

Japan's High Saving Rate in the 1960s through the 1980s

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ABSTRACT

An endogenous growth model with both the bequest motive and the precautionary motive for saving is calibrated to the Japanese and the U.S. economy in order to quantify the contribution of various factors that account for huge differences in the saving and growth rates between the two countries during the Japan's high-growth period of the 1960's through the 1980's. Among others, saving incentives in Japanese tax system are found to be an important factor to Japan's high saving rate and fast growth rate.

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I. Introduction

For several decades since the 1960's, Japan's saving rate had been one of the highest among developed economies. Japan's average saving rate over the period 1965-85 was more than twice as high as that of the United States (see Table 1).¹⁾ Since the trade surplus equals the excess of savings over investment by the national income accounts and the U.S. economy has had a large trade deficit with Japan for decades, a lot of attention has been paid by economists and policy makers to the difference in the saving rate between the two countries. Moreover, the period of high saving rate coincides with a successful period of high income growth in Japan. Japan's huge savings are considered to provide funds to finance investment, which lead to fast accumulation of capital and fast growth of productivity.

Possible explanations for Japan's high saving rate in this period have been intensively discussed in the literature, and among the explanations is the distinctive tax system in Japan. The Japanese tax system promotes savings since most incomes from interest, dividend and bequest are very lightly taxed. Above all, taxes on interest and dividend income have two important features in the Japanese tax system. First, they can be taxed separately or aggregately with other incomes at the taxpayer's discretion, and high-income people can have interest and dividend incomes taxed separately at a rate lower than that on other income. Second, some types of capital income are tax exempt, which is called *Maruyu* system.²⁾ Furthermore, there

1) The saving rate in Japan is reported to have been falling in more recent years, but still higher than that in the U.S. (see the web page of The Central Council for Financial Services Information at <http://www.saveinfo.or.jp>).

2) As of 1980, nontaxable income includes: (1) interest income from postal savings when the principal does not exceed 3 million yen, (2) interest income from deposits, bonds, and debentures, open-end bond investment trusts, or specific stock investment trusts if the principal does not exceed 3 million yen, (3) interest income on central and local government bonds if the total face value is less than 3 million yen, (4) interest income received in accounts set up for the formation of employees' assets, particularly for housing and pensions when the principal is less than 5 million yen. In total each individual was eligible for tax exemption on interest income up to 14 million yen

is widespread evidence of abuse of this system such as opening multiple accounts using fictitious names. Capital gains from stocks are not taxed if they are less than a certain amount and if the number of transactions is not large.

Bequest tax in Japan is levied on beneficiaries or donee of bequest while the U.S. estate tax is levied on donors. The burden of bequest tax in Japan can be reduced since bequest per person is small if the number of heirs is large. Moreover, land or real estate is appraised for tax purposes at a value lower than the market value in Japan. This incentive encourages Japanese people to invest heavily in real estate, and in fact, three quarters of taxable bequest in Japan is in real estate while only one quarter is in real estate in the United States.

Several demographic characteristics in Japan are also considered to contribute to Japan's high saving rate. First, the Japanese have the longest life expectancy in the world. A long life span results in a long retirement period for which the Japanese need more savings. Second, the population proportion of the aged was still small in Japan before 1990's, which implies there were relatively few old dissavers.

Another explanation offered in the literature is a cultural factor; strong intergenerational altruism among Japanese families. Horioka (1984) shows from the attitudinal surveys that saving for retirement is not important for Japanese people as a saving motive. Using household survey data, Hayashi (1986) and Hayashi et al. (1988) find that both the elderly who live independently and those who live with their grown children continue to save and that there are signs of significant wealth transfer between generations.³⁾

The existence of substantial intergenerational transfers, however, can be the result of several factors. Parents leave accidental bequests to their children if there is no perfect annuity market and they die prematurely

which was worth about 90 thousand U.S. dollars.

3) In Japan elderly parents often invite one of their children and his (or her) family to move into their house. 67 percent of people with age 65 or over in Japan are reported in 1983 to live with their children while only 14 percent of those over age 65 in the U.S. lived with their children in 1980.

(precautionary motive).⁴⁾ Second, selfish parents can use bequests as payments for their children's service to care for them.⁵⁾ Finally, parents give their wealth to children because they are altruistic toward their children as in Barro (1974) and Becker (1974) (bequest motive). The first two cases can be well integrated into the life-cycle hypothesis as the extended life-cycle models where the implication of the life-cycle hypothesis would still hold. The implication for the saving rate depends critically on whether or not intergenerational altruism exists.

While it is controversial on which model is a better fit for the United States,⁶⁾ the altruism model is more appropriate than the life-cycle model for the Japanese society. Contrary to the finding in Hurd (1987) for the United States, Hayashi, Ando and Ferris (1988) show that old singles decumulate assets while the elderly with children do not, which implies that the bequest motive is an important motive for saving. Hayashi (1986) presents evidence that supports intergenerational altruism: savings of the elderly have increased since the large expansion of Japan's social security in 1973, which is inconsistent with the prediction of the life-cycle model that an unanticipated increase in annuities will be consumed. He also uses the Euler equation

4) Research on the magnitude of precautionary saving motivated by life-span uncertainty is abundant in case of the United States. Kotlikoff, Shoven and Spivak (1986) uses the simulation method to show that accidental bequests can account for a sizable fraction of aggregate wealth in the absence of annuity insurance. Abel (1985) and Hubbard (1987) develop models with life-span uncertainty to show that an actuarially fair Social Security can generate reduction in national wealth. This factor can explain the existence of bequests although it is not clear why children receive them.

