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Long-term Care Burden, Endogenous Fertility Rate
-The Effects of Child Allowance and Immigration-

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ABSTRACT

Japan currently faces a situation of declining fertility rate on the one hand and increasing longevity on the other. An increasing number of elderly people are demanding an expanded social security program. In this paper, we analyze the effects of enforcing child allowance and admitting immigration in an economy where there is demand for a certain number of care workers per elderly person. These policies could certainly decrease the capital-labor ratio of the next generation. However, the burden of the next generation per capita decreases and the social welfare could increase.

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1. Introduction

The claims for an expansion in social security, pension, long-term care, and so on, have been increasing in Japan, which faces the chronic problems of an aging society due to longer life expectancy coupled with a lower fertility rate. To adjust the pension size, the government can change the replacement ratio or the pension benefits rate.

On the other hand, to increase the provision of long-term care, the government must increase the number of long-term care workers since long-term care firms cannot easily mechanize the long-term care service provision. To provide the sufficient number of long-term care workers, it would be necessary to transfer workers from firms producing consumption goods in the general sector to nursing care centers.

In Japan, today, nursing-care insurance premiums are kept low, and the wages for long-term care workers, too, are kept low as a result¹⁾. This is one of the reasons why the job turnover rate is higher in the field of welfare services.²⁾ Thus, to increase and keep the sufficient number of long-term care workers so that elderly people can receive sufficient amount of long-term care, the government should adjust and raise the wages of them to be equal with those of workers in firms and employ the sufficient number of long-term care workers by increasing the tax rate.

On the other hand, Japan faces a declining birthrate in addition to an aging population, which implies a direct decrease in the labor force. The working generation's per capita burden is higher owing not only to people aging but also to

¹⁾ According to Care Worker Support Center Foundation in its "Fact-finding Survey on Economic Conditions in Long-term Care (2006)," the average value of scheduled cash earnings for long-term care workers is ¥213,837. The Ministry of Health, Labor and Welfare's "Monthly Labor Survey (2006)" shows that the average value of scheduled cash earnings for workers in industries surveyed is ¥252,809. It shows that the wage rate of long-term care workers is lower by ¥36,972 per month.

²⁾ According to Care Worker Support Center Foundation's "Fact-Finding Survey on Long-term care Workers (2007), while the average job turnover rate of workers in all industries is 16.2%, that of workers in the field of welfare/long-term care services is 21.6%. On the question of "how would you rate distress, discomfort, discontent, etc. in working conditions and workload (multiple answers allowed)," the answer given by 49.4% of all the long-term care workers was that "The wage rates are relatively lower though the work load is very heavy."

falling fertility. To decrease the burden on the working generation, the government has devised a series of measures to counteract the falling fertility rate³⁾.

An expanded child allowance would lead to an increase in workers in the next generation, while improving the welfare of the current generation because the number of workers per saving becomes higher. What about the welfare of the next generation? Without a child allowance, the population of the next generation would be lower, the capital-labor ratio would be higher, and the welfare per capita would be high. These things imply that child allowance decreases the capital-labor ratio and may decrease the welfare of the next generation. This paper studies the effects of enforcing child allowance on the welfare of the next generation.

At the same time, the introduction of immigrants has been considered as a solution to the heavy per capita burden of long-term care of elderly persons. Since 2008, Japan began recruiting immigrant workers to meet the need for more long-term care workers. Accepting adult workers means increasing the labor force without the cost of bearing and educating children. However, this policy also may have negative effects that decrease the welfare of the generation accepting immigration because it decreases the capital-labor ratio. This paper studies which effect of accepting immigrants is predominant.

There is a considerable amount of existing literature relating to the care industry. Such papers (Sandmo, 1990; Kleven, Richter and Sorensen, 2000; Yoshida and Koichi, 2004) analyze the optimal tax rate necessary to provide for care services. In particular, Yoshida and Koichi incorporate a consumption-loan model (Samuelson, 1958).

It is shown that in an economy, the aging of society raises the social security rate in relation to GDP (Galasso and Profeta, 2004). It is further pointed out—on the basis of voting behavior—that in the complementary relationship between health care and

³⁾ Since April 1, 2007, the scope of coverage for the Child Allowance System has been expanded. The sum of ¥10,000 per month has been paid not only for third and additional children but also for a first and second child.

social security, health care is relatively larger than social security (Bethencourt and Galasso, 2008). While analyzing the problems of the care industry, Bethencourt and Galasso reveal little with respect to the labor market.

Luciano and Luca(2009) consider the labor market and shows a reallocation of labour in favor of the long-care service in endogenous fertility model causes an additional beneficial effect on per capita income with respect to the model with exogenous population. They assume that households can decide the amount of long-care service on the preference for them and study the effects of an increase in the preference for the number of long-care service on the economic growth.

They consider that an increase in the preference for the number of long-care service in turn decreases those employed in the commodity sector but do not consider that it increases the social burden for the next generation because the wages of long-care workers are not financed by tax. In a sense, they do not consider the financial burden of population aging. To study this burden, it should be assumed that population aging necessary causes an increase in the number of long-term care workers whose wages are financed by society: taxes.

To study social burden mainly, this paper assumes that the elderly people necessarily need a certain number of care-workers whose wages are financed by a tax. Under this assumption, it is analyzed whether or not child allowance and admitting immigration which are not considered in Luciano and Luca(2009) can improve the welfare of the next generation who has the increased population of the same generation.

