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Estimating the Size and Distribution of Bequests in Japan

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Abstract

We first estimate the amount of bequest in Japan for 1986, 1988, 1989, 1990, 1992 and 1994 using published aggregate data. We define bequest as wealth left by male deceased aged 50 years and over. Bequests occupy 40 to 60 per cent of net household assets. Secondly, using the bequest tax data and our estimates, we compute bequest distributions. Our study confirms the importance of the bequest motive in the context of a life-cycle savings hypothesis applicable to Japanese society. Furthermore, it justifies inheritance tax, because the size of bequest is enormous and its distribution has a strong positive skew.

Keywords: The size of bequests, Bequest distribution, Life-cycle savings hypothesis, Inheritance tax, Lognormal distribution

JEL classification: D39, E21, H31

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** According to Japanese name order, family name is first and given name second. We hope you will respect our native name order.

1.Introduction

Economic inequality is a controversial issue in economics. One of the important factors in inequality of income and wealth is bequest. Kotlikoff and Summers (1981) have estimated the amount of bequest by calculating life-cycle wealth based on accumulation of life cycle savings (=earnings– consumption). Bequest is calculated as the difference between net household wealth and life-cycle wealth for all generations at given time. They conclude that some 80 per cent of household wealth is bequest, although Modgliani (1988) insists only 20 per cent. The big difference comes mainly from the varying treatment of interest income from bequest received.

For Japan, Barthold and Ito (1992) estimated from bequest tax data and other published data that the amount of bequest in 1988 was some 40 per cent of household wealth, though for the US it was only some 25 per cent. Takayama and Arita (1996, Section 3) analysed individual assets data, including responses to many questions on bequest, and concluded that almost one third of household wealth is bequest. They, however, pointed out that their figures might be underestimated, because of a shortage of data on wealthy families. Shimono (1991, Section 7) showed that if household heads are between 45 and 59 years, bequest occupies some 70 per cent of their holding assets, by calculating the amount of bequest according to educational level based on other individual assets data. An assumption of her simulation is that bequest received is equal to bequest left in real terms.

In this paper, we define bequest as wealth left by male deceased aged 50 years and over,

that is, intergenerational transfers. We first calculate the amount of bequest in Japan, in 1986, 1988, 1989, 1990, 1992 and 1994, and focus on the ratio of bequest to net household assets. We then derive the bequest distributions from bequest tax data and our estimates.

Our method of estimating bequest is a modified version of Barthold and Ito's (1992), which was developed for the Japanese case. They use a variety of published aggregate data, including bequest tax data, rather than individual assets data. Their method is appropriate, because access to individual data is severely restricted in Japan. Net monetary assets at death are calculated by a similar method to that presented by Barthold and Ito (1992), however, net bequest, including real assets, is estimated by our own method. The most significant difference between their method and ours is that we do not use the bequest tax data at this stage, although they do.

Although Barthold and Ito (1992) estimated bequest in Japan only for 1988, we calculate these for 1986, 1988, 1989, 1990, 1992 and 1994. Our estimated ratios of bequest to household wealth are some 40 to 60 per cent for the period 1986 to 1994. Our estimate for 1988 is higher than Barthold and Ito's. We show that the ratio of bequest has been increasing with an expansion of the aged population.

Secondly, using Japanese bequest tax data, we divide bequests between taxed cases and non-taxed cases, and then compute the bequest distribution from our estimates. It is known that income is well fitted to a lognormal distribution, and wealth distribution tends to fit a lognormal or Pareto distribution. Sargan (1957) and Pestieau and Possen

(1979) present models of wealth distribution which lead to a lognormal distribution under utility maximisation. Then we apply a lognormal distribution with two parameters to our bequest data for six years. Each bequest distribution has a strong positive skew. The mean is over ten times the mode. Furthermore, Gini coefficients of bequest are between 0.61 and 0.68 for our estimated years of 1986, 1988, 1989, 1990 and 1994, excepting only 1992.

This paper consists of two parts. Section 2 shows the expected amount of bequest per male deceased and the ratio of bequest to net household wealth for six years between 1986 and 1994. In Section 3, we estimate the average amount of bequest both for taxed cases and for non-taxed cases and then obtain distributions of bequest for six years. Concluding remarks follow.

2. The Amount of Bequest

(1) Estimation Strategy

Barthold and Ito (1992) estimated the ratio of bequest to net household assets in Japan, using bequest tax data as well as a variety of data on household wealth and population. Their method has the advantage of using published aggregate data rather than individual assets data. Access to individual data is restricted to a limited number of academics, and no data is available for the most wealthy people, as pointed out by Takayama and Arita (1996). Barthold and Ito's estimate of bequest, however, applies only to 1988,

and at that time Japan experienced rapid increase in land prices, some 70 per cent in the Tokyo metropolitan area and 25 per cent on average within a year (see Figure 1). It would seem to be worth investigating the amount of bequest over a longer period.

<Figure 1>

We define bequest as the amount of wealth left by male deceased aged 50 years and over, including both monetary assets and real assets. The reasons for limiting our analysis to male deceased aged 50 years and over are as follows. Firstly, we are interested in intergenerational transfer, so we analyse only male deceased. A large proportion of wealth held by female household heads aged 50 and over must be intragenerational transfer, that is, from ex-husband to wife. Where a husband is alive, the majority of wives who belong to the older generation do not have any of their own assets, because they have accepted the traditional gender roles and have worked in the home throughout their lives. Secondly, the current average life expectancy for men in Japan is 78 years. There are few persons who die before the age of 50 years. Thirdly, those aged 50 years and over can leave a large amount of net wealth at death, because most of them have their own houses (with land) and little or no mortgage. Actually some 85 per cent of household heads aged 50 years and over have their own houses in Japan. As we will explain in Section 3, land is the most important bequest in Japan. Tachibanaki and Shimono (1986) analysed saving behavior for the 1921 born cohort and pointed out that house purchasing decisions such as whether to buy or not, purchasing time, place and value, are a key to the amount of wealth held by each household. Furthermore, they suggested that if a couple bequeaths or buys a house with

land, it must be a future bequest for their children.

In this section, we focus on the expected amount of bequest per male deceased and the ratio of bequest to net household assets. These are calculated for 1986, 1988, 1989, 1990, 1992 and 1994 without using the bequest tax data which Barthold and Ito (1992) used in their estimation. We estimate the amount of net monetary assets in part (2), using an estimation method based on Barthold and Ito's. In part (3) of this section, the total amount of bequest is calculated. Here the method of estimation is totally different from that used by Barthold and Ito. The ratio of bequest to net household wealth is presented in part (4).

(2) The Amount of Net Monetary Assets per Male Deceased

We assess the average amount of monetary assets left per male deceased aged 50 years and over in this part. The results, obtained by a method based on Barthold and Ito's (1992), are summarised in Table 1. Let us explain this table briefly.

The figures in columns (1) and (2) indicate the number of male or female household heads by age class. Both in 1989 and in 1992, figures are derived directly from the Basic Survey on Living Standards conducted by the Bureau of Statistics for each year. For other years, we do not have any exact data on the number of male and/or female household heads, but only have the total number of household heads by age group. We compute an average of the ratio of female household heads to all households in 1989 and that in 1992 by age class, and use them as proxy variables for 1986, 1988, 1990 and

1994. Female household heads are 12 per cent of all household heads for those aged 50 to 54 years, 14 per cent for those aged 55 to 59 years, 17 per cent for those aged 60 to 64years, and 28 per cent for those aged 65 years and over. The number of male and female household heads is one of the key elements in this estimation. As we will mention later, in 1988 the average amount of net monetary assets at death presented by Barthold and Ito (1992) is some 8 per cent less than our estimate, because of a different assumption regarding the number of male and female household heads. They may not have been in a position to use the more plausible data of the 1989 Basic Survey on Living Standards.

