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Financing Elderly Care Service Subsidies

Masaya Yasuoka
School of Economics, Kwansei Gakuin University

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SCHOOL OF ECONOMICS

KWANSEI GAKUIN UNIVERSITY

1-155 Uegahara Ichiban-cho
Nishinomiya 662-8501, Japan

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Masaya Yasuoka†

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Abstract

This paper presents consideration of how a subsidy for the elderly care services should be financed in terms of income growth and social welfare. An increase in the tax burden for older people and firm with a decrease in the tax burden for young people can raise the income growth rate. However, the policy to decrease the unemployment to increase tax revenue by virtue of an increase in labor input can raise the income growth rate if the unemployment rate is low. Even if these tax systems increase the income growth rate, social welfare can not always be pulled up because an increase in the tax burden for older people worsens the welfare of older people.

JEL Classification:H51, H21, J14

Keywords: Aging society, Elderly care services, Tax system, Endogenous growth

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†Corresponding to: School of Economics, Kwansei Gakuin University, 1-155 Uegahara Ichiban-Cho, Nishinomiya, Hyogo 662-8501 Japan, Tel.:+81-798-54-6993, E-mail: yasuoka@kwansei.ac.jp

1 Introduction

This paper presents an examination of a subsidy for elderly care services to raise social welfare. Concretely, this paper presents consideration of some tax means and derives how the tax system should be set in terms of social welfare. No other report in the literature describes a study that examines a multiple tax system in subsidies or elderly care services.

Many studies examine elderly care services. Pauly (1990) insists on the necessity for the public long-term care insurance. Cremer and Pestieau (2011) and Cremer and Roeder (2012) report a private subsidy for private elderly care in addition to public elderly care services. The subsidy for elderly care services brings about moral hazard by which the total amount of elderly care cost increases, which brings about the social inefficiency as derived by Richter and Ritzberger (1995).[1] Even if the moral hazard problem exists in subsidy for elderly care services, Smith and Witter (2004) show that elderly care services entail the positive effects of risk pooling. Miyazawa, Moudoukoutas and Yagi (2000) obtain the result that public long-term care is better than private long-term care insurance. Papers described above present the necessity for publicly provided elderly care insurance.

Some studies examine how subsidies for elderly service care affect the macroeconomic status. Korn and Werde (2012) derive the effects on the female labor supply by a subsidy for elderly care services. Mou and Winer (2012) show that the subsidy for elderly care services affects the purchase of elderly care services supplied in the market and the substitution between elderly care services and informal care given by children and others.

Subsidies for elderly care services are examined in terms of social welfare. Tabata (2005) derives that the subsidy for elderly care services can raise the utility of the present generation instead of a decrease in the utility of future generations. Mizushima (2009) derives the tax rate to maximize social welfare. Miyazawa (2010) considers subsidies as cash (pension and others) or in-kind (medical services, elderly care services, and others).

Colombo et al. (2011) survey a study of long-term care in OECD countries. In 2008, average public spending on long-term care was 1.5% of the Gross Domestic Product (GDP) in 2008. Not only in Japan but also in OECD countries, an aging society is progressing. Cremer and Pestieau (2012) show an

[1] Because of elderly care insurance, people do not make an effort not to be in elderly care. Then people are apt to require elderly care.

increase in the elderly care services because of an aging society. Therefore, it is important to examine the subsidy for elderly care services in aging societies. Lundholm and Ohlsson (1998) and Hashimoto and Tabata (2010) set a two sector model with an elderly care sector, which differs from the final goods sector. Hashimoto and Tabata (2010) show that labor in the elderly care sector increases with the aging of society.

[Insert Fig.1 around here.]

In Japan, aging of society is progressing quickly. The cost for elderly care continues to increase. The ratio of elderly people to total population is shown in Fig. 1.[2] Elderly care insurance (substantially equivalent to a subsidy for elderly care) is financed by taxes and premiums. The premium is financed not only by older people but also by younger people.[3] This paper shows how the difference taxation to finance the subsidy for elderly care affects the income growth rate and social welfare. Furthermore, this paper shows how the government should collect tax revenue.

