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ABSTRACT

This paper studies the extent to which the impact of tax policy on consumer spending differs between temporary and permanent, as well as anticipated and unanticipated tax changes. To discriminate between them, we use institutional information such as legal distinction between temporary and permanent tax changes, as well as timing of policy announcement and implementation. We find that the impact of temporary changes is significantly smaller than the impact of permanent changes. We also find that more than 80 per cent of Japanese consumers, including those who distinguish between temporary and permanent tax changes, respond to tax changes at the time of their implementation and not at the time of a policy announcement. We suggest an interpretation that these consumers follow a near-rational decision rule.

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1. Introduction The Japanese government has been regarding reductions in individual income tax as one of the major policy tools to stimulate the economy. The government implemented an income tax reduction of 5.5 trillion yen in 1994 and continued tax reductions of the same size until the end of 1996 (see Table 1). In early 1997, the focus of economic policy temporarily shifted to the rapid accumulation of public debt. However, it was not long before the Hashimoto administration was forced to announce a temporary tax reduction of 2 trillion yen for CY1998 to stimulate consumer spending, which had been deteriorating since April 1997. Moreover, on April 24, 1998, the Hashimoto administration announced a policy package, "Comprehensive Economic Measures," which included another tax reduction of 2 trillion yen.

The total tax reductions during 1993 to 1998 amounted to 28 trillion yen. Even taking into account the additional tax revenue from the consumption tax increase in April 1997, the tax policy in these six years increased public debt by 21 trillion yen. These large-scale tax reductions can be viewed as unprecedented fiscal experiments. The purpose of this paper is to investigate Japanese consumers' responses to these changes in taxes.

The focus of the paper is on the effectiveness of tax policy. First, we are interested in the difference between temporary and permanent tax reductions in their effects on consumer spending. According to the permanent income hypothesis (PIH), the impact of a temporary tax cut on permanent income, and therefore on consumer spending, is limited. The prediction of the PIH seems to be consistent with the Japanese experience: the impacts of temporary tax cuts in 1994–1998 were said to be limited, in spite of their large size. Based on such experience, many politicians and researchers, both inside and outside the country, have been arguing that the tax reduction that is to commence in the spring of 1999, should be a permanent one.

Second, we are interested in the impact of tax cuts on consumer spending at the time of a policy announcement. The PIH again provides a clear prediction: consumers increase their spending at the time of a policy announcement, but there is no effect at the time of its implementation. The fiscal experiments in 1993–1998, however, provide evidence against the prediction. A typical example is the consumption tax increase in April 1997, which was announced in September 1994, 30 months before the enforcement. If the PIH holds, we should have observed a decrease in consumer spending in September 1994, and no change in April 1997. Contrary to the prediction, however, consumer spending decreased significantly in April 1997.[1] Many researchers insist that the implementation of the consumption tax increase in April 1997 triggered further deterioration of the Japanese economy in 1997 and 1998. Does this episode mean that most of the Japanese are rule-of-thumb consumers who decide the level of spending according to current income rather than permanent income?

To address the two issues above, we need a data set that allows us to discriminate between temporary and permanent, as well as unanticipated and anticipated, changes in taxes. Such a data set permits us to estimate what types of tax changes took place and when.

The core of our empirical strategy is to use institutional information about the tax systems in identifying various types of shock. For example, tax reductions in Japan can be classified into two categories: "institutional tax reductions" and "special tax reductions." The former is a tax reform in which the laws concerning income tax rates, as well as various allowances, are amended; the latter

[1] The consumption tax increase has not only the income effect, which we focus on here, but also the substitution effect. For instance, researchers often point out that the decrease in consumption in April 1997

is a change in tax credit that is effective only for a specific year. This institutional information allows researchers to distinguish between temporary and permanent tax reductions. More importantly, it is probably safe to assume that consumers had the same belief about the distinction between temporary and permanent tax reductions.[2]

The distinction between unanticipated and anticipated changes in taxes is more subtle than that between temporary and permanent ones. Given that policy decisions are made over time in the process of political negotiation, it is not easy to pinpoint an exact date on which a consumer's belief about the future course of tax policy is revised.[3] However, it is still possible to estimate it by looking carefully at the sequence of the events involved. To be more concrete, it is probably natural to assume that consumers revise their beliefs about a change in taxes at the timing of major events such as: (1) the tax advisory commission of the Prime Minister making a policy recommendation; (2) the Liberal Democratic Party (LDP) tax committee submitting, to the government, a proposal for the reform; (3) the Cabinet approving the proposal; and (4) the Diet approving the bill.

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was at least partially due to the reversal in the stepped-up demand in and before March 1997. We will consider this substitution effect in the section of empirical analysis.

[2] Of course, not all consumers have enough time to read the laws carefully. In addition, 'intelligent' consumers, who observe the economy is getting worse, might have an expectation that a special tax reduction will be rolled over in the next year or even longer. As shown later in the section of empirical analysis, however, the data suggest that most Japanese consumers distinguish between temporary and permanent tax changes as written in the laws.

[3] An exception is Prime Minister Hashimoto's sudden announcement in December 1997 about the special tax reduction for 1998. This was 'news' to almost all consumers, because the Prime Minister made the decision without consulting many politicians and bureaucrats, but such top-down decision-making is rare in Japan.

Our "institutional information" approach differs from the time-series approach, which is adopted in many empirical studies on consumer behaviour (see, for example, Flavin 1981). For example, the time-series approach extracts unanticipated fluctuations in disposable income as the residuals of the time-series model. Although the residuals represent the unanticipated part of fluctuations in disposable income for those researchers who make a forecast using the time-series model, there is no guarantee that the same thing is true for consumers; they might have more information than is expressed by the time-series model. Moreover, if one wants to decompose fluctuations in disposable income into temporary and permanent changes using the time-series method, one has to impose some strong assumptions.[4] The "institutional information" approach, which requires relatively weak assumptions to discriminate between anticipated and unanticipated, as well as permanent and temporary, changes in taxes and social security contributions, is suitable to the study of the impacts of those changes.

Our institutional information approach is similar to that adopted by Poterba (1988), who carefully picks out two episodes of temporary income tax shocks in the U.S. (1968 surtax and 1975 income tax rebate) to study consumers' response to them at the time of their implementation. He finds that consumers' response to temporary tax shocks was much larger than predicted by the PIH, interpreting this as an evidence of consumers' myopic behaviour. In addition, he looks at consumption response at the time of policy announcement, which is defined as the month of congressional passage of tax bill, but fails to detect any statistically significant impacts of policy

[4] Many ways to decompose fluctuations in disposable income into temporary and permanent changes exist, so it is impossible to choose one among them without imposing some restrictions (see, for example, Quah 1990).

announcement.[5] Japanese data set that contains more than forty episodes of tax shock allows us to conduct Poterba's exercise in way that is more efficient.

The rest of the paper is organized as follows: Section 2 explains the institutional information and our empirical approach; and Section 3 presents regression results. Through a careful examination of the contemporaneous relationship between various types of tax innovations and monthly changes in aggregate consumption, we find that the impact of temporary tax changes is significantly smaller than the impact of permanent tax changes. We also find that more than 80 per cent of Japanese consumers, including forward-looking consumers who distinguish between temporary and permanent tax changes, respond to tax changes not at the timing of the policy announcement, but at the timing of its implementation. We suggest an interpretation that forward-looking consumers who ignore policy announcements follow a near-rational decision rule. To reinforce this interpretation, the consumers' utility cost of ignoring policy announcements is estimated in Section 4. The estimated utility cost is less than 0.1 per cent of the PIH consumption. Section 5 concludes the paper.

2. Empirical strategy

2.1. Institutional information Our data set contains 43 episodes of changes in national income tax, local income tax, consumption tax, and social security contribution.[6] The sample

[5] Our approach is also similar, at least in spirit, to Wilcox (1989), who uses the institutional information that the statutory changes in social security benefits are announced at least six weeks in advance of the payable date.

[6] There are two kinds of individual income tax in Japan: "Individual income tax" and "individual inhabitant's tax." The former taxes are collected by the central government, whereas the latter taxes are

period is 1975 to 1998. For each of these episodes, the data set contains institutional information on: (1) the date of announcement; (2) the date of implementation; (3) the size of changes; and (4) the distinction between temporary and permanent changes.

Table A1 gives the details of the data set. The first column, labelled "Date of implementation", shows the date on which changes in the disposable income occurred, reflecting changes in taxes and social security contributions.

The column labelled "Date of announcement" presents the date on which the LDP tax committee submitted a proposal report to the government, "Outline of tax reform," describing the details of the reform. Consumers are thought to revise their beliefs about a tax reform at the timing of the major events, such as: (1) the tax advisory commission of the Prime Minister making a policy recommendation; (2) the LDP tax committee submitting the "Outline of tax reform" to the government; (3) the Cabinet approving the proposal; and (4) the Diet approving the bill. We regard the second event as "announcement" because it provides consumers with a significant amount of information about future tax reform.[7]

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collected by the local governments. In this paper, "individual income tax" is referred as national income tax, and "individual inhabitant's tax" is referred as local income tax. See Appendix A for a description of the major tax reforms in Japan during the post-war period, and see Appendix B for an outline of the Japanese social insurance system.

