budget such that the aggregate transfer amounts are of the proper proportions relative to total tax revenue to GDP. The average ratio from 1947 to 2009 is 0.25%. Given that we omit business income, employment, and excise taxes, we set the target of the total gift and estate taxes, including estate and trust income tax, to be 2.5% of the total tax take. This target includes both estate and gift and individual income taxes and is based on the gross tax collections data by type of tax from fiscal years 1960 to 2017 as published by the IRS. This target is higher than the fraction relative to federal revenues according to the Budget of the United States

Government in Fiscal Year 2017, which shows that since 1945, estate and gift tax receipts have consistently remained near or below 0.7% of the total revenue.<sup>6</sup> The benchmark effective<sup>7</sup> tax rate  $\tau_g$  is set to 12%.

We also set the target of the total gift amount-to-output ratio  $\frac{T_g}{Y}$ . According to the GDP and gift tax collection from 1990 to 2016, the average ratio is 0.02%. The second target is the total amount of gifts that are above the exemption level  $g^{ex}$ . The annual personal exclusion amount has risen since 2002 from \$11,000 to \$14,000 in 2014–2017.<sup>8</sup> From the distribution of total transfers, we find that 28% of parents made bequests and gifts of less than \$14,000. In our model economy, by setting  $g^{ex} = 1$ , we generate taxable gifts at around 72% of the total gifts. The baseline capital gains tax rates are set at 25% to match the estate and gift tax revenues relative to the capital income tax revenues.

## V. Results

An analytical solution to the problem does exist yet is difficult to solve manually. The numerical solutions are obtained by the value function iteration method given the recursive nature of the problem. The algorithm for computing the equilibrium is based on that described in İmrohoroglu et al. (1998). The convergence tolerance for capital stock and bequests is 0.001. This value is also applied for consumption increments in utility tabulation. The convergence gradients for capital stock and bequests are set as 0.2 and 0.6, respectively. We use 1025 points on an asset grid with equal distribution. We find the optimum asset choice over several (generally five) possibly non-contiguous grid points and the global optimal asset choice for a single state by performing a golden section search. This section summarizes the main features of the baseline model.

### 5.1. Baseline Results

We examine whether the distribution of the calibrated economy matches the US

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<sup>6</sup> In 2014, the estate tax raised \$19.3 billion according to the OMB or 0.6% of the total federal revenue of over \$3 trillion.

<sup>7</sup> The statutory gift tax rate has been studied in some public policy literature, such as Poterba (2001) and Joulfaian (2005), at 50%, generating an effective rate of 20%.

<sup>8</sup> The donor does not pay gift taxes for gifts greater than the annual exclusion amount if the total gifts that are made during his/her lifetime are less than the lifetime exclusion amount. For example, a married couple was able to shield slightly less than \$11 million for 2017. Although most estates (including cash, publicly traded securities, and small amounts of other easily valued assets and excluding special deductions or elections or jointly held properties) do not require the filing of an estate tax return, estates with combined gross assets and prior taxable gifts exceeding \$11 million in 2018 and \$11.4 million in 2019 require the filing of these returns.

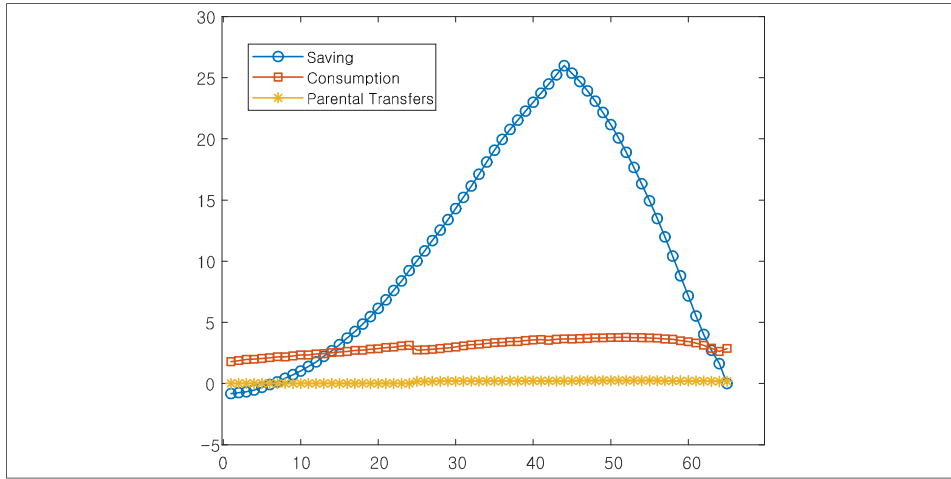
wealth distribution observations when our models contain inter vivos giving and income heterogeneity. Net asset holdings are defined as the concept of wealth without considering human capital following a typical measure of physical capital in the US data. We examine several targets to check if the total gift amounts produced in the model economy represents that of the actual economy.

