Theoretical and Empirical Analysis of Mixed Medical Care Services in Japan

~ What is Equity? ~

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Abstract

The aim of this study is to examine the manner in which a Japanese medical regulation affects equity in health care within an economic framework. The regulation is termed “the ban on mixed treatment.” Mixed treatment is the mixed use of treatments covered by public health insurance as well as those not covered by such insurance in the course of treating an illness. In principle, the Japanese Health Ministry bans mixed treatment.

In order to examine the effect of mixed treatment on equity in health care, we explain the background of Japanese mixed treatment. Thereafter, we introduce a simple economic model and provide suggestions regarding the behavior of patients under the ban rule. Based on the theoretical model, we simulate the behavior of patients using questionnaire data and analyze the results from various perspectives. Here, we create data using the Contingent Valuation Method (CVM).

The results suggest that lifting the ban could reduce differences in treatments among income/asset class but would make payment for health care regressive slightly. The results also suggest that the behavior of patients is different even within the same income/asset class, and there are other factors for receiving uninsured treatment besides capacity to pay.

Keyword: Mixed treatments, Equity in access to health care, Freedom of choice in health care, Contingent Valuation Method.

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1. Introduction

On November 7, 2007, the judgment on a medical regulation lawsuit filed by a cancer patient caused significant ripples in Japan. The lawsuit filed by a cancer patient independently may not appear to be of much significance. However, its implication is crucially important for the Japanese health care system in terms of indicating the requirement for reexamining the “freedom of choice and equity” in health care.

The medical regulation is termed “the ban on mixed treatment.” Mixed treatment refers to the mixed use of medical treatments covered by public health insurance (hereafter referred to as “insured treatment”) as well as those not covered by such insurance (hereafter referred to as “uninsured treatment”) in the course of treating an illness.

In principle, the Japanese Ministry of Health, Labor, and Welfare (MHLW) bans mixed treatment. Despite this ban, patients can receive mixed treatment if they want it. However, patients cannot receive any public insurance payments for such treatment. In fact, patients must pay for not only uninsured but also insured treatments that they could have otherwise received at only a certain cost in the form of co-payment. On the other hand, if mixed treatment is permitted publicly, patients pay for uninsured treatments as out-of-pocket expenditure, but only pay a certain expenditure as co-payment for insured treatments as well (Figure 1). As far as we know, this regulation is probably unique to Japan.

In the above mentioned case, the cancer patient filed the lawsuit against the MHLW demanding confirmation that he has the right to receive benefit from public insurance; the judgment was in favor of the patient. While the court ruled that there exists no legal basis of the ban rule, it was stated that the judgment on what type of medical care must be covered by public health insurance must be made on a case-by-case basis. The MHLW promptly appealed against the decision.

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1. Detailed information on this lawsuit is available on the following news website. The Japan Times Online, December 3, 2007.
2. In fact, he initiated the lawsuit without lawyers because no lawyers had taken on such a lawsuit before (Kiyosato, 2006).
3. Here, the term “in principle” is used because, in reality, partial mixed treatments are permitted, limiting application to certain treatments and hospitals. This will be described in detail subsequently.
4. In Japan, a majority of the people can receive treatments within public insurance coverage if they have to pay only 30% of the actual cost of treatment.
5. To be more precise, the ban on mixed treatment usually regulates medical agencies. It prevents medical agencies from charging patients for uninsured treatments other than co-payment for insured treatment. Then, medical agencies would lose incentive to use mixed treatment because they would be unable to receive payment for uninsured treatments. Therefore, medical agencies would treat patients if and only if they pay the entire amount including for insured treatments.
In the first place, why does such a regulation exist in Japan? The aim of this study is to organize the background and to show a part of our economic studies (Saito and Tokita 2003, Suzuki and Saito 2006, Saito and Suzuki 2006). We particularly focus on equity in access to health care in terms of treatment level patients obtain and payment burden for them.

In Section 2, we explain the background of the ban rule and the controversy over it. In Section 3, we examine the economic implication of the ban rule and lifting it through a simple economic model. Based on the model, we simulate the behavior of the patients under the ban rule using questionnaire data and empirically analyze the result from the viewpoint of equity. In conclusion, we re-examine this result in light of other previous studies and provide implications for the future keeping in mind a recent situation.

2. Background

There are certain differences in the health care systems of Japan and the U.S. In the U.S., it is often held that there is inequity in access to health care among people in the sense that the treatment people receive largely depends on their capacity to pay. The U.S. has no universal health care system and a large number of people do not even possess private insurance. On the other hand, Japan has a universal health care system, where there is equity in access to health care in the sense that people can usually receive treatment regardless of their capacity to pay. In Japan, a compulsory insurance system enables people to receive general medical treatment at lower cost as a rule. Patients have to pay only a certain expenditure of the actual cost of treatment as co-payment. In addition, “the benefit of a high-cost medical care system” enables patients to pay within the limits of co-payment per month even if the health expenditure is rather high. Japan also has a medical fee schedule system that establishes the official price for each medical service.

However, this holds true only for insured treatments. If patients receive mixed treatment beyond insured coverage, the ban on mixed treatment virtually makes patients pay not only for uninsured but also for insured treatments, which could have otherwise received at only a certain cost in the form of co-payment. Thus, patients only have an all-or-nothing option whether they receive treatments at a relatively low cost within the coverage of public health insurance or at a relatively high cost without insurance. Therefore, it has been indicated that heavy payment burdens due to the ban on mixed treatment prevent patients from opting for access to new drugs and medical technologies that have not yet been listed in public health insurance. This
implies a trade-off between freedom of choice and equity in access to health care in the sense that people have equitable access within the coverage of insured treatments but a few options for health care over the prescribed limit.