[7] The second event is more informative than the other three events. The report made by the tax advisory commission of the Prime Minister provides the grand design of the reform, not the details of the reform. Therefore, it is impossible for consumers to know from the report how much their tax burden will change. The third event almost always takes place within two weeks after the second event, which implies that the third event is a 'ceremony' that provides no additional information to consumers. The fourth event seems to be a strong competitor to the second event. In reality, however, there is no example in the 1990s in which the bills reflecting the proposal contained in "Outline of tax reform" were rejected by the Diet and thus it is

The column labelled "Estimated size" reports the size of the changes in taxes and social security contributions for the average "worker household" in the *Family Income and Expenditure Survey* (FIES),[8] which is the source of the monthly consumption data used in the empirical analysis of Section 3. A "worker household" is defined in the FIES as a household whose head is on a payroll. The size of a change in income taxes for the average worker household is primarily determined by its annual labour income and family size. We take both of them from the FIES and estimate the size of changes in income taxes, following the formulae described in the laws. The size of a change in consumption tax is estimated by multiplying the total of expenditures on taxable items, which are taken from the FIES, by the percentage change in the consumption tax rate. The size of a change in social security contributions, which is primarily determined by the annual labour income of the average worker household, is estimated following the formulae described in the corresponding laws.

The fourth column indicates the type of institutional change: 21 episodes of changes in national income tax; 15 episodes of changes in local income tax; two episodes of changes in consumption tax; and five episodes of changes in social security contribution.

The fifth column indicates the legal distinction between temporary and permanent changes. There are 18 episodes of temporary changes and 25 episodes of permanent changes. All of the changes in social security contributions and consumption taxes are permanent ones. As to national

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safe to assume that the fourth event does not provide any significant amount of additional information to consumers.

[8] This survey is a monthly diary survey conducted by the Management and Coordination Agency of the Japanese government. It covers about 8000 households, one-sixth of which are replaced by new households every month.

and local income taxes, permanent large-scale tax reductions were implemented in 1975, 1977, 1984, 1989 and 1995. Most of the temporary tax reductions (13 episodes out of 18) were implemented in the post-bubble period.

We construct four time-series variables that summarize the institutional information described in Table A1. For episode i, the month of implementation is denoted by t_i; the month of announcement by t_i-τ_i; and the size of change, which is deflated by the Consumer Price Index and divided by the average household's real labour income in the previous month, is denoted by x_i. Denote the total number of episodes by n (n = 43), and rearrange the order of the episodes so that i = 1 to m represent the episodes of permanent changes and $i = m+1$ to n represent those of temporary changes. Denoting the discount factor by β_0, the four variables, v^{IP}, v^{IT}, v^{AP}, and v^{AT} are defined as:

$$v_t^{IP} = \sum_{i \in IP_t} x_i \qquad where \quad IP_t \equiv \{ j \in [1,m] \mid t_j = t \} \tag{1.1}$$

$$v_t^{IT} = \sum_{i \in IT_t} x_i \qquad where \quad IT_t \equiv \{ j \in [m+1,n] \mid t_j = t \} \tag{1.2}$$

$$v_t^{AP} = \sum_{i \in AP_t} \beta_0^{\,t_i} x_i \qquad where \quad AP_t \equiv \{ j \in [1,m] \mid t_j - \tau_j = t \} \tag{1.3}$$

$$v_t^{AT} = \sum_{i \in AT_t} \beta_0^{\,t_i} x_i \qquad where \quad AT_t \equiv \{ j \in [m+1,n] \mid t_j - \tau_j = t \} \tag{1.4}$$

The superscripts I and A represent 'implementation' and 'announcement', respectively, and the superscripts P and T represent 'permanent' and 'temporary', respectively. The variable v^{IP} (v^{IT}) represents when and how much permanent (temporary) changes are implemented. Similarly, the variable v^{AP} (v^{AT}) represents when and how much permanent (temporary) changes are announced. Note that the size of change, x_i, is transformed into the value evaluated at the month of

announcement, t_i-t_i, by multiplying by $b_0{}^{ti}$, as shown on the right-hand side of equations (1.3) and (1.4).

2.2. Four types of consumers The institutional information in our data set tells us when and how much changes in taxes and social security contributions are announced and implemented, as well as whether those changes are temporary or permanent. It allows us to identify four types of consumers. The first type consists of consumers who adjust their consumption according to current disposable income and, therefore, are labelled "current income consumers." They do *not* distinguish between temporary and permanent changes and respond *not* at the timing of announcement but at the timing of implementation. Consumers of the second type, labelled "permanent income consumers," distinguish between temporary and permanent changes and adjust their responses depending on the persistence of shock. They respond to changes in taxes only at the timing of announcement. The third type, called "near-rational consumers," distinguishes between temporary and permanent changes and responds *not* at the timing of announcement but at the timing of implementation. Finally, the fourth type, labelled "Ricardian consumers," does not respond at all to changes in taxes.

We make two remarks about the above classification of consumers. First, why do permanent-income consumers and near-rational consumers respond to changes in taxes? One explanation is that they simply fail to recognize government's intertemporal budget constraint. An alternative explanation is that, although they recognize the government's intertemporal budget constraint, they have a belief that the government will finance tax reductions by cutting future

expenditures. Unless otherwise indicated, the arguments in the rest of the paper will be based on the second interpretation.

As long as we interpret the behaviour of the second and third type in this way, both are forward-looking consumers. In this respect, there is no distinction between these two types and the fourth type. However, they differ in their expectations about how tax reduction today will be financed in the future. The second and third types expect that the government will cut future expenditures to finance today's tax reduction, while the fourth type expects that the government will increase tax burdens in the future without changing government expenditures.

Second, why do near-rational consumers ignore policy announcements, although they take into consideration the persistence of shocks in deciding their responses? An explanation is that they follow a near-rational decision rule, as suggested by Cochrane (1989),[9] in which the utility gained by using policy announcements to better adjust consumption does not outweigh the costs of obtaining and processing the information. Therefore, they choose not to respond at the timing of the policy announcement. On the other hand, the utility gained by distinguishing between temporary and permanent tax changes is large relative to the costs.

[9] The idea of near-rationality was proposed by Akerlof and Yellen (1985a, b) and applied to the consumer behaviour by Cochrane (1989) and Caballero (1995). Cochrane (1989) interprets the excess sensitivity of consumption as a near-rational decision rule in an environment where the costs of obtaining and processing information are not negligible. In Caballero's (1995) model, consumers do not adjust their consumption until the deviation from the theoretical level, computed from the permanent income, reaches a pre-specified trigger point, because the cost of such inaction is small in utility terms. His model is supported by U.S. data. Shea (1995), in an empirical analysis using panel data, finds that consumption is more sensitive to large absolute expected wage changes than to small expected wage changes and concludes that this is inconsistent with near-rationality.

For example, suppose that the LDP tax committee releases a report recommending a special tax reduction to be implemented in six months. In our definition, this is regarded as a policy announcement. The announcement provides detailed information about how much money will be refunded to a worker depending upon his/her annual income, family size, etc. The worker has the ability to calculate the amount of special tax reduction he/she will receive, but the costs in time and effort are not negligible. On the other hand, what would be obtained from the calculation? The worker could revise his/her permanent disposable income based on the calculation and adjust his/her spending six months earlier, thereby succeeding in consumption smoothing. If he/she were very smart, like the second type of consumer, the costs of the calculation would be smaller than the utility gained by the prompt adjustment. Otherwise, the best strategy would be to wait for the next six months to see what information becomes available on the exact amount of special tax reductions.[10]

It is important to note that the behaviour of near-rational consumers is consistent with two regularities repeatedly observed in empirical studies on consumer behaviour: excess smoothness and excess sensitivity of consumption. Their behaviour is excessively smooth in the sense that they ignore policy announcements,[11] and, at the same time, it is excessively sensitive, in the sense that they respond to predictable, or already announced, changes in taxes and social security

[10] An alternative explanation of the behaviour of the third type of consumers is that the policy announcement lacks credibility for some reason, so that the consumers do not respond to it. The theoretical possibility of this cannot be denied, but it is not realistic in our setting. Given that the LDP releases a report after a series of hard political negotiations, the probability of failure would be quite small.

[11] Note that this definition of excess smoothness is stronger than that of Campbell and Deaton (1989). See Deaton (1992) for more on the difference between the two definitions.

contributions. Also, note that it is consistent with the response of the Japanese consumers to the pre-announced increase in the consumption tax rate in April 1997.

2.3. Derivation of an estimating equation The empirical analysis of the paper aims to estimate the fractions of each type of consumer, as well as the discount factor. Estimating them leads to answering the questions raised in Section 1: (1) how much difference there is between temporary and permanent changes; and (2) whether consumers respond to policy announcements.

Let C_{it} (i=1, 2, 3, 4), Y_t, D_t denote, respectively, the per-household real consumption of type i consumer, the per-household real labour income, and the per-household real disposable income. Here we assume that the consumer type is unrelated to income, so that the variables Y and D are not a function of i. The variables DC_{it}, DY_t, and DD_t, represent monthly changes. We divide DC_{it}, DY_t, and DD_t by Y_{t-1} for scaling, and express the corresponding variables by Dc_{it}, Dy_t, and Dd_t.

Under the assumption that the subjective discount rate is equal to the real interest rate and that the instantaneous utility function is quadratic, monthly changes in consumption of each type is expressed by

$$\Delta c_{1t} = \Delta d_t = \Delta y_t - v_t^{IP} - \Delta v_t^{IT} \tag{2.1}$$

$$\Delta c_{2t} = u_t - v_t^{A} \tag{2.2}$$

$$\Delta c_{3t} = u_t - v_t^{I} \tag{2.3}$$

$$\Delta c_{4t} = u_t \tag{2.4}$$

where $v_t^A = v_t^{AP} + (1-b_0)v_t^{AT}$ and $v_t^I = v_t^{IP} + (1-b_0)v_t^{IT}$, and the variable, u_t, which is defined by

$$u_t = (1-\beta_0)\sum_{j=0}^{\infty} \beta_0{}^j (E_t Y_{t+j} - E_{t-1} Y_{t+j}) / Y_{t-1}$$

represents the annuity value of revisions in the expected labour income stream.