[Table 2] Comparing Inequality: Data and Baseline Models

	Wealth Gini	Earnings Gini	Capital-to- Output Ratio	Taxable Gifts as of Total gifts	$T_g / (T_g + T_k)$	$T_g / Y$
US data	0.78	0.60	3.00	72%	0.025	0.2%
Model economy	0.52	0.60	3.01	73%	0.03	0.24%

Table 2 compares the distribution of earnings and wealth in the model economy with those in the US data from the SCF. The benchmark model shows that the size of aggregate capital stock and the total amount of gifts relative to total tax revenues and economic output are modeled fairly well. As shown in Figure 2, the average lifetime savings have a hump-like shape, while both consumption and transfer paths have smooth patterns.

[Figure 2] Average Lifetime Saving, Consumption, and Giving Paths



The Gini coefficients for earnings are nearly identical. However, for the wealth Gini, the model produces a smaller coefficient than what was calculated from the data. This result may be ascribed to two reasons. First, in our model, the available data on a child household’s conjecture on his/her parent’s decision about intergenerational transfer only include the expected gift and bequest amounts between generations. Thus, the model may underestimate intra-generational wealth inequality. Second, in other models such as that of De Nardi and Yang (2014), gifts

and bequests are treated as luxury goods, and these models explain a considerable part of wealth inequality. In this paper, we make substantial efforts using proxies and imputation to arrive at very reasonable approximations, but we cannot conclusively determine a rule of private inter vivos giving when some data are missing. If more data become available in the future, then we should consider their addition to the model to obtain fine-grained outputs.

[Table 3] Sensitivity Analysis on  $\Lambda_j$

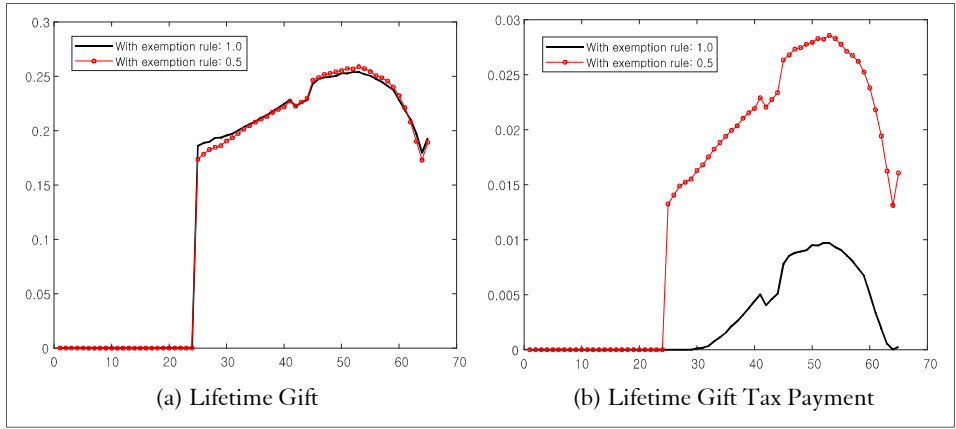
$\Lambda_j$	$G$	$K$	$K / Y$	$w$	$r$	$EV_{newborn}$
0.30	0.083	4.96	3.00	1.26	0.095	-16.86
0.50	0.094	5.15	3.04	1.27	0.092	-17.94
0.70	0.106	5.18	3.05	1.27	0.091	-19.59
0.90	0.114	5.02	2.99	1.26	0.093	-20.81

Source: Author’s calculations from the model.