The results presented in this paper are the following. An increase in the tax burden for older people or firms instead of a decrease in tax burden for younger people can raise the income growth rate because it facilitates capital accumulation. However, the policy to decrease the unemployment rate and then to increase tax revenues because of an increase in the employment rate instead of a decrease in the tax burden for younger people can raise the income growth rate if the unemployment rate is low. In an aging society with fewer children, it is important to maintain the labor supply. In addition to an increase in fertility, an increase in the labor participation rate can contribute to maintenance of the labor supply. This paper presents consideration of this issue as cutting of the unemployment rate.

Even if the income growth rate increases, social welfare does not always increase. The tax burden for older people raises the income growth rate. However, a tax burden for older people decreases their utility and intergenerational conflict might worsen.

The remainder of this paper consists of the following. Section 2 explains the model settings. Section 3 derives the equilibrium. Section 4 derives how the change of tax system to finance elderly care services

[2]The ratio of elderly people to total population reached 25% in 2013 (Data: Population Estimates, Statistics Japan).

[3]Elderly care insurance is financed 50%$bytaxes$, Older people (more than 65 years old) 19% and younger people (40–64 years old) 31% at 2014. The premium increases with age, as shown in Fig. 1. In the elderly care insurance system in Japan, the premium for elderly people is revised every three years. Moreover, half of the premium for younger people is paid by the employer.

affects both the income growth rate and social welfare. The final section concludes this paper.

2 Model

This model economy has three agents: households, firms, and government. This section explains the model settings.

2.1 Household

Individuals live in two periods: young and old periods. Our paper presents consideration of an overlapping-generations model. A young generation and old generation exist in each period. The model includes no population growth. The population size is assumed as unity over time. The household utility function is assumed by the following log utility function as[4]

$$u_t = \alpha \ln c_{1t} + \beta \ln c_{2t+1} + (1-\alpha-\beta)\ln e_{t+1},\ 0<\alpha<1,\ 0<\beta<1,\ \alpha+\beta<1, \tag{1}$$

where c_{1t} and c_{2t+1} respectively denote consumption by young and old people. The older people consume elderly care services e_{t+1} themselves.[5] t denotes the period. In the young period, younger people work inelastically to gain wage income, which is allocated into the consumption in young period and the saving to consume and to receive elderly care services in the old period. However, this paper presents consideration of unemployment and some young persons can work. Others can not work because of a lack of jobs. The government places the tax burden to provide a subsidy for elderly care services and the benefit for unemployment. Defining l_t as employment rate, the household's lifetime budget constraint is shown as

$$c_{1t} + \frac{c_{2t+1}}{1+r_{t+1}} + (1-d_{t+1})\frac{e_{t+1}}{1+r_{t+1}} = (1-\tau_l-\sigma)l_t w_t + (1-l_t)u_t - \frac{T_{t+1}}{1+r_{t+1}}. \tag{2}$$

$1+r_{t+1}$ and w_t denotes an interest rate and wage rate. τ_l denotes the tax rate to subsidize elderly care services. T_t is defined as the tax burden for older people to subsidize elderly care services that are given proportionally by the rate of d_{t+1}. The government provides unemployment benefit u_t financed by tax

[4]This paper does not consider uncertainty for elderly care and precautionary saving. With precautionary saving, household savings increase more than the saving in this deterministic model economy. Long-term care and precautionary saving were analyzed by Hemmi, Tabata and Futagami (2007). This paper assumes a deterministic economy model for ease of analysis.

[5]The elderly care services for older people are provided not only by themselves but also by children or offspring, as shown by the model presented in earlier studies. This paper assumes that elderly care for older people is provided only by themselves.

rate σ. We obtain the following allocations to maximize the utility (1) subject to the life time budget constraint (2),[6]

$$c_{1t} = \alpha\left((1-\tau_l-\sigma)l_t w_t + (1-l_t)u_t - \frac{T_{t+1}}{1+r_{t+1}}\right), \tag{3}$$

$$c_{2t+1} = \beta(1+r_{t+1})\left((1-\tau_l-\sigma)l_t w_t + (1-l_t)u_t - \frac{T_{t+1}}{1+r_{t+1}}\right), \tag{4}$$

$$e_{t+1} = \frac{(1+r_{t+1})(1-\alpha-\beta)}{1-d_{t+1}}\left((1-\tau_l-\sigma)l_t w_t + (1-l_t)u_t - \frac{T_{t+1}}{1+r_{t+1}}\right). \tag{5}$$