The Japanese medical security system faces numerous problems that require urgent solutions. The declining birthrate and ageing of society cause a severe drain on the finance of public insurance on account of the lack of defrayers and increase in health expenditures\(^6\). The advancement in medical technologies are also described as a cause of the increase in health expenditures. On the other hand, these advances offer a variety of options in health care and respond to growing demands\(^7\). It would be difficult to include all these growing demands by public health insurance in terms of financial constraints—the big turning point has been reached. Therefore, it has been controversial whether or not nations must be permitted to provide uninsured treatment beyond public coverage, that is, mixed treatment.

Here, we discuss the possible merits and demerits of mixed treatment. First, we discuss the freedom of choice of patients. One of the merits of mixed treatment is that it expands the options of medical treatments for patients. On the other hand, the demerit is that patients suffer losses of induced demands under asymmetric information because they have no choice but to take the doctor for his word.

Second, we consider access to new drugs and technologies. The merit of this is that patients would be able to obtain easier access to new drugs and technologies because their economic burden would be reduced through mixed treatment. Those who emphasize the merits also state that time loss would be unavoidable if new treatments are to be included in public health insurance. On the other hand, the demerit is the risk of undergoing medical treatment without safety and effectiveness.

Third, we consider the perspective of health expenditures. The merit includes reduction of financial difficulties. Advances in medical technologies have expanded the options of medical treatments and driven up medical cost. However, the public health insurance system is no longer sufficient to include many of the options. On the other hand, the demerit includes that the level of uninsured treatments will raise the level of insured treatments, thereby leading to an increase in public health expenditures (Ikegami and Cambell 1996).

\(^6\) In Japan, the birthrate has been decreasing each year and the total fertility rate in 2005 was 1.26\% (MHLW 2007). The population aging rate (the proportion of elderly population to total population) reached 20.4\% in 2005—over 20\% for the first time. The national health care expenditure also tends to increase each year. It was 33.1 trillion yen in 2005: the proportion of national health expenditures to national income was 9.01\% in the same year (MHLW 2005).

\(^7\) We believe that the diversification of individual values in the relatively wealthy community and various treatments for chronic disease, etc., is responsible for this trend.
Fourth, we consider introducing markets to the health care sector. The merit includes that lifting the ban on mixed treatment will industrialize the health sector and create new business opportunities for uninsured treatments: for example, a private insurance market, etc. On the other hand, the demerit includes inequity in the sense that insurance companies will insure only those with low risk and certain people would not be able to purchase private insurances due to the high risk or the lack of capacity to pay.

Fifth, we consider the perspective of “equity.” The merit includes that lifting the ban on mixed treatment would actually reduce differences in access to health care in terms of capacity to pay because patients would only have to pay the co-payment for insured treatments in addition to their out-of-pocket expenditure for uninsured treatments. On the contrary, the demerit includes that lifting the ban would result in differences in access to health care “treatment level patients obtain, here” in terms of capacity to pay because only wealthier people will have access to better treatments that are not covered by public health insurance, which is usually more expensive. MHLW and the Japan Medical Association (JMA) tend to take such stands as a whole.

While advocates for mixed treatment tend to support market-driven reform and consumer sovereignty, advocates against mixed treatment tend to support the anti-market-driven reform and paternalistic tendency.

There are various connotations for the term “mixed treatments”. There are various cases that correspond to mixed treatments. In certain cases, patients receive advanced medical services and drugs that are not yet approved or covered by public insurance in addition to insured treatments. Second, there are certain cases in which patients receive medical services and drugs that are covered by public insurance but are not approved in term of usage in addition to insured treatments. Third, there are also certain cases related to conformity, convenience, and the choices of medical agencies (or those of patients) in addition to insured treatments: for example, special care setting and usage exceeding the number of times limited by public insurance. When referring to mixed treatment, it is often considered in terms of “complete” lifting of the ban in all cases. However, we have used “mixed treatments” as a phrase that includes cases in which mixed treatments are permitted only for certain cases.

Although mixed treatments are banned in principle, a few are permitted by “the combined use with uninsured treatment costs (hereafter referred to as CUCs)” system. This system permits mixed treatment only for certain treatments and only in

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8 The JMA mainly comprises private practitioners in clinics that have less than 19 sickbeds.
9 Japan Regulation Reform and Opening to Private Sector Council (2004c) organize such conflicts in opinion.
particular hospitals that are well equipped\textsuperscript{10}. However, it can continue to remain banned in principle if not for such permission by the MHLW.

On December 15, 2004, a political compromise was established in form of expanding cases permitted as mixed treatment. Therefore, on October 1, 2006, CUCs was replaced from the specified medical costs (SMCs) system\textsuperscript{11}. However, the SMCs is rarely different from the CUCs. To stretch a point, CUCs provide more explicit identification. Far from it, certain treatments were increasingly regulated as compared with earlier because the MHLW had given a notice that mixed treatments for medical technologies would not be permitted without approvals on the basis of the pharmaceutical law in June 2005.