We check the model’s sensitivity according to changes in the constant giving weight  $\Lambda_j$ . We assess the changes in the capital stock, output, market wages, and interest rates according to the changes in  $\Lambda_j$ . We perform the analysis using the baseline model with capital gains tax rate adjustments to balance out the government’s budget by the gift amounts and estate and gift tax changes. We summarize the changes in the key statistics by the changes in  $\Lambda_j$  in Table 3.

In Table 3,  $EV_{newborn}$  is a measure of the average lifetime utility of consumption and gift or the expected discounted utility of a newly born individual during his/her lifetime under a given fiscal policy regime. The results provide strong implications about the role of joy of giving utility by showing that a higher propensity to give relative to consume is associated with an increase in gifts and a lower consumption. However, its role in asset accumulation is not monotone. For example, when  $\Lambda_j$

[Figure 3] Age Profiles with Different Exemption Rules:  $g^{ex} = 0.5$  vs.  $g^{ex} = 1.0$



reaches 90%, a household saves less, and the total capital stock and capital-to-output ratio are lowered.

Figure 3 shows different optimal lifetime gift amounts and gift tax payments in a baseline economy with  $g^{ex} = 1.0$  (baseline, in black) and  $g^{ex} = 0.5$  (in red dotted), respectively. As expected, our baseline economy shows that a lower exemption rule generates more tax revenues. We extend our results from different combinations of tax rates and exemption rules in Section 5.2.

## 5.2. Results from Policy Experiments

We summarize the results from our experiments on gift and estate tax repeals in Table 4. We test the effect of the estate and gift tax repeal in three economic models, namely, a closed economy without capital gains tax rate adjustment, a small open economy without tax adjustment, and a closed economy with tax adjustment (our baseline model). In a small open economic setting, wages and interest rates remain constant with the repeal by assuming that the international flows of physical and human capital are flexible. We propose two welfare measures, namely, veil of

[Table 4] Aggregate Values and Welfare Changes with Gift Tax Repeal

	Without capital gain tax rate adjustment		With capital gain tax rate adjustment		With lump-sum tax adjustment	
	(1) Closed	(2) Small open	(3) Closed (Baseline)	(4) Small open	(5) Closed	(6) Small open
%Δ $K$	0.51	1.81	-1.49	-3.18	0.52	1.69
%Δ $K / Y$	0.33	1.08	-0.95	-1.92	0.28	1.02
%Δ $C_p / Y$	0.42	-0.05	0.46	0.88	0.14	0.05
%Δ $(C_p - T) / Y$	4.23	2.75	1.3	3.68	3.95	-12.11
%Δ Bequest/ $Y$	1.35	1.69	0.22	-0.85	1.10	2.16
%Δ $G / Y$	4.54	3.96	4.35	3.76	4.14	2.83
Δ Interest rate	0.19		1.67		0.24	
Δ Wage rate	-0.4		-0.54		-0.55	
%Δ Welfare						
Veil of ignorance <sup>a</sup>	0.24	0.28	-0.38	-0.41	0.30	0.43
Equivalent wealth <sup>b</sup>	0.75	2.09	-1.86	-1.8	0.83	2.12
Wealth Gini	0.58	0.57	0.59	0.59	0.55	0.53

Note: %Δ and Δ denote the change in percentage and percentage points from the baseline model, respectively.

<sup>a</sup>  $\left[ \left( \frac{Ev(s_1, S_1; \Psi_1)}{Ev(s_0, S_0; \Psi_0)} \right)^{\frac{1}{1-\gamma}} - 1 \right]$ , where  $Ev$  is the average welfare,  $s_0$  and  $s_1$  are individual states,

$S_0$  and  $S_1$  are the aggregate values before and after tax repeal, and  $\Psi_0$  and  $\Psi_1$  denote the policy schedules before and after the tax repeal, respectively.

