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Approach

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Abstract

This paper presents a computable general equilibrium (CGE) framework to numerically examine the effect of tax and subsidy policies on the medical service sector and the pharmaceutical industry. The generalized framework with the latest Japanese input-output table of year 2005 with 108 different production sectors provides the following results: A welfare gain is approximately 97,402 million yen when the subsidy rate of the sector of private hospitals and the medical analyzing industry increases by 10 percent if the government budget is not considered explicitly, while the same policy reversely induces approximately a 54,256 million yen welfare loss if the government finances the shortage caused by the policy change by a non-distortionary income tax on individuals. Furthermore, the effect of tax and subsidy policies on individual medical sectors differs, while the high dependency of the pharmaceutical industry with other medical sectors can be found. In particular, the pharmaceutical industry is most better off not by a decrease in its own production tax rate but by a decrease in the production tax rate of the sector of private hospitals and the medical sample analyzing industry.

Keywords: Computable General Equilibrium (CGE) Model, Medical Service, Pharmaceutical Industry, Taxation, Subsidy, Simulation

JEL Classification: C68, H51, and H53

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1 Introduction

This paper presents a computable general equilibrium (CGE) framework to numerically examine the effect of tax and subsidy policies on the private medical service sector and the pharmaceutical industry¹.

This paper uses the latest Input-Output table of Japan of year 2005 with 108 different production sectors, and it evaluates the effect of several tax and subsidy policies on the private medical service sector and the pharmaceutical industry in Japan. By using the actual input-output table, the paper has successfully realized the real Japanese economy within the model. The purpose of this paper is to develop a general framework to numerically explore several government policies related to medical and health services, and it is thus applicable to any other countries, although the Japanese input-output table has been used in this paper.

Japan is going to experience very rapid as well as high population aging in the near future, which any developed countries have not experienced ever. The National Institute of Population and Social Security Research predicts the more than 40% aging rate at its peak level around year . Furthermore, the total number of the Japanese population has already started to decrease in year 2006 from 120 million, and the forecasted total population of Japan by the National Institute of Population and Social Security Research reaches approximately 70 million at its stable level in year . A future decrease in the total population would likely result in decreasing GDP, and stable future growth of the Japanese economy needs a merging sector to stimulate the economy in an aging Japan with its decreasing total population in the future.. An aging population will induce more demand for medical services, and the private medical sector is expected to play a more important role not only to stimulate the economy but also to complement the public health services.

The private medical service sector has been taxed and subsidized in Japan. The increasing importance of the private medical service sector implies that the government can more strategically use its tax and subsidy policies related to the private medical sector in

¹FORTRAN programmes have been used for the numerical calculation in this paper.

order to achieve stable economic growth as well as to maintain the sustainable public health services in an aging Japan. The purpose of this paper is to numerically examine the effect of such policies that affect the private medical service sector within a general equilibrium framework. The paper also considers several financing methods of the government in order to finance the shortage in the revenue caused by policy changes by explicitly incorporating the government budget constraint, and it highlights that different financing methods induce very different effects on welfare. Since a general equilibrium model is employed, all possible linkages of economic activities are taken into account. The latest input-output table with 108 different intermediate production sectors is used to estimate parameter values, and the benchmark model successfully reflects the real economy. The employed model is computable, and the effect of government policies can be examined numerically. Thus, the comparison of several simulated cases with the benchmark model gives us realistic evaluations of the effect of several government policies on the medical service sector. The welfare comparison is also given, and the effect of policy changes is examined not only on each medical sector but also on the whole economy..

Simulation results are as follows. First of all, since the medical service sector which includes private hospitals and private medical sample analyzing firms is the largest and its subsidy rate is also the highest among all other medical sectors, the subsidy for this sector is the best policy instrument among all other tax and subsidy policies in order to enhance the welfare of the whole Japanese economy, as long as the government does not consider its budget constraint explicitly: A welfare gain is measured to be approximately 97,402 million yen when the subsidy rate of the sector increases by 10%. The 10% increase in the subsidy rate is also the most preferable for all individual medical sectors as well. Secondly, however, if the budget constraint of the government is explicitly considered and the shortage of the revenue is financed by a non-distortionary income tax on individuals, then such a policy becomes worst, and the effect becomes reverse: A welfare loss by such a policy is measured to be approximately 54,256 million yen. This is an expected result, since any policy change in

a distortionary tax results in the largest welfare loss when a non-distortionary tax is used in order to finance the shortage in the government revenue caused by the change in the distortionary tax. This is always correct, and the welfare loss is measured to be approximately 54,256 million yen when a 10% increase in the subsidy rate (distortionary) is followed by an increase in the income tax rate (non-distortionary). This simulation result highlights the importance of the financing method in order to fulfill the government budget constraint. Since a policy without the consideration of the (current) budget constraint corresponds to a debt financing policy, the policy implication of this result is that the best policy for the whole economy when it were financed by issuance of the government bonds becomes worst if the financing method is replaced with a non-distortionary tax. Actually, a distortionary tax should be used to finance the shortage in the revenue caused by the same policy instead of using a non-distortionary tax, in order to minimize an efficiency (welfare) loss, which is induced by an increase in the tax rate. Thirdly, the effect of tax and subsidy policies on individual medical sectors differs. There is always a trade-off among different medical sectors in terms of the effect on their net benefits, or factor payments except for the pharmaceutical industry. Fourthly, the high dependency of the pharmaceutical industry with other medical sectors is found. In particular the pharmaceutical industry heavily depends on the medical sector of private hospitals and the medical sample analyzing industry. Finally, the pharmaceutical industry is most better off not by a decrease in its own production tax rate but by a decrease in the production tax rate of private hospitals and the medical sample analyzing industry.

The paper is organized as follows. The next section explains the numerical model, and Section 3 simulates several scenarios with results and evaluations. Section 4 concludes the paper.

2 Numerical Analysis

In order to obtain the numerical effects of tax and subsidy policies on the medical and health related sectors as well as on welfare of the economy, this paper uses the latest input-output table of Japan within a general equilibrium framework, in order to make the simulation analysis realistic. By using the actual input-output table of Japan, the paper has successfully realized the real economy within the model. This paper employs the conventional static computable general equilibrium (CGE) model with the actual input-output table of Japan of year 2005. Note that all parameter values in the model are calculated by using the actual data, so that the calculated values of endogenous variables obtained within the model also become quite realistic.

2.1 Data

The latest input-output table of Japan of year 2005 with 108 different intermediate sectors has been used in order to construct the social accounting matrix (SAM). The SNA data has also been used to obtain the amount of aggregate private savings. The last sector, namely the 108th sector, includes all unclassified items. Since the value of its factor payments of some intermediate sectors becomes negative², this paper has integrated the 108th sector with the 106th sector which includes all other services. The integration makes the actual input-output table data consistent to the model, and it is assumed in this paper that there are 107 different production sectors, all of which are allowed to have intermediate production processes. Based on this simplification, the social accounting matrix (SAM) has been made, which is given in Appendix. Note that the following production sectors are particularly relevant to this paper; Medicaments ($i = 26$), Medical Service and Health ($i = 94$), Social Security ($i = 95$), and Nursing Care ($i = 96$). The economic activities of the pharmaceutical industry is shown in Medicaments ($i = 26$), and the private medical service sector such as private hospitals is categorized in Medical Service and Health ($i = 94$). The private medical sample analyzing

²Labor income and capital income are factor payments.

industry³ is also categorized in Medical Service and Health ($i = 94$). Nursing Care ($i = 96$) shows the economic activities of the industry of the long-term care for the elderly. Social Security ($i = 95$) includes activities of private nurseries, and nursing homes.

2.2 Model

The computable general equilibrium model of this paper employs the conventional static model⁴. The Japanese economy is assumed to consist of 107 different sectors, households, the government, and the investment firm sector. All 107 industries are allowed to have intermediate production processes, and they are assumed to maximize their profit. Households are assumed to maximize their utility over 107 different consumption goods. The government is assumed to determine its tax revenue, the amount of subsidies, and its consumption in order to satisfy its budget constraint. The economy is assumed to be fully competitive, so that all prices are determined in the relevant markets in order to equate the amount of demand to the amount of supply at its fully competitive price level in equilibrium. Note that the model is static and thus the short-run effect is only investigated. Thus, it is assumed for simplicity that factor inputs are not mobile among different sectors in the short-run.

<Households>

Households are assumed to be homogenous, and their utility is given by:

$$U(X_1, X_2, \dots, X_{107}) = \prod_{i=1}^{107} X_i^{\alpha_i}, \quad (1)$$

where X_i denotes consumption of good i . $\sum_{i=1}^{107} \alpha_i = 1$ is assumed. i denotes each sector.

The parameter value of each α_i is determined by using the actual social accounting matrix,

³A typical firm categorized in this industry is a blood test examination firm.

⁴In terms of the conventional static model, see Ballard, Fullerton, Shoven, and Whalley (1985), Shoven and Whalley (1992), and Scarf and Shoven (2008). In particular, the model used in this paper is similar to Hosoe, Ogawa, and Hashimoto (2004). Regarding the dynamic model, it is conventional to employ an overlapping generations model. In terms of computable overlapping generations model within a general equilibrium framework, see Auerbach and Kotlikoff (1987). Kato (1998), Kato (2002b), Kato (2002a), and Ihori, Kato, Kawade, and Bessho (2006) also apply the dynamic model to several policies in Japan.

which is given in Table 1.

Households are assumed to maximize (1) with respect to their consumption goods subject to their budget constraint such that:

$$\sum_{i=1}^{107} p_i X_i = I (1 - \tau^I) - S^I,$$

where p_i and I denote the price of good i and income, respectively. τ^I is the proportional income tax rate, and it is calculated by using the actual social accounting matrix. S^I denotes the amount of savings, and households are assumed to save the constant amount relative to their disposal income. The amount of savings is assumed to be given by

$$S^I = s^I (1 - \tau^I) I,$$

where the constant ratio, s^I , is given exogenously⁵. The value of s^I has been calculated by using the actual SAM. The calculated values of τ^I and s^I are given in Table 1. Then income is given by

$$I = \sum_{i=1}^{107} r_i \bar{K}_i + \sum_{i=1}^{107} w_i \bar{L}_i,$$

where r and w denote the rental cost and the wage rate, respectively. \bar{K} and \bar{L} are endowments of capital and labour, respectively. The factor payments change as r or w changes. Note that the amounts of $r_i \bar{K}_i$ and $w_i \bar{L}_i$ are both obtained from the actual social accounting matrix.

The first order conditions yield the demand functions such that:

$$X_i = X_i(p_i, Y; \alpha_i) = \frac{\alpha_i I (1 - \tau^I) (1 - s^I)}{p_i}, \quad i = 1, 2, \dots, 107. \quad (2)$$

Note that α_i can be calculated by using (2) and the actual social accounting matrix so

⁵The assumption that the ratio is exogenously given is made only for the model to be consistent to the actual social accounting matrix, and this assumption is very common in the literature.

that:

$$\alpha_i = \frac{p_i X_i}{I(1 - \tau^I)(1 - s^I)} = \frac{p_i X_i}{(1 - s^I)(1 - \tau^I) \left(\sum_{j=1}^{107} r_j \bar{K}_j + \sum_{j=1}^{107} w_j \bar{L}_j \right)}, \quad i = 1, 2, \dots, 107,$$

where both the values of the denominator and the numerator can be obtained from the actual social accounting matrix. The estimated values of α_i are given in Table 1.

<Private Firms>

Following the conventional assumption, the multiple decisions by each firm are described by the tree structure, where each firm is assumed to make a decision over several different items. In the tree structure, the optimal behavior of each firm which makes a decision over different items is described as if the firm always makes a decision over two different items at different steps. Each firm makes a decision over different items; the amount of exports of its own product, the amount of imported goods and intermediate goods used for its production, and the amount of labor and capital. This assumption simplifies a complicated decision over several items by each firm. Each step is also shown in Figure 1.

At step 1, a private firm, i , is assumed to use labor and capital to produce its composite goods, Y_i . Then, the firm is assumed to produce its domestic goods, Z_i , by using its own Y_i and $X_{i,j}$ at the second step. $X_{i,j}$ denotes the final consumption goods produced by firm j used by firm i for its production. Thus, $X_{i,j}$ is the amount of the final consumption goods produced by firm j for the intermediate production process of firm i . At the third step, the firm is assumed to decompose its domestic goods, Z_i , into exported goods, E_i , and final domestic goods, D_i . This step is concerned about its optimal decision over the amount of its product to be exported. At the final step (the fourth step), the firm is assumed to produce its final consumption goods, Q_i , by using its final domestic goods, D_i , and imported goods, M_i . This step corresponds to its optimal decision over how much it uses imported goods, M_i , and its own goods, D_i , to produce its final consumption goods, Q_i , which are consumed

by domestic households. The assumption of this tree structure in terms of different decisions can incorporate firm's complicated decisions over the amount of exports of its own product, the amount of imported goods and intermediate goods which the firm uses in its production process, and the amount of factor inputs into the model in a tractable way.

Note that all market clearing conditions are used to determine all prices endogenously in their corresponding markets, and also that at each step the private firm is assumed to determine the amount of relevant variables in order to maximize its profit.

By the assumption of the above tree structure, all decision making processes can be simplified, and the optimal behavior about all different decisions can be incorporated as follows:

Step 1: The production of composite goods

Each firm is assumed to produce its composite goods by using capital and labor. Each firm is assumed to maximize its profit given by:

$$\pi_i = p_i^Y Y_i(K_i, L_i) - r_i K_i - w_i L_i, \quad (3)$$

where Y_i and p_i^Y denote the composite goods produced by firm i and its price, respectively. K_i and L_i denote capital and labor used by firm i in order to produce its composite goods, respectively. The production technology is given by:

$$Y_i(K_i, L_i) = K_i^{\beta_{K,i}} L_i^{\beta_{L,i}}, \quad i = 1, 2, \dots, 107, \quad (4)$$

where $\beta_{K,i} + \beta_{L,i} = 1$ is assumed for all $i = 1, 2, \dots, 107$. Each firm is assumed to maximize (3) with respect to labor and capital subject to (4), and the first order conditions yield the demand functions such that:

$$K_i = K_i(p_i^Y, r_i, w_i; \beta_{K,i}, \beta_{L,i}) = \frac{\beta_{K,i}}{r_i} p_i^Y Y_i, \quad (5a)$$

$$L_i = L_i(p_i^Y, r_i, w_i; \beta_{K,i}, \beta_{L,i}) = \frac{\beta_{L,i}}{w_i} p_i^Y Y_i, \quad i = 1, 2, \dots, 107. \quad (5b)$$

Note that $\beta_{K,i}$ and $\beta_{L,i}$ can be calculated by using (5a), (5b), and the actual social accounting matrix so that:

$$\beta_{K,i} = \frac{r_i K_i}{p_i^Y Y_i},$$

$$\beta_{L,i} = \frac{w_i L_i}{p_i^Y Y_i}, \quad i = 1, 2, \dots, 107,$$

where $r_i K_i$, $w_i L_i$, and $p_i^Y Y_i$ can be obtained from the actual social accounting matrix. The estimated values of $\beta_{K,i}$ and $\beta_{L,i}$ are given in Table 1.