<Table 1 >

Another assumption about households is that all males aged 50 to 59 years are household heads. In contemporary Japan, older people are coming to prefer an independent life to living with their children. When they are sick or miss their wives or cannot afford the cost of living, some old men choose to live with one of their children, usually the eldest son according to Japanese custom. In this case, most of them are not household heads. The number of men who are not household heads is calculated by subtracting the number of household heads from the total male population for each age class. Some 15-20 per cent of men aged 65 and over are not household heads (see columns (4) and (5)).

The amounts of monetary assets and monetary debts per household in columns (6) and (7) come from the Family Savings Survey for each year, which is published by the

Bureau of Statistics. Column (8) calculates the average amount of net monetary assets held by male household heads. We assume that a female household head has half the amount of monetary assets held by a male counterpart, and a man who is not a household head has no assets. This is because a surviving wife is guaranteed half the amount of bequest left by a dead husband by the inheritance law, and a man who is a non-household head is, in all possibility, a dependent of children with low income and small savings. The figures in column (9), which indicate the average amount of net monetary assets held by all males aged 50 years and over, including non-household heads, are obtained by multiplying the figures in column (8) by those in column (5).

It should be noted that Japanese households on average do not show any decrease in net monetary assets, as shown in column (9) of Table 1. For instance, in 1994, net monetary assets per male aged 54-54 years were 11.7 million yen, for males aged 55-59 years, they were15.6 million yen, for 60-64 years, 22.0 million yen, and for 65 years and over, 22.9 million yen. Tachibanaki and Shimono (1991) analysed the wealth accumulation process by income class and pointed out that even middle income households do not decrease their wealth during a life-time, though low income households do after 60-65 years. This is because retirees who were employees receive large public pensions, and because own houses with no mortgage have given them the tremendous amount of capital gain during land prices have risen. It is important to note that the elderly are on average richer than the younger generation in Japan.

Column (10) shows the number of male deceased, which is derived from the Japanese Vital Statistics published by Ministry of Health and Welfare each year. The figures in

column (11) indicate the distribution of deceased when men aged 50 years and over are taken as a unit. Over 75 per cent of the deceased in this age group are those aged 65 years and over.

Expected net monetary assets per male deceased are presented at the bottom of column (12). We obtain the figures as follows:

$$\begin{aligned}
&\textit{expected net monetary assets per male deceased} \\
&= \frac{\sum_i \{(\textit{Net Monetary Assets})_i \, x \, (\textit{possibility of death})_i\}}{\textit{total number of male deceased}} \\
&= \frac{\sum_i \{(\textit{NMA per male})_i \, x \, (\textit{number of males})_i \, x \, \frac{(\textit{number of male decased})_i}{(\textit{number of males})_i}\}}{\textit{total number of male deceased}} \\
&= \sum_i \{(\textit{NMA per male})_i \, x \, \frac{(\textit{number of male deceased})_i}{\textit{total number of male deceased}}\} \\
&= \sum_i \{\textit{column}(9) \, x \, \textit{column}(11)\} \qquad\qquad i\text{: age class}
\end{aligned}$$

In consequence, the average amount of net monetary assets per male aged 50 years and over is some 12.2 million yen in 1986, 14.8 million yen in 1988, 19.3 million yen in 1989, 18.8 million yen in 1990, 19.8 million yen in 1992 and 21.7 million yen in 1994. The expected amount of net monetary assets per male deceased is some 3 to 4 times the annual income per household.

If we compare the 1988 estimate with Barthold and Ito's (1992), their figure is some 8

per cent less than ours. Their estimate is 13.8 million yen and ours is 14.8 million yen. This difference comes from differing assumption regarding the number of male and female household heads. Their estimates for the number of male/female household heads are less accurate than ours, as discussed earlier.

(3) The Total Amount of Bequest per Male Deceased

In this part of Section 2, we estimate the total amount of bequest, that is, the sum of net monetary assets and real assets which are mainly land. The procedure presented here is totally different from Barthold and Ito's (1992) which seems complicated and unclear. We simply assume that the ratio of real assets to monetary assets for bequest is the same as that for wealth held by households, because bequest is a sort of wealth left at death. It may be possible that the ratio in bequest is slightly higher than that in wealth. We can obtain the average ratio of real assets to net monetary assets from the Annual Report on National Accounts. It should be noted that all real assets, including land, in the Annual Report on National Accounts are assessed at market price. Land value, in particular, is evaluated at "Kouji Kakaku", which means public noticed price, although some economists have complained that "Kouji Kakaku" is underestimated when compared with "real" market price. Since, however, no one knows "real" market price, we assume "Kouji Kakaku" to be market price on land in our analysis.

<Table 2>

According to Table 2, since 1980 the amount of real assets held by households has been

2 to 3 times the amount of net monetary assets. Most real assets are just land. Land occupies over 50 per cent of household wealth in Japan. On the other hand, in the US and the UK the figure is only 10 – 20 per cent. As a result of excess demand on land, caused by bequest and investment purposes adding to housing and business purposes, land prices are very high in Japan. For the past two decades land has been assessed at 10 – 50 per cent of market price in land holding tax and at 50 – 90 per cent in bequest tax. This means that land has always had an advantage in taxation, compared with monetary assets.

Tachibanaki and Shimono (1991) analysed individual assets data called the Survey on Saving Behaviours and Consciousness conducted by the Department of Sociology, University of Tokyo, in 1981. This survey included data on self-assessed housing and land values as well as monetary assets, although the number of samples used was limited to some 1700 for non-single member households. According to their careful study, real assets are almost 3 times net monetary assets. On the other hand, Takayama (1994) and Takayama and Arita (1996, Section 1 and 2) estimated that real assets are almost 6 times net monetary assets on average, excluding single member households. They had access to a large individual database called the National Survey of Family Income and Expenditure in 1979, 1984 and 1989. The survey is carried out by the Bureau of Statistics every 5years. It compiles randomly sampled individual data, comprising over 50 thousand households. The survey includes data on monetary assets, but real assets have to be estimated. Their estimation of real assets seems rather large.

We use the ratios of real assets to net monetary assets from the National Accounts (see

Table 2) and compute the average amount of bequest left by males aged 50 years and over. The result is shown in Table 3. The amount of bequest is 42.2 million yen in 1986, 53.0 million yen in 1988, 66.6 million yen in 1989, 71.8 million yen in 1990, 65.7 million yen in 1992 and 65.1 million yen in 1994. Land prices strongly affect these figures. The amount of bequest is over 10 times the average income per household.

<Table 3>

We may compare our estimates of bequest per deceased with Takayama and Arita's (1996, Section 3) 1992 estimate, although Barthold and Ito (1992) do not report the amount of bequest per deceased. Takayama and Arita used an individual data set titled the Survey on Household Assets Composition in 1992, which is conducted by the Research Institution of Post and Telecommunications. This survey includes self-assessed value on housing, land and bequest received. The average amount of bequest received is 54.6 million yen per household. Our estimate in 1992 is 65.7 million yen, which is bequest left by deceased. The difference is significant, but Takayama and Arita admitted that their figures might be underestimated, because of lack of data on wealthy families. We believe our estimates of bequest to be the appropriate ones.

(4) The Ratio of Bequest to Net Household Wealth

Next, we investigate the percentage of bequest to wealth. In the previous part we calculated estimated bequest per male deceased aged 50 years and over. Hence we can easily obtain the total amount of bequest as follows: the expected amount of bequest per

male deceased in Table 3 multiplied by the number of male deceased aged 50 years and over in column (10) of Table 1. As a result, the amount of bequest is some 40 to 60 per cent of net household assets for 1986 to 1994. The ratio has been increasing year by year with an increase in the aged population.