This paper is organized as follows. In Section 2, we introduce a simple model for considering the effects of enforcing child allowance and accepting immigrants. In Section 3, we present some concluding remarks.

2. The model

This section develops an overlapping generational model. The life of a household is

divided into three periods: a youth period, working period, and retirement period. Having some uncontrollable amount of consumption in the first period of their life, households of generation t work, bear n_t children, consume a single all-purpose good c_t^y , and save s_t for retirement consumption c_{t+1}^o in the second period of their lives.

For simplicity, we assume every household faces a lottery: dying immediately, or living through the entire retirement period. The possibility of survival p is the same for all households. In the last period, households only consume their retirement savings. They inevitably need $h \in (0,1)$ workers as long-term care workers⁴⁾. Households in the working period pay an income tax to finance the wage of long-term care workers, which implies that a lower fertility rate increases the burden per capita for households in the working periods.

2.1 The population transition between generations

N_t denotes the population of “generation t ” who spends the young period in the period $t-1$, the working period in the period t , and the elderly period in the period $t+1$. Some households in generation t are employed as workers in competitive firms, and others are employed as long-term care workers. Vocational selections are decided not by households but on the basis of probability.

For simplification, surviving elderly households need a certain number of long-term care workers: $h \in (0,1)$. The term h is constant over periods. As a result, the necessary number of long-term care workers is

$$H_t = hpN_{t-1}. \quad (1)$$

The number of children per households of generation t is \hat{n}_t . The transition in the generation population becomes $N_{t+1} = \hat{n}_t N_t$. Henceforth, variables with $\hat{}$ denote

⁴⁾ Of course, not all elderly people need support from long-term care workers. Some can take care of themselves with only support from family members. On the other hand, others inevitably need support from long-term care workers. Whether or not they need support from long-term care workers depends on their level of health. This paper, however, does not consider the health level of each household and only assumes that an elderly representative household inevitably needs h long-term care workers.

the average values. According to the transition in the generation population and equation (1), the number of workers in firms: L_t becomes

$$L_t = (\bar{n}_{t-1} - hp)N_{t-1}. \quad (2)$$

$\bar{n}_{t-1} > hp$ is assumed. The assumption is that the number of children per households is more than the necessary number of long-term care workers. This assumption is easily approval. Equation (2) implies that the number of workers in firms decreases as the survival possibility and the necessary number of long-term care workers increase.

2.2 Firms

Firms produce consumption goods. In each period, the capital stock: K_t is the sum of households' savings in the preceding period: $K_t = \hat{s}_{t-1}N_{t-1}$, where \hat{s}_{t-1} is the average savings. The capital stock lasts for only one period and has zero scrap value in the subsequent period. The initial capital stock (K_0), which belongs to N_{-1} households, is given to those who are elderly in period zero. Each of them owns $\hat{s}_{-1} = K_0 / N_{-1}$.

In each period, the Cobb-Douglas technology is employed for production using two inputs: physical capital K_t and labor L_t . Moreover, $Y_t = K_t^\alpha L_t^\beta$ such that we have

$$(1 + r_t) = \alpha Y_t / K_t \quad (3)$$

$$w_t^L = \beta Y_t / L_t, \quad (4)$$

where $\alpha + \beta = 1$. In addition, r_t is the return rate from savings, and w_t^L is the wage rate of workers in firms. Perfect competition in the factor markets ensures that, in equilibrium, the returns from savings and wages per worker are equal to the respective marginal products.

2.3 Long-term care tax and child care tax

The government imposes an income tax to finance the wages of care workers and an income tax to finance the child allowance. We call the former tax a long-term

care tax and the latter one a child care tax. The income tax rate: τ_t^X is constant over incomes. X=H or C. The variables with superscript H are related to long-term care and ones with superscript C are related to child allowance. Collected long-term care taxes are divided equally among care workers. The budget constraint for this system is

$$w_t^H H_t = \tau_t^H (w_t^H H_t + w_t^L L_t), \quad (5)$$

where w_t^H is the wage rate of care workers. The government adjusts the long-term care tax rate to equalize the wages of long-term care workers with those of workers in firms. Thus, the superscripts on the wage that make a distinction between wages of care workers and those of workers in the firms are no longer necessary. The term w_t denotes the wage rate for long-term care workers and workers in firms.

Taking into consideration the adjustment in the long-term care tax to equalize wages along with equations (1) and (2) makes the elderly tax rate

$$\tau_t^H = hp(t-1)/\hat{n}_{t-1}. \quad (6)$$

Equation (6) implies that an increase in the number of children decreases the elderly tax rate.

Child allowances are subsidized proportional to the cost of bearing children: b_t . The child allowance rate is denoted by q_t . The government budget constraint becomes

$$q_t b_t \hat{n}_t N_t = \tau_t^C (w_t H_t + w_t L_t). \quad (7)$$

2.4 Households

Long-term care workers and workers in firms have the same utility function, which depends on the amounts of consumption in the working period and in the elderly period and on the number of children. For analytical convenience, we assume the utility function to be additively separable and logarithmic as follows:

$$U(c_t^{YX}, c_t^{OX}, n_t^X : t) = a_1 \ln(c_t^{YX}) + a_2 p \ln(c_t^{OX}) + a_3 \ln(n_t^X), \quad (8)$$

where $X=H$ or L , a_1 denotes preference for consumption in the working period, a_2 for consumption in the elderly period, and a_3 for the number of children. The term c_t^{YX} is the consumption in the working period, c_{t+1}^{OX} the consumption in the elderly period, n_t^X the number of children⁵⁾.