To illustrate the implications of equations (2.1) to (2.4), we compare the responses of each type of consumer to a permanent/temporary tax reduction of one thousand yen. According to equation (2.1), current income consumers increase their consumption by one thousand yen, irrespective of whether it is a permanent or a temporary tax reduction. Equation (2.2), combined with equations (1.3) and (1.4), states that permanent income consumers increase their consumption by $\beta_0{}^t$ thousand yen in response to a permanent tax reduction, but they increase consumption by (1-β_0)$\beta_0{}^t$ thousand yen in response to a temporary one (t represents the interval between an announcement and its implementation). Note that, since β_0 is less than but close to one, $\beta_0{}^t$ is close to one while (1-β_0)$\beta_0{}^t$ is close to zero. This means that the impact of a temporary tax reduction is limited relative to a permanent one.[12] Equation (2.3) says that near-rational consumers increase their consumption by one thousand yen in response to a permanent tax reduction, but they increase their consumption by (1-β_0) thousand yen in response to a temporary reduction. Finally, equation (2.4) says that Ricardian consumers have no response to changes in taxes.

Let λ denote the fraction of the aggregate income that accrues to current income consumers. The amounts of the remainder, 1- λ, that accrue to permanent income consumers, near-rational consumers and Ricardian consumers are (1- λ)ϕ_1, (1- λ)ϕ_2 and (1- λ)(1$-\phi_1$-ϕ_2), respectively. The monthly change in the real consumption of the average household, denoted by Δc_t, is expressed as:

$$\Delta c_t = \lambda \Delta c_{1t} + (1-\lambda)\phi_1 \Delta c_{2t} + (1-\lambda)\phi_2 \Delta c_{3t} + (1-\lambda)(1-\phi_1-\phi_2)\Delta c_{4t} + \varepsilon_t \qquad (3)$$

$$= \lambda \Delta d_t - (1-\lambda)(\phi_1 v_t^A + \phi_2 v_t^I) + (1-\lambda)u_t + \varepsilon_t$$

where $v_t^A = v_t^{AP} + (1-\beta_0)v_t^{AT}$ and $v_t^I = v_t^{IP} + (1-\beta_0)v_t^{IT}$ and ε_t is the error term. The second equality follows from equations (2.2), (2.3) and (2.4). The equation to be estimated in Section 3 is a less restrictive version of equation (3):

$$\Delta c_t = \lambda \Delta d_t - (1-\lambda)\{\phi_1[v_t^{AP} + (1-\beta_1)v_t^{AT}] + \phi_2[v_t^{IP} + (1-\beta_2)v_t^{IT}] - u_t\} + \varepsilon_t . \qquad (4)$$

Note that β_1 and β_2 could be different from β_0, which is used in the construction of v_ts in equations (1.3) and (1.4). Also, note that equation (4) reduces to equation (3) when $\beta_0=\beta_1=\beta_2$.

2.4. Econometric issue Before we estimate the model, we need to consider the contemporaneous correlation between Δd_t and u_t.

Since changes in current disposable income contain information about the total lifetime income, the two variables Δd_t and u_t are almost certainly correlated. When Δd_t takes a positive value, u_t is expected to have a positive value. In this case, estimating equation (4) by ordinary least-squares (OLS) regression, which regards $\lambda_2 u_t + \varepsilon_t$ as the error term, leads to biased estimators for the parameters. One way to deal with this problem is to construct a proxy for u_t and add it to the list of independent variables. To be more specific, we first estimate a univariate time-series model for the growth rate of real labour income, Δy_t, and use the series of residuals as a proxy

[12] Note that both β_0^t and $(1-\beta_0)\beta_0^t$ are smaller for larger t. Thus, the announcement effect of a tax reduction to be implemented in the distant future is very small.

variable.[13] Expressing the estimated time-series model by $Dy_t = \sum_{j=0}^{\infty} a_j u_{t-j} = A(L)u_t$ and denoting the series of residuals by $\hat{u}_t$, equation (4) becomes:

$$\Delta c_t = l\Delta d_t - (1-l)\{f_1[v_t^{AP} + (1-b_1)v_t^{AT}] + f_2[v_t^{IP} + (1-b_2)v_t^{IT}] - q\hat{u}_t\} + e_t \qquad (5)$$

where a new parameter, q, is defined by

$$q = A(b) \equiv \sum_{j=0}^{\infty} a_j b^j ,$$

which represents the degree of persistence of innovations in the growth rate of real labour income.[14] We use this estimation method in the regression analysis of Section 3.

The above two-step procedure might fail if $\hat{u}_t$ is not a good proxy for u_t.[15] An alternative way to estimate equation (4), without constructing a proxy variable, is to regard $l_2 u_t + e_t$ of equation (4) as the error term and estimate equation (4) using an instrumental variable for Dd_t involving lagged variables, as proposed by Campbell and Mankiw (1989, 1990, 1991). In Section 3, we also use this method to check that the regression results do not depend crucially on the estimation method.

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[13] Since changes in the consumption tax are already included in v^{AP} and v^{IP}, we must make sure that the same innovations are not contained in $\hat{u}_t$. We do this by: (1) removing the effects of changes in the consumption tax from the series of the CPI; (2) constructing the adjusted series of the real income by deflating the nominal income by the CPI constructed in (1); and (3) estimating a time-series model for the log of the adjusted real income.

[14] See, for example, Quah (1990) for more details on this point.

[15] More generally, it is known that in the two-step procedure such as this (i.e. imputing unobserved regressors from an auxiliary econometric model), the second-step estimated standard errors and related test statistics are incorrect. See Murphy and Topel (1985) for more on this issue.

3. Empirical results

3.1. Preliminary analysis Table 2 presents the mean of monthly changes in propensity to consume out of labour income. The sample period, 1975:01 to 1998:06, is divided into sub-samples according to the sign of v_t^I or v_t^A. The row labelled "v_t^I <0" shows the mean of monthly changes in propensity to consume in months when tax reductions are implemented. For example, the mean value for "all items" is +0.00288, which is significantly larger than the no-implementation mean value at the five per cent level. On the other hand, in months whenv_t^I is positive, that is, a tax (or social security contributions) increase is implemented, the mean of monthly changes in propensity to consume for all items is significantly smaller than that for the no-implementation mean value at the five per cent level. The tendency that the propensity to consume is higher in months when tax reductions are implemented, and lower in months when tax increases are implemented, is observed not only for "all items" but also for the subcategories "non-durables and services" and "durables."

The row labelled "v_t^A <0" shows the mean of monthly changes in propensity to consume in months when tax reductions are announced. The figure for all items is significantly *smaller* than that for the no-announcement mean value at the 10 per cent level, which contradicts the hypothesis that the announcements of tax reductions stimulate consumer spending. It is important to note that consumer spending on durables increases in response to the announcements of tax reductions, while spending on non-durables and services decreases. In months when v_t^A is positive, the figure for all

items is significantly smaller than that for the no-announcement mean value at the five per cent level.

In summary, the above simple analyses seem to indicate that the implementation of tax changes has a significant impact on consumer spending, but the policy announcement does not. In particular, the data indicate that the announcement of tax reductions is not effective in stimulating consumer spending.

3.2. Baseline regression results Table 3 presents estimates for the parameters of equations (5) and (4). We use the monthly data from 1975:01 to 1998:06. The variables v_t and $\hat{u}_t$ are constructed as described in Section 2; and the variables Dc_t and Dd_t are constructed using the monthly series of per-household total expenditure and the corresponding series of disposable income, both being taken from the FIES.[16] The FIES provides monthly per-household expenditures by item, but we use total expenditure as the dependent variable, unless otherwise indicated, because our main interest is in the effect of tax changes on total spending, rather than that on expenditure on specific items.

Estimation method used is non-linear least squares (NLLS) or two-stage least squares (2SLS). In addition to the independent variables listed on the right-hand side of equations (5) and (4), we include intercepts and the two dummy variables associated with changes in the

[16] The variables Dc_t and Dd_t are constructed as follows: (1) deflate the original (i.e., non-seasonally-adjusted) series of consumption and disposable income by the CPI; (2) estimate a univariate seasonal ARIMA model for the log of the real consumption and for the log of the real disposable income; (3) construct a seasonally-adjusted series by the signal extraction method; (4) transform the two seasonally-adjusted series into original units; (5) take the first difference and divide by the real income in the previous month for scaling.

consumption tax rate. One of the two dummies represents the stepped-up demand before the introduction of the consumption tax in April 1989, as well as its reversal effects. It takes the value of +1 in 1989:03 and -1 in 1989:04. The other dummy, which is associated with the increase in the consumption tax rate in April 1997, takes the value of +1 in 1997:03 and -1 in 1997:04. The discount factor used in the construction of the v_ts in equations (1.3) and (1.4) is set at β_0=0.99, unless otherwise indicated.

The first column of Table 3 shows the result for the specification in which no parameter restriction is imposed. All of the six coefficients are positive and less than one, which is consistent with theoretical expectations. The estimate of λ is 0.24, which means that 24 per cent of Japanese households are current income consumers.[17]

The coefficient ϕ_1 represents the fraction of permanent income consumers who respond appropriately to policy announcements. The estimate of ϕ_1 was 0.59, with standard error of 0.62, so the hypothesis that ϕ_1 is equal to zero cannot be rejected. The Japanese aggregate consumption is excessively smooth in this sense. [18] On the other hand, the coefficient ϕ_2 represents the fraction of near-rational consumers who respond to the pre-announced changes in taxes and social security

[17] Campbell and Mankiw (1989, 1990, 1991) estimates λ, the fraction of current income consumers, by regressing Dc_t on Dd_t, by using an instrumental variable for Dd_t, involving lagged variables. We estimate λ following their method to find that the estimate of λ is 0.2887, with the standard error of 0.1149. This is close to the estimates shown in Table 3.

