

# The Impact of the Tax Reform in 2004 on the Female Labour Supply in Japan\*

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## ABSTRACT

In 2003, the Japanese Diet passed legislation to abolish part of the special deduction for spouses (*Haigusha Tokubetsu Kojo*), with the abolition to take effect in the 2004 tax year. This paper investigates the impact of this tax reform on the female labour supply in Japan. A number of earlier studies have shown that married women are likely to adjust their labour supply so that their husbands will be eligible to take advantage of the spouse deduction. By using data from the first and second waves of the Keio Household Panel Survey (KHPS) collected in 2004 and 2005, this paper uses the difference-in-differences approach to examine whether there has been any change in the behaviour of female labour supply as a result of this tax reform. Our approach is unique in that we use information on the awareness of the policy change to find a control group and a treatment group. This method is effective to rule out the possibility of dynamic aspects of labour supply. The empirical evidence indicates that the tax reform in 2004 did not have any impact on the decision of female spouses to enter the labour market. However, there are some effects on the number of hours they worked conditional on their participation in the labour market. Due to the partial abolition of the special spouse deduction, it is estimated that part-time female workers increased their weekly hours of work by about 3.7 hours. It can be argued that the awareness of the partial abolition of the spouse allowance is crucial in accounting for the changes in married women's labour supply.

**Keywords:** *Difference-in differences, female labour supply; policy reform; program evaluation; tax reform*

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## 1. INTRODUCTION

The purpose of this paper is to examine whether the abolition of a significant portion of the special deductions for spouses (*Haigusha Tokubetsu Kojo*) has had an impact on the female labour supply in Japan. In the recent wave of structural reforms, tax reform has been one of the top items on the agenda for the Japanese government. Given extremely large budget deficits, the Japanese tax system has been the subject of heated debate, and has been targeted for reform. The tax reform in 2003 cut into income tax system, and, in particular, abolished a significant portion of the special deductions for spouse. This reform was implemented from the 2004 tax year.

Spouse deductions were initially designed to support the nuclear family where full-time housewives specialized in domestic work and child bearing, on the basis of the argument that the contribution of housewives to their households should not be underestimated. In addition, Japanese firms often provide employees an allowance for spouses whose incomes are less than 1 million yen<sup>1</sup>. This threshold is set to closely match the threshold associated with the spouse deductions in the tax system (Nagase (2001) and Higuchi (1995)). However, as the labour force participation rate of women has increased over time, the policy of protecting fulltime housewives in this way has come under heavy criticism, and it has been suggested it causes significant distortions in the labour market.

The change in tax system that came into effect in 2004 enables us to investigate what incentives or disincentives the tax system provides for the suppliers of labour. By analyzing the abolition of a significant portion of the special deductions for spouses, it is possible to gain a better understanding of the labour market effects of the tax system. Furthermore, as other spouse-related deductions are expected to be abolished in Japan in the near future, the change in tax system in 2004 provides an opportunity to examine how sensitively households might react to such tax changes.

The tax system may be seen as having a possible impact on both the decision to participate in the labour market and the number of hours of worked given a decision to participate in the labour market. Depending on how tax system operates, it can provide an incentive or disincentive for labour supply. In the context of the social security earnings test in the USA, Friedberg (2000), Disney and Smith (2002) and Gruber and Orszag (2003) examine the impact of changes in the earning tests on labour supply decisions. They suggest there are some effects of the earning test on the labour supply of older workers.

Moreover, the relationship between tax system and labour supply is often discussed in the context of female labour supply. Since 1980s, various tax reforms, which may have had an impact on female labour supply, have been implemented in the United States and European countries, and there are number of studies which examine the effects of those policy reforms on labour market behaviour (Blundell and Macurdy, 1999). The Earned Income Tax Credits (EITC) in the United States and the Working Family Tax Credit (WFTC) in the U.K. were implemented to give tax credits to lower income households. Eissa and Liebman (1996) examine the impact of the American Tax Reform Act of 1986 (TRA86), which included an expansion of the earned income tax credit (EITC), on labour supply decisions. As only single women with children were eligible for the credit, in order to capture the effects of change in the system, Eissa and Liebman (1996) compare the change in labour supply of single women with children to that of single women without children. They conclude that the expansion of the earned income tax increased the labour force participation of single women with children. Blundell et al. (1998) estimated the labour supply effects of the tax reforms of 1980s in the U.K., and found positive and moderately sized wage elasticity. They also found negative income effects for women with children

There are numerous studies that examine the relationship between female labour supply and the tax system in Japan. Abe and Ohtake (1995) examine the income distribution of married part-time workers, and found that married part-time workers were "bunching" at the earnings limit. This implies that married women adjust their labour supply so that they can avoid becoming liable for taxation, and their husbands can be eligible for the spouse deductions. Higuchi (1995) poses the question of whether policies protecting fulltime housewives in fact protect wealthy household rather than low income households. He examines whether married part-time workers adjust their annual income taking into account various features of the tax system. According to Higuchi (1995), 35.6% of married part-time workers adjust their annual income, and their

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<sup>1</sup> All figures are in Japanese yen. In 2003, 100 yen=US\$0.84 (approx).

annual working hours are as much as 24.8% shorter than those who do not adjust their income. Furthermore, the higher the income of the husband, the more likely he is to be eligible for both the basic and special spouse deductions. Kohara (2001) also finds a similar trend in that the wives of husbands with relatively high incomes are more likely to adjust their labour supply to avoid exceeding the threshold for their husbands to be eligible for the spouse allowance. In contrast, Akabayashi's (2003) simulation results suggest that the abolition of the spouse deductions would have little impact on female labour supply in Japan. Nagase and Nawata (2005) present simulation based estimates of the impact of totally eliminating the spouse and special spouse deductions. Their simulations suggest that the elimination of both deductions would lead to a significant increase in the labour supply of women who currently work more than 1100 hours per year.

This paper aims to answer the question of whether the partial abolition of the special spouse deduction has influenced the labour supply decisions of women. If married women adjust their income to ensure that their husbands are eligible to receive the special spouse deduction, the abolition of the spouse allowance should increase the labour supply of married women. However, there could be no effect after the policy change if the labour supply of married women is independent of the special spouse deduction, if they are not aware of the amendment, or if they could not immediately adjust their work hours due to some constraints.

The tax reform in 2004 is said to be a relatively small change, and for most people, the loss of income is around \$350 or \$700 annually. As a result, many may argue that this amount is too small to give any substantial impact on the suppliers of labour. However, this argument may be empirically very important for policy administrators because if such criticism is correct, they can cut various allowances by small amounts like this policy change since those cuts do not affect on people's behaviour.

There are four major contributions of this paper. First, in order to find a control group who are unaffected by the reform and a treatment group who are affected by the reform, information on the awareness of the policy change is used. Second, various combinations of control and treatment groups are used for testing the robustness of the results. Third, rather than only estimating by simple pooled OLS, random effects models are also estimated to control for individual effects. Finally, it is found that the policy reform has not affected on married women who were out of the labour market, but affected on those who were already in the market.

The rest of this paper consists of five sections. Section 2 provides some details of the spouse allowance. Section 3 discusses the identification strategy and the models to be estimated, while section 4 describes the data. Section 5 reports the results of estimation, and section 6 contains a brief conclusion.

## 2. SPOUSE DEDUCTIONS

It may be useful to provide some explanation of the spouse deductions in Japan. Under the *Japanese Income Tax Law*, individual income earners are subject to income tax. The income tax is computed on the basis of a taxpayer's annual income tax in the tax year which is defined as January to December. Couples are not able to file jointly in Japan. There are basically two steps to compute an individual's income tax. First, eligible deductions and allowances are deducted from the individual's annual earnings. These deductions include deductions for dependents and a spouse if they are present. What remains after these deductions is taxable income. Second, progressive income tax rates are then applied to this taxable income to determine an individual's required tax payments.

In order to simplify the discussion, it is assumed that the head of the household is a husband and the spouse is a wife. In addition, the explanation is based on the case where the annual income for tax purposes of the head of the household is less than 10 million yen.

There are some annual earning thresholds for tax savings. In 2003, if a spouse's annual earning exceeds 1 million yen, the spouse's income becomes subject to income tax, and if her annual earning exceeds 1.03 million yen, she is liable for residential tax. Not only does her income become liable for taxation when her earning exceeds the 1.03 million yen threshold, but her husband also loses his basic spouse deductions. It is also worth noting that if the spouse's earning exceeds 1.3 million yen, she has to pay her own social security fees.

There are two types of spouse deductions: the spouse deduction (haigusha kojo); and the special spouse deduction (haigusha tokubetu kojo). Figure 1 graphically depicts how the spouse deduction system worked prior to the reform in 2003. The basic spouse deduction is a deduction of 380,000 yen that can be claimed by

a husband provided his wife's net earning is 1.03 million yen or less. On the other hand, the special spouse deduction is a three part system. Husbands whose spouse had net earnings of less than 700,000 yen were entitled to special spouse deduction 380,000 yen. Husbands whose spouse had net earnings between 760,000 yen and 1.03 million yen were entitled to special spouse deduction with a value between 380,000 yen and zero, where the amount was reduced in step wise fashion as the spouse's earnings rose. It is important to note that it is these two parts of special spouse deduction (the section denoted A in Figure 1) which have been abolished from the 2004 tax year. Here we refer to them as the special spouse deduction A. The final part of the special spouse allowance is the spouse earns more than 1.03 million yen and less than 1.41 million yen (special spouse deduction B in Figure 1). In this case, even though he is not eligible to claim a basic spouse deduction, the husband was eligible for a special spouse allowance between 380,000 yen and zero, where the amount was reduced in step-wise fashion as the spouse's income rose. That is, a significant portion of the special spouse allowance available in the 2003 tax year was not available in the 2004 tax year.