5) The Attitude Survey on Wealth Transmission (Horioka, 1984) reports that more than three-quarters of the respondents insist wealth should be distributed among their children according to the amount of support received from each child. See Kotlikoff, Shoven and Spivak (1987) for theoretical analysis of this argument.

6) Hurd (1987) tests the bequest motive by checking whether the saving rate of the elderly with children differs from that with no children, and finds no support for the bequest motive. Altonji, Hayashi and Kotlikoff (1992) rejects the prediction of altruism models that the distribution of consumption between parents and children is independent of the distribution of their incomes. Blinder, Gordon and Wise (1981) find no evidence for the life-cycle model's implication that the marginal propensity to consume rises with age. Abel and Kotlikoff (1988) presents evidence for the altruism model's implication that the family will respond to the income shocks of its members by increasing or decreasing the consumptions of all members by the same percentage.

method to show that this expansion of social security system does not have a positive effect on the consumption growth of older cohorts. Dekle (1990) supports the applicability of the altruism model to Japan by showing that the wealth holding of independent elderly is significantly higher when they have children and is positively associated with the number of children.

The objective of this paper is to quantitatively analyze Japan's high saving rate over the period from the 1960's through the 1980's. The approach will involve finding out how much of the saving rate difference between the United States and Japan can be accounted for by each aforementioned explanation. Calibrating an endogenous growth model with intergenerational altruism and precautionary saving in addition to other factors such as tax incentives and population growth to both Japanese and the U.S. economy, we use simulations to find out what the saving and growth rate in Japan would be if the model's parameters take the values of the U.S. economy.

The rest of the paper proceeds as follows. Section II presents the theoretical framework and its steady state equilibrium. Section III shows the calibration method and the parameter values estimated for each country. The simulation results are presented in Section IV, and Section V concludes.

II. Theoretical Framework

The economy is populated with many dynastic families, and each family consists of two overlapping generations; parents and children. Each agent lives the first period for certainty and survives to the second period with the probability ϕ . Parents care not only for their own welfare but also for their children's. The utility of parents therefore depends on the welfare of all future descendants.

In the first period of life, each agent consumes and saves out of total income that is the sum of labor income, gift (or bequest) income and government transfers. The budget constraint in the first period is thus

$$c_t^t + s_t^t = (1 - \tau_n)w_t l + (1 - \tau_g)g_t^t + T_t^t, \quad (1)$$

where c_t^t is consumption in the first period, s_t^t is saving, w_t is the wage rate, l is exogenous labor supply, g_t^t is gift income, and T_t^t is government transfers in the first period. τ_n and τ_g are the tax rates on labor income and gift income, respectively. If alive in the second period, the agent consumes and leaves bequest. Otherwise, all of the agent's income is bequeathed to children. Therefore, the second period budget constraint is

$$c_{t+1}^t + q_{t+1}^t = R_{t+1}s_t^t + T_{t+1}^t \quad (2)$$

$$\begin{aligned} (1+n)g_{t+1}^{t+1} &= q_{t+1}^t \text{ when parents survive in the second period,} \\ &= R_{t+1}s_t^t + T_{t+1}^t \text{ otherwise.} \end{aligned} \quad (3)$$

where c_{t+1}^t is consumption in the second period, q_{t+1}^t is bequests, T_{t+1}^t is government transfers in the second period, and g_{t+1}^{t+1} is gifts to children. R_{t+1} is the after-tax real interest rate. The population of a family grows at the constant rate $(1+n)$, and bequest from parents, whether intentional or accidental, is assumed to be divided up evenly for all children as shown in (3).

Since family members are altruistically linked, the head of a family takes into account the total present value of family resources. Let W_t be the total family wealth in period t with its law of motion as follows:

$$W_t - \frac{W_{t+1}(a)}{(1-\tau_g)R_{t+1}} = (1-\tau_g)c_t^{t-1}(a) + (1+n)c_t^t(a) \quad (4)$$

where a in a parenthesis represents the case when parents are alive in the second period.

$$W_t - \frac{W_{t+1}(d)}{(1-\tau_g)R_{t+1}} = (1+n)c_t^t(d) \quad (5)$$

where d in a parenthesis represents the case when parents are dead in

the second period.

If we define the utility of the family's head as the value function, $V(\cdot)$, it should be a function of the total family wealth, which is the only state variable of the model:

$$V(W_t) = \max \left\{ \begin{array}{l} \phi \left[\beta \cdot u(c_t^{t-1}(a)) + \lambda(1+n) \cdot u(c_t^t(a)) + \lambda(1+n) \cdot V(W_{t+1}(a)) \right] \\ + (1-\phi) \left[\lambda(1+n) \cdot u(c_t^t(d)) + \lambda(1+n) \cdot V(W_{t+1}(d)) \right] \end{array} \right\} \quad (6)$$

where the first and second terms in brackets are the expected utility when parents are alive and dead, respectively. β is time preference and λ is the altruism parameter which discounts children's utility. Since parents treat all their children equally, the altruism parameter is multiplied by $(1+n)$.