[18] In interpreting the result that ϕ_1 is close to zero, we should note the possibility that our definition of the time of announcement might be imprecise. Our regression is based on the assumption that consumers revise their beliefs on the day when the LDP tax committee submits the "outline of tax reform," but they might

contributions, so that f_2 can be interpreted as the measure of the excess sensitivity of consumption. The estimate of f_2 is close to one and nearly twice its standard error. Japanese consumption is excessively sensitive in this sense. The sum of f_1 and f_2 is well above one ($f_1+f_2=1.57$), and the Wald test fails to reject the null hypothesis that $f_1+f_2=1$ (p-value=0.4693). In other words, we cannot reject the null hypothesis that the fraction of Ricardian consumers, $1-f_1-f_2$, is equal to zero.

The discount factors, b_1 and b_2, are both close to one, and significantly different from zero. Thus, both permanent income consumers and near-rational consumers distinguish temporary and permanent changes, and respond differently depending on whether it is temporary or permanent. According to the estimates of b_1, for example, permanent income consumers increase their spending by about 180 yen to a temporary tax reduction of 10,000 yen, while they increase it by about 10,000 yen for a permanent tax reduction of the same size. The finding that the estimates of the discount factor are close to one is consistent with the anecdotal evidence concerning the responses of Japanese consumers to special tax reductions. For example, according to a survey conducted by the Nikkei, the fraction of the consumers who spent the tax refund of 1997 was 43 per cent, while the remaining 57 per cent saved it, recognizing that it was a temporary tax reduction.

The second and third columns of Table 3 show the regression results when additional restrictions on coefficients are imposed: $b_1=b_2$ for the second column; $b_1=b_2$ and $f_1+f_2=1$ for the third column. We observe in both cases that (1) l is about 0.24; (2) f_1 is close to zero (excess

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revise their beliefs at a different stage in the legislative process. If this is the case, the estimate of f_1 is biased to zero.

smoothness) while ϕ_2 is close to one (excess sensitivity); (3) βs are between 0.9 and 1.0. The basic findings are unchanged if we impose a further restriction that β_0, the discount factor used in the construction of v_ts, coincides with β_1 and β_2. (Regression results corresponding to this case are not reported in the table.[19])

According to the estimates reported in the third column of Table 3, a permanent tax reduction of 10,000 yen per month would increase the monthly spending of the average household by about 1500 yen after the time of announcement of a policy change, and by an additional 8500 yen after the month of implementation. By comparison, a one-time tax reduction of the same size would increase the monthly spending by 150 yen during the months between the announcement and its implementation, 3200 yen in the month of implementation, and 800 yen in or after the next month. The estimated impact of a temporary tax reduction is quite close to that reported in Poterba (1988) and Blinder (1981): Poterba (1988) reports that a $1 temporary tax reduction increases consumer spending by 12–24 cents, while Blinder (1981) gives the estimate of 16 cents per dollar of temporary tax rebate.

The fourth to the sixth columns of Table 3 repeat the same set of regressions as the first three columns, but the 2SLS method is used instead of NLLS, to rule out the possibility that $\hat{u}_t$ might not be a good proxy for u_t, so that the regression results might be distorted. The fourth column re-estimates the specification [1], dropping $\hat{u}_t$ from the list of independent variables and using instrumental variables for Dd_t, being the lags, $Dd_{t-2},...,Dd_{t-6}$, $Dc_{t-2},...,Dc_{t-6}$. The estimated coefficients, λ and ϕ_2, are slightly larger than those before, but otherwise the results are similar to

[19] We set β_0 at a particular value, calculate the v_ts, and conduct a NLLS to obtain the estimates of β_1 and β_2.

those reported in the first column. The fifth and sixth columns of the table also corroborate the regression results reported in the second and third columns.

3.3. Sensitivity analysis To check the robustness of the estimates obtained in the baseline regression, we re-estimated the equations in several different ways. The first column of Table 4 addresses the possibility that the estimates might be distorted by measurement errors contained in the four variables representing changes in taxes and social security contributions: v^{AP}, v^{AT}, v^{IP}, and v^{IT}. We re-estimated the specification [2] of Table 3, using instrumental variables for the four independent variables. The instrumental variable corresponding to v^{AP} takes the value of +1 in months when $v^{AP}>0$, -1 when $v^{AP}<0$ and zero otherwise, and the other three instrumental variables were constructed in the same way. The estimated results, which are presented in the first column of Table 4, are similar to those reported in the second column of Table 3. The estimate of f_2 is slightly smaller than before, but the Wald test does not reject the null hypothesis that the sum of f_1 and f_1 equals one. The estimate of b_1 is smaller than before, but still significantly different from zero. Other estimates are almost the same as before.

Next, we checked the possibility that the two dummy variables associated with changes in the consumption tax rate might not capture the stepped-up demand before the tax-rate increases, as well as its reversal effects. We re-estimated the specification [2] of Table 3, deleting the observations related to changes in the consumption tax rate: 1989:03, 1989:04, 1997:03, and

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We repeat this procedure until the value of b_0 coincides with the estimates of b_1 and b_2.

1997:04. The results were similar to those reported in Table 3, except that the estimate of ϕ_1 was slightly smaller than before.

We conducted the diagnostic test proposed by Belsley, Kuh and Welsch (1980) to test if the estimated coefficients were affected by outliers. We calculated DFBETAS$_{ij}$, a scaled measure of the change in the jth estimated coefficients that would occur if the ith observation were deleted. This statistic is compared with the critical value, $2/\sqrt{N}$, where N is the sample size. The result of the test (which is *not* shown on the table) indicated that the estimated coefficients were nearly always stable, but a large change in the estimated coefficient of v_t^{AT} occurred when we deleted the observation for December 1997.[20] The third column of Table 4 presents the regression results when we deleted this observation. The estimate of β_1 showed a large change from 0.9418 to 0.8890, which is comparable with the standard error of the estimated coefficient. Nevertheless, the estimate of β_1 was still significantly different from zero, so that it is reasonable to assert, even in this case, that temporary changes in taxes have smaller impacts on consumer spending relative to permanent changes.

The fourth and fifth columns of Table 4 address the possibility that the dependent variable in the regression, the total expenditure, might not be an appropriate variable to represent c_t in equation (5), because it includes expenditures on durables. To be more specific, the variable c_t in equation

[20] December 1997 is the month when people showed serious concern about the stability of the Japanese financial system after observing two big failures: Hokkaido-Takushoku Bank and Yamaichi Securities. On the other hand, this is the month when the Prime Minister Hashimoto announced special tax reduction for CY 1998 in an unusual way (see footnote 3). The first event predicts a negative residual in this month while the second events predicts a positive residual. We consistently observe unusually large negative residual in this month, which suggests that the financial disorder had a dominantly large impact.

(5) should be consumption rather than expenditure, and the timing of consumption does not necessarily coincide with that of expenditure for commodities with durability. To deal with this problem, we first re-estimate the specification [2] of Table 3, replacing the total expenditure by the expenditure on "on-durables and services," a sub-category available in the FIES. According to the regression results reported in the fourth column of Table 4, both f_1 and f_1 are smaller than before, but the sum of the two is still above one and the Wald test rejects the null-hypothesis that $f_1+f_1=1$.

As pointed out by Mankiw (1982) and Hayashi (1985), however, even commodities labelled as non-durables or services might have some durability, in the sense that the timing of expenditure does not coincide with that of consumption.[21] To take this point into consideration explicitly, following Mankiw (1982) and Hayashi (1985), we assume that current consumption on all commodities, denoted by $\bar{c}_t$, is a Koyck-type distributed lag function of current and past expenditures on all commodities:

$$\bar{c}_t = \sum_{k=0}^{\infty} r^k c_{t-k} = (1-rL)^{-1} c_t$$

where L is the lag operator, and r is the coefficient representing the durability of consumption, where $0 \leq \rho \leq 1$. Under this assumption, the equation (5) to be estimated changes to:

$$\Delta c_t = l\Delta d_t + (1-l)(1-rL)\{q\hat{u}_t - f_1[v_t^{AP} + (1-b_1)v_t^{AT}] - f_2[v_t^{IP} + (1-b_2)v_t^{IT}]\} + (1-rL)e_t \qquad (6)$$

[21] For example, a special dinner at a restaurant is physically perishable and thus labelled "services" in the FIES. However, people may derive utility from the memory of the dinner, and, if so, expenditure on the special dinner at a restaurant should be treated as if it were durable. See Hayashi (1985) for more on this issue.

Equation (6) differs from (5) in that consumers overreact to changes in taxes in period t and correct it in period t+1. For example, equation (6) implies that permanent income consumers would increase their expenditure by one yen in period t in response to the announcement of a permanent tax reduction of one yen, and decrease them in period t+1 by ρ yen.[22] We estimate equation (6) by NLLS using total expenditure as the dependent variable. The regression results are presented in the fifth column of Table 4, where standard errors are Newey-West estimators that are robust to serial correlation in the error term. Again we found no significant changes in the estimated coefficients: both f_1 and f_1 were smaller than before but the Wald test still rejected the null hypothesis that $f_1 + f_1 = 1$. The estimated value of ρ, 0.158, was fairly close to that obtained by Hayashi (1985) using Japanese panel data, although we cannot reject the null hypothesis that ρ equals zero because of the low precision of the estimator (standard error equal to 0.243).[23]

Table 5 continues the sensitivity analysis. We checked to see whether the estimates of f_1 were biased toward zero, due to the contemporaneous correlation between v^A and e, through the so-called "non-Keynesian effects of fiscal expansion."

According to Giavazzi and Pagano (1990, 1995), fiscal expansions are sometimes accompanied by decreases in private demand, particularly private consumption, because consumers

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[22] That is, $\Delta c_t = 1$, $\Delta c_{t+1} = -r$, and $\Delta c_{t+j} = 0$ for j>1. It is easy to see that, given this stream of expenditure, $\Delta \bar{c}_t = \Delta \bar{c}_{t+1} = \Delta \bar{c}_{t+2} = \ldots = 1$.