<Table 4>

It should be noted that we assume that a surviving wife does not decrease the wealth inherited from her ex-husband (intragenerational transfer), although Barthold and Ito (1992) think that a half of the bequest from an ex-husband will be consumed by a wife. Our assumption is justified by the fact that a large part of bequest in Japan is just land, 60 to 70 per cent of bequest on average, and increase in land value may be expected to have exceeded consumption of bequest by a surviving wife, at least until the current recession. Furthermore, a surviving wife receives three fourths of the benefit her husband received when he was an employee. We may assume this is enough to cover her daily expenses.

According to Table 4, the ratio of bequest to household wealth increases from 41.6 per cent to 57.4 per cent for the period 1986 to 1994. Barthold and Ito (1992) suggested that the amount of bequest in 1988 was some 40 per cent of net household wealth in Japan, compared with some 25 per cent for the US. Takayama and Arita (1996, Section 3) used individual assets data, including much data on bequest, and concluded that almost one-third of household wealth is bequest. Our estimates are higher than previous studies. One might be surprised at the high proportion of bequest in Japan, approaching

60 per cent in 1994. High land prices contribute to the high percentage of bequest to net household wealth.

3. The Estimation of Bequest Distribution

(1) The Inheritance Tax System in Japan

In this section, we estimate the distribution of bequests, using Japanese bequest tax data and the average amount of bequest per male deceased, which was obtained in part (3) of Section 2. We first explain the inheritance tax system briefly, since Barthold and Ito (1992) present very detailed information on the Japanese intergenerational transfer tax system, regarding both inheritance and gift taxes. Japanese inheritance taxation is characterised as being more law-oriented. Most people do not leave a valid will at their death, and even then inheritance law takes precedence over the will of the deceased. The law protects the family member's benefit and decides who are to be recipients - called "statutory" heirs - and how much they are to receive (the "statutory" share for each heir).

All property of the deceased except a basic deduction is subject to inheritance tax and recipients of bequest are taxed. In a case where the recipients (statutory heirs) are a spouse and two children, the current basic deduction in bequest taxation is 80 million yen, over 10 times current average annual income. Since 1994 the basic deduction has been calculated at "50 million yen + 10 million yen x the number of statutory heirs". In

the above case, the bequest is divided into three parts: a half to a spouse and another half between two children equally. In the case of no spouse and three children, the basic deduction is the same and the bequest is equally divided between the three. The Japanese bequest law guarantees an equal division of bequest for all children. A strong progressive rate schedule, currently 10-70 per cent, is applied to each statutory heir and then the sum of the tax burden is determined. It may be lessened by a tax exemption for a spouse if one of the statutory heirs is a surviving wife. Furthermore, a rich family could reduce its tax burden by increasing the number of statutory heirs, for example via "adopted children", as discussed by Barthold and Ito (1992). The number of statutory heirs, however, has been limited since 1989.

<Table 5 >

According to Table 5, taxed bequests per deceased were 104 million yen in 1975, 113 million yen in 1980, 131 million yen in 1986, 292 million yen in 1990 and 321 million yen in 1994. They were increasing until the recent recession, especially during the latter half of the 1980s with tremendous increase in land price. Land is the main asset of bequest in Japan, which is very different from other industrialised countries. For instance, the Estate Tax Returns Fields in the US used by Barthold and Ito (1992) indicate that real estate occupies at most one fourth of bequest. On the other hand, some 70-80 per cent of bequest taxed in Japan is land, even when underestimated by calculating at an official price called "Rosen Ka" in bequest taxation.

It should be noted that all land values reported in the Tax Bureau Statistics Annual are

underestimated, although all monetary assets are evaluated at market prices. The land evaluation in bequest taxation ("Rosen Ka") seems from 50 per cent to 90 per cent of market price ("Kouji Kakaku"), although "Rosen Ka" has been increasing and approaching market price since the heated economy of the latter half of the 1980s (see land index in Table 6). Furthermore, agricultural properties benefit from special provisions to lessen their assessment value, and also small properties (200 square meters) for housing or family business use have been assessed at a lower rate since 1983.

The Tax Bureau Statistics Annual reports no information on age or sex in bequest tax data. Supposing that taxed cases are all males whose age is 50 years and over, the ratio of taxed cases to male deceased aged 50 years and over has been almost 10 to 15 per cent since 1986. These ratios depend on the inheritance tax system and on asset prices, especially land price and price evaluation in bequest taxation.

As mentioned before, land is the main source of bequest, which is shown to be some 70-80 percent of bequest in Table 5. In 1994 term deposits occupy some 9 per cent of total property, and only 8 per cent is securities and bonds. The percentage of land for taxed cases, even when evaluated at "Rosen Ka", is much higher than that for the average cases, 60 - 70 per cent at market price. The reason wealthy families prefer land to monetary assets is that land holding cost is very cheap, especially in urban areas, where land value is assessed at some 10 per cent of market price for land holding tax. Land is, also, assessed at a lower value than market price under current bequest taxation.

Tax revenue on bequests and gifts occupies some 5 per cent of total tax revenue in 1994.

It occupies third position in national tax revenue and is some half of 3% GST. The ratio of bequest tax revenue to GDP is 0.5 to 0.6 per cent in the 1990s, which is a high proportion compared with other developed countries: 0.4 per cent in France, 0.3 per cent in Germany, 0.2 per cent in the UK and 0.1 per cent in the USA, although the ratio in Japan was only 0.2 per cent till the first half of the 1980s. Japan experienced a bubble economy with high land and security prices in the latter half of the 1980s and since then bequest tax revenue has increased rapidly.

(2) The Average Amount of bequest for Taxed cases and for non-Taxed Cases

Using the bequest tax data, we divide the bequest left by male deceased between those cases taxed and those not taxed in this part, and then compute the bequest distributions from our estimates in the next part. The bequest tax data from the Tax Bureau Statistics Annual is summarised in Table 5. It presents the average amount of bequest for taxed cases and the number of cases taxed. It is important to note that we assume that reported cases are all male deceased persons aged 50 years and over, because we have no information on age or sex.

<Table 6 >

First, we should remember that the land value reported by the Tax Bureau Statistics Annual is calculated not at market price, but at an official price in bequest taxation called "Rosen Ka", which is lower than the official market price, called "Kouji Kakaku". So we have to evaluate the land at market price. Real assets for taxed cases in Table 6

are evaluated at market price by using the "land index".

It is difficult to evaluate the land at market price, because we cannot find an exact "land index" such as the ratio of official land price in bequest taxation to market price. We may, however, refer to some statistics by the Japan Research Institute for Real Estate. They give an average land index for 47 principal cities for the period 1986 to 1990: 0.574 in 1986, 0.589 in 1988, 0.620 in 1989, and 0.653 in 1990. We, however, do not use these figures directly, because they are the average of 47 principal cities, not that of all areas in Japan. Taking account of other information on land price, we set them some 10 per cent higher than estimates by the Japan Research Institute for Real Estate. See "land index" in Table 6: 0.65 in 1986, 0.70 in 1988 and 1989, 0.75 in 1990. We also set the figure of 0.9 in 1992 and 1994, considering of land price information and of change in land evaluation in bequest taxation. Since 1990, the Tax Bureau has tried to ensure that "Rosen Ka" approaches market price.

Next, we can calculate the total bequest for non-taxed cases as follows. According to the 1994 Tax Bureau Statistics Annual, the average amount of bequest for taxed cases is 349 million yen at market price (321 million yen at "Rosen Ka") and the number of taxed cases is 10.5 per cent of the total male deceased whose age is 50 years and over. We estimate the expected amount of bequest per male deceased aged 50 years and over as 65 million yen on average in Table 3. Thus we can calculate that men leave 32 million yen on average for non-taxed cases. This figure is arrived at by the following calculation: $(65.1 - 348.8 \times 0.105) / (1 - 0.105)$. The same procedure being applied for net monetary assets, real assets and total bequest for each year, we can obtain the

reasonable figures in Table 6. The year 1992, however, is an exception. At that time, Japan experienced the first decrease in land prices since the first oil shock (see Figure 1).