2.2 Firm

Firms produce the final goods with capital stock and labor input in a perfectly competitive market. The product function is assumed as

$$Y_t = K_t^{\gamma}(A_t N_t)^{1-\gamma},\ 0<\gamma<1. \tag{6}$$

Therein, Y_t denotes the final goods.[7] K_t and N_t denote the capital stock and the labor input in t period. A_t denotes the labor productivity, which is assumed as $A_t \equiv a\frac{K_t}{N_t}$ (a is a positive constant parameter).[8] Now, for these analyses we assume that the government levies a wage-based tax burden for the firm because of the subsidy for elderly care services at the rate of τ_f. Then, the firm's profit π_t is given as $\pi_t = K_t^{\gamma}(A_t N_t)^{1-\gamma} - (1+\tau_f)w_t N_t - (1+r_t)K_t$. Maximizing the firm's profit in competitive market, the demand for the physical capital stock and labor input are shown as

$$w_t = \frac{1-\gamma}{1+\tau_f}\left(\frac{K_t}{N_t}\right)^{\gamma} A_t^{1-\gamma}, \tag{7}$$

$$1+r_t = \gamma K_t^{\gamma-1}(A_t N_t)^{1-\gamma}, \tag{8}$$

It is assumed that the physical capital stock is fully depreciated in one period.

2.3 Government

The government provides not only subsidies for elderly care services but also benefits to compensate for unemployment. The subsidy for elderly care services is financed by taxation of younger people and older

[6] This model includes the assumption that large size households that includes some people works and other people are in unemployment.

[7] This model economy considers one type of final good that is available for consumption goods and elderly care services. However, being different from this setting, Lundholm and Ohlsson (1998) and Hashimoto and Tabata (2010) set a two-sector model that the elderly care service sector exist and consider the labor mobility between two sectors.

[8] Romer (1986) sets the endogenous growth model with externality of physical capital. Grossman and Yanagawa (1993) specify the externality of physical capital such as $A_t = a\frac{K_t}{N_t}$.

people. Then, assuming $T_t = \tau_o w_t$ and a balanced budget, the budget constraint for a subsidy for elderly care services is

$$d_t e_t = (n l_t(\tau_l + \tau_f) + \tau_o) w_t, \tag{9}$$

where n denotes the gross rate of increase in population or the intergeneration population ratio of younger people population size L_t to older people population size L_{t-1}. Here, n is assumed to be constant over time. Next, the government also provides unemployment benefits. If the unemployment benefit is given by the balanced budget, then $l_t \sigma w_t = (1 - l_t) u_t$, i.e., we obtain the following:

$$u_t = \frac{l_t \sigma w_t}{1 - l_t}. \tag{10}$$

2.4 Labor Union

This model includes a labor union. The labor union cares not only about wage rate w_t, but also about employment rate $l_t \left(\equiv \frac{N_t}{L_t} \right)$. The labor union decides the wage rate w_t to maximize the following function as considered by Daveri and Tabellini (2000).[9]

$$\begin{aligned} v_t &= N_t w_t + (L_t - N_t) u_t \\ &= L_t (l_t w_t + (1 - l_t) u_t). \end{aligned} \tag{11}$$

Employment rate l_t is given as $N_t = \left(\frac{1-\gamma}{1+\tau_f} \right)^{\frac{1}{\gamma}} w_t^{-\frac{1}{\gamma}} K_t$. The wage rate to maximize (11) is derived as

$$w_t = \frac{u_t}{1 - \gamma}. \tag{12}$$

Both the wage rate w_t and unemployment rate $1 - l_t$ increase if the unemployment benefit increases.