[Figure 1 around here]

Table 1 illustrates the pre and post tax savings of the tax reform on the spouse deductions. The direct impact of the partial abolition of special spouse allowance on a household's income will depend on the husband's marginal tax rate. If a husband was eligible for the full amount of the special spouse deduction A, 380,000 yen, and his marginal tax rate is 10%, he loses 38,000 yen due to the tax change. If his marginal tax rate is 20%, the husband loses 76,000 yen.

[Table 1 around here]

The tax reform in 2003 involves both income effects and substitution effects. There are three cases we need to consider. First, Figure 2 depicts the case where the spouse whose earning is zero enters labour market after the reform. Under the pre-reform regime, the budget constraint is ACDF. The budget constraint is changed to ABEF under the post-reform regime. The indifferent curve shifts from  $U_03$  to  $U_04$  due to the negative income effect, and the wife enters labour market. Those married women who earn less than 700,000 yen are thought to increase their labour supply due to the negative income effect. This is summarized in Figure 3. The first two cases are free from the substitution effect. However, those married women who earns between 700,000 and 1.03 million yen are subject to both income and substitution effects. In particular, it is important to consider the married women maximizing their utility at the kink D in 2003, that is, those women who are willing to work more at the given wage rate, but do not work more due to the tax system. Figure 4 illustrates this. If the special spouse deduction was not reduced between D and E, the married women would maximize their utility  $U'03$  at D' in 2003. These women may increase their labour supply after the tax reform in 2004.

[Figures 2-4 around here]

It is beneficial to indicate income distribution of women in the sample. The married women who are affected by the spouse deduction are part-time workers. Figure 5 illustrates the Kernel estimation of the women whose weekly work hours are less than 35 hours. There is a peak around 1 million yen, which is consistent with Abe and Ohtake (1995). However, there is not another peak around 700,000 yen. Those married women fall in between 700,000 and 1.03 million yen may be very few, and substitution effects may be limited. The abolition can be interpreted as income effects, and is expected to have positive effects on the labour supply of housewives. However, we will use sub-samples according to the married women's earnings in 2003.

[Figure 5 around here]

### 3. MODEL

As Disney and Smith (2002) point out, within the context of tax system and labour supply, there are mainly two ways of investigating the effects of tax reforms. One way is to rely on simulated responses derived from labour supply modeling. The other is to directly examine the actual reforms. Rather than simulating the responses of tax reforms, this paper examines the impacts of actual reforms. In order to examine the effects of the partial abolition of the special spouse deduction on the labour supply decisions of women, this paper applies the methodology of Eissa and Liebman (1996). However, as will be discussed in detail, this paper improves the methodology of Eissa and Liebman (1996) in two directions: the selections of control and treatment groups, and the use of random effect model to check robustness of the results.

As mentioned earlier, Eissa and Liebman investigated the effects of the TRA86 on labour force participation rates and hours worked of single women. The TRA86 changed the EITC system by providing greater financial encouragement to single women to take low wage jobs, but this only applied to those women with children in their care. Eissa and Liebman (1996) estimate the impact of the TRA86 using the difference-in-differences approach by comparing the treatment group of single women with children to the control group of single women without children. Eissa and Liebman (1996) computed a simple difference-in-difference estimator, and then estimated a probit model for labour participation and hours worked equation by pooled ordinary least squares to check the robustness of the results.

The use of a difference-in-difference estimator requires setting up a treatment group, which is affected by a policy change, and a control group, which is not affected by the policy change *but* has similar characteristics to the treatment group. The simple difference-in-difference estimator can be defined as follow:

$$\Delta^2 = (Y_T^{04} - Y_T^{03}) - (Y_C^{04} - Y_C^{03}) \quad (1)$$

where  $Y_i^t$  denotes the outcome of group  $i$  in year  $t$ . In this paper, various combinations of treatment groups and control groups are used to examine the effects of the tax change on the female labour supply. For example, those who are expected to be affected by the partial abolition of the spouse deductions are married women. Thus, the obvious treatment group is married women. On the other hand, the control group consists of single women. In order to refine the control and treatment groups, and to take account of data limitations, other definitions of the treatment and control groups are also used. These definitions will be discussed in more detail the next section.

The analysis is twofold since we examine both labour force participation and hours worked. The following discrete variable model is estimated for the labour force participation of individual women:

$$P(lfp_{it} = 1) = \Phi(\alpha_p + \beta_p X_{it} + \gamma_{p0} treat_i + \gamma_{p1} year04_t + \gamma_{p2} (treat_i \times year04_t)), \quad (2)$$

where  $lfp_{it}$  is a 0-1 dummy variable taking unity if the  $i$ 'th woman reported working at least one hour in period  $t$ , and zero otherwise. In addition,  $treat_i$  and  $year04_t$  are 0-1 dummies which take the value unity if the women is a member of the treatment group and the observation relates to 2004, respectively.  $X_{it}$  is a vector of demographic characteristics that includes education dummies, age, age squared, dummies for male and female parents living at home, husband's income, other unearned income of the women, the number of family members living at home (excluding the women in question), the number of preschool children, the unemployment rate for the region where the women lives, city size dummies, and regional dummies. The key parameter of interest in equation (2) is  $\gamma_{p2}$ . If the treatment group adjusted their labour supply to avoid earning beyond the threshold before the abolition of the special spouse deduction, it is expected that the treatment effect,  $\gamma_{p2}$ , will be positive. The inclusion of the regional unemployment rate and regional dummies is to take account of differing macroeconomic conditions across regions in Japan, and differences in macroeconomic conditions in 2004 and 2005.

For the hours worked of individual women, the following equation can be specified:

$$HW_{it} = \alpha_h + \beta_h X_{it} + \gamma_{h0} treat_i + \gamma_{h1} year04_t + \gamma_{h2} (treat_i \times year04_t) + \varepsilon_{it}, \quad (3)$$

where  $HW$  is the number of hours worked in a week, and the sample is limited to  $HW > 0$ . The definitions of the explanatory variables for this model are essentially the same as for equation (2). The key parameter of interest is  $\gamma_{h2}$ .

Dynamic Model

#### 4. DATA

The data used in this paper are the first two waves of the Keio Household Panel Survey (KHPS) collected in early 2004 and early 2005. This survey aims to investigate various aspects of household behaviour including consumption and labour supply behaviour. The first wave of KHPS was conducted in the period of January-March 2004 with a sample size of 4005 households, and is referred to as KHPS2004. The second wave of KHPS was conducted in January to March 2005, and is referred to as KHPS2005. This is illustrated in Figure 6. Between the first and second waves, there was an attrition rate of 17.3%. KHPS contains a variety of information on households, families, and individuals. Since for married couples the survey asks identical questions to both the respondent and his or her spouse, the first wave contains detailed data on approximately 7000 individuals.

[Figure 6 around here]

KHPS contains two sets of questions about labour force participation. The first set of questions ask about labour force participation in the calendar year prior to the survey, while the second set of questions ask about labour force participation in the month prior to the survey. To ensure that the data relate to before and after the tax change, we have used data taken from the first of questions which will provide data on labour force participation in the calendar years 2003 (KHPS2004) and 2004 (KHPS2005).

Since there are some differences in the questions asked in KHPS2004 and KHPS2005 about labour force participation in the last year, we explain briefly how we have used the data. To construct data on  $lfp_{it}$  for 2003 in equation (2), we used answers to the following question in KHPS2004: “Have you worked for any period of time in last year (from January to December)?”  $lfp_{it}$  is constructed as a zero-one dummy variable, and is set equal to one if the respondent answers that he or she worked for all of 2003 or some period in 2003, and zero if the respondent answers he or she did not work at all in 2003. In KHPS2005, the wording of the question relating to labour force participation is different. Respondents are asked to “Please circle all items that are applicable to your job status in the past year (January to December)”. The options provided are: (1) worked throughout the year; (2) had a job, but was on leave for the whole year; (3) looked for work for the whole year; (4) did not work at all for the whole year; (5) did not have a period of leave throughout the year; (6) did not look for work throughout the year. To construct data on  $lfp_{it}$  for 2004, the variable is assigned the value one if the respondent chose option (1) that he or she had worked throughout the year, and the value zero if the respondent chose option (4) that he or she did not work at all for the whole year. In order to pick up those who only worked for part of 2004, another question in KHPS2005 to indicate all of the months between January to December in the last year that he or she worked. For any person who indicated that they had worked at least one month their value of  $lfp_{it}$  was also set equal to one. These differences in the questions relating to labour force participation may be the reason for the dramatic increase in the labour force participation rate that is discussed in the next section. It can be argued that the modified questions in KHPS2005 reduced the number of people who answered that they did not work at all in last year.

For the analysis of hours worked in equation (3), answers to a question about the average number of hours worked for paid employment per week are used. However, neither KHPS2004 nor KHPS 2005 specify the period for which this average weekly hours worked relates. As a result, it is possible that the respondents may have answered their average weekly hours worked from January to March in 2004, which is *after* the tax change. As the purpose of this paper is to examine the difference in the labour supply between 2003 and 2004, if the respondents answered the hours worked in 2004 in KHPS2004 rather than the hours worked in the previous year, we would be merely examining after-after effects.

To try and remedy this problem, we used answers to the question in KHPS2004: “Are you aware that the special spouse deduction has been partially abolished from this year?” The use of answers to this particular question enables to conduct a difference-in-difference analysis even if the respondents answered the hours worked in 2004 in KHPS2004. That is, if respondents answer that they were not aware of the tax change, it is

assumed that they have not been influenced by the tax change, and have not changed their labour supply. In addition, because of this existence of this question we assume that they would be aware of the tax change in 2004, and should be able to alter their labour supply before the next survey in 2005.