If the momentary utility function $u(\cdot)$ takes the constant relative risk aversion form, we can show that the value function takes the same form. Suppose $V(W) = kW^{1-\sigma}$ where k is a constant⁷⁾ and σ is the inverse of the intertemporal elasticity of substitution. From the maximization problem in (6) with the budget constraints (4) and (5), we can derive the consumptions as the functions of family wealth W and k :

$$c_t^{t-1}(a) = J_1 W_t, \quad c_t^t(a) = J_2 W_t \quad \text{and} \quad c_t^t(d) = J_3 W_t$$

where

$$J_2^{-1} = [(1+n)(1-\sigma)k]^{1/\sigma} (1-\tau_g)^{(1-\sigma)/\sigma} R^{(1-\sigma)/\sigma} + (1-\tau_g) \left[\frac{\beta}{\lambda(1-\tau_g)} \right]^{1/\sigma} + (1+n),$$

$$J_1 = J_2 \cdot \left[\frac{\beta}{\lambda(1-\tau_g)} \right]^{1/\sigma},$$

and

$$J_3^{-1} = [(1+n)(1-\sigma)k]^{1/\sigma} (1-\tau_g)^{(1-\sigma)/\sigma} R^{(1-\sigma)/\sigma} + (1+n).$$

Plugging these into (6), we get one equation from which k can be solved as a function of the interest rate R and the parameters in the model:

7) k is not a constant when the real interest rate is not a constant. However, we can show that the interest rate is constant in a steady state equilibrium.

$$\begin{aligned}
k = & \frac{\beta\phi}{1-\sigma} J_1^{1-\sigma} + \frac{\phi\lambda(1+n)}{1-\sigma} J_2^{1-\sigma} \\
& + \phi\lambda(1+n)k(1-\tau_g)^{1-\sigma} R^{1-\sigma} [1 - (1-\tau_g)J_1 - (1+n)J_2]^{1-\sigma} \\
& + \frac{(1-\phi)\lambda(1+n)}{1-\sigma} J_3^{1-\sigma} + (1-\phi)\lambda(1+n)k(1-\tau_g)^{1-\sigma} R^{1-\sigma} [1 - (1+n)J_3]^{1-\sigma} \quad (7)
\end{aligned}$$

Since the expected family wealth in the next period is the probability-weighted sum of family wealth, we have

$$\begin{aligned}
EW_{t+1} &= \phi W_{t+1}(a) + (1-\phi)W_{t+1}(d) \\
&= \phi(1-\tau_g)R[1 - (1-\tau_g)J_1 - (1+n)J_2]W_t + (1-\phi)(1-\tau_g)R[1 - (1+n)J_3]W_t \quad (8)
\end{aligned}$$

and in a steady state of the model populated with a large number of families, the growth rate of family wealth EW_{t+1}/W_t should be equal to the labor income growth rate. Hence,

$$\frac{EW_{t+1}}{W_t} = (1+n) \cdot g \quad (9)$$

where g is the growth rate of per capita labor income.

We assume that there are two firms in the economy: firm 1 produces consumption goods and firm 2 produces investment goods. The relative price of investment goods to consumption goods is p_{kt} . Let V_1 be the present value at $t = 0$ of firm 1, which is the discounted sum of future net cash flows.⁸⁾ Firm 1 has the Cobb-Douglas technology with inputs of capital K_1 and labor L .

$$\begin{aligned}
V_1 = & \sum_{t=0}^{\infty} \left(\prod_{s=0}^t \frac{1}{1+\rho_{1s}} \right) \left\{ (1-\tau_p) \left(AK_{1t}^{\alpha} L_t^{1-\alpha} - w_t L_t \right) - (1-\Omega_c - \Omega_d) p_{kt} [K_{1t+1} - (1-\delta)K_{1t}] \right\}, \\
\text{where } \rho_{1s} = & (1-\tau_p)(r_{1s} + \pi) \frac{\mu_{1s}}{1+\mu_{1s}} + \left(d_{1s} + \frac{\Delta p_{e1s}}{p_{e1s-1}} + \pi \right) \frac{1}{1+\mu_{1s}} - \pi.
\end{aligned}$$

The net cash flow is equal to the gross profit after tax, less the cost of

8) The following analysis of firms is based on a discrete-time version of Brock and Turnovsky (1981).

