THE REFORM OF THE PUBLIC HEALTH INSURANCE AND ECONOMIC GROWTH OF JAPAN

Toshihiro Ihori, Ryuta Ray Kato, Masumi Kawade, Shun-ichiro Bessho

ASIA PACIFIC ECONOMIC PAPERS
No. 392, 2011
THE REFORM OF THE PUBLIC HEALTH INSURANCE AND ECONOMIC GROWTH OF JAPAN

Toshihiro Ihori, Ryuta Ray Kato, Masumi Kawade, Shun-ichiro Bessho

AUSTRALIA–JAPAN RESEARCH CENTRE
CRAWFORD SCHOOL OF ECONOMICS & GOVERNMENT
ANU COLLEGE OF ASIA AND THE PACIFIC
This work is copyright. Apart from those uses which may be permitted under the
Copyright Act 1968 as amended, no part may be reproduced by any process without
written permission.

Asia Pacific Economic Papers are published under the direction of the Editorial
Committee of the Australia–Japan Research Centre (AJRC). Members of the Editorial
Committee are:

Professor Jenny Corbett
Executive Director
Australia–Japan Research Centre
The Australian National University, Canberra

Professor Christopher Findlay
Professor of Economics
University of Adelaide
Adelaide, South Australia

Dr Kazuki Onji
Crawford School of Economics and Government
The Australian National University, Canberra

Papers submitted for publication in this series are subject to double-blind external review
by two referees. The views expressed in APEPs are those of the individual authors and
do not represent the views of the Australia–Japan Research Centre, the Crawford
School, or the institutions to which authors are attached.
The Australia–Japan Research Centre is part of the Crawford School of Economics and
Government, The Australian National University, Canberra.

ISSN 0 728 8409
Australia–Japan Research Centre

Crawford School of Economics and Government
The Australian National University
Canberra ACT 0200

Telephone: (61 2) 6125 3780
Facsimile: (61 2) 6125 8448
E-mail: ajrc@anu.edu.au
URL: http://www.crawford.anu.edu.au
THE REFORM OF THE PUBLIC HEALTH INSURANCE AND ECONOMIC GROWTH OF JAPAN

Toshihiro Ihori¹, Ryuta Ray Kato², Masumi Kawade³, Shun-ichiro Bessho⁴

ABSTRACT

This paper evaluates one of the most drastic reforms of the Japanese public health insurance started in year 2006, by numerically examining the reform in an aging Japan in a dynamic context with overlapping generations within a computable general equilibrium framework. Our simulation results are as follows. First of all, an increase in the co-payment rate, which is one of the most prominent changes in the reform, would result in higher economic growth as well as higher welfare since it stimulates private savings. Secondly, the ex-post moral hazard behavior reduces economic growth. Thirdly, an increasing trend of the future public health insurance benefits can mainly be explained by an aging population, and an increase in the co-payment rate has little effect to reduce the public health insurance benefits in the future. Fourthly, the effect of a decrease in the medical cost, which could possibly be achieved by the improvement in efficiency in the public health insurance, the provision of more preventative medical services, or technological progress in the medical field, on the future burdens is very small. Finally, if the government implements a policy to keep the ratio of the public health insurance benefits to GDP constant, then the government has to keep reducing the public health insurance benefits over time, and the reduction rate should be 45 percent in year 2050. Such a policy also eventuates in lower economic growth until around year 2035. Our simulation results thus indicate that the reform is not so effective to reduce the future public health insurance benefits, but it can achieve higher economic growth and enhance welfare by stimulating private savings.

Keywords: public health insurance; Japan; national medical expenditure; economic growth; aging population; dynamic CGE model.

JEL Classification: C68, D58, E17, E62, H51, H55, H62, I18, O40

¹ The Grants-in-Aid for Scientific Research of Scientific Research C (No. 19530294) by Japan Society for the Promotion of Science (JSPS) are acknowledged. We are responsible for any remaining errors.
² University of Tokyo.
³ International University of Japan.
⁴ Nihon University.
⁵ Hitotsubashi University, bessho@econ.hit-u.ac.jp
1 Introduction

Japan has experienced one of the most drastic reforms of the public health insurance since the current system was launched. The reform started in year 2006, and several reform policies have gradually been implemented since 2006. The necessity of the reform is found in the fact that Japan is aging very rapidly and thus the current scheme of the public health insurance could not be sustainable without drastic reforms. The purpose of this paper is to investigate the effect of the reform on economic growth of Japan by simulating several scenarios in an aging Japan in a dynamic context with overlapping generations within a general equilibrium framework.

The background of the reform is that growth of the national medical expenditure has been higher than economic growth. It has often been argued that if the current public health insurance scheme is maintained, higher growth of the national medical expenditure than economic growth would result in further burdens on the future generations in an aging Japan through an increase in the premium of the public health insurance. Since the national medical expenditure of the age group of 65 and over accounts for more than a half of the total expenditure, more severe conditions for the public health insurance are expected to be unavoidable due to rapid population aging. Thus, the reform particularly aims at a decrease in the medical expenditure by the elderly, and it consists of several reforming policies related to an aging population. The reform focuses on the following: 1. an importance of preventative medical services, 2. the efficiency in the provision of health services, 3. a launch of a new public health insurance program for the elderly, 4. an increase in the co-payment rate of the elderly, 5. the integration of several public health insurers, and 6. the reform of the medical fee system. These reforming policies target to reduce the national medical expenditure on the transition to an aging Japan.

This paper explores the effect of the reform on economic growth. In fact, the

---

About 30% of the total national medical expenditure was spent by the age group of 75 and over in year 2006.
current ratio of the national medical expenditure to GDP has already been over 8%, and its effect on GDP is no longer negligible. Furthermore, an increasing trend of the national medical expenditure implies that the effect of the national medical expenditure on economic growth could relatively become larger in the future. Since one of the main purposes of the reform is to reduce the rate of growth of future national medical expenditure in an aging Japan, the detailed numerical examination of the effect of the reform on economic growth should be conducted in order to evaluate the reform.

Another background of the reform is found in the argument that future generations will suffer from higher premiums of the public health insurance if the current scheme is maintained. The intergenerational effect of the scheme has also been an important issue related to the reform. This paper investigates the effect of the reform from the intergenerational aspect by employing a multi-period overlapping generations model developed by Auerbach and Kotlikoff (1983) within a general equilibrium framework.

How this paper differs from past studies is that this paper numerically explores the effect of the reform by considering all possible channels in a dynamic context within a general equilibrium framework, and the reform can be evaluated based on welfare of not only the existing but also future generations. Since the paper employs a multi-period overlapping generations model, the effect of the reform can also be explored based on the intergenerational issue.

One of the most prominent changes in the reform is an increase in the co-payment rate. This paper simulates the effect of an increase in the co-payment rate. Since a

---

2The “national medical expenditures” is the estimate of medical cost in medical institutions. Because Japan has a universal public health insurance, and because the OTC drug market is much smaller than the public insurance, we focus only on public health insurance.

3There are many empirical studies on the Japanese health care system. However, almost all of them use a partial equilibrium framework, and the Japanese health care system has not been examined within a general equilibrium framework. See Ii and Bessho (2006) for the existing empirical literature.
general equilibrium model is employed in a dynamic context, all possible channels of the effect over time can be taken into account. It has empirically been observed that the effect of the change in the co-payment rate is very small¹, and the empirical studies find little evidence of ex-post moral hazard in the individual behavior by using the micro data. Note that the main focus in the empirical literature is to evaluate the effect of the change in the co-payment rate on the individual behavior within a partial equilibrium framework, and the effect on the whole economy as well as welfare of different generations has not been explored. Note also that the main purpose of the reform is to reduce the national medical expenditure in an aging Japan. This implies that the reform should be evaluated at the aggregate level in a dynamic context. This paper numerically examines the effect of the change in the co-payment rate over time on the aggregated economy as well as welfare of different generations within a general equilibrium framework.

The reform tries to improve efficiency in the provision of medical services and it also recommends medical institutions and physicians to provide more preventative medical services, in order to reduce the national medical expenditure. The improvement in efficiency by the reform would eventuate in more technological progress in the medical field as well. Technological progress in the medical field would also contribute to the further reduction of the national medical expenditure. However, as pointed out by Hiroi (1994), progress in technology in the medical field might induce an increase in the national medical expenditure. Thus, the effects of both directions of changes, an increase as well as a decrease, in the national medical expenditure are simulated in this paper. By changing the future national medical expenditure, this paper numerically evaluates these effects; the improvement in efficiency and the provision of more preventative medical services.

It has recently been argued that the growth rate of the national medical expenditure should be kept at least at the same rate as that of economic growth, in order to make the public health insurance scheme sustainable. The recent argument is also

¹See Ii and Bessho (2006), which mainly surveyed the empirical literature where the micro data were used.
evaluated numerically.

The paper uses the actual as well as the forecasted future population data in order to capture the realistic demographic structure of an aging Japan. A multi-period overlapping generations model is used within a general equilibrium framework, and the effect of the reform through all possible channels is evaluated in the long-run.

Our simulation results are summarized as follows. First of all, an increase in the co-payment rate, which is one of the most prominent changes in the reform, would result in higher economic growth as well as higher welfare. This is because the increase in the co-payment rate stimulates private savings to prepare for more medical expenditures when they get aged. The negative income effect of the increase in co-payment is offset by this saving effect. The effect of the stimulated private savings on the whole economy in the long-run can only be captured by the dynamic general equilibrium model. However, the magnitude of the effect on economic growth is not so large. The positive effect on economic growth is relatively larger when the reform policy is implemented, and the magnitude of the positive effect becomes smaller over time. The change in the economic growth rate in the long-run is between 0.0% and 0.01% points in year 2050 depending on the change in the co-payment rate, while it is between 0.01% and 0.09% points in the short-run. On the other hand, due to a relatively larger effect on economic growth in the short-run, the Japanese economy once jumps to a relatively better path and then moves along the path. This implies that the positive effect of an increase in the co-payment rate in the reform on lifetime income or welfare is larger among relatively younger generations. Our simulation model estimates that the actual increase in the co-payment rate in the reform have induced benefits which varies between 10,000 yen for the generation born in year 1920 and 3.52 million yen for the generation born in year 2000. The estimated amount of benefits generated by an increase in the co-payment rate in the actual reform becomes larger for future generations.