Therefore, the Regulatory Reform Council of the Cabinet Office debated with regard to whether mixed treatments must be entirely permitted again. However, it eventually decided against reporting it in the second report for regulatory reform submitted on December 25, 2007. However, “the evaluation for high medical technologies system” was newly established in April 2008. It permitted for advanced medical treatments as mixed treatments even if such advanced treatments are not approved on the basis of the pharmaceutical law. Thus, coverage of mixed treatments tends to expand in the form of CUCs but not entirely. After all, this problem continues to be included in the proposal of the Regulatory Reform Council as one of the important plans on March 25, 2008. The discussion continues to be underway.

There are some papers which examine the policy implication on mixed treatment\textsuperscript{12}. However, there are scarcely papers analyzed within an economic framework even though mixed treatment involves certain extreme economic factors. Therefore, in next section, we present certain economic results of our studies (Saito and Tokita 2003; Suzuki and Saito 2006; Saito and Suzuki 2006).

3. Analysis
3.1 Theoretical model

We introduce a simple partial equilibrium model in order to examine the economic essence of mixed treatment. Patients usually receive a package of certain medical services for a disease, such as consultations, examination, medication, etc. We regard

\textsuperscript{10} In a strict sense, when certain mixed treatments are permitted as coverage of CUCs by the MHLW, patients can receive payment equivalent to insurance payment for them, in the form of CUCs. An absolute ban on mixed treatment would imply that payment that was not permitted by the ban rule is permitted not as insurance payment but as CUCs.

\textsuperscript{11} For greater details on the political process behind the controversy on mixed treatments refer to Ikegami (2006).

\textsuperscript{12} Example for, Endo (1999), Yashiro ed (1999), Kawabuchi (2002), Niki (2005) and so on. They are written in Japanese but only exception is Ikegami(2006).
this package as a good which is available at various levels of quality. We assume that the extension of package corresponds to the expansion in the treatment level which we denote by \( q \in [\underline{q}, \bar{q}] \). \( \bar{q} \) is the limit of public coverage and assumed to be given.

While receiving only insured treatment corresponds to receiving the treatment at \( q \in [\underline{q}, \bar{q}] \), receiving uninsured treatment in addition to insured treatment, namely mixed treatment, corresponds to receiving the treatment at \( q \in (\bar{q}, \bar{q}] \).

In Figure 2, let the horizontal axis represent the treatment level \( q \) and the vertical axis marginal cost or marginal utility evaluated in money terms. For the sake of simplicity, we assume that marginal cost \( c \) is constant regardless of the treatment level and eliminate fixed cost. Further, we assume that the medical fee schedule officially fixes price \( p \) per treatment level equal to marginal cost \( c (p = c) \). We also assume that there is no asymmetric information and the market is perfect. The supply curve is horizontal and product surplus becomes 0 here. Let \( k \) be the co-payment rate \((0 \leq k \leq 1)\) for insured treatment and \( kc \) the co-payment price. Let \( q_i^* = D_i(p) \) be the demand function of patient \( i \) and is linear downward-sloping for the sake of simplicity. In addition, let \( q_i^* = D_i(p) \) be the equilibrium demand level of patient \( i \) at price \( p = c \).

When do patients have incentive to receive uninsured treatment? We believe that it is when they have the willingness to pay more than \( c \) for the treatment at \( q \in (\bar{q}, \bar{q}] \). Let \( p_i(q) \) be the willingness to pay (WTP) for \( q \) for patient \( i \). When such people receive treatment at \( q_i^* \) over \( \bar{q} \), they obtain additional surplus

\[
\int_c^{p_i(q)} D(p)dp - (p_i(q) - c)\bar{q}.
\]

In Figure 2, this corresponds to triangle GFH.

However, it is not necessarily the case that patients actually receive uninsured treatment under the ban rule even if they have such an incentive. Patients can receive a treatment at co-payment price \( kc \) as long as the treatment level is at \( q \in [\underline{q}, \bar{q}] \).

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\(^{13}\) We can also treat \( q \) as the quantity of a medical service, since we believe that the improvement in quantity is parallel to the increase in treatment level.
However, when the treatment level is over $\tilde{q}$, the ban rule makes the fee schedule that patients face change from price $kc$ to price $c$ even for treatment at $q \in [\underline{q}, \tilde{q}]$. Then, they would bear the additional cost $(1 - k)c\tilde{q}$ in term of losing benefit from public insurance. In Figure 2, this corresponds to square BCEF.

Under the ban rule, since people with high demand for the treatment level cause an additional surplus that is larger than additional cost, they would receive uninsured treatment in addition to insured treatment, namely, mixed treatments, even if at an out-of-pocket expenditure for all of them. In brief, when we expect that people with low demand have additional surplus that is smaller than additional cost, they would restrain from receiving mixed treatment.

On the other hand, if mixed treatment is permitted, patients would have to only pay for insured treatment at $kc$ in addition to paying for uninsured treatment at $c$.

3.2 Empirical methods

In this section, we address the question of how many people would receive uninsured treatment under the ban rule? In addition, which system induces inequity, the ban or lifting it? An empirical analysis is required for a concrete discussion of these issues. However, we were unable to obtain sufficient data on the topic because mixed treatment is actually banned at this time.

Therefore, we applied the Contingent Valuation Method (CVM) from among limited options. We asked respondents to imagine a hypothetical situation and respond to our questions.