[23] An alternative way to deal with the problem of consumption durability is to estimate equation (4) by 2SLS using more than twice-lagged instruments, $Dd_{t-2},\ldots,Dd_{t-6}$, $Dc_{t-2},\ldots,Dc_{t-6}$. Note that twice-lagged instruments are uncorrelated with the error term, even if the error term was an AR(1) process. Thus, the regression results [4] to [6] of Table 3 are still valid even in the presence of consumption durability, as long as we use the Newey-West estimator for standard errors.

who observe fiscal expansions expect that their tax burden will be increased in the future to finance additional government spending.[24] Incorporating this effect into our model, equation (5) changes to:

$$\Delta c_t = \lambda \Delta d_t - (1-\lambda)\phi_1[v_t^{AP} + (1-\beta_1)v_t^{AT}] - (1-\lambda)\phi_2[v_t^{IP} + (1-\beta_2)v_t^{IT}] + (1-\lambda)\theta\,\hat{u}_t + \kappa g_t + \eta_t$$

where g_t represents the amount of additional government spending announced at t. If the non-Keynesian effect exists, the coefficient on g_t, κ, should be negative.

If g_t is not correlated with other explanatory variables, we can safely ignore this variable in estimating equation (5). The variable g_t is a part of the error term ε_t of equation (5), which is uncorrelated with other explanatory variables. But, we have at least one reason to believe that v^A and g might be negatively correlated in our sample period; that is, reductions in taxes and increases in government expenditures, both of which are important components of fiscal stimulus packages, have often been announced simultaneously during the post-bubble period.[25]

The variable, g_t, is defined as announced additional issue of "construction bonds," a type of government bond that is issued specifically for financing public investments, divided by the nominal GDP. The variable, g_t, takes positive values 15 times in the sample period of 1975 to

[24] Giavazzi and Pagano (1995) found a large negative error in the consumption function during the Swedish fiscal expansion of the early 1990s, and suggested that this was due to a downward revision in the permanent disposable income that was triggered by the fiscal expansion.

[25] Tax reductions and increases in government spending are announced on the same month in nine episodes out of the 43 in our data set.

1998.[26] The first column of Table 5 presents the results of the regression analysis, in which g_t is added to the specification [2] of Table 3. Contrary to the implications of the hypothesis of non-Keynesian effects, the coefficient on g_t, k, was positive (p-value=0.076), which means that announcements about additional government spending have a positive impact on the private consumption, rather than a negative one. In this sense, we fail to find evidence in Japanese data for the non-Keynesian effects of fiscal expansion.[27] Reflecting the positive estimate of k, the estimate of f_1 is much smaller than before, which is also contrary to our ex-ante expectation. The second column of Table 5, which adds g_t into the specification [3] of Table 3, reports similar results.

Finally, we address the possibility that the effect of a tax reduction and that of a tax increase might be asymmetric. To do so, we disaggregate each of v^{IP}, v^{IT}, v^{AP}, and v^{AT} into two variables. For example, we define new variables, v^{IP+} and v^{IP-}, by

$$v_t^{IP+} = \sum_{i \in IP_t \ x_i > 0} x_i \quad \text{and} \quad v_t^{IP-} = \sum_{i \in IP_t \ x_i < 0} x_i \quad \textit{where} \quad IP_t \equiv \{ j \in [1, m] \mid t_j = t \} .$$

The variable v^{IP+} represents when and how much permanent increases in taxes and social security contributions are implemented. Likewise, the variable v^{IP-} represents permanent reductions

[26] The Japanese government announced policy packages, which included additional government spending, on the following dates: 09/17/75, 09/03/77, 09/02/78, 10/08/82, 10/21/83, 10/15/85, 09/19/86, 07/24/87, 08/28/92, 04/13/93, 09/16/93, 02/08/94, 04/14/95, 09/20/95, 04/24/98.

[27] Note that the government spending shock that we pick up here is a temporary one. That is, when the Japanese government increases spending as a part of stimulus package, it tends to increase spending for short-life projects (typically, less than one year) to make undesirable impacts on public debt as small as possible. This is in sharp contrast with Giavazzi and Pagano (1990, 1995) where the argument was focused on changes in consumers' expectations in response to *permanent* changes in government expenditures. In

in taxes and social security contributions. The variables v^{IT+}, v^{IT-}, v^{AP+}, v^{AP-}, v^{AT+}, and v^{AT-} are defined in the same way.[28] Using these disaggregated tax variables, equation (5) can be expressed as:

$$\begin{aligned}\Delta c_t = {} & \lambda\Delta d_t + (1-\lambda)\gamma\hat{u}_t \\ & -2(1-\lambda)\phi_1\{[(1-m_1)v_t^{AP+} + m_1 v_t^{AP-}] + (1-\beta_1)[(1-m_1)v_t^{AT+} + m_1 v_t^{AT-}]\} \\ & -2(1-\lambda)\phi_2\{[(1-m_2)v_t^{IP+} + m_2 v_t^{IP-}] + (1-\beta_2)[(1-m_2)v_t^{IT+} + m_2 v_t^{IT-}]\} + \varepsilon_t \qquad (7)\end{aligned}$$

where m_1 and m_2 are parameters measuring the degree of asymmetry concerning the impacts of tax changes. Note that, if m_1=m_2=1/2, the effects of tax changes are symmetric and equation (7) reduces to equation (5).

We estimate equation (7) under two different parameter restrictions. The first column of Table 6 uses the same specification as the second column of Table 3, except that asymmetric effects of tax changes are allowed. The coefficients of interest, m_1 and m_2, are both positive and less than one. However, the estimate of m_1 was 0.0105, which is close to zero, while that of m_2 was 0.3376, which is fairly close to 1/2. Using the Wald test, the null hypothesis that m_1 equals 1/2 is rejected at the one per cent significance level, but the hypothesis that m_2 equals to 1/2 is not rejected. Thus, the announcement effects of tax changes on consumer spending are asymmetric: the impact of tax increases on consumer spending is significantly larger than that of tax reductions.[29] On the other hand, the impact of tax changes at the timing of implementation, i.e., the

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this sense, it might not be appropriate to interpret our results as evidence against the argument of Giavazzi and Pagano.

[28] During the sample period, temporary tax increases never occurred, so that the variables v^{IT+} and v^{AT+} are empty.

[29] An interpretation of this result is that tax cut promises are less credible than tax increase promises.

impact of tax changes through the spending behaviour of near-rational consumers, is symmetric. These findings are consistent with those obtained through the preliminary analysis in Section 3.1. The second column of Table 6, which is an asymmetric version of the specification [3] of Table 3, reports a similar result.

3.4. Effects of the tax policy in 1993–98 Table 7 presents the effects of the tax policy in 1993–98, which are estimated using the regression results of the specification [3], in Table 3. The figures of the table represent the contributions of changes in taxes to the annual growth rate of consumption. For example, the first column of the table represents the contributions of permanent income-tax reductions through the spending behaviour of current income consumers.

From Table 7, it is evident that the contributions through the spending behaviour of near-rational consumers are dominantly large. For example, the third column indicates that the permanent tax reduction of 1995 contributes about 0.6 per cent to the growth rate of consumption in 1995. Also, the sixth column indicates that the temporary tax reductions contribute between 0.3 and 0.8 per cent every year through the spending behaviour of those consumers.[30]

[30] Note that the estimated impacts of tax changes shown in Table 7 might contain nonnegligible errors, which come from the errors of the estimated parameters. In particular, since the discount factor β is imprecisely estimated, the impacts of temporary tax changes might be imprecise. The discount factor is estimated to be 0.9053 with the standard error of 0.1059 in [3] of Table 3, which means that the per-month discount rate is 9.47 per cent. This figure is, admittedly, too large. Although the main arguments of the paper depends solely on the result that the estimated discount factor is significantly different from zero (therefore, temporary tax changes have weaker effects relative to permanent changes) and not on how close it is to the unity, it is true that the estimated discount factor that is far from the unity makes the impacts of temporary tax changes extremely large. For example, if we change the value of β from 0.9053 to 0.9900,

The consumption-tax increase of 1997 had a large negative impact on the growth rate of consumption in 1997, through the weakening of the spending behaviour of near-rational consumers, as well as current income consumers, as shown on the seventh and ninth columns of Table 7. The contribution through near-rational consumers is -0.8 per cent, which is more than twice as large as that through current income consumers. A larger contribution through near-rational consumers implies that a temporary tax reduction will not be effective enough to compensate deterioration in consumer spending due to the permanent increase in the consumption tax rate.

The announcement effects of tax policy were quite limited, as indicated by the near-zero estimates of f_1 in Table 7. For example, the announcement effect of the permanent tax-reduction of 1995 was less than 0.2 per cent and that of the consumption-tax increase was about -0.2 per cent.

4. Near-rationality of the Japanese consumers? The regression analyses in the previous section indicate that a fairly large fraction of forward-looking consumers, who distinguish between temporary and permanent tax changes, respond to tax changes, not at the time of the policy announcement but at the time of implementation. They deviate from the optimal path of consumption in the sense that they ignore policy announcements, and thus are labelled near-rational consumers in Section 2. To reinforce this interpretation, we calculate in this section how much utility these near-rational consumers lose by deviating from the optimal path of consumption, following the methodology of Cochrane (1989).

