Wage premium of fatherhood and labor supply in Japan

Yukawa, Shiho
Osaka University

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Shiho Yukawa†

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Abstract

Using data from the Japanese Panel Survey of Consumers (JPSC)1994-2006, we examine the effect of child birth on fathers' wage rates and labor supply in Japan. We also compare effects of fatherhood among different cohorts by dividing the JPSC sample into two birth year cohorts (born in or before 1960 and born after 1960). We find that birth of child significantly increase hourly wage rates by 2.8 percents and annual work by 65 hours. Comparing with results in the U.S. (Lundberg and Rose 2002), the effect of child birth on labor supply is large but the effect on wage rates are relatively small in Japan. We also find that child birth have different impact on labor market outcome between the early and the later cohorts. In the early cohort, birth of child significantly increases wage rates but has no significant effect on labor supply. On the contrary, birth of child does not increases wage rates but significantly increases labor supply in the later cohort. Finally, we examine how gender difference of children matters. Although the impact of gender difference is not so large, the effect of birth of sons is larger than the effect of birth of dauhters.

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†Osaka School of International Public Policy, Osaka University,1-31, Machikameyama, Toyonaka, Osaka, 560-0043, Japan

1 Introduction

How does the birth of children affect the household labor supply and income? An increase in nursing time and childcare cost due to birth of a child may affect household budget constraints, time constraint, and intra-household specialization. It is well known that many women leave the labor market after they have babies and there are many studies that analyze the relationship between child birth and the female labor supply (i.e. Waldfogel 1995, 1998 and Kawaguchi 2001). These studies find that birth of child significantly decreases the women's labor supply and wage rates. However, these changes in the women's labor supply and wages due to child birth may also affect the labor supply and earnings of their husbands. On the other hand, the labor supply and wages of husbands may also have some influence on the labor market outcomes of their wives. Therefore, we should examine the effects of child birth on the men's labor supply and wages in order to precisely understand the total effect of child birth on the household. The aim of this study is to clarify the labor market effect of fatherhood in Japan. Using the Japanese Panel Survey of Consumers (JPSC), we estimate the effects of child birth on the men's labor supply and hourly wage rates in Japan and compare the results with those in the United States (Lundberg and Rose 2002) and Germany (Choi et al. 2008).

The impact of child birth may depend on the labor market environment that each household is confronted with. For instance, family allowances that firms provide, maternity leave discrimination, type of employment contract, and expected wage growth may have a large effect on the change in labor supply behavior after child birth. Therefore, we should pay attention to large changes in the Japanese labor market during the past three decades. First, a new law that aims to promote women's labor force participation was enforced in this period (Equal Employment Opportunity Law 1986, Childcare Leave Law 1992). After these enforcements, the share of employed women increased from 35.9% in 1985 to 42.3% in 2008. Second, long term stagnation of macro economy, which is often called the "lost decade", altered the characteristics of the Japanese employment system such as lifetime employment, seniority-based wages, and low unemployment rates, to a certain degree. The negative effect of stagnation is especially large in the younger cohort. A rise in unemployment rates of the young cohort is larger than that of older cohorts and many young workers are employed as non-regular workers (fixed-term employees). The number of non-regular workers considerably increased and the share of non-regular workers reached 34% in 2008.

Moreover some studies show that the macro-economic environment has persistent impact on young workers. Kondo (2007) found that for workers who fail to get regular jobs at the time of their graduation, the probability that they get regular jobs afterward is considerably lower. Genda et al. (2010) showed that the wage loss of less educated workers

who graduated during the depression was persistent in Japan, whereas the wage loss of American workers was temporary. These changes in labor market systems and practices could have an effect on the labor market outcome of households. Especially, since different generations are confronted with different labor market conditions, so the effect of fatherhood might be different between older and younger cohorts. Therefore, we divided our sample into those born in 1960 or before (early cohort) and those born after 1960 (later cohort) to examine whether the effect of child birth on men's labor supply and wage are different between cohorts or not.

The main findings of this paper are as follows. We find that birth of child significantly increase hourly wage rates by 2.8% and annual work hours by 65 hours. Comparing with results in the U.S. (Lundberg and Rose 2002), the effect of child birth on labor supply is large but the effects on wage rates are relatively small in Japan. We also find that child birth have different impact on labor market outcome between the early and the later cohorts. In the early cohort, birth of child significantly increases wage rates but has no significant effect on labor supply. On the contrary, birth of child does not increase wage rates but significantly increases labor supply in the later cohort. Following the previous literature, we also examine how gender difference of children matters. Although the impact of gender difference is not so large, the effect of birth of sons is larger than the effect of birth of daughters. The effects of child gender are also different between cohorts.

This paper is organized as follows. Section 2 proposes theoretical hypotheses and gives a survey of related literature on the effect of fatherhood on labor market outcome. Section 3 provides a detailed description of the data and identification strategy that we adopted. Section 4 describes econometric models used in the analysis. Section 5 provides the empirical results. Section 6 presents the conclusion of this study.