Step 2: The production of domestic goods

Each firm is assumed to produce domestic goods, Z_i , by using intermediate goods and its own composite goods, which production has been described at step 1. The optimal behavior of each firm in terms of the production of domestic goods can be described such that:

$$\begin{aligned} \underset{Y_i, X_{i,j}}{\text{Max}} \pi_i &= p_i^Z Z_i - \left(p_i^Y Y_i - \sum_j^{107} p_j^X X_{i,j} \right), \\ \text{st} \quad Z_i &= \min \left(\frac{X_{i,j}}{ax_{i,j}}, \frac{Y_i}{ay_i} \right), \quad i = 1, 2, \dots, 107, \end{aligned}$$

where $X_{i,j}$ and p_j^X denote intermediate good j used by firm i and its price, respectively. p_i^Z is the price of Z_i . $ax_{i,j}$ denotes the amount of intermediate good j used for producing one unit of a domestic good of firm i , and ay_i denotes the amount of its own composite good for producing one unit of its domestic good. The estimated values of ay_i are given in Table

1⁶. Note that the production function at this step is assumed to be the Leontief type. Using $ax_{i,j}$ and ay_i , and assuming that the market is fully competitive, the zero-profit condition can be written by:

$$p_i^Z = p_i^Y ay_i + \sum_j^{107} p_j^X ax_{i,j}, \quad i = 1, 2, \dots, 107.$$

Step 3: Decomposition of Domestic Goods into Exported Goods and Final Domestic Goods

The optimal decision made by firm i in terms of the amount of exports of its own goods is described as the the decomposition of Z_i ($i = 1, 2, \dots, 107$) into exported goods, E_i , and final domestic goods, D_i . Each firm is assumed to maximize its profit such that:

$$\pi_i = p_i^e E_i + p_i^d D_i - (1 + \tau_i^p - \tau_i^s) p_i^Z Z_i, \quad (6)$$

where p_i^e and p_i^d denote the price when the domestic goods are sold abroad, and the price when the domestic goods are sold domestically, respectively. Note that p_i^e is measured in the domestic currency. τ_i^p and τ_i^s are the tax rates of a production tax imposed on the production of Z_i and the subsidy rate, respectively. The values of τ_i^p and τ_i^s are calculated by using the actual social accounting matrix, and the calculated values are given in Table 2-1 and 2-3. The decomposition is assumed to follow the Cobb-Douglas technology such that:

$$Z_i = E_i^{\kappa_i^e} D_i^{\kappa_i^d}, \quad i = 1, 2, \dots, 107, \quad (7)$$

where $\kappa_i^d + \kappa_i^e = 1$ ($i = 1, 2, \dots, 107$) is assumed. Each firm is assumed to maximize (6) with respect to E_i and D_i subject to (7), and the first order conditions yield

⁶The estimated values of $ax_{i,j}$ are not presented in Table 2, since the number of the estimated values reach 11,449. The estimated values are given upon request.

$$E_i = E_i(p_i^e, p_i^d, p_i^Z; \tau_i^p, \tau_i^s, \kappa_i^d, \kappa_i^e) = \frac{\kappa_i^e (1 + \tau_i^p - \tau_i^s) p_i^Z Z_i}{p_i^e}, \quad (8a)$$

$$D_i = D_i(p_i^e, p_i^d, p_i^Z; \tau_i^p, \tau_i^s, \kappa_i^d, \kappa_i^e) = \frac{\kappa_i^d (1 + \tau_i^p - \tau_i^s) p_i^Z Z_i}{p_i^d}, \quad i = 1, 2, \dots, 107. \quad (8b)$$

Note that κ_i^e and κ_i^d can be calculated by using (8a), (8b), and the actual social accounting matrix so that:

$$\begin{aligned} \kappa_i^e &= \frac{p_i^e E_i}{(1 + \tau_i^p - \tau_i^s) p_i^Z Z_i}, \\ \kappa_i^d &= \frac{p_i^d D_i}{(1 + \tau_i^p - \tau_i^s) p_i^Z Z_i}, \quad i = 1, 2, \dots, 107, \end{aligned}$$

where $p_i^e E_i$, $p_i^d D_i$, $p_i^Z Z_i$, $\tau_i^s p_i^Z Z_i$, and $\tau_i^p p_i^Z Z_i$ can be obtained from the actual social accounting matrix. The estimated values of κ_i^e and κ_i^d are given in Table2.

Step 4: The Production of the final goods

Denote the final consumption goods by Q_i ($i = 1, 2, \dots, 107$). The final consumption goods are assumed to be produced by using the final domestic goods, D_i , and the imported goods, M_i . This step corresponds to the optimal decision making behavior of each firm in terms of the amount of imported goods which are used in its production process. The production technology at this final step is given by the following Cobb-Douglas function:

$$Q_i = M_i^{\gamma_i^m} D_i^{\gamma_i^d}, \quad i = 1, 2, \dots, 107, \quad (9)$$

where $\gamma_i^m + \gamma_i^d = 1$ ($i = 1, 2, \dots, 107$) is assumed. Each firm is assumed to maximize its profit with respect to M_i and D_i subject to (9). Its profit is given by:

$$\pi_i = p_i^Q Q_i - (1 + \tau_i^m) p_i^m M_i - p_i^d D_i, \quad i = 1, 2, \dots, 107,$$

where p_i^Q and τ_i^m denote the price of its final consumption goods, Q_i , and the import tariff rate, respectively. The import tariff rate is calculated by using the actual social accounting matrix, and it is given in Table 2-2. Then, the first order conditions yield

$$M_i = M_i \left(p_i^m, p_i^d, p_i^Q; \tau_i^m, \gamma_i^m, \gamma_i^d \right) = \frac{\gamma_i^m p_i^Q Q_i}{(1 + \tau_i^m) p_i^m}, \quad (10a)$$

$$D_i = D_i \left(p_i^m, p_i^d, p_i^Q; \tau_i^m, \gamma_i^m, \gamma_i^d \right) = \frac{\gamma_i^d p_i^Q Q_i}{p_i^d}, \quad i = 1, 2, \dots, 107. \quad (10b)$$

Note that γ_i^m and γ_i^d can be calculated by using (10a), (10b), and the actual social accounting matrix so that:

$$\gamma_i^m = \frac{(1 + \tau_i^m) p_i^m M_i}{p_i^Q Q_i},$$

$$\gamma_i^d = \frac{p_i^d D_i}{p_i^Q Q_i}, \quad i = 1, 2, \dots, 107,$$

where $p_i^m M_i$, $p_i^d D_i$, $p_i^Q Q_i$ and $\tau_i^m p_i^m M_i$ can be obtained from the actual social accounting matrix. The estimated values of γ_i^m and γ_i^d are given in Table 1.

<The Government>

The government is assumed to impose several taxes to satisfy its budget constraint. Its budget constraint is given by:

$$\sum_{i=1}^{107} p_i^Q X_i^g + S^g + Sub = T^I + T^p + T^m,$$

where the left hand side is the total government expenditure, and the right hand side is the total government revenue. X_i^g and S^g denote government consumption of final consumption good i , and government savings, respectively. Sub denotes the total amount of subsidies such that:

$$Sub = \sum_{i=1}^{107} \tau_i^s (p_i^Z Z_i).$$

The total tax revenue is given by:

$$T^I = \tau^I I = \tau^I \left(\sum_{i=1}^{107} r_i \bar{K}_i + \sum_{i=1}^{107} w_i \bar{L}_i \right),$$

$$T^p = \sum_{i=1}^{107} \tau_i^p (p_i^Z Z_i),$$

$$T^m = \sum_{i=1}^{107} \tau_i^m (p_i^m M_i),$$

where T^I , T^p , and T^m denote the total income tax revenue, the total production tax revenue, and the total import tariff revenue, respectively. The government is assumed to save the constant amount relative to the total amount of tax revenue, and the government savings are assumed to be given by

$$S^g = s^g (T^I + T^p + T^m),$$

where the constant ratio, s^g , is given exogenously, and its value has been calculated by using the actual SAM.

<Equilibrium Conditions>

There are two factor inputs, labour and capital. Since the model is static and thus the short-run effect is explored, it is assumed that each factor cannot move among different sectors (industries) in the short-run. This implies the equilibrium conditions of factor markets such that

$$\bar{K}_i = K_i, \quad (11a)$$

$$\bar{L}_i = L_i, \quad i = 1, 2, \dots, 107, \quad (11b)$$

where the total amount of endowments is given by:

$$\bar{K} = \sum_{i=1}^{107} \bar{K}_i,$$

$$\bar{L} = \sum_{i=1}^{107} \bar{L}_i.$$

Note that r_i and w_i ($i = 1, 2, \dots, 107$) are determined in order to satisfy (11a) and (11b), respectively.

In terms of the market clearing condition of good i ($i = 1, 2, \dots, 107$), a private investment sector is introduced in order to close the economy in this paper⁷. Denoting the amount of good i consumed by the private investment sector by X_i^s , the market clearing condition of good i is given by:

$$Q_i = X_i + X_i^g + X_i^s + \sum_j^{107} X_{i,j}, \quad i = 1, 2, \dots, 107, \quad (12)$$

where the left hand side is the total supply, and the right hand side is the total demand for good i . p_i^Q ($i = 1, 2, \dots, 107$) is determined in order to satisfy (12). Note that the budget constraint of the private investment sector is given by:

$$\sum_{i=1}^{107} p_i^Q X_i^s = S^g + S^I + S^f,$$

where the left hand side is the total amount of its consumption, and the right hand side is

⁷This is also the conventional assumption in the literature.

the total amount of its income. S^f denotes the total amount of savings by the foreign sector, or the deficits in the current account, and it is given by subtracting exports from imports⁸. Since both the amount of exports and the amount of imports can be obtained from the actual social accounting matrix, S^f can be calculated from the actual social accounting matrix, and thus it is exogenously given in the model. Furthermore, the foreign trade balance is given by

$$\sum_{i=1}^{107} p_i^{w,e} E_i + S^f = \sum_{i=1}^{107} p_i^{w,m} M_i,$$

where $p_i^{w,e}$ and $p_i^{w,m}$ denote the world price of export goods, and import goods of good i , respectively, and both of them are assumed to be given exogenously. Since p_i^e and p_i^m are both measured in the domestic currency, they are also expressed such that:

$$\begin{aligned} p_i^e &= \varepsilon p_i^{w,e}, \\ p_i^m &= \varepsilon p_i^{w,m}, \quad i = 1, 2, \dots, 107, \end{aligned}$$

where ε denotes the exchange rate. Note that the exogeneity assumption on the world prices implies that the exchange rate is endogenously determined within the model.

3 Simulation Analysis

3.1 Benchmark and Calibration

The benchmark case should reflect the real Japanese economy in order to make the subsequent simulation scenarios realistic. Thus, the benchmark model should carefully be calibrated until the calculated values of all endogenous variables within the model become close to the actual values. Table 4-1 to 4-4 show the calculated model values as well as the cor-

⁸The FDI is assumed to be negligible in this paper.

responding actual values in year 2005. Note that the tax rates and the subsidy rates shown in Table 2-1 to 2-3 have been calculated by using the actual amount of taxes collected and subsidies, so that they can be interpreted as the average proportional rates. Note that the following production sectors are particularly relevant to this paper; Medicaments ($i = 26$), Medical Service and Health ($i = 94$), Social Security ($i = 95$), and Nursing Care ($i = 96$). Note that the pharmaceutical industry is included in Medicaments ($i = 26$), private hospitals and the private medical analyzing industry are in Medical Service and Health ($i = 94$), private nurseries and nursing homes are categorized in Social Security ($i = 95$), and the long term care for the elderly is in Nursing Care ($i = 96$).

As shown in Table 4-1 to 4-4, the benchmark case has successfully been able to reproduce the real economy within the model. The actual and calculated values of the above 4 sectors are again shown below:

Economic Values in the Benchmark Model

(Unit: one million Japanese yen)

Final Consumption Goods

($P_i^Q Q_i$; $i = 26, 94, 95, \text{ and } 96$)

i	26	94	95	96
model	7,287,054	37,209,390	6,616,330	6,387,536
actual	7,287,054	37,209,390	6,616,330	6,387,536

Medicaments ($i = 26$), Medical Service and Health ($i = 94$), Social Security ($i = 95$), and Nursing Care ($i = 96$)

Capital Income

($r_i K_i$; $i = 26, 94, 95, \text{ and } 96$)

i	26	94	95	96
model	1,438,660	4,579,116	283,558	807,134
actual	1,438,660	4,579,116	283,558	807,134

Medicaments ($i = 26$), Medical Service and Health ($i = 94$), Social Security ($i = 95$), and Nursing Care ($i = 96$)

Labour Income

$(w_i L_i; i = 26, 94, 95, \text{ and } 96)$

i	26	94	95	96
model	1,046,236	16,267,535	4,407,172	3,816,420
actual	1,046,236	16,267,535	4,407,172	3,816,420

Medicaments ($i = 26$), Medical Service and Health ($i = 94$), Social Security ($i = 95$), and Nursing Care ($i = 96$)

Calculated values of the production tax rate and the subsidy rate of the relevant 4 sectors by using the actual SAM are also presented again as follows:

Production Tax Rate

$(\tau_i^P; i = 26, 94, 95, \text{ and } 96)$

i	26	94	95	96
calculated	2.718%	1.776%	0.656%	1.918%

Medicaments ($i = 26$), Medical Service and Health ($i = 94$), Social Security ($i = 95$), and Nursing Care ($i = 96$)

Subsidy Rate

$(\tau_i^S; i = 26, 94, 95, \text{ and } 96)$

i	26	94	95	96
calculated	0.004%	2.119%	0.012%	0.700%

Medicaments ($i = 26$), Medical Service and Health ($i = 94$), Social Security ($i = 95$), and Nursing Care ($i = 96$)

Note that the production tax rate for the sector ($i = 26$) which includes the pharmaceutical industry is the highest (2.718%), and also that the subsidy rate for the sector ($i = 94$) which includes the private hospitals and the private medical sample analyzing industry is the highest (2.11%). Since the benchmark case successfully re-produces the actual Japanese economy, it is now used to compare the current Japanese economy with possible situations caused by several different tax, transfer, and subsidy policies in the next section.

3.2 Simulations

Two policy instruments, namely a production tax, and a subsidy, are considered in this paper. In particular, these instruments related to the following sectors are explored; Medicaments ($i = 26$), Medical Service and Health ($i = 94$), Social Security ($i = 95$), and Nursing Care ($i = 96$). The economic activities of the pharmaceutical industry is shown in Medicaments ($i = 26$), and the private medical service sectors such as private hospitals and the private medical analyzing industry are categorized in Medical Service and Health ($i = 94$). Nursing Care ($i = 96$) shows the economic activities of the industry of the long-term care for the elderly. Social Security ($i = 95$) includes activities of private nurseries and nursing homes.

Any policy changes must be followed by changes in revenue as well as expenditure. This paper explicitly takes into account the budget constraint of the government. Simulation results depend upon the assumption regarding how the government fulfill its budget constraint after the policy change. This paper simulates several policies followed by the two financing methods; a debt financing policy or an income tax financing policy.

When the shortage in the government revenue caused by the policy change is financed by issuing government bonds in a scenario, then the scenario only considers the direct effect of the policy change, since all other policy instruments remain unchanged⁹. Since the framework of this paper is static, the long-run effect of government bonds in the capital market is beyond our concern. Obviously, this assumption might be inconsistent to the general equilibrium

⁹The government expenditure is assumed to be unchanged as well.

framework. However, it can investigate the pure and thus the direct effect of the policy change. Note also that the budget constraint of the government is satisfied by debt financing, and thus in this sense it is consistent to a static general equilibrium model.

On the other hand, if the shortage is financed completely within a general equilibrium framework in a static model, then it must be financed through the change in a tax, transfer, and/or subsidy policies, if the government expenditure does not change. In this case, the effect of another policy change to finance the shortage is also involved, and the result generated by such a mixed policy is more difficult to interpret, while it is consistent to a static framework. This paper assumes that an income tax on the individual is only used to finance the gap between revenue and expenditure after the policy change. This implies that the income tax rate is endogenously determined in order to satisfy the budget constraint of the government. Note that the income tax is not distortionary in this paper, and the substitution effect is not involved.

The following 4 scenarios are explored based on two policy instruments and the financing methods:

Simulation Scenarios		
	Method 1 (debt financing)	Method 2 (income tax financing)
Production Tax	P-1	P-2
Subsidies	S-1	S-2

The above two policy instruments are changed only for the four sectors; Medicaments ($i = 26$), Medical Service and Health ($i = 94$), Social Security ($i = 95$), and Nursing Care ($i = 96$). Note that the debt financing method (Method 1) only considers the pure effect of policy changes, since it does not take into account the budget constraint of the government explicitly. In this paper, the following scenarios are investigated.

<P-1: a decrease in the production tax rate followed by issuing government bonds>

Scenario P-1 explores the effect of the change in the production tax rate. In this scenario, the production tax is a policy instrument, and all other policy instruments, including the government expenditure, remain unchanged. The effect of a decrease in the production tax rate is studied. In order to satisfy the budget constraint, the government is assumed to issue government bonds. The calculated production tax rates of 4 sectors (Medicaments ($i = 26$), Medical Service and Health ($i = 94$), Social Security ($i = 95$), and Nursing Care ($i = 96$)) obtained by using the actual SAM are simulated to decrease by 5, and 10% from the benchmark rates. Note that the benchmark rates have been calculated by using the actual SAM, and also that they are actual average rates, which are shown in the previous section as well as in Table 2-1.