Eissa and Liebman (1996) argues that theoretically, the 1987 expansion of the EITC should have increased labour force participation and reduced the hours worked by the EITC recipients who are already working. However, they obtained results that contradicted their theoretical prediction for hours worked- the expansion of EITC did not reduce hours worked. One of the explanations for this offered by Eissa and Liebman (1996) is that many recipients do not know they are recipients and, even if they do, they do not know how the system works. Our use of the information about the awareness of the tax change partly deals with this problem.

Moreover, another benefit of using the information about the awareness of the tax change is that it enables to use a difference-in-difference analysis even when people expect the tax change and adjust their labour supply prior to the actual abolishment of the special spouse deduction in 2004. Looney and Singhal (2005) highlights the importance of anticipated tax reforms on intertemporal labour supply. The abolition of the special spouse deduction passed the Diet in March 2003. People might become aware of the tax change at that point in time (or even before the amendment passed the Diet), and might have adjusted their labour supply for the expected loss in their income. If people behave in such a manner, our analysis again ends up with an after-after analysis. In this respect, it is beneficial to use the information of the awareness of the abolition of the spouse allowance.

The interpretation of the difference-in-difference can be slightly different from the standard case when information on the awareness of the abolition is used. Table 2 shows three possible cases. In the standard case (Case (A)), the control group is *not* affected by the policy change in either periods in  $t$  and  $t+1$ , and it only the treatment group in  $t+1$  that is affected by the policy change. In Case (B), the control group is chosen to be unaffected by the policy change regardless of whether they know of the change or not. However, for the treatment group while the policy change might potentially have affected their behaviour in both  $t$  and  $t+1$ , the lack of knowledge of the policy change in  $t$  is the basis for the assumption that their behaviour is not affected in  $t$ . In Case (C), for both the control and treatment groups the policy change might potentially have affected their behaviour in both  $t$  and  $t+1$ . The treatment group knows of the policy change at time  $t$  so it is assumed to affect their behaviour in both  $t$  and  $t+1$ . In contrast, the control does not know of the policy change at time  $t$ , so it is assumed their behaviour at time  $t$  is unaffected. The key difference between Case (A) and Case (C) is that for the control group in Case (A) there is no effect in either period, while for the control group in Case (C) there are effects in both periods. It is important to note that for the purpose of this analysis, respondents when answering the question in KHPS2004 relating to the average hours worked per week are assumed to answer their average hours worked for 2004, that is, after the tax change, rather than their hours for the previous year. Thus, in Case (C), the control group is assumed to be affected by the policy change at both points in time, whereas the treatment group, which is not aware of the abolition at time  $t$ , only adjust their labour supply at time  $t+1$ .

[Table 2 around here]

Taking these problems in the data set into the consideration, the combinations of the control and treatment groups used in this paper are summarized in Table 3. For the analysis of labour force participation, four groupings are used. For married women, the sample is always limited to women whose husband's estimated taxable income is below 10 million yen. This is to ensure that the head of the household is eligible for the special spouse deduction. In grouping (1), single women who are not eligible for the special spouse allowance are defined as the control group, and married women are defined as the treatment group. The second grouping adds the elements of the husbands' marginal tax rates to grouping (1). In grouping (2), the control group is single women, and the treatment group is married women whose husbands' estimated tax rate is 0.1 or 0.2. We could not secure a sufficiently large enough sample size for the analysis with a treatment group of married women whose husbands' estimated tax rate is 0.3. As discussed earlier, the initial financial impact of the partial abolition of the special spouse allowance will depend on the husband's marginal tax rate. It is assumed that women whose husbands' marginal tax rate is low are less affected by the tax change than those women whose husbands face a high marginal tax rate. One of the problems with using single women as a control group in groupings (1) and (2) is that the characteristics of single women may not quite be the same as those of married women, even though single women are not affected by the tax change. Thus, in grouping (3), we divide the sample of married women into sub-samples according to their husband's marginal tax rate, and compare married women. Thus, the control group is married women whose husband tax rate is 0.1, whereas the treatment group is those of the tax rate of 0.2. In this case, both the control and treatment groups are expected to be affected by the partial abolition of the special spouse allowance, but it is

expected that the impact will be greater for the treatment group. Similarly, grouping (4) compares married women whose husbands have a positive estimated marginal tax rate (that is, their taxable income is positive) as the treatment group to married women whose husband's estimated marginal tax rate is 0 as the control group.

[Table 3 around here]

For the analysis of hours worked, the sample is limited to women who reported their average weekly hours worked in KHPS2004 as being below 35 hours. The purpose of limiting the sample is to focus on the behaviour of part-time workers. Arguably, it is difficult for the full-time workers to adjust their work hours even though the tax system is changed, whereas it is relatively easy for the part-time workers to adjust their work hours. Three types of analysis are conducted. The first grouping is the same with the analysis of labour force participation: single women versus married women. As discussed earlier, given the formulation of the questions relating to hours worked, for married women this grouping may lead to an after-after analysis. In the second grouping, the control group is single women, and the treatment group is married women who were unaware of the tax change in KHPS2004. Single women are free from the effects of the tax change. On the other hand, as discussed earlier, it is assumed that those married women who were unaware of the tax change did not adjust their labour supply in the period  $t$ , but they became aware of it due to the questionnaire and adjusted their labour supply in the next period. So for married women this can be considered as a before-after analysis. In grouping (3), under the assumption that the respondents answered hours worked in 2004 in KHPS2004, the control group is married women who are aware of tax change, and the treatment group is married women who are unaware of tax change. Thus, for the control group this is an after-after analysis and for the treatment group this is a before-after analysis corresponding to Case (C) in Table 2.

Descriptive statistics for the variables used in the analysis are summarised in Table 4. For most variables, the sample size is 3486. In this Table *Worked last year*, refers to  $lfp$  in equation (2), and *hours worked* refers to  $HW$  in equation (3). *Married*, *Highschool*, *Junior College* and *University* are zero-one dummy variables taking the value 1 if the individual is married, and if the individual's final schooling was senior high school, junior college, respectively. *Living with Female Parent* and *Living with Male Parent* are zero-one dummy variables taking the value unity if the individual reports that she is living with a female parent and male parent, respectively. *Husband's income* refers to the husband's reported income for the previous year if the individual is married, and zero if the individual is not married. *Nonlabour income* is the individual's reported nonlabour income in the previous month. *No of family members* and *no of preschool children* refer to the number of members that are reported as being in the individual's household, and the number of children not yet attending school. The *area unemployment rate* is the unemployment rate for the region the individual is living in. The regional unemployment rate is obtained from *Labour Force Survey*. The *Labour Force Survey* provides the yearly regional unemployment rates. *Awareness of the abolition* is a zero-one dummy variable taking the value unity if the individual reports that she knows that the special spouse allowance will be partially abolished. *Large size cities* and *other cities* are zero-one dummy variables taking the value unity if the individual lives in a large city and non-large cities, respectively. (The base value is villages.) The regional dummies (*Hokkaido*, *Tohoku*, etc) are zero-one dummies that take the value unity if the individual lives in the particular region, and zero otherwise. For "Hours worked", the weekly hours worked, and "nonlabour income", the sample size is 733. These two variables are used in the analysis of hours worked. As nonlabour income is robustly not significant in the analysis of the labour force participation, only the sample size used in the analysis of hours worked is reported.

[Table 4 around here]

## 5. RESULTS

### 5-1. Labour Force Participation

For both analyses of labour force participation and hours worked, rather than only estimating using simple pooling, random effects models are also estimated to control for individual effects. Table 5 reports the results of a simple difference-in-differences estimator of the impact of the tax change on the labour force participation of women. The estimated impact of the change is an increase in the probability of labor force participation of 0.05, and this effect is significant at the 10% significance level. However, the labour force participation ratios are very high, and there is a big increase between the two periods for both married and



single women. One of the reasons for the high participation ratio is that the sample is limited to women from 20 to 65 years old. In Table 5, the labour participation ratio and employment ratio are calculated according to their marital status using the *Labour Force Survey*. In spite of the use of close definitions, the ratio in KHPS is much higher. In Table 6 using data from the *Labour Force Survey*, there is hardly any movement in the labour participation ratio and employment ratios between 2003 and 2004. The participation and employment ratios are 0.81 and 0.75 respectively for “never married” in 2003. On the other hand, in Table 5 based on KHPS data, the participation ratio for single women is 0.89 in 2003 and 0.93 in 2004, and a substantial increase can be observed. For married women, Table 6 indicates much lower participation and employment ratios compared to those in KHPS, and no substantial increase in two periods. In contrast, using the KHPS data, Table 5 shows that the participation ratio is 0.64 in 2003 and 0.73 in 2004. Again, there is a jump in numbers.

[Tables 5-6 around here]

As discussed in section 4, KHPS2004 and KHPS2005 have slightly different questions relating to labour force participation. This change in the questions appears to have reduced the number of people who answered that they did not work at all in the last year. In addition, to be precise, when we computed the labour force participation rate using the KHPS data, we excluded those who did not answer the questions. When we include those who did not answer the question in the denominator of the labour force participation ratio, the numbers are still high, but the increase between the two periods moderates. The participation ratio for married women including those who did not answer the question is 0.57 in 2003 and 59.6 in 2004. For single women, the ratio is 0.79 in 2003 and 0.81 in 2004. Thus, it is important to note that some care needs to be taken when interpreting the empirical results using labour force participation.

The treatment and control groups may differ in their demographic characteristics, so there is a possibility that the results in Table 5 may simply reflect differences of demographic characteristics between the treatment group and the control group rather than a treatment effect. In order to control for these demographic characteristics, equation (2) is estimated for labour force participation. As is indicated in Table 3, for the analysis of the labour force participation, there are four different groupings of control and treatment groups used in this difference-in-difference analysis.