Secondly, if the effect of the ex-post moral hazard behavior exists at the aggregate level and it also results in a decrease in medical expenditures, then it weakens the
above mentioned positive effect of an increase in the co-payment rate on economic growth. The short-run effect of the ex-post moral hazard on economic growth is measured to be at most -0.04% points when the medical expenditures decrease by 10% due to the ex-post moral hazard behavior.

Thirdly, an increasing trend of the future public health insurance benefits can mainly be explained by an aging population, and an increase in the co-payment rate has little effect to reduce the public health insurance benefits in the future. This implies that the effect of the change in the co-payment rate is still small even though it is re-examined within a general equilibrium framework.

Fourthly, the effect of a decrease in the medical cost, which could possibly be achieved by the improvement in efficiency in the public health insurance, the provision of more preventative medical services, or technological progress in the medical field, on the future burdens is also very small. A change in the national burden ratio in year 2050 is only 1.2% points even when the per capita medical cost changes by 10%.

Finally, if the government implements a policy to keep the ratio of the public health insurance benefits to GDP constant, then the government has to keep reducing the benefits over time, and the reduction rate should be 45 percent in year 2050. Such a policy also eventuates in lower economic growth until around year 2035.

This paper is organized as follows: The next section introduces the Japanese health care system, and section 3 explains about the reform of the Japanese health care system commenced in year 2006. Section 4 simulates the effect of the changes in several key instruments on the future growth and burdens by incorporating population aging, and section 5 concludes this paper.
2 The Japanese Health Care System

The demand side of the Japanese health care system can be characterized by two aspects: It guarantees “free access” to medical services at any medical institutions, and its compulsory scheme covers all age and income groups\(^5\).

“Free access” implies that persons can obtain all consultations, medical treatments, and procedures at any medical institution without referrals. This does not mean that the persons can receive medical services for free, but they have the freedom to decide where/when they visit medical institutions.

The public health insurance is universal in a sense that it is compulsory, and also that all age and income groups are covered by the scheme. All persons are forced to contribute to an insurer consisting of the public health insurance\(^6\), depending on the difference in their employment type\(^7\). It consists of several insurers\(^8\), as shown in Figure 1. The Japanese public health insurance can be categorized based on the employment type, employment based health insurance, and the other type of insurance. Persons who are not insured by any of employment based public health insurance are insured by the other type of insurance, which is called Local Governments’ National Health Insurance (Shichoson Kokuho). In terms of the self-employed, some of them have their own public health insurance which consists

---

\(^5\)There is another public health insurance for the long-term care, which is called the long-term care insurance (Kaigo Hoken). Since any persons of age 40 and over also have to contribute to this public health insurance, the Japanese public health insurance can be interpreted as being compulsory and universal. Persons of age 65 and over are categorized as category 1 insured persons. Category 1 persons are entitled to obtain the long-term care through the public long-term care insurance. Persons between age 40 and 64 are categorized as category 2 insured persons. Category 2 persons are not eligible to obtain services through the public long-term care except for several cases, but they have to contribute to the system.

\(^6\)All dependents and the retired persons are also insured.

\(^7\)There is an issue that the number of the insured who have not paid the premium has been increasing while it is compulsory. This is another issue, and we do not discuss it in this paper.

\(^8\)See also Tokita (2002) for the detailed explanation about the Japanese health care system.
of persons with the similar job such as medical doctors and barbers, and such kinds of public health insurance are integrated into the body called the Unions of National Health Insurance (Kokumin Kenko Hoken Kumiai). Both Local Governments’ National Health Insurance (Shichoson Kokuho) and the Unions of National Health Insurance (Kokumin Kenko Hoken Kumiai) are together called National Health Insurance (Kokuho). The self-employed, who are not insured by any of the insurance of the Unions of National Health Insurance, are insured by Local Governments’ National Health Insurance. Employees health insurance consists of 4 different types; Seamen’s Insurance, Mutual Aid Associations, Insurance by National Federations of Health Insurance Societies, and Insurance by Japan Health Insurance Association. Table 1 shows several insurers consisting of the public health insurance.

Almost all medical services are covered by the public health insurance, and the cost of medical services, including medical drugs prescribed at medical institutions, is financed by the following three sources: premiums of the public health insurance, public funds (taxes), and co-payments. The co-payment rate depends on age but not on different insurers. All insured persons can obtain almost all medical services by paying a co-payment at any medical institution at the time when they receive services.

In terms of the public health insurance for the elderly, the government introduced a new system in year 2008, in order to cope with the biased distribution of financial burdens among different bodies consisting of the public health insurance. Figure 2 shows the new public health insurance for the elderly. In general, employees usually contribute to their own insurance by paying the premium during their working

---

9For instance, normal birth giving and cosmetic surgeries are not covered by the public health insurance. Many expensive medical services are also not covered by the public health insurance.

10The current co-payment rates are 20-30%. In terms of the contribution rate, it depends on different insurers, although the range of the contribution is regulated by law.
periods\textsuperscript{11}. Then, they move to National Health Insurance after their retirement. Since they usually need more medical services as they get aged, this implies that National Health Insurance has to have more 'costly' persons who did not contribute to it during their working periods. Hence, the government has divided the group of age 65 and over into two groups as shown in Figure 2. The first group consists of the elderly between age 65 and 74. The elderly in this group remain in their insurance even after their retirement, but the biased distribution of financial burdens is adjusted among different insurance according to the ratio of the number of the elderly to the total number of insured persons in each insurance. Regarding the elderly of age 75 and over, they completely move to a new public health insurance called Choju Iryo Seido. This newly introduced public health insurance for the elderly is financed by the premium of the elderly of age 75 and over (10%), the contributions (premiums) by insured persons of all other existing insurance (40%), and a public fund (50%). Note that the transferred contributions (premiums) from other insurance can be interpreted as intergenerational transfers.

The supply side of the Japanese health care system can be characterized by the fee-for-service scheme\textsuperscript{12} with the regulated prices (points) of the medical fee system. The Japanese medical fee system called 'Shinryo-hoshu Seido' employs a point method. Points are allocated to all treatments, procedures, and drugs covered by the public health insurance, and the points are fully controlled by the government. Points include income of physicians generated by the provision of medical services.

\textsuperscript{11}As explained in Section 4.2.3 later, a premium of the public health insurance is usually paid monthly as a short-term contribution to the social insurance scheme together with a contribution to the public pension. The contribution to the public pension is called a long-term contribution in the scheme. The social insurance scheme consists of several schemes, and the public health insurance and the public pension are main schemes of the social insurance scheme of Japan.

\textsuperscript{12}There have been several hospitals which moved to the prospective reimbursement scheme with the DPC (Diagnosis Procedure Combination), which is Japan’s specific DRG. However, many medical services are still reimbursed based on the fee-for-service scheme in Japan.
Since almost all medical services are covered by the public health insurance, this implies that almost all prices of medical services are regulated by the government, and prices, including labor income of physicians, are officially determined. The cost of all medical services covered by the public health insurance is reimbursed to physicians and hospitals based on the points\textsuperscript{13}. Although the cost is fully reimbursed by the regulated price system, drugs and some services such as medical inspections are traded in the private market, and thus market prices for these items also exist apart from the regulated prices. This implies that there are financial incentives among hospitals and physicians to use more profitable items if the whole sale prices are lower than the regulated prices. Figure 3 shows the actual procedure of payment. In practice, hospitals or physicians do not claim to the insurers of their patients directly. They firstly claim to the local fund based on the allocated points of medical services they provided their patients. Then the local fund examines their claims, and it reports the amount to each of the insurers of patients after investigation\textsuperscript{14}. Each of the insurers then pays the amount to the local fund, and the local fund reimburses the amount to hospitals and physicians. This implies that each of the insurers has no right to investigate medical services provided by hospitals and physicians. Tokita (2002) pointed out that their weak power over the investigation resulted in an increase in the national medical expenditure.

The difference in the employment structure of physicians also characterizes the supply side of the Japanese health care system. Physicians can be categorized by being self-employed or hospital-employed. Note that the Japanese medical fee system does not treat them differently, and any physicians can be self-employed or

\textsuperscript{13}One point is equivalent to 10 Japanese yen. Thus, for instance, if a physician provides a patient with a medical treatment which earns 1,000 points, then the physician can claim 10,000 Japanese yen minus the amount of a co-payment paid by the patient to the patient’s insurer.

\textsuperscript{14}The local fund sometimes returns their claims back to hospitals and physicians in order to make them re-calculate their claims after investigation. However, as it will be mentioned, due to the huge amount of claims given to the fund every month, it does not seem in practice that investigation efficiently works to detect all of inadequate claims.
hospital-employed as long as they are qualified as physicians. The most distinctive difference between the self-employed and the hospital-employed can be found in their income: Income of hospital-employed physicians is usually paid by salary thus fixed, while income of self-employed physicians depends on their choice of working hours, treatments, and procedures they provide their patients. While insured persons can visit any medical institutions, they tend to visit self-employed physicians to obtain primary care, and it seems that self-employed physicians have been playing a role as gatekeepers.
3 The Reform

One of the main purposes of the reform is to reduce the national medical expenditure. A successive increase in the national medical expenditure has politically been discussed, and it has been argued that the government should keep growth of the national medical expenditure at least the same as economic growth. As shown in Figure 4, both the per capita national medical expenditure and the ratio of the national medical expenditure to GDP have basically been increasing. The background of the reform is a rapid aging population of Japan. In fact, as shown in Figure 5, the latest estimates of a future population predict a rapid aging population of Japan in a very short period. Figure 6 also shows the age difference in the national medical expenditure of year 2006. In year 2006, the ratio of the expenditure by age 65 and over to the total national medical expenditure was 51.6% and the ratio by age 75 and over was 21.9%. Both figures predict a drastic increase in the future national medical expenditure due to a rapid aging population. However, as pointed out by Zweifel and Breyer (1997), it is distortionary to keep the ratio of the national medical expenditure to GDP constant. In our simulation scenarios, the distortionary policy to keep the ratio of the national medical expenditure to GDP constant is numerically examined.