In the end, for deceased whose bequest is taxed, the average amount of bequest is 349 million yen in 1994: 53 million yen for monetary assets and 296 million yen for real assets. On the other hand, in the case of deceased whose bequest is not taxed, their bequest value is only 32 million yen on average, which consists of 18 million yen for monetary assets and 14 million yen for real assets. The difference in the amount of bequest between taxed and non-taxed cases is quite substantial; the former bequest is over 10 times the latter one. The difference comes mainly from inequality in land holding. The ratio of land to total bequest is some 80 to 90 per cent for taxed cases and some 50 per cent for non-taxed cases.

In the next part of this section, we compute the distribution function of bequest, using estimates in Table 6.

(3) The Distribution of Bequest

In the above part, we calculated the average amount of bequest for male deceased aged 50 years and over, both for taxable and for non-taxable cases, in 1986, 1988, 1989, 1990, 1992 and 1994. In this part, we present a computation method to obtain the bequest distribution from our bequest estimates in Table 6. Then we calculate the variation and Gini coefficients.

We assume that bequest is distributed lognormally, uniquely determined from two parameters. Our assumption that bequest is distributed lognormally is justified by the fact that a lognormal distribution is well fitted to wealth as well as to income. Furthermore, Sargan (1957) presents a model of wealth distribution which produces a lognormal distribution, though his model is too complicated. Pestieau and Possen (1979) show a complete model, in which wealth distribution is lognormal, with utility maximisation on consumption, savings, investment, bequest and so on. Bequest is a part of wealth left at death. Hence we assume that bequest is a lognormal distribution, which implies that there are no negative bequests. This is not an unrealistic assumption.

The density function of lognormal distribution is shown in equation (1). Given two parameters, μ and σ, a lognormal distribution is uniquely determined.

$$(1) \qquad f(x) = \frac{1}{\sqrt{2\pi}\sigma}\frac{1}{x}\exp\{-\frac{(\log x - \mu)^2}{2\sigma^2}\}$$

We know the average amount of bequest for deceased aged 50 years and over , $\bar{x}$, the average amount of bequest for deceased whose bequest is not taxed, $\overline{x_1}$, and the ratio of non-taxable cases to all deceased, α. See Figure 2.

<Figure 2 >

These three parameters are represented in the following equations (2) to (4), where x_0 is the tax threshold in bequest tax.

(2) $\int_0^{x_0} f(x)\,dx = \alpha$

(3) $\int_0^{x_0} x\,f(x)\,dx = \overline{x_1}$

(4) $\int_0^{\infty} x\,f(x)\,dx = \overline{x}$

If these equations are solved, we obtain two parameters μ, σ which determine the unique lognormal distribution, and x_0 which is the exempt threshold of bequest tax. "Maple V", however, can not solve directly these equations. Then we transform equations (2) to (4) to equations (6) to (8) by using the identity (5).

(5) $t_0 = \dfrac{\log x_0 - \mu}{\sigma}$

The transformed equations are as follows;

(6) $\int_{-\infty}^{t_0} \dfrac{1}{\sqrt{2\pi}} \exp\left(-\dfrac{1}{2}t^2\right) dt = \alpha$

(7) $\int_{-\infty}^{t_0-\sigma} \dfrac{1}{\sqrt{2\pi}} \exp\left(-\dfrac{1}{2}t^2\right) dt = \overline{x_1} \exp\left\{-\left(\mu + \dfrac{1}{2}\sigma^2\right)\right\} = \dfrac{\overline{x_0}}{x}$

(8) $\int_{-\infty}^{\infty} \dfrac{1}{\sqrt{2\pi}} \exp\left(-\dfrac{1}{2}t^2\right) dt = \overline{x} \exp\left\{-\left(\mu + \dfrac{1}{2}\sigma^2\right)\right\} = 1$

The unknown parameters, μ, σ and x_0 are obtained by solving the equations (6) to (8). The result is presented in Table 8. For two of the unknown parameters, μ and σ,

which determine the shape of lognormal distribution, each estimate shows very much the same values for six years, namely, μ is around 10 and σ is around 1.3. The only exception is σ in 1992, which is calculated at 1.68.

<Table 7>

We can judge how realistic our calculations are, from investigating the tax threshold, x_0. The estimated tax thresholds for the years 1986 to 1994 are presented in the first row of Table 7. They are evaluated at market price. In order to compare them with tax thresholds in bequest taxation, we have to reevaluate land value at the official "Rosen Ka" price, which is lower than market price. According to Table 5, land occupies over 90 per cent of real assets for taxed cases, even evaluating at "Rosen Ka'. Therefore, it is quite reasonable to assume that all real assets are land. The second row of Table 7 presents our estimates of the reevaluated tax threshold for each year.

Under the Japanese bequest tax system, tax threshold depends on the number and category of heirs. If the number of heirs are three and a surviving spouse is one of them, "tax exemption for spouse" must be the tax threshold, because the tax exemption for spouse is larger than the basic deduction. If not, the "basic deduction", which varies with the number of heirs, will set the tax threshold. Both "basic deduction for three heirs" and "tax exemption for spouse" are presented in Table 7. "Tax exemption for spouse" is 40 million yen from 1975, 80 million yen from 1988 and 160 million yen from 1994.

Our estimated tax thresholds assessed at "Rosen Ka" in 1988 and 1994 are between "basic deduction for three heirs" and "tax exemption for spouse". These estimates are acceptable. Other estimates are higher than "tax exemption for spouse". These figures might be explained by the fact that wealthy families reduce bequest tax burden by using "adopted children" to increase the number of statutory heirs. These "adopted children" disappear after receiving some compensation for this service from wealthy families (see Barthold and Ito (1992)). The number of statutory heirs has been limited since 1989. As a result of comparing the estimated tax thresholds with those in bequest taxation, our estimated bequest distributions are not far from the real ones.

Estimated distributions of bequest are shown in Figure 3 and the summary of these distributions is indicated in Table 8. Figure 3 shows that distributions in 1986, 1988, 1989, 1990 and 1994, excepting 1992, are very similar to each other. The year 1992 was a time when land price decreased sharply at the end of a heated economic period from 1986 to 1990 (see Figure 1).

<Figure 3> and <Table 8>

Five of the distributions of bequest in Figure 3 are very much the same. They are extremely positively skewed. The mean is over ten times the mode. The Gini coefficients of bequest distributions for five years, 1986, 1988, 1989, 1990 and 1994, are between 0.61 and 0.68. These figures mean that bequests are distributed very unequally. They are higher than the Gini coefficients of wealth distribution estimated by Takayama (1994), Takayama and Arita (1996, Section 1 and 2). This fact is quite

reasonable, because bequest is the wealth left by older people in most cases. The older people are, the more inequality of wealth increases in Japan.

Furthermore, for five years' distributions, the median is some 5 times the mode and the mean is over 10 times. There are only 10 per cent of male deceased whose bequest is less than the mode, which is nearly the average income for each year. These bequest distributions in Figure 3 support the hypothesis suggested by Tachibanaki and Shimono (1986) (1991) of the life-cycle savings pattern with bequest motive, applicable to most Japanese households. Although few people cite the bequest motive for saving in response to surveys, most of them do not think of their housing, which is the main source of bequest in Japan.

4. Conclusion

In this paper, we first estimated the amount of bequest per male deceased and the ratio of bequest to net household wealth in 1986, 1988, 1989, 1990, 1992 and 1994. The concept of bequest is defined as wealth left by male deceased aged 50 years and over, which includes both voluntary and involuntary bequests. Our method is partly based on Barthold and Ito's (1992). Estimated ratios of bequest to household assets are some 40 to 60 per cent for the period 1986 to 1994, and these ratios increase with an expansion of the aged population. The percentage of bequest to household wealth is higher than that shown in previous studies.