Table 7 reports the results of a probit model estimated using pooled OLS and a random effects model. Here, the control group is single women, and the treatment group is married women. In both specifications, husband’s income, the cross product of a married dummy, the number of family members, and the number of preschool children are statistically significant, and their signs match with the expected signs. The empirical evidence supports the Douglas-Arisawa Law of a negative correlation between husband’s income and wife’s labour supply. On the other hand, education dummies are not statistically significant. The level of education does not seem to have much effect on women’s decision to participate in the labour market. The parameter of interest,  $\gamma_{p2}$  in equation (2), which is the parameter on (Year2004)x(Treat) is not statistically significant in either models. In the random effects model, the sign of the estimated  $\gamma_{p2}$  is negative, which is not consistent with our expectations.

[Table 7 around here]

In Table 8, single women are used as the control group, and married women are further limited to sub-samples according to their husbands’ estimated marginal tax rate. The purpose of dividing the sub-sample in this way is to examine if the effects of the tax change in households with relatively higher tax rates are more substantial. Husbands’ marginal income tax rate depends on their annual taxable income. If a husband’s taxable income is below 3.3 million yen, his marginal tax rate is 10%, and if his income is in between 3.3 million yen and 9.9 million yen, his marginal tax rate is 20%. The results of a test for random effects chooses random effects model, and therefore, only random effects model are reported in Table 7. In spite of the expectation that households with a husband facing a higher marginal tax rate would have been affected more by the tax change, neither of the results indicates a statistically significant  $\gamma_{p2}$ .

[Table 8 around here]

The use of single women as the control group may be problematic since their characteristics are not quite same as those of married women. In Table 9, we divide the sample of married women into sub-samples

according to their husbands' estimated marginal tax rate. We expect that the households which have a husband with a higher marginal tax rate are affected by the tax change more than households with a husband facing a lower marginal tax rate. Thus, the control group is married women whose husband tax rate is 0.1, whereas the treatment group is those of the tax rate of 0.2. Similarly, we compare married women whose husbands' have taxable income (positive marginal tax rate) as treatment group to married women whose husbands' estimated marginal tax rate is 0 as the control group. The results are summarised in Table 8, but neither case suggests a statistically significant increase in the labour participation of the treatment group after the abolition of the special spouse deduction. The results in Tables 6-9 provide no evidence to suggest a significant change in the labour force participation rates of women after the change in spite of the large changes observed in Table 5.

[Table 9 around here]

## 5-2. Hours Worked

Following the analysis of labour force participation, a simple difference-in-difference analysis of hours worked for single women versus married women is shown in Table 10. In order to control for the effects of these outliers, the sample is limited to individuals who report their weekly hours worked are less than 70 hours. The value of the difference-in-difference is -5.31, that is married women appear to reduce their hours worked by over five hours. Although the estimated value is not statistically significant, the sign is negative.

[Table 10 around here]

In order to control for the demographic characteristics of women, equation (3) is estimated for hours worked. . For the analysis of hours worked, the difference-in-difference analysis is conducted for the three cases shown in Table 2. Table 11 reports the results of a difference-in-difference estimator using single women as the control group and married women as the treatment group. For married women, the sample is limited to married women whose husband does not have a second job, and whose husbands' annual income is below 10 million yen. Furthermore, as the income of full-time workers is likely to be far beyond the earning limit of the spouse deduction, and these workers are not likely to be able to adjust their hours of work, we focus our analysis on part-time workers. In order to do this, we limit the sample to women who report their weekly hours worked are at least one hour and less than 35 hours in KHPS2004. In addition, in order to eliminate outliers, we used a sub-sample limited to women who report their weekly hours worked are less than 70 hours in KHPS2005.

[Table 11 around here]

In Table 10, the results of pooled OLS shows no statistically significant increase in hours of work as a result of the tax change. However, for random effects model,  $\gamma_{h2}$  is negative and statistically significant. This is not consistent with theory. This result may be caused by the choice of control and treatment groups, and problems with the data set.

As mentioned in section 4, the data on hours work needs to be used with caution because it is not entirely clear for what period these hours worked are being measured. In section 4, we have indicated that there is possibility that the respondents might have answered hours of work in 2004 in KHPS2004 rather than that of previous year. In order to overcome this problem, we used the information about whether women knew about the partial abolition of the special spouse deduction. Table 12 summarises the characteristics of women who knew the partial abolition of the special spouse allowance. About 60% of married women knew about the abolition. Women aged between 30 to 59 years appear to have higher levels of awareness of the abolition than those women in other age groups. The higher the educational qualification is, the more likely it is that the women knew of the abolition.

[Table 12 around here]

Table 13 reports the results of the analysis using single women as the control group and married women who did not know of the tax change as the treatment group. Both pooled OLS and random effects models indicate that while  $\gamma_{h2}$  is negative, it is not statistically significant. Table 13 uses the information about the awareness of the abolition of the special spouse allowance, but we use married women for both the control

group and the treatment group. In this way, we expect the characteristics of the two groups are very similar. The reported results in Table 14 point out positive and statistically significant  $\gamma_{h2}$  in both the pooled OLS and random effects model. The magnitude of the coefficient is around 4. That is, married women who did not know about the tax change increase their hours worked by four hours. Given the difference in the results between Tables 12 and 13 on the one hand, and Table 14 on the other hand, it can be argued that the information of the awareness is crucial for measuring the impact of the abolishment of the special spouse deduction.

[Tables 13 and 14 around here]

## 6. CONCLUSION

This paper has examined the impact of tax reform implemented in 2004 which partially abolished the special spouse allowance on the female labour supply in Japan. A number of earlier studies have shown that married women are likely to adjust their labour supply in order for their husbands to become eligible to take advantage of the spouse deduction. By using the first and second waves of the Keio Household Panel Survey (KHPS) collected in 2004 and 2005, this paper uses the difference-in-differences approach to examine whether there has been any change in the behaviour of female labour supply as a result of this tax reform. The empirical evidence indicates that the abolition of the special spouse allowance did not have any significant impact on the decision of female spouses to enter the labour market. However, there appear to be some effects on the number of hours they worked conditional on their participation in the labour market. Due to the partial abolition of the special spouse deduction, it is estimated that part-time female workers increased their weekly hours of work by about 3.7 hours. It can be argued that the awareness of the abolition is crucial in accounting for their labour supply.

For many households, the partial abolition of the special spouse allowance meant their budget constraint moved inward, so the households would have been unable to achieve their pre-consumption level. An examination of households' consumption before and after the tax change provides an alternative way to establish how households respond to changes in the tax environment.

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Figure 1: Spouse and Special Deductions

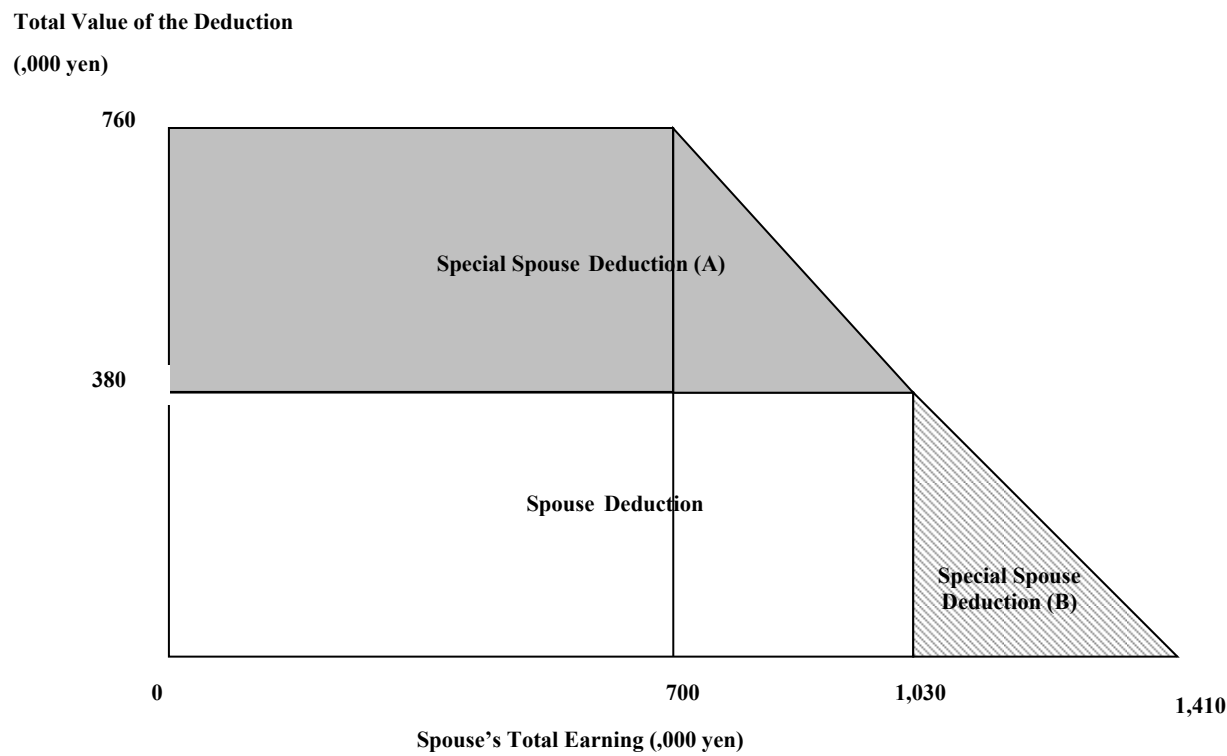


Figure 2: Response of women who do not work prior to the change in the spouse allowance