3 Equilibrium

Defining household's saving as $s_t \equiv (1 - \tau_l - \sigma) l_t w_t + (1 - l_t) u_t - c_{1t}$, the capital market equilibrium condition $K_{t+1} = s_t$ derives the following dynamics equation of capital stock $k_t \equiv \frac{K_t}{N_t}$ as

$$\frac{k_{t+1}}{k_t} = \frac{(1 - \alpha) \left((1 - \tau_l - \sigma) l + (1 - l)(1 - \gamma) \right) (1 - \gamma) a^{1-\gamma}}{n(1 + \tau_f) l - \frac{\alpha \tau_o (1-\gamma) a^{1-\gamma}}{1+r}}. \tag{13}$$

[9] Some studies consider the labor union to bring about unemployment. Ono (2010) sets the model by which the labor union cares about the lifetime income of a household who is employed and in unemployment. Corneo and Marquardt (2000) consider the Nash negotiation solution within the wage rate and unemployment rate. The model presented in this paper assumes the household's income in the young period, as assumed by Daveri and Tabellini (2000). Then, because no pension benefit is considered, the effect of pension benefit caused by the policy does not exist.

The employment rate l is constant over time:

$$l = \frac{1-\gamma}{1-\gamma+\sigma}. \tag{14}$$

An increase in σ, which increases unemployment benefit u_t, lowers the employment rate. Considering $A_t = a\frac{K_t}{N_t}$, the wage rate and interest rate given by (7) and (8) are given as

$$w_t = \frac{(1-\gamma)a^{1-\gamma}}{1+\tau_f}k_t, \tag{15}$$

$$1 + r_t = \gamma a^{1-\gamma}. \tag{16}$$

4 How to collect tax revenue to subsidize elderly care

This paper presents an examination of how the subsidy for elderly care services should be financed. Concretely, this paper presents an examination of an increase in taxation for firms or older people and a decrease in unemployment with a decrease in taxation for labor income that is gained by young people without a change of the ratio of the amount of subsidy for elderly care services to wages $\frac{d_t e_t}{w_t}$. First, this subsection presents analysis of the policy effects on the income growth rate.

4.1 Effect on Income Growth

First, we consider the case of an increase in taxation for firm τ_f with a decrease in taxation for wage income τ_l. Then, we obtain $d\tau_l = -d\tau_f$ at the approximation of $\tau_f = 0$ because of the government budget constraint (9) and no change of $\frac{d_t e_t}{w_t}$. Income growth rate $1+g$ is given by $\frac{k_{t+1}}{k_t}$ at the balanced growth path. We obtain the sign of $\frac{dg}{d\tau_f}$ as shown below:

$$\frac{dg}{d\tau_f} = \frac{(1-\alpha)(1-\gamma)a^{1-\gamma}}{nl}\left(l - ((1-\tau_l-\sigma)l + (1-l)(1-\gamma))\right). \tag{17}$$

With $l > \frac{1-\gamma}{1-\gamma+\tau_l+\sigma}$, we obtain the positive sign of $\frac{dg}{d\tau_l}$. However, we obtain $l = \frac{1-\gamma}{1-\gamma+\sigma}$. Therefore, an increase in τ_f with a decrease in τ_l always raises the income growth rate $1+g$.

Second, we consider the case in an increase in taxation for older people τ_o with a decrease in taxation for younger people τ_l. Then, considering that the government budget constraint reduces to $d\tau_l = -\frac{1}{nl}d\tau_o$, the income growth rate can always be pulled up by this policy because of the following:

$$\frac{dg}{d\tau_o} = \frac{(1-\alpha)(1-\gamma)a^{1-\gamma}}{nl^2}\left(\frac{l}{n} + ((1-\tau_l-\sigma)l + (1-l)(1-\gamma))\frac{\alpha(1-\gamma)a^{1-\gamma}}{n^2(1+r)}\right) > 0. \tag{18}$$

Third, we consider the policy of a decrease in unemployment rate to increase labor demand. The unemployment benefit decreases the rise in the unemployment rate. An increase in labor demand reduces the unemployment rate and increases tax revenue. Then the government can decrease the tax rate τ_l under a constant tax revenue. Then, we obtain $d\tau_l = \frac{\tau_l(1-\gamma)}{l(1-\gamma+\sigma)^2}d\sigma$. Calculating $\frac{dg}{d\sigma}$ shows the following.