The reform consists of several policies relating to: 1. an importance of preventative medical services, 2. the efficiency in the provision of health services, 3. a launch of a new public health insurance program for the elderly, 4. an increase in the co-payment rate of the elderly, 5. the integration of several public health insurers, and 6. the reform of the medical fee system. Each of them is explained as follows.

3.1 Importance of Preventative Medical Services

Medical providers have strongly been guided to provide more preventative medical services, since it has been recognized that the provision of more preventative medical services would reduce the national medical expenditure. Several concrete plans to guide medical institutions and physicians for providing more preventative
medical services were listed in the reform.

3.2 Efficiency in the Public Health Insurance

A positive correlation between the number of beds for acute care and the national medical expenditure as well as a positive correlation between the average length of stay for acute care and the national medical expenditure have both been observed in Japan. In the reform, the point system has been modified in order to shorten the average length of stay. In order to provide medical services more efficiently, the provision of medical services at the province level (Todohuken) rather than the nationwide level has been introduced, while a free access to any medical institutions has been maintained. This implies that the quality of medical services including the premium level could differ among different provinces. The plan to achieve the efficient provision follows the PDCA (Plan-Do-Check-Act) method, and the plan will be evaluated comprehensively in year 2012.

3.3 New Public Health Insurance for the Elderly

Based on the prediction of a rapid aging population, a new public health insurance for the elderly has been launched separately from the existing insurance. This newly introduced public health insurance for the elderly called 'Choju Iryo Seido' covers the elderly of age 75 and over. This insurance scheme is financed by the premium of the elderly of age 75 and over (10%), the contributions (premiums) by insured persons of all other existing insurance (40%), and a public fund (50%).

3.4 Increase in the Co-payment Rate

The reform has modified the co-payment rates. As shown in Table 2, the co-payment rates do not depend on the difference in insurers, but on age. In particular, the co-payment rates for the elderly have increased. In addition, the co-payment rate for the age group between 70 and 74 years old was planned in the
reform to increase from 10% to 20% in April 2009\textsuperscript{15}. Note that the elderly have to pay the premium regularly in addition to co-payments when they receive medical services.

\subsection*{3.5 Integration of Several Insurers}
Table 1 shows the current existing insurers of the public health insurance. In fact, there are several insurers whose financial bases are relatively weak. In particular, the integration of National Health Insurance, National Federation of Health Insurance Societies, and Japan Health Insurance Association has been considered.

\subsection*{3.6 Reform of the Medical Fee System}
The Japanese medical fee system employs a point system, which is called 'Shinryo Hosyu Seido’ or the medical fee schedule. Allocated points are modified every 2 years. Points to several medical services and medical drugs have been modified since year 2006, and the total points also decreased by 3.16\% in year 2006. The modification of points are expected to directly change the allocation of medical resources, and it is modified in order to fulfill the budget constraint of the public health insurance. Since all prices of medical services covered by the public health insurance are fully regulated by this medical fee system, the modification of points should be carefully considered.

The reform was conducted basically in order to cope with an increase in the national medical expenditure, which will further be caused by an aging population. Thus, a key element behind the reform is that a rapid aging population in the near future will result in further burdens on the current public health insurance scheme. This implies that the accurate prediction of the future population is important to evaluate the reform in the long-run. The next section explains our simulation model, which

\textsuperscript{15}Indeed, it has already increased to 20\%.
is used for several simulation scenarios by incorporating the realistic demographic structure.
4 Simulation Analysis

The effect of the reform on economic growth as well as welfare is simulated in the long-run, by explicitly taking into account an aging population in the future. Our simulations employ a multi-period overlapping generations model developed by Auerbach and Kotlikoff (1983) within a general equilibrium framework. Taxes, a public pension scheme, and a public health insurance scheme are incorporated into the model to investigate the effect of the reform of the existing Japanese system. The model consists of the household, the private firm, and the government. The government runs the general account and the social insurance account. The social insurance account consists of a pay-as-you-go public pension scheme and a public health insurance scheme. In order to capture the realistic demographic change in an aging Japan, the actual population data as well as the latest estimate of a future population are both used.

4.1 The Model

The representative household is assumed to optimize its intertemporal consumption through its lifetime, taking the wage rate, the interest rate, and its own survival rates as given. The tax system, the public pension scheme, and the public health insurance scheme are also assumed to be taken as given by the household. The household is assumed to obtain its wage income by supplying labor inelastically until it retires, and once it retires it never returns to the labor market. There are no altruistic bequest motives and Ricardian equivalence does not hold.

The firm is assumed to maximize its profit by taking the wage rate and the interest rate as given. The wage rate and the interest rate are determined in each fully competitive factor market in equilibrium.

The government sector is assumed to collect taxes from the household, and also to issue government bonds in order to fulfill its budget constraint. The government sector has its general account as well as the social insurance account. In order to capture the realistic aspect of its accounts, the government is assumed to have
transfers from the general account to the social insurance account. The social insurance account is assumed to consist of a pay-as-you-go public pension scheme and a public health insurance scheme. The government is also assumed to accumulate a public pension fund.

It is assumed that there is no private life insurance, and thus there is no mechanism for the household to hedge the risk of dying in each period. Since the household is assumed to have no bequest motives, this assumption implies that the household leaves an accidental bequest when it dies. However, it is also assumed that there is no uncertainty in the whole economy in terms of the size of each generation, and thus there is no uncertainty in the total (aggregate) amount of bequests inherited in each period.

4.1.1 The Household

The household appears in the economy at age 20 as a decision maker. Although the household faces uncertainty regarding its death in each period, it dies with certainty at the end of its age of 99 if it is alive until age 99. Denote the survival rate of generation \( i \) at time \( t \) by \( q_{i,t} \). There is assumed to be no uncertainty regarding the size of the total population in each period.

The household is assumed to maximize its expected lifetime utility with respect to its own consumption. The household’s expected lifetime utility of generation \( i \) is given by\(^{16}\)

\[
E[V_i] = \sum_{t=i}^{i+79} q_{i,t} (1 + \delta)^{(t-i)} \frac{(c_{i,t} - m_{i,t})^{1-\rho}}{1-\rho},
\]

where \( c_{i,t}, \delta, \) and \( \rho \) denote consumption at time \( t \), the discount rate of time, and

\(^{16}\)According to the result by Hayashi (1995), bequest motives are not considered here. Strategic bequest motives are also not considered. Since there is also no uncertainty regarding wage income, a precautionary saving motive for uncertain wage fluctuation is not considered, which was discussed in Horioka and Watanabe (1997).
the index of relative risk aversion, respectively. \( m_{i,t} \) represents a subsistence level of consumption at age \( t - i \), and it is the minimum level of consumption at which the household can be “healthy” in the sense that it can only enjoy its consumption in excess of \( m_{i,t} \). Note that the net amount of consumption over \( m_{i,t} \) only generates utility. \( m_{i,t} \) can be interpreted as the medical expenditure measured in a consumption good \( c \) to be healthy in each period, while consumption of medical services is not considered explicitly in this paper\(^17\). In order to simulate the effect of the change in the medical expenditure in the subsequent sections, it is simply assumed that \( m_{i,t} \) is exogenously given. As pointed out by several studies\(^18\), the per capita medical expenditure by age shows a U-shaped pattern, and \( m_{i,t} \) is given to be U-shaped in the simulations. As explained in the previous section, many medical services are covered by the public health insurance in the current system. Due to the U shape of the medical expenditure by age, an aging population results in an increase in the aggregate amount of benefits provided through the public health insurance, although it is assumed that the age pattern of \( m_{i,t} \) does not change in the future.

The budget constraint of the \( s \)-year-old household of generation \( i \) at time \( t \) is given by

\[
a_{i,t} = [1 - (1 - \tau_{r,t})r_t]a_{i,t-1} + (1 - \tau_{y,t} - \tau_{p,t})w_{t}e_{i,t} + b_{i,t} + p_{s_{i,t}} + (1 - c_{p_{i,t}})m_{i,t} - (1 + \tau_{c,t})c_{i,t},
\]

where \( a_{i,t}, \tau_t, \) and \( e_{i,t} \) denote its assets of generation \( i \) at the end of period \( t \), the interest rate, and a measure of effective labor, respectively\(^19\). The household supplies labor inelastically until it retires, and once it retires, it never comes back to the labor market. \( w_{t} \) is the wage rate per efficiency unit of labor, and \( w_{t}e_{i,t} \) is

\(^{17}\)See Johansson (2000) for the case where the household optimally chooses the amount of medical services.

\(^{18}\)See Reinhardt (2000) for instance.