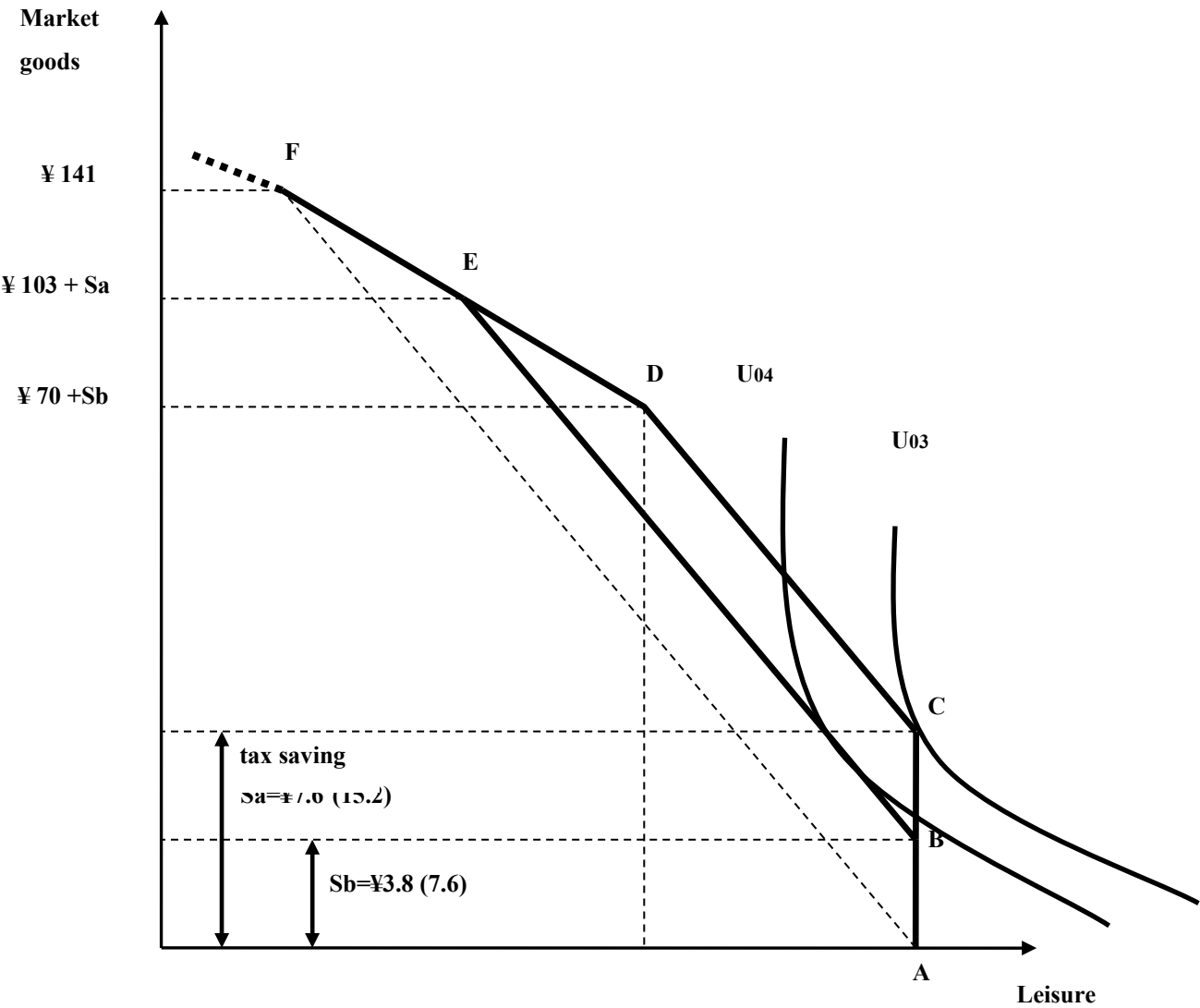
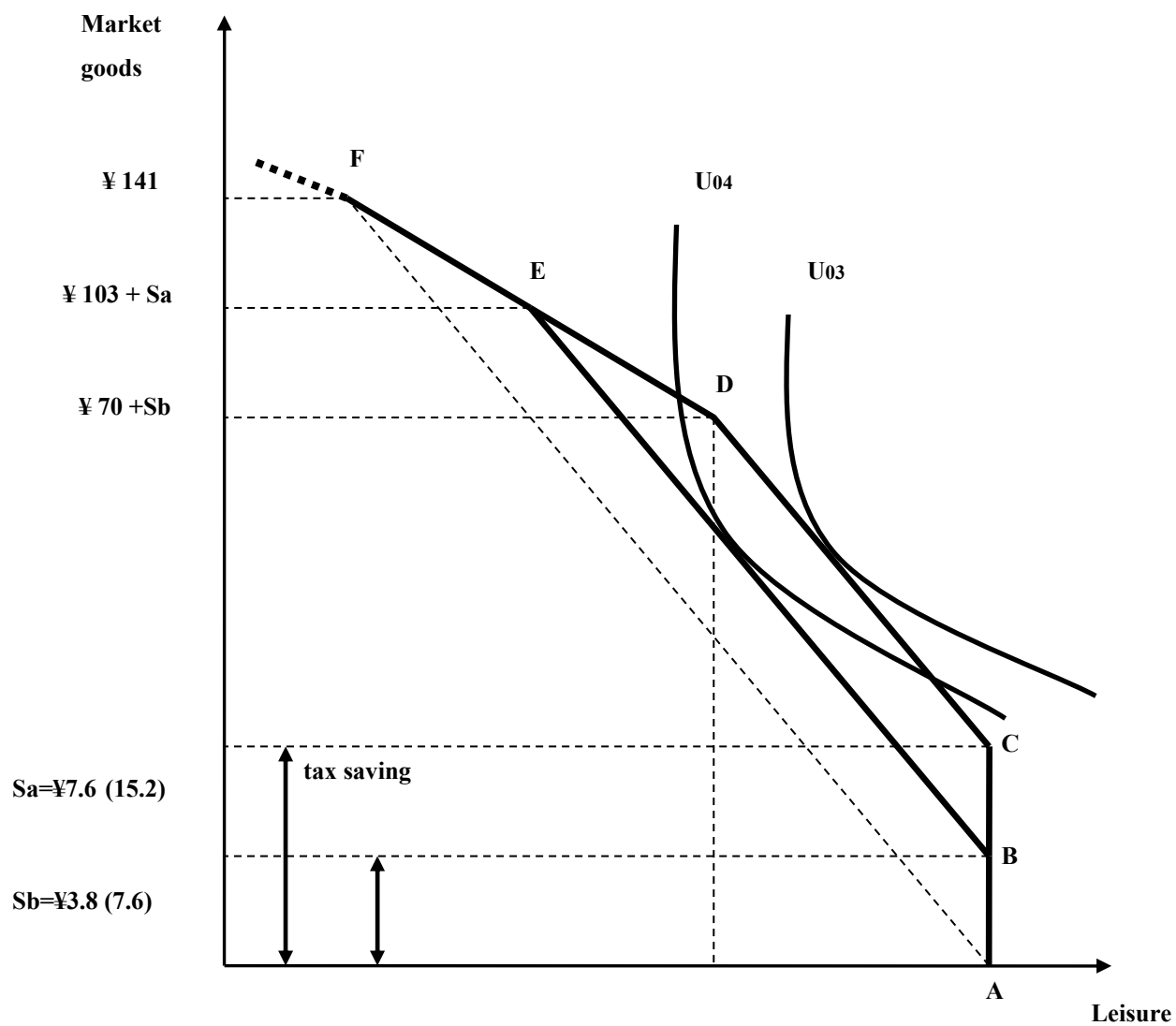
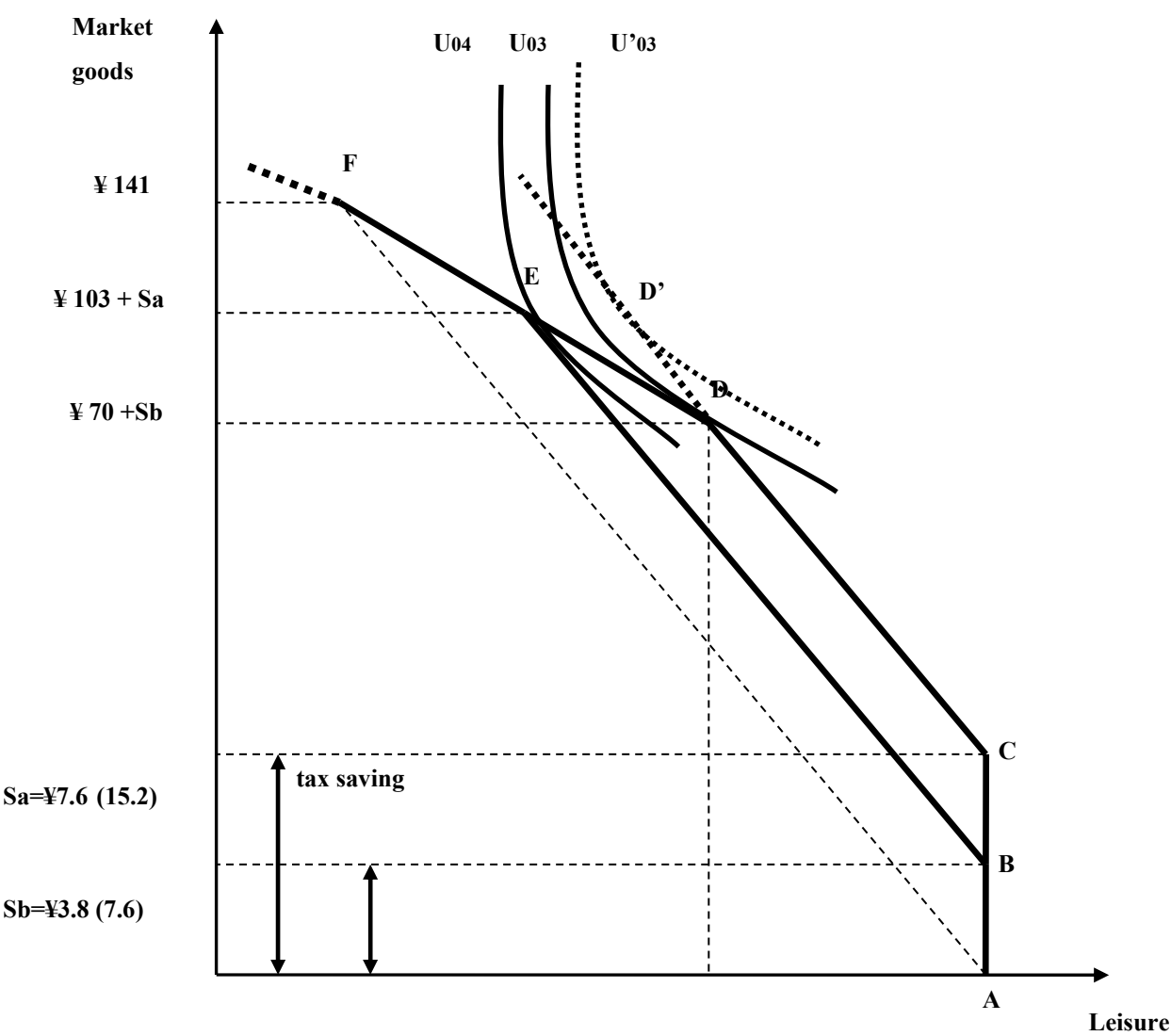


