Evaluation of the Japanese Rice Policy Reforms under the WTO Agreement on Agriculture

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Abstract

This study aims to quantitatively evaluate the rice policy reforms in Japan since 1995. First, we review the development of the Japanese rice policy reforms since the Uruguay Round Agreement on Agriculture and the transition of the representative indices that measure the level of agricultural protection, such as the producer support estimate (PSE) and the aggregate measure of support (AMS). Next, a quantitative evaluation of the volume of transfers facilitated by the rice policies is carried out by employing the standard framework of welfare analysis. The changes in social welfare are simulated when the ex ante and ex post policies related to rice, namely, direct payment per output, purchase of rice by the government, and acreage control, are abolished and when the import tariff on rice is abolished. In addition, we calculate the average transfer efficiency (ATE) of the rice policies during the analysis period and draw the surplus transformation curve (STC) along with the changes in the acreage control rate. It is concluded that acreage control is the most important policy instrument in the current rice policy mix, but it is highly inefficient and imposes a serious burden on consumers and government expenditure.

Keywords: rice policies, welfare analysis, acreage control

JEL Classification: Q11, Q17, Q18

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1. Introduction

This study aims to quantitatively evaluate the rice policy reforms in Japan since the enforcement of the Staple Food Law in 1995. Rice is the most important crop, accounting for approximately 25% of the Japanese agricultural production. Meanwhile, the rice policy reforms introduced in conformance with the WTO Agreement on Agriculture are functional, starting from the revision of the Staple Food Law in 1995 to the newly introduced "Programs of Direct Payment for Paddy-Field Farming" in 2007. In developed countries, the reduction in domestic support is one of the three "pillars" in the current Doha Round negotiations. Moreover, in the trade liberalization process of farm products, it is important to monitor developed countries such as Japan, which have a high agricultural protection level. In addition, as pointed out by Hart and Beghin (2006), the method of reducing the aggregate measure of support (AMS) by the Japanese government takes advantage of the loophole in the current WTO Agreement on Agriculture. Therefore, the study of the Japanese rice policy reforms, which were introduced to ensure that the policies conformed to the WTO Agreement on Agriculture, provides an insight into the formulation of desirable domestic support rules. Furthermore, the evaluation of the Japanese rice policy that was prevalent before the introduction of the Programs of Direct Payment for Paddy-Field Farming in 2007 offers significant insight into the domestic agricultural policy reforms in Japan. For example, the acreage control policy, designed to reduce the produced quantity and maintain the price of rice, is being criticized for its inefficiency and farmers' unwillingness to participate in the program. While some insist on abolishing acreage control and reinforcing the use of abundant rice for feed (Suzuki and Kaiser, 1998), others insist on providing increased direct payment to principal farmers (Yamashita, 2006). Recently, OECD (2009) estimated the impact of the acreage control program using the Policy Evaluation Model and suggested gradual reduction of acreage control and provision of transition assistance for the large-scale farmers. However, before discussing such alternative policies, it is necessary to evaluate the effect of the rice policies on producers, consumers, and tax payers since the enforcement of the Staple Food law.

The studies on quantitative evaluation of rice polices were frequently made during the Uruguay Round negotiations and published thereafter. Kako, Gemma and Ito (1997) assessed the impact of the minimum access import on the supply and demand balance of rice, and projected the rice production by 2010. Saito (1996) also discussed the economic effect of minimum access import of rice employing a general equilibrium model. Fujiki (2000) took a competitive equilibrium approach to quantify the effect of Japanese rice imports, with special attention to the farmland market in Japan. These studies assumed that rice was imported with a low tariff rate, or that imported minimum access rice was distributed in the market for edible use. However, these studies are not based on the actual policy reforms in Japan, such as tariffication of rice import with the high out-of-quota tariff rate and introduction of direct payment systems for rice farmers. Earlier than these studies, Otsuka and Hayami (1985) evaluated the economic effect of rice policies in Japan from 1965 to 1980, employing a partial equilibrium model. They distinguished producers from farmers, who also consumed a part of their product. They argued that the motivation of the government in this period was to raise producers' welfare while minimizing the budget costs and that it was not concerned with consumer welfare. They also concluded that acreage control was the second-best policy to reduce social inefficiency under the policy of supporting high prices for rice. Hayami and Godo (1997) and Godo (2002) also evaluated the rice policy using similar models. Hayami and Godo (1997) simulated the economic implications when rice import was tarifficated with and without acreage control. Godo (2002) evaluated the rice policies until 1997 and decomposed the producer support estimate (PSE) into budgetary policies and non-budgetary

polices. He argued that the non-budgetary policies, such as the acreage control program and prohibition of rice import, played the predominant roles in the rice policies. In this paper, we develop a modified version of the model used in Otsuka and Hayami (1985), taking the recent rice policy reforms into account, and discuss how the economic welfare of farmers, consumers and tax payers is affected by those reforms.

This paper is organized as follows. In Section 2, the development of the Japanese rice policy reforms since the Uruguay Round Agreement on Agriculture is reviewed. The transition of the representative indices that measure the level of agricultural protection, namely, the PSE measured by OECD and the AMS notified by the Japanese government is also reviewed. In Section 3, a quantitative evaluation of the volume of transfers facilitated by the rice policies is carried out. In order to evaluate the effect of domestic policies, the changes in social welfare are simulated when the ex ante and ex post policies related to rice, namely, direct payment per output, purchase of rice by the government, and acreage control, are abolished In addition, we calculate the average transfer efficiency (ATE) of the rice policies and draw the surplus transformation curve (STC) along with the changes in the acreage control rate, both of which are argued by Gardner (1983). Finally, the findings and the policy implications of this study are discussed.

2. Rice Policy Reforms since 1995

2.1 Rice Policy under the Uruguay Round Agreement on Agriculture

In this section, the rice policy reforms from 1995 to 2006 are reviewed[1].