<sup>b</sup> (Equivalent wealth/Baseline total wealth -1) × 100.

ignorance and equivalent wealth.<sup>9</sup>

In our estate and gift tax repeal (3) experiment where the revenue is recovered by adjusting capital gain tax rates in a closed economy, we find that capital and capital-to-output ratio are lowered. If households face higher capital gain tax rates, then their savings decline, whereas their personal transfers significantly increase. Figure 4 shows that younger and middle-aged households save less and consume less yet give more to their children. The increase in government spending is also related to lower private consumption. Given the national income identity in equation (33), an increase in government spending, while holding taxes constant, must decrease the sum of consumption and investment regardless of whether individuals view new debt as equivalent to taxation. If individuals do not take future taxes into account, then consumption decreases along with the deficit-induced increase in interest rates.

The reductions in saving and consumption explain the decrease in aggregate welfare in model (3), in which greater weight is applied to the values of younger households than those of older ones. Despite the increase in the wealth Gini coefficient, our results emphasize the welfare aspect of the gift tax repeal even when a parent transfers the gift while facing stochastic shocks to income according to the recent trends in the gifts made by younger parents. The welfare loss in the adjustment scenario is consistent with the results in the bequest model of Heer (2001) in his search for an optimal inheritance tax, thereby suggesting that the introduction of an inheritance tax contributes to an increase in welfare, promotes wealth distribution equality, creates additional wealth, and evenly distributes such wealth.

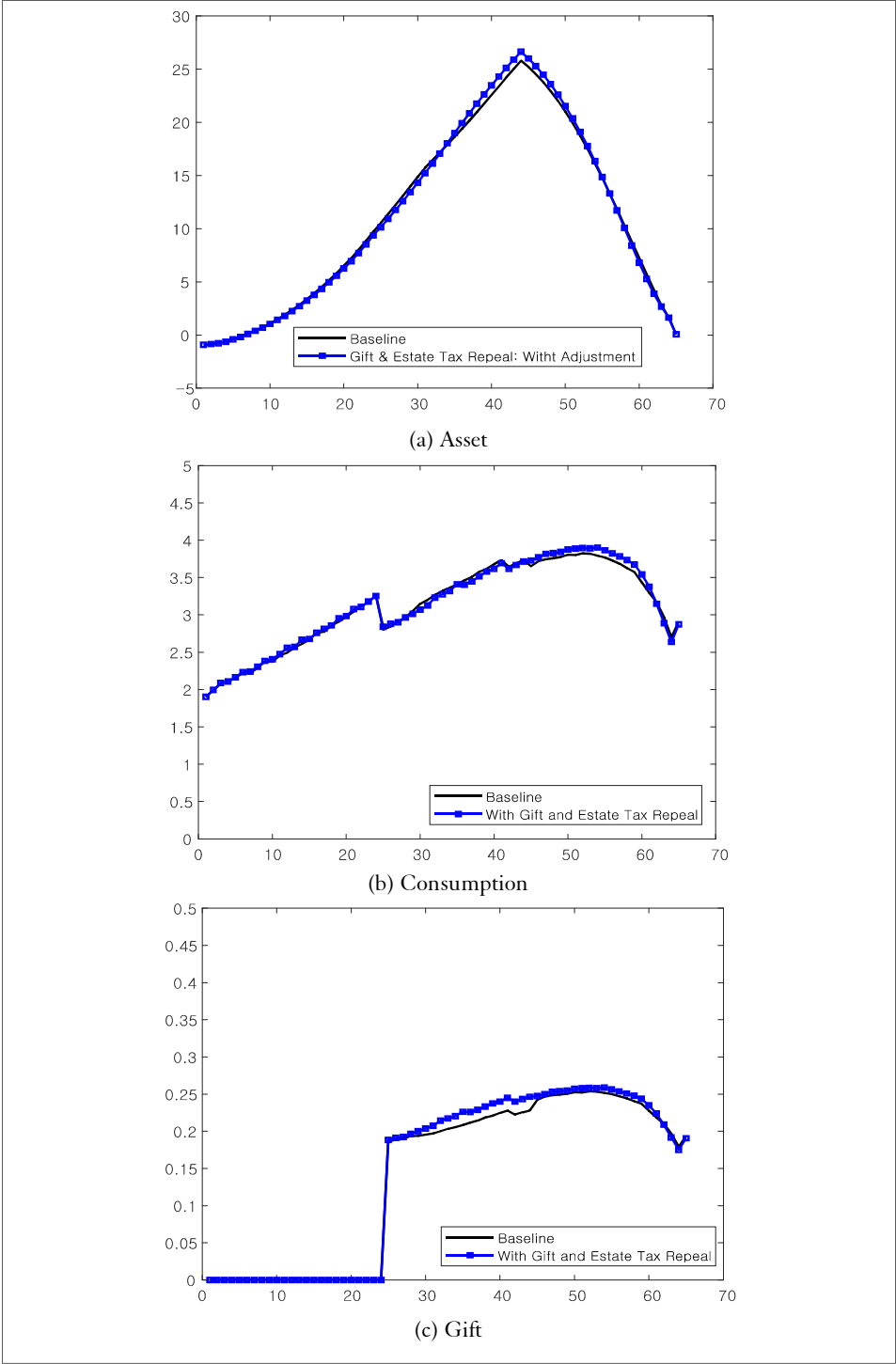
We also find that flexible factor prices, wages, and interest rates are important in the search of optimal estate and gift tax rates. When prices are constant given a small open economic setting, the tax repeal brings a larger decrease in aggregate capital stock. Without the general equilibrium effect, older households would not expect capital gains in association with interest income, and their saving is discouraged by higher capital gain tax rates.