<P-2: a decrease in the production tax rate followed by an increase in the income tax rate>

The difference between P-1 and P-2 is found in the financing method. In scenario P-2, an income tax is used to finance the gap between revenue and expenditure rather than issuing government bonds. The income tax rate is endogenously calculated in order to satisfy the budget constraint of the government, when the effect of a decrease in the production tax rate is simulated.

<S-1: an increase in the subsidy rate followed by issuing government bonds>

Scenario S-1 uses the amount of subsidies as a policy instrument. In this scenario, the government increases the amount of subsidies, and it also issues government bonds to finance the gap between revenue and expenditure. The actual subsidy rates obtained by using the actual SAM are shown in the previous section as well as in Table 2-3. In this scenario, The calculated subsidy rates of 4 sectors (Medicaments ($i = 26$), Medical Service and Health ($i = 94$), Social Security ($i = 95$), and Nursing Care ($i = 96$)) are simulated to increase by 5, and 10% from the benchmark rates.

<S-2: an increase in the subsidy rate followed by an increase in the income

tax rate>

The difference between S-1 and S-2 is found in the financing method. In scenario S-2, an income tax is used to finance the gap between revenue and expenditure rather than issuing government bonds. The income tax rate is endogenously calculated in order to satisfy the budget constraint of the government, when the effect of an increase in the subsidy rate is simulated.

Method 1 (**P1** and **S1**) is the simplest case where the gap between revenue and expenditure caused by a policy change is financed by the issuance of government bonds, which is given from the outside of the model. Thus, the income tax rate for the household, the productions tax rates and the subsidy rates for all other production sectors remain unchanged. On the other hand, Method 2 (**P2** and **S2**) considers other policy instruments to satisfy the budget constraint. In this paper the income tax is used to finance the gap between revenue and expenditure, and the income tax rate is endogenously determined in order to satisfy the budget constraint.

3.3 Evaluation of the Simulation Results

In order to evaluate each simulation, a common indicator should be introduced apart from the effects on relevant economic variables. In this paper the equivalent variation is used in order to evaluate the effect on welfare. The effect on the whole economy should be explored by the change in utility. Before moving on to the evaluation of the effect of policy changes on the whole economy, this paper summarizes the effect on the medical service sector and the pharmaceutical industry as follows.

3.3.1 The Effect on the Pharmaceutical Industry ($i = 26$)

The Effect on its revenue $\left(P_{26}^Q Q_{26}\right)$:

The pharmaceutical industry ($i = 26$) obtains larger benefits by a decrease in the production tax rate of the 'Medical Service and Health' sector ($i = 94$) rather than a decrease in its

own production tax rate, although the production tax rate of the pharmaceutical industry is higher than that of the 'Medical Service and Health' sector. This result does not depend on the financing method, while the magnitude of the effect is different between debt financing and income tax financing. Table 4-1 and 4-2 show the effects of **P1** (debt financing) and **P2** (income tax financing) on its revenue $(P_{26}^Q Q_{26})$, respectively. The second table in Table 4-1 (**P1**) shows that a 10% decrease in its own production tax rate only results in a 0.01388% increase in its revenue, while the same decrease in the production tax rate of the 'Medical Service and Health' sector ($i = 94$) results in a 0.172255% increase in its revenue. The second table in Table 4-2 (**P2**) also shows that the effect of the 10% decrease in the production tax rate of the 'Medical Service and Health' sector ($i = 94$) becomes smaller, but it still results in a 0.152621% increase in its revenue, which is larger than the case when its own production tax rate increases (a 0.009210% increase). This is because the pharmaceutical industry ($i = 26$) heavily relies on the 'Medical Service and Health' sector ($i = 94$), and also because the economic size of the 'Medical Service and Health' sector ($i = 94$) is much larger than that of the pharmaceutical industry. Note that 'Medical Service and Health' sector ($i = 94$) includes the private hospitals and the private medical analyzing industry. Thus, the effect of the same decrease in the production tax rate eventuates in a different increase in the revenue of the pharmaceutical industry, and the high dependency of the pharmaceutical industry on the 'Medical Service and Health' sector ($i = 94$) results in the reduction of the production tax rate of the 'Medical Service and Health' sector ($i = 94$) being more beneficial to the pharmaceutical industry, rather than the reduction of its own production tax rate.

As shown in Table 4-3 and 4-4, the same result can be obtained when the subsidy rate increases (**S1** and **S2**)¹⁰. Furthermore, the pharmaceutical industry obtains the largest benefits by a 10% increase in the subsidy rate of the 'Medical Service and Health' sector ($i = 94$) rather than the same increase in its own subsidy rate, when an increase in the subsidy rate is financed by the issuance of government bonds. Table 4-3 shows that the revenue of the

¹⁰Table 7 shows the endogenous income tax rates for all simulation cases (P2 and S2).

pharmaceutical industry would increase by 0.205% when the subsidy rate for 'Medical Service and Health' sector ($i = 94$) increases by 10% with debt financing. Note that an increase in revenue by sales of its final product does necessarily not imply an increase in income or factor payments of the pharmaceutical industry, since a policy change also induces changes in prices of imported goods, and intermediate goods which the pharmaceutical industry uses for its production. Then the effect of tax and subsidy policies on factor payments is more important for the pharmaceutical industry, since factor payments are net fruits (benefits) the industry obtains from policy changes.

The Effect on its Income, Factor Payments ($r_{26}K_{26} + w_{26}L_{26}$) :

Table 5-1 and 5-2 show the effect of a decrease in the production tax rate and an increase in the subsidy rate on factor payments, respectively. First of all, the effect of an increase in its own subsidy rate is very little as shown in Table 5-2. Secondly, similar to the effect on the revenue, the pharmaceutical industry obtains larger benefits by an increase in the subsidy rate of the 'Medical Service and Health' sector ($i = 94$) rather than an increase in its own subsidy rate. For instance, a 10% increase in the subsidy rate of the 'Medical Service and Health' sector ($i = 94$) results in a 0.2056% increase in the factor payments of the pharmaceutical industry, while the same increase in its own subsidy rate only results in a 0.0004% increase when debt financing is used. Thirdly, however, when a production tax rate is reduced, the effect is different from that on the revenue: As Table 5-1 shows, a decrease in its own production tax rate induces a larger increase in factor payments irrespective of its financing method. For instance, a 10% decrease in its own production tax rate results in a 0.2793% increase in its factor payments, while the same decrease in the production tax rate of the 'Medical Service and Health' sector ($i = 94$) induces a 0.1723% increase with debt financing. While high dependency of the pharmaceutical industry on the 'Medical Service and Health' sector ($i = 94$) is found in terms of the effect on its revenue, the effect on the net fruits (benefits) is different. This is because the production tax rate of the pharmaceutical industry is the higher than that of the 'Medical Service and Health' sector ($i = 94$), and a

decrease in its own production tax rate eventuates in the largest increase in the net fruits (benefits) for the pharmaceutical industry.

Note that P1 or S1 always induces a larger increase in revenue and factor payments than P2 or S2, since the current society does not bear any cost caused by a decrease in the production tax rate or an increase in the subsidy rate with debt financing (P1 and S1). The above results also imply that the pharmaceutical industry obtains the largest net fruits (benefits) or factor payments when its own production tax rate decreases, while its revenue increases most when the subsidy rate of the 'Medical Service and Health' sector ($i = 94$) increases due to its high dependency on the 'Medical Service and Health' sector ($i = 94$). The pharmaceutical industry is most better off when the government decreases its own production tax rate. However, as Table 5-1 shows, all other 3 sectors are worse off when a decrease in the production tax rate of the pharmaceutical industry is followed by an increase in the income tax rate. Thus, when the budget constraint of the government is explicitly taken into account, there is always a trade off in terms of the effect on factor payments between 4 related medical sectors.

3.3.2 The Effect on Private Hospitals and Medical Analyzing Industry ($i = 94$)

The economic activities of the 'Medical Service and Health' sector ($i = 94$) which includes private hospitals and private medical analyzing industry is the largest compared to other three sectors, and the effects of policy changes are analyzed as follows.

The Effect on its revenue $(P_{94}^Q Q_{94})$:

Table 4-1 (**P1**) and 4-3 (**S1**) show the effects of a decrease in the production tax rate and an increase in the subsidy rate, respectively, when policy changes are financed by the issuance of government bonds. As both tables show, a decrease in its own production tax rate and/or an increase in its own subsidy rate results in the largest increase in its revenue, while the magnitude of the effect is very small. For instance, even when its own production tax rate decreases by 10%, its revenue only increases by 0.012% (**P1**). When its subsidy rate

increases by 10%, the magnitude of an increase in its revenue is only 0.015% (**S1**). Thus, as long as the effect on its revenue is concerned, both policies of a decrease in the production tax rate and an increase in the subsidy rate have very little effect. As discussed in the previous section, the effect of both policies is much larger on the pharmaceutical industry than on its own sector.

Table 4-2 (**P2**) and 4-4 (**S2**) show the effects of both policy changes when policy changes are followed by an increase in the income tax rate. In these cases, the current society bears the cost caused by policy changes through an increase in the income tax rate. In both cases, the revenue eventually decreases although its production tax rate decreases or its subsidy rate increases. This is because an increase in the income tax rate to finance the shortage of the government revenue decreases the disposal income of individuals, and thus it eventuates in a decrease in demand for Q_{94} . Thus, as long as the shortage of the government revenue is financed by an increase in the income tax rate, policy changes always reduce the revenue of private hospitals and the private medical analyzing industry.

The Effect on its Income, Factor Payments ($r_{94}K_{94} + w_{94}L_{94}$) :

Table 5-1 and 5-2 show the effect on the factor payments. As both tables show, factor payments always increase irrespective of the financing method, while policy changes always reduce the revenue when the shortage of the government revenue is financed by an increase in the income tax rate. The comparison between Table 5-1 and 5-2 also shows that factor payments increases more when its own subsidy rate increases. For instance, when its own subsidy rate increases by 10% followed by debt financing, then its factor payments increases by 0.2282%. This implies that private hospitals and the private medical analyzing industry are most better off when the government increases their own subsidy rate. However, when an increase in its own subsidy rate is followed by an income tax financing, the factor payments of sectors $i = 95$ and 96 decrease as shown in Table 5-2, and only private hospitals, the medical analyzing industry, and the pharmaceutical industry ($i = 26, 94$) are better off when the subsidy rate of the sector $i = 94$ increases.

3.3.3 The Effect on Private Nurseries and Nursing Homes ($i = 95$)

The production tax rate of the 'Social Security' sector ($i = 95$) is the lowest (0.656%), and the subsidy rate is also very low (0.012%). Simulation results are as follows.

The Effect on its revenue $(P_{95}^Q Q_{95})$:

Since both of its own production tax rate and its own subsidy rate are quite low, policy changes of its own rates have very little effect. Private nurseries and nursing homes are more affected by changes in the rates of the 'Medical Service and Health' sector ($i = 94$) rather than the changes of its own rates. Table 4-1 and 4-3 show that the revenue increases most when the production tax rate or the subsidy rate of the 'Medical Service and Health' sector ($i = 94$) changes by 10% when debt financing method is used. For instance, the revenue increases by 0.026% (0.031%) when the production tax rate decreases (the subsidy rate increases) of the 'Medical Service and Health' sector ($i = 94$) by 10%. However, when an income tax financing method is used, the revenue decreases most if the same policy changes are conducted. The revenue decreases by 0.015% (0.018%) when the production tax rate decreases (the subsidy rate increases) of the 'Medical Service and Health' sector ($i = 94$) by 10%.

The Effect on its Income, Factor Payments $(r_{95}K_{95} + w_{95}L_{95})$:

Although the effect of policy changes in its own rates on factor payments is quite small, a decrease in its own production tax rate is the most effective instrument in order to increase the factor payments of this sector. As Table 5-1 shows, the factor payments increase by 0.06% when its own production tax rate decreases by 10%. This result does not depend on the financing method. Even when its own subsidy rate increases by 10%, its factor payments only increase by 0.0012%. While a decrease in its own production tax rate is the most effective to make this sector better off, the decrease slightly reduces the factor payments of the sectors of $i = 94$ and 96 when the income tax financing method is used.

3.3.4 The Effect on the Long-Term Nursing Care Industry ($i = 96$)

The 'Nursing Care' sector ($i = 96$) mainly includes the private long-term nursing care industry. Since the long-term nursing care system was launched in year 2000, the private sector of the long-term care has drastically expanded.

The Effect on its revenue $\left(P_{96}^Q Q_{96}\right)$:

Table 4-1 and 4-3 show that the effects of both a decrease in its own production tax rate and an increase in its own subsidy rate are very little. Table 4-1 also shows that the private long-term care industry depends on the sectors of $i = 26$ and 94. When debt financing method is used, a 10 % decrease in the production tax rate of the 'Medical Service and Health' sector ($i = 94$) most increases the revenue of the private long-term care industry (a 0.004% increase), while the same decrease in its own production tax rate only increases the revenue by 0.0007%. As long as debt financing method is used, the effect of an increase in the subsidy rate is the same, and an increase in the subsidy rate of the 'Medical Service and Health' sector ($i = 94$) is more effective to increase the revenue rather than the same increase in its own subsidy rate. When policy changes are followed by income tax financing, a decrease in its own production tax rate (an increase in its own subsidy rate) reduces not only the revenue of the long-term care industry but also other two sectors ($i = 94, 95$), while the reduction in revenue is very little. Only the pharmaceutical industry is better off when policy changes in the rates of the long-term nursing care industry are followed by income tax financing.

The Effect on its Income, Factor Payments $\left(r_{96}K_{96} + w_{96}L_{96}\right)$:

Table 5-1 shows that a decrease in its own production tax rate is most effective to increase its factor payments. A 10% decrease in its own production tax rate induces roughly a 0.19% increase in its factor payments irrespective of the financing method, while a 10% increase in its own subsidy rate results in only a 0.069% increase in it. Both a 10% decrease in its own production tax rate and a 10% increase in its own subsidy rate slightly decrease the factor

payments of the sectors of $i = 94$ and 95 when an income tax financing method is used.

As the above results show, there is always a trade-off between the relevant four sectors in terms of the effect on their factor payments. When the cost of a decrease in the production tax rate or an increase in the subsidy rate is explicitly considered through changes in the endogenous income tax rate in order to fulfill the budget constraint of the government, then a policy change which makes a medical service industry better off always eventuates in other medical service industries being worse off. The pharmaceutical industry is most better off when its own production tax rate decreases, while all other sectors are worse off. Private hospitals and the medical analyzing industry are most better off by an increase in their own subsidy rate, while this policy change makes other two sectors ($i = 95$ and 96) worse off. Private nurseries and nursing homes are most better off by a decrease in their production tax rate, while other two sectors ($i = 94$ and 96) are slightly worse off. The private long-term nursing care industry is most better off by the reduction of its own production tax rate, while other two sectors ($i = 94$ and 95) are slightly worse off. In addition, the pharmaceutical industry is the only sector which never becomes worse off by the best policy of all other sectors, and the best policy for a sector always reduces the factor payments of other sectors except for the pharmaceutical industry.

Now the effect of tax and subsidy policies for medical sectors on the whole economy is investigated in the next section.