The data was obtained from the original survey that was delegated to a research company specialized in internet investigations from December 5–8, 2005. We randomly sampled 50,000 males and females from among 2,400,000 people registered with the monitor of the firm. They were aged between 20 and 69 and their inhabitable areas included the entire country\(^\text{14}\). The number of actual respondents was 7,156 people (14.3%)\(^\text{15}\). However, we could finally obtain data pertaining to only 1,712 because of the

\(^{14}\) The areas include the division of the country into 8 blocks (Hokkaido/Tohoku, Kanto, Koshinetsu/Hokuriku, Tokai, Kinki, Chugoku, Shikoku, Kyushu/Okinawa); samples are extracted at no less the same rate as the ratio of population in each area, based on population data reported by the Ministry of Internal Affairs and Communication—Bureau of Statistics (declaration on October 1, 2004).

\(^{15}\) However, this numeric value is different from the collection rate in the usual sense. It is the reason why numerous monitors did not probably read e-mails requesting participation in this research because we were able to research for merely three days.
limitation of the contract\textsuperscript{16}. Table 1 presents the definitions and basic descriptive statistics of the variables.

However, we were required to make certain adjustments in order to create a concrete questionnaire. First, we considered only one case because there were a large number of cases corresponding to mixed treatment. We selected a serious case in which the condition of the patient was so severe that he/she would not be able to live for over a year only with the insured treatments.

We also asked the participants how much they were willing to pay, not for the treatment level itself but for increasing their life expectancy to a certain health level because we believe that it would be difficult for them to respond to the question of the treatment level they would demand. In other words, we questioned the “demand for life expectancy” itself—marginal utility evaluated in money terms. However, we believe that how long the respondent would like to survive is dependent on the severity of the health status and the probability of recovery. Therefore, we fix quality of life expectancy at 1 and patients can certainly reach the status, representing complete recovery of health. Therefore, we use the word “QALYs” for $q$ in place of life expectancy in this paper\textsuperscript{17}. The concrete abstract of the hypothetical questionnaire is presented in the Appendix.

The basic method of analysis is as follows. First, we estimate the demand function for QALYs “life expectancy of quality 1, here” of each respondent by using the available data. Next, based on our theoretical model, we estimate individualized additional surplus and cost, and simulate the behavior of participants under the ban.

We estimate individualized demand function for QALYs by the Interval (Grouped) Regression Model. The estimated equation for the $i$th individual for price $p$ is given below\textsuperscript{19}.

\textsuperscript{16} We intended to collect data pertaining to 1,100 monitors in the initial contract. This data acquisition system does not save responses over the target value; numbers are selected randomly and there is also random deletion in series if the target value of monitors that have been agreed upon to cooperate in this research is exceeded. In other words, when the basket with a pre-determined size is full, overflowing responses are excluded randomly. In order to avoid sample biases according to day and time, the system adopted random deletion. Therefore, in order to obtain a larger number of samples, we repeated the download in real time and were able to obtain 1,712 samples over the target value.

\textsuperscript{17} However, we used “life expectancy” in questionnaires in order to avoid confusing the respondents. For details of questionnaires refer appendix.

\textsuperscript{19} We adopt a non-linear model with a square term that decreases at an accelerated pace with an increase in price because it would prevent us from overestimating the demand functions in cases in which certain respondents do not require such a medical treatment irrespective of how low the cost is.
\[ q_{i,p}^* = \alpha_p p^2 + \beta p + v_i + e_{i,p} \quad e_{i,p} \sim N(0, \sigma_e^2) \quad v_i \sim N(0, \sigma_v^2) \] (1)

\[ q_i = j \quad \text{if} \quad A_{j-1} \leq q_i^* < A_j, \quad j = 1, \ldots, J, \quad A_0 = -\infty, \quad A_J = +\infty. \]

\( q_i \) represents QALYs and also class mark \( A_j \). The lower limit is fixed at additional life expectancy of 0 years and only the upper limit is censored. This is panel data because the options are the same as the price \( p \) for each respondent. The gradient of the estimated model is the same among individuals and differences are indicated only by differences of individual effect \( v_i \). In order to estimate \( v_i \) explicitly, we use the fixed-effect model. We also calculate \( v_i \) by coefficient of individual dummy and constant term. The demand curve shifts above and below by \( v_i \). The degree of shift leads to changes in individualized additional surplus. Therefore, whether or not individuals receive uninsured treatment under the ban rule depends on the degree of shift. Table 2 presents the results of the estimation.

For estimating each additional surplus, we also require health expenditure per QALYs—life expectancy of quality 1. Here, we applied the terminal health expenditure as the definition, 3.6 million yen by a result (Konno 2003).

The additional cost essentially corresponds to co-payment in the upper limit of insured treatment \( kc q^* \), here. However, the Japanese “benefit for high-cost medical care” system establishes the limit of co-payment per month, if it is within insured treatment (see section 2). We believe that, in our case, cost is as expensive to apply as the target. Therefore, we calculate the limit of co-payment per year for each income class and use it as the additional cost. Then, a patient would receive uninsured treatment in addition to insured treatment if additional surplus > limit of co-payment established by the benefit of a high-cost medical care system\(^{20}\).

3.3 Empirical Analysis and Results

First, we present the ratio of people who receive uninsured treatment under the ban rule, which implies lengthening the QALYs to over a year (Table 3). In terms of income level, 43% of the people receive uninsured treatment even under the ban. The

\(^{20}\) In this hypothetical questionnaire, we did not prevent respondents from responding with consideration not only for current income but also future income. However, we excluded respondents from samples if the individual responds with a co-payment that is much higher than the predicted lifetime income. We defined the predicted lifetime income as “total amount of asset + current income \( \times (65 \text{ years} – \text{current age}) \)” here. Therefore, the number of samples is below 1,654.
demands for uninsured treatment appear to be relatively larger. The higher the income class, the higher the ratio of demands for uninsured treatment. The same holds true for asset level as a whole.