After paying long-term care tax and child care tax out of wages, households decide the amount of consumption, savings s_t^X in the working period and the number of children. The cost of having a child is the opportunity cost. The budget constraints of households in the working period become

$$c_t^{YX} = (1 - \tau_t^H - \tau_t^C)w_t - n_t^X b_t (1 - q_t) - s_t^X. \quad (9)$$

Assuming that insurance companies are risk neutral and that private annuity markets are competitive, insurance companies promise households a payment of $(1 + r_{t+1})s_t^X / p$ in exchange for having the estate s_t^X accruing to the companies⁶⁾. Since we assume the no-bequest motive, households are willing to invest their assets in such insurance policies. The budget constraints of households in the elderly period become

$$c_{t+1}^{OX} = (1 + r_{t+1})s_t^X / p. \quad (10)$$

Thus, the higher possibility of survival from the working period to the elderly period decreases the returns from the savings.

The households choose the consumptions in the working and elderly periods, the savings, and the number of children to maximize their expected lifetime utility. The optimal savings and number of children become

$$n_t^X = a_3 (1 - \tau_t^H - \tau_t^C)w_t / (b_t (1 - q_t)A_t), \quad (11)$$

$$s_t^X = a_2 p (1 - \tau_t^H - \tau_t^C)w_t / A_t, \quad (12)$$

where $A = a_1 + a_2 p + a_3$. By the wage equalization adjustment in the elderly tax rates, the households' decided amount of savings and number of children become the same. Henceforth, the superscripts, which denote occupation, are omitted.

⁵⁾ Hereinafter, the superscript Y(O) represents working (elderly) age. The superscript L(H) denotes the variables relating to firm (care) workers.

⁶⁾ This assumption is also adopted in Yakita (2001).

By substituting equation (7) into equations (11) and (12), the child care tax and the optimal savings and number of children become

$$\tau_t^C = (1 - \tau_t^H) \alpha_3 \theta_t / [A(1 - q_t) + a_3 q_t], \quad (13)$$

$$n_t = a_3 (1 - \tau_t^H) w_t / [b_t (A(1 - q_t) + a_3 q_t)], \quad (11')$$

$$s_t = a_2 p (1 - \tau_t^H) w_t / [A(1 - q_t) + a_3 q_t]. \quad (12')$$

After some calculation, for example, substituting equations (11'), (12') and (13) into equation (8), the indirect utility function becomes

$$U(q_t : t) = A \ln \left[(1 - \tau_t^H) (1 - q_t) w_t / (A(1 - q_t) + a_3 q_t) \right] \\ + a_2 p \ln [a_2 (1 + r_{t+1})] - a_3 \ln (b_t (1 - q_t)) + Z, \quad (14)$$

where $Z \equiv a_1 \ln(a_1) + a_2 p \ln(a_2 p) + a_3 \ln(a_3)$.

2.5. Child Allowance

We analyze the effect on generation t and t+1 by putting child allowance into effect for a limited period. Concrete steps are as follows. Effects of putting child allowance into effect for only a period are analyzed by partially differentiating equation (14) with q_t and evaluating it with $q_t = 0$. In effect, we have

$$U'(q_t : t) \Big|_{q_t=0} = \beta(1 + \Omega_t). \quad (15)$$

where $\Omega_{t+1} \equiv (a_1 + a_2 p) \bar{\tau}_{t+1}^H / (A(1 - \bar{\tau}_{t+1}^H))$. The welfare of generation t necessarily improves. The term $\bar{\tau}_t^H$ is the long-term care tax rate when the child allowance is not enforced.

On the other hand, for the welfare of generation t+1, we have

$$U'(q_t : t+1) \Big|_{q_t=0} = (-\alpha + \beta \Omega_{t+1}) \left[(a_1 + \alpha a_2 p + a_3) + \frac{a_2 p \beta}{(1 - \bar{\tau}_{t+2}^H)} \right] \quad (16)$$

Thus, we have

$$U'(q_t : t+1) \Big|_{q_t=0} \underset{<}{\overset{\geq}{>}} 0 \quad \text{if} \quad \bar{\tau}_{t+1}^H \underset{<}{\overset{\geq}{>}} \left(\frac{\alpha}{\beta} \right) \left(\frac{A}{\alpha A + \beta(a_1 + a_2 p)} \right) \quad (16')$$

According to equation (16'), sign condition of the indirect utility of generation t+1

depends on the value of the elderly tax rate when the child allowance is not enforced. The higher elderly tax rate implies that the number of children is much lower or that the number of necessary long-term care workers is much higher. It is the aging population combined with the diminishing number of children, itself. In that case, this paper shows that an increase in the number of children made by child allowance improves the welfare of generation $t+1$ because the burden per capita becomes lower.

Intuitively, the effects of child allowance for a single period only are as follows. While child allowance imposes a tax burden on generation t , it generates an increase in the labor force in the next generation and totally increases the welfare of generation t . On the other hand, generation $t+1$ who have increased people of the same generation get the disbenefit of a decrease in the capital-labor ratio, however, child allowance improves the welfare of generation $t+1$ because the burden of long-term care tax per capita decreases⁷⁾.