By contrast, when we introduce the tax repeal to the economy without capital gain tax rate adjustment (as in (1) and (2)), the tax repeal in models (1) and (2) increases the aggregate capital stock and welfare. This trend is also consistently observed in models that include the estate and gift tax repeal and the government revenue adjusted by lump-sum taxes in both closed (model (5)) and small open economies (model (6)). Thus, the welfare aspect of estate and gift taxes is closely related to which tax rule would efficiently collect the most taxes from the wealthy. Given that our model adopts intentional inter vivos giving before retirement and

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<sup>9</sup> Although the present discount sum of compensating variations of all current and future households is available, the sum does not, in general, imply a Hicksian increase in efficiency from the policy change (Nishiyama and Smetters, 2014).

[Figure 4] Age Profiles Before and After the Tax Repeal (Model (3) with Capital Gain Tax Rate Adjustment in a Closed Economy)





adjusts the capital gains tax, a marginal increase in  $\tau_k$  negatively affects welfare, thus implying opposite effects of the estate and gift taxation on welfare. Mariger (1986) found that although planned intergenerational transfers appear in only a very small number of families, these families are extremely wealthy and account for a significant portion of the capital stock. Therefore, our results concerning estate and gift taxes may be reconciled with those of Kotlikoff and Summers (1981), who found that the majority of the US capital stock is due to intergenerational transfers. In our model, by separating intentional giving from accidental bequests, we explain the welfare aspect of positive estate and gift taxation according to the wealth accumulation behavior of older households.

We also conduct an experiment according to different gift and estate tax exemption rules. Table 5 summarizes the results from experiments with alternative gift tax rates and exemption rules in a closed economy with either capital gains tax rate or lump-sum tax rate adjustments. The long-run capital stock and output of the closed economy increase with higher gift tax rates given each exemption rule. The highest welfare is found in the economy with  $\tau_g = 50\%$  and  $g^{ex} = 0.5$  and with a capital tax rate adjustment. We also find that the exemption rule has a limited role in increasing total welfare because the marginal increases in aggregate capital stock and welfare are negligible by tax rate changes given  $g^{ex} = 1.0$ .