\(^{19}\)The profile of effective labor follows Kato (2002).
pre-tax labor income. All taxes are proportional, and $\tau_{y,t}$, $\tau_{r,t}$ and $\tau_{o,t}$ denote the wage income tax rate, the interest income tax rate, and the consumption tax rate, respectively. The contribution rate, or the premium rate of the social insurance account is denoted by $\tau_{p,t}$. The social insurance account consists of a public pension scheme as well as a public health insurance scheme, and the total amount of collected contributions or premiums is divided into the two schemes. $ps_{t,z}$ denotes the amount of per capita public pension benefits. $cp_{t,z}$ denotes a co-payment rate, and thus $cp_{t,z}m_{t,z}$ is the total medical expenditure the household has to pay when it receives medical services at medical institutions. $(1 - cp_{t,z})m_{t,z}$ is the total medical expenditure covered by the public health insurance, and this can be interpreted as the amount of benefits given to the household through the public health insurance when it receives medical services. An ex-post moral hazard problem in the health insurance is not considered in this paper$^{20}$. Denoting the age when the household starts obtaining pension benefits by $R$ and the replacement rate by $\beta_p$, the amount of pension benefits the household receives is given by

$$ps_{t,z} = \begin{cases} \beta_p \left( \frac{1}{R} \sum_{s=0}^{R-1} w_{t,s} e_{s,z} \right) & \text{if } t - i \geq R, \\ 0 & \text{if } t - i < R \end{cases}$$

It is assumed that the household contributes to the social insurance scheme from age 20 to age 64. It is also assumed that there is no private pension market$^{21}$.

Assets held by the household which dies are left as accidental bequests. These accidental bequests are assumed to be redistributed equally to all households alive in each period, which is denoted by $b_{t,z}$ in equation (2).

The first order necessary conditions of the household yield the Euler equation such

$^{20}$While our model itself does not incorporate the ex-post moral hazard behavior into the framework, the effect of the ex-post moral hazard behavior is investigated in the simulation section by changing $m_{t,z}$ exogenously.

$^{21}$See Iwamoto et al. (1993), Friedman and Warshawsky (1988), and Friedman and Warshawsky (1990) for models which include the private pension market.
that
\[
(c_{i,t} - m_{i,t})^{-\rho} = \frac{q_{i,t+1} \frac{1 + (1 - \tau_{c,t+1})\tau_{t+1}}{1 + \delta}}{q_{i,t} \frac{1 + \tau_{c,t}}{1 + \tau_{c,t+1}} (c_{i,t+1} - m_{i,t+1})^{-\rho}}, \tag{3}
\]
from which the optimal consumption path can be derived once the initial value of consumption is given. In the simulation section, the initial value of consumption is given to satisfy the lifetime budget constraint of the household, so that the optimal consumption path also satisfies the budget constraint.

### 4.1.2 The Firm

The firm is assumed to maximize its profits, taking the wage rate and the interest rate as given. The wage rate and the interest rate are determined in perfectly competitive factor markets in equilibrium. The aggregate private production function is assumed to be Cobb-Douglas such that
\[
Y_t = Z_t L_t^a K_t^{1-a}, \tag{4}
\]
where \(Y_t\) represents aggregate output at time \(t\), \(K_t\) the aggregate private capital stock, \(L_t\) aggregate labor supply measured in the effective labor unit. \(Z_t\) denotes technology of production of the private sector. Assuming that each factor market is perfectly competitive with the above aggregate production function, output is fully distributed to labor and capital.

The first order necessary conditions of the firm yield
\[
w_t = aZ_t L_t^{a-1} K_t^{1-a} \tag{5}
\]
\[
r_t = (1-a)Z_t L_t^a K_t^{-a} - \delta_k, \tag{6}
\]
where \(\delta_k\) denotes the depreciation rate for the capital stock.

### 4.1.3 The Government Sector

The government sector consists of a general account and a social insurance account. Expenditure in the general account includes the general government expenditure
and transfers to the social insurance account. Expenditure of the general account is financed by taxes and government bonds. The general government expenditure includes government consumption, government investments, interest payments incurred by government debts, and transfers to the household. Note that these transfers to the household are different from the transfers to the social insurance account.

The social insurance account consists of a public pension account and a public health insurance account. The amount of transfers to the social insurance account from the general account is characterized by $\eta$, which is the ratio of the amount of transfers to the total amount of social insurance benefits. The government sector is assumed to have no particular objective function which it maximizes. The budget constraint of the general account is

$$G_t + \eta S_t = R_t + B_t - (1 + \tau_t)B_{t-1}$$  \hspace{1cm} (7)

$$R_t = \tau_{t, c}C_t + \tau_{t, y}w_tL_t + \tau_{t, r}r_tK_t + \tau_{t, h, t}Q_t$$ \hspace{1cm} (8)

where $B_t$, $R_t$, and $G_t$ denote the amount of outstanding government bonds, the total tax revenue, and the total general government expenditure, respectively. The total amount of bequests is represented by $Q_t$. Transfers to the social insurance account are denoted by $\eta S_t$, where $S_t$ is the total social insurance benefits. $\tau_{t, h, t}$ denotes the inheritance tax rate. In the following simulations only the consumption tax rate is endogenously determined to satisfy the budget constraint over time, and all other tax rates are exogenously fixed at the values of year 2007.

The budget constraint of the social insurance account and the contribution, or the premium rate, are defined as

$$F_t = (1 + \tau_t)F_{t-1} + \tau_{t, y}w_tL_t - (1 - \eta)S_t$$ \hspace{1cm} (9)

where $F_t$ is an accumulated public pension fund at the end of period $t$. The total amount of benefits includes public pension benefits and public health insurance benefits. The contribution (premium) rate is determined endogenously in order to satisfy (9), while the realistic value of $F_t$ is given exogenously in our simulation.
4.1.4 Equilibrium

The equilibrium condition of the capital market in period $t$ is given by:

$$\sum_i N_{i,t} a_{i,t-1} + F_{t-1} = K_t + B_t,$$

where $N_{i,t}$ is the number of households of generation $i$ in period $t$. The equilibrium condition of the goods market is given by:

$$Y_t = C_t + (K_{t+1} - (1 - \delta_k)K_t) + G_t.$$

Note that the general equilibrium of fully competitive markets is described by these two equilibrium conditions in addition to the first order conditions described by (3), (5), and (6), where the contribution (premium) rate $\tau_{pt}$ and the consumption tax rate $\tau_{ct}$ are also determined endogenously in order to satisfy the budget constraints of the government given by (7), (8), and (9).

4.2 Data and Assumptions

In order to make our simulations as realistic as possible, available actual and projected data have been used together with estimated values of relevant parameters based on the empirical research. The key elements are; demography, government deficits, public pension scheme, public health insurance scheme, and the tax structure. The following assumptions have been made in order to obtain our realistic benchmark model.

4.2.1 Demography

The actual population data have been used from 1965 to 2000. Before 1965 the population data were calculated under the assumption that the fertility rate and the
mortality rate were the same as in 1965. Regarding population projections, the “medium variant” projections from the latest edition of Projection of Future Population in Japan (Shourai-Jinko-Suikei, 2006) have been used. Life Tables in Kanzen and Seimeihyo and Shourai-Jinko-Suikei (2006) were used to obtain survival rates. Since Projection of Future Population in Japan only gives estimates of the future population until 2105, it has been assumed that the number of births and deaths, and the survival rates after 2105 are fixed at the same levels as those in 2105.

4.2.2 Government Deficits

Until 2007 the actual data from SNA have been used. From 2008, the future sequence of government deficits has been given based on the following assumptions. Since the average growth rate of the ratio of government debts to GDP (the debt-to-GDP ratio) between 1998 and 2007 was calculated to be 5%, the growth rate of the debt-to-GDP ratio in year 2008 has been assumed to be 5%. Furthermore, the growth rate of the debt-to-GDP ratio from 2009 has been assumed to decrease by 0.5% every year. This implies that the annual growth rate of the debt-to-GDP ratio from 2009 has been given to be 4.5%, 4.0%, 3.5% so on. Then, it has been assumed that the growth rate of the debt-to-GDP ratio continues to decrease until year 2019, and also that the growth rate of the ratio becomes zero after year 2019. This implies that the debt-to-GDP ratio keeps constant after year 2019, and the constant debt-to-GDP ratio is 150% as shown in Table 3.

4.2.3 Social Insurance Scheme

The social insurance scheme consists of two schemes: the public pension scheme and the public health insurance scheme.

The actual data until 2007 have been used for both schemes. The amount of transfers to the social insurance account from the general account, characterized by \( \eta \), and the replacement rate, \( \beta_p \), were both calculated from SNA. In terms of the contribution (premium) rate, the actual data have also been used until 2007. In
Japan’s actual system, the public pension contribution (the long-term contribution) and the public health insurance premium (the short-term contribution) are typically collected together as the social insurance contribution. The contribution rate was calibrated in order to satisfy (9), where the amount of the pension fund is exogenously given.

Public Pension Scheme

The public pension scheme has been assumed to have the same replacement rate $\beta_p$ of year 2007 in the future. In terms of the years before 2007, the actual data have been used in simulations. Regarding the amount of the public pension fund, the actual data have been used until 2007. From 2008, the ratio of the fund to GDP has been assumed to be constant at the same level as that of 2007.

Public Health Insurance Scheme

The actual data have been used until 2007. Based on National Medical Expenditure issued by Japan’s Ministry of Health, Labor and Welfare, the SNA data have been modified to obtain per capita public health insurance benefits which the household receives every year. Until 2007, the actual per capita benefits have been calculated, and a U-shaped pattern on age similar to Figure 6 has been obtained for simulations. From 2008, the U-shaped pattern of year 2007 has been assumed to continue. This implies that $m_{i,t}$ changes with $s$ but not with generation $t$ from 2008 onward. The growth rate of per capita national medical expenditure has been assumed to be the same as that of technological progress in production given by (4). In terms of the co-payment rate, $c_{p_{i,t}}$, it has been assumed in the benchmark case that $c_{p_{i,t}}$ is 20% for age 20-69, 10% for age 70-74, and 5% for age over 75, respectively. Note that the actual co-payment rate in recent years at the aggregate level was calculated to be around 14% on average. The co-payment rates for different age groups in the benchmark case have been calculated by taking into account the cohort and age differences in the distribution of the actual population, so that the calculated co-payment rates result in the average co-payment rate at the aggregate level in the
benchmark case being the same as the actual average rate (14%). The total medical expenditure of different age groups calculated in the benchmark case thus becomes very close to the actual amount, while the co-payment rates given in the benchmark case are different from the actual rates in Table 2. The effect of changes in the co-payment rate for different age groups will be simulated.