Second, we examine the manner in which demands for QALYs patients obtain change when the ban rule is lifted. In Table 4, we show the results by income/asset classes. The number of QALYs increases in every income class when the ban is lifted. In Table 5, we show difference of the QALYs between high class and other classes under each system. There is no gap between high- and middle-income classes; however, the gap between high- and low-income classes narrows slightly when the ban is lifted. The same holds true for asset class as a whole. This implies that lifting the ban rule would not necessarily induce the gap in treatment level, QALYs, on the ground of capacity to pay but would narrow the gap in this case.

Third, we analyze the burden of the patient when the ban is lifted to examine equity in access to health care from another view point. It is possible that lifting the ban would make the burden of patients regressive because the burden on the high-income class would decrease while that of the low-income class would increase when the ban is lifted. Lifting the ban would provide insurance payment for people who received uninsured treatment through full out-of-pocket expenditure. On the other hand, it would make people who had restrained uninsured treatment receive such treatment easily and would also result in increasing their burden although it is the result of individual rational choice.

We examine this aspect using the Kakwani index (Kakwani 1977 a, b). This is an index for measuring progressive degree of expenditure by the Gini and concentration coefficients. We use this index for measuring the progressive or regressive degree of out-of-pocket expenditure on health expenditure in this paper21. We define this as [concentration coefficient for out-of-pocket health expenditure – Gini coefficient]. If the Kakwani index is negative, it implies regressive burden, that is, the poor relatively bear a heavier out-of-pocket expenditure than the rich.

In Table 6, the Kakwani index in income class appears to be slightly different between cases under the ban and those after lifting the ban. Why is this? When the ratio of expenditures (= health expenditure/ex-ante income) in each income class change to the same degree, the Kakwani index shows the same value regardless of the size of the ratio of expenditure. Therefore, we examine the average ratio of expenditure for each income class. In Table 7, the column on the extreme right presents the average

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21 Endo and Shinozaki (2003) also analyze how public health insurance affects on patients’ burden using Kakwani index.
ratio of expenditure after the ban is lifted divided by that under the ban, and shows the change in the vicinity of lifting the ban. In terms of income class, the degree of change is approximately the same among different income classes. The same almost holds true for asset class. Thus, we believe that the degree of increase is almost the same in each class; this is the reason why the Kakwani index is constant even after lifting the ban.

Fourth, we examine the burden of patients. Here, we use the ratio of expenditure as an index of actual burden of health expenditure. The expenditure to optional consumption as a percentage of income is usually greater in high income than in low income. It is easier for high income to switch his expenditure to necessary consumption. Therefore, we believe that the burden of the low income/asset class in health expenditure is greater than that of the high-income/asset class when the ratio of expenditure in every class is high despite the same Kakwani index.

In the Table 7, this case is a disadvantage for the low-income class because the average ratio of expenditures in any class increases when the ban is lifted rather than under the ban. Although we are not sure what to make it, we believe that the degree of increase is not great as whole. Therefore, we believe that lifting the ban barely affects the burden of the low-income class. The same holds true for asset class.

Fifth, we examine that the gap in access to health care depends on the capacity to pay. In our case, there were a relatively large number of people who received uninsured treatment under the ban rule, and those with a higher capacity to pay received such treatment to a greater extent. Although this is correct in itself, there are people who receive uninsured treatment under the ban regardless of their low capacity to pay—approximately 35% of the people.

While we have examined differences among income/asset class, we have not examined differences among individuals within the same class. Therefore, we will examine the change in out-of-pocket expenditure within each class when the ban is lifted using kernel estimation. In Figure 3, the thin line represents the distribution under the ban and the thick line represents the distribution when the ban is lifted. In the low-income class, it is described as diphasic under the ban. This indicates that even within the same class certain people receive uninsured treatment and others do not under the ban. However, when the ban is lifted, the distribution changes to a single-peaked pattern. What does this imply? Table 8 presents the average ratio of expenditure under each system in the case distinguishing people who receive uninsured treatment and people who do not under the ban in income class. The out-of-pocket expenditure of people who receive uninsured treatment under the ban decreases in every class after the ban is lifted. On the other hand, the out-of-pocket
expenditure of people who receive only insured treatment increases in every class after the ban is lifted. We believe that it is the reason why diphasic distribution changes to a single-peaked one. However, this holds true for every class as a whole. It also appears to be slightly different in the income class in terms of the median increase in out-of-pocket expenditure. The same holds true for asset class as a whole, except in the high-asset class.

These results suggest that there are differences in the behavior of patients with regard to receiving uninsured treatments within the same capacity to pay under the ban, and that such differences create gaps in out-of-pocket expenditure within the same class. The same holds true after the ban is lifted.

Until now, we have been focusing on the capacity to pay in order to examine inequity in mixed treatments. However, thus far, these results reveal that we were unable to conclude whether receiving uninsured treatments is only dependent on the aspect of capacity to pay. Unlike traditional aspects, it is indicated that lifting the ban would not necessarily induce a gap in access to health care among the capacity-to-pay classes and would even narrow the gap. The results suggest that aspects other than capacity to pay must also be taken into consideration when determining who receives uninsured treatment.