Consider the optimization problem:

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which is within one standard error of the estimate, the estimated impact of temporary tax reduction in 1995 through the behaviour of near-rational consumers decreases from +0.79 to +0.08.

$$\max \; U = E_t \sum_{i=0}^{\infty} b^i u(C_{t+i}) \tag{8}$$

subject to the appropriate budget constraint, and write the optimal path of consumption as C_t* and the actual path by C_t. The utility gained from the optimal path is U*, and that gained from the actual path is U. The second-order Taylor expansion gives:

$$U - U^* \approx E_t \sum_{i=0}^{\infty} b^i u'(C_{t+i}^*)(C_{t+i} - C_{t+i}^*) + \frac{1}{2} E_t \sum_{i=0}^{\infty} b^i u''(C_{t+i}^*)(C_{t+i} - C_{t+i}^*)^2 \tag{9}$$

Note that the first sum of the right-hand side of equation (9) is zero for any feasible deviation from the optimal path of consumption. The utility costs can be approximated by the second sum of the right-hand side of equation (9). We divide the second sum by the corresponding marginal utility, evaluated at the optimal consumption level. This transforms the utility value expression into a yen-equivalent expression. Dividing the second sum by the optimal consumption level, we express the loss in terms of a percentage of the optimal consumption level. That is,

$$\frac{1}{2} E\left[\frac{u''(C_t^*)(C_t - C_t^*)^2}{u'(C_t^*)C_t^*}\right] = \frac{1}{2} E\left[\frac{C_t^* u''(C_t^*)}{u'(C_t^*)} \frac{(C_t - C_t^*)^2}{(C_t^*)^2}\right] = \frac{g}{2} E\left[\frac{(C_t - C_t^*)^2}{(C_t^*)^2}\right] \tag{10}$$

where g is the coefficient of relative risk aversion.

Let L_3 denote the utility loss of near-rational consumers relative to permanent income consumers. Using equation (10), we can express L_3 as:

$$L_3 = \frac{g}{2} E\left[\frac{(C_{3t} - C_{2t})^2}{(C_{2t})^2}\right] = \frac{g}{2} E\left[\left(\sum_{s=75:01}^{t} v_s^A - \sum_{s=75:01}^{t} v_s^I\right)^2 \Big/ \; (c_{2t})^2\right] \tag{11}$$

where the second equality follows from equations (2.2) and (2.3). Note that the utility loss of near-rational consumers is caused by their sub-optimal responses to changes in taxes and social security contributions. The variable, c_{2t}, in equation (11) is implicitly defined by:

$$\begin{aligned} c_t &= \lambda d_t + (1-\lambda)\phi_1 c_{2t} + (1-\lambda)\phi_2 c_{3t} \\ &= \lambda d_t + (1-\lambda)c_{2t} + (1-\lambda)(1-\phi_1)\left(\sum_{s=75:01}^{t} v_s^A - \sum_{s=75:01}^{t} v_s^I \right) \end{aligned} \tag{12}$$

where the second equality follows from the restriction, $\phi_1 + \phi_2 = 1$. Similarly, we can define L_1, the utility loss of current income consumers, as:

$$L_1 = \frac{\gamma}{2} E\left[\frac{(C_{1t} - C_{2t})^2}{(C_{2t})^2} \right] = \frac{\gamma}{2} E\left[\left(\sum_{s=75:01}^{t} v_s^A - \sum_{s=75:01}^{t} (v_s^{IP} + \delta v_s^{IT}) \right)^2 \Big/ \ (c_{2t})^2 \right] \tag{13}$$

where the second equality follows from equations (2.1) and (2.2).

Table 8 reports the utility losses corresponding to the estimates obtained in the specification [3] of Table 3. The table expresses utility losses in percentage points, relative to the optimal consumption. The second column of the table shows L_3 for various values of the coefficient of relative risk aversion. The utility losses are 0.003 per cent for γ=1, and 0.033 per cent for γ=10. Even when γ is as high as 30, the loss is 0.098 per cent. We conclude from these figures that the welfare losses, which the forward-looking consumers who ignore policy announcements have to pay, are quite small. In this sense, they are qualified to be called near-rational consumers. On the other hand, the utility losses of current income consumers, which are shown on the first column of the table, range from 0.009 per cent to 0.282 per cent for γ between 1 and 30.[31] The figures are

[31] Campbell and Mankiw (1991) calculates the welfare losses of current income consumers using the data of various countries. For example, their estimate for the U.S. is about two per cent for the case of γ=30. In

about three times those of near-rational consumers, but do not indicate a serious welfare loss. The third column of the table presents the average utility losses across different types of consumer, which range from 0.004 per cent to 0.130 per cent for g between 1 and 30.[32]

5. Conclusion Do the impacts of tax reductions on consumer spending depend on whether they are permanent or temporary? If so, what would be the difference? Do the announcements of tax reductions affect consumer spending? To prepare an empirical answer to these questions, we would need a data set that distinguishes between temporary and permanent reductions in spending, as well as anticipated and unanticipated changes in taxes. One method that provides these distinctions is the use of institutional information, such as the legal distinction between temporary and permanent changes, as well as the timing of policy announcements and their implementations.

Using a data set including this institutional information for 43 episodes of changes in taxes and social security contributions in Japan during the period of 1975–98, we found that more than three-quarters of Japanese consumers are forward-looking consumers who distinguish between temporary and permanent tax changes. The fraction of rule-of-thumb consumers, or Keynesian-type consumers, whose spending depends on current income rather than permanent income, is less than a quarter. We cannot reject the null hypothesis that the fraction of Ricardian consumers is zero.

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addition, Caballero (1995) calculates the welfare losses of those who are characterized by infrequent actions to shocks. The estimate is about one per cent for the case of g=30.

[32] These calculations assume that (1) consumers face no idiosyncratic risk with respect to disposable income; and (2) consumers respond optimally to shocks other than tax changes. The welfare losses could be much larger if these assumptions are not satisfied.

The response of forward-looking consumers to temporary changes in taxes is significantly smaller than that for permanent tax changes. The regression results, reported in this paper, show that a permanent tax reduction of 10,000 yen per month would increase the monthly spending of a forward-looking consumer by about 10,000 yen. However, a one-time tax reduction of the same size would increase the spending of the forward-looking consumer by less than 1000 yen.

We have also found that more than 80 per cent of Japanese consumers respond to changes in taxes not at the timing of policy announcements but at the timing of their implementations. This is consistent with two regularities repeatedly observed in the empirical studies on consumer behaviour: excess smoothness and excess sensitivity of consumption. However, our findings are new in that, not only rule-of-thumb consumers, but also a part of forward-looking consumers, who distinguish between temporary and permanent tax changes, ignore policy announcements. We suggest an explanation that forward-looking consumers who ignore policy announcements follow a near-rational decision rule. For those consumers, the utility gained by using policy announcements to better adjust consumption, does not outweigh the costs of obtaining and processing the information, while that gained by distinguishing between temporary and permanent tax changes is large relative to the costs. The estimated utility cost of ignoring policy announcements is less than 0.1 per cent of the PIH consumption.

Appendix A: Major tax reforms in Japan

This appendix gives a brief description of the major tax reforms in Japan during the post-war period: The Nakasone Tax Reform in 1987, the Takeshita Tax Reform in 1988, and the 1994 Tax Reform.

The Nakasone Tax Reform The Nakasone Tax Reform in 1987 aimed at achieving equality, fairness and simplicity of taxation by changing the basic structure of the existing tax system that had been untouched since the tax reform in 1949, based on the recommendation by the Shoup mission. The existing tax system was considered unequal not only vertically but also horizontally.[33] It was also criticized for unfair treatment of investment income: interest was exempt from income taxation up to a certain level, and capital gains from selling stocks were not taxed in principle.[34] In September 1987, the Nakasone administration solved these problems, at least partially, by: (1) reducing the income tax burden, especially for the middle-income salaried workers, by two trillion yen; (2) simplifying the rate structure for income tax from 15 brackets with the top marginal rate of 70 per cent to 12 brackets with the top marginal rate of 60 per cent; and (3) taxing interest by a withholding tax at the rate of 20 per cent.

[33] It was considered horizontally unequal because of the "10:5:3:1 problem": labour income of salaried workers is reported in full to the tax authority, while the self-employed can declare only 50 per cent of what they earn, farmers 30 per cent, and politicians a mere 10 per cent.

[34] Another complaint about the existing tax system was the excessively high corporate income tax burden. The effective corporate income tax rate was 53 per cent in 1984, significantly higher than those in the major industrial countries.

The Takeshita Tax Reform Inheriting the key concepts of the Nakasone Tax Reform, the Takeshita administration emphasized the importance of introducing VAT as an alternative revenue source in reducing the income-tax burden substantially.[35] In July 1988, the Takeshita administration succeeded in introducing the so-called consumption tax, a Japanese version of VAT, with the tax rate of three per cent, as well as flattening the schedule of the income tax rate by reducing the number of brackets to five, with the top marginal rate of 50 per cent. The income tax reduction amounted to three trillion yen, while additional revenue from the introduction of the consumption tax was 3.3 trillion yen in FY1989, 5.7 per cent of the national tax revenue.

The 1994 Tax Reform On January 1, 1994, Prime Minister Hosokawa proposed to abandon the consumption tax and introduce a new tax, named "welfare tax," a kind of VAT, the revenue of which would be used specifically for government expenditure necessary to make the transition to the ageing society easier. Although the ruling parties rejected the Prime Minister's initial idea, discussion lead to a consensus that the consumption tax rate should be increased in anticipation of the expected social security outlays in the 21st century, and that income tax rates should be decreased to give incentives to middle-income workers. In September 1994, the Diet passed the tax-reform bills, in which the consumption tax rate was raised from three to five per cent, and the progressiveness of the income tax was relaxed, especially for the range of seven to 15 million yen annual income. The tax mix of consumption-tax increase and income tax reduction was designed

[35] The Nakasone administration tried to introduce VAT, but failed because of opposition from small- and medium-sized businesses in the wholesale and retail trades, as well as taxpayers who showed a strong resentment against the regressive structure of the VAT.

to be revenue neutral: the consumption tax increase to create additional revenue of four trillion yen, while the income-tax cut to reduce revenue by 3.7 trillion yen.[36]

Appendix B: An outline of the Japanese social insurance system

The social insurance programme in Japan consists of three major components: public pensions, medical care insurance, and labour insurance. This appendix gives a brief summary of each insurance system, with a special focus on contributions/premiums the insured persons need to pay.