2.6. Immigration

We analyze the effects of admitting immigration in period $t+1$. The government admits immigrants proportional to the elderly population for only a period. The rate of immigration to generation t population is f_t and the number of immigrants becomes $f_t N_t$. Thus, the number of workers in period $t+1$ becomes

$$L_{t+1} = (\bar{n}_t - hp + f_t)N_t. \quad (2')$$

It changes the wage rate, the long-term care tax rate and the returns from savings.

Effects of admitting immigrants for only a period are analyzed by partially

⁷⁾ On the welfare of generation $t+i$ ($i>1$), we have $U'(q_t : t+i)_{|q_t=0} = \beta^{i-1}(\bar{\tau}_{t+i}^H)$

$[-\alpha + \beta\Omega_{t+1}] [(a_1 + \alpha a_2 p + a_3)(1 - \bar{\tau}_{t+i+1}^H) + \beta a_2 p] / \prod_{j=2}^{i+1} (1 - \bar{\tau}_{t+j}^H)$. The condition that the

welfares of generation $t+i$ improve is the same as generation $t+1$. This implies that if the elderly tax rate is sufficiently high, an increase in the number of children made by enforcing child allowance improves the whole welfare of all the subsequent generation. Effects of enforcing child allowance decrease as periods pass.

differentiating equation (13) after insertion of equation (2') with f_t and evaluating it with $f_t = 0$ and $Q_t = 0$. In effect, we have

$$dU(f_t : t)/df_t|_{f_t=0} = \frac{\beta a_2 p}{\bar{n}_t (1 - \bar{\tau}_{t+1}^H)} > 0, \quad (17)$$

$$\begin{aligned} & dU(f_t : t+1)/df_t|_{f_t=0} \\ &= \left((a_1 + \alpha a_2 p(t+1) + a_3)(1 - \bar{\tau}_{t+2}^H) + \beta a_2 p(t+1) \right) \left(\frac{(\bar{\tau}_{t+1}^H - \alpha)}{\bar{n}_t (1 - \bar{\tau}_{t+1}^H)(1 - \bar{\tau}_{t+2}^H)} \right)^8. \end{aligned} \quad (18)$$

Equation (17) shows that the welfare of generation t necessarily improves by admitting immigration which increases the return from savings. On the welfare of generation $t+1$, it depends on the value of parameters. Because admitting immigrants decreases not only the capital-labor ratio but the long-term care tax rate, it has the negative and positive effects on the welfare of generation $t+1$. If the initial elderly tax rate is sufficiently high, which means the high burden per capita, admitting immigrants decreases the burden per capita. The condition that it increases the welfare of generation is that $\bar{\tau}_{t+1}^H > \alpha$ which is calculated by equation (18).

Comparison between equation (16') and (18) shows that

$$\left(\frac{1}{\beta} \right) \left(\frac{A}{\alpha A + \beta(a_1 + a_2 p)} \right) > 1. \quad (19)$$

Thus, the condition that admitting immigration increases the welfare of generation $t+1$ is lower than that child allowance increases the welfare of generation $t+1$. This is because while child allowance imposes an additional tax on households to decrease the

⁸⁾ On the welfare of generation $t+i$ ($i > 1$), we have

$$U'(f_t : t+i)|_{f_t=0} = \beta^{i-1} \left((\bar{\tau}_{t+1}^H - \alpha) / \bar{n}_t \right) \left((a_1 + \alpha a_2 p + a_3)(1 - \bar{\tau}_{t+i+1}^H) + \beta a_2 p \right) \prod_{j=2}^{i+1} \bar{\tau}_{t+j}^H / \prod_{j=1}^{i+1} (1 - \bar{\tau}_{t+j}^H)$$

. The condition that the welfares of generation $t+i$ improve is the same as generation $t+1$. This implies that if the elderly tax rate is sufficiently high, an admitting immigration improves the whole welfare of all the subsequent generation. Effects of admitting immigration decrease as periods pass.

burden per capita of future generation, admitting immigrants decreases the burden per capita of future generation without extra burden.

We have calculated the conditions whereby enforcing the child allowance and admitting immigrants for one period improve the welfare of generations. Next, we would seek to determine if these perpetual policies can improve the welfare of each generation using numerical analysis.

2.7 Numerical analysis

2.7.1. Initial numerical values

We present the values of the main parameters and exogenous variables of the model in table 1. A period in this model is converted to a span of 25 years. The preference ratio between the consumption in the working period and the consumption in the elderly period is $1/3$ and the value implies that the time preference corresponds to approximately 0.04.

The transition in the number of those who require nursing care, the long-term care workers, and people aged 65 or over are put together in table 2. According to table 2, the actual ratio in 2006 of those who require nursing care to labor population is about 0.27. It implies that a long-term care worker works for 4 persons who require nursing care. The necessary number of long-term care workers per person aged 65 and over becomes about 0.04.

The capital share rate of the production function is based on the capital distribution rate acquired from the data in the Cabinet Office's "Annual Report on National Accounts for 2003." The Development Bank of Japan's (2004) "Movement of Capital and Labor from the Cost Side," Research, Vol. 60 estimates the recent capital-labor rate in Japan to be around 4. The "White Paper on low fertility (2005)" denoted that the cost of child rearing from zero years to 17 years totals ¥27 million and the lifetime income per household totals three hundred million. The cost of child-rearing consumes 10% of the

total income of a household.

According to the above values, exogenous variables are defined in table 1. The necessary number of long-term care workers per surviving elderly persons becomes 0.05 and the cost of child rearing consumes 10% of the total income of a household, the capital/labor ratio is a little more than 4 and the endogenous fertility rate is less than 1⁹⁾. The initial values of the endogenous variables calculated in this model are put together in table 3.