Except for a consumption tax, all taxes (a labor income tax, an interest income tax, and an inheritance tax) have been assumed to be fixed at the 2007 rates. The 2007 tax rates were obtained from the SNA data. Note that the consumption tax is the only indirect tax in this paper, and its rate was calculated from the actual total amount of indirect tax revenue in the national account, in order for the consumption tax rate in the benchmark case to result in the close amount of the total indirect tax revenue to the actual one. Thus the consumption tax rate calculated here does not coincide with the actual rate.

4.2.4 Technological Progress

Technological progress of private production plays a very important role. Thus careful attention should be paid to the assumption on technological progress, since the value of technological progress directly affects simulation results. In this paper technological progress is measured by the Solow residual. Following Hayashi and Prescott (2002), the capital share is set at 0.361585. In the benchmark case the value of technological progress from 2008 is assumed to be 1%.

When values of parameters could be obtained from the existing empirical research, the values have been used in the simulations. The values used in this paper are summarized as follows:

<table>
<thead>
<tr>
<th>The Values of Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\delta$</td>
</tr>
<tr>
<td>0.02</td>
</tr>
</tbody>
</table>
4.3 Benchmark Simulation

With these assumptions mentioned above, the benchmark result is shown in Table 3, where the actual values in year 2005 are also presented. Figure 7-1, 7-2, and 7-3 show the trends of per capita GDP, the ratio of public pension benefits to GDP, and the ratio of public health insurance benefits to GDP, respectively. In all figures, both of the actual and the benchmark figures are shown in a certain period. Note that the benchmark values of both the ratio of public pension benefits to GDP and the ratio of public health insurance benefits to GDP are very close to the actual values of year 2007. The increasing trend in the ratio of public pension benefits to GDP, as well as in the ratio of public health insurance benefits to GDP can be explained by an aging population, as pointed out by several papers (See Dekle (2002) and Broda and Weistein (2004)). The benchmark case forecasts that the social security burden ratio will become more than double in 2050 in comparison with the ratio in 2005. Our benchmark case also shows that the ratio of public health insurance benefits to GDP would increase by from 1.3% to 1.5% points every ten years, while Tokita et al. (1997) argue that the national medical expenditure would increase by 40% in 30 years. It is more expensive to be healthy as the individual gets aged, and population aging results in an increase in the total amount of public health insurance benefits at the aggregate level.

Furthermore, our benchmark case shows an interesting result. As shown in the last column of Table 3, the average co-payment rate at the aggregate level is expected to decrease by an aging population. This is because an aging population results in a relative increase in the number of the elderly, whose co-payment rate is lower than other age groups. Thus, while an aging population induces an increase in the total amount of public health insurance benefits, it reduces the average co-payment rate at the aggregate level.

4.4 Reform Simulations

The effect of the reform is simulated in this section. As presented in the benchmark
simulation, an aging population will increase the total amount of public health insurance benefits. The increase in the total amount of benefits obviously makes the financial situation of the scheme more severe, and in fact the government has increased the co-payment rate in the process of the reform in order to cope with an increase in the amount of benefits. One of the most prominent changes in the reform is an increase in the co-payment rate, and in the first simulation the effect of increasing the co-payment rate is investigated.

In the second simulation, the effect of changes in the medical cost is examined. The reform tries to improve efficiency in the provision of medical services and it also recommends medical institutions to provide more preventative medical services, in order to reduce the national medical expenditure. The improvement in efficiency by the reform would eventuate in more technological progress in the medical field as well. Technological progress in the medical field would also contribute to the further reduction of the medical cost. However, as pointed out by Hiroi (1994), progress in technology in the medical field might induce an increase in the medical cost. Then, in the second simulation, the effects of both an increase and a decrease in the medical cost are explored as the effects of the reform.

In the last simulation, a recent argument is examined. One of the main purposes of the reform is to make the public health insurance scheme sustainable in an aging Japan, and it has recently been argued that the government should keep growth of the national medical expenditure at least the same as economic growth. The last simulation numerically studies the recent argument within the general equilibrium framework.

4.4.1 An increase in the co-payment rate

In the first simulation, the effect of increasing the co-payment rate has been investigated, and the results are shown in Table 4 and 5. Indeed, the government

\[\text{increase in the co-payment rate}\]

An increase in the co-payment rate is also expected to reduce the number of visits due to the ex-post moral hazard behavior. While Li and Bessho (2006) empirically argue that the
has increased the co-payment rate for the elderly in the reform in order to reduce the national medical expenditure. Note that the co-payment rates, $c_{p_{age}}$, in the benchmark case have been given to be 20% for the age group of 20-69, 10% for 70-74, and 5% for 75 and over, respectively. In this first simulation, the change in the co-payment rate has been assumed to occur in year 2008, and the following four cases have been explored.

In Case (1), the effect of the change in the co-payment rate only for age 70-74 is simulated. As shown in Table 2, the co-payment rate for age 70-74 has really increased from 10% to 20% in the actual reform since 2009. Case (1) simulates the actual reform within our model, and the effect of the increase is evaluated based on economic growth as well as welfare. In Case (1), only the co-payment rate for age 70-74 increases from 10% to 20%, but the co-payment rates of other age groups remain at the same rates as the benchmark case.

In Case (2), except for the age group of 20-69, the co-payment rates of all other age groups increase from their benchmark levels to 20%. Since the co-payment rate for the age group of 20-69 remains at 20% in Case (2), this implies that the different co-payment rates on age vanish and all different age groups face the same co-payment rate of 20%. Then the co-payment rates of the age groups of 70-74 and 75 and over increase from 10% to 20%, and 5% to 20%, respectively, and the common and unique co-payment rate of 20% is applied to all age groups in Case (2).

Note that an increase in the co-payment rates would affect the individuals’ behavior to a certain extent. In particular an increase in the co-payment rate might reduce the number of their visits to medical institutions, and thus the medical expenditure, $m_{t,s}$, would decrease in both Case (1) and Case (2). Then, as Case (3) and Case (4), ex-post moral hazard behavior is insignificant in Japan, the effect of the ex-post moral hazard behavior is also explored in Case (3) and (4) separately.

$^{23}$An analysis of the behavioral response to the change in the co-payment rate has been added to an earlier version based on the comment by a reviewer. We all thank the reviewer for her/his valuable comment.
the effect of the behavioral response to the change in the co-payment rate is also taken into account. In both cases (Case (3) and Case (4)), the effect of a 10% decrease in \( m_{1,2} \) is simulated, but Case (3) and Case (4) are examined to supplement Case (1) and Case (2), respectively. This implies that Case (3) and Case (4) also investigate the effect of an increase in the co-payment rate only for the age group of 70-74 to 20%, and for all age groups to 20%, respectively. Note that the comparison of Case (3) (or Case (4)) with Case (1) (or Case (2)) clarifies the pure effect of the behavioral response by the individual to the change in the co-payment rate.

The results of these four cases are shown in Table 4. Note that an increase in the co-payment rate implies that the amount which each individual has to pay at medical institutions increases, while the cost the public health insurance has to bear decreases. Panel A in Table 4 indeed shows that the reduction in the cost for the public health insurance eventuates in a decrease in the social security contribution rates in all cases in comparison with the benchmark case. The reduction in the social security contribution rate is larger when the co-payment rate for 75 and over also increases to the common rate of 20% in Case (2) compared to Case (1) in which the co-payment rate only for 70-74 increases to 20%. Due to a decrease in the cost for the public health insurance, both the national burden ratio and the consumption tax rate also decrease as shown in Panel A in Table 4.

A striking result can be in particular found in the effect on economic growth. An increase in the co-payment rate stimulates the Japanese economy, although the effect is not so large. Furthermore, while in both Case (1) and Case (2) the positive effect on economic growth weakens as time passes, Case (2) induces higher economic growth than Case (1). Table 5 also shows the effect of Case (1) and Case (2) on welfare. Table 5 presents the equivalent variation in Case (1) and (2), where the minimum expenditure and prices in the benchmark case have been used as bases for comparison. From the individuals’ point of view, an increase in the co-payment rate implies an increase in prices of medical services at medical institutions, and it is obviously not favorable. However, since it is likely to seek more medical services
when individuals get aged, as shown as the U-shaped pattern of the medical expenditure, an increase in the co-payment rate stimulates private savings at the same time in order for them to prepare for more medical expenditures when they get aged. Thus, while a rise in prices of medical services individuals have to face at medical institutions is not favorable, an increase in the co-payment rate results in higher national income through stimulated private savings, which generates more fruits (benefits) to each individual eventually. As shown in Table 5, all generations are better off in both cases, and this implies that the latter stimulative effect on private savings dominates the former negative effect of price changes on efficiency in our realistic simulation model. An increase in the co-payment rate then expands the GDP of Japan, and eventually enhances welfare. Note that Case (1) has simulated the effect of the actual reform where the co-payment rate for the age group of 70-74 increased to 20%. Table 5 shows that all generations are better off by the actual reform in the co-payment rate. The positive effect of the reform is measured to be from 10,000 yen for the generation born in year 1920 to 3.52 million yen for the generation born in year 2000. The positive effect is obviously smaller for older generations, since older generations have to bear more medical expenditures caused by an increase in the co-payment rate.