$$\frac{dg}{d\sigma} = \frac{(1-\alpha)(1-\gamma)a^{1-\gamma}}{nl^2}\left(\left(\frac{1-\gamma}{1-\gamma+\sigma}\right)^2 - \frac{l\tau_l(1-\gamma)}{(1-\gamma+\sigma)^2} - l^2\right) \tag{19}$$

We can find the employment rate $l = l^*$ to be $\frac{dg}{d\sigma} = 0$ because the bracket at the right-hand side decreases with an increase in l. Then, with $l^* < l$, we obtain $\frac{dg}{d\sigma} < 0$: if the employment rate l is large level that is more than l^*, then an increase in labor input with a decrease in unemployment benefit increases the income growth rate. The following proposition is established.

Proposition 1 An increase in taxation for firms and the older generation with a decrease in taxation for the young generation to subsidize elderly care services can always raise the income growth rate. However, a decrease in the unemployment rate to increase tax revenues decreases the income growth rate in the case of a high unemployment rate.

An increase in the tax burden for older people has a positive effect on savings because households maintain the consumption level for older people. A decrease in the tax burden for younger people raises savings because of an increase in household disposable income during the young period. An increase in the tax burden for the firms with a decrease in tax burden for younger people can raise the income growth rate in this model. The tax burden for firms has a negative effect on saving. The firm reduces the wage rate for the employees because the unit labor cost increases as a result of the tax burden for firms. However, a decrease in the tax burden for younger people increases savings. This positive effect on savings is greater than the negative one in this model. Ono (2010) sets a model that includes the public pension and unemployment and which derives that tax burden for both younger people and firms reduces the income growth rate. This paper presents analysis of an increase in tax burdens for firms with a decrease in tax burdens for younger people. This case has a positive effect on income growth.

This paper presents consideration of the policy of a decrease in unemployment rate with cutting of unemployment benefits. Then, a decrease in the unemployment rate decreases not only the unemployment

rate but also the wage rate determined by a labor union function. These decreases reduce the household income. However, a decrease in the unemployment rate signifies a transformation from unemployment to employment. This effect has a positive effect on saving. As described in this paper, if the unemployment rate is low, then this positive effect on savings is large. The income growth rate increases.

4.2 Welfare Analysis

This subsection presents an examination of how social welfare is affected by the policies. This paper assumes social welfare as

$$\begin{aligned} W_t &= \sum_{s=t}^{\infty} \rho^{s-t-1}(\rho\alpha \ln c_{1s} + \beta \ln c_{2s} + (1-\alpha-\beta)\ln e_s) \\ &= \frac{1}{1-\rho}\ln w_t + \frac{\alpha+\beta}{1-\rho}\ln X + \frac{1-\alpha-\beta}{1-\rho}\ln Y + \frac{\rho}{(1-\rho)^2}\ln(1+g) \\ &+ \frac{1}{\rho}(\beta \ln c_{2t} + (1-\alpha-\beta)\ln e_t) + const, \end{aligned} \tag{20}$$

where

$$\begin{aligned} X &= (1-\tau_l-\sigma)l + (1-\gamma)l - \frac{\tau_o(1+g)}{1+r}, \\ Y &= (1+r)(1-\alpha-\beta)\left((1-\tau_l-\sigma)l + (1-l)(1-\gamma) - \frac{\tau_o(1+g)}{1+r}\right) \\ &+ (nl(\tau_l+\tau_f)+\tau_o)(1+g), \\ const. &= \frac{\alpha}{1-\rho}\ln\alpha + \frac{\beta}{1-\rho}\ln\beta + \frac{\beta}{1-\rho}\ln(1+r) \end{aligned}$$

First, we examine an increase in τ_f with a decrease in τ_l without any change of the elderly care service level. The condition to have $\frac{dW_t}{d\tau_f} > 0$ is

$$\frac{dg}{d\tau_f} > \frac{\left(1 - \frac{(\alpha+\beta)l}{X} - \frac{(1-\alpha-\beta)^2(1+r)l}{Y}\right)}{(1-\alpha-\beta)\frac{nl\tau_l}{Y} + \frac{\rho}{1-\rho}\frac{1}{1+g}}. \tag{21}$$