Furthermore, bequest is not the only type of intergenerational transfer. Taking account of other types of intergenerational transfer such as education fees, which in Japan are paid in full by parents, and financial support for children to purchase a house, the total amount of intergenerational transfer is higher than 40-60 per cent of net household assets. So research on bequests (or intergenerational transfer) is quite important for Japan's future society.

It should be noted that the ratio of land value to household wealth is quite high in Japan. Over half of net household assets are just land in Japan. On the other hand, in the US and the UK, land occupies only some 10 – 20 per cent. Immoderate land prices are the reason for the high ratio of land to net household assets, and are themselves the outcome of excessive demand for land. Land has been in demand for bequest and investment purposes, as well as for housing and business purposes, because land has had a tax advantage, being assessed at a rate lower than market price. Land is assessed at 10 – 50 per cent of market price in land holding tax, and at 50 – 90 per cent in bequest tax. There has also been earnest housing demand, especially in the limited urban areas. It has been induced since World War II by government policies, such as low assessment on land in bequest and holding taxes, limited public housing, low interest public loans for housing and so on. As a result, a typical house with land (some 100 square metres) costs over 10 times the average income and even an apartment (some 70 square metres) costs 6-8 times the average income in the Tokyo metropolitan area, even in the 1990s when land prices are down because of the current recession.

Secondly, in Section 3, we divided bequests between taxed cases and non-taxed cases,

and then computed the bequest distribution for each year from our bequest estimates. According to Table 6, the average amount of bequest for taxed cases is almost 10 times that for non-taxed cases. The big difference comes from land holdings. As land prices in Japan are much higher than in other industrialised countries, land holdings are a key element which divides the rich and the poor, as pointed out by Shimono (1991).

Assuming that bequest is distributed lognormally, we can draw the bequest distributions by solving equations on bequests by Maple V. Figure 3 shows that five years' distributions, excepting the year 1992, are very similar each other (see Figure 3). They are extremely positively skewed. The median is some 5 times the mode which is around the average annual income. The mean is over ten times the mode. As a result, Gini coefficients of bequest distributions in 1986, 1988, 1989, 1990 and 1994 are between 0.61 and 0.68.

Our study supports the view that a life-cycle savings hypothesis with bequest motive suits the saving behaviour of most Japanese people rather than a simple life-cycle savings hypothesis, also suggested by Tachibanaki and Shimono (1986) (1991). Furthermore, this research justifies inheritance tax in Japan, because the size of bequest is enormous and its distribution is so unequal.

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Table 1 Estimation of Net Monetary Assets at Death

1986

Age	Number of Household Heads (thousand persons) (1) Male	(2) Female	(3) Total	Number of Non-Household Heads (4) Male only (Thousand persons)	(5) Ratio of Household Heads for Males	(6) Monetary Assets per Household (thousand yen)	(7) Debt per Household (thousand yen)	(8) Net MA per Male Household Head	(9) Net Monetary Assets per Male	(10) Number of Male Deceased	(11) Death Distribution (total=1)	(12) Expected Net Monetary Assets at Death
50 - 54	3,859	526	4,385	0	1.00	9,686	2,811	7,314	7,314	24,208	0.068	(501)
55 - 59	3,395	553	3,948	0	1.00	13,541	2,772	11,580	11,580	31,248	0.088	(1,023)
60 - 64	2,512	514	3,026	78	0.97	14,626	2,675	13,061	12,668	32,597	0.092	(1,168)
65 -	3,981	1,548	5,529	599	0.87	13,487	950	14,578	12,671	265,510	0.751	(9,516)
total	13,747	3,141	16,888	677	0.95					353,563	1.000	12,208

1988

Age	Number of Household Heads (thousand persons) (1) Male	(2) Female	(3) Total	Number of Non-Household Heads (4) Male only (Thousand persons)	(5) Ratio of Household Heads for Males	(6) Monetary Assets per Household (thousand yen)	(7) Debt per Household (thousand yen)	(8) Net MA per Male Household Head	(9) Net Monetary Assets per Male	(10) Number of Male Deceased	(11) Death Distribution (total=1)	(12) Expected Net Monetary Assets at Death
50 - 54	3,948	538	4,486	0	1.00	13,108	3,808	9,894	9,894	22,209	0.059	(581)
55 - 59	3,803	586	4,189	0	1.00	15,749	3,204	13,489	13,489	32,926	0.087	(1,174)
60 - 64	2,765	566	3,331	144	0.95	19,333	1,625	19,353	18,395	38,238	0.101	(1,859)
65 -	4,399	1,711	6,110	1,144	0.79	17,412	1,307	18,727	14,662	285,044	0.753	(11,195)
total	14,714	3,402	18,116	1,288	0.92					378,419	1.000	14,808

1989

Age	Number of Household Heads (thousand persons) (1) Male	(2) Female	(3) Total	Number of Non-Household Heads (4) Male only (Thousand persons)	(5) Ratio of Household Heads for Males	(6) Monetary Assets per Household (thousand yen)	(7) Debt per Household (thousand yen)	(8) Net MA per Male Household Head	(9) Net Monetary Assets per Male	(10) Number of Male Deceased	(11) Death Distribution (total=1)	(12) Expected Net Monetary Assets at Death
50 - 54	3,849	513	4,362	0	1.00	13,176	3,580	10,196	10,196	20,889	0.055	(563)
55 - 59	3,646	576	4,222	0	1.00	16,997	3,455	14,533	14,533	32,691	0.086	(1,256)
60 - 64	2,979	622	3,601	163	0.95	21,016	1,680	21,164	20,066	39,981	0.106	(2,121)
65 -	4,672	1,818	6,490	1,159	0.80	24,122	2,161	25,536	20,462	264,721	0.753	(15,401)
total	15,146	3,529	18,675	1,322	0.92					378,282	1.000	19,341

1990

Age	Number of Household Heads (thousand persons) (1) Male	(2) Female	(3) Total	Number of Non-Household Heads (4) Male only (Thousand persons)	(5) Ratio of Household Heads for Males	(6) Monetary Assets per Household (thousand yen)	(7) Debt per Household (thousand yen)	(8) Net MA per Male Household Head	(9) Net Monetary Assets per Male	(10) Number of Male Deceased	(11) Death Distribution (total=1)	(12) Expected Net Monetary Assets at Death
50 - 54	3,814	520	4,334	0	1.00	13,012	4,020	9,566	9,566	20,161	0.051	(488)
55 - 59	3,694	601	4,295	0	1.00	17,132	3,639	14,509	14,509	32,925	0.083	(1,210)
60 - 64	3,111	637	3,748	206	0.94	20,422	1,645	20,521	19,247	42,742	0.108	(2,083)
65 -	4,826	1,877	6,703	1,141	0.81	23,125	2,044	24,513	19,826	299,088	0.757	(15,015)
total	15,445	3,635	19,080	1,347	0.92					394,916	1.000	18,796

1992

Age	Number of Household Heads (thousand persons) (1) Male	(2) Female	(3) Total	Number of Non-Household Heads (4) Male only (Thousand persons)	(5) Ratio of Household Heads for Males	(6) Monetary Assets per Household (thousand yen)	(7) Debt per Household (thousand yen)	(8) Net MA per Male Household Head	(9) Net Monetary Assets per Male	(10) Number of Male Deceased	(11) Death Distribution (total=1)	(12) Expected Net Monetary Assets at Death
50 - 54	4,022	548	4,570	0	1.00	15,484	4,683	11,490	11,490	20,400	0.049	(561)
55 - 59	3,811	620	4,431	0	1.00	19,930	4,295	16,812	16,812	32,794	0.079	(1,320)
60 - 64	3,283	673	3,956	205	0.94	23,796	2,352	23,436	22,059	45,689	0.109	(2,413)
65 -	5,471	2,127	7,598	1,140	0.83	23,617	2,487	24,570	20,333	318,724	0.763	(15,516)
total	16,586	3,969	20,555	1,345	0.92					417,607	1.000	19,813