3.3.5 The Effect on the Welfare of the Whole Economy

While different tax and subsidy policies have different effects on the four sectors, policy changes also have the effect on the welfare of the whole economy. The effect on welfare is measured by the equivalent variation in this paper. Table 6-1 and 6-2 show the equivalent variation of each policy change. Note that the equivalent variation provides a financial measure to evaluate the effect of policy changes on the whole economy. Note also that the current society does not bear any cost caused by policy changes with debt financing (**P1**

and **S1**), and a decrease in the production tax rate or an increase in the subsidy rate always increases welfare. The comparison between **P1** and **S1** evaluates the effect of the difference in policy instruments; the production tax policy or the subsidy policy. As both tables show, a 10% increase in the subsidy rate of the sector of $i = 94$, which includes private hospitals and the medical analyzing industry, is the most preferable to the Japanese society when the budget constraint of the government is not considered explicitly. The welfare gain by such a policy change is measured to be approximately 97,402 million yen. The 10% increase in the subsidy rate of the sector of $i = 94$ is also most preferable for all other sectors, as shown in Table 5-2. The factor payments of all four sectors increase most by such a policy. On the other hand, if the budget constraint of the government is considered explicitly and thus the society bears the cost generated by the policy change, then such a policy becomes most undesirable as both tables show. When the budget constraint is explicitly considered, the subsidy on the pharmaceutical industry is the best policy instrument in order to minimize the welfare loss caused by the policy change. The policy change in the subsidy rate of the pharmaceutical industry is least distortionary. Note that the equivalent variation of any policy change is always negative as long as the budget constraint of the government is explicitly considered. This surprising result can be explained as follows: The key element to result in a decrease in welfare by policy changes is the fulfilled budget constraint of the government. Note that an income tax is proportional to income, and it is not distortionary when the labor-leisure relationship is not considered, while a production tax and a subsidy are both distortionary. When the government uses a tax to fulfill its budget constraint, an increase in the tax rate of a non-distortionary tax induces a more welfare loss. This is the reverse situation when a non-distortionary tax is used to finance a certain amount of revenue rather than a distortionary tax. A non-distortionary tax achieves higher utility to finance a certain amount of revenue than a distortionary tax. This implies that the smaller amount of a non-distortionary tax collected is needed to maintain the same utility level. If the government uses a non-distortionary tax to finance the same amount of revenue as before,

then utility should decrease. Note also that a decrease in the production tax rate improves efficiency, while an increase in the subsidy rate decreases efficiency. Thus, A welfare loss is smaller when the production tax rate decreases than when the subsidy rate increases. If the budget constraint of the government is also considered explicitly, the welfare loss of a 10% increase in the subsidy rate of the sector of $i = 94$ is measured to be 54,256 million yen, while the welfare loss is 45,443 million yen when a 10% decrease in the production tax rate of the sector of $i = 94$ is conducted. Table 7 also indicates that the income tax rate should increase most when the production tax rate or the subsidy rate of the sector of $i = 94$ changes by 10%. In particular, when the subsidy rate of the sector of $i = 94$ increases by 10%, the relative change in the endogenous income tax rate is the largest (a 0.05386% increase), thus resulting in a largest decrease in the disposal income of individuals.

4 Concluding Remarks

This paper has presented a computable general equilibrium (CGE) framework to numerically examine the effect of tax and subsidy policies on the private medical service sector and the pharmaceutical industry.

This paper has used the latest Input-Output table of Japan of year 2005 with 108 different production sectors, and it has evaluated the effect of several tax and subsidy policies on the economic performance of the private medical service sector and the pharmaceutical industry as well as on welfare of the economy.

Several simulations have been conducted with our very realistic parameter values, and the obtained results are as follows. First of all, the subsidy for the medical service sector, which includes private hospitals and private medical sample analyzing firms, is the best policy instrument among all other tax and subsidy policies for the medical sectors in order to enhance the welfare of the whole Japanese economy, as long as the cost of policy changes in the budget constraint of the government is not considered explicitly: A welfare gain is

measured to be approximately 97,402 million yen when the subsidy rate of the sector which includes private hospitals and the medical analyzing industry increases by 10%. The 10% increase in the subsidy rate is also most preferable for all individual medical sectors as well. Secondly, however, if the budget constraint of the government is explicitly considered and thus the shortage of the government revenue caused by the 10 increase in the subsidy rate is financed by a non-distortionary income tax on individuals, then such a policy becomes the worst, and the effect becomes reverse: The welfare loss by such a policy is measured to be approximately 54,256 million yen. This result indicates the importance of the explicit consideration of the budget constraint of the government when policy changes are simulated. Thirdly, the effect of tax and subsidy policies on individual medical sectors differs. There is always a trade-off among different medical sectors in terms of the effect on their net benefits, or factor payments except for the pharmaceutical industry. Fourthly, the high dependency of the pharmaceutical industry with other medical sectors is found. In particular the pharmaceutical industry heavily depends on the medical sector of private hospitals and the medical sample analyzing industry. Finally, the pharmaceutical industry is most better off not by a decrease in its own production tax rate but by a decrease in the production tax rate of private hospitals and the medical sample analyzing industry.

While this paper has used the Japanese input-output table, it is applicable to all other countries in order to investigate the effect of several policies related to the medical services sector. Furthermore, the model can easily be generalized by incorporating any other instruments than an income tax on individuals in order to finance the shortage of the government revenue caused by policy changes into the model. If other distortionary taxes are used to finance the shortage, then the effect on welfare would be different. However, by explicitly considering the budget constraint within a computable general equilibrium framework, this paper has thrown light on the importance of the explicit consideration of the government budget constraint when simulations on tax and subsidy policies are conducted.

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Figure 1: Structure

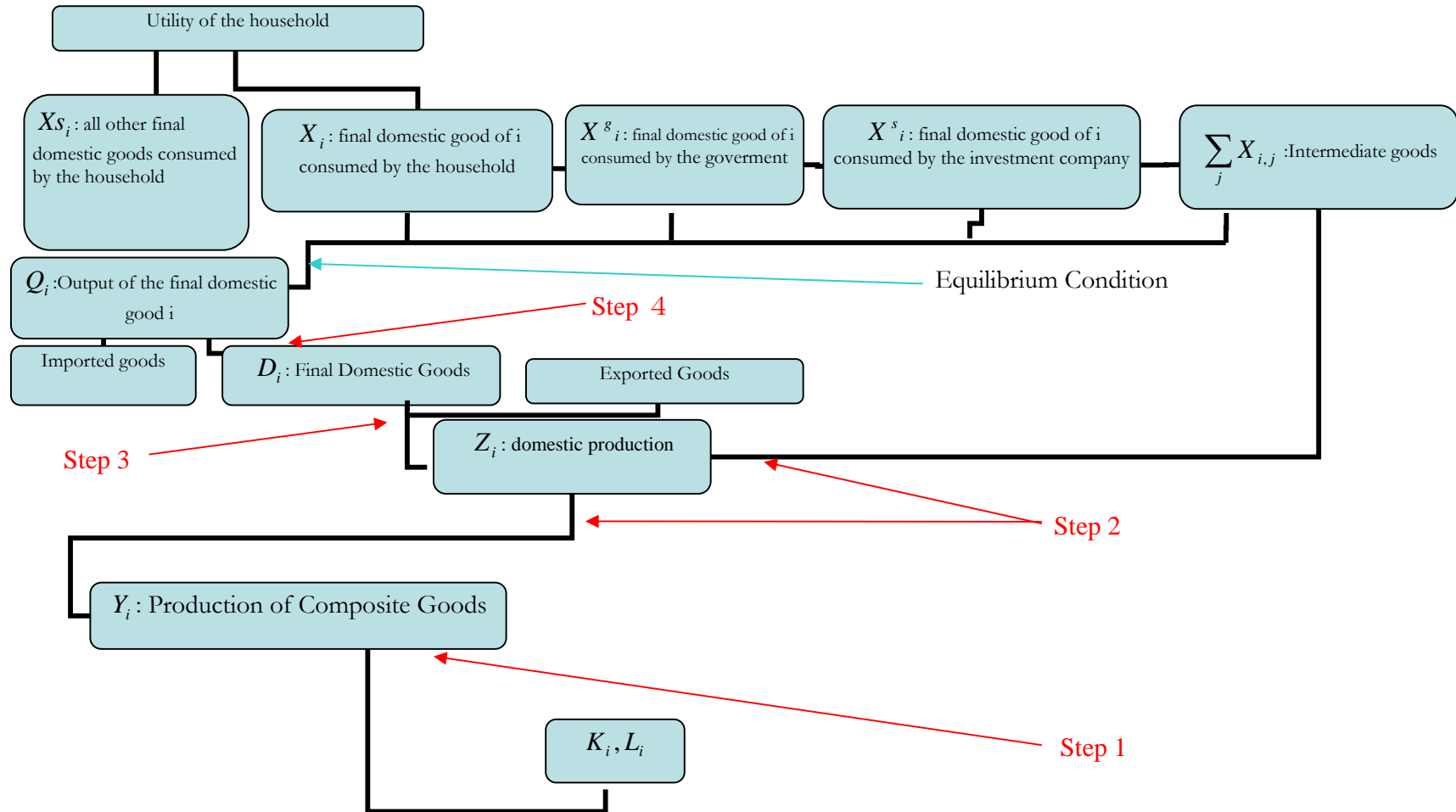


Table 1: Parameter Values
 $ALPHA(i) = \alpha_i; i = 1, 2, \dots, 107$

ALPHA(1)	ALPHA(2)	ALPHA(3)	ALPHA(4)	ALPHA(5)	ALPHA(6)	ALPHA(7)	ALPHA(8)	ALPHA(9)	ALPHA(10)	ALPHA(11)	ALPHA(12)	ALPHA(13)	ALPHA(14)	ALPHA(15)
0.008454	0.000697	0.000958	0.000563	0.001298	0.000000	-0.000051	0.000000	0.061399	0.020494	0.000777	0.010540	0.000647	0.012440	0.000165
ALPHA(16)	ALPHA(17)	ALPHA(18)	ALPHA(19)	ALPHA(20)	ALPHA(21)	ALPHA(22)	ALPHA(23)	ALPHA(24)	ALPHA(25)	ALPHA(26)	ALPHA(27)	ALPHA(28)	ALPHA(29)	ALPHA(30)
0.000860	-0.000143	0.001110	0.000310	0.000021	0.000047	0.000000	0.000001	0.000000	0.000000	0.002072	0.007346	0.019774	0.000005	0.001354
ALPHA(31)	ALPHA(32)	ALPHA(33)	ALPHA(34)	ALPHA(35)	ALPHA(36)	ALPHA(37)	ALPHA(38)	ALPHA(39)	ALPHA(40)	ALPHA(41)	ALPHA(42)	ALPHA(43)	ALPHA(44)	ALPHA(45)
0.001304	0.003456	0.000226	0.000005	0.000202	0.000427	-0.000110	0.000000	0.000000	0.000000	0.000315	0.000048	0.000131	0.001049	0.000057
ALPHA(46)	ALPHA(47)	ALPHA(48)	ALPHA(49)	ALPHA(50)	ALPHA(51)	ALPHA(52)	ALPHA(53)	ALPHA(54)	ALPHA(55)	ALPHA(56)	ALPHA(57)	ALPHA(58)	ALPHA(59)	ALPHA(60)
0.000099	0.000001	0.000152	0.000082	0.000000	0.002079	0.007615	0.013658	0.003033	0.000005	0.000803	0.015434	0.002895	0.000037	0.000035
ALPHA(61)	ALPHA(62)	ALPHA(63)	ALPHA(64)	ALPHA(65)	ALPHA(66)	ALPHA(67)	ALPHA(68)	ALPHA(69)	ALPHA(70)	ALPHA(71)	ALPHA(72)	ALPHA(73)	ALPHA(74)	ALPHA(75)
0.000304	0.003085	0.005440	0.000086	0.000000	0.000000	0.000000	0.000000	0.015339	0.004461	0.006358	0.000813	0.163165	0.040117	0.001186
ALPHA(76)	ALPHA(77)	ALPHA(78)	ALPHA(79)	ALPHA(80)	ALPHA(81)	ALPHA(82)	ALPHA(83)	ALPHA(84)	ALPHA(85)	ALPHA(86)	ALPHA(87)	ALPHA(88)	ALPHA(89)	ALPHA(90)
0.040023	0.153327	0.013895	0.021978	0.000000	0.000848	0.007116	0.000420	0.000817	0.006671	0.024290	0.003689	0.004204	0.000372	0.005041
ALPHA(91)	ALPHA(92)	ALPHA(93)	ALPHA(94)	ALPHA(95)	ALPHA(96)	ALPHA(97)	ALPHA(98)	ALPHA(99)	ALPHA(100)	ALPHA(101)	ALPHA(102)	ALPHA(103)	ALPHA(104)	ALPHA(105)
0.002643	0.024685	0.000874	0.025467	0.014922	0.002219	0.013087	0.000018	0.002299	0.010085	0.003110	0.031930	0.072608	0.025772	0.017842
ALPHA(106)	ALPHA(107)													
0.025222	0.000000													

Table 1: Parameter Values (continued)
 $TETA(i) = ; i = 1, 2, \dots, 107$

TETA(1)	TETA(2)	TETA(3)	TETA(4)	TETA(5)	TETA(6)	TETA(7)	TETA(8)	TETA(9)	TETA(10)	TETA(11)	TETA(12)	TETA(13)	TETA(14)	TETA(15)
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.002854	0.000000	0.000000	0.000000	0.000005	0.000000	0.000015
TETA(16)	TETA(17)	TETA(18)	TETA(19)	TETA(20)	TETA(21)	TETA(22)	TETA(23)	TETA(24)	TETA(25)	TETA(26)	TETA(27)	TETA(28)	TETA(29)	TETA(30)
0.000125	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000037
TETA(31)	TETA(32)	TETA(33)	TETA(34)	TETA(35)	TETA(36)	TETA(37)	TETA(38)	TETA(39)	TETA(40)	TETA(41)	TETA(42)	TETA(43)	TETA(44)	TETA(45)
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	-0.000231	0.000000	0.000000	0.000000	0.000000	0.000000	0.000007	0.000015	0.000930
TETA(46)	TETA(47)	TETA(48)	TETA(49)	TETA(50)	TETA(51)	TETA(52)	TETA(53)	TETA(54)	TETA(55)	TETA(56)	TETA(57)	TETA(58)	TETA(59)	TETA(60)
0.000659	0.000033	0.000241	0.000536	0.001528	0.000354	0.000025	0.000893	0.001975	0.000000	0.000000	0.000188	0.000312	0.000000	0.000541
TETA(61)	TETA(62)	TETA(63)	TETA(64)	TETA(65)	TETA(66)	TETA(67)	TETA(68)	TETA(69)	TETA(70)	TETA(71)	TETA(72)	TETA(73)	TETA(74)	TETA(75)
0.000320	0.001057	0.000936	0.000000	0.023000	0.000000	0.139914	0.015876	0.000000	0.000000	-0.003126	0.008649	0.003668	0.000000	0.000000
TETA(76)	TETA(77)	TETA(78)	TETA(79)	TETA(80)	TETA(81)	TETA(82)	TETA(83)	TETA(84)	TETA(85)	TETA(86)	TETA(87)	TETA(88)	TETA(89)	TETA(90)
0.000000	0.000323	0.000001	0.000251	0.000000	0.000009	0.000001	0.000009	0.000016	-0.000682	0.000000	0.000000	0.009389	0.000000	0.000312
TETA(91)	TETA(92)	TETA(93)	TETA(94)	TETA(95)	TETA(96)	TETA(97)	TETA(98)	TETA(99)	TETA(100)	TETA(101)	TETA(102)	TETA(103)	TETA(104)	TETA(105)
0.319013	0.133885	0.012411	0.250054	0.018932	0.049862	0.000000	0.000000	0.000000	0.000000	0.004877	0.000000	0.000000	0.000000	0.000000
TETA(106)	TETA(107)													
0.000000	0.000000													

Table 1: Parameter Values (continued)

$$AY(i) = ay_i; i = 1, 2, \dots, 107$$

AY(1)	AY(2)	AY(3)	AY(4)	AY(5)	AY(6)	AY(7)	AY(8)	AY(9)	AY(10)	AY(11)	AY(12)	AY(13)	AY(14)	AY(15)
0.569112	0.259441	0.638091	0.714903	0.545627	0.502516	0.372137	0.509977	0.288914	0.399620	0.243640	0.558255	0.302586	0.326348	0.364356
AY(16)	AY(17)	AY(18)	AY(19)	AY(20)	AY(21)	AY(22)	AY(23)	AY(24)	AY(25)	AY(26)	AY(27)	AY(28)	AY(29)	AY(30)
0.335517	0.269011	0.365120	0.545367	0.300808	0.313485	0.079872	0.158423	0.196041	0.282342	0.383997	0.266826	0.038388	0.198565	0.297147
AY(31)	AY(32)	AY(33)	AY(34)	AY(35)	AY(36)	AY(37)	AY(38)	AY(39)	AY(40)	AY(41)	AY(42)	AY(43)	AY(44)	AY(45)
0.374181	0.363061	0.439348	0.394900	0.416436	0.421920	0.198469	0.206669	0.388615	0.217738	0.154559	0.229930	0.340688	0.457585	0.335708
AY(46)	AY(47)	AY(48)	AY(49)	AY(50)	AY(51)	AY(52)	AY(53)	AY(54)	AY(55)	AY(56)	AY(57)	AY(58)	AY(59)	AY(60)
0.342878	0.453480	0.202632	0.315002	0.281943	0.323336	0.263178	0.228452	0.225449	0.292368	0.239345	0.121935	0.128995	0.195727	0.257239
AY(61)	AY(62)	AY(63)	AY(64)	AY(65)	AY(66)	AY(67)	AY(68)	AY(69)	AY(70)	AY(71)	AY(72)	AY(73)	AY(74)	AY(75)
0.319016	0.375707	0.335744	0.387335	0.445074	0.427856	0.444292	0.467505	0.419332	0.296537	0.516646	0.707740	0.673664	0.630237	0.718393
AY(76)	AY(77)	AY(78)	AY(79)	AY(80)	AY(81)	AY(82)	AY(83)	AY(84)	AY(85)	AY(86)	AY(87)	AY(88)	AY(89)	AY(90)
0.784767	0.885020	0.605151	0.671504	0.000000	0.303933	0.243508	0.669003	0.600236	0.636452	0.648946	0.449275	0.602636	0.407587	0.440701
AY(91)	AY(92)	AY(93)	AY(94)	AY(95)	AY(96)	AY(97)	AY(98)	AY(99)	AY(100)	AY(101)	AY(102)	AY(103)	AY(104)	AY(105)
0.735921	0.851534	0.558195	0.558358	0.713532	0.732654	0.637750	0.294748	0.655198	0.361597	0.735262	0.631194	0.439779	0.470239	0.717599
AY(106)	AY(107)													
0.399887	0.000000													