That is, if the income growth rate increases sufficiently, then the social welfare increases because Y increases with $1+g$ and the amount of the right-hand-side decreases. Next, we examine an increase in τ_o with a decrease in τ_l. The condition to have $\frac{dW_t}{d\tau_o}$ is

$$\frac{dg}{d\tau_o} > \frac{\left(\frac{1+g}{1+r} - \frac{1}{n}\right)\left((\alpha+\beta) + (1-\alpha-\beta)\frac{1}{Y}(1+r)(1-\alpha-\beta)\right) + \frac{\beta^2(1-\rho)}{\rho}\frac{w_t}{c_{2t}} + \frac{(1-\alpha-\beta)^2(1-\rho)w_t}{\rho e_t}}{(1-\alpha-\beta)\frac{nl\tau_l}{Y} + \frac{\rho}{1-\rho}\frac{1}{1+g}}. \tag{22}$$

Although $n(1+g) < 1+r$, social welfare can not always be raised by this policy because $\frac{\beta^2}{\rho}\frac{w_t}{c_{2t}} + \frac{(1-\alpha-\beta)^2 w_t}{\rho e_t}$. Therefore, if $1+r$ is sufficiently larger than $n(1+g)$, then we might obtain $\frac{dW}{d\tau_o} > 0$ because of the negative

sign of the right-hand side of (22). Finally, we consider the policy of a decrease in the unemployment rate to increase labor demand. The condition to have $\frac{dW_t}{d\sigma} < 0$ is

$$\frac{dg}{d\sigma} < \frac{-\frac{1-\gamma}{(1-\gamma+\sigma)^2 l} - \frac{(1-\rho)(1-\alpha-\beta)(1-\gamma)}{\rho(1-\gamma+\sigma)^2}\frac{n\tau_l w_t}{e_t} + \left((\alpha+\beta)\frac{1}{X} + (1-\alpha-\beta)(1+r)\frac{1}{Y}\right)\left(\frac{(1-\gamma)(2-\gamma-\sigma)}{(1-\gamma+\sigma)^2} + l\right)}{(1-\alpha-\beta)\frac{nl\tau_l}{Y} + \frac{\rho}{1-\rho}\frac{1}{1+g}}. \tag{23}$$

Then, the following proposition is established.

Proposition 2 An increase in the tax burden for a firm with a decrease in the tax burden for younger people can raise the social welfare if the income growth rate is sufficiently large to hold (21). An increase in the tax burden for older people with a decrease in the tax burden for younger people can raise the level of social welfare if the interest rate is sufficient to be less than the income growth rate and the population growth rate holds as in (22). A decrease in unemployment to increase tax revenue raises the level of social welfare if (23) holds.

It is the intuitive result that even if the income growth rises, social welfare decreases. The tax burden for older people caused by cutting the tax burden for younger people raises the income growth rate. An increase in income growth pulls up the future generation's utility. However, the tax burden for older people decreases their utility. They can not receive benefits from income growth.

The tax burden for firms increases the income growth rate. This effect raises the future generation's utility. However, an increase in tax burden for firm reduces the wage rate, as shown by (15). A decrease in the wage rate reduces both the present generation and future generation's utility. If we make ρ close to one, then we can find that the right-hand side of (21) and (22) is nearly zero. Consequently, we obtain the condition shown by (21) easily: if the government cares to a considerable degree about the future generation's utility, then the social welfare can be pulled up by virtue of a change in financing a subsidy for elderly care services.

A decrease in the unemployment rate can not always raise the level of social welfare. Similarly with income growth, a decrease in unemployment brought by a decrease in the unemployment rate can not always raise the household disposable income. Then the effect on the social welfare is ambiguous.

This paper does not provide any method to ascertain the optimal subsidy for elderly care. However,

this paper describes a case in which the social welfare maximized optimal subsidy for elderly care financed only by taxation for labor income can rise by a change in financing subsidies for elderly care services.

5 Conclusions

This paper presents consideration of how the subsidy for the elderly care services is financed in terms of income growth and social welfare. The income growth rate is pulled up by a policy of an increase in the tax burden for older people and firms instead of a decrease in the burden for younger people. The policy to reduce unemployment can raise the income growth rate if the unemployment rate is low. These results show that the tax burden for firms and older people should increase instead of a decrease in tax burden for younger people in terms of income growth.