the additional capital purchased. τ_p , Ω_c and Ω_d are the corporate tax rate, the investment tax credit and tax saving from depreciation allowances. ρ_{1s} is the discount factor or the cost of capital for firm 1 that has two alternative methods of financing, borrowing or issuing equities. $(r_{b1t} + \pi)$ and $(d_{1t} + \Delta p_{e1t}/p_{e1t-1} + \pi)$ are the nominal returns of bonds and equities issued by firm 1 where π is the inflation rate, d_{1t} denotes dividend yield, and $\Delta p_{e1t}/p_{e1t-1}$ denotes capital gain. The debt-equity ratio μ_{1t} is assumed exogenous for the firm. From the maximization problem, we have

$$(1 - \tau_p) \alpha A K_{1t}^{\alpha-1} L_t^{1-\alpha} = (1 - \Omega_c - \Omega_d) p_{kt} \left[\frac{p_{kt-1}}{p_{kt}} (1 + \rho_{1t}) - (1 - \delta) \right] \quad (10)$$

$$(1 - \alpha) A K_{1t}^{\alpha} L_t^{-\alpha} = w_t \quad (11)$$

It is assumed that firm 2 has the linear technology with capital input only, which is an assumption required for sustained income growth in the economy. Let V_2 be the present value of firm 2.

$$V_2 = \sum_{t=0}^{\infty} \left(\prod_{s=0}^t \frac{1}{1 + \rho_{2s}} \right) \left\{ (1 - \tau_p) p_{kt} B K_{2t} - (1 - \Omega_c - \Omega_d) p_{kt} [K_{2t+1} - (1 - \delta) K_{2t}] \right\},$$

$$\text{where } \rho_{2s} = (1 - \tau_p) (r_{b2s} + \pi) \frac{\mu_{2s}}{1 + \mu_{2s}} + \left(d_{2s} + \frac{\Delta p_{e2s}}{p_{e2s-1}} + \pi \right) \frac{1}{1 + \mu_{2s}} - \pi.$$

And the first-order optimization condition is

$$(1 - \tau_p) p_{kt} B = (1 - \Omega_c - \Omega_d) p_{kt} \left[\frac{p_{kt-1}}{p_{kt}} (1 + \rho_{2t}) - (1 - \delta) \right] \quad (12)$$

With the assumption that all four kinds of assets in the economy (bonds and equities of firm 1 and 2) exist in positive amounts, their after-tax rates of return should be equalized.⁹⁾ If we assume in addition that the dividend ratios for both firms are the same, we have $r_{b1t} = r_{b2t} \equiv r_{bt}$, and

9) We assume that the tax rate on bonds (or equities) of firm 1 is equal to that of firm 2.

$$\Delta p_{e1t}/p_{e1t-1} = \Delta p_{e2t}/p_{e2t-1} \equiv \Delta p_{et}/p_{et-1}, \text{ and}$$

$$(1 - \tau_i)(r_{bt} + \pi) = (1 - \tau_d)d_t + (1 - \tau_c)(\Delta p_{et}/p_{et-1} + \pi) \quad (13)$$

where τ_i , τ_d and τ_c are the tax rates on interest income, dividend income and capital gains, respectively.¹⁰⁾

Assuming that the debt-equity ratios of firm 1 and 2 are the same, the costs of capital in both firms are equalized. From equations (10), (11), (12) and the definition of the cost of capital, we have

$$\begin{aligned} \frac{1 - \tau_p}{1 - \Omega_c - \Omega_d} B \left(\frac{K_{1t}}{K_{1t-1}} \right)^{\alpha-1} \left(\frac{L_t}{L_{t-1}} \right)^{1-\alpha} + (1 - \delta) \left(\frac{K_{1t}}{K_{1t-1}} \right)^{\alpha-1} \left(\frac{L_t}{L_{t-1}} \right)^{1-\alpha} \\ = 1 + (1 - \tau_p)(r_{bt} + \pi) \frac{\mu_t}{1 + \mu_t} + \left(d_t + \frac{\Delta p_{et}}{p_{et-1}} + \pi \right) \frac{1}{1 + \mu_t} - \pi \end{aligned} \quad (14)$$

In the following analysis, d , $\Delta p_e/p_e$ and μ are assumed constant over time, which guarantees with equation (13) that the real interest rate r_b is constant over time. Since the right-hand side of (14) is constant and L_t grows at the same rate as the family population, K_{1t} grows at a constant rate in the equilibrium.

In a steady state of the model when $K_t (= K_{1t} + K_{2t})$ grows at a constant rate and the ratio K_{1t}/K_{2t} is constant, equation (14) becomes

$$\left[\frac{1 - \tau_p}{1 - \Omega_c - \Omega_d} B + (1 - \delta) \right] g^{(\alpha-1)/\alpha} = 1 + (1 - \tau_p)(r_b + \pi) \frac{\mu}{1 + \mu} + \left(d + \frac{\Delta p_e}{p_e} + \pi \right) \frac{1}{1 + \mu} - \pi \quad (15)$$

where g is the growth rate of per capita income. Equations (7), (9) and (15) form a set of non-linear simultaneous equations. Since no closed-form solutions exist, the equilibrium values of k , $R = 1 + (1 - \tau_i)(r_b + \pi) - \pi$, and

10) Throughout the analysis, it is assumed the government budget is balanced in each period. The entire tax revenues from personal income (labor, gift, interest, dividend, and capital gain) and corporate income are used for government transfers and tax credits.

g should be derived through simulations.