Table 1: Parameter Values (continued)

$$GSAI(i) = \rho_i; i = 1, 2, \dots, 107$$

GSAI(1)	GSAI(2)	GSAI(3)	GSAI(4)	GSAI(5)	GSAI(6)	GSAI(7)	GSAI(8)	GSAI(9)	GSAI(10)	GSAI(11)	GSAI(12)	GSAI(13)	GSAI(14)	GSAI(15)
0.000418	0.001846	0.000000	0.007704	0.000023	0.000009	0.000378	-0.001540	0.001904	0.001241	0.000105	-0.000541	0.000953	0.001007	0.001002
GSAI(16)	GSAI(17)	GSAI(18)	GSAI(19)	GSAI(20)	GSAI(21)	GSAI(22)	GSAI(23)	GSAI(24)	GSAI(25)	GSAI(26)	GSAI(27)	GSAI(28)	GSAI(29)	GSAI(30)
0.003683	0.000401	-0.000053	0.000015	0.000003	0.000119	-0.000029	0.000609	0.000388	-0.000063	-0.000118	0.000100	-0.001943	0.000210	0.000776
GSAI(31)	GSAI(32)	GSAI(33)	GSAI(34)	GSAI(35)	GSAI(36)	GSAI(37)	GSAI(38)	GSAI(39)	GSAI(40)	GSAI(41)	GSAI(42)	GSAI(43)	GSAI(44)	GSAI(45)
0.000078	-0.000038	0.000057	0.000003	0.000154	0.000419	-0.001777	0.002139	0.000111	0.000180	-0.001248	0.002241	0.000520	0.003091	0.041242
GSAI(46)	GSAI(47)	GSAI(48)	GSAI(49)	GSAI(50)	GSAI(51)	GSAI(52)	GSAI(53)	GSAI(54)	GSAI(55)	GSAI(56)	GSAI(57)	GSAI(58)	GSAI(59)	GSAI(60)
0.071786	0.018354	0.029925	0.024607	0.015242	0.002979	0.002122	0.019012	0.032610	0.000412	-0.000317	0.035209	0.019425	0.001465	0.002726
GSAI(61)	GSAI(62)	GSAI(63)	GSAI(64)	GSAI(65)	GSAI(66)	GSAI(67)	GSAI(68)	GSAI(69)	GSAI(70)	GSAI(71)	GSAI(72)	GSAI(73)	GSAI(74)	GSAI(75)
0.014186	0.018706	0.011439	0.000000	0.304971	0.000000	0.001472	0.058366	0.000000	0.000000	0.000000	0.000000	0.136365	0.000000	0.000000
GSAI(76)	GSAI(77)	GSAI(78)	GSAI(79)	GSAI(80)	GSAI(81)	GSAI(82)	GSAI(83)	GSAI(84)	GSAI(85)	GSAI(86)	GSAI(87)	GSAI(88)	GSAI(89)	GSAI(90)
0.000000	0.000000	0.000015	0.007806	0.000000	0.000501	0.000020	0.000294	0.000577	0.000000	0.000000	0.000000	0.078944	0.000000	0.000560
GSAI(91)	GSAI(92)	GSAI(93)	GSAI(94)	GSAI(95)	GSAI(96)	GSAI(97)	GSAI(98)	GSAI(99)	GSAI(100)	GSAI(101)	GSAI(102)	GSAI(103)	GSAI(104)	GSAI(105)
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.024440	0.000000	0.000000	0.000000	0.000000
GSAI(106)	GSAI(107)													
0.000000	0.000000													

Table 1: Parameter Values (continued)

$$GAMMAM(i) = \gamma_i^M ; i = 1, 2, \dots, 107$$

GAMMAM(1)	GAMMAM(2)	GAMMAM(3)	GAMMAM(4)	GAMMAM(5)	GAMMAM(6)	GAMMAM(7)	GAMMAM(8)	GAMMAM(9)	GAMMAM(10)	GAMMAM(11)	GAMMAM(12)	GAMMAM(13)	GAMMAM(14)	GAMMAM(15)
0.204213	0.015883	0.000000	0.159696	0.169359	0.989016	0.161561	0.991011	0.151897	0.057352	0.092149	0.244285	0.205769	0.588887	0.296517
GAMMAM(16)	GAMMAM(17)	GAMMAM(18)	GAMMAM(19)	GAMMAM(20)	GAMMAM(21)	GAMMAM(22)	GAMMAM(23)	GAMMAM(24)	GAMMAM(25)	GAMMAM(26)	GAMMAM(27)	GAMMAM(28)	GAMMAM(29)	GAMMAM(30)
0.178307	0.078185	0.031427	0.007000	0.228893	0.166364	0.015279	0.262157	0.150654	0.139844	0.130729	0.132632	0.151774	0.065853	0.059744
GAMMAM(31)	GAMMAM(32)	GAMMAM(33)	GAMMAM(34)	GAMMAM(35)	GAMMAM(36)	GAMMAM(37)	GAMMAM(38)	GAMMAM(39)	GAMMAM(40)	GAMMAM(41)	GAMMAM(42)	GAMMAM(43)	GAMMAM(44)	GAMMAM(45)
0.174788	0.634839	0.133737	0.005358	0.134695	0.126247	0.046285	0.038267	0.010569	0.057458	0.518190	0.143344	0.030947	0.067039	0.090442
GAMMAM(46)	GAMMAM(47)	GAMMAM(48)	GAMMAM(49)	GAMMAM(50)	GAMMAM(51)	GAMMAM(52)	GAMMAM(53)	GAMMAM(54)	GAMMAM(55)	GAMMAM(56)	GAMMAM(57)	GAMMAM(58)	GAMMAM(59)	GAMMAM(60)
0.159450	0.094953	0.057172	0.167955	0.392915	0.159768	0.164382	0.199346	0.671938	0.587932	0.147661	0.120402	0.027670	0.026757	0.039290
GAMMAM(61)	GAMMAM(62)	GAMMAM(63)	GAMMAM(64)	GAMMAM(65)	GAMMAM(66)	GAMMAM(67)	GAMMAM(68)	GAMMAM(69)	GAMMAM(70)	GAMMAM(71)	GAMMAM(72)	GAMMAM(73)	GAMMAM(74)	GAMMAM(75)
0.299314	0.389652	0.289767	0.000000	0.000000	0.000000	0.000000	0.000000	0.000068	0.000063	0.000318	0.000072	0.007164	0.012048	0.000000
GAMMAM(76)	GAMMAM(77)	GAMMAM(78)	GAMMAM(79)	GAMMAM(80)	GAMMAM(81)	GAMMAM(82)	GAMMAM(83)	GAMMAM(84)	GAMMAM(85)	GAMMAM(86)	GAMMAM(87)	GAMMAM(88)	GAMMAM(89)	GAMMAM(90)
0.000123	0.000000	0.030748	0.011163	0.000000	0.453834	0.394777	0.000000	0.000000	0.043256	0.005262	0.000000	0.022020	0.002268	0.031897
GAMMAM(91)	GAMMAM(92)	GAMMAM(93)	GAMMAM(94)	GAMMAM(95)	GAMMAM(96)	GAMMAM(97)	GAMMAM(98)	GAMMAM(99)	GAMMAM(100)	GAMMAM(101)	GAMMAM(102)	GAMMAM(103)	GAMMAM(104)	GAMMAM(105)
0.000000	0.002954	0.042848	0.000056	0.000000	0.000000	0.006711	0.022928	0.002069	0.000019	0.026586	0.018407	0.041963	0.220840	0.000424
GAMMAM(106)	GAMMAM(107)													
0.058544	0.000000													

Table 1: Parameter Values (continued)

$$GAMMAD(i) = \gamma_i^D; i = 1, 2, \dots, 107$$

GAMMAD(1)	GAMMAD(2)	GAMMAD(3)	GAMMAD(4)	GAMMAD(5)	GAMMAD(6)	GAMMAD(7)	GAMMAD(8)	GAMMAD(9)	GAMMAD(10)	GAMMAD(11)	GAMMAD(12)	GAMMAD(13)	GAMMAD(14)	GAMMAD(15)
0.795787	0.984117	1.000000	0.840304	0.830641	0.010984	0.838439	0.008989	0.848103	0.942648	0.907851	0.755715	0.794231	0.411113	0.703483
GAMMAD(16)	GAMMAD(17)	GAMMAD(18)	GAMMAD(19)	GAMMAD(20)	GAMMAD(21)	GAMMAD(22)	GAMMAD(23)	GAMMAD(24)	GAMMAD(25)	GAMMAD(26)	GAMMAD(27)	GAMMAD(28)	GAMMAD(29)	GAMMAD(30)
0.821693	0.921815	0.968573	0.993000	0.771107	0.833636	0.984721	0.737843	0.849346	0.860156	0.869271	0.867368	0.848226	0.934147	0.940256
GAMMAD(31)	GAMMAD(32)	GAMMAD(33)	GAMMAD(34)	GAMMAD(35)	GAMMAD(36)	GAMMAD(37)	GAMMAD(38)	GAMMAD(39)	GAMMAD(40)	GAMMAD(41)	GAMMAD(42)	GAMMAD(43)	GAMMAD(44)	GAMMAD(45)
0.825212	0.365161	0.866263	0.994642	0.865305	0.873753	0.953715	0.961733	0.989431	0.942542	0.481810	0.856656	0.969053	0.932961	0.909558
GAMMAD(46)	GAMMAD(47)	GAMMAD(48)	GAMMAD(49)	GAMMAD(50)	GAMMAD(51)	GAMMAD(52)	GAMMAD(53)	GAMMAD(54)	GAMMAD(55)	GAMMAD(56)	GAMMAD(57)	GAMMAD(58)	GAMMAD(59)	GAMMAD(60)
0.840550	0.905047	0.942828	0.832045	0.607085	0.840232	0.835618	0.800654	0.328062	0.412068	0.852339	0.879598	0.972330	0.973243	0.960710
GAMMAD(61)	GAMMAD(62)	GAMMAD(63)	GAMMAD(64)	GAMMAD(65)	GAMMAD(66)	GAMMAD(67)	GAMMAD(68)	GAMMAD(69)	GAMMAD(70)	GAMMAD(71)	GAMMAD(72)	GAMMAD(73)	GAMMAD(74)	GAMMAD(75)
0.700686	0.610348	0.710233	1.000000	1.000000	1.000000	1.000000	1.000000	0.999932	0.999937	0.999682	0.999928	0.992836	0.987952	1.000000
GAMMAD(76)	GAMMAD(77)	GAMMAD(78)	GAMMAD(79)	GAMMAD(80)	GAMMAD(81)	GAMMAD(82)	GAMMAD(83)	GAMMAD(84)	GAMMAD(85)	GAMMAD(86)	GAMMAD(87)	GAMMAD(88)	GAMMAD(89)	GAMMAD(90)
0.999877	1.000000	0.969252	0.988837	1.000000	0.546166	0.605223	1.000000	1.000000	0.956744	0.994738	1.000000	0.977980	0.997732	0.968103
GAMMAD(91)	GAMMAD(92)	GAMMAD(93)	GAMMAD(94)	GAMMAD(95)	GAMMAD(96)	GAMMAD(97)	GAMMAD(98)	GAMMAD(99)	GAMMAD(100)	GAMMAD(101)	GAMMAD(102)	GAMMAD(103)	GAMMAD(104)	GAMMAD(105)
1.000000	0.997046	0.957152	0.999944	1.000000	1.000000	0.993289	0.977072	0.997931	0.999981	0.973414	0.981593	0.958037	0.779160	0.999576
GAMMAD(106)	GAMMAD(107)													
0.941456	1.000000													

Table 1: Parameter Values (continued)

$$KAPPAE(i) = \kappa_i^E; i = 1, 2, \dots, 107$$

KAPPAE(1)	KAPPAE(2)	KAPPAE(3)	KAPPAE(4)	KAPPAE(5)	KAPPAE(6)	KAPPAE(7)	KAPPAE(8)	KAPPAE(9)	KAPPAE(10)	KAPPAE(11)	KAPPAE(12)	KAPPAE(13)	KAPPAE(14)	KAPPAE(15)
0.003039	0.000270	0.000000	0.001252	0.025258	0.182150	0.031150	0.001016	0.008845	0.002643	0.003551	0.010760	0.236228	0.021328	0.004348
KAPPAE(16)	KAPPAE(17)	KAPPAE(18)	KAPPAE(19)	KAPPAE(20)	KAPPAE(21)	KAPPAE(22)	KAPPAE(23)	KAPPAE(24)	KAPPAE(25)	KAPPAE(26)	KAPPAE(27)	KAPPAE(28)	KAPPAE(29)	KAPPAE(30)
0.027498	0.049164	0.015724	0.007009	0.032443	0.137034	0.109029	0.301676	0.290771	0.275001	0.046991	0.193032	0.053784	0.033542	0.103752
KAPPAE(31)	KAPPAE(32)	KAPPAE(33)	KAPPAE(34)	KAPPAE(35)	KAPPAE(36)	KAPPAE(37)	KAPPAE(38)	KAPPAE(39)	KAPPAE(40)	KAPPAE(41)	KAPPAE(42)	KAPPAE(43)	KAPPAE(44)	KAPPAE(45)
0.236375	0.041396	0.210679	0.008462	0.154667	0.145432	0.016499	0.189440	0.010059	0.004244	0.188856	0.158541	0.006420	0.078360	0.261322
KAPPAE(46)	KAPPAE(47)	KAPPAE(48)	KAPPAE(49)	KAPPAE(50)	KAPPAE(51)	KAPPAE(52)	KAPPAE(53)	KAPPAE(54)	KAPPAE(55)	KAPPAE(56)	KAPPAE(57)	KAPPAE(58)	KAPPAE(59)	KAPPAE(60)
0.374836	0.219185	0.064306	0.322125	0.559810	0.440164	0.079687	0.259846	0.607049	0.679630	0.256909	0.527340	0.354772	0.139857	0.604501
KAPPAE(61)	KAPPAE(62)	KAPPAE(63)	KAPPAE(64)	KAPPAE(65)	KAPPAE(66)	KAPPAE(67)	KAPPAE(68)	KAPPAE(69)	KAPPAE(70)	KAPPAE(71)	KAPPAE(72)	KAPPAE(73)	KAPPAE(74)	KAPPAE(75)
0.222479	0.375409	0.139016	0.255331	0.000000	0.000000	0.000000	0.000000	0.001922	0.000244	0.002235	0.000838	0.081116	0.015740	0.000207
KAPPAE(76)	KAPPAE(77)	KAPPAE(78)	KAPPAE(79)	KAPPAE(80)	KAPPAE(81)	KAPPAE(82)	KAPPAE(83)	KAPPAE(84)	KAPPAE(85)	KAPPAE(86)	KAPPAE(87)	KAPPAE(88)	KAPPAE(89)	KAPPAE(90)
0.001465	0.000000	0.015210	0.054490	0.000000	0.619934	0.258458	0.070603	0.049171	0.088519	0.004668	0.000010	0.010135	0.003421	0.010506
KAPPAE(91)	KAPPAE(92)	KAPPAE(93)	KAPPAE(94)	KAPPAE(95)	KAPPAE(96)	KAPPAE(97)	KAPPAE(98)	KAPPAE(99)	KAPPAE(100)	KAPPAE(101)	KAPPAE(102)	KAPPAE(103)	KAPPAE(104)	KAPPAE(105)
0.000000	0.001252	0.027012	0.000006	0.000000	0.000000	0.003981	0.013002	0.012756	0.000177	0.013158	0.008165	0.011575	0.088229	0.000147
KAPPAE(106)	KAPPAE(107)													
0.008925	0.000000													