Before the enforcement of the Staple Food Law in 1995, the Japanese rice marketing system was based on the Food Control Law, which was enacted in 1942 and which originally placed all food items under strict government control. Although the food control system for all crops, except rice, was abolished, the government system for controlling the distribution of the entire quantity of rice was effective until 1995. This system had become a dead letter in the 1990s; the illegal “free-market rice,” which is outside the purview of the orderly marketing system, became prevalent, and the government expenditure to support the price of rice by buying and disposing rice was considerable. The year 1993 was a turning point with respect to rice policies in Japan in that the harvest was exceptionally poor, producing only 74% of the average harvest, and the government was forced to urgently import 2.6 million tons of rice. Furthermore, after an agreement of the Uruguay Round negotiations at the end of 1993, the government was required to revise the Food Control Law in order to import rice under the minimum access commitment. By exempting rice from tariffication, the Japanese government was imposed greater rice imports with minimum access commitment; the minimum access import quota was 4% of the domestic consumption in 1995 and to be increased gradually up to 8% in 2000, while the quota was 3% and 5% respectively if the tariffication had been implemented.

Finally, the Food Control Law was replaced by the Staple Food Law (the Law for Stabilization of Supply-Demand and Price of Staple Food) in 1995, which came into effect on November 1, 1995[2]. The compulsory system of selling rice to the government was abolished, and the role of the government purchase was limited to maintaining a rotating stock of rice. In addition, the free-market rice was legalized as “nonorderly marketed rice.” Rice import with minimum access also began in 1995, with an import of 426,000 tons, which was 4% of

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[1] See also Hayami (1988) and Hayami and Godo (1997) for the rice policy under the Food Control System. The details of the data can be obtained from the authors on request.

[2] In the Japanese rice system, the rice year begins from November in the previous year and ends in October in the subsequent year. Therefore, the Staple Food Law came into effect in the 1996 rice year. Note that the rice available in the market in the 1996 rice year was mainly produced in the 1995 rice year.

the domestic consumption. The import quota was controlled by the Food Agency, the state trading enterprise (STE) of the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan.

However, even after the implementation of the Staple Food Law, the government continued to support the price of rice by purchasing large amounts of rice. The stock of rice purchased by the government amounted to over 3 million tons, partly because of the good harvest from 1994 to 1997. In order to deal with these problems, the New Rice Policies was introduced in 1998. First, acreage control for curbing rice production was reinforced in order to reduce the government stock and maintain the price of rice. Second, as a substitute to the conventional subsidy for voluntarily marketed rice, the Rice Farming Income Stabilization Program (JRIS) compensated for the decrease in the price of voluntarily marketed rice from the average price for three years. As a part of this program, eligible producers had to participate in the acreage control program. Third, the liberalization of distribution system, such as the abolishment of market price control for orderly marketed rice, was implemented.

The Staple Food Law was once again revised in 1999 to tarifficate rice imports. The import quota was converted to the tariff rate quota, while the official control of quota was maintained. The out-of-quota tariff rate of rice was set at 341 yen per kg, which virtually prohibited all rice imports except for the minimum access imports. The volume of the minimum access rice imports was thereby reduced from 8% to 7.6% of the total consumption in 2000.

Subsequently, the Basic Law on Food, Agriculture and Rural Areas was established in 1999, and the Basic Plan in 2000 announced agricultural policies that were more market-oriented and changed the conventional price support for all farmers to income support for principal farmers. Accordingly, on the basis of the Principle and Outline of Rice Policy Reform in 2002, the Staple Food Law was revised in 2004. This revision completely liberalized the orderly marketing system and regulated the government purchase of rice through the bidding system. In addition, the Income Stabilization Program for Principal Farmers, which produced additional payments for principal rice farmers with large farms, was introduced along with the conventional JRIS. In 2007, a new income stabilization program called the Programs of Direct Payment for Paddy-Field Farming was introduced, but the measures of income stabilization are the same as the conventional rice policies.

[Table 1]

The key statistics of the rice economy in Japan in this period are summarized in Table 1. The quantity of rice produced decreased from 10.72 billion tons in 1995 to 8.55 billion tons in 2006, following the considerable decline of rice price, i.e., from 285 yen per kg in 1995 to 216 yen in 2006. This is because of the declining amount of government purchase of rice, especially from 1998. The amount of payment per output is the average of subsidy for total production, including the free market rice that is not covered by direct payment programs. The declining amount of subsidy indicates both the reduction in the government expenditure for the program and the decrease of the former orderly marketed rice. Instead of providing more direct payment, the government made efforts to maintain the price of rice by raising the acreage control rate and providing more subsidies for acreage control. In 2006, only 70% of the paddy field was cultivated for rice production, and the remaining 30% of the land was used for the production of diverted crops, such as wheat and soybeans, or in land improvement programs. The amount of subsidy for acreage control is increased up to 165 billion yen in 2006. The distribution margin of rice is being reduced, reflecting the market liberalization of rice distribution.

The amount of government purchase and sale of rice is also summarized in Table 1. Under the Food Control Law, the government supported the market price of rice through purchasing domestic rice and disposing of rice for non-edible use, such as feed, processing use and food

aid. This system was maintained even after the enforcement of the Staple Food Law in 1995. However, the government purchase of domestic rice has been restricted and the stock of domestic rice has been significantly reduced since the enforcement of the New Rice Policies in 1998. In the year of bad harvest, such as 1998 and 2003, the government stabilized the market price of rice by releasing the stock of domestic rice. In contrast, the stock of imported rice was accumulated up to 1,890 thousand tons in 2006. It was decided on the agreement of the UR negotiation that the imported rice should not affect the domestic market of rice, so most of the minimum access rice imports have been sold for non-edible use. The government denies the negative impact of imported rice on the market price of domestic rice, claiming that it disposes of imported rice for non-edible use and the amount of domestic rice sold for non-edible use is larger than the amount of imported rice for edible use. However, observing the decreasing amount of domestic rice and the increasing amount of imported rice in the government stock, it seems that the government's ability to purchase and dispose domestic rice is limited by the stock of imported rice and the financial burden of disposing the stock.

2.2 Rice Policy Reforms and Agricultural Protection Rate

Next, the influence of the rice policy reforms on the indices for the level of agricultural protection, such as the PSE measured by OECD and the AMS notified by the Japanese government is discussed[3].

[Table 2]

Table 2 summarizes the trend of PSE in Japanese agriculture since 1986 and the PSE related to rice. Some payments, such as the payment for the diversion program and the direct payment for principal farmers, are reported as being unrelated to rice, but are still included in Table 2 because they are apparently related to rice production.