Figure 3: Response of women in households that can claim the full tax deduction for spouses before the change



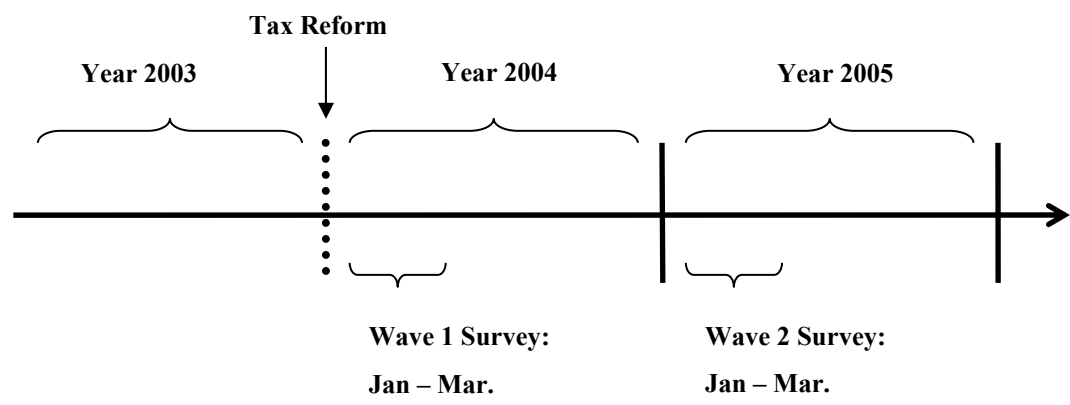
**Figure 4: Response of women in households where the women earns the maximum income permissible and still be eligible for the full spouse allowance prior to the tax change**





**Figure 5: Kernel Estimation**

**Figure 6**



**Table 1: Change in the Value of the Spouse Allowance**

|                                                                           | Pre-reform | Post Reform |
|---------------------------------------------------------------------------|------------|-------------|
| Wife's maximum allowable income for husband to be entitled to full spouse | ¥700,000   | ¥1,030,000  |
| Size of full spouse deduction                                             | ¥760,000   | ¥380,000    |
| Tax saving when the husband's marginal tax rate is 10%                    | ¥76,000    | ¥38,000     |
| Tax saving when the husband's marginal tax rate is 20%                    | ¥152,000   | ¥76,000     |

**Table 2: The Use of Information on Awareness of the Abolition in DID Analysis**

|                                                          | t             | t+1           |
|----------------------------------------------------------|---------------|---------------|
| Case (A) Standard Difference-in-Difference Analysis      |               |               |
| Treatment                                                | No Adjustment | Adjust        |
| Control                                                  | No Adjustment | No Adjustment |
| Use of the Awareness Information in DID Analysis         |               |               |
| Case (B): Control Unaffected by Change                   |               |               |
| Treatment                                                | No Adjustment | Adjust        |
| Control                                                  | NoAdjustment  | No Adjustment |
| Case (C): Control Affected by Change and Knows of Change |               |               |
| Treatment                                                | No Adjustment | Adjust        |
| Control                                                  | Adjust        | Adjust        |

**Table 3: Definitions of Control and Treatment Groups**

| <b>Analysis</b>            | <b>Case</b>                              | <b>Control Group</b> | <b>Treatment Group</b>                                  |
|----------------------------|------------------------------------------|----------------------|---------------------------------------------------------|
| Labour Force Participation | 1 Single Women                           |                      | Married Women                                           |
|                            | 2 Single Women                           |                      | Married Women (Husbands' Tax Rate 0.1/0.2)              |
|                            | 3 Married Women (Husbands' Tax Rate 0.1) |                      | Married Women (Husbands' Tax Rate 0.2)                  |
|                            | 4 Married Women (Husbands' Tax Rate 0)   |                      | Married Women (Husbands' marginal tax rate is positive) |
| Hours Worked               | 1 Single Women                           |                      | Married Women                                           |
|                            | 2 Single Women                           |                      | Married Women (Unaware of the Abolition)                |
|                            | 3 Married Women (Aware of the Abolition) |                      | Married Women (Unaware of the Abolition)                |

**Table 4: Descriptive Statistics**

| <b>Variable</b>               | <b>Mean</b> | <b>Std.Dev.</b> | <b>Minimum</b> | <b>Maximum</b> | <b>Sample Size</b> |
|-------------------------------|-------------|-----------------|----------------|----------------|--------------------|
| Worked last year              | 0.720       | 0.449           | 0              | 1              | 3486               |
| Hours worked                  | 20.261      | 11.720          | 1              | 70             | 733                |
| Married                       | 0.780       | 0.415           | 0              | 1              | 3486               |
| Highschool                    | 0.553       | 0.497           | 0              | 1              | 3486               |
| Junior college                | 0.242       | 0.428           | 0              | 1              | 3486               |
| University                    | 0.147       | 0.354           | 0              | 1              | 3486               |
| Age                           | 42.929      | 11.305          | 20             | 65             | 3486               |
| Age Squared                   | 1970.694    | 974.738         | 400            | 4225           | 3486               |
| (Married)x(Living with female | 0.083       | 0.275           | 0              | 1              | 3486               |
| (Married)x(Living with male p | 0.056       | 0.229           | 0              | 1              | 3486               |
| Husband's income              | 428.308     | 319.446         | 0              | 2107           | 3486               |
| Nonlabour income              | 20.065      | 97.934          | 0              | 2000           | 733                |
| No. of family members         | 2.241       | 1.660           | 0              | 8              | 3486               |
| No. of preschool children     | 0.295       | 0.638           | 0              | 5              | 3486               |
| Area unemployment rate        | 5.042       | 0.854           | 3.531          | 6.5            | 3486               |
| Aware of the abolition        | 0.421       | 0.494           | 0              | 1              | 3486               |
| (Married)x(Aware of the aboli | 0.326       | 0.469           | 0              | 1              | 3486               |
| Large size cities             | 0.234       | 0.423           | 0              | 1              | 3486               |
| Other cities                  | 0.581       | 0.494           | 0              | 1              | 3486               |
| Hokkaido                      | 0.039       | 0.193           | 0              | 1              | 3486               |
| Tohoku                        | 0.061       | 0.238           | 0              | 1              | 3486               |
| Chubu                         | 0.193       | 0.395           | 0              | 1              | 3486               |
| Kinki                         | 0.180       | 0.385           | 0              | 1              | 3486               |
| Chugoku                       | 0.056       | 0.230           | 0              | 1              | 3486               |
| Shikoku                       | 0.031       | 0.174           | 0              | 1              | 3486               |
| Kyushu                        | 0.104       | 0.305           | 0              | 1              | 3486               |

Source: KHPS2004 and KHPS2005

**Table 5: Simple Difference-in-Difference Analysis of Labour Force Participation**

|                                 | <b>2003</b> | <b>2004</b> | <b>Difference</b> | <b>DID</b> |
|---------------------------------|-------------|-------------|-------------------|------------|
| <b>Married Women</b>            |             |             |                   |            |
| Labor Force Participation Ratio | 0.636       | 0.728       | 0.092             | 0.050      |
| Standard Error                  | 0.012       | 0.012       | 0.017             | 0.026      |
| Sample Size                     | 1708        | 1298        |                   |            |
| <b>Single Women</b>             |             |             |                   |            |
| Labor Force Participation Ratio | 0.889       | 0.931       | 0.041             |            |
| Standard Error                  | 0.014       | 0.013       | 0.019             |            |
| Sample Size                     | 479         | 375         |                   |            |

Notes:

(1) The sample is limited to women aged between 20 and 65.

(2): For married women, the sample is limited to married women whose husbands: (a) do not have a second job; and (b) have an annual income that is below 10 million yen.

(3): Labour force participation ratio = (those who were employed for at least one month last year )/((those who were employed for at least one month last year)+(those who were not employed at all during the last year)).