Table 1: Parameter Values (continued)

$$KAPPAD(i) = \kappa_i^D; i = 1, 2, \dots, 107$$

KAPPAD(1)	KAPPAD(2)	KAPPAD(3)	KAPPAD(4)	KAPPAD(5)	KAPPAD(6)	KAPPAD(7)	KAPPAD(8)	KAPPAD(9)	KAPPAD(10)	KAPPAD(11)	KAPPAD(12)	KAPPAD(13)	KAPPAD(14)	KAPPAD(15)
0.996961	0.999730	1.000000	0.998748	0.974742	0.817850	0.968850	0.998984	0.991155	0.997357	0.996449	0.989240	0.763772	0.978672	0.995652
KAPPAD(16)	KAPPAD(17)	KAPPAD(18)	KAPPAD(19)	KAPPAD(20)	KAPPAD(21)	KAPPAD(22)	KAPPAD(23)	KAPPAD(24)	KAPPAD(25)	KAPPAD(26)	KAPPAD(27)	KAPPAD(28)	KAPPAD(29)	KAPPAD(30)
0.972502	0.950836	0.984276	0.992991	0.967557	0.862966	0.890971	0.698324	0.709229	0.724999	0.953009	0.806968	0.946216	0.966458	0.896248
KAPPAD(31)	KAPPAD(32)	KAPPAD(33)	KAPPAD(34)	KAPPAD(35)	KAPPAD(36)	KAPPAD(37)	KAPPAD(38)	KAPPAD(39)	KAPPAD(40)	KAPPAD(41)	KAPPAD(42)	KAPPAD(43)	KAPPAD(44)	KAPPAD(45)
0.763625	0.958604	0.789321	0.991538	0.845333	0.854568	0.983501	0.810560	0.989941	0.995756	0.811144	0.841459	0.993580	0.921640	0.738678
KAPPAD(46)	KAPPAD(47)	KAPPAD(48)	KAPPAD(49)	KAPPAD(50)	KAPPAD(51)	KAPPAD(52)	KAPPAD(53)	KAPPAD(54)	KAPPAD(55)	KAPPAD(56)	KAPPAD(57)	KAPPAD(58)	KAPPAD(59)	KAPPAD(60)
0.625164	0.780815	0.935694	0.677875	0.440190	0.559836	0.920313	0.740154	0.392951	0.320370	0.743091	0.472660	0.645228	0.860143	0.395499
KAPPAD(61)	KAPPAD(62)	KAPPAD(63)	KAPPAD(64)	KAPPAD(65)	KAPPAD(66)	KAPPAD(67)	KAPPAD(68)	KAPPAD(69)	KAPPAD(70)	KAPPAD(71)	KAPPAD(72)	KAPPAD(73)	KAPPAD(74)	KAPPAD(75)
0.777521	0.624591	0.860984	0.744669	1.000000	1.000000	1.000000	1.000000	0.998078	0.999756	0.997765	0.999162	0.918884	0.984260	0.999793
KAPPAD(76)	KAPPAD(77)	KAPPAD(78)	KAPPAD(79)	KAPPAD(80)	KAPPAD(81)	KAPPAD(82)	KAPPAD(83)	KAPPAD(84)	KAPPAD(85)	KAPPAD(86)	KAPPAD(87)	KAPPAD(88)	KAPPAD(89)	KAPPAD(90)
0.998535	1.000000	0.984790	0.945510	1.000000	0.380066	0.741542	0.929397	0.950829	0.911481	0.995332	0.999990	0.989865	0.996579	0.989494
KAPPAD(91)	KAPPAD(92)	KAPPAD(93)	KAPPAD(94)	KAPPAD(95)	KAPPAD(96)	KAPPAD(97)	KAPPAD(98)	KAPPAD(99)	KAPPAD(100)	KAPPAD(101)	KAPPAD(102)	KAPPAD(103)	KAPPAD(104)	KAPPAD(105)
1.000000	0.998748	0.972988	0.999994	1.000000	1.000000	0.996019	0.986998	0.987244	0.999823	0.986842	0.991835	0.988425	0.911771	0.999853
KAPPAD(106)	KAPPAD(107)													
0.991075	1.000000													

Table 1: Parameter Values (continued)
 $BETA(i, j) = \beta_j^i, i = 1(\text{capital}), 2(\text{labor}), j = 1, 2, \dots, 107$

BETA(1 1)	BETA(2 1)	BETA(1 2)	BETA(2 2)	BETA(1 3)	BETA(2 3)	BETA(1 4)	BETA(2 4)	BETA(1 5)	BETA(2 5)	BETA(1 6)	BETA(2 6)	BETA(1 7)	BETA(2 7)
0.873705	0.126295	0.795029	0.204971	0.377652	0.622348	0.789692	0.210308	0.619845	0.380155	0.425395	0.574605	0.348301	0.651699
BETA(1 8)	BETA(2 8)	BETA(1 9)	BETA(2 9)	BETA(1 10)	BETA(2 10)	BETA(1 11)	BETA(2 11)	BETA(1 12)	BETA(2 12)	BETA(1 13)	BETA(2 13)	BETA(1 14)	BETA(2 14)
0.385843	0.614157	0.430065	0.569935	0.626244	0.373756	0.708251	0.291749	0.800717	0.199283	0.153092	0.846908	0.171611	0.828389
BETA(1 15)	BETA(2 15)	BETA(1 16)	BETA(2 16)	BETA(1 17)	BETA(2 17)	BETA(1 18)	BETA(2 18)	BETA(1 19)	BETA(2 19)	BETA(1 20)	BETA(2 20)	BETA(1 21)	BETA(2 21)
0.398741	0.601259	0.186805	0.813195	0.583062	0.416938	0.275022	0.724978	0.332154	0.667846	0.485737	0.514263	0.580994	0.419006
BETA(1 22)	BETA(2 22)	BETA(1 23)	BETA(2 23)	BETA(1 24)	BETA(2 24)	BETA(1 25)	BETA(2 25)	BETA(1 26)	BETA(2 26)	BETA(1 27)	BETA(2 27)	BETA(1 28)	BETA(2 28)
0.747311	0.252689	0.474172	0.525828	0.462937	0.537063	0.334964	0.665036	0.578962	0.421038	0.413419	0.586581	0.508695	0.491305
BETA(1 29)	BETA(2 29)	BETA(1 30)	BETA(2 30)	BETA(1 31)	BETA(2 31)	BETA(1 32)	BETA(2 32)	BETA(1 33)	BETA(2 33)	BETA(1 34)	BETA(2 34)	BETA(1 35)	BETA(2 35)
0.627415	0.372585	0.207273	0.792727	0.338813	0.661187	0.353164	0.646836	0.480519	0.519481	0.378114	0.621886	0.317792	0.682208
BETA(1 36)	BETA(2 36)	BETA(1 37)	BETA(2 37)	BETA(1 38)	BETA(2 38)	BETA(1 39)	BETA(2 39)	BETA(1 40)	BETA(2 40)	BETA(1 41)	BETA(2 41)	BETA(1 42)	BETA(2 42)
0.394347	0.605653	0.544357	0.455643	0.622426	0.377574	0.414574	0.585426	0.227985	0.772015	0.450008	0.549992	0.324905	0.675095
BETA(1 43)	BETA(2 43)	BETA(1 44)	BETA(2 44)	BETA(1 45)	BETA(2 45)	BETA(1 46)	BETA(2 46)	BETA(1 47)	BETA(2 47)	BETA(1 48)	BETA(2 48)	BETA(1 49)	BETA(2 49)
0.238573	0.761427	0.205336	0.794664	0.297464	0.702536	0.316831	0.683169	0.217319	0.782681	0.405635	0.594365	0.166071	0.833929
BETA(1 50)	BETA(2 50)	BETA(1 51)	BETA(2 51)	BETA(1 52)	BETA(2 52)	BETA(1 53)	BETA(2 53)	BETA(1 54)	BETA(2 54)	BETA(1 55)	BETA(2 55)	BETA(1 56)	BETA(2 56)
0.230711	0.769289	0.433889	0.566111	0.445027	0.554973	0.259323	0.740677	0.368190	0.631810	0.284373	0.715627	0.203093	0.796907
BETA(1 57)	BETA(2 57)	BETA(1 58)	BETA(2 58)	BETA(1 59)	BETA(2 59)	BETA(1 60)	BETA(2 60)	BETA(1 61)	BETA(2 61)	BETA(1 62)	BETA(2 62)	BETA(1 63)	BETA(2 63)
0.341356	0.658644	0.331808	0.668192	0.219457	0.780543	0.338121	0.661879	0.329092	0.670908	0.276800	0.723200	0.307300	0.692700
BETA(1 64)	BETA(2 64)	BETA(1 65)	BETA(2 65)	BETA(1 66)	BETA(2 66)	BETA(1 67)	BETA(2 67)	BETA(1 68)	BETA(2 68)	BETA(1 69)	BETA(2 69)	BETA(1 70)	BETA(2 70)
0.136513	0.863487	0.126572	0.873428	0.117856	0.882144	0.192903	0.807097	0.170729	0.829271	0.688454	0.311546	0.471007	0.528993
BETA(1 71)	BETA(2 71)	BETA(1 72)	BETA(2 72)	BETA(1 73)	BETA(2 73)	BETA(1 74)	BETA(2 74)	BETA(1 75)	BETA(2 75)	BETA(1 76)	BETA(2 76)	BETA(1 77)	BETA(2 77)
0.659005	0.340995	0.200339	0.799661	0.356460	0.643540	0.507732	0.492268	0.693330	0.306670	0.933852	0.066148	1.000000	0.000000
BETA(1 78)	BETA(2 78)	BETA(1 79)	BETA(2 79)	BETA(1 80)	BETA(2 80)	BETA(1 81)	BETA(2 81)	BETA(1 82)	BETA(2 82)	BETA(1 83)	BETA(2 83)	BETA(1 84)	BETA(2 84)

0.566626	0.433374	0.112466	0.887534	0.000000	0.000000	0.396298	0.603702	0.371840	0.628160	0.158816	0.841184	0.299568	0.700432
BETA(1 85)	BETA(2 85)	BETA(1 86)	BETA(2 86)	BETA(1 87)	BETA(2 87)	BETA(1 88)	BETA(2 88)	BETA(1 89)	BETA(2 89)	BETA(1 90)	BETA(2 90)	BETA(1 91)	BETA(2 91)
0.511584	0.488416	0.514368	0.485632	0.523790	0.476210	0.356325	0.643675	0.474659	0.525341	0.309968	0.690032	0.408598	0.591402
BETA(1 92)	BETA(2 92)	BETA(1 93)	BETA(2 93)	BETA(1 94)	BETA(2 94)	BETA(1 95)	BETA(2 95)	BETA(1 96)	BETA(2 96)	BETA(1 97)	BETA(2 97)	BETA(1 98)	BETA(2 98)
0.162627	0.837373	0.170565	0.829435	0.219657	0.780343	0.060451	0.939549	0.174570	0.825430	0.114685	0.885315	0.435003	0.564997
BETA(1 99)	BETA(2 99)	BETA(1100)	BETA(2100)	BETA(1101)	BETA(2101)	BETA(1102)	BETA(2102)	BETA(1103)	BETA(2103)	BETA(1104)	BETA(2104)	BETA(1105)	BETA(2105)
0.810139	0.189861	0.169821	0.830179	0.276521	0.723479	0.565949	0.434051	0.278234	0.721766	0.365413	0.634587	0.456596	0.543404
BETA(1106)	BETA(2106)	BETA(1107)	BETA(2107)										
0.347163	0.652837	0.000000	0.000000										

Table 2-1: Parameter Values (Production tax Rate)

$$TAUP(i) = \tau_i^P; i = 1, 2, \dots, 107 \text{ (Production Tax Rate)}$$

TAUP(1)	TAUP(2)	TAUP(3)	TAUP(4)	TAUP(5)	TAUP(6)	TAUP(7)	TAUP(8)	TAUP(9)	TAUP(10)	TAUP(11)	TAUP(12)	TAUP(13)	TAUP(14)	TAUP(15)
5.9867%	2.5114%	6.1820%	1.2527%	4.3722%	3.8090%	6.3187%	12.9820%	1.8945%	27.6149%	1.1470%	162.3026%	3.8493%	3.4444%	2.8209%
TAUP(16)	TAUP(17)	TAUP(18)	TAUP(19)	TAUP(20)	TAUP(21)	TAUP(22)	TAUP(23)	TAUP(24)	TAUP(25)	TAUP(26)	TAUP(27)	TAUP(28)	TAUP(29)	TAUP(30)
3.1706%	3.6937%	3.3152%	3.6528%	2.9897%	1.8001%	1.7417%	2.1078%	1.3484%	6.8352%	2.7184%	2.7862%	38.7680%	1.8750%	2.2056%
TAUP(31)	TAUP(32)	TAUP(33)	TAUP(34)	TAUP(35)	TAUP(36)	TAUP(37)	TAUP(38)	TAUP(39)	TAUP(40)	TAUP(41)	TAUP(42)	TAUP(43)	TAUP(44)	TAUP(45)
3.5739%	2.2774%	3.3468%	5.0663%	5.5992%	4.0437%	5.2686%	1.1492%	4.0811%	2.1405%	4.2144%	2.4866%	3.2158%	3.4331%	2.2434%
TAUP(46)	TAUP(47)	TAUP(48)	TAUP(49)	TAUP(50)	TAUP(51)	TAUP(52)	TAUP(53)	TAUP(54)	TAUP(55)	TAUP(56)	TAUP(57)	TAUP(58)	TAUP(59)	TAUP(60)
1.7931%	1.8188%	2.0160%	1.6598%	1.3144%	1.7305%	1.4357%	1.5851%	1.4624%	1.6600%	1.3251%	1.2068%	1.3410%	1.6146%	2.4806%
TAUP(61)	TAUP(62)	TAUP(63)	TAUP(64)	TAUP(65)	TAUP(66)	TAUP(67)	TAUP(68)	TAUP(69)	TAUP(70)	TAUP(71)	TAUP(72)	TAUP(73)	TAUP(74)	TAUP(75)
1.4796%	2.6985%	2.7755%	7.2375%	3.3239%	3.7016%	3.8125%	3.9683%	7.6883%	3.0249%	4.5282%	5.5395%	3.7119%	4.6608%	9.9487%
TAUP(76)	TAUP(77)	TAUP(78)	TAUP(79)	TAUP(80)	TAUP(81)	TAUP(82)	TAUP(83)	TAUP(84)	TAUP(85)	TAUP(86)	TAUP(87)	TAUP(88)	TAUP(89)	TAUP(90)
5.9533%	5.1196%	5.8426%	6.2693%	0.0000%	2.0770%	5.2643%	2.8005%	6.7776%	6.6531%	3.2352%	3.5600%	4.4300%	2.4485%	2.7756%
TAUP(91)	TAUP(92)	TAUP(93)	TAUP(94)	TAUP(95)	TAUP(96)	TAUP(97)	TAUP(98)	TAUP(99)	TAUP(100)	TAUP(101)	TAUP(102)	TAUP(103)	TAUP(104)	TAUP(105)
0.2775%	0.4211%	1.5446%	1.7759%	0.6563%	1.9178%	3.0825%	3.2853%	2.0742%	1.7716%	3.8589%	10.2152%	2.4778%	3.8533%	5.0795%
TAUP(106)	TAUP(107)													
8.6114%	0.0000%													