2.7.2. Enforcing child allowance

In this section, mainly two scenarios on child allowance are compared. Scenario 1: Child allowance is enforced in period 2 only. Scenario 2: Child allowance is enforced permanently after period 2. Scenario 1 shows that a period of enforcing child allowance does not, unfortunately, increase the welfare of the third generation with respect to the initial values. The elderly tax rate is not sufficiently higher than the threshold. In this simulated society, the burden of taking care of the elderly is not so high. A decrease of the elderly tax burden due to a period of enforcing child allowance does not sufficiently counteract a direct loss in the wage rate. Results are described in figure 1.

Perpetual enforcing of child allowance results in less loss of welfare for the third generation than would a period of enforcing child allowance. The effects of perpetual enforcing of child allowance through the fourth period increases the welfare of the third generation like the second generation when child allowance is enforced. On the other hand, the welfare of the second generation has the same transition regardless of whether child allowance is enforced for a single period or perpetually.

⁹⁾ The National Institute of Population and Social Security Research estimates Japan's 2007 total fertility rate (average number of children each woman has in her lifetime) is about 1.32. The fertility rate per household becomes 0.66. Thus, the endogenous fertility rate in this model is a little higher than the current value.

Thus, perpetual child allowance is better than a single-period enforced child allowance.

We describe effects of enforcing child allowance for a single period and perpetually on generations in figure 2. First, effects of enforcing child allowance are as follows. Enforcing child allowance increases the welfare of the second generation because of increased returns from savings but decreases the welfare of the afterward generations because of lower wage rates of third generation. The negative effects of enforcing child allowance become lower as periods pass. The wage rate in third period becomes lower, thus the number of children in the period becomes lower and the elderly tax rate for the forth generation to pay becomes higher.

Next, we analyze the effects of enforcing child allowance in cases that surviving elderly people (per people aged 65 and over) need the different necessary numbers of long-term care workers. The welfare of the third generation due to perpetual enforcing child allowance is described in figure 3.

The more the number of necessary long-term care workers is, the higher child allowance improves the welfare because the burden of taking care of parents per capita is very high. Perpetual enforcing of child allowance not only increases the number of worker of the same generation for the third generation but also decreases the burdens of taking care of parents per capita. However, too much child allowance decreases the welfare because the burden of paying the tax to finance child allowance becomes higher than an improvement in the welfare made by a decrease in the burden of taking care of the elderly.

2.7.3. Immigration

In this section, effects of permitting immigration are analyzed. When the initial elderly tax rate is higher than the capital distribution rate, then permitting immigration for a single period improves welfare. This condition is calculated in

section 2.6. Such a situation is described in figure 4. The condition under which admitting immigrants for a single period increases the welfare of the third generation is that the number of necessary long-term care workers is very high, that is, 0.25 per surviving elderly persons. However, too much immigration decreases the welfare. Figure 4 shows the optimal immigration rate is at about 8% of the elderly¹⁰.

3. Conclusions and remaining issues

It is often said that increasing a population by enforcing child allowance is undesirable because it decreases the capital-labor ratio¹¹. This paper considers effects of enforcing child allowance and admitting immigration where the long-term care tax rate is adjusted so that the wages of the long-term care workers can be equal to those of workers in firms to ensure a sufficient number of long-term care workers. This paper calculates the condition that enforcing child allowance and admitting immigration improve the welfare.

We have to revise the system so that elderly people can utilize the services of long-term care workers as they wish, and the wages rate of long-term care workers can be endogenously decided to finance the budget constraints on the long-term care market, like Luciano and Luca(2009). In such a situation, the effects of enforcing child allowance and admitting immigrants should be analyzed.

There are other remaining issues. This paper does not consider the pension system, which greatly influences a society marked by low birthrate and longevity, nor does it consider the aspects of education. Consideration of how meeting the

¹⁰ In this situation, with parameters under which immigration increases the welfare of the third generation, enforcing child allowance does not increase the welfare of the third generation. This implies that permitting immigration is more likely to improve the welfare of the generation than enforcing child allowance does.

¹¹ Papers such as Samuelson(1975), Michel and Pestieau(1993), Jaeger and Kuhle(2009) discuss the optimal population rate. They show there is an optimal inner fertility rate with some limited conditions.

needs of the long-term care market may contribute to the participation of women in the labor market is another issue for further analysis. Finally, this paper shows that enforcing child allowance and admitting immigrants can improve the welfare of the next generation and the generation after it when the burden of long care is sufficient high.

References

- Bethencourt, C., Galasso, V., 2008. Political complements in the welfare state: Health care and social security. *Journal of Public Economics* 92, 609-632.
- Galasso, V., Profeta, P., 2004. Lessons for an aging society: The political sustainability of social security systems. *Economic Policy* 63-115.
- Jaeger, K., Kuhle, W. The optimum growth rate for population reconsidered. *Journal of Population Economics* 22, 23-41.
- Kleven, H. J., Richter, W. F., and Sorensen, P. B., 2000. Optimal taxation with household production. *Oxford Economic Papers* 52, 584-594.
- Luciano, F. and G. Luca, 2009, A two-sector OLG economy: economic growth and demographic behaviour, *MPRA Paper* No. 18869.
- Michel, Ph., Pestieau, P., 1993. Population growth and optimality -When does serendipity hold?- *Journal of Population Economics* 6, 353-362.
- Samuelson, P. A., 1958. An exact consumption-loan model of interest with or without the social contrivance of money. *Journal of Political Economy* 66, 467-482.
- Samuelson, P. A., 1975. The Optimum Growth Rate for Population. *International Economic Review*, 16(3), 531-538.
- Sandmo, A., 1990. Tax distortions and household production. *Oxford Economic Papers* 42,78-90.
- Yakita, A.,2001. Uncertain lifetime, fertility and social security. *Journal of Population Economics* 14, 635-640.
- Yoshida M.,Koichi, Y., 2004. Optimal taxation of long-term care services. *The Japanese Economic Review* 55(1), 86-100.