[Table 5] Results of Changing Tax Rates and Exemption Rules

$(\tau_g, g^{ex})$	$\bar{g}^a$	$K$	$K/Y$	$w$	$r$	$T_g / (T_g / T_k)$	$T_g / Y$	$EV_{newborn}$
<i>With capital gains tax rate adjustment</i>								
(10%, 0.5)	0.054	5.139	3.037	1.268	0.092	3.8%	0.27%	-14.70
(30%, 0.5)	0.051	5.114	3.028	1.266	0.092	10.1%	0.78%	-14.64
(50%, 0.5)	0.048	5.179	3.049	1.272	0.091	15%	1.23%	-14.53
(10%, 1.0)	0.053	5.114	3.027	1.266	0.092	3.3%	0.23%	-14.74
(30%, 1.0)	0.051	5.086	3.021	1.262	0.093	8.8%	0.67%	-14.76
(50%, 1.0)	0.049	5.085	3.022	1.261	0.093	13.3%	1.07%	-14.76
<i>With lump-sum tax rate adjustment</i>								
(10%, 0.5)	0.038	4.82	2.92	1.236	0.097	2.4%	0.2%	-26.89
(30%, 0.5)	0.036	4.73	2.89	1.227	0.098	6.2%	0.5%	-27.43
(50%, 0.5)	0.035	4.63	2.85	1.217	0.100	9.1%	0.85%	-27.92
(10%, 1.0)	0.040	4.89	2.94	1.243	0.096	2.0%	0.16%	-26.67
(30%, 1.0)	0.039	4.96	2.97	1.249	0.094	5.6%	0.47%	-26.69
(50%, 1.0)	0.039	5.02	2.99	1.256	0.094	8.5%	0.76%	-26.72

Source: Author's calculations according to the model in a closed economy.

Note: <sup>a</sup> The average optimal gift amount per agent.

From Table 6, with the distribution of gifts according to different estate and gift tax rules, we find that fewer gifts are made with lower exemption rules and higher

gift tax rates and that the shape of the gift distribution is consistent across different rules such that more taxes are collected from wealthy benefactors. In the discussion about the optimal capital taxation in a second-best economy in Chamley (1986) and Judd (1985), optimal capital taxation need not be zero in an overlapping-generations model (e.g., Aiyagari, 1994; İmrohoroglu, 1998). According to Boadway et al. (1997) and Heer (2001), it is optimal to tax interest income and bequests, with the result of improving the distribution of unobservable wealth. Apart from several points where higher taxes lead to higher welfare, we also note a positive trend in the results where a higher increase in taxes corresponds to a more substantial increase in welfare.

**[Table 6]** Distribution of Gifts and Gift Taxes by Quintile

$(\tau_g, g^{ex})$	Q1	Q2	Q3	Q4	Q5	$P[g^* > g^{ex}]$
(10%, 0.5)	0 (0)	0 (0)	0.036 (0.002)	0.137 (0.007)	0.246 (0.014)	9.0%
(30%, 0.5)	0 (0)	0 (0)	0.033 (0.004)	0.134 (0.022)	0.243 (0.04)	
(50%, 0.5)	0 (0)	0 (0)	0.032 (0.007)	0.132 (0.03)	0.240 (0.07)	
(10%, 1.0)	0 (0)	0 (0)	0.037 (0.00008)	0.138 (0.0014)	0.246 (0.003)	8.0%
(30%, 1.0)	0 (0)	0 (0)	0.036 (0.00004)	0.133 (0.003)	0.239 (0.008)	
(50%, 1.0)	0 (0)	0 (0)	0.035 (0.00004)	0.131 (0.004)	0.236 (0.013)	

Source: Author's calculations in a baseline model.

Note: The values in parentheses represent the average gift and estate tax.

However, welfare continues to increase as the exemption amount declines, thereby broadening the inheritance and gift tax base. Given that these taxes only tend to affect the very wealthy old families, the marginal utility for each dollar is significantly lower for these people than others who benefit from value-added government services. Philosophically, higher taxes seem to increase welfare, hence providing evidence against those who oppose these taxes on economic efficiency grounds, contending that such charges will only lead to over-consumption by the rich. This provides another data point against the long-run trend of lowering gift and estate taxes in the US.