Source: KHPS2004 and KHPS2005

**Table 6: Female Labour Force Participation and Employment Rate**

|                              | <b>Total</b> | <b>Never<br/>Married</b> | <b>Married</b> | <b>Divorced or<br/>Widowed</b> |
|------------------------------|--------------|--------------------------|----------------|--------------------------------|
| 2003                         |              |                          |                |                                |
| Labour Force Participation I | 0.637        | 0.810                    | 0.565          | 0.738                          |
| Employment Ratio             | 0.605        | 0.745                    | 0.546          | 0.686                          |
| 2004                         |              |                          |                |                                |
| Labour Force Participation I | 0.639        | 0.810                    | 0.567          | 0.740                          |
| Employment Ratio             | 0.610        | 0.752                    | 0.550          | 0.691                          |

Notes:

(1) The sample is limited to women in the age group 20 to 64.

(2) The labour force participation ratio is defined as

$(\text{Employed Population} + \text{Unemployed Population}) / (\text{Population aged between 20 and 64 years old})$

(3) The employment ratio is defined as

$(\text{Employed Population}) / (\text{Population aged between 20 and 64 years old})$

Source: Labour Force Survey (2003) and (2004).

**Table 7: DID Analysis of Labour Force Participation : Single versus Married**

| Control<br>Treatment             | Probit (Pooled)   |            | Probit (Random Effects) |            |
|----------------------------------|-------------------|------------|-------------------------|------------|
|                                  | Single<br>Married |            | Single<br>Married       |            |
| Variable                         | Coef.             | Std. Error | Coef.                   | Std. Error |
| Year2004                         | 0.274             | 0.182      | 0.792                   | 0.367 **   |
| Treat                            | -0.449            | 0.123 ***  | -1.571                  | 0.405 ***  |
| (Year2004) × (Treat)             | 0.037             | 0.145      | -0.040                  | 0.296      |
| High School                      | 0.126             | 0.104      | 0.532                   | 0.341      |
| Junior college                   | 0.059             | 0.116      | 0.319                   | 0.386      |
| University                       | 0.012             | 0.123      | 0.145                   | 0.411      |
| Age                              | 0.082             | 0.020 ***  | 0.253                   | 0.072 ***  |
| Age squared                      | -0.0012           | 2E-04 ***  | -0.0034                 | 8E-04 ***  |
| (Married)x(Living with female pa | 0.010             | 0.109      | 0.036                   | 0.327      |
| (Married)x(Living with male pare | -0.165            | 0.130      | -0.479                  | 0.400      |
| Husband's income                 | -0.0007           | 1E-04 ***  | -0.0017                 | 4E-04 ***  |
| (Married)x(No. of family member  | 0.062             | 0.025 **   | 0.154                   | 0.087 *    |
| No. of preschool children        | -0.710            | 0.046 ***  | -1.831                  | 0.157 ***  |
| Regional unemployment rate       | 0.022             | 0.214      | 0.306                   | 0.374      |
| City & Regional dummies          | YES               |            | YES                     |            |
| Test for Random Effects          |                   |            | 0.888                   | 0.015 ***  |
| Sample Size                      | 3486              |            | 3486                    |            |
| Log likelihood function          | -1750.9           |            | -1503.0                 |            |

Notes:

(1) \*\*\*, \*\*, and \* indicate the coefficient is significant at the 1%, 5%, and 10% significance levels, respectively.

(2) The sample is limited to women aged between 20 and 65.

(3) For married women, the sample is limited to married women whose

husbands: (a) do not have a second job; and (b) have an annual income that is

(4) For the education dummies, the base education group is junior high school.

A constant was included, but details are not reported.

Source: KHPS2004 and KHPS2005



**Table 8: DID Analysis of Labour Force Participation : Single versus Married Women  
(Husbands' Tax Rate 0.1/0.2)**

| Variable                         | Probit (Random Effects)                    |            |                                            |            |
|----------------------------------|--------------------------------------------|------------|--------------------------------------------|------------|
|                                  | Single Married<br>(Husbands' Tax Rate 0.1) |            | Single Married<br>(Husbands' Tax Rate 0.2) |            |
|                                  | Coef.                                      | Std. Error | Coef                                       | Std. Error |
| Year2004                         | 0.675                                      | 0.396 *    | 1.192                                      | 0.517 **   |
| Treat                            | -1.677                                     | 0.473 ***  | -2.777                                     | 0.938 ***  |
| (Year2004) × (Treat)             | -0.067                                     | 0.301      | -0.158                                     | 0.356      |
| High School                      | 0.851                                      | 0.351 **   | 1.172                                      | 0.693 *    |
| Junior college                   | 0.829                                      | 0.416 **   | 0.548                                      | 0.744      |
| University                       | 0.539                                      | 0.455      | 1.010                                      | 0.780      |
| Age                              | 0.208                                      | 0.072 ***  | 0.364                                      | 0.128 ***  |
| Age squared                      | -0.0029                                    | 8E-04 ***  | -0.0050                                    | 0.002 ***  |
| (Married)x(Living with female pa | 0.156                                      | 0.389      | 0.112                                      | 0.697      |
| (Married)x(Living with male pare | -0.310                                     | 0.454      | -1.147                                     | 0.933      |
| Husband's income                 | -0.0006                                    | 7E-04      | -0.0021                                    | ##### **   |
| (Married)x(No. of family member  | 0.201                                      | 0.107 *    | 0.064                                      | 0.177      |
| No. of preschool children        | -1.782                                     | 0.218 ***  | -2.408                                     | 0.281 ***  |
| Regional unemployment rate       | 0.173                                      | 0.454      | 0.578                                      | 0.624      |
| City & Regional dummies          | YES                                        |            | YES                                        |            |
| Test for Random Effects          | 0.857                                      | 0.027 ***  | 0.946                                      | 0.011 ***  |
| Sample Size                      | 2279                                       |            | 1934                                       |            |
| Log likelihood function          | -911.3                                     |            | -753.6                                     |            |

Notes:

- (1) \*\*\*, \*\*, and \* indicate the coefficient is significant at the 1%, 5%, and 10% significance levels, respectively
- (2) The sample is limited to women aged between 20 and 65.
- (3) For married women, the sample is limited to married women whose husbands: (a) do not have a second job; and (b) faces a marginal tax rate of 0.1 or 0.2.
- (4) For the education dummies, the base education group is junior high school. A constant was included, but details are not reported.

Source: KHPS2004 and KHPS2005

**Table 9: DID Analysis of Labour Force Participation : Married Women (Differing Tax Rates) and Married Women (Differing Eligibilities)**

| Estimator                        |     | Probit (Random Effects)          |            |                                                          |            |
|----------------------------------|-----|----------------------------------|------------|----------------------------------------------------------|------------|
| Control                          |     | Married (Husbands' Tax Rate 0.1) |            | Married (Husbands' Tax Rate 0)                           |            |
| Treatment                        |     | Married (Husbands' Tax Rate 0.2) |            | Married (Eligible for Deduction & Husbands' Tax Rate >0) |            |
| Variable                         |     | Coef.                            | Std. Error | Coef                                                     | Std. Error |
| Year2004                         |     | 0.761                            | 0.286 ***  | 0.269                                                    | 0.539      |
| Treat                            |     | -0.635                           | 0.304 **   | 0.029                                                    | 0.578      |
| (Year2004) × (Treat)             |     | 0.052                            | 0.213      | 0.473                                                    | 0.497      |
| High School                      |     | 0.300                            | 0.399      | 0.340                                                    | 0.367      |
| Junior college                   |     | 0.044                            | 0.449      | 0.112                                                    | 0.418      |
| University                       |     | -0.157                           | 0.479      | -0.205                                                   | 0.447      |
| Age                              |     | 0.440                            | 0.096 ***  | 0.399                                                    | 0.091 ***  |
| Age squared                      |     | -0.0053                          | 0.001 ***  | -0.0048                                                  | 0.001 ***  |
| (Married)x(Living with female pa |     | 0.023                            | 0.332      | -0.052                                                   | 0.322      |
| (Married)x(Living with male pare |     | -0.389                           | 0.403      | -0.374                                                   | 0.393      |
| Husband's income                 |     | -0.0010                          | 5E-04 *    | -0.0017                                                  | 4E-04 ***  |
| (Married)x(No. of family member  |     | 0.136                            | 0.090      | 0.125                                                    | 0.086      |
| No. of preschool children        |     | -1.572                           | 0.164 ***  | -1.594                                                   | 0.160 ***  |
| Regional unemployment rate       |     | 0.405                            | 0.406      | 0.319                                                    | 0.397      |
| City & Regional dummies          | YES |                                  |            | YES                                                      |            |
| Test for Random Effects          |     | 0.890                            | 0.017 ***  | 0.887                                                    | 0.016 ***  |
| Sample Size                      |     | 2677                             |            | 2814                                                     |            |
| Log likelihood function          |     | -1277.5                          |            | -1353.5                                                  |            |

Notes:

(1) \*\*\*, \*\*, and \* indicate the coefficient is significant at the 1%, 5%, and 10% significance levels,

(2) The sample is limited to women aged between 20 and 65.

(3) For married women, the sample is limited to married women whose husbands: (a) do not have a second job; (b) are eligible for the special spouse allowance; and (c) face a marginal tax rate of 0, 0.1, or 0.2.

(4) For the education dummies, the base education group is junior high school. A constant was included, but details are not reported.

Source: KHPS2004 and KHPS2005

**Table 10: Simple Difference-in-Difference Analysis of Hours Worked**

|                | 2004  | 2005  | Difference | DID   |
|----------------|-------|-------|------------|-------|
| Married Women  |       |       |            |       |
| Average        | 17.72 | 22.35 | 4.63       | -5.31 |
| Standard Error | 9.63  | 12.91 | 16.11      | 24.14 |
| Sample Size    | 579   | 445   |            |       |
| Single Women   |       |       |            |       |
| Average        | 18.48 | 28.42 | 9.94       |       |
| Standard Error | 10.47 | 14.62 | 17.98      |       |
| Sample Size    | 127   | 91    |            |       |

Notes:

(1) The sample is limited to women aged between 20 and 65.