Table 1

Exogenous Variables of the Model

Exogenous Variables	Value
Preference to the consumption in the working period	3.00
Preference to the consumption in the elderly period	1.00
Preference to the number of children	0.408
The cost of child-rearing	2.00
Capital share rate	0.268
Production function scale parameter	20
Survival rate	0.9
The necessary number of long-term care workers per surviving elderly persons	0.05
The initial population of generation 0	100

Table 2

The number of nursing-care workers and persons requiring long-term care

	nursing-care workers	persons requiring long-term care (thousand)	nursing-care workers per persons requiring long-term care	people aged 65 or over (thousand)	nursing-care workers per people aged 65 or over
2001	548,924	2,180	0.25	22,005	0.02
2002	661,588	2,582	0.26	22,869	0.03
2003	755,810	3,029	0.25	23,628	0.03
2004	884,983	3,484	0.25	24,311	0.04
2005	1,002,144	3,874	0.26	24,876	0.04
2006	1,124,691	4,108	0.27	25,672	0.04
2007	1,171,812	4,348	0.27	26,597	0.04

Source: Ministry of Health, Labor and Welfare, "Business report on nursing-care insurance", "Survey of Institutions and Establishments for Long-term Care", Ministry of Internal Affairs and Communications, "National Census."

Table 3

The endogenous variables in the steady state

Endogenous Variables	Value
The capital/labor ratio	4.620
Wage rate	22.064
1 + the return rate from savings	1.750
The fertility rate	0.998
The elderly tax rate	0.05