Furthermore, in the comparison between Case (1) and (2), all generations before the generation born in year 1965 obtain more benefits in Case (1) than (2). This is because relatively older generations do not need face an increase in the co-payment rate in Case (1) while they have to accept a more increase in the co-payment rate in Case (2). Thus, Case (1) is more favorable for older generations. However, the stimulative effect on private savings becomes relatively larger among younger generations, and generations born after year 1965 are better off in Case (2) rather than (1), since they try to save more to prepare for higher medical expenditures caused by an increase in the co-payment rate when they get aged. Since the latter effect to stimulate private savings is larger in Case (2) compared to Case (1) at the aggregate level, the effect of an increase in the co-payment rate on the aggregate economy is also larger in Case (2) than Case (1) in the long-run. For instance, while the overall effect of an increase in the co-payment rate is measured to be 10,000 yen
in both cases for the generation born in year 1920, the generation born in 2000 obtains benefits equivalent to 7.37 million yen through its lifetime in Case (2). Note that Case (2) differs from (1) only in the co-payment rate for the age group of 75 and over. In Case (1) the co-payment rate for 75 and over remains at 5%, the current level, while it increases to 20% in Case (2). Thus, the overall effect of an increase in the co-payment rate for 75 and over from 5% to 20% can be measured to be 3.85 million yen (=7.37 million - 3.52 million) for the generation born in year 2000. Table 5 shows that the overall effect becomes larger for younger generations born after 1965.

Panel B in Table 4 shows the effect of the same increases in the co-payment rates when the behavioral response to the increases is taken into account. Case (3) and (4) in Panel B correspond to Case (1) and (2) in Panel A, respectively, and the comparison between Case (1) (or Case (2)) and Case (3) (or Case (4)) clarifies the effect of the behavioral response. Note that the behavioral response to an increase in the co-payment rate is represented by a 10% decrease in $m_{it}$ in this paper. If the effect of the ex-post moral hazard behavior exists even at the aggregate level, then it would also result in a decrease in $m_{it}$. This implies that the comparison between Panel A and Panel B could possibly provide an inference of the effect of the aggregate ex-post moral hazard behavior provided that it exists at the aggregate level. Thus, it could be possible to interpret the effect of a 10% decrease in $m_{it}$ caused by the behavioral response to an increase in the co-payment rate as the aggregate effect of the ex-post moral hazard behavior in this paper, and the behavioral response is considered as the aggregate ex-post moral hazard behavior from now on.

As both panels show, the aggregate ex-post moral hazard behavior weakens the effect of reducing the burdens: All of the national burden ratio, the social security contribution rate, and the consumption tax rate do not decrease as much as the case when the aggregate ex-post moral hazard behavior is not taken into account. This can be explained as follows: Due to the ex-post moral hazard behavior, each individual decreases medical expenditures by responding to an increase in the co-payment rate. Thus, they do not need save to prepare for future medical
expenditures as much as before when they get aged, and the ex-post moral hazard behavior to result in less savings weakens the stimulative effect of an increase in the co-payment rate on private savings at the aggregate level. Thus, GDP does not expand as much as the case when the aggregate ex-post moral hazard effect does not exist, and a smaller expansion of GDP requires higher burdens on the Japanese economy to fulfill the budget constraint of the government which is given to the economy. Another striking result is the numerical magnitude of the effect of the ex-post moral hazard behavior on the aggregate economy. The magnitude of the effect of the aggregate ex-post moral hazard behavior on economic growth is measured to be -0.04% points in the short-run in Case (2) (1.43% minus 1.47% in year 2010). Note that the negative effect of the aggregate ex-post moral hazard behavior on economic growth persists over time, while the effect on the economic growth rate vanishes in year 2050 in Table 4. Since the economy once jumps down by the aggregate ex-post moral hazard effect in the short-run and thus it stays along a lower path over time, the aggregate ex-post moral hazard effect exists even in the long-run, while its effect on the growth rate vanishes in around 2050. Since the aggregate ex-post moral hazard effect remains in the long-run in this sense, the burdens on the economy such as the national burden ratio, the social contribution rate, and the consumption tax rate all show heavier values even in the long-run when the aggregate ex-post moral hazard effect, or the behavioral response, is taken into account.

The numerical magnitude of the effect of an increase in the co-payment rates is presented in Table 4 and 5 in detail. Table 4 also shows the effect of the behavioral response, or the aggregate ex-post moral hazard behavior, numerically. See both tables for the detailed magnitude of the effects.

4.4.2 Efficiency in the Scheme and Provision of Preventative Medical Services

In this second simulation, the effect of changes in medical expenditures has been examined. The reform tries to improve efficiency in the provision of medical services and it also recommends medical institutions to provide more preventative
medical services, in order to reduce the national medical expenditure. The improvement in efficiency and the provision of more preventative medical services would contribute to the reduction of medical expenditures. However, the improvement in efficiency also stimulates technological progress in the medical field, which might result in an increase in medical expenditures, as pointed out by Hiroi (1994). Then, in the second simulation, the effects of both an increase and a decrease in the medical expenditures have been explored as the effects of the reform; the improvement in efficiency and the provision of more preventative medical services.

In the second simulation, the age pattern of $m_{iz}$, or the U-shaped pattern, has been assumed to be unchanged, but it has been assumed to shift by 10%. When the public health insurance benefits eventually decrease due to the improvement in efficiency and/or the provision of more preventative medical services, then the pattern has been assumed to shift downward by 10%. On the other hand, when it increases, it has been assumed to shift upward by 10%.

Table 6 shows the result of this second simulation. When the improvement in efficiency and/or the provision of more preventative medical services eventuates in a 10% decrease in the public health insurance benefits, then the similar effect to the case where the ex-post moral hazard behavior is taken into account is obtained. The burdens indicated by the national burden ratio, the social security burden ratio, and the consumption tax rate decrease, and thus it is favorable for each individual. However, since it reduces private savings, it eventually reduces national income, and GDP growth would decrease in the short-run. However, the negative effect on economic growth gradually vanishes, and it cannot be found in the long-run, while smaller burdens still remain even in the long-run. On the other hand, if the improvement in efficiency stimulates technological progress in the medical field and then the technological progress eventually results in an increase in the public health insurance benefits, then the effect is completely reversed. The burdens increase, and more medical expenditures are obviously not favorable from the individual’s point of view. However, it stimulates private savings, thus resulting in higher economic
growth. The positive effect gradually vanishes, and it finally disappears in the long-run, while larger burdens still exist even in the long-run.

4.4.3 Recent Argument

It has recently been argued that growth of the national medical expenditure should be kept at least the same as economic growth by the government. In this last simulation, the recent argument has been examined, and the following assumptions have been made: First of all, the ratio of the public health insurance benefits to GDP in year 2008 in the benchmark case was calculated, and the calculated value has been 7.846%. Then the amount of the public health insurance benefits from 2009 was calculated by using the benchmark model under the assumption that the ratio keeps constant at 7.846% even after 2008. This implies that the path of the public health insurance benefits from 2009 has been obtained when the ratio of the public health insurance benefits to GDP keeps constant at the same level as that of year 2008, which is 7.846%. Furthermore, the ratios of these calculated values of the public health insurance benefits to the values obtained in the benchmark model were calculated from 2008. The ratio in year 2008 is obviously unity. This ratio is called the reduction rate in this paper, since the ratio presents how much the public health insurance benefits should be reduced in order to keep its value relatively constant to GDP when the general equilibrium effects are not taken into account. Then by using the reduction rate as well as the age pattern of $m_{ix}$, the age specific amount of the medical expenditure at each age was calculated from 2008, and the numerical calculation was conducted again. Note that this simulation takes into account the behavioral response of individuals since the simulation was re-executed by using the new amount of $m_{ix}$. This simulation thus examines the case when the government announces the policy in year 2008 that the public health insurance benefits will be reduced in the future in order to keep its value relatively constant to GDP. The result of this last simulation is given by Table 7, where the reduction

---

24As shown in Table 7, the ratio of the national medical expenditure to GDP does not
rate is shown in the second column. Since the government decreases the public health insurance benefits somehow in order to keep its ratio to GDP constant, the government can reduce the burdens. However, as mentioned before, the increasing trend in the public health insurance benefits can mainly be explained by population aging, which seems very difficult to avoid. Thus, as Japan becomes aged, the reduction rate should keep increasing to maintain the policy over time, and the government has to reduce the public health insurance benefits by 45% in year 2050. Even economic growth under the policy based on the current argument is lower until around year 2035, although a basis of the current argument is for higher economic growth. The very high reduction rate seems unrealistic, and the expected negative effect on economic growth also indicates that the current argument seems unreasonable.

---

coinide with 7.846% from 2009, since GDP in this simulation is different from that of the benchmark model.
5 Concluding Remarks

The paper has investigated the effect of the reform of the Japanese public health insurance scheme on economic growth and welfare, by simulating the reform in an aging Japan within a dynamic computable general equilibrium framework.

The paper has used the actual and forecasted future population data in order to capture the realistic demographic structure, and the effect of the reform as well as the recent argument have been evaluated in a dynamic context.

Our simulation results are summarized as follows. First of all, an increase in the co-payment rate, which is one of the most prominent changes in the reform, would result in higher economic growth as well as higher welfare. This is because the increase in the co-payment rate stimulates private savings. The effect of the stimulated private savings on the whole economy in the long-run can only be captured by the dynamic general equilibrium model. However, the magnitude of the effect on economic growth is not so large. The positive effect on economic growth is relatively larger when the policy change is implemented, and the magnitude of the positive effect becomes smaller over time. The change in the economic growth rate in the long-run is between 0.0% and 0.01% points in year 2050 depending on the change in the co-payment rate, while it is between 0.01% and 0.09% points in the short-run. On the other hand, due to a relatively larger effect on economic growth in the short-run, the Japanese economy once jumps to a relatively better path and then moves along the path. This implies that the positive effect of an increase in the co-payment rate in the reform on lifetime income or welfare is larger among relatively younger generations. Our simulation model estimates that the actual increase in the co-payment rate in the re-form have induced benefits which varies between 10,000 yen for the generation born in year 1920 and 3.52 million yen for the generation born in year 2000. The estimated amount of benefits generated by an increase in the co-payment rate in the actual reform becomes larger as generations get younger.