1994

Age	Number of Household Heads (thousand persons) (1) Male	(2) Female	(3) Total	Number of Non-Household Heads (4) Male only (Thousand persons)	(5) Ratio of Household Heads for Males	(6) Monetary Assets per Household (thousand yen)	(7) Debt per Household (thousand yen)	(8) Net MA per Male Household Head	(9) Net Monetary Assets per Male	(10) Number of Male Deceased	(11) Death Distribution (total=1)	(12) Expected Net Monetary Assets at Death
50 - 54	4,311	588	4,899	0	1.00	18,309	6,327	11,683	11,683	21,353	0.050	(590)
55 - 59	3,861	629	4,490	0	1.00	18,808	4,278	15,624	15,624	30,032	0.070	(1,091)
60 - 64	3,466	710	4,176	211	0.94	24,772	3,393	23,385	22,024	46,332	0.108	(2,373)
65 -	6,132	2,385	8,517	1,223	0.83	25,461	1,866	27,436	22,874	332,362	0.773	(17,677)
total	17,771	4,311	22,082	1,434	0.93					430,079	1.000	21,721

Note: "Expected Net Monetary Assets at Death" for each year is shown in the bottom cell in column (12), which is the sum of (column (9) x column (11)) by age class.
These figures are our estimates of net monetary assets per male deceased aged 50 years and over for the period of 1986 to 1994.

Table 2 Household Assets in National Accounts

unit: billion yen

Year	1975	1980	1986	1988	1989	1990	1992	1994
Total Assets	519,320.2	987,609.8	1,675,268.7	2,236,351.5	2,581,046.1	2,704,562.7	2,499,391.2	2,541,108.2
Real Assets	334,096.2	646,348.9	1,041,343.9	1,420,410.6	1,622,681.7	1,755,857.5	1,507,120.5	1,452,765.9
Monetary Assets	175,224.0	341,260.9	633,924.8	815,940.9	958,364.4	948,705.2	992,270.7	1,088,342.3
Debt	67,728.4	130,378.0	320,725.2	265,694.6	294,301.0	326,251.4	341,978.3	361,621.3
Net Monetary Assets (a)	107,495.6	210,882.9	423,199.6	550,246.3	664,063.4	622,453.8	650,292.4	726,721.0
Net Total Assets (b)	451,591.8	857,231.8	1,464,543.0	1,970,656.9	2,286,745.1	2,378,311.3	2,157,412.9	2,179,486.9
(b) / (a)	3.20	2.06	2.46	2.58	2.44	2.82	2.32	2.00
Real Assets / (b)	74.0%	75.4%	71.1%	72.1%	71.0%	73.8%	69.9%	66.7%

Note: Land is evaluated at market price ("Kouji Kakaku").

Data: Economic Planning Agency, *Annual Report on National Accounts*.

Table 3 The Amount of Bequest per Male Deceased aged 50 years and over

unit: thousand yen

Year	1986	1988	1989	1990	1992	1994
net monetary assets	12,208	14,808	19,341	18,796	19,813	21,721
real assets	30,040	38,226	47,261	53,021	45,919	43,422
total assets	42,248	53,034	66,602	71,817	65,732	65,143

Note: All figures are our estimates.

Table 4 The Amount of Bequest and the Ratio of Bequest to Net Household Assets

unit: billion yen

Year	1986	1988	1989	1990	1992	1994
net household assets (SNA)	1,464,543.0	1,970,656.9	2,286,745.1	2,378,311.3	2,157,412.9	2,179,486.9
our estimated bequest amount	609,385.2	848,650.1	1,096,801.7	1,205,951.1	1,178,640.5	1,251,071.3
percentage of bequest	41.6%	43.1%	48.0%	50.7%	54.6%	57.4%

Note: "Net household assets" is from *the Annual Report on National Accounts*.

Table 5 Bequest Tax Data

Year	1975	1980	1986	1988	1989	1990	1992	1994
Ratio of Tax Cases to Deceased	4.8%	8.2%	14.7%	13.3%	11.0%	12.2%	13.0%	10.5%
Number of Deceased Taxed	14,587	26,789	51,822	50,625	41,604	48,302	54,465	45,333
<Average Amount of Bequest per Deceased Taxed> (thousand yen)								
net monetary assets	23,151	27,870	34,395	41,365	62,045	51,180	44,966	53,248
real assets	80,928	85,406	96,814	154,654	221,187	241,249	301,700	268,013
land	76,847	80,032	90,360	146,401	206,045	225,560	284,037	248,267
housing	3,042	3,959	5,260	7,086	13,773	14,309	16,189	17,999
others	1,040	1,415	1,195	1,167	1,369	1,381	1,474	1,747
total assets	104,079	113,276	131,209	196,019	283,232	292,429	346,666	321,261
real assets / total assets	77.8%	75.4%	73.8%	78.9%	78.1%	82.5%	87.0%	83.4%

Note: (1) "Deceased" in this table means only MALE deceased whose age is 50 years and over.
(2) Land is assessed at an official price ("Rosen Ka"), which is lower than market price.

Data: Tax Bureau (Ministry of Finance), *Tax Bureau Statistics Annual*.

Table 6 Bequest Division between Taxed Case and non-Taxed Case using Bequest Tax Data

Year	1986	1988	1989	1990	1992	1994
land index	0.650	0.700	0.700	0.750	0.900	0.900
{Net Monetary Assets: thousand yen}						
Average Bequest per Deceased	12,208	14,808	19,341	18,796	19,813	21,721
Taxed Case	34,395	41,365	62,045	51,180	44,966	53,248
Non-Taxed Case	8,384	10,734	14,063	14,296	16,055	18,022
{Real Assets: thousand yen}						
Average Bequest per Deceased	30,040	38,226	47,261	53,021	45,919	43,422
Taxed Case *	145,469	217,397	309,492	316,436	333,260	295,598
Non-Taxed Case	10,147	10,740	14,850	16,419	2,983	13,837
[Total Bequest: thousand yen]						
Average Bequest per Deceased	42,248	53,034	66,602	71,817	65,732	65,143
Taxed Case * (a)	179,864	258,762	371,537	367,616	378,226	348,846
Non-Taxed Case (b)	18,531	21,474	28,913	30,715	19,038	31,859
(a) / Average Bequest	4.26	4.88	5.58	5.12	5.75	5.36
(b) / (a)	10.3%	8.3%	7.8%	8.4%	5.0%	9.1%
<supplement>						
Real/Total Assets on average	71.1%	72.1%	71.0%	73.8%	69.9%	66.7%
Real/Total Assets in Taxed Case	80.9%	84.0%	83.3%	86.1%	88.1%	84.7%
Real/Total Assets in Non-Taxed Case	54.8%	50.0%	51.4%	53.5%	15.7%	43.4%

Note: (1) "Land index" is set by us, taking account of much information on land price.
(2) * Real assets for taxed case are reevaluated at market price.

Table 6 Bequest Division between Taxed Case and non-Taxed Case using Bequest Tax Data

Year	1986	1988	1989	1990	1992	1994
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Taxed Case	34,395	41,365	62,045	51,180	44,966	53,248
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Average Bequest per Deceased	30,040	38,226	47,261	53,021	45,919	43,422
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[Total Bequest: thousand yen]						
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<supplement>						
Real/Total Assets on average	71.1%	72.1%	71.0%	73.8%	69.9%	66.7%
Real/Total Assets in Taxed Case	80.9%	84.0%	83.3%	86.1%	88.1%	84.7%
Real/Total Assets in Non-Taxed Case	54.8%	50.0%	51.4%	53.5%	15.7%	43.4%

Note: (1) "Land index" is set by us, taking account of much information on land price.
(2) * Real assets for taxed case are reevaluated at market price.