Note: The return rate from savings per year becomes about 2.3%

Figure 1
 Enforcing child allowance for a single period or permanently

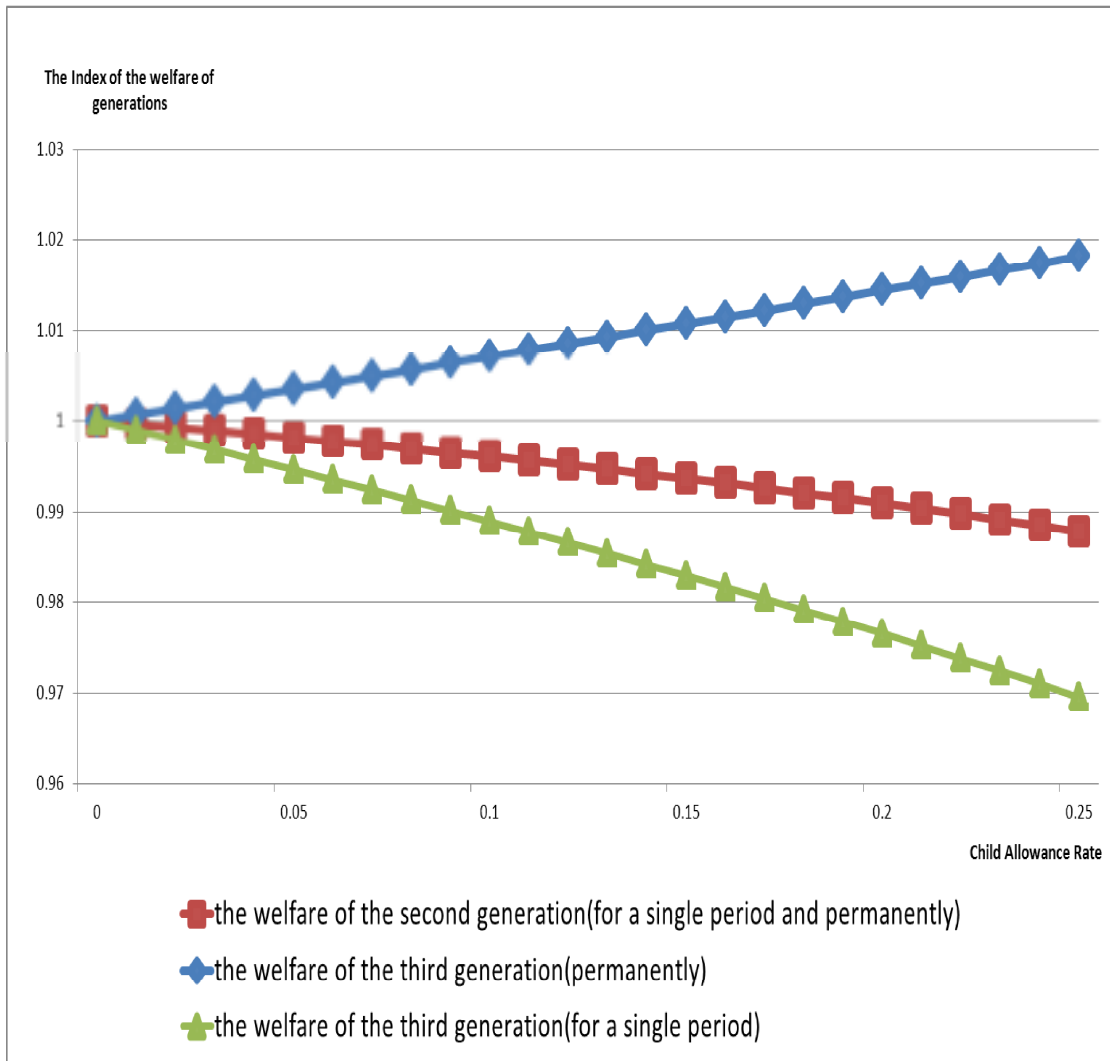
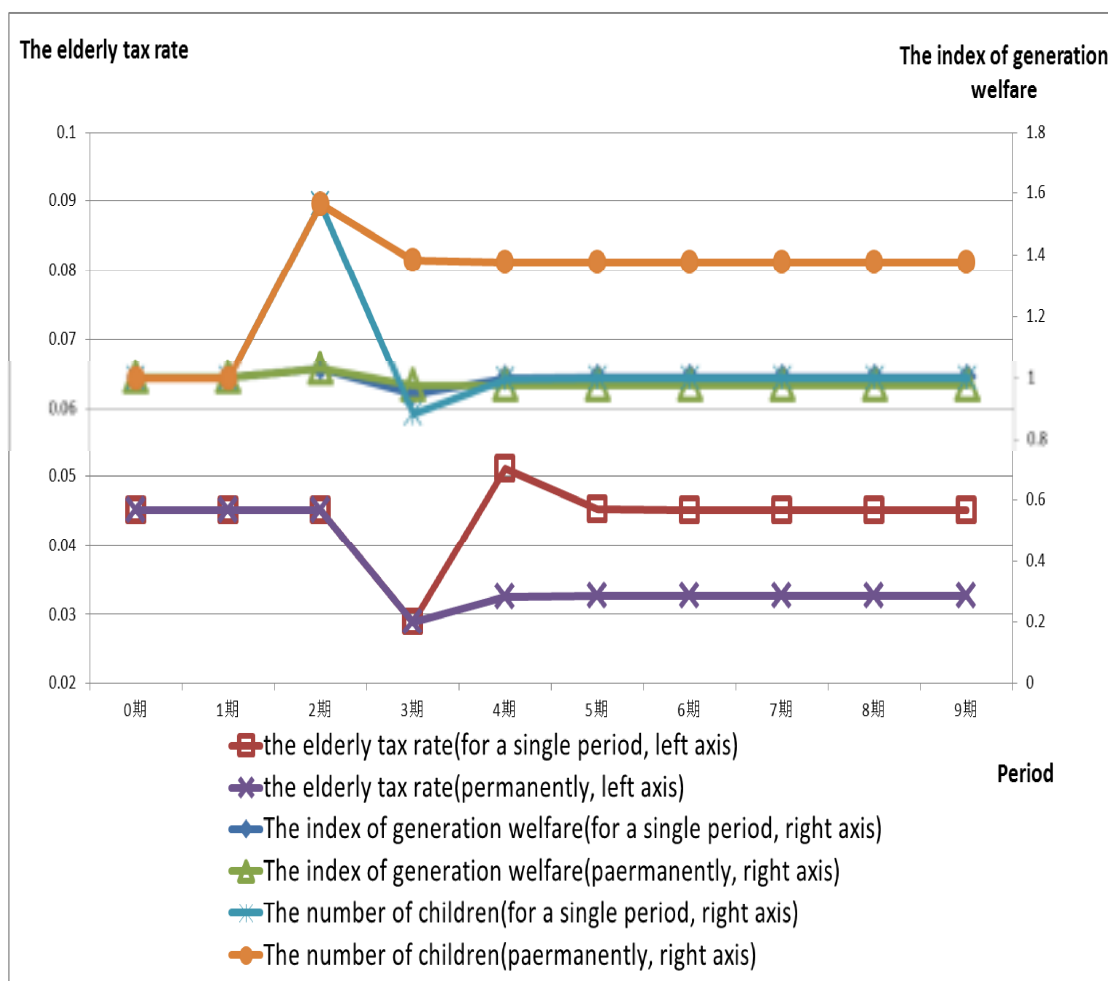


Figure 2

The elderly tax rate, the number of children, and the index of generation welfare



Note: Enforcing child allowance for a single period means that the government enforces child allowance by 30% in the second period. Permanently enforcing child allowance means that the government enforces child allowance by 20 % after second period permanently. The effects made by these policies, which are not visible in this figure, last in the fourth and fifth period.

Figure 3

The index of the welfare of the third generation depending on the number of necessary long-term care workers