Table 2-2: Parameter Values (Import Tariff Rate)

$$TAUM(i) = \tau_i^m; i = 1, 2, \dots, 107 \text{ (Import Tariff Rate)}$$

TAUM(1)	TAUM(2)	TAUM(3)	TAUM(4)	TAUM(5)	TAUM(6)	TAUM(7)	TAUM(8)	TAUM(9)	TAUM(10)	TAUM(11)	TAUM(12)	TAUM(13)	TAUM(14)	TAUM(15)
6.8081%	15.5478%	0.0000%	5.6808%	8.7406%	5.0000%	5.0004%	9.8945%	14.4770%	25.5089%	5.3134%	109.5661%	9.3138%	12.6582%	7.9865%
TAUM(16)	TAUM(17)	TAUM(18)	TAUM(19)	TAUM(20)	TAUM(21)	TAUM(22)	TAUM(23)	TAUM(24)	TAUM(25)	TAUM(26)	TAUM(27)	TAUM(28)	TAUM(29)	TAUM(30)
5.1066%	4.9944%	5.5484%	4.9737%	5.0410%	6.1612%	5.0006%	6.0696%	7.6112%	10.8256%	5.0446%	5.8942%	5.7067%	5.2018%	6.7533%
TAUM(31)	TAUM(32)	TAUM(33)	TAUM(34)	TAUM(35)	TAUM(36)	TAUM(37)	TAUM(38)	TAUM(39)	TAUM(40)	TAUM(41)	TAUM(42)	TAUM(43)	TAUM(44)	TAUM(45)
9.9136%	14.9538%	5.7152%	5.8357%	5.5806%	5.4506%	7.2644%	5.0002%	5.0047%	4.9999%	5.1549%	5.9397%	5.2741%	5.6103%	5.0002%
TAUM(46)	TAUM(47)	TAUM(48)	TAUM(49)	TAUM(50)	TAUM(51)	TAUM(52)	TAUM(53)	TAUM(54)	TAUM(55)	TAUM(56)	TAUM(57)	TAUM(58)	TAUM(59)	TAUM(60)
5.1301%	4.9999%	4.9994%	4.9999%	5.0000%	8.9702%	4.9828%	4.9800%	5.2524%	5.0000%	4.9998%	4.9557%	4.9848%	5.0001%	2.7342%
TAUM(61)	TAUM(62)	TAUM(63)	TAUM(64)	TAUM(65)	TAUM(66)	TAUM(67)	TAUM(68)	TAUM(69)	TAUM(70)	TAUM(71)	TAUM(72)	TAUM(73)	TAUM(74)	TAUM(75)
4.8217%	4.9596%	5.1917%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
TAUM(76)	TAUM(77)	TAUM(78)	TAUM(79)	TAUM(80)	TAUM(81)	TAUM(82)	TAUM(83)	TAUM(84)	TAUM(85)	TAUM(86)	TAUM(87)	TAUM(88)	TAUM(89)	TAUM(90)
0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.4634%	0.0000%	1.8618%
TAUM(91)	TAUM(92)	TAUM(93)	TAUM(94)	TAUM(95)	TAUM(96)	TAUM(97)	TAUM(98)	TAUM(99)	TAUM(100)	TAUM(101)	TAUM(102)	TAUM(103)	TAUM(104)	TAUM(105)
0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.1495%	0.0000%	0.0000%	0.0000%	0.0000%
TAUM(106)	TAUM(107)													
0.1669%	0.0000%													

Table 2-3: Parameter Values (Subsidy Rate)

$$SUBR(i) = \tau_i^s; i = 1, 2, \dots, 107 \text{ (Subsidy Rate)}$$

SUBR(1)	SUBR(2)	SUBR(3)	SUBR(4)	SUBR(5)	SUBR(6)	SUBR(7)	SUBR(8)	SUBR(9)	SUBR(10)	SUBR(11)	SUBR(12)	SUBR(13)	SUBR(14)	SUBR(15)
0.7094%	1.7234%	0.0459%	3.0764%	0.2472%	0.0369%	0.0096%	1.6950%	0.8771%	0.0045%	0.5283%	0.0053%	0.0165%	0.0110%	0.0153%
SUBR(16)	SUBR(17)	SUBR(18)	SUBR(19)	SUBR(20)	SUBR(21)	SUBR(22)	SUBR(23)	SUBR(24)	SUBR(25)	SUBR(26)	SUBR(27)	SUBR(28)	SUBR(29)	SUBR(30)
0.0079%	0.0035%	0.0061%	0.0085%	0.0037%	0.0038%	0.0009%	0.0027%	0.0030%	0.0056%	0.0044%	0.0044%	0.4716%	0.0016%	0.0054%
SUBR(31)	SUBR(32)	SUBR(33)	SUBR(34)	SUBR(35)	SUBR(36)	SUBR(37)	SUBR(38)	SUBR(39)	SUBR(40)	SUBR(41)	SUBR(42)	SUBR(43)	SUBR(44)	SUBR(45)
0.0089%	0.0694%	0.0069%	0.0073%	0.0102%	0.0079%	0.0028%	0.0042%	0.0079%	0.0036%	0.0042%	0.0051%	0.0078%	0.0102%	0.0068%
SUBR(46)	SUBR(47)	SUBR(48)	SUBR(49)	SUBR(50)	SUBR(51)	SUBR(52)	SUBR(53)	SUBR(54)	SUBR(55)	SUBR(56)	SUBR(57)	SUBR(58)	SUBR(59)	SUBR(60)
0.0068%	0.0091%	0.0047%	0.0066%	0.0053%	0.0058%	0.0049%	0.0050%	0.0034%	0.0064%	0.0062%	0.0022%	0.0025%	0.0049%	0.0130%
SUBR(61)	SUBR(62)	SUBR(63)	SUBR(64)	SUBR(65)	SUBR(66)	SUBR(67)	SUBR(68)	SUBR(69)	SUBR(70)	SUBR(71)	SUBR(72)	SUBR(73)	SUBR(74)	SUBR(75)
0.0682%	0.0087%	0.0113%	0.0085%	0.0163%	0.0165%	0.2631%	3.5499%	0.0130%	2.9362%	3.7943%	0.0077%	0.0716%	2.7243%	0.0071%
SUBR(76)	SUBR(77)	SUBR(78)	SUBR(79)	SUBR(80)	SUBR(81)	SUBR(82)	SUBR(83)	SUBR(84)	SUBR(85)	SUBR(86)	SUBR(87)	SUBR(88)	SUBR(89)	SUBR(90)
0.6671%	0.0000%	0.9291%	0.4615%	0.0000%	0.4080%	0.0063%	0.0244%	0.0202%	0.3951%	0.0080%	0.0074%	0.0289%	0.0026%	0.0189%
SUBR(91)	SUBR(92)	SUBR(93)	SUBR(94)	SUBR(95)	SUBR(96)	SUBR(97)	SUBR(98)	SUBR(99)	SUBR(100)	SUBR(101)	SUBR(102)	SUBR(103)	SUBR(104)	SUBR(105)
0.0000%	0.0007%	0.4221%	2.1191%	0.0118%	0.7001%	2.5735%	0.0073%	0.0040%	0.0076%	0.1523%	0.0072%	0.0033%	0.0118%	0.0137%
SUBR(106)	SUBR(107)													
0.0140%	0.0000%													

Table 3-1: Economic Values of the Benchmark Model
Final Consumption Goods, $P_i^Q Q_i$; $i = 1, 2, \dots, 107$

Unit: One million Japanese yen

<i>i</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
model	7992445	3076453	867591	1507966	1889503	1673551	997155	13666806	28226829	8448175	1528645	3087907	2024194	5403523	3545906	2864489	4718832	3383067	6295844	388535
actual	7992445	3076453	867591	1507966	1889503	1673551	997155	13666806	28226829	8448175	1528645	3087907	2024194	5403523	3545906	2864489	4718832	3383067	6295844	388535
<i>i</i>	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
model	2014268	2646909	5170128	2438742	417929	7287054	6308055	17484729	1289256	10137398	2776993	1249173	1559315	2988851	716762	1675103	7818878	11656182	1901806	2113988
actual	2014268	2646909	5170128	2438742	417929	7287054	6308055	17484729	1289256	10137398	2776993	1249173	1559315	2988851	716762	1675103	7818878	11656182	1901806	2113988
<i>i</i>	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
model	3624169	5085451	4791626	7716325	7736765	9649963	3346489	3968133	5585456	1924973	2445823	2919353	6776294	4409610	4075496	9563708	7856948	2718049	25319384	1004116
actual	3624169	5085451	4791626	7716325	7736765	9649963	3346489	3968133	5585456	1924973	2445823	2919353	6776294	4409610	4075496	9563708	7856948	2718049	25319384	1004116
<i>i</i>	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
model	3563331	3809563	5232559	648298	30715358	9119713	16205999	7196254	15754107	2893277	4549749	3745112	98358600	41431380	8595547	11913778	45678819	6638078	16293277	9960768
actual	3563331	3809563	5232559	648298	30715358	9119713	16205999	7196254	15754107	2893277	4549749	3745112	98358600	41431380	8595547	11913778	45678819	6638078	16293277	9960768
<i>i</i>	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
model	3554235	3512957	489752	1786627	6506596	16367961	3678393	17614538	1214895	7440836	38537877	23178561	13371738	37209390	6616330	6387536	5044458	9175582	11969164	12657970
actual	3554235	3512957	489752	1786627	6506596	16367961	3678393	17614538	1214895	7440836	38537877	23178561	13371738	37209390	6616330	6387536	5044458	9175582	11969164	12657970
<i>i</i>	101	102	103	104	105	106	107													
model	30319697	10129655	21613601	7671606	6337175	12761623	1517809													
actual	30319697	10129655	21613601	7671606	6337175	12761623	1517809													

Table 3-2: Economic Values of the Benchmark Model (Continued)
Capital Income, rK_i ; $i = 1, 2, \dots, 107$

Unit: One million Japanese yen

<i>i</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
model	3013193	619764	196982	729575	522992	4630	105212	21743	2970822	1565909	238849	402011	93908	122904	354057	147044	692022	323586	1100374	43932
actual	3013193	619764	196982	729575	522992	4630	105212	21743	2970822	1565909	238849	402011	93908	122904	354057	147044	692022	323586	1100374	43932
<i>i</i>	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
model	348142	171629	401898	261535	43896	1438660	727686	221319	152394	640925	367357	59695	349608	426126	91958	273911	778178	1758911	294256	97254
actual	348142	171629	401898	261535	43896	1438660	727686	221319	152394	640925	367357	59695	349608	426126	91958	273911	778178	1758911	294256	97254
<i>i</i>	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
model	143678	377406	368039	709631	930517	1384756	375474	322166	352810	170457	506256	306073	427506	301195	428739	526290	601345	172999	1211068	207040
actual	143678	377406	368039	709631	930517	1384756	375474	322166	352810	170457	506256	306073	427506	301195	428739	526290	601345	172999	1211068	207040
<i>i</i>	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
model	332438	377004	433360	42930	1674911	443521	1341333	571988	4231709	403822	1540735	503561	2.5E+07	1.3E+07	3894961	8303863	3.8E+07	2135328	1216237	0
actual	332438	377004	433360	42930	1674911	443521	1341333	571988	4231709	403822	1540735	503561	2.5E+07	1.3E+07	3894961	8303863	3.8E+07	2135328	1216237	0
<i>i</i>	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
model	605096	246642	54476	316483	2092779	5289614	835932	3579498	229693	967790	1.2E+07	3190946	1238479	4579116	283558	807134	366078	1127663	6291773	763930
actual	605096	246642	54476	316483	2092779	5289614	835932	3579498	229693	967790	1.2E+07	3190946	1238479	4579116	283558	807134	366078	1127663	6291773	763930
<i>i</i>	101	102	103	104	105	106	107													
model	5863257	3249479	2501464	1084820	1975728	1549710	0													
actual	5863257	3249479	2501464	1084820	1975728	1549710	0													

Table 3-3: Economic Values of the Benchmark Model (Continued)
Labour Income, wL_i ; $i = 1, 2, \dots, 107$

Unit: One million Japanese yen

<i>i</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
model	435559	159785	324614	194298	320754	6254	196860	34609	3937017	934570	98389	100053	519501	593274	533880	640107	494854	852997	2212473	46512
actual	435559	159785	324614	194298	320754	6254	196860	34609	3937017	934570	98389	100053	519501	593274	533880	640107	494854	852997	2212473	46512
<i>i</i>	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
model	251076	58033	445681	303412	87151	1046236	1032481	213753	90498	2451248	716890	109334	377955	700852	197407	420682	651357	1066983	415523	329327
actual	251076	58033	445681	303412	87151	1046236	1032481	213753	90498	2451248	716890	109334	377955	700852	197407	420682	651357	1066983	415523	329327
<i>i</i>	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
model	175601	784184	1174627	2746319	2197655	2985889	1352278	472061	1771645	568377	660530	381689	1221040	516848	1078927	2065088	1160290	348384	4307408	405285
actual	175601	784184	1174627	2746319	2197655	2985889	1352278	472061	1771645	568377	660530	381689	1221040	516848	1078927	2065088	1160290	348384	4307408	405285
<i>i</i>	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
model	677728	985003	976858	271545	1.2E+07	3319718	5612059	2778276	1914977	453536	797235	2009988	4.4E+07	1.3E+07	1722796	588194	0	1633166	9598060	0
actual	677728	985003	976858	271545	1.2E+07	3319718	5612059	2778276	1914977	453536	797235	2009988	4.4E+07	1.3E+07	1722796	588194	0	1633166	9598060	0
<i>i</i>	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
model	921774	416659	288537	739983	1998002	4994099	759999	6466088	254219	2154436	1.7E+07	1.6E+07	6022563	1.6E+07	4407172	3816420	2825959	1464649	1474520	3734524
actual	921774	416659	288537	739983	1998002	4994099	759999	6466088	254219	2154436	1.7E+07	1.6E+07	6022563	1.6E+07	4407172	3816420	2825959	1464649	1474520	3734524
<i>i</i>	101	102	103	104	105	106	107													
model	1.5E+07	2492172	6489054	1883934	2351357	2914220	0													
actual	1.5E+07	2492172	6489054	1883934	2351357	2914220	0													

Table 3-4: Economic Values of the Benchmark Model (Continued)

Unit: One million Japanese yen

savings							
private sector		government sector		foreign sector			
model	actual	model	actual	model	actual		
27265700	27265700	70847256	70847256	-6059608	-6059608		
tax and subsidy							
income tax		production tax		import tax		subsidy	
model	actual	model	actual	model	actual	model	actual
146907949	146907949	34024445	34024445	4774091	4774091	3506668	3506668

The above figures indicate the total amount.