The total PSE measured by the farm gate price decreased by more than 40% from 7,726 billion yen in 1986 to 4,149 billion yen in 2007. The percentage PSE also decreased from 65% in 1986 to 46% in 2007. There are three types of PSE that are related to rice: (A) supports based on commodity outputs, (C) payments for which production is required, and (E) payments for which production is not required. The total amount of the PSE related to rice almost halved from 3,386 billion yen to 1,558 billion yen. This shows that the agricultural policy reforms in Japan resulted in a reduction in the agricultural protection rate.

[Table 3]

Table 3 shows the trend of AMS till 2006 and the overall trade-distorting domestic support (OTDS), that is, the sum of the authorized AMS, de minimis, and Blue Box expenditure, which will become a basis for domestic support reduction.

The total AMS decreased more drastically than PSE, especially since 1998, because the official "administered price" for rice became unreported and the market price support for rice became zero. This reflects the liberalization of the marketing regulation of rice after the implementation of the New Rice Policies. However, the sudden reduction in the market price support for rice in 1998 does not imply that there was a significant decrease in the farmers' income. The liberalization process was functional before 1995 and was completed under the revised Staple Food Law in 2004. Furthermore, the price support of rice through the acreage control program and the intervention of rice market by the government purchase and sale of stock are still in effect. Therefore, the official announcement of Japanese MAFF in the notification documents is a little misleading. Since 1998, the AMS related to rice has been zero, and the OTDS related to rice, including JRIS and other income stabilization programs, only constitutes approximately 10% of the total OTDS. Another problem in the notification of

[3] See also Godo and Takahashi (2008) for the notification of domestic agricultural policies by the Japanese government.

the domestic policy by the Japanese government is that the payments for acreage control are included in the Green Box. Acreage control stimulates the production of diverted crops such as wheat and soybeans; however, the government explains it as “payments for maintaining paddy fields in an environmentally good condition.” The rice policy reforms are successful in that they reduced the amount of AMS significantly.

3. Quantitative Evaluation of the Rice Policy Reforms

3.1 Outline of the Evaluation Model

This section evaluates the rice policy reforms described in the previous section by the standard welfare analysis. We assume a supply and demand curve with a constant elasticity and that the market price is determined at the equilibrium in a perfectly competitive market. The model sets the producer and consumer prices of rice and the acreage control rate as exogenous variables, and the quantity of the government procurement is endogenously determined. As per Otsuka and Hayami (1985), the welfare effect of rice policies for farmers as producers and farmers as consumers is differentiated by decomposing demand for rice into farmers’ demand and non-farmers’ demand. Farmers determine their demand for rice by a farm gate price of rice and household income, which partly comes from rice production. However, due to the following rice policy reforms, the models used in the previous studies cannot be directly applied in this paper. There are three points that are incorporated into the model. First, the orderly marketing system has been abolished, and the price of rice is determined by the market equilibrium. The government has a smaller effect than before on the supply and demand of rice through acreage control and maintenance of the government stock for food security. Second, the minimum access rice import began in 1995. Third, as a substitute for the support of the market price of rice under the Food Control System, a system of direct payments that enables rice farmers to compensate for the price fluctuation has been introduced. In order to incorporate these changes into the model, the direct payment per output, the acreage control rate, and the quantity of the government procurement are set as exogenous variables and the equilibrium price of rice, as an endogenous variable. The imported quantity is exogenous, because the import is controlled by the government. It is also assumed there is no difference in the quality of rice regardless of when or where it was produced.

The structural equations of the rice market model are as follows.

Demand function of non-farmers: $Q_d^1 = A \cdot p_d^{\alpha 1}$ (1)

Demand function of farmers: $Q_d^2 = B \cdot p_s'^{\alpha 2} \cdot Y^{\gamma}$ (2)

Supply function: $Q_s = C \cdot (1 - \theta) \cdot p_s'^{\beta}$ (3)

Relationship between producer price and farm gate price: $p_s' = p_s + g$ (4)

Relationship between consumer and producer price: $p_s + m = p_d$ (5)

Market equilibrium condition: $Q_d^1 + Q_d^2 + G = Q_s$ (6)

In the above equations, the variables represent the following.

p_s: farm gate price of rice

p_s': farm gate price of rice, including subsidy

p_d: retail price of rice

g: average subsidy per unit

Y: household income of farmers

m: distribution margin, defined by the gap between actual farm gate and retail price and assume to be constant in each year

G: net purchase of rice by the government, namely, the purchased quantity of domestic rice less the released quantity of minimum access rice

Q_d^1, Q_d^2: demand of non-farmers and farmers, respectively
Q_s: supply
A, B, C: shift parameters of supply and demand
θ: rate of acreage control, defined by the ratio of unplanted paddy field to cultivated paddy field
$\alpha 1, \alpha 2$: price elasticities of demand of non-farmers and farmers, respectively
β: price elasticity of supply
γ: income elasticity of demand

The simulation results are affected by the values of elasticities as well as the structure of the evaluation model. The elasticities of price are obtained from a survey of related studies. We use –0.335 as the price elasticity of demand and –0.77 as the income elasticity of demand, following the estimation by Kusakari and Kakino (1998). The estimation of Kusakari and Kakino (1998) considers the rising opportunity cost of cooking rice. This price elasticity is greater than –0.13, as in Kako et al. (1997), and –0.12, as in Otsuka and Hayami (1985). The elasticity of demand of farmers and non-farmers are assumed to be the same. The total price elasticity of price of farmers is approximated to be –0.44, as per the calculation of the price elasticity of market supply in Otsuka and Hayami (1985)[4]. The price elasticity of supply depends on how the agricultural structure is assumed. Fujiki (2000) estimated the elasticity of supply from the factor shares in rice production by assuming a Cobb-Douglas production function. He argued the supply elasticity was 0.45 when the farmland market worked in the flat agricultural areas, while the elasticity was 0.18 when the farmland market did not work. Therefore, the price elasticity of supply is set as 0.45 in the baseline simulation and the sensitivity analysis is conducted in which the supply elasticity is set as 0.18.