Secondly, if the effect of the ex-post moral hazard behavior exists at the aggregate level and it also results in a decrease in medical expenditures, then it weakens the
above mentioned positive effect of an increase in the co-payment rate on economic growth. The short-run effect of the ex-post moral hazard on economic growth is measured to be at most -0.04% points when the medical expenditures decrease by 10% due to the ex-post moral hazard behavior.

Thirdly, an increasing trend of the future public health insurance benefits can mainly be explained by an aging population, and an increase in the co-payment rate has little effect to reduce the public health insurance benefits in the future. This implies that the effect of the change in the co-payment rate is still small even though it is re-examined within a general equilibrium framework, and the similar result to Li and Bessho (2006) can also be obtained.

Fourthly, the effect of a decrease in the medical cost, which could possibly be achieved by the improvement in efficiency in the public health insurance, the provision of more preventative medical services, or technological progress in the medical field, on the future burdens is also very small. A change in the national burden ratio in year 2050 is only 1.2% points even when the per capita medical cost changes by 10%.

Finally, if the government implements a policy to keep the ratio of the public health insurance benefits to GDP constant, then the government has to keep reducing the public health insurance benefits over time, and the reduction rate should be 45 percent in year 2050. Such a policy also eventuates in lower economic growth until around year 2035.

The simulation results thus indicate that the reform is not so effective to reduce the future national medical expenditure, but it can achieve higher economic growth by stimulating private savings. In particular even if the co-payment rate is increased in order to reduce the national medical expenditure, then the magnitude of the effect of the increase is expected to be very small. Note also that the positive effect of an increase in the co-payment rate on economic growth is also small although it results in higher economic growth. Furthermore, even when the national medical expenditure is successfully reduced by 10%, the effect of the reduction on the aggregated economy is also small. This implies that the improvement in efficiency
in the current public health insurance as well as the provision of more preventative medical services does not induce a significant effect on the aggregated economy, even if it successfully reduces the national medical expenditure. An increasing trend of the future national medical expenditure can mainly been explained by an aging population. The very small effect on the aggregated economy suggests that the efficiency in the public health insurance and/or the provision of more preventative medical services should be examined in the context of the microeconomic rather than macroeconomic perspective.
References


Figure 1. The Structure of the Public Health Insurance of Japan
Table 1. The insurers of the Public Health Insurance of Japan

<table>
<thead>
<tr>
<th>Type</th>
<th>Insurers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National Health Insurance</strong> (Kokuho)</td>
<td>Local Governments National Health Insurance</td>
</tr>
<tr>
<td></td>
<td>(Shichoson Kokuho)</td>
</tr>
<tr>
<td></td>
<td>Unions of National Health Insurance</td>
</tr>
<tr>
<td></td>
<td>(Kokumin Kenko Hoken Kumiai)</td>
</tr>
<tr>
<td></td>
<td>Local governments</td>
</tr>
<tr>
<td></td>
<td>Each union of National Health Insurances</td>
</tr>
<tr>
<td><strong>Employees Health Insurance</strong></td>
<td>Seamen’s Insurance</td>
</tr>
<tr>
<td></td>
<td>Insurances by mutual aid associations</td>
</tr>
<tr>
<td></td>
<td>Insurances by each member of National Federation of Health Insurance Societies</td>
</tr>
<tr>
<td></td>
<td>Insurance by Japan Health Insurance Association</td>
</tr>
<tr>
<td></td>
<td>Central Government</td>
</tr>
<tr>
<td></td>
<td>Each mutual aid association</td>
</tr>
<tr>
<td></td>
<td>Each member of National Federation of Health Insurance Societies</td>
</tr>
<tr>
<td></td>
<td>Japan Health Insurance Association</td>
</tr>
</tbody>
</table>
Figure 2. New Public Health Insurance for the Elderly

- Newly introduced public health insurance for the elderly
  (Choju Iryo Seido)
- National Health Insurance
  (Kokuho)
- Employees Health Insurance

Age 75
Age 65
0
Figure 3. procedure of payment
Figure 4. Growth of national medical expenditure

Data Source: Ministry of Health, Labor and Welfare
Figure 5: Aging Rates

Until 2005 actual data has been used. From 2006 the latest population projection by the National Institute of Population and Social Security Research has been used.
Figure 6. The age group difference in the national medical expenditure of year 2006

Data Source: Ministry of Health, Labor and Welfare
### Table 2. The Co-Payment Rates

<table>
<thead>
<tr>
<th>Age</th>
<th>0 - before junior high school</th>
<th>After junior high school -- 69</th>
<th>70 --74</th>
<th>75 and over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-payment rates</td>
<td>20 %</td>
<td>30 %</td>
<td>20 % *</td>
<td>10 %</td>
</tr>
</tbody>
</table>

*10 % until the end of March of 2009

**Notice**: a 30% rate is applied to the elderly of 70 and over with high income.
### Table 3. Benchmark Simulation Results

<table>
<thead>
<tr>
<th>Year</th>
<th>Simulation</th>
<th>Actual</th>
<th>GDP</th>
<th>GDP</th>
<th>GDP</th>
<th>GDP</th>
<th>GDP</th>
<th>GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
</tr>
<tr>
<td>2011</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
</tr>
<tr>
<td>2012</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
</tr>
<tr>
<td>2013</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
</tr>
<tr>
<td>2014</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
</tr>
</tbody>
</table>

Note: |
Figure 7-1: Per Capita GDP (Benchmark Model)

(actual value)

(benchmark)

(year 1990 = 1)
Figure 7-2: The Ratio of Public Pension Benefits to GDP (Benchmark Model)

- Benchmark
- Actual Value
Figure 7-3: The Ratio of Public Health Insurance Benefits to GDP (Benchmark Model)
Table 4. Increases in the co-payment rate

<table>
<thead>
<tr>
<th>Case (2): 20% for all age groups</th>
<th>Case (1): 20% for the age group of 60-69, 20% for 70-74, and 5% for 75 and over</th>
<th>Benchmark:</th>
<th>Co-payment rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP growth rate</td>
<td>National budget ratio</td>
<td>Social security contribution ratio</td>
<td>Consumption tax ratio</td>
</tr>
<tr>
<td>0.13</td>
<td>0.12</td>
<td>0.12</td>
<td>0.12</td>
</tr>
<tr>
<td>0.60</td>
<td>0.60</td>
<td>0.60</td>
<td>0.60</td>
</tr>
<tr>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>0.17</td>
<td>0.17</td>
<td>0.17</td>
<td>0.17</td>
</tr>
<tr>
<td>0.47</td>
<td>0.47</td>
<td>0.47</td>
<td>0.47</td>
</tr>
<tr>
<td>0.80</td>
<td>0.80</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>0.94</td>
<td>0.94</td>
<td>0.94</td>
<td>0.94</td>
</tr>
<tr>
<td>0.83</td>
<td>0.83</td>
<td>0.83</td>
<td>0.83</td>
</tr>
</tbody>
</table>
Panel B: Behavioral response in medical consultation:

<table>
<thead>
<tr>
<th>Year</th>
<th>National burden ratio</th>
<th>Social security contribution rate</th>
<th>Consumption tax rate</th>
<th>GDP growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Benchmark</td>
<td>Case (3)</td>
<td>Case (4)</td>
<td>Benchmark</td>
</tr>
<tr>
<td>2010</td>
<td>39.01</td>
<td>38.82</td>
<td>37.98</td>
<td>15.26</td>
</tr>
<tr>
<td>2015</td>
<td>44.93</td>
<td>44.70</td>
<td>43.67</td>
<td>18.86</td>
</tr>
<tr>
<td>2020</td>
<td>48.97</td>
<td>48.68</td>
<td>47.45</td>
<td>20.95</td>
</tr>
<tr>
<td>2025</td>
<td>50.34</td>
<td>50.09</td>
<td>48.62</td>
<td>22.20</td>
</tr>
<tr>
<td>2030</td>
<td>51.67</td>
<td>51.44</td>
<td>49.80</td>
<td>23.87</td>
</tr>
<tr>
<td>2035</td>
<td>53.51</td>
<td>53.26</td>
<td>51.51</td>
<td>26.04</td>
</tr>
<tr>
<td>2040</td>
<td>56.33</td>
<td>56.04</td>
<td>54.21</td>
<td>28.89</td>
</tr>
<tr>
<td>2045</td>
<td>58.64</td>
<td>58.28</td>
<td>56.32</td>
<td>30.67</td>
</tr>
<tr>
<td>2050</td>
<td>60.48</td>
<td>60.13</td>
<td>57.95</td>
<td>31.85</td>
</tr>
</tbody>
</table>

Co-payment rates
Benchmark: 20% for the age group of 20-69, 10% for 70-74, and 5% for 75 and over
Case (3): 20% for the age group of 20-69, 20% for 70-74, and 5% for 75 and over
Case (4): 20% for all age groups
Table 5. Welfare effects of an increase in the co-payment rate

Unit: million yen in the FY2000 price

<table>
<thead>
<tr>
<th>Year</th>
<th>Case (1)</th>
<th>Case (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1920</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>1925</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>1930</td>
<td>0.03</td>
<td>0.01</td>
</tr>
<tr>
<td>1935</td>
<td>0.05</td>
<td>0.02</td>
</tr>
<tr>
<td>1940</td>
<td>0.06</td>
<td>0.02</td>
</tr>
<tr>
<td>1945</td>
<td>0.09</td>
<td>0.02</td>
</tr>
<tr>
<td>1950</td>
<td>0.12</td>
<td>0.04</td>
</tr>
<tr>
<td>1955</td>
<td>0.17</td>
<td>0.08</td>
</tr>
<tr>
<td>1960</td>
<td>0.26</td>
<td>0.18</td>
</tr>
<tr>
<td>1965</td>
<td>0.41</td>
<td>0.41</td>
</tr>
<tr>
<td>1970</td>
<td>0.76</td>
<td>0.94</td>
</tr>
<tr>
<td>1975</td>
<td>1.16</td>
<td>1.68</td>
</tr>
<tr>
<td>1980</td>
<td>1.79</td>
<td>2.83</td>
</tr>
<tr>
<td>1985</td>
<td>1.94</td>
<td>3.72</td>
</tr>
<tr>
<td>1990</td>
<td>3.61</td>
<td>6.26</td>
</tr>
<tr>
<td>1995</td>
<td>3.31</td>
<td>6.60</td>
</tr>
<tr>
<td>2000</td>
<td>3.52</td>
<td>7.37</td>
</tr>
</tbody>
</table>

The above values are measured in the equivalent variation (EV), where the minimum expenditure and the prices in the benchmark case have been used as the bases for comparison. The numbers in the first column indicate the years when they were born, and thus they imply generations.