4. Conclusion and perspectives
There are certain issues that remain unresolved in this study. First, it must be noted that data was evaluated using CVM. However, we proposed a method to create a draft for further discussion within an economic framework because it is difficult for us to quantitatively evaluate how such deregulation affects the behavior of patients and produces results for the future. Second, such a result cannot be generated yet because we evaluated only one case. Other cases must also be evaluated for this purpose. Further, certain prior theoretical studies indicate that lifting the ban completely may cause the condition of certain people to worsen (Hayashi and Yamada 2003; Hayashi 2004; Saito et al. 2005; Saito 2007a). We believe that the essence of this finding is that lifting the ban completely causes a transfer of cost from high-demanders to low-demanders who have not received uninsured treatment even once. Lifting the ban would raise the burden of insurance finance because additional insurance payments would accrue for people who had received uninsured treatments without insurance payment. Therefore, insurance fee or co-payment increases in order to finance the burden and results in making the condition worse for low-demanders.

There are various health care services and demand for them may depend on the
severity of the health status and the values of each individual other than capacity to pay. Lifting the ban completely treats these factors without distinguishing them. Therefore, lifting the ban probably permits not only transfer insurance benefits from mild to severe cases but also transfer from low- to high-income class, or transfer from those with special preference\textsuperscript{22} for the method of treatment to those without, etc.

This may be because public insurance coverage is not sufficient for patients to receive uninsured treatments. Now, the question that arises is what is the suitable level of public insurance coverage? This would depend on national discussions. However, it is difficult to state that choices of a nation affect public coverage because, presently, public coverage is usually decided by a group of a few specialists. The manner in which more equitable public insurance coverage can be insured must be examined\textsuperscript{23}.

The mixed treatment problem gives rise to important issues. How can technical progress and the health care insurance system be combined? Further, could the trade-off between freedom and equity be adjusted? Although medical technology in the U.S. may be the best, only a limited number of people have access to it. On the other hand, although a majority of people in Japan can obtain health care within public insurance coverage in an equitable manner, it is difficult for them to obtain health care beyond public insurance coverage. These are issues that must be examined in the future.

References

\textsuperscript{22} There are numerous types of health care ranging from recovery of health itself to making patients more comfortable. Examples of the latter include luxury rooms for hospitalization, breast reconstruction surgery after undergoing a mastectomy for breast cancer, etc.

\textsuperscript{23} Although we exclude details here due to the limitation on the length of the paper, recent paradigms on social choice theory provide a few suggestions. We examined the manner in which public coverage must be decided using a normative theory (Dworkin 1981, 2000) and suggest that mixed treatments in full would secure freedom of choice and a certain equity if public coverage depends on the choices of nation (Saito 2007b).


Japan. Regulation Reform and Opening to Private Sector Council. 2004c. The supplements on “Outline of the Interim Summary—“Realization of a Private
Sector-led Economic Society” through the Opening of Government-driven Markets for Entry into the Private Sector”.

(accessed, May 12, 2008)


search.japantimes.co.jp/cgi-bin/ed20071203a1.html (accessed, March 29, 2008)


Appendix

Questionnaire

Suppose that you have been diagnosed with a serious terminal disease and have been given only a year to live after undergoing a medical checkup today. However, suppose that you can recover completely and extend your life expectancy if you received the most advanced medical treatment that is not currently approved in Japan.

How long do you hope to extend your life expectancy at the cost for such treatments that are provided below? Tick the column you regard most appropriate as the number of years of life expectancy you hope to increase for each cost.

However, “the number of years of life expectancy you hope to extend multiplied by the cost of one such year” will be the total expenditures that you will incur because this most advanced medical treatment is not currently approved by public health insurance. On the other hand, keep in mind that you can survive for up to a year if you undergo medical treatments currently covered by public health insurance.

We asked respondents to select the number of years of life expectancy that they would like to increase (over a year but less than 3 years, over 3 years but less than 6 years, over 6 years but less than 10 years, over 10 years but less than 15 years, and over 15 years) at the rate of 2.5 million yen, 5 million yen, 10 million yen, 20 million yen, and 30 million yen, respectively.
Figure 1 The ban on mixed treatment and permission for mixed treatment

A case in which mixed treatments are banned in principle (current system).

Treatments in the course of treating a single illness

Treatments covered by public insurance + Treatments not covered by public insurance → Mixed treatments

Treatments not covered by public insurance

Total payments for the patient

A case in which mixed treatments are permitted.

Treatments in the course of treating a single illness

Treatments covered by public insurance + Treatments not covered by public insurance → Mixed treatments

Treatments covered by public insurance

Patients pay only for uninsured treatment in addition to co-payment.