After all, it is a red herring to say that estate taxes are bad and confiscatory, and this is true of any and all forms of taxation. The real question is: are inheritance taxes worse than other forms of taxation, most notably income taxes? Quite arguably not. At its extremes, the Laffer curve is certainly correct, especially at high levels of income taxation approximating 100%, because one's effort should collapse

when s/he keeps nothing from it. However, for inheritance taxation, it is impossible to avoid the triggering event, and the taxpayer can receive substantial benefits from his/her wealth before paying the tax at his/her death, unlike an income earner who can reduce his/her efforts. Given that the primary goal of any tax is to raise revenue, estate and gift taxes appear to be more effective and efficient than other policy choices, or even the status quo. Given the extremely small number of people who pay these taxes, these taxes seem to be vastly underutilized.

## VI. Conclusion

This study examines the welfare aspects of estate and gift taxes by studying the effects of different tax rates and exemption rules on welfare and wealth in an applied life-cycle model built on the observed features of giving. Building on previous research, the main modifications adopted in the model include the relative weight of the utility from making intentional transfers to one's children, a borrowing constraint, idiosyncratic labor income and mortality shocks, and the absence of markets for insuring this uncertainty. Unlike previous studies, we have added and modeled the fluid additional effects of inter vivos giving in addition to examining bequests. Our model is robust and reproduces the conditions expected for a wide range of variables, and its results for known factors are in line with our expectations, with the exception of the extreme upper tail of the distribution in formulating the wealth Gini. The clear takeaway is that our model is sufficiently detailed and encompasses a broad swath of economic activities and data. Therefore, our results are proven reliable for policy-related simulations.

According to our model, the national welfare increases with higher gift and estate taxes along with a broader base, raising a greater percentage of government expenditures through these taxes. The triggering event is impossible to avoid, and these taxes are arguably just and meritocratic. No one "picks" their parents, and thus any gains that survivors achieve from them are stochastic and not earned. This finding goes against the US trend of increasing estate tax exemptions and lowering tax rates. While there are also political and moral considerations embedded in this debate, to meet national priorities and collect taxes in the least painful way possible, the US government is underutilizing a powerful method of taxation. We hope that the results of this work encourage policy makers to ask more questions about the current paradigm of ever lower and narrower estate and gift taxes and generate further scholarly interest in these taxes as a more efficient and effective means of combating social ills than the status quo.

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## 생애 주기 경제 모형 기반 유산/증여세의 복지증진적 관점에 대한 연구\*

Troy Felver\*\* · 유재인\*\*\*

**초 록** 본고에서는 중첩세대모형을 이용하여 유산 및 증여세의 복지증진적 관점에 대해 연구하였다. 제시한 모형에서는 이질적 개인들이 매 시점 확률적으로 사망하며 자녀에게 우발적 유산을 남기고 일부 개인들은 사망하기 전까지 자발적으로 증여한다. 특히, 이 모형에서는 최근 미국 가계자산조사에서 은퇴 전 중장년 세대가 부모로부터 유산을 상속받는 동시에 자녀에게 자발적으로 증여하는 경향을 파악하고 이를 3세대 간 사적자원분배로 고려하였다. 닫힌 경제와 소규모 개방 경제에서의 일반균형에서 유산 및 증여 세율과 세제 감면 혜택 기준 값 변동에 따른 개인 저축과 소비의 변화를 수치적 해로 제시한 후, 총 자본량과 기대 생애 효용을 분석하였다. 본고의 결과에 따르면 증여세율 인상과 더불어 자본소득세율을 인하시켜 총 세입규모를 고정시켰을 때 기대 효용이 증가하였다. 이 증여세의 복지증진적 경향은 증여세 지급을 준비하기 위한 자본 축적 동기 부여와 관련이 있으며 사적자원분배의 혜택을 받지 못하는 계층을 향한 증여세의 자원 재분배적 역할을 함의하고 있다.

**핵심 주제어:** 증여, 유산/증여세, 생애주기모형, 복지, 일반균형

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