3.2 Scenarios of the Simulation

On the basis of the abovementioned model, the effect of the rice policy reforms is evaluated by analyzing how the changes in each policy affect social welfare. In this model, the government can alter three parameters in the domestic rice policies: the acreage control rate,θ; direct payment per output to producers, g; and volume of net purchase by the government, G. In these three policy variables, acreage control is an ex ante policy that maintains the price of rice, while the direct payment and government's purchase can be regarded as ex post policies that compensate for the price fluctuation. Therefore, we first evaluate the welfare effect of direct payment and the government purchase by the simulation of abolishing these two policies. Next, we simulate the case of abolishing the acreage and compare it with the first case. In order to evaluate the effect of gradual policy reforms, simulations are conducted for the whole period under the WTO Agreement on Agriculture, namely from 1995 to 2006.

The details of each simulation are as follows[5].

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[4] By differentiating (2) with respect to p_s' and rearranging, the total price elasticity of demand for farmers is calculated as $\left(\frac{\partial Q_d^2}{\partial p_s'}\right)\left(\frac{p_s'}{Q_d^2}\right) = \alpha + \gamma\left(\frac{p_s' \cdot q}{Y}\right)$, where q represents individual farmers' production and $\left(\frac{p_s' \cdot q}{Y}\right)$ represents the share of rice income in total income. This share is obtained from the MAFF publication as 0.14.

[5] We did not consider the case of market liberalization in the simulations. It is difficult to evaluate the economic impact of abolishing the current import prohibition; the international price of rice is well below the variable cost of rice production in Japan, so most of rice farmers would quit production in the case of full liberalization. As per Fujiki (2000), it is possible to simulate the impact of partial liberalization with the assumed import tariffs and supply elasticity of imported rice, but such a simulation is not relevant to the current discussion.

(a) Abolition of direct payment and government purchase

In this simulation, the direct payment per output to producers, g, is set as zero. Since the direct payment is based on output, it stimulates farmers' incentives for production. We assume that farmers can expect the amount of payment before production, which is realistic considering the payment stabilizes the price of rice to the level of the average price in the previous years. In addition, we also assume that the function of the government with regard to domestic rice is restricted to maintaining a rotating stock while it maintains the state trading of imported rice and dispose of the actual stock of imported rice for processing use. The amount saved in government expenditure by the abolition of government purchase is obtained as the actual expenditure of rice procurement in each year, which is published in the official documents of the Japanese MAFF.

(b) Abolition of acreage control[6]

This scenario supposes that acreage control is abolished as well as direct payment per output and government purchase, which means all the three rice policies considered in this article are abolished. The results are shown as the change from simulation (a) to make clear the effect of acreage control. In this case, although the government does not have to grant a subsidy for acreage control, the revenue from selling minimum access rice for edible use decreases due to the decline in the price of rice.

The result of each simulation is obtained as follows. First, the shift parameters of supply and demand are estimated from the actual data and assumed elasticities. These shift parameters reflect the actual fluctuation of supply and demand in each year. Next, after changing the values of exogenous policy variables, a new equilibrium farm gate price is calculated from the market equilibrium condition. Then, the retail price, which is a sum of farm gate price and actual distribution margin, the quantity of supply and demand, and changes of producer and consumer surplus are calculated from the model equations.

3.3 Simulation Results

The results of the baseline simulation are shown in Table 4. The changes of economic surplus of farmers, shown in the tables, are the sum of changes of producer surplus and consumer surplus of farmers.

[Table 4]

First, from simulation (a), it is observed that the effect of the government purchase and direct payment on farmers' economic surplus is positive by 1997, but the increased amount of producer surplus has declined since 1998. This is because the government has started selling government stock of domestic rice for edible use and restricted purchase since the implementation of the New Rice Policies. The effect of the two policies on consumer surplus is negative in most years, although the amount is not substantial since 1998. This is partly because the effect of direct payment is shifted not only to producers but also to consumers through increased production. In the case of a bad harvest, as in 2003, the government sells a larger amount of rice to the domestic market than that it purchases, thus preventing farmers from taking advantage of the high price of rice.

Next, the simulation results of simulation (b) are examined, in which not only direct payment per output and government purchase but also acreage control is abolished. The farm gate price of rice in simulation (a) is approximately 60% higher than that in simulation (b), while the quantity produced is approximately 10% smaller. This is the effect of price support

[6] Simulation (b) assumes all the diverted paddy fields under acreage control are used for rice production. However, some farmers may continue producing diverted crops such as soybeans and wheat. In addition, some may quit production and let the farmland idle because transaction cost of farmland leasing is high. Therefore, simulation (b) may overestimate the effect of acreage control.

by acreage control. The change of producer surplus and farmers' economic surplus from simulation (a) to (b) is about 620 and 520 billion yen, on average. The effect of acreage control to increase producer surplus is much larger than the effect of direct payment and government purchase; it is clear that the most significant transfer is made to farmers by the acreage control program. This has especially been the case after 1998, when the New Rice Policies was introduced and the government purchase of rice was restricted. On the other hand, the acreage control policy imposes a serious burden on consumers and increases the government expenditure. The sum of reduced consumer surplus and government expenditure by the acreage control program is about 810 billion yen, on average, which is much larger than the increase in producer surplus. The government provides farmers with subsidy for acreage control, but the amount of the subsidy is smaller than the burden on consumers. The acreage control generates heavy deadweight loss of about 430 billion yen on average.

[Table 5]

The results of sensitivity test, assuming lower supply elasticity, are shown in Table 5. As theoretically expected, the change of the economic surplus is larger and the change of the produced quantity is smaller than in Table 4; when supply is inelastic, farmers cannot adjust their production to decline in the rice price, so the effect on economic welfare is amplified. However, the essence of the current discussion is not affected by a different value of supply elasticity.

[Figure 1]

Following Godo (2002), the decomposition of the current PSE related to rice farming into the domestic policies and import prohibition is made from the results of simulations (a) and (b). The PSE that comes from import prohibition can be calculated from simulation (b), where all the domestic rice policies are abolished and the import prohibition and the state trading system is maintained. In Figure 1, the light-shadowed area represents the PSE from domestic policies, and the dark-shadowed area represents the PSE from border restriction. The bold line in Figure 1 indicates the PSE in simulation (a). It is observed that approximately half of the PSE is composed of import prohibition, while acreage control plays a key role in supporting domestic rice price and thus increasing the PSE related to rice farming. Considering the international price of rice used in the calculation of PSE is lower than the actual import price, it can be concluded that difference between the domestic price and international price of rice is mostly accrued from the price support policies.