III. Parameterization of the Model

We calibrate the model's basic parameters using the actual Japanese and the U.S. data and some consensus estimates in the literature. Table 2 reports the benchmark values of the parameters for each country. Most Japanese tax rates and two tax incentives are drawn from Shoven and Tachibanaki (1988). These tax rates are marginal rates because the marginal rate is a relevant measure for the incentive effects of taxation. The U.S. tax rates are marginal rates drawn from King and Fullerton (1984). However, the gift (bequest)income tax rates of both countries are the average rates calculated by the author based on the data in Barthold and Ito (1992). The comparison of the U.S. and the Japanese tax system reveals that saving incentives in the Japanese tax system are stronger because personal income from capital and intergenerational transfers are very lightly taxed.¹¹⁾

Japanese firms have a considerable advantage from debt-financed investment since Japanese households can have tax exemption on most of their interest income, and firms can deduct interest expenses. This advantage is evident in Table 2 as the average debt-to-equity ratio of Japanese firms is higher than that of the U.S. firms. Dividend yield, which is the ratio of dividend income to equity value, is higher in Japan as well. Higher debt-to-equity ratio and dividend yield result from several features of Japanese corporate and personal income taxes which alleviate the problem of double taxation on dividends. For example, the corporate income tax rate is lower for earnings paid out as dividends and dividends income can be taxed separately from other income at lower rates.

11) Shoven and Tachibanaki (1988) and King and Fullerton (1984) report that the effective marginal tax rate on investment, which is a measure of the government's take from the return of an additional investment, is 4.4 percent and 37.2 percent for Japan and the U.S., respectively. This means that investors in Japan gain 96 percent of the return which their investments produce, while American investors earn only 63 percent of the gross return from an additional investment.

The depreciation rates for both countries are calculated from Shoven et al. (1988) and King et al. (1984) as the weighted average with the weight of the capital stock share. The inflation and population growth rates are calculated from Maddison (1991). The consumer price indices are used for calculating inflation rates.

The survival probabilities are derived from the age distribution of population in both countries. The survival probability for the 25-54 age group in year t is calculated as the ratio of the number of the 55-84 age group in year $t+30$ to the number of the 25-54 age group in year t . The reported numbers in Table 2 are the average of the survival probabilities for the 25-54 age groups from year 1950 to 1960. The benchmark value for σ , the inverse of intertemporal elasticity of substitution, is 2. It is assumed that one period of the model is 30 years, and the first period starts at age 25, which implies some die at age 55 and others survive to age 85.

The other four parameters, α , B , λ and β , are solved from the equilibrium steady state conditions of our model, using the Japanese and the U.S. data. The technology parameters, α and B , are derived from the following equations, using the information on the gross national saving rate and the growth rates of per capita income and capital;

$$\alpha = \frac{\log(g)}{\log(g_k) - \log(1+n)}$$

$$B = [(1-\alpha) + \alpha/SAV] \left[(1+n)g^{1/\alpha} - (1-\delta) \right]$$

where g is the per capita income growth rate, and g_k is the capital growth rate, and SAV is the gross national saving rate. If we add the following age-consumption ratio to equations (7), (9), and (15), we have four equations to solve for k , r_b , λ , and β .

$$\frac{J_1}{\phi J_2 + (1-\phi)J_3} = CONS \equiv \frac{c^{\text{old}}}{c^{\text{young}}}$$

where c^{old} and c^{young} are the per capita consumptions of old and young

generation.

Table 2 presents the values of economic indices that are used to calibrate these four parameters. The gross national saving rates in Japan and the United States are from Boskin and Roberts (1988). These rates are measured in the OECD method which includes government nonmilitary investment.¹²⁾ The per capita GDP growth rates are calculated from Summers and Heston (1988). The estimates of capital stock in both countries are drawn from Maddison (1991). They include all non-residential structures, machinery, equipment and vehicles. They exclude residential structures (housing), non-reproducible items (natural resources, land), foreign assets, inventories, and intangibles (human capital).

The age-consumption ratios in both countries are derived from Hayashi et al. (1988) which report the age-consumption profile from two sets of cross-section household data, the 1984 "National Survey of Family Income and Expenditure" for Japan and the 1983 "Survey of Consumer Finance" for the United States.¹³⁾

The last four rows in Table 2 report the calibrated values of the four parameters. Japan appears less capital-intensive, but more productive than the United States. Japanese people seem to have a stronger altruistic linkage between generations, and to be more patient.

IV. Simulation Results

The simulation results for the benchmark case when $\sigma = 2$ are presented in Table 3. In an attempt to measure the contribution of the Japanese tax system to higher saving rate and faster growth, we first

12) National saving rates in Table 1 are smaller in two reasons. First, those are the net national saving rates. Second, they are measured in the BEA (Bureau of Economic Analysis) method which treats all types of government expenditure as consumption. Boskin and Roberts report net national saving rates in the BEA method similar to Hayashi (15.79 percent for Japan and 6.72 percent for the U.S.).