Insurance payment + Individual payment (Co-payment) → Total payments for the patient

Source: Japan Regulation Reform and Opening to Private Sector Council (2004b). We rewrote a little.
Figure 2  Graphical Explanation on Mixed Treatment

Table 1. Definitions and descriptive statistics of variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Number of observations</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW_INCOME</td>
<td>=1 if the household annual income is less than 4 million yen, =0 otherwise</td>
<td>1654</td>
<td>0.39601</td>
<td>0.489214</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>MED_INCOME</td>
<td>=1 if the household annual income is more than 4 million yen but less than 8 million yen, =0 otherwise</td>
<td>1654</td>
<td>0.434099</td>
<td>0.495788</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>HIGH_INCOME</td>
<td>=1 if the household annual income is more than 8 million yen, =0 otherwise</td>
<td>1654</td>
<td>0.169891</td>
<td>0.375651</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>LOW_ASSET</td>
<td>=1 if the household asset is less than 5 million yen, =0 otherwise</td>
<td>1654</td>
<td>0.399637</td>
<td>0.489972</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>MED_ASSET</td>
<td>=1 if the household asset is more than 5 million yen but less than 20 million yen, =0 otherwise</td>
<td>1654</td>
<td>0.262999</td>
<td>0.440395</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>MED_HIGH_ASSET</td>
<td>=1 if the household asset is more than 20 million yen less than 50 million yen, =0 otherwise</td>
<td>1654</td>
<td>0.223096</td>
<td>0.416448</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>HIGH_ASSET</td>
<td>=1 if the household asset is more than 50 million yen, =0 otherwise</td>
<td>1654</td>
<td>0.114268</td>
<td>0.318233</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 2. Estimated demand function of QALYs

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>SE</th>
<th>Z-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>-0.0032004***</td>
<td>0.0001523</td>
<td>-21.01</td>
<td>0</td>
</tr>
<tr>
<td>Price squared</td>
<td>0.000000752***</td>
<td>0.000000046</td>
<td>16.39</td>
<td>0</td>
</tr>
<tr>
<td>Constant</td>
<td>10.78825***</td>
<td>1.429461</td>
<td>7.55</td>
<td>0</td>
</tr>
</tbody>
</table>

Individual Dummy: Yes

Number of Observations: 8560

Log likelihood: -18379.091

Note: The number of actual respondents was 1712 people. We asked them how they wanted to lengthen in every 5 prices. Therefore, the number of observations on estimation of demand function are 8560 people which 1712 people times 5 prices is.

***=significant at 1%

Source: Saito and Suzuki (2006). However, we added a little information.

Table 3. Ratio of people who receive mixed treatment under the ban rule.

<table>
<thead>
<tr>
<th>By Income class</th>
<th>High Income</th>
<th>Middle Income</th>
<th>Low Income</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>53.7%</td>
<td>46.2%</td>
<td>35.0%</td>
<td>43.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>By Asset class</th>
<th>High Asset</th>
<th>Middle High Asset</th>
<th>Middle Asset</th>
<th>Low Asset</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>59.8%</td>
<td>46.9%</td>
<td>42.8%</td>
<td>36.3%</td>
<td>43.0%</td>
</tr>
</tbody>
</table>

Table 4. Average QALYs patients obtain under each system

<table>
<thead>
<tr>
<th>Income class</th>
<th>The ban</th>
<th>Lifting the ban</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>High income</td>
<td>5.7</td>
<td>6.1</td>
<td>0.3</td>
</tr>
<tr>
<td>Middle income</td>
<td>4.1</td>
<td>4.5</td>
<td>0.4</td>
</tr>
<tr>
<td>Low income</td>
<td>3.4</td>
<td>3.9</td>
<td>0.4</td>
</tr>
<tr>
<td>Total</td>
<td>4.1</td>
<td>4.5</td>
<td>0.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Asset class</th>
<th>The ban</th>
<th>Lifting the ban</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>High asset</td>
<td>6.3</td>
<td>6.6</td>
<td>0.3</td>
</tr>
<tr>
<td>Middle high asset</td>
<td>4.4</td>
<td>4.7</td>
<td>0.4</td>
</tr>
<tr>
<td>Middle asset</td>
<td>3.6</td>
<td>3.9</td>
<td>0.4</td>
</tr>
<tr>
<td>Low asset</td>
<td>3.7</td>
<td>4.1</td>
<td>0.4</td>
</tr>
<tr>
<td>Total</td>
<td>4.1</td>
<td>4.5</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Note: "Differences" is calculated as follows that years when lifting the ban minus years when the ban.

Table 5. Differences in average QALYs between high income/asset class and other classes under each system

<table>
<thead>
<tr>
<th>Income class</th>
<th>The ban</th>
<th>Lifting the ban</th>
</tr>
</thead>
<tbody>
<tr>
<td>High income</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Middle income</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Low income</td>
<td>2.3</td>
<td>2.2</td>
</tr>
</tbody>
</table>
By Asset class (years)

<table>
<thead>
<tr>
<th>Asset class</th>
<th>The ban</th>
<th>Lifting the ban</th>
</tr>
</thead>
<tbody>
<tr>
<td>High asset</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Middle high asset</td>
<td>1.9</td>
<td>1.8</td>
</tr>
<tr>
<td>Middle asset</td>
<td>2.7</td>
<td>2.6</td>
</tr>
<tr>
<td>Low asset</td>
<td>2.6</td>
<td>2.4</td>
</tr>
</tbody>
</table>


Table 6. Kakwani Index

<table>
<thead>
<tr>
<th>By Income Class</th>
<th>Concentration Index</th>
<th>Kakwani Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ban</td>
<td>0.158</td>
<td>−0.183</td>
</tr>
<tr>
<td>Lifting the ban</td>
<td>0.143</td>
<td>−0.198</td>
</tr>
</tbody>
</table>


Note: Kakwani Index is defined as follow that Concentration Index of out-of-pocket of health expenditures minus Gini coefficient in income. Gini coefficient in income is 0.341 here.