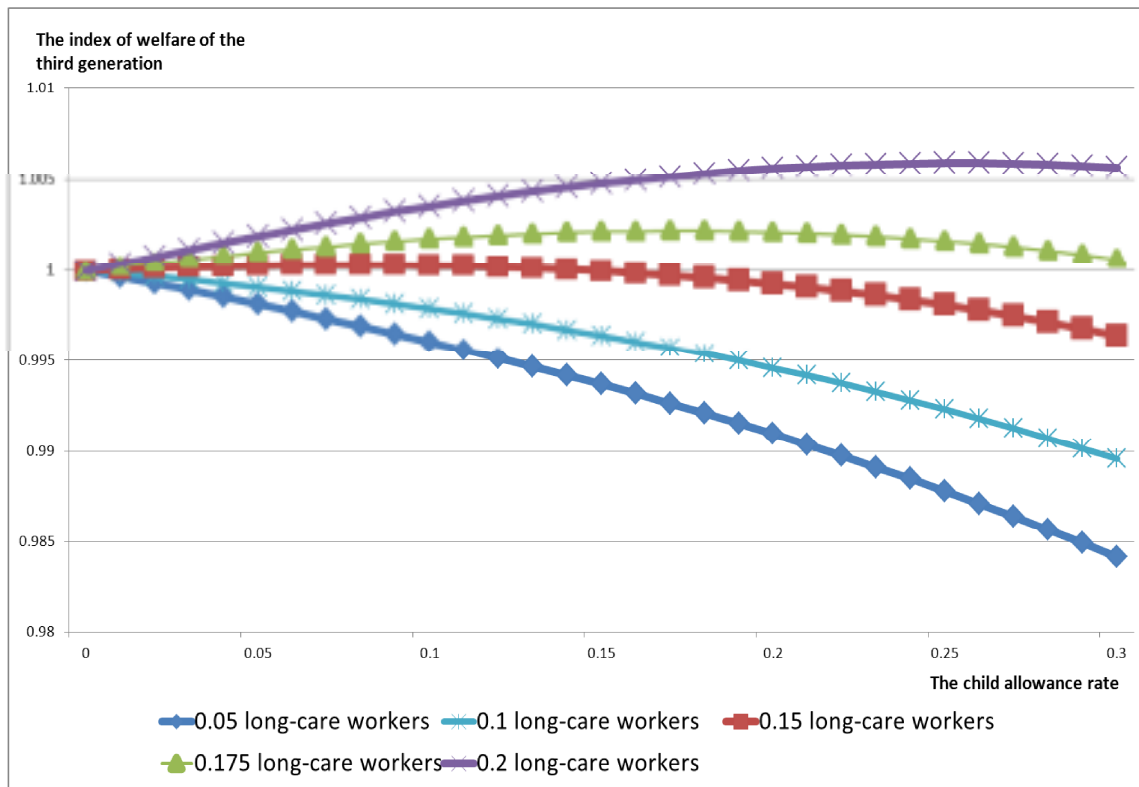
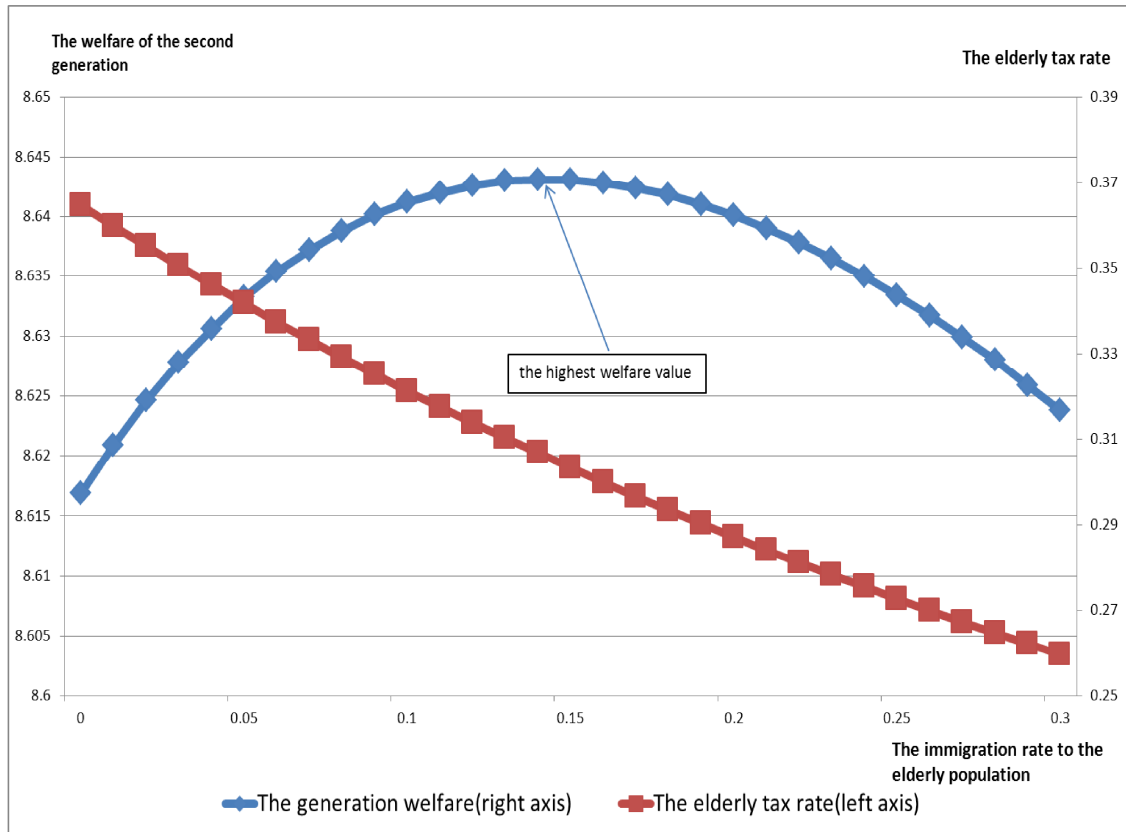


Figure 4

The effects of permitting immigration for a single period on the welfare of the generation



Note: The necessary number of long-care workers per surviving elderly person is 0.3.