Moreover, this paper presents an examination of how these policies affect social welfare. Even if these policies can raise the income growth rate, social welfare can not always be pulled up because of intergenerational conflict. For example, an increase in the burden for older people can raise the income growth rate, which is better for the utility of young people and children. However, the utility of older people decreases because of an increase in the tax burden.

This paper presents consideration of a subsidy for elderly care services as the social security for older people and derives how the government should collect tax revenue to provide subsidies for elderly care services. Although this paper presents consideration of subsidies for elderly care services, the result obtained in this paper is applicable to other social security systems for older people such as pensions. For instance, pensions are financed not only by taxes for younger people but also by taxes for older people in Japan. The analyses explained in this paper show that we can consider methods for intergenerational transfer, but also for intragenerational transfer.

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Appendix

Social Welfare Function

Considering that $c_{1t+1} = (1+g)c_{1t}, c_{2t+2} = c_{2t+1}, e_{t+2} = e_{t+1}$, the following social welfare function is obtained.

$$\begin{aligned} W_t &= \frac{\alpha \ln \alpha + \beta \ln \beta + \beta \ln(1+r)}{1-\rho} + \frac{\ln w_t}{1-\rho} + \frac{(\alpha+\beta)\ln X + (1-\alpha-\beta)\ln Y}{1-\rho} + \frac{\rho \ln(1+g)}{(1-\rho)^2} \\ &= \frac{\beta \ln c_{2t} + (1-\alpha-\beta)\ln e_t}{\rho}. \end{aligned} \tag{24}$$

where

$$\begin{aligned} e_t &= (1+r)(1-\alpha-\beta)\left((1-\tau_{l,t-1}-\sigma_{t-1})l_{t-1}w_{t-1} + (1-l_{t-1})(1-\gamma)w_{t-1} - \frac{\tau_o w_t}{1+r}\right) \\ &\quad + (nl(\tau_l+\tau_f)+\tau_o)w_t, \end{aligned} \tag{25}$$

$$c_{2t} = \beta(1+r)\left(((1-\tau_{l,t-1}-\sigma_{t-1})l_{t-1} + (1-\gamma)l_{t-1})w_{t-1} - \frac{\tau_o w_t}{1+r}\right). \tag{26}$$

The policy to change the tax rate or the benefit for unemployment is in t and after t period. It is noteworthy that policy parameters such as τ_l, τ_f and σ do not change or are treated fix valuables in the $t-1$ period. Comparative statics casts the policy variables in $t-1$ period as fixed variables.

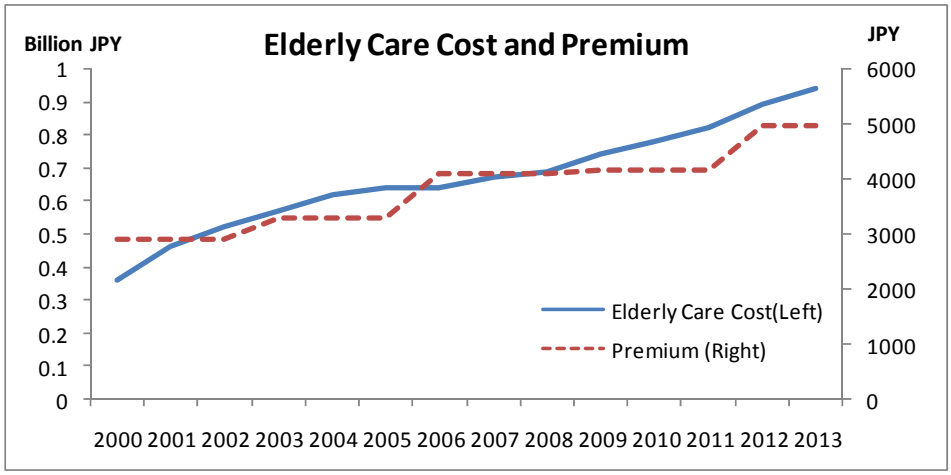

Figure 1 Elderly Care Cost and Premium.

(Data: Ministry of Health, Labour and Welfare)