13) Because of the prevalence of extended families in Japan, consumption of old generation in expended families is calculated by subtracting consumption in nuclear families from consumption in extended families.

calculate the income growth rate, the saving rate and the interest rate for Japan when Japan's tax parameters take the values of the United States with other parameters intact at the values for Japan. The results in Table 3 illustrate a favorable saving incentive of the Japanese tax system. It shows that the saving rate in Japan would drop by 9 percentage points (from 34 to 25 %) and the annual growth rate would fall by 0.5 percentage points (from 5.3 to 4.8 %) if Japan adopts the U.S. tax system. This implies that the unique tax system in Japan alone can explain 15 % of the growth rate difference and 58 % of the saving rate difference between two countries. Among the individual taxes, higher tax rate on personal income in the United States has the most deterrent effect on growth and savings.¹⁴⁾

The second experiment considers demographic factors. In the life-cycle model, an increase in the population growth rate implies relatively more young savers and less old dissavers in the economy, which increases the saving rate. However, an increase in n may lead to a decline in per capita savings, and therefore per capita income growth because it can lower the real wage rate. The effect of population growth in the altruism model critically depends upon the functional form of altruism. In the previous section, we assumed γ equals one when the generational discount factor is $\lambda(1+n)^\gamma$. If we take this assumption in the pure altruism model, the change in n has no impact on growth and savings. Therefore, the effect of n in this simulation is induced by the life-cycle part of the model. Since the difference in the population growth rates is small, an increase in n to the U.S. parameter value does not change the saving and growth rates much in our simulation. When the survival probability ϕ decreases to the U.S. level, the growth and the saving rates increase in our model. In fact, it can be shown that they are maximized in the neighborhood of 0.5 because

14) Higher tax rate on personal capital income (interest income, dividend income or capital gain) or on bequest income raises the after-tax interest rate, and hence it has a deterrent effect on saving and growth as long as the income effect doesn't dominate the substitution effect. The effect of corporate income tax is theoretically ambiguous because it influences both the marginal cost and the marginal return of firm's investment.

uncertainty, and therefore the precautionary saving, disappears at the value of zero or one. The magnitude of changes in the saving or growth rate, however, seems to be very small when φ is changed.

The stronger is the altruism toward future generations, the more the present generation saves and the faster the economy grows. If Japanese families had the same level of intergenerational altruism as the U.S. families (i.e. the same value of λ), the annual growth rate of per capita income in Japan would fall by 1.1 percentage points, and the saving rate would also fall by 16 percentage points. Compared to other experiments, the difference in the altruism parameter appears to explain a fairly big portion of the saving and growth rate differences between the two countries 33 % and 100 %, respectively.

Another cultural factor considered in our analysis is the difference in patience. Even though the subjective time preference parameter β differs much between two countries, changes in the growth and the saving rates are very small when β is changed. In the simple altruism model without uncertainty, we can show that a change in β strongly affects the consumption distribution between generations, but it has no effect on growth or savings. The channel through which β affects savings and growth is the precautionary saving in this model.

The rest of Table 3 reports the effects of changes in other parameters in the model, including production function parameters, the inflation rate, and the depreciation rate. Differences in technology parameters, B and α , have opposing effects on the growth and the saving rate. While a larger value of α for the U.S. increases the growth rate and decreases the saving rate, the decline of productivity decrease of B reduces the growth rate and increases the saving rate.¹⁵⁾ In this calibration, the latter effect dominates the former, and the net effect of technology difference is a decrease in growth (0.7 percentage points) and an increase in savings (17 percentage points).

The direction and magnitude of the effect of a change in the inflation

15) Theoretically, the effects on growth and saving from the changes of B and α are ambiguous. The above statement is just the result of our simulation.

rate is dependent on the size of other parameter values, and especially, various tax rates because most taxes are levied on nominal values. In our simulation, a decline in π to the U.S. level reduces the growth rate and the saving rate in a small magnitude. An increase in the depreciation rate to the U.S. level slows down capital accumulation and therefore income growth while it increases the investment ratio or the saving rate. However, the new growth and saving rate for Japan with the U.S. depreciation rate are not much different from the actual values.

The magnitude of changes in the growth rate and the saving rate from different parameter values should vary with the value of the intertemporal elasticity of substitution, which is the only free parameter in our model. Table 4 reports the sensitivity analysis result for different values of the intertemporal elasticity of substitution. For most parameters of the model, the simulation result is not so sensitive to the value of σ . For instance, tax system difference can explain 10 to 19 % of the growth rate difference and 39 to 68 % of the saving rate difference between Japan and the U.S. for the range of σ from 1 (log utility) to 4. The exception is the altruism parameter λ even though its explanatory power for the saving and growth difference between two countries is fairly big for σ values in this range.

In recent years the role of intergenerational transfers in savings and wealth accumulation has been the subject of numerous studies. Numerous evidences suggests that intergenerational transfers play an important role, if not the most dominant one, in wealth accumulation in such developed countries as Japan and the United States (Hayashi, 1986; Kotlikoff and Summers, 1981). Two simulation experiments are carried out in Table 5 in an attempt to find out what portion of Japan's saving and income growth rate can be attributed to intergenerational transfers in our model. In the first experiment, we derive the saving rate and the growth rate of Japan in a hypothetical situation where Japanese people have no intergenerational altruism, and hence no intentional bequest. The same values for other parameters in the previous section are used except in this calculation. See appendix for the mathematical setups of this and the following model. It appears that 70 percent of savings and 40 percent of income growth in

Japan are due to intentional wealth transfer between generations, and that the magnitude of this effect does not vary much with different values of σ . The second experiment deals with the additional reduction in the saving rate and the growth rate when we assume further that there is a perfect annuity market in addition to no altruism. Therefore, in this experiment, we have neither intentional bequest nor unintentional bequest, and the sole motive for saving is for old age. The saving rate and the growth rate in the life-cycle model without any intentional or unintentional bequest are reported in Table 5 to be only 17 % and 39 % of the actual rates in the benchmark case.