By Asset Class

<table>
<thead>
<tr>
<th>Concentration Index</th>
<th>Kakwani Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ban</td>
<td>0.103</td>
</tr>
<tr>
<td>Lifting the ban</td>
<td>0.089</td>
</tr>
</tbody>
</table>


Note: Kakwani Index is defined as follow that Concentration Index of out-of-pocket of health expenditures minus Gini coefficient in asset. Gini coefficient in asset is 0.649 here.
Table 7. Average out-of-pocket expenditure and Ratio of average expenditures by each class

### By Income Class

<table>
<thead>
<tr>
<th>Income class</th>
<th>Amount of average income (million yen)</th>
<th>Amount of average out-of-pocket expense (million yen)</th>
<th>Ratio of average expenditures</th>
<th>Ratio (lift/ban)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The ban</td>
<td>Lifting the ban</td>
<td>The ban</td>
<td>Lifting the ban</td>
</tr>
<tr>
<td>High Income</td>
<td>11.56</td>
<td>19.79</td>
<td>19.86</td>
<td>171.2%</td>
</tr>
<tr>
<td>Middle Income</td>
<td>5.68</td>
<td>13.25</td>
<td>13.29</td>
<td>233.3%</td>
</tr>
<tr>
<td>Low Income</td>
<td>2.49</td>
<td>10.42</td>
<td>10.96</td>
<td>419.0%</td>
</tr>
<tr>
<td>Total</td>
<td>5.41</td>
<td>13.24</td>
<td>13.48</td>
<td>244.5%</td>
</tr>
</tbody>
</table>


Note: Rate of average expenditures is the amount of average out-of-pocket expenditure divided by amount of average income in each income class. The rightmost column is the average ratio of expenditure under lifting divided by those under the ban in each income class.

### By Asset Class

<table>
<thead>
<tr>
<th>Asset class</th>
<th>Amount of average asset (million yen)</th>
<th>Amount of average out-of-pocket expense (million yen)</th>
<th>Ratio of average expenditures</th>
<th>Ratio (lift/ban)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The ban</td>
<td>Lifting the ban</td>
<td>The ban</td>
<td>Lifting the ban</td>
</tr>
<tr>
<td>High Asset</td>
<td>88.37</td>
<td>21.71</td>
<td>21.24</td>
<td>24.6%</td>
</tr>
<tr>
<td>Middle High Asset</td>
<td>31.69</td>
<td>14.32</td>
<td>14.45</td>
<td>45.2%</td>
</tr>
<tr>
<td>Middle Asset</td>
<td>12.30</td>
<td>11.24</td>
<td>11.48</td>
<td>91.4%</td>
</tr>
<tr>
<td>Low Asset</td>
<td>1.03</td>
<td>11.54</td>
<td>12.04</td>
<td>1117.2%</td>
</tr>
<tr>
<td>Total</td>
<td>20.81</td>
<td>13.24</td>
<td>13.48</td>
<td>63.6%</td>
</tr>
</tbody>
</table>


Note: Rate of average expenditures is the amount of average out-of-pocket expenditure divided by amount of average asset in each asset class. The rightmost column is the average ratio of expenditure under lifting divided by those under the ban in each asset class.
Figure 3. Distributions of out-of-pocket of health expenditures under each system

By Income Class


Note: Both income and asset is descriptive as logarithm.
Table 8. Changes of amount of average out-of-pocket expenditure by people who receive or don't receive uninsured treatments under the ban

### By Income Class

<table>
<thead>
<tr>
<th>Income Class</th>
<th>People who receive uninsured insurance under the ban</th>
<th>People who don't receive uninsured insurance under the ban</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>out-of-pocket expense under the ban</td>
<td>out-of-pocket expense under lifting the ban</td>
<td>Diffrences</td>
</tr>
<tr>
<td>High Income</td>
<td>35.38</td>
<td>33.45</td>
<td>-1.92</td>
</tr>
<tr>
<td>Middle Income</td>
<td>27.65</td>
<td>24.92</td>
<td>-2.73</td>
</tr>
<tr>
<td>Low Income</td>
<td>28.72</td>
<td>25.77</td>
<td>-2.94</td>
</tr>
<tr>
<td>Total</td>
<td>29.63</td>
<td>27.00</td>
<td>-2.63</td>
</tr>
</tbody>
</table>

### By Asset Class

<table>
<thead>
<tr>
<th>Asset Class</th>
<th>People who receive uninsured insurance under the ban</th>
<th>People who don't receive uninsured insurance under the ban</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>out-of-pocket expense under the ban</td>
<td>out-of-pocket expense under lifting the ban</td>
<td>Diffrences</td>
</tr>
<tr>
<td>High Asset</td>
<td>35.45</td>
<td>33.09</td>
<td>-33.09</td>
</tr>
<tr>
<td>Middle High Asset</td>
<td>29.40</td>
<td>26.93</td>
<td>-26.93</td>
</tr>
<tr>
<td>Middle Asset</td>
<td>25.12</td>
<td>22.45</td>
<td>-22.45</td>
</tr>
<tr>
<td>Low Asset</td>
<td>30.55</td>
<td>27.72</td>
<td>-27.72</td>
</tr>
<tr>
<td>Total</td>
<td>29.63</td>
<td>27.00</td>
<td>-27.00</td>
</tr>
</tbody>
</table>


Note: "Differences" is calculated as follows that out-of-pocket expenditure when lifting the ban minus out-of-pocket expenditure when the ban.