[Figure 2]

To discuss the effect of domestic rice policies, we plot the change of producer surplus on the vertical line and the sum of the change of consumer surplus and the government expenditure on the horizontal line in Figure 2. The 45-degree line represents efficient transfer to the producer without deadweight loss. The sum of the transfer to producers by these three policies declined from 710 billion yen in 1995–1997 to 580 billion yen in 2004–2006; this is shown by the shift of plots in the bottom right direction. Figure 2 also shows the ATE, which is defined as the ratio of producer surplus change to the sum of changes in consumer surplus and government expenditure, and is calculated as the slope of the line between each point and the original point. Except for 1998 and 2003 (the years of bad harvest), the plots are approximately on the same line. This implies that the ATE remains constant even with the rice policy reforms. The average ATE during the analysis period is 0.56 and 0.58 excluding 1998 and 2003, which implies that approximately 60% of the loss of consumers and government expenditure is transferred to producers and the remaining is forgone as dead weight loss.

In order to further examine the efficiency of the acreage control program, we draw the STC of rice policies along with the changes in the acreage control rate from 0 to 0.5 by 0.05. The average statistics from 2004 to 2006 are used in this simulation. The dotted line represents the

STC in Figure 2. As per the numerical example by Gardner (1983), the slope of the STC is less than one and declines as the acreage control rate rises. This implies that the inefficiency of acreage control becomes even more substantial as the policy is reinforced. However, the importance of the acreage control policy in the current rice policy mix is growing, as shown in Table 4.

As argued by Alston and Hurd (1990), efficient redistribution along with the 45-degree line in Figure 2 is possible by providing decoupled direct payment or by combining direct payment per output with production quota. Therefore, it could be concluded that the government has arbitrarily chosen to adopt inefficient policy mix by strengthening the acreage control program. The reason should be the financial burden of direct payment; the acreage control is more "efficient" than other policies in that it requires less financial burden compared to the increased producer surplus, although the loss of consumer surplus is significant. The indication by Otsuka and Hayami (1985) that the government is indifferent to the changes in consumer welfare and tries to minimize the budgetary cost of protecting the interest of farmers is still valid in this sense.

4. Conclusion

The current AMS of the Japanese agricultural policies is well below the commitment level, and the prohibitive tariff rate of rice has been accepted. On the other hand, the market price support through acreage control and procurement continues to exist, although the distribution system has been liberalized. The Japanese government does not have to introduce additional reforms to ensure that the policies conform to the WTO Agreement on Agriculture, and is even able to grant large amount of trade-distorting direct payment to domestic producers. This raises a question against the ability of the WTO rules to control domestic policies, especially by developed countries. The quantitative analysis conducted in this study offers a basis for improving transparency of domestic policies by Japan and negotiating effective disciplines of domestic support, such as redefinition of AMS and Green Box. With regard to domestic policy reforms, this study clearly verified the inefficiency of current policy mix related to rice. The government should not only passively respond to the reforms of the domestic policies following the international negotiations but also ensure positive reforms in order to improve the efficiency of these policies. Above all, it should examine the effect of the conventional acreage control policy and implement alternative policies which support farmers' welfare with a limited loss of consumer surplus and financial cost.

In the simulations, it was assumed that the market of rice is homogenous, perfectly competitive and closed economy. However, the assumptions of homogenous good and perfect competition may be oversimplified, considering the quality difference and the market structure of rice. In addition, the assumption of closed economy may become invalid when the prohibitive tariff is controlled by a tariff reduction or the import quota is expanded. It is necessary to modify the evaluation model to account for these limitations.

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Table 1: Key Statistics on the Rice Economy in Japan (source: the MAFF publications)

Rice Year	Farm Gate Price	Subsidized Farm Gate Price	Retail Price	Distribution Margin	Acreage Control Rate	Subsidy for Acreage Control	Produced Quantity	Consumed Quantity by Non-farmers	Consumed Quantity by Farmers
1995	285	295	433	148	18.2	81	10,720	8,400	1,220
1995	286	295	419	133	23.0	133	10,330	8,750	1,130
1997	256	265	400	143	23.3	133	10,000	8,290	1,080
1998	270	270	389	119	28.7	116	8,940	8,200	1,040
1999	245	258	370	125	28.7	117	9,160	7,900	990
2000	232	249	359	127	28.9	136	9,470	8,440	940
2001	235	245	356	121	31.0	167	9,050	8,380	890
2002	232	245	363	131	31.3	201	8,880	8,310	850
2003	304	298	388	84	31.8	186	7,780	7,780	810
2004	224	228	336	112	29.9	159	8,720	7,690	780
2005	217	223	332	115	29.2	168	9,060	8,230	730
2006	216	221	328	112	29.6	165	8,550	7,970	690
		(yen/kg)			(%)	(billion yen)		(thousand tons)	

	Government Purchase and Sale of Rice (thousand tons)								
Rice Year	Government Stock of Domestic Rice	Purchase of Domestic Rice	Sale of Domestic Rice for Edible Use	Sale of Domestic Rice for Non-Edible Use	Government Stock of Imported Rice	Imported Quantity of Minimum Access Rice	Sale of Imported Rice for Edible Use	Sale of Imported Rice for Non-Edible Use	Total Government Stock
1995	1,180	1,650	550	40	0	430	0	120	1,180
1996	2,240	1,160	680	50	310	510	30	400	2,550
1997	2,670	1,190	520	370	390	600	40	530	3,060
1998	2,970	300	500	440	420	680	100	560	3,390
1999	2,330	570	200	1,090	440	720	100	350	2,770
2000	1,610	410	230	40	560	770	90	490	2,170
2001	1,750	80	200	0	750	770	100	470	2,500
2002	1,550	140	380	0	950	770	40	410	2,500
2003	1,660	20	770	340	1,270	760	60	540	2,930
2004	570	370	40	180	1,480	770	80	420	2,050
2005	710	390	190	230	1,750	770	100	530	2,460
2006	760	250	250	0	1,890	770	110	1,020	2,650