Public pensions The public pension system in Japan is a two-tier system: the flat-rate basic benefit and the earnings-related benefits. The first tier, the Basic Benefits (*Kiso-Nenkin*), covers all residents, irrespective of whether they are employed or not. The second tier consists of two types of funds: the Employees' Pension Fund (*Kosei-Nenkin*) for private-sector employees; and the Cooperative Pension Funds (*Kyosai-Nenkin*) for government employees, private school teachers, etc. Independent workers, the self-employed and jobless persons are covered only by the Basic Benefits, but employees are also covered by the Employees' Pension Fund or the Cooperative Pension Funds.

[36] At the beginning of 1994, it was a political consensus that the government should stimulate the economy by income tax reductions as soon as possible. However, the income tax reduction, in the bills passed in September 1994, was scheduled to start in January 1995. To fill the gap, the government implemented a temporary tax reduction of 5.5 trillion yen in 1994. In 1995, the income tax reductions, in the 1994 tax reform package, were 3.7 trillion yen, *plus* a temporary tax reduction of 2.0 trillion yen, to keep the total amount of tax reductions as large as that implemented in 1994.

The major programme in the Basic Benefits is the old-age pensions.[37] The full old age pension, 65,000 yen per month, is payable from age 65, provided that 40 years of contributions were made. The monthly contribution, which is independent of the income of the insured, is currently 13,000 yen. Those who are covered only by the Basic Benefits are required to pay this amount individually to social security offices, while those who are covered by the Employees' Pension Fund or the Cooperative Pension Fund are not required to do so because they pay contributions indirectly through those funds.

The full old age pension of the Employees' Pension Fund is 30 per cent of his/her career average monthly real earnings, and payable from age 60, provided that 40 years of contributions were made. The average benefit for those who started to receive benefits in April 1997 is about 202,000 yen per month. Under the Employees' Pension Fund, equal percentage contributions are required of employees and their employers. The monthly contributions are calculated by multiplying the "monthly standard remuneration" by the contribution rate. The "monthly standard remuneration", which consists of wages, salaries, allowances, and all other cash income paid to an employee for services rendered, is revised once a year, in August, based on the average income of the insured in May through June of the year. The contribution rate, currently 17.35 per cent, is revised every four or five years[38] based on the government's reassessment of the future path of benefits and contributions. The employers are obliged to pay the total contributions (both from

[37] The Basic Benefits include not only old-age pensions, but also disability and survivors' pensions, etc.

[38] During our sample period, changes in the contribution rate based on the reassessments were implemented in 1976, 1980, 1985, 1989, 1990, and 1994. See Table A1 for the exact dates of implementation as well as announcement.

employers and employees) for a given month to the social insurance office by the end of the next month, and, to do so, they collect contributions from the employees in the next month.

Medical care insurance Medical care insurance consists of Health Insurance for employees and National Health Insurance for the self-employed. Both are systems of paying medical care benefits and allowances to the employees of business firms and their families when they are taken ill or injured. Premiums of the Health Insurance are determined by multiplying the monthly standard remuneration of the insured person by the prescribed premium rate. The premium rate for Health Insurance, which is now 8.5 per cent of the monthly standard remuneration, is revised every five years.

Labour insurance Labour insurance consists of two kinds of insurance: Workers' Accident Compensation Insurance, a protection against injury, disease, disability or death resulting from an employment, and Employment Insurance, or unemployment compensation. Premiums for the two insurances are calculated by multiplying the total amount of wages paid to workers by the corresponding premium rates. Premiums for the Workers' Accident Compensation Insurance are paid by the employers. Premiums for the Employment Insurance are paid by both the employers and the employees. At present, the premium rate is 1.45 per cent, of which 0.9 per cent is borne by the employers and 0.55 per cent by the employees.

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Table 1.
Changes in income tax and consumption tax, 1993-1998

	Changes in income tax		Changes in consumption tax
	Temporary	Permanent	
Total amount, trillion yen			
CY1993	-	-0.1	-
CY1994	-5.5	-0.1	-
CY1995	-2.0	-3.6	-
CY1996	-2.0	-3.6	-
CY1997	-	-3.6	+3.1
CY1998	-4.0	-3.7	+4.1
A typical family,[1] thousand yen			
CY1993	-	-5.0	-
CY1994	-40.4	-6.5	-
CY1995	-26.6	-31.0	-
CY1996	-26.3	-33.3	-
CY1997	-	-33.3	+41.0
CY1998	-137.5	-38.3	+54.0

1) A married family with two children. Before-tax annual income is 5 million yen.

Table 2.
Propensity to consume out of income

		Mean of monthly changes in propensity to consume out of income		
		All items	Nondurables and services	Durables
Full sample	(OBS=281)	-0.00033	-0.00043	+0.00010
$n_t^I < 0$	(OBS= 34)	+0.00288 **	+0.00151 *	+0.00137 *
$n_t^I = 0$	(OBS=241)	-0.00057	-0.00055	-0.00002
$n_t^I > 0$	(OBS= 6)	-0.00901 **	-0.00682 **	-0.00219
$n_t^A < 0$	(OBS= 16)	-0.00079 †	-0.00100	+0.00021 †
$n_t^A = 0$	(OBS=260)	-0.00015	-0.00025	+0.00010
$n_t^A > 0$	(OBS= 5)	-0.00853 ††	-0.00821 ††	-0.00032 †

** Different from the no-implementation mean value at the 5% level (one-tailed).

* Different from the no-implementation mean value at the 10% level (one-tailed).

†† Different from the no-announcement mean value at the 5% level (one-tailed).

† Different from the no-announcement mean value at the 10% level (one-tailed).

Table 3.
Baseline regression results

$$\Delta c_t = \lambda \Delta d_t - (1-\lambda)\phi_1[v_t^{AP} + (1-\beta_1)v_t^{AT}] - (1-\lambda)\phi_2[v_t^{IP} + (1-\beta_2)v_t^{IT}] + \{(1-\lambda)\theta\ \hat{u}_t \text{ OR } (1-\lambda)u_t\} + \varepsilon_t$$

Perameter restrictions	No	$\beta_1 = \beta_2$	$\beta_1 = \beta_2$ $\phi_1 + \phi_2 = 1$	No	$\beta_1 = \beta_2$	$\beta_1 = \beta_2$ $\phi_1 + \phi_2 = 1$
Regression method	NLLS	NLLS	NLLS	2SLS	2SLS	2SLS
	[1]	[2]	[3]	[4]	[5]	[6]
λ	0.2385	0.2408	0.2371	0.3074	0.3156	0.2897
	(0.0523)	(0.0519)	(0.0513)	(0.1103)	(0.1084)	(0.1020)
ϕ_1	0.5919	0.4639	0.1978	0.5012	0.3041	0.0554
	(0.6234)	(0.5488)	(0.3130)	(0.6915)	(0.5135)	(0.3138)
ϕ_2	0.9779	1.0268		1.3093	1.3716	
	(0.5195)	(0.5086)		(0.6578)	(0.6525)	
β_1	0.9817	0.9418	0.9053	0.9841	0.9155	0.8702
	(0.0940)	(0.0783)	(0.1059)	(0.1230)	(0.0772)	(0.1068)
β_2	0.9168			0.9045		
	(0.1056)			(0.0866)		
θ	0.2922	0.2869	0.2934	-	-	-
	(0.1327)	(0.1325)	(0.1310)			
$\bar{R}^2$	0.2192	0.2215	0.2233	0.2133	0.2155	0.2166
Wald test: $\phi_1 + \phi_2 = 1$						
Chi-squared statistic	0.5237	0.4103		0.7763	0.6123	
p-value	0.4693	0.5218		0.3783	0.4339	

Notes :

1) Standard errors are in parentheses. Intercept and the coefficients on the two dummy variables associated with changes in consumption tax rate are not reported. $\beta_0 = 0.99$.

2) [4], [5] and [6] are estimated by 2SLS, instrumenting for Δd_t with $\Delta d_{t-2}, ..., \Delta d_{t-6}, \Delta c_{t-2}, ..., \Delta c_{t-6}$.

Table 4.
Sensitivity analysis

	Measurement errors	Delete the observations related with changes in consumption tax rate	Delete the observation of December 1997	Dependent variable is nondurables plus services	Consumption durability
	[1]	[2]	[3]	[4]	[5]
ι	0.2348 (0.0520)	0.2410 (0.0519)	0.2357 (0.0515)	0.2347 (0.0417)	0.2181 (0.0638)
f_1	0.4345 (0.7082)	0.4561 (0.5483)	0.7817 (0.5322)	0.2130 (0.4959)	0.4421 (0.6106)
f_2	0.5022 (0.5380)	0.9046 (0.5462)	0.8892 (0.4687)	0.8224 (0.4104)	0.9134 (0.5754)
b_1	0.8814 (0.2008)	0.9383 (0.0868)	0.8890 (0.0848)	0.9977 (0.0816)	0.9362 (0.0950)
q	0.3028 (0.1309)	0.3049 (0.1329)	0.2966 (0.1300)	0.2644 (0.1061)	0.3323 (0.1162)
r	-	-	-	-	0.1579 (0.2434)
$\overline{R}^2$	0.2175	0.2209	0.2306	0.2702	0.2191
Wald test: $f_1 + f_2 = 1$					
Chi-squared statistic	0.0042	0.2034	0.7531	0.0032	0.1572
p-value	0.9481	0.6520	0.3855	0.9546	0.6918
Regression method	TSLS	NLLS	NLLS	NLLS	NLLS

Notes :

1) Standard errors are in parentheses. Intercept and the coefficients on the two dummy variables associated with changes in consumption tax rate are not reported. $\beta_0 = 0.99$.
2) The first column reestimates the specification [2] of table 3, instrumenting for the change in tax and social security contribution with the four dummy variables corresponding to v^{AP}, v^{AT}, v^{IP} and v^{IT}. The dummy variable corresponding to v^{AP} takes the value of +1 in months when $v^{AP}>0$, -1 when $v^{AP}<0$ and zero otherwise. The other three dummy variables are defined in the same way.
3) The second column reestimates the specification [2] of table 3, deleting the observations related with changes in consumption tax rate: 1989:03, 1989:04, 1997:03, and 1997:04.
4) The third column reestimates the specification [2] of table 3, deleting the observation of December 1997.
5) The fourth column reestimates the specification [2] of table 3, using expenditures on nondurables and services as dependent variable.
6) The fifth column estimates equation (6) in text. Standard errors shown on the fifth column are Newey-West estimator.