Table 7 Tax Threshold : Estimated Tax Threshold vs Tax Threshold in Bequest Taxation

unit: thousand yen

year	1986	1988	1989	1990	1992	1994
Estimated Tax Threshold (market price)	72,402	95,641	139,374	139,237	106,298	142,868
Estimated Tax Threshold ("Rosen Ka")	51,901	71,539	104,544	109,266	96,933	130,767
*Basic Deduction for Three Heirs	32,000	64,000	64,000	64,000	76,500	80,000
*Tax Exemption for Spouse	40,000	80,000	80,000	80,000	80,000	160,000

Note:* If a spouse is one of the statutory heirs, the "Tax Exemption for Spouse" must be the tax threshold in bequest taxation. Otherwise, "Basic Deduction", which depends on the number of heirs, is the tax threshold.

Table 8 Summary of Distribution of Bequests

Year	1986	1988	1989	1990	1992	1994
Tax Threshold at market price *	72,402	95,641	139,374	139,237	106,298	142,868
mu	9.926	9.963	10.137	10.274	9.681	10.264
sigma	1.204	1.353	1.392	1.347	1.681	1.281
Mode *	4,805	3,405	3,634	4,717	949	5,558
Median *	20,469	21,235	25,262	28,977	16,006	28,678
Mean *	42,248	53,034	66,602	71,817	65,732	65,143
Variation Coefficient	1.806	2.289	2.439	2.268	3.983	2.040
Gini Coefficient	0.605	0.661	0.675	0.659	0.765	0.635

Note: * unit: thousand yen

Figure 1

Annual Change of Land Price, Nikkei 225 Index and Term deposit

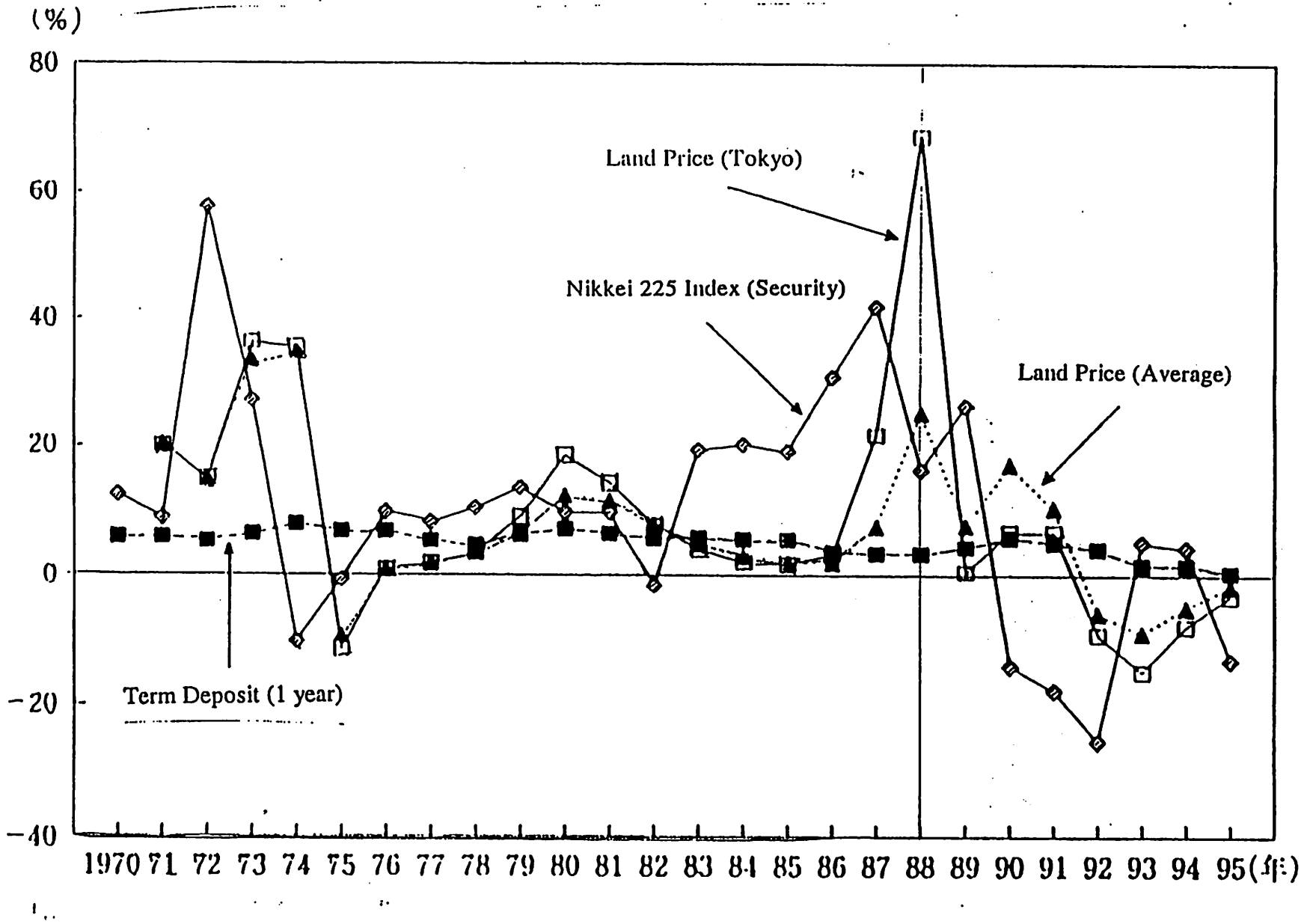
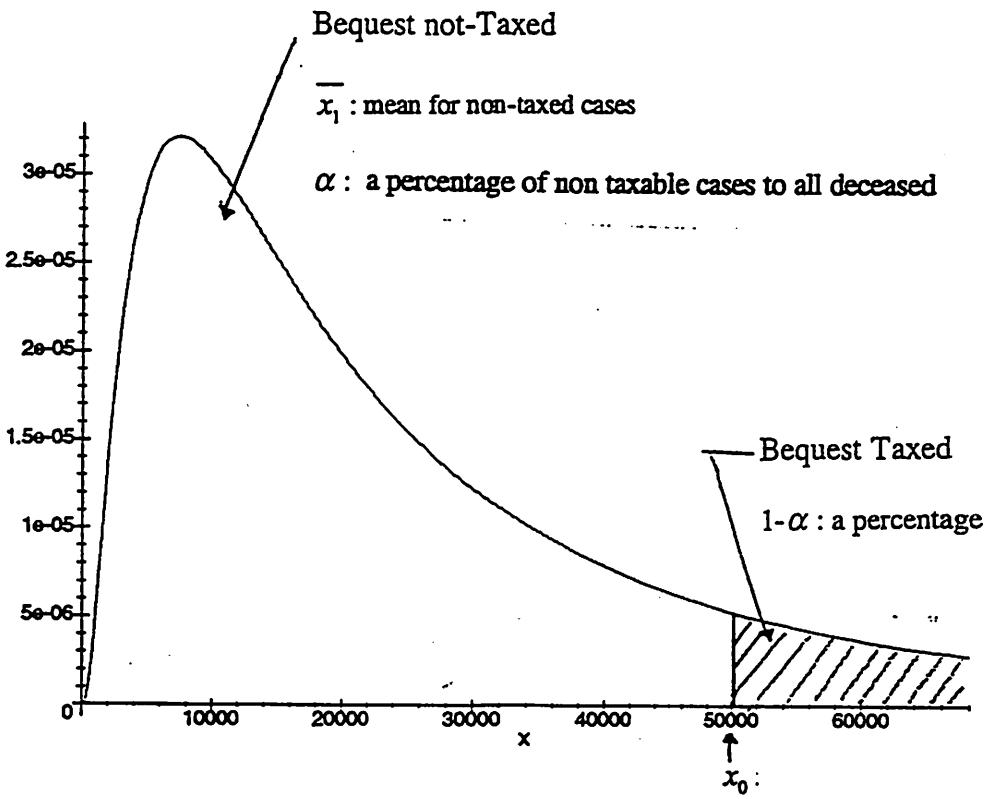
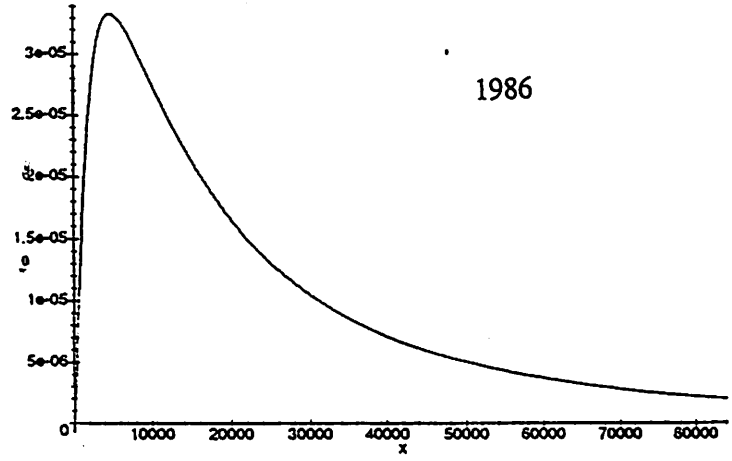