Table 2: Trend of the PSE in Japanese Agriculture (source: OECD)

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Total value of production	11,171	10,356	10,303	10,862	11,339	11,304	11,151	10,366	11,248	10,388	10,243
Producer Support Estimates (PSE)	7,726	7,135	6,845	6,564	6,190	6,159	6,686	6,339	7,415	6,841	6,254
Percentage PSE	64.7	64.4	61.8	56.8	51.6	51.5	56.6	57.6	62.7	62.2	57.9
Value of rice production	3,623	3,109	2,773	2,888	2,887	2,624	2,889	2,140	3,273	2,936	3,047
PSE related to rice farming	3,386	2,921	2,536	2,573	2,553	2,338	2,598	2,038	2,819	2,657	2,613
A. Support based on commodity outputs											
Market Price Support	3,013	2,592	2,204	2,213	2,235	2,025	2,316	1,801	2,650	2,449	2,400
Payments based on output	123	114	114	133	145	141	136	136	94	119	80
C. Payments (production required)											
Area payment	0	0	0	0	0	0	0	0	0	0	0
Rice farmers management support	0	0	0	0	0	0	0	0	0	0	0
E. Payments (production not required)											
Diversion	250	216	218	227	173	172	146	101	75	89	133
Direct payment for core farmers	0	0	0	0	0	0	0	0	0	0	0
Level of production (thousand tons)	11,647	10,627	9,935	10,347	10,499	9,604	10,573	7,834	11,981	10,748	10,344
Producer price (yen/kg)	311	293	279	279	275	273	273	273	273	273	295
Reference price (yen/kg)	52	49	57	65	62	62	54	43	52	45	63

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total value of production	9,746	9,765	9,299	9,130	8,881	8,930	8,857	8,714	8,489	8,310	8,504
Producer Support Estimates (PSE)	5,607	5,991	5,906	5,804	5,376	5,511	5,462	5,191	4,908	4,566	4,149
Percentage PSE	54.2	58.2	60.0	59.4	56.4	57.5	57.5	55.9	54.2	51.5	45.5
Value of rice production	2,629	2,424	2,260	2,140	2,032	1,970	2,087	2,061	1,916	1,783	1,789
PSE related to rice farming	2,240	2,206	2,161	2,093	1,992	1,858	2,028	1,846	1,774	1,569	1,558
A. Support based on commodity outputs											
Market Price Support	1,981	1,990	1,933	1,847	1,727	1,591	1,768	1,624	1,552	1,341	1,265
Payments based on output	126	100	111	118	115	99	81	73	58	66	41
C. Payments (production required)											
Area payment	0	0	0	0	0	0	0	4	4	5	5
Rice farmers management support	0	0	0	0	0	0	0	0	12	8	1
E. Payments (production not required)											
Diversion	133	116	117	129	150	168	179	145	148	150	148
Direct payment for core farmers	0	0	0	0	0	0	0	0	0	0	98
Level of production (thousand tons)	10,025	8,960	9,175	9,490	9,057	8,889	7,792	8,730	9,074	8,556	8,714
Producer price (yen/kg)	262	271	246	226	224	222	268	236	211	208	205
Reference price (yen/kg)	65	48	36	31	34	43	41	50	40	52	60

Table 3: Trend of the AMS and OTDS (billion yen, source: the WTO notification documents)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Green Box	3169.0	2818.1	2651.7	3001.6	2685.9	2595.3	2546.9	2275.2	2086.3	2098.3	1916.3	1802.4
Payments for conversion from rice production	80.7	133.3	132.9	115.6	116.7	136.2	166.7	200.6	185.8	158.8	168.4	164.6
Blue Box	-	-	-	50.2	92.7	92.7	91.1	86.5	68.2	67.8	65.3	70.1
Amber Box	3507.5	3329.7	3170.8	766.5	747.8	708.5	666.7	730.0	641.8	607.8	593.3	571.2
Price support	3271.3	3125.8	2967.9	641.5	619.6	503.9	389.7	404.0	405.6	403.0	394.7	389.9
(rice)	2560.7	2464.5	2315.3	-	-	-	-	-	-	-	-	-
Domestic payment	236.2	203.9	202.9	125.0	128.2	204.6	277.0	326.0	236.2	204.8	198.6	181.4
(rice)	100.8	93.0	82.2	-	-	-	-	-	-	-	-	-
de minimis	36.6	37.3	36.1	75.5	32.6	31.7	32.1	43.6	35.0	41.1	41.3	18.6
(rice)	-	-	-	41.9	-	-	-	-	-	7.5	7.5	2.3
Current total AMS	3507.5	3329.7	3170.8	766.5	747.8	708.5	666.7	730.0	641.8	607.8	593.3	571.2
(Commitment)	4800.6	4635.0	4469.5	4304.0	4138.4	3972.9	3972.9	3972.9	3972.9	3972.9	3972.9	3972.9
Overall Trade-distorting Domestic Support	3544.1	3367.0	3206.9	841.8	780.4	740.2	698.8	773.6	676.8	648.9	634.6	659.9
TDS related to rice	2661.5	2557.5	2397.5	92.1	92.7	92.7	91.1	86.5	68.2	75.3	72.8	72.4
Percentage	75.1	76.0	74.8	10.9	11.9	12.5	13.0	11.2	10.1	11.6	11.5	11.0

Table 4: Results of the Baseline Simulations (source: authors' calculation)

(a) abolition of direct payment per output and government purchase, compared to the current situation

Rice Year	Farm Gate Price	Retail Price	Demand of Non-farmers	Demand of Farmers	Supply	Changes of Producer Surplus	Changes of Economic Surplus of Farmers	Changes of Consumer Surplus	Changes of Government Expenditure	Changes of Deadweight Loss
1995	250	399	8,639	1,313	9,952	-465	-408	296	276	221
1996	273	406	8,841	1,169	9,980	-221	-196	112	308	242
1997	238	381	8,424	1,134	9,518	-269	-239	156	280	215
1998	279	398	8,140	1,026	9,066	77	68	-70	116	41
1999	240	365	7,939	1,023	8,862	-165	-147	43	224	158
2000	238	365	8,398	960	9,268	-109	-98	-45	237	163
2001	246	367	8,294	887	9,081	17	15	-93	160	85
2002	251	381	8,171	841	8,973	51	46	-154	200	112
2003	340	424	7,550	764	8,254	336	303	-278	77	-41
2004	215	326	7,762	801	8,484	-116	-106	71	122	56
2005	214	329	8,257	743	8,900	-78	-71	27	126	62
2006	220	332	7,941	692	8,523	-13	-12	-28	120	57
	(yen/kg)			(thousand tons)				(billion yen)		