Table 5.
Non-Keynesian effects of fiscal expansion?

$$\Delta c_t = \lambda \Delta d_t - (1-\lambda)\phi_1[v_t^{AP} + (1-\beta_1)v_t^{AT}] - (1-\lambda)\phi_2[v_t^{IP} + (1-\beta_2)v_t^{IT}] + (1-\lambda)\theta\,\hat{u}_t + \kappa g_t + \eta_t$$

Perameter restrictions	$\beta_1 = \beta_2$	$\beta_1 = \beta_2$ $\phi_1 + \phi_2 = 1$
	[1]	[2]
λ	0.2510 (0.0521)	0.2494 (0.0516)
ϕ_1	0.1853 (0.5130)	0.0592 (0.3448)
ϕ_2	1.0566 (0.5222)	
β_1	0.9298 (0.0925)	0.9104 (0.1023)
θ	0.2756 (0.1347)	0.2788 (0.1337)
κ	0.2032 (0.1143)	0.2099 (0.1131)
$\bar{R}^2$	0.2276	0.2302
Wald test: $\phi_1 + \phi_2 = 1$		
Chi-squared statistic	0.1085	
p-value	0.7419	
Regression method	NLLS	NLLS

Notes :

1) Standard errors are in parentheses. Intercept and the coefficients on the two dummy variables associated with changes in consumption tax rate are not reported. $\beta_0 = 0.99$.

2) The variable g_t represents additional government expenditures announced at t. It is measured by the additional issue of government construction bonds divided by the nominal GDP.

Table 6.
Asymmetric effects of tax changes?

$$\Delta c_t = \lambda \Delta d_t + (1-\lambda)\theta\hat{u}_t$$
$$-2(1-\lambda)\phi_1\{[(1-\mu_1)v_t^{AP+} + \mu_1 v_t^{AP-}] + (1-\beta_1)[(1-\mu_1)v_t^{AT+} + \mu_1 v_t^{AT-}]\}$$
$$-2(1-\lambda)\phi_2\{[(1-\mu_2)v_t^{IP+} + \mu_2 v_t^{IP-}] + (1-\beta_2)[(1-\mu_2)v_t^{IT+} + \mu_2 v_t^{IT-}]\} + \varepsilon_t$$

Perameter restrictions	$\beta_1 = \beta_2$	$\beta_1 = \beta_2$ $\phi_1 + \phi_2 = 1$
	[1]	[2]
λ	0.2453 (0.0519)	0.2318 (0.0510)
ϕ_1	1.0811 (0.5888)	0.4851 (0.3683)
ϕ_2	1.0258 (0.5217)	
β_1	0.8842 (0.1847)	0.6234 (1.1548)
θ	0.2767 (0.1338)	0.2994 (0.1298)
μ_1	0.0105 (0.1831)	0.0045 (0.1438)
μ_2	0.3376 (0.2641)	0.2159 (0.5360)
$\bar{R}^2$	0.2253	0.2222
Wald test: $\mu_1 = 0.5$		
Chi-squared statistic	7.1440	11.8682
p-value	0.0075	0.0006
Wald test: $\mu_2 = 0.5$		
Chi-squared statistic	0.3780	0.2808
p-value	0.5387	0.5961
Regression method	NLLS	NLLS

Note: Standard errors are in parentheses. Intercept and the coefficients on the two dummy variables associated with changes in consumption tax rate are not reported. $\beta_0 = 0.99$.

Table 7.
Estimated effects of the tax policy in 1993-1998

	Percentage contributions to the consumption growth rate of:									Growth rate of real consumption, percent
	permanent income-tax reduction			temporary income-tax reduction			consumption tax increase			
	current income consumers	permanent income consumers	near-rational consumers	current income consumers	permanent income consumers	near-rational consumers	current income consumers	permanent income consumers	near-rational consumers	
CY1993	+0.00	+0.02	+0.01	0.00	0.00	0.00	0.00	0.00	0.00	+0.34
CY1994	+0.01	+0.06	+0.09	+0.32	+0.24	+0.42	0.00	-0.06	0.00	-1.49
CY1995	+0.23	+0.11	+0.63	-0.11	+0.12	+0.79	0.00	-0.12	0.00	+1.06
CY1996	-0.24	+0.00	+0.14	-0.02	+0.12	+0.63	0.00	0.00	0.00	-0.02
CY1997	0.00	+0.00	0.00	-0.20	+0.03	+0.33	-0.31	0.00	-0.80	-0.22
CY1998	0.00	+0.02	0.00	+0.70	+0.41	+0.34	+0.32	0.00	-0.28	-

Notes :

1) Contributions of the tax reduction/increase are calculated using the estimated result shown in [3] of table 3.
2) The growth rate of consumption in a year is defined as the annual average of the consumption divided by the level of consumption in December of the previous year. The percentage contribution of changes in taxes is defined in the same way.

Table 8.

Utility losses of the current income consumers and the near-rational consumers

	Loss of the current income consumers L_1	Loss of the near-rational consumers L_3	Weighted average $\lambda L_1 + (1-\lambda)(1-\phi)L_3$
$\gamma = 1$	0.009	0.003	0.004
$\gamma = 2$	0.019	0.007	0.009
$\gamma = 5$	0.047	0.016	0.022
$\gamma = 10$	0.094	0.033	0.043
$\gamma = 30$	0.282	0.098	0.130

Note: Losses are expressed in percentage points, as a fraction of the consumption level of the type 2 consumer. ã is the coefficient of relative risk aversion. See text for the details of calculation.

Table A1.
Chronology of changes in income tax, consumption tax, and social security contribution, 1975-1998

Date of implementation	Date of announcement[1)]	Estimated size[2)]	Income tax or consumption tax or social security contribution[3)]	Temporary or permanent[4)]
04/01/75	12/26/74	-0.464	N	P
06/01/75	12/26/74	-0.314	L	P
09/01/76	02/09/76	+0.521	S	P
04/01/77	01/10/77	-0.557	N	P
06/01/77	01/10/77	-0.195	L	P
06/01/77	03/09/77	-0.053	N	T
06/01/78	02/28/78	-0.049	N	T
06/01/79	01/11/79	-0.119	L	P
06/01/80	12/29/79	-0.046	L	P
11/01/80	02/28/80	+0.228	S	P
12/01/81	10/13/81	-0.005	N	T
12/01/83	10/21/83	-0.016	N	T
04/01/84	01/20/84	-0.298	N	P
06/01/84	01/20/84	-0.194	L	P
11/01/85	01/24/84	+0.557	S	P
10/01/87	07/24/87	-0.844	N	P
06/01/88	07/24/87	-0.522	L	P
09/01/88	07/26/88	-0.023	N	T
01/01/89	06/14/88	-0.625	N	P
04/01/89	06/14/88	+0.749	C	P
06/01/89	06/14/88	-0.548	L	P
02/01/90	02/27/89	+0.751	S	P
12/01/93	04/08/93	-0.073	N	P
06/01/94	04/08/93	-0.044	L	P
06/01/94	02/10/94	-0.029	N	T
06/01/94	02/10/94	-0.025	L	T
07/01/94	02/10/94	-0.028	L	T
12/01/94	02/10/94	-0.019	N	T
12/01/94	03/01/94	+0.708	S	P
01/01/95	09/22/94	-0.412	N	P
06/01/95	09/22/94	-0.023	N	T
06/01/95	09/22/94	-0.022	L	T
06/01/95	09/22/94	-0.336	L	P

12/01/95	09/22/94	-0.022	N	T
06/01/96	12/20/95	-0.021	N	T
06/01/96	12/20/95	-0.023	L	T
12/01/96	12/20/95	-0.016	N	T
04/01/97	09/22/94	+1.042	C	P
02/01/98	12/19/97	-0.075	N	T
06/01/98	12/19/97	-0.071	L	T
08/01/98	04/09/98	-0.084	N	T
12/01/98	12/19/97	-0.070	N	P
06/01/99	12/19/97	-0.028	L	P

Notes :

1) For changes in income tax and consumption tax, the announcement date is defined as the date on which the LDP tax committee submits "Outline of tax reform," a proposal describing the details of the tax reform, to the government. For changes in social security contribution, the announcement date is defined as the date on which the advisory committee for social security system submits a report to the minister of health and welfare.
2) Percent. For permanent changes, figures indicate a per-month change divided by the monthly income. For temporary changes, figures indicate the amount of change multiplied by the discount rate, 0.01 per-month, and divided by the monthly income.
3) *N*, *L*, *C* and *S* represent, respectively, national income tax, local income tax, consumption tax, and social security contribution.
4) *T* and *P* represent, respectively, temporary and permanent changes in taxes and social security contributions.