(2) For married women, the sample is limited to women married whose husbands: (a) do not have a second job; and (b) whose annual income is below 10 million yen.

(3) Those women who reported that they worked 70 hours or more in the KHPS2004 survey are excluded from the sample.

Source: KHPS2004 and KHPS2005

**Table 11: DID Analysis of Hours Worked: Single versus Married**

| Control<br>Treatment<br>Estimator<br>Variable | Single<br>Married<br>Pooled |            | Single<br>Married<br>Random Effects |            |
|-----------------------------------------------|-----------------------------|------------|-------------------------------------|------------|
|                                               | Coef.                       | Std. Error | Coef                                | Std. Error |
| Year2004                                      | 9.824                       | 3.195 ***  | 9.569                               | 2.682 ***  |
| Treat                                         | 0.722                       | 1.793      | 0.513                               | 1.912      |
| (Year2004) × (Treat)                          | -3.687                      | 2.441      | -3.548                              | 2.079 *    |
| High School                                   | -5.866                      | 2.522 **   | -5.928                              | 2.081 ***  |
| Junior college                                | -7.478                      | 2.659 ***  | -7.726                              | 2.263 ***  |
| University                                    | -8.053                      | 2.742 ***  | -8.265                              | 2.442 ***  |
| Age                                           | 0.015                       | 0.046      | 0.014                               | 0.05       |
| (Married)x(Living with female pa              | -0.726                      | 1.793      | -0.54                               | 2.119      |
| (Married)x(Living with male pare              | -0.605                      | 2.365      | -0.538                              | 2.672      |
| Husband's income                              | -0.0002                     | 0.002      | 0.0001                              | #####      |
| Non-labour Income                             | -0.0064                     | 0.003      | -0.0056                             | 0.004      |
| (Married)x(No. of family member               | -0.651                      | 0.385 *    | -0.626                              | 0.393      |
| No. of preschool children                     | -1.541                      | 0.861 *    | -1.497                              | 0.957      |
| Regional unemployment rate                    | 3.645                       | 3.834      | 3.594                               | 3.566      |
| City & Regional dummies                       | YES                         |            | YES                                 |            |
| Test for Random Effects                       |                             |            | 15.65                               | ***        |
| Sample Size                                   | 733                         |            | 733                                 |            |
| Log likelihood function                       | -2801.1                     |            |                                     |            |

**Notes:**

(1) \*\*\*, \*\*, and \* indicate the coefficient is significant at the 1%, 5%, and 10% significance levels, respectively.

(2) The sample is limited to women aged between 20 and 65.

(3) For married women, the sample is limited to married women whose husbands: (a) do not have a second job; and (b) have an annual income that is below 10 million yen.

(4) The sample is limited to women who report their weekly hours worked are at least one hour and less than 35 hours in KHPS2004.

(5) The sample is limited to women who report their weekly hours worked are less than 70 hours in KHPS2005.

(6) For the education dummies, the base education group is junior high school. A constant was included, but details are not reported.

(7) For the pooled OLS results, White's heteroscedasticity robust covariance matrix is used to compute the standard errors.

Source: KHPS2004 and KHPS2005

**Table 12: Awareness of the Abolition**

|                        |       |
|------------------------|-------|
| Total                  | 55.2% |
| Marital Status         |       |
| Married                | 60.2% |
| Single                 | 35.5% |
| Age                    |       |
| Below 30 years old     | 39.7% |
| 30 to 39 years old     | 56.5% |
| 40 to 49 years old     | 59.2% |
| 50 to 59 years old     | 59.5% |
| 60 years old and above | 52.5% |
| Education              |       |
| Junior High            | 43.8% |
| High School            | 57.2% |
| College                | 55.4% |
| University             | 57.9% |

Source: KHPS2004

**Table 13: DID Analysis of Hours Worked: Single versus Married (Unaware of the Tax Change)**

| Control<br>Treatment               | Single<br>Married<br>(Unaware of the Tax Change) |            | Single<br>Married<br>(Unaware of the Tax Change) |            |
|------------------------------------|--------------------------------------------------|------------|--------------------------------------------------|------------|
| Estimator                          | Pooled                                           |            | Random Effects                                   |            |
| Variable                           | Coef.                                            | Std. Error | Coef                                             | Std. Error |
| Year2004                           | 8.739                                            | 3.939 **   | 6.562                                            | 1.662 ***  |
| Treat                              | -0.478                                           | 1.903      | -1.337                                           | 1.941      |
| (Year2004) × (Treat)               | -2.319                                           | 2.749      | -1.086                                           | 1.135      |
| High School                        | -4.815                                           | 2.603 *    | -4.630                                           | 2.327 **   |
| Junior college                     | -7.178                                           | 2.734 ***  | -7.332                                           | 2.538 ***  |
| University                         | -6.828                                           | 2.863 **   | -7.471                                           | 2.754 ***  |
| Age                                | 0.039                                            | 0.048      | 0.019                                            | 0.054      |
| (Married) × (Living with female pa | -0.349                                           | 2.218      | 0.617                                            | 2.293      |
| (Married) × (Living with male pare | -0.393                                           | 2.548      | -0.517                                           | 2.840      |
| Husband's income                   | 0.0009                                           | 0.0022     | 0.0033                                           | 0.0015 **  |
| Non-labour Income                  | -0.0075                                          | 0.0028     | -0.0019                                          | 0.0033     |
| (Married) × (No. of family member  | -0.254                                           | 0.441      | -0.189                                           | 0.439      |
| No. of preschool children          | -1.618                                           | 0.903 *    | -1.476                                           | 0.991      |
| Regional unemployment rate         | 1.685                                            | 5.317      | 0.0034                                           | 2.600      |
| City & Regional dummies            | YES                                              |            | YES                                              |            |
| Test for Random Effects            |                                                  |            | 3.64                                             | *          |
| Sample Size                        | 555                                              |            | 555                                              |            |
| Log likelihood function            | -2102.5                                          |            |                                                  |            |

Notes:

(1) \*\*\*, \*\*, and \* indicate the coefficient is significant at the 1%, 5%, and 10% significance levels, respectively.

(2) The sample is limited to women aged between 20 and 65.

(3) For married women, the sample is limited to married women whose husbands: (a) do not have a second job; and (b) have an annual income that is below 10 million yen.

(4) The sample is limited to women who report their weekly hours worked are at least one hour and less than 35 hours in KHPS2004.

(5) The sample is limited to women who report their weekly hours worked are less than 70 hours in KHPS2005.

(6) For the education dummies, the base education group is junior high school. A constant was included, but details are not reported.

(7) For the pooled OLS results, White's heteroscedasticity robust covariance matrix is used to compute the standard errors.

Source: KHPS2004 and KHPS2005

**Table 14: DID Analysis of Hours Worked: Married (Aware of the Tax Change) versus Married (Unaware of the Tax Change)**

| Control                            | Married<br>(Aware of the Tax Change)   |            | Married<br>(Aware of the Tax Change)   |            |
|------------------------------------|----------------------------------------|------------|----------------------------------------|------------|
| Treatment                          | Married<br>(Unaware of the Tax Change) |            | Married<br>(Unaware of the Tax Change) |            |
| Estimator                          | Pooled                                 |            | Random Effects                         |            |
| Variable                           | Coef.                                  | Std. Error | Coef                                   | Std. Error |
| Year2004                           | 5.068                                  | 2.438 **   | 4.916                                  | 2.329 **   |
| Treat                              | -1.267                                 | 1.101      | -1.233                                 | 1.299      |
| (Year2004) × (Treat)               | 3.727                                  | 2.095 *    | 3.678                                  | 1.865 **   |
| High School                        | -5.795                                 | 2.551 **   | -5.815                                 | 2.128 **   |
| Junior college                     | -7.574                                 | 2.697 ***  | -7.846                                 | 2.336 ***  |
| University                         | -9.799                                 | 2.879 ***  | -9.914                                 | 2.637 ***  |
| Age                                | 0.039                                  | 0.061      | 0.038                                  | 0.062      |
| (Married) × (Living with female pa | -0.457                                 | 1.833      | -0.255                                 | 2.097      |
| (Married) × (Living with male pare | -0.819                                 | 2.417      | -0.704                                 | 2.639      |
| Husband's income                   | 0.001                                  | 0.002      | 0.001                                  | 0.002      |
| Non-labour Income                  | -0.006                                 | ##### **   | -0.0054                                | 0.004      |
| (Married) × (No. of family member  | -0.767                                 | 0.385 **   | -0.735                                 | 0.398 *    |
| No. of preschool children          | -1.237                                 | 0.923      | -1.189                                 | 0.997      |
| Regional unemployment rate         | 3.535                                  | 4.095      | 3.365                                  | 3.822      |
| City & Regional dummies            | YES                                    |            | YES                                    |            |
| Test for Random Effects            |                                        |            | 15.9                                   | ***        |
| Sample Size                        | 605                                    |            | 605                                    |            |
| Log likelihood function            | -2299.6                                |            |                                        |            |

Notes:

(1) \*\*\*, \*\*, and \* indicate the coefficient is significant at the 1%, 5%, and 10% significance levels, respectively.

(2) The sample is limited to women aged between 20 and 65.

(3) For married women, the sample is limited to married women whose husbands: (a) do not have a second job; and (b) have an annual income that is below 10 million yen.

(4) The sample is limited to women who report their weekly hours worked are at least one hour and less than 35 hours in KHPS2004.

(5) The sample is limited to women who report their weekly hours worked are less than 70 hours in KHPS2005.

(6) For the education dummies, the base education group is junior high school. A constant was included, but details are not reported.

(7) For the pooled OLS results, White's heteroscedasticity robust covariance matrix is used to compute the standard errors.

Source: KHPS2004 and KHPS2005