(b) abolition of acreage control, compared to (a)

Rice Year	Farm Gate Price	Retail Price	Demand of Non-farmers	Demand of Farmers	Supply	Changes of Producer Surplus	Changes of Farmers' Economic Surplus	Changes of Consumer Surplus	Changes of Government Expenditure	Changes of Deadweight Loss
1995	187	335	9,158	1,495	10,653	-428	-339	566	81	308
1996	187	320	9,575	1,383	10,928	-604	-495	791	131	427
1997	161	304	9,088	1,349	10,396	-542	-447	674	130	357
1998	172	290	9,044	1,272	10,215	-650	-528	918	105	495
1999	146	271	8,769	1,273	9,943	-580	-474	780	107	414
2000	144	270	9,281	1,200	10,391	-626	-526	829	128	430
2001	143	264	9,267	1,129	10,296	-696	-593	906	156	469
2002	144	274	9,125	1,077	10,162	-745	-644	922	196	474
2003	200	284	8,634	966	9,540	-805	-685	1,126	177	618
2004	127	239	8,620	1,011	9,551	-578	-500	716	152	367
2005	128	243	9,142	933	9,975	-603	-531	747	160	376
2006	131	242	8,820	872	9,582	-594	-525	745	155	375
	(yen/kg)			(thousand tons)				(billion yen)		

Table 5: Results of the Sensitivity Analysis (source: authors' calculation)

(a) abolition of direct payment per output and government purchase, compared to the current situation

Rice Year	Farm Gate Price	Retail Price	Demand of Non-farmers	Demand of Farmers	Supply	Changes of Producer Surplus	Changes of Economic Surplus of Farmers	Changes of Consumer Surplus	Changes of Government Expenditure	Changes of Deadweight Loss
1995	225	373	8,831	1,376	10,208	-737	-646	518	221	93
1996	260	394	8,936	1,194	10,101	-353	-313	226	242	155
1997	221	365	8,549	1,170	9,679	-433	-383	295	215	127
1998	284	403	8,104	1,017	9,021	125	110	-114	41	38
1999	229	354	8,020	1,044	8,964	-265	-235	130	157	52
2000	231	357	8,454	973	9,337	-177	-159	15	163	19
2001	248	368	8,285	885	9,070	27	25	-103	85	7
2002	254	385	8,145	836	8,941	84	76	-184	112	4
2003	367	451	7,397	739	8,076	545	492	-478	-40	-26
2004	206	318	7,829	815	8,564	-188	-171	135	55	20
2005	209	324	8,303	751	8,954	-127	-116	71	62	17
2006	219	331	7,949	693	8,533	-21	-20	-21	56	16
	(yen/kg)			(thousand tons)				(billion yen)		

(b) abolition of acreage control, compared to (a)

Rice Year	Farm Gate Price	Retail Price	Demand of Non-farmers	Demand of Farmers	Supply	Changes of Producer Surplus	Changes of Farmers' Economic Surplus	Changes of Consumer Surplus	Changes of Government Expenditure	Changes of Deadweight Loss
1995	136	284	9,674	1,719	11,393	-713	-577	820	81	324
1996	137	271	10,132	1,586	11,688	-1,002	-835	1,167	130	462
1997	113	256	9,628	1,579	11,167	-884	-738	985	129	375
1998	126	245	9,572	1,456	10,929	-1,118	-930	1,383	100	553
1999	98	223	9,365	1,521	10,786	-962	-800	1,131	104	435
2000	97	224	9,892	1,430	11,232	-1,040	-885	1,217	124	456
2001	97	218	9,874	1,338	11,112	-1,153	-993	1,350	152	508
2002	97	228	9,706	1,279	10,945	-1,224	-1,066	1,386	194	515
2003	156	240	9,138	1,079	10,157	-1,354	-1,170	1,718	173	722
2004	83	195	9,227	1,220	10,367	-927	-807	1,042	149	384
2005	85	200	9,754	1,117	10,771	-974	-864	1,105	156	398
2006	89	201	9,392	1,032	10,315	-968	-861	1,114	150	404
	(yen/kg)			(thousand tons)				(billion yen)		