V. Concluding Remarks

Japan's high saving rate from the 1960's through the 1980's has drawn attention from economists and policy makers for many years. Among possible factors brought up by life-cycle models, Japan's income tax system is considered to provide strong saving incentives because personal incomes from capital and wealth transfers are lightly taxed. Demographic factors like the growth and age distribution of Japanese population and strong intergenerational altruism among Japanese families have also been claimed to be important for Japan's high saving rate.

This paper quantifies the explanatory power of these factors. For that purpose, we calibrate an endogenous growth model that incorporates these factors to the Japanese and the U.S. economy, and use the simulation method to account for the contribution of each factor in Japan's high saving and growth rates. Among various factors, Japan's strong intergenerational altruism and unique tax system which is favorable to savers are shown to be important in explaining the differences in the growth rate and the saving rate between two countries. We also show that intergenerational wealth transfer in Japan is an important factor as well.

Our theoretical model does not incorporate several popular explanations for Japan's high saving rate. One is the underdeveloped social security system in Japan which is said to have increased the need to save more for

life during retirement. However, Japan's social security has expanded dramatically since 1973 and is now comparable to that of other developed countries. Furthermore, Hayashi (1986) shows that savings of the elderly have not decreased but increased slightly since the large expansion of Japan's social security.

Another explanation offered in the literature is the bonus system in Japan. Japanese workers receive large lump-sum payments twice a year. This bonus system was started in the large firms after World War II and has been spread out to the whole economy thereafter. This explanation is based on the idea that the bonus income is a transitory income and thus largely saved according to the permanent income hypothesis. However, in recent years, the bonus income has been institutionalized and the date and amount of bonus is no longer unpredictable. The bonus hypothesis enjoyed popularity in 1980's with the observation of the close co-movement of bonus-income ratio and the personal saving rate since 1973. This observation, however, can be explained easily. Bonuses are transfers of corporate savings to households, and if they can see through the corporate veil, the personal saving rate should rise with bonus ratio. Therefore, the bonus system can not be a good explanation for high national saving rate.

The retirement age for Japanese workers in the private sector is traditionally 55 which is quite early by international standards. If people retire early, they do need more savings for the old age after retirement. Although Japanese workers formally retire early, they, however, typically continue working until very late in life. In fact, the labor force participation rate of the aged in Japan is one of the highest among the developed countries.

Many opinion surveys consistently find that housing purchase is a major saving motive for the Japanese. The land and housing prices are very high in Japan and a down payment for a house costs up to 40 % of the purchase price of a house. Although this factor is likely to contribute to high saving rate for the young generation, evidence does not support this explanation. Hayashi (1986), for instance, showed that in urban areas where the price of housing is much higher, the saving rate is lower than that in rural areas. In

sum, although these four aforementioned factors enjoy some currency in the literature, their explanatory power is apparently limited and our analysis ignored these factors accordingly.

Since the Shoup recommendations in 1949, the Japanese tax system has been revised occasionally but has failed to keep up with the changes in Japanese society and economy. Japanese people in homes and businesses feel more heavily and unfairly taxed and preferential tax treatment of personal savings has given rise to especially sharp complaints. The ongoing tax reform is hence aimed to revise unfair taxation on capital income. No longer has this new tax system the strong saving incentives, and this may partially explain why Japanese saving and growth rates have declined in recent years.

Appendix

The following is the maximization problem for a family which is not altruistically linked. The maximization problems for firms are the same as in section II.

$$\begin{aligned} \max \quad & u(c_t^t) + \beta \cdot \varphi \cdot u(c_{t+1}^t) \\ \text{s.t.} \quad & c_t^t + s_t^t = (1 - \tau_n) \cdot w_t \cdot l + (1 - \tau_g) \cdot g_t^t + T_t^t \\ & c_{t+1}^t = R_{t+1} \cdot s_t^t + T_{t+1}^t \end{aligned}$$

where

$$(1+n) \cdot g_t^t = \begin{cases} 0 & \text{when alive in the 2nd period} \\ R_{t+1} \cdot s_t^t + T_{t+1}^t & \text{when dead in the 2nd period} \end{cases}$$

If we assume that there is a perfect annuity market, people do not leave any unintentional bequest to their children. People who are not altruistic and have a perfect annuity market solve the following problem

$$\begin{aligned} \max \quad & u(c_t^t) + \beta \cdot \varphi \cdot u(c_{t+1}^t) \\ \text{s.t.} \quad & c_t^t + s_t^t = (1 - \tau_n) \cdot w_t \cdot l + T_t^t \\ & c_{t+1}^t = \frac{1}{\varphi} \cdot R_{t+1} \cdot s_t^t + T_{t+1}^t \end{aligned}$$

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Table 1 SAVING RATES OF JAPAN AND THE UNITED STATES