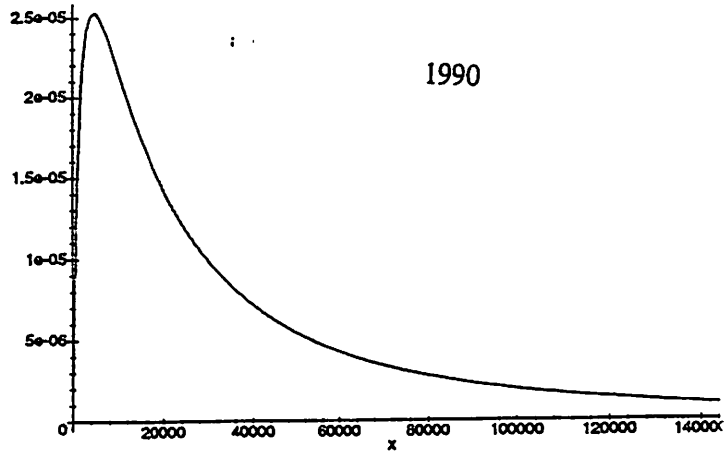
Figure 2 Estimation of Bequest Distribution

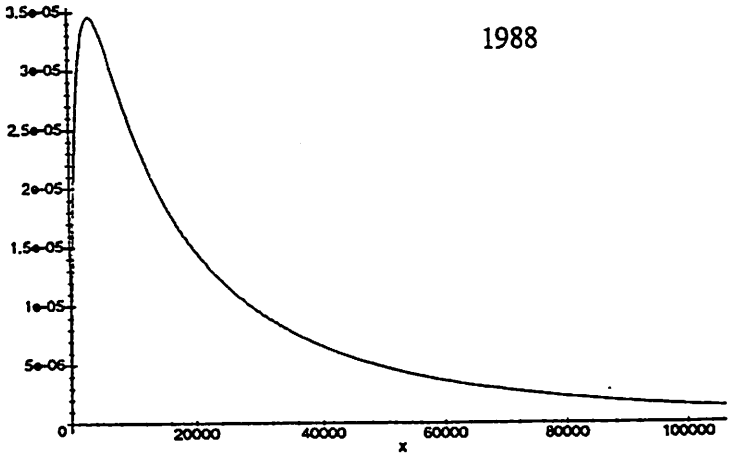


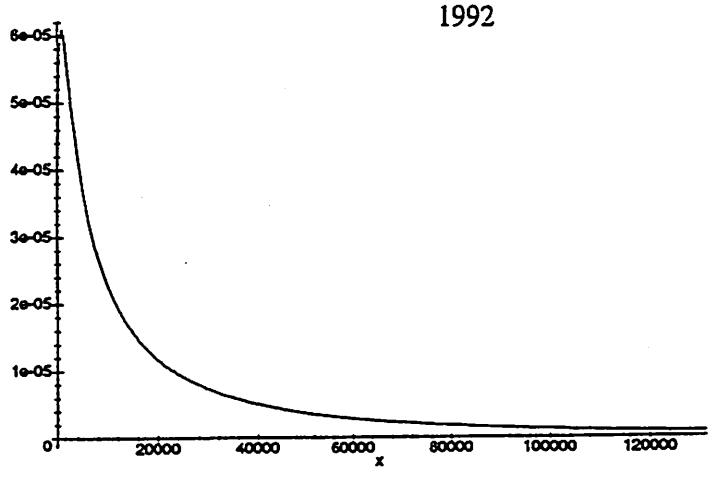
$\bar{x}$: average bequest left by male deceased

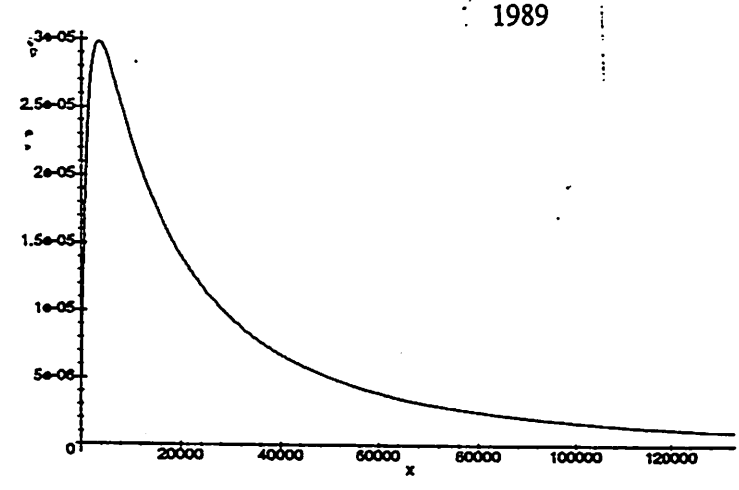
Figure 3 Distributions of Bequest for 1986 to 1994

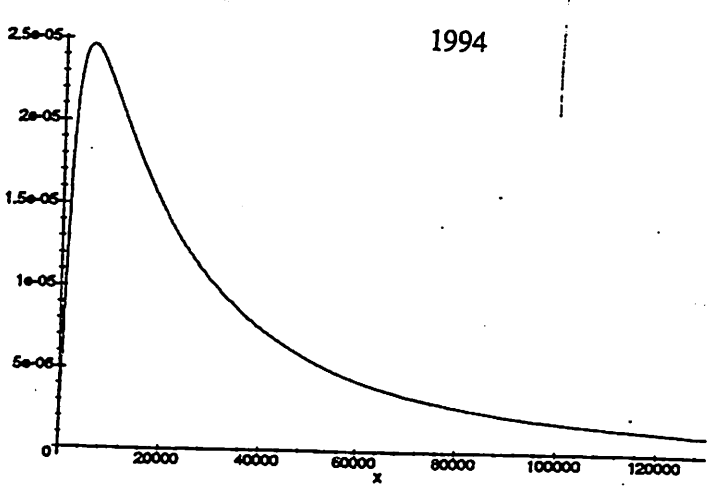












Note: (1) The sign of "x" indicates the mean of distribution.

(2) Vertical axis in the unites of "percentage" and horizontal axis is "thousands yen".