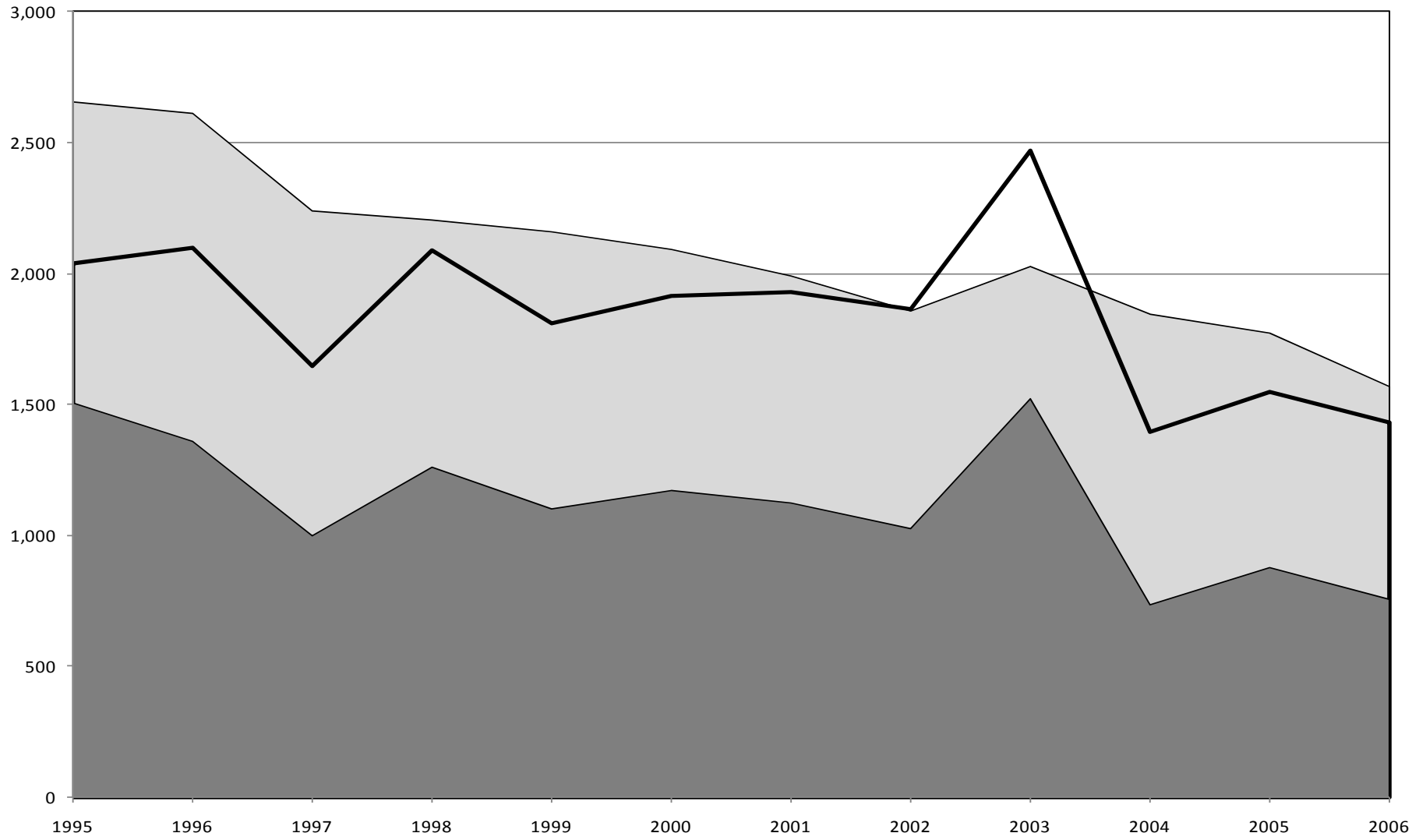

Figure 1: Decomposition of the Actual PSE into the Domestic Policies and Import Prohibition (billion yen, source: authors' calculation)

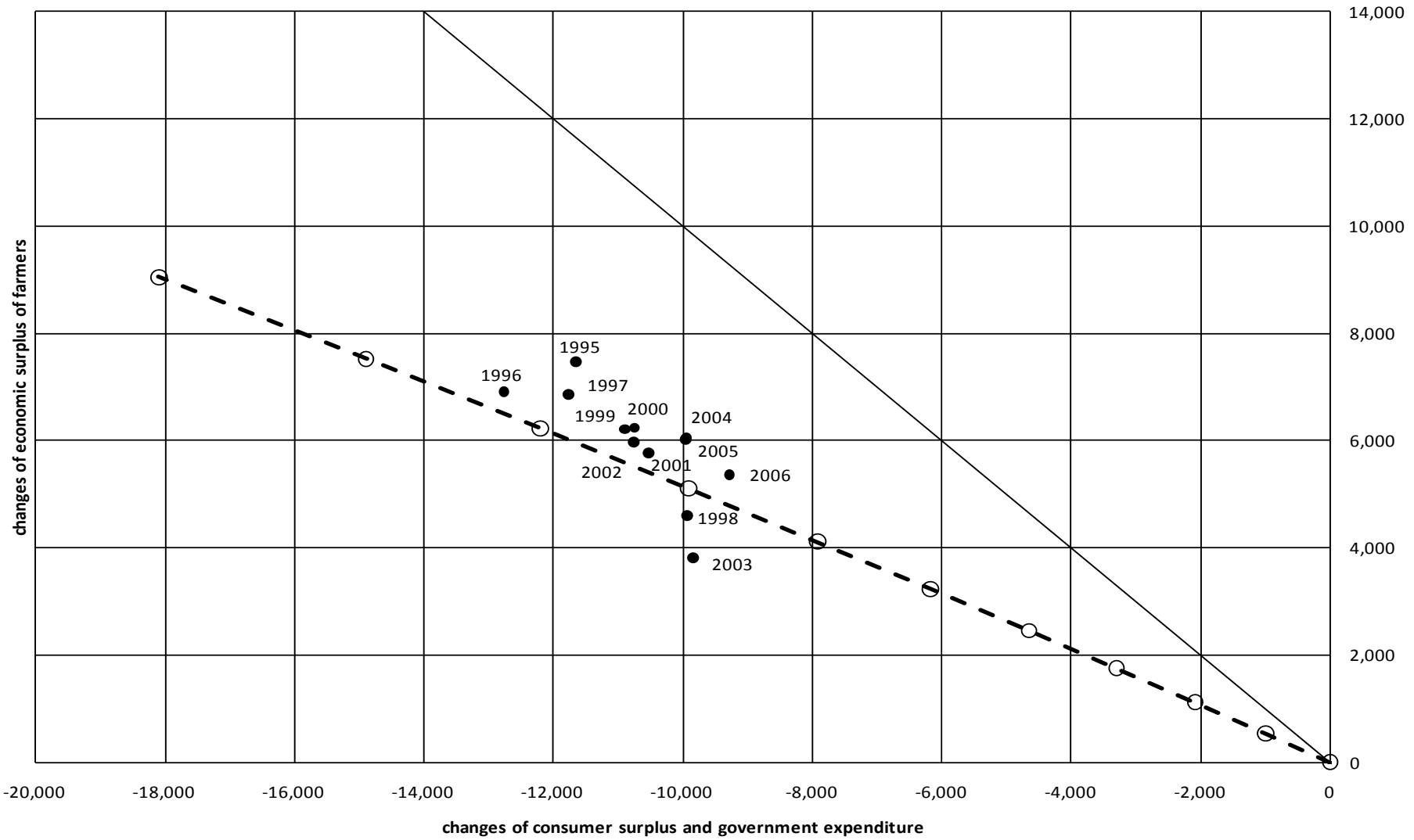

Figure 2: The Surplus Transformation Curve along with the Changes in the Acreage Control Rate (billion yen, source: authors' calculation)