**Table 4-1: Effects of a Decrease in the Production Tax Rate on the Final Consumption Goods, $P_i^Q Q_i$
Debt Financing Case (P1)**

In Value

Unit: One million Japanese yen

decrease in production tax rate with government issue of bonds (P1)

		tax rate of i=26 only changes by		tax rate of i=94 only changes by		tax rate of i=95 only changes by		tax rate of i=96 only changes by	
		5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease
final output of	i=26	7287557.796	7288065.451	7293322.873	7299606.309	7287102.404	7287153.218	7287179.567	7287307.838
	i=94	37209777.17	37210170.71	37211739.53	37214098.93	37209486.62	37209588.62	37209676.7	37209969.27
	i=95	6616550.299	6616774.619	6617211.84	6618098.825	6616384.191	6616441.867	6616487.535	6616648.805
	i=96	6387567.959	6387601.311	6387666.295	6387798.168	6387543.221	6387551.832	6387558.567	6387582.554

Relative Change

decrease in production tax rate with government issue of bonds (P1)

		tax rate of i=26 only changes by		tax rate of i=94 only changes by		tax rate of i=95 only changes by		tax rate of i=96 only changes by	
		5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease
final output of	i=26	0.006914%	0.013880%	0.086028%	0.172255%	0.000664%	0.001362%	0.001723%	0.003483%
	i=94	0.001041%	0.002098%	0.006314%	0.012655%	0.000260%	0.000534%	0.000771%	0.001557%
	i=95	0.003330%	0.006720%	0.013328%	0.026734%	0.000819%	0.001691%	0.002381%	0.004818%
	i=96	0.000500%	0.001022%	0.002040%	0.004104%	0.000113%	0.000248%	0.000353%	0.000729%

- i=26: Medicaments Sector (incl. the pharmaceutical industry)
- i=94: Medical Service and Health Sector (incl. private hospitals)
- i=95: Social Security Sector (incl. private nurseries and nursing homes)
- i=96: Nursing Care Sector (incl. private long term care for the elderly)

**Table 4-2: Effects of a Decrease in the Production Tax Rate on the Final Consumption Goods, $P_i^Q Q_i$
Income Tax Financing Case (P2)**

In Value

Unit: One million Japanese yen

decrease in production tax rate with an endogenous income tax (P2)

		tax rate of i=26 only changes by		tax rate of i=94 only changes by		tax rate of i=95 only changes by		tax rate of i=96 only changes by	
		5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease
final output of	i=26	7287391.173	7287725.162	7292612.449	7298175.584	7287062.048	7287066.262	7287056.168	7287054.144
	i=94	37209155.22	37208905.55	37209019.36	37208627.96	37209325.88	37209249.54	37209199.69	37208994.88
	i=95	6616202.138	6616069.544	6615816.483	6615297.331	6616301.072	6616267.417	6616240.573	6616146.077
	i=96	6387515.548	6387491.998	6387402.455	6387264.474	6387529.649	6387520.761	6387514.46	6387489.972

Relative Change

decrease in production tax rate with an endogenous income tax (P2)

		tax rate of i=26 only changes by		tax rate of i=94 only changes by		tax rate of i=95 only changes by		tax rate of i=96 only changes by	
		5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease
final output of	i=26	0.004627%	0.009210%	0.076278%	0.152621%	0.000110%	0.000168%	0.000030%	0.000002%
	i=94	-0.000631%	-0.001302%	-0.000996%	-0.002048%	-0.000172%	-0.000377%	-0.000511%	-0.001062%
	i=95	-0.001933%	-0.003937%	-0.007761%	-0.015608%	-0.000437%	-0.000946%	-0.001352%	-0.002780%
	i=96	-0.000320%	-0.000689%	-0.002091%	-0.004251%	-0.000099%	-0.000239%	-0.000337%	-0.000721%

- i=26: Medicaments Sector (incl. the pharmaceutical industry)
- i=94: Medical Service and Health Sector (incl. private hospitals)
- i=95: Social Security Sector (incl. private nurseries and nursing homes)
- i=96: Nursing Care Sector (incl. private long term care for the elderly)

**Table 4-3: Effects of an Increase in the Subsidy Rate on the Final Consumption Goods, $P_i^Q Q_i$
Debt Financing Case (S1)**

In Value

Unit: One million Japanese yen

increase in subsidy rate with government issue of bonds (S1)

		subsidy rate of i=26 only changes by		subsidy rate of i=94 only changes by		subsidy rate of i=95 only changes by		subsidy rate of i=96 only changes by	
		5% increase	10% increase	5% increase	10% increase	5% increase	10% increase	5% increase	10% increase
final output of	i=26	7287054	7287054.343	7294536.212	7302037.93	7287054	7287054.101	7287098.322	7287145.01
	i=94	37209390	37209390	37212195.09	37215012	37209390	37209390.61	37209491.26	37209597.79
	i=95	6616330	6616330	6617383.089	6618442.075	6616330	6616330	6616385.319	6616444.1
	i=96	6387536	6387536	6387691.826	6387849.291	6387536	6387536	6387543.437	6387552.104

Relative Change

increase in subsidy rate with government issue of bonds (S1)

		subsidy rate of i=26 only changes by		subsidy rate of i=94 only changes by		subsidy rate of i=95 only changes by		subsidy rate of i=96 only changes by	
		5% increase	10% increase	5% increase	10% increase	5% increase	10% increase	5% increase	10% increase
final output of	i=26	0.000000%	0.000005%	0.102678%	0.205624%	0.000000%	0.000001%	0.000608%	0.001249%
	i=94	0.000000%	0.000000%	0.007539%	0.015109%	0.000000%	0.000002%	0.000272%	0.000558%
	i=95	0.000000%	0.000000%	0.015917%	0.031922%	0.000000%	0.000000%	0.000836%	0.001725%
	i=96	0.000000%	0.000000%	0.002440%	0.004905%	0.000000%	0.000000%	0.000116%	0.000252%

- i=26: Medicaments Sector (incl. the pharmaceutical industry)
- i=94: Medical Service and Health Sector (incl. private hospitals)
- i=95: Social Security Sector (incl. private nurseries and nursing homes)
- i=96: Nursing Care Sector (incl. private long term care for the elderly)

**Table 4-4: Effects of an Increase in the Subsidy Rate on the Final Consumption Good, $P_i^0 Q_i$
Income Tax Financing Case (S2)**

In Value

Unit: One million Japanese yen

increase in subsidy rate with an endogenous income tax (S2)

		subsidy rate of i=26 only changes by		subsidy rate of i=94 only changes by		subsidy rate of i=95 only changes by		subsidy rate of i=96 only changes by	
		5% increase	10% increase	5% increase	10% increase	5% increase	10% increase	5% increase	10% increase
final output of	i=26	7287054	7287054.208	7293686.805	7300327.984	7287054	7287054	7287057.248	7287056.674
	i=94	37209390	37209390	37208944.36	37208474.53	37209390	37209389.82	37209328.41	37209254.65
	i=95	6616330	6616330	6615716.216	6615096.497	6616330	6616330	6616300.376	6616266.048
	i=96	6387536	6387536	6387375.936	6387210.651	6387536	6387536	6387529.769	6387521.006

Relative Change

increase in subsidy rate with an endogenous income tax (S2)

		subsidy rate of i=26 only changes by		subsidy rate of i=94 only changes by		subsidy rate of i=95 only changes by		subsidy rate of i=96 only changes by	
		5% increase	10% increase	5% increase	10% increase	5% increase	10% increase	5% increase	10% increase
final output of	i=26	0.000000%	0.000003%	0.091022%	0.182158%	0.000000%	0.000000%	0.000045%	0.000037%
	i=94	0.000000%	0.000000%	-0.001198%	-0.002460%	0.000000%	0.000000%	-0.000166%	-0.000364%
	i=95	0.000000%	0.000000%	-0.009277%	-0.018643%	0.000000%	0.000000%	-0.000448%	-0.000967%
	i=96	0.000000%	0.000000%	-0.002506%	-0.005094%	0.000000%	0.000000%	-0.000098%	-0.000235%

- i=26: Medicaments Sector (incl. the pharmaceutical industry)
- i=94: Medical Service and Health Sector (incl. private hospitals)
- i=95: Social Security Sector (incl. private nurseries and nursing homes)
- i=96: Nursing Care Sector (incl. private long term care for the elderly)

Table 5-1: Effects of a Decrease in the Production Tax Rate on the Total Income, $r_i K_i + w_i L_i$

Debt Financing Case (P1): Relative Change

decrease in production tax rate with government issue of bonds (P1)

		tax rate of i=26 only changes by		tax rate of i=94 only changes by		tax rate of i=95 only changes by		tax rate of i=96 only changes by	
		5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease
total income of	i=26	0.1394%	0.2793%	0.0860%	0.1723%	0.0007%	0.0014%	0.0017%	0.0035%
	i=94	0.0010%	0.0021%	0.0955%	0.1912%	0.0003%	0.0005%	0.0008%	0.0016%
	i=95	0.0033%	0.0067%	0.0133%	0.0267%	0.0334%	0.0669%	0.0024%	0.0048%
	i=96	0.0005%	0.0010%	0.0020%	0.0041%	0.0001%	0.0002%	0.0952%	0.1906%

Income Tax Financing Case (P2): Relative Change

decrease in production tax rate with an endogenous income tax (P2)

		tax rate of i=26 only changes by		tax rate of i=94 only changes by		tax rate of i=95 only changes by		tax rate of i=96 only changes by	
		5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease
total income of	i=26	0.1371%	0.2746%	0.0763%	0.1526%	0.0001%	0.0002%	0.0000%	0.0000%
	i=94	-0.0006%	-0.0013%	0.0882%	0.1765%	-0.0002%	-0.0004%	-0.0005%	-0.0011%
	i=95	-0.0019%	-0.0039%	-0.0078%	-0.0156%	0.0322%	0.0643%	-0.0014%	-0.0028%
	i=96	-0.0003%	-0.0007%	-0.0021%	-0.0043%	-0.0001%	-0.0002%	0.0945%	0.1891%

- i=26: Medicaments Sector (incl. the pharmaceutical industry)
- i=94: Medical Service and Health Sector (incl. private hospitals)
- i=95: Social Security Sector (incl. private nurseries and nursing homes)
- i=96: Nursing Care Sector (incl. private long term care for the elderly)

Table 5-2: Effects of an Increase in the Subsidy Rate on the Total Income, $r_i K_i + w_i L_i$

Debt Financing Case (S1): Relative Change

increase in subsidy rate with government issue of bonds (S1)

		subsidy rate of i=26 only changes by		subsidy rate of i=94 only changes by		subsidy rate of i=95 only changes by		subsidy rate of i=96 only changes by	
		5% increase	10% increase	5% increase	10% increase	5% increase	10% increase	5% increase	10% increase
total income of	i=26	0.0002%	0.0004%	0.1027%	0.2056%	0.0000%	0.0000%	0.0006%	0.0012%
	i=94	0.0000%	0.0000%	0.1140%	0.2282%	0.0000%	0.0000%	0.0003%	0.0006%
	i=95	0.0000%	0.0000%	0.0159%	0.0319%	0.0006%	0.0012%	0.0008%	0.0017%
	i=96	0.0000%	0.0000%	0.0024%	0.0049%	0.0000%	0.0000%	0.0347%	0.0695%

Income Tax Financing Case (S2): Relative Change

increase in subsidy rate with an endogenous income tax (S2)

		subsidy rate of i=26 only changes by		subsidy rate of i=94 only changes by		subsidy rate of i=95 only changes by		subsidy rate of i=96 only changes by	
		5% increase	10% increase	5% increase	10% increase	5% increase	10% increase	5% increase	10% increase
total income of	i=26	0.0002%	0.0004%	0.0910%	0.1822%	0.0000%	0.0000%	0.0000%	0.0000%
	i=94	0.0000%	0.0000%	0.1052%	0.2106%	0.0000%	0.0000%	-0.0002%	-0.0004%
	i=95	0.0000%	0.0000%	-0.0093%	-0.0186%	0.0006%	0.0012%	-0.0004%	-0.0010%
	i=96	0.0000%	0.0000%	-0.0025%	-0.0051%	0.0000%	0.0000%	0.0345%	0.0690%

- i=26: Medicaments Sector (incl. the pharmaceutical industry)
- i=94: Medical Service and Health Sector (incl. private hospitals)
- i=95: Social Security Sector (incl. private nurseries and nursing homes)
- i=96: Nursing Care Sector (incl. private long term care for the elderly)

**Table 6-1: Effects of a Decrease in the Production Tax Rate on Welfare
Debt Financing Case (P1)**

Unit: One million Japanese yen

decrease in production tax rate with government issue of bonds (P1)

	i=26		i=94		i=95		i=96	
	5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease
EV	10197.42991	20537.84426	40692.3836	81578.60069	2541.74362	5200.223331	7305.60259	14739.07338

Income Tax Financing Case (P2)

Unit: One million Japanese yen

decrease in production tax rate with an endogenous income tax (P2)

	i=26		i=94		i=95		i=96	
	5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease
EV	-5897.387733	-11938.23957	-22640.152	-45443.02512	-1325.7486	-2805.026399	-3999.5223	-8161.741635

**Table 6-2: Effects of an Increase in the Subsidy Rate on Welfare
Debt Financing Case (S1)**

Unit: One million Japanese yen

increase in subsidy rate with government issue of bonds (S1)

	i=26		i=94		i=95		i=96	
	5% increase	10% increase	5% increase	10% increase	5% increase	10% increase	5% increase	10% increase
EV	3.070344707	7.361056059	48587.3117	97401.79243	16.5240698	41.65657257	2593.04005	5301.606324

Income Tax Financing Case (S2)

Unit: One million Japanese yen

increase in subsidy rate with an endogenous income tax (S2)

	i=26		i=94		i=95		i=96	
	5% increase	10% increase	5% increase	10% increase	5% increase	10% increase	5% increase	10% increase
EV	-7.267895079	-15.06987014	-27046.625	-54256.03545	-15.066833	-32.11384213	-1361.9427	-2876.396844

EV: Equivalent Variation

Table 7: Endogenous Income Tax Rate

decrease in production tax rate with an endogenous income tax (P2)

	tax rate of i=26 only changes by		tax rate of i=94 only changes by		tax rate of i=95 only changes by		tax rate of i=96 only changes by	
	5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease
income tax rate	31.1363%	31.1382%	31.1415%	31.1485%	31.1349%	31.1354%	31.1358%	31.1371%

increase in subsidy rate with an endogenous income tax (S2)

	subsidy rate of i=26 only changes by		subsidy rate of i=94 only changes by		subsidy rate of i=95 only changes by		subsidy rate of i=96 only changes by	
	5% increase	10% increase	5% increase	10% increase	5% increase	10% increase	5% increase	10% increase
income tax rate	31.1345%	31.1345%	31.1429%	31.1513%	31.1345%	31.1345%	31.1350%	31.1354%

Relative Changes from the Benchmark Rate (31.1345%)

decrease in production tax rate with an endogenous income tax (P2)

	tax rate of i=26 only changes by		tax rate of i=94 only changes by		tax rate of i=95 only changes by		tax rate of i=96 only changes by	
	5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease	5% decrease	10% decrease
income tax rate	0.005987%	0.011974%	0.022567%	0.045134%	0.001469%	0.002937%	0.004119%	0.008238%

increase in subsidy rate with an endogenous income tax (S2)

	subsidy rate of i=26 only changes by		subsidy rate of i=94 only changes by		subsidy rate of i=95 only changes by		subsidy rate of i=96 only changes by	
	5% increase	10% increase	5% increase	10% increase	5% increase	10% increase	5% increase	10% increase
income tax rate	0.000010%	0.000020%	0.026928%	0.053856%	0.000026%	0.000053%	0.001504%	0.003008%

- i=26: Medicaments Sector (incl. the pharmaceutical industry)
- i=94: Medical Service and Health Sector (incl. private hospitals)
- i=95: Social Security Sector (incl. private nurseries and nursing homes)
- i=96: Nursing Care Sector (incl. private long term care for the elderly)

Appendix: Social Accounting Matrix of Year 2005

year 2005	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031	032	033	034	035	036	037	038	039	040	041	042								
	Govt	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household	Household			
001 Crop cultivation	186099	307356	5980	2511	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	274		
002 Livestock	4944	336036	3271	275	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	274		
003 Agricultural services	429233	129181	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
004 Forestry	977	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
005 Fisheries	0	786	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
006 Metallic ores	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
007 Non-metallic ores	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
008 Coal mining, Coking petroleum, and natural gas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
009 Fuels	0	29136	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
010 Rearing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
011 Fertilizer and organic fertilizer, n.e.c.	123337	94239	22540	100	24579	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
012 Textiles	490	71	1604	4004	15619	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
013 Textile products	19863	1973	728	541	12334	12	4186	363	31954	8473	363	578	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
014 Timber and wooden products	201	14927	330	1129	2489	1	546	122	10244	3119	8717	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
015 Furniture and fixtures	0	0	95	219	492	32	1308	416	9820	3572	149	2210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
017 Pulp, paper, paperboard, bookbinding paper	607	0	1428	0	134	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
018 Paper products	124075	4846	1635	4855	1182	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
019 Publishing, printing	0	0	425	82	616	18	399	155	244102	29480	73	3487	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
020 Chemical fertilizer	258021	634	50	258	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
021 Basic inorganic chemical products	2545	638	831	57	905	9	75	0	89935	21548	1308	171	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
022 Basic organic chemical products	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
023 Organic chemical products	0	20	285	100	0	189	54	0	7027	48035	2071	1613	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
024 Synthetic resins	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
025 Synthetic fibers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
026 Machinery	0	20010	28181	0	6086	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
027 Fertilizer chemical products, n.e.c.	250400	9794	5165	1069	403	267	7479	194	42159	21312	4275	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
028 Rubber products	1037770	582	689	1185	13288	234	12942	394	12455	24628	5278	2166	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
030 Plastics products	55732	1648	5799	1588	19661	46	249	141	33348	296131	120	2999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
031 Rubber products	5153	988	8297	799	1443	3	3022	498	4627	562	72	159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
032 Leather, fur skins and miscellaneous leather products	159	12	16	136	486	0	2015	0	969	100	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
033 Glass and glass products	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
034 Cement and cement products	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
035 Pottery, china and earthenware	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
036 Other ceramic, stone and clay products	14224	2342	48	60	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
037 Pig iron and crude steel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
038 Steel products	599	7	1	3	225	0	0	0	0	0																																								