The co-payment rates

**Benchmark:** 20% for the age group of 20-69, 10% for 70-74, and 5% for 75 and over

**Case (1):** 20% for the age group of 20-69, 20% for 70-74, and 5% for 75 and over

**Case (2):** 20% for all age groups
Table 6. Changes in medical expenditures (unit: %)

<table>
<thead>
<tr>
<th>Year</th>
<th>National burden ratio</th>
<th>Social security contribution rate</th>
<th>Consumption tax rate</th>
<th>GDP growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>benchmark 10% increase 10% decrease</td>
<td>benchmark 10% increase 10% decrease</td>
<td>benchmark 10% increase 10% decrease</td>
<td>benchmark 10% increase 10% decrease</td>
</tr>
<tr>
<td>2010</td>
<td>39.01 39.68 38.32</td>
<td>15.26 16.10 14.42</td>
<td>35.76 36.13 35.39</td>
<td>1.38 1.41 1.35</td>
</tr>
<tr>
<td>2015</td>
<td>44.93 45.65 44.20</td>
<td>18.86 19.79 17.93</td>
<td>41.68 42.03 41.33</td>
<td>0.80 0.81 0.78</td>
</tr>
<tr>
<td>2020</td>
<td>48.97 49.75 48.17</td>
<td>20.95 21.96 19.93</td>
<td>46.38 46.75 46.01</td>
<td>0.90 0.91 0.90</td>
</tr>
<tr>
<td>2025</td>
<td>50.34 51.19 49.49</td>
<td>22.20 23.29 21.11</td>
<td>47.23 47.61 46.84</td>
<td>0.78 0.78 0.77</td>
</tr>
<tr>
<td>2030</td>
<td>51.67 52.57 50.75</td>
<td>23.87 25.03 22.71</td>
<td>47.41 47.82 47.00</td>
<td>0.46 0.46 0.45</td>
</tr>
<tr>
<td>2035</td>
<td>53.51 54.49 52.52</td>
<td>26.04 27.27 24.80</td>
<td>47.84 48.27 47.41</td>
<td>0.16 0.16 0.16</td>
</tr>
<tr>
<td>2040</td>
<td>56.33 57.37 55.28</td>
<td>28.89 30.19 27.38</td>
<td>49.07 49.53 48.61</td>
<td>-0.03 -0.03 -0.03</td>
</tr>
<tr>
<td>2045</td>
<td>58.64 59.74 57.52</td>
<td>30.67 32.04 29.29</td>
<td>50.66 51.13 50.17</td>
<td>0.08 0.08 0.08</td>
</tr>
<tr>
<td>2050</td>
<td>60.48 61.65 59.29</td>
<td>31.85 33.30 30.40</td>
<td>51.99 52.48 51.49</td>
<td>0.12 0.12 0.13</td>
</tr>
</tbody>
</table>
Table 7: The Effect of the Constant Ratio of National Medical Expenditure to GDP (unit: %)

<table>
<thead>
<tr>
<th>Year</th>
<th>Expenditure to GDP (unit: %)</th>
<th>GDP Growth Rate</th>
<th>Consumption Tax Rate</th>
<th>Social Security</th>
<th>National Health Ratio</th>
<th>National Medical Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>0.16</td>
<td>0.12</td>
<td>0.59</td>
<td>0.66</td>
<td>0.67</td>
<td>0.73</td>
</tr>
<tr>
<td>2017</td>
<td>0.20</td>
<td>0.12</td>
<td>0.59</td>
<td>0.66</td>
<td>0.67</td>
<td>0.73</td>
</tr>
<tr>
<td>2018</td>
<td>0.20</td>
<td>0.12</td>
<td>0.59</td>
<td>0.66</td>
<td>0.67</td>
<td>0.73</td>
</tr>
<tr>
<td>2019</td>
<td>0.20</td>
<td>0.12</td>
<td>0.59</td>
<td>0.66</td>
<td>0.67</td>
<td>0.73</td>
</tr>
<tr>
<td>2020</td>
<td>0.20</td>
<td>0.12</td>
<td>0.59</td>
<td>0.66</td>
<td>0.67</td>
<td>0.73</td>
</tr>
<tr>
<td>2021</td>
<td>0.20</td>
<td>0.12</td>
<td>0.59</td>
<td>0.66</td>
<td>0.67</td>
<td>0.73</td>
</tr>
<tr>
<td>2022</td>
<td>0.20</td>
<td>0.12</td>
<td>0.59</td>
<td>0.66</td>
<td>0.67</td>
<td>0.73</td>
</tr>
<tr>
<td>2023</td>
<td>0.20</td>
<td>0.12</td>
<td>0.59</td>
<td>0.66</td>
<td>0.67</td>
<td>0.73</td>
</tr>
<tr>
<td>2024</td>
<td>0.20</td>
<td>0.12</td>
<td>0.59</td>
<td>0.66</td>
<td>0.67</td>
<td>0.73</td>
</tr>
<tr>
<td>2025</td>
<td>0.20</td>
<td>0.12</td>
<td>0.59</td>
<td>0.66</td>
<td>0.67</td>
<td>0.73</td>
</tr>
<tr>
<td>2026</td>
<td>0.20</td>
<td>0.12</td>
<td>0.59</td>
<td>0.66</td>
<td>0.67</td>
<td>0.73</td>
</tr>
</tbody>
</table>
Previous Asia Pacific Economic Papers

391  Negative impacts of capital injection policies on the capital crunch: evidence from japan
    Takeshi Osada, 2011

390  Capital Injection, Restructuring Targets and Personnel Management: The Case of Japanese Regional Banks
    Kazuki Onji, David Vera, Jenny Corbett, 2011

389  Beyond ‘Asian Values’: Rationales for Australian-Japan Cooperation in Asian Regionalism
    Go Ito, 2010

388  How Does a Decrease in Oil Production Affect the World Economy?
    Naohiko Yabaha, 2010

387  Internal Promotion and the Effect of Board Monitoring: a Comparison of Japan and the United States
    Meg Sato, 2010

386  Interaction between trade, conflict and cooperation: the case of Japan and China
    Shiro Armstrong, 2010

385  Japanese Aid as a prerequisite for FDI: the case of Southeast Asian countries
    Sérénine Blais, 2009

384  Insular Decision-making in the Board Room: Why Boards Retain and Hire Sub-Standard CEOs
    Meg Sato, 2009

383  How does Financial System Efficiency Affect the Growth Impact of FDI in China?
    Ying Xu, 2009

382  A Tale of Pork Prices: Evasion and Attenuation of a Japanese Tariff
    Kazuki Onji, 2009

381  Are the East Asian Currencies Still Misaligned? An Analysis Based on Absolute ppp-Income Relationship using Panel Data
    Tazuo Motonishi, 2009

380  Is Foreign Aid a Vanguard of Foreign Direct Investment? A Gravity-Equation Approach
    Hidemi Kimura and Yasuyuki Todo, 2009

379  Rain, Elections and Money: The Impact of Voter Turnout on Distributive Policy Outcomes in Japan
    Yusaku Horiuchi and Jun Saito, 2009

378  Japanese FDI in China: determinants and performance
    Shiro Armstrong, 2009

377  Expansion Abroad and Jobs at Home: Evidence from Japanese Multinational Enterprises
    Nobuaki Yamashita and Kyoji Fukao, 2009

376  Should Australia Encourage Developing Countries to Adopt Competition Laws?
    Henry Ergas, 2008

375  Will New Trends in Foreign Direct Investment Change the Structure of Intra-industry Trade between China and Japan?
    Tao Tao, 2008

374  Competition Policy in ASEAN: Case studies
    Johanna Branson, 2008

    Kazukiyo Onishi, 2008

372  Immunising future trade against protectionists: preventing the emergence of more sensitive sectors
    Andrew Elek, 2008
Annual subscription rate for up to eight issues:

Individuals A$65.00 (includes GST) A$60 (overseas)
Institutions A$110.00 (includes GST) A$100 (overseas)

Cost for single issues:

A$16.50 (includes GST) A$15.00 (overseas)
A$10.00 (Students)
No postage required within Australia

Available from:

Centre Administrator
Australia–Japan Research Centre
Crawford School of Economics and Government
ANU College of Asia and the Pacific
The Australian National University
Canberra ACT 0200, Australia

Facsimile: (61 2) 6125 8448
Telephone: (61 2) 6125 3780
Email: ajrc@anu.edu.au
URL: http://www.crawford.anu.edu.au