	Japan ^a	USA ^a
Personal saving rate (%)	16.6	7.1
Private saving rate (%)	17.0	8.0
National saving rate (%)	15.4	6.7

Note: a. Numbers are the average saving rates over the period from 1965 to 1985.
Private saving is the sum of personal and corporate saving, and national saving is the sum of private and government saving.
Source: Hayashi (1986)

Table 2 BENCHMARK VALUES OF PARAMETERS

	JAPAN	USA
Tax rate on Corporate income (τ_p)	0.526	0.495
Interest income (τ_i) ^a	0.119	0.236
Dividend income (τ_d) ^a	0.158	0.356
Capital gains (τ_c) ^a	0	0.058
Gift (bequest) income (τ_g)	0.099	0.148
Investment tax credit (Ω_c)	0	0.040
Depreciation tax credit (Ω_d)	0	0
Debt-to-equity ratio (μ)	0.855	0.511
Dividend yield (d)	0.105	0.032
Depreciation rate (δ) ^b	0.671	0.769
Inflation rate ($1+\pi$) ^b	6.880	6.164
Population growth rate ($1+n$) ^b	1.352	1.364
Survival probability (φ)	0.777	0.767
Intertemporal elasticity of substitution ($1/\sigma$)	1/2	1/2
Gross national saving rate (SAV)	0.341	0.187
Per capita GDP growth rate (g) ^b	4.735	1.764
Capital growth rate (g_k) ^b	17.206	2.690
Age-consumption ratio ($CONS$)	0.727	0.708
Capital intensity (α)	0.6113	0.8358
Productivity (B)	36.8064	11.3771
Altruism parameter (λ)	1.8798	0.7428
Subjective time preference (β)	1.0022	0.3520

Note: a. These tax rates are annual rates. We have to convert them into the rates for 30 year span in order to use in the analysis. b. The numbers are the compounded rates over the 30 year period.

Table 3 SIMULATION RESULTS FOR JAPAN (BENCHMARK CASE)

	Annual per capita income growth (%)	Gross national saving rate (%)	Annual real interest rate (%)
Actual number	5.32	34.11	12.24
All taxes	4.79	25.19	12.68
τ_p only	5.30	33.71	12.20
τ_i only	4.82	25.66	12.56
τ_g only	5.24	32.65	12.29
Ωc only	5.38	35.24	12.35
n	5.31	34.24	12.25
φ	5.32	34.13	12.24
λ	4.19	18.15	12.98
β	5.30	33.72	12.25
B and α	4.55	51.28	10.82
B only	3.70	56.45	9.39
α only	6.48	30.12	14.49
π	5.30	33.81	12.16
δ	5.31	34.20	12.23

Table 4 SIMULATION RESULT FOR DIFFERENT VALUES

	$\sigma =4$		$\sigma =1$	
	Growth rate (annual %)	Saving rate (%)	Growth rate (annual %)	Saving rate (%)
Actual number	5.32	34.11	5.32	34.11
All taxes	4.99	28.29	4.67	23.66
n	5.30	34.08	5.31	33.96
φ	5.32	34.16	5.32	34.13
λ	3.43	12.05	4.64	23.28
β	5.28	33.27	5.31	33.87
B, α	4.89	58.74	4.33	47.09
π	5.31	33.93	5.30	33.75
	5.32	34.26	5.31	34.16

Table 5 ALTRUISM AND BEQUEST

	Model	Saving rate (%)	Growth rate (%)
$\sigma = 2$	Actual number	34.11 [100]	5.32 [100]
	No altruism	10.10 [30]	3.10 [58]
	No bequest	5.79 [17]	2.07 [39]
$\sigma = 4$	Actual number	34.11 [100]	5.32 [100]
	No altruism	10.44 [31]	3.16 [59]
	No bequest	5.14 [15]	1.85 [35]
$\sigma = 1$	Actual number	34.11 [100]	5.32 [100]
	No altruism	9.89 [29]	3.06 [58]
	No bequest	6.16 [18]	2.18 [41]

1960-80년대 일본의 높은 저축률과 경제성장

김진영

논문 초록

일본의 고성장 시기인 1960년대 초에서 1980년대 말에 이르는 기간동안 일본의 저축율과 경제성장율은 미국보다 훨씬 높은 수준을 유지하였다. 내생성장이론(endogenous growth theory)에 바탕을 둔 경제모델의 calibration을 통하여, 이 논문은 이들 두 국가간의 저축율과 경제성장율이 달랐던 이유를 밝히는데 그 목적을 두고 있다. 이 논문은 기존 연구들에서 중요하게 다루어졌던 저축의 유산동기 (bequest motive)와 예비금동기 (precautionary motive)를 동시에 고려한 포괄적인 모델을 제시하고 있다.

고려가 된 여러 사회적, 경제적 요인들 중에서 일본인들의 자식에 대한 강한 altruism과 일본의 특수한 세율제도가 일본이 1960-80년대에 빠른 성장률과 높은 저축율을 갖게 한 중요한 요인이었음을 이 논문은 밝히고 있다.

JEL 분류번호 : E21, O40

핵심주제어어 : 저축률, 저축동기, 경제성장, 일본