2 Theretical Hypotheses and Related Literature

2.1 Theoretical Hypotheses

Theoretically, child birth affects the labor market outcomes of the parents mainly through specialization effects and intensity effects (Lundberg and Rose 2002). Specialization effect means that the child birth promotes sexual division of labor, thus, it urges women to spend more times in house work and men in market work (Becker 1985). Therefore, specialization effect predicts an increase in the labor supply of male workers. Moreover, if division of labor involves productivity gains, specialization effect also predicts an increase in wage rate. On the other hand, child birth reduces available time in households since it necessary increases nursing time, which is called intensity effect, and it has a negative impact on the male labor supply. If the tight time constraints also reduce job training time, the child birth may have negative effect on wage rates. In addition, since an increase in the

pecuniary cost of child care may reduce household consumption , child birth may increase the real value of income and thus have a positive effect on the men's labor supply.

This theoretical mechanism is not the only source of a premium for fatherhood. Since many Japanese firms provide family allowance pay, child birth may automatically increase disposable income. As JPSC has no information about family allowance pay, it is difficult to eliminate an increase of income due to family allowance pay. Therefore, we should take notice that some part of the estimated effect of child birth on wage rates may be caused by family allowance pay. It is well known that the employee benefits of Japanese firms are decreasing in recent years and most non-regular workers receive little employee benefits. Therefore, contraction of employee benefits may be one reason why the effect of child birth is different between generations.[1]

This discussion implies that the total effect of child birth on the men's labor supply and wages depends on the magnitude of each effect and the labor market environment. How changes in productivity caused by the sexual division of labor or job training are related with wage rates depends on the labor market system and practices. In the performance-based wage system, specialization effects forecast a large increase in wages. On the other hand, in the seniority wage system, changes in productivity may have little impact on wages. In addition, how workers can adjust the labor supply also depends on employment status, corporate culture and labor market conditions. Therefore, cross-country differences in the characteristics of labor markets and inter-generational differences in labor market environments that workers face can make a difference in the effects of child birth on the men's labor supply and wages. One of the aims of this study is to reveal these differences.

2.2 Previous Studies

Many studies have analyzed the relationship between marriage and earnings. For example, Korenman and Neumark (1991) and Cornwell and Rupert (1997) showed that marriage has a positive impact on the earnings of male workers. However, there is relatively little attention to the relationship between child birth and labor market outcomes. However, some recent studies estimate the effect of child birth on the male labor supply and wages. Using the data from Panel Study of Income Dynamics (PSID), Lundberg and Rose (2000, 2002) showed that child birth significantly increases both the male labor supply and wages, and that the effect of child birth on is different among cohorts. They also showed that births of sons have a larger impact on wages and the labor supply than births of daughters. Choi et al. (2008) used the data from the German Socio-Economic Panel Study (SOEP) and found that child birth also had a positive impact on wages and the labor supply in Germany. They also showed that the gender of children make different impacts only for

[1]Sasajima(2009) point out that expanding performance-based wage system in 90's goes with reduction of employee.

higher educated workers.

In Japan, Kawaguchi (2005) used the data from JSPS 1993-2000 and examined the effect of child birth on the parent's wage. He found that the birth of children had a positive impact on male wages, but most of the impact disappears when the effect of time invariant individual characteristics is controlled. Kawaguchi (2005) had results the most close to ours, but there are some important differences with this study. First, although we used the same data source as Kawaguchi (2005), we used dates in a longer period of 1994-2006. Second, we considered the impact of child birth not only on wages but also on the labor supply. Third, we examined the difference in the effect of child birth among cohorts. Fourth, we examined how differences in child gender affects the labor supply and wage.

The main contribution of this study to the literature is to provide comparable evidence about the effect of child birth on wages and the labor supply in Japan. Given the theoretical prediction that the effects of child birth depend on labor market environments and institutions, comparing cross-country effects of child birth helped us understand the relationship between child birth and labor market outcomes. Since labor market conditions change drastically during past decades, and economic stagnation have different impacts between old and young cohorts, we believe that it is also meaningful to compare the effects of child birth among different cohorts.

3 Data and Identication Strategy

3.1 Description of Data

We used data of the Japanese Panel Survey of Consumers (JPSC) collected by the Institute for Research on Household Economics. JPSC started in 1993 and repeatedly interviews 1500 women who were aged 24 to 34 from a national representative sample. Since JPSC is a survey of young women, we can only use information about male workers who are married with surveyed women.

Therefore, this study used only a married men sample, and thus our data does not contain the birth of children outside of marriage. As children outside of marriage are very rare in Japan, we think that this is not a significant problem for our study. JPSC contains rich information on labor supply, wage, number of children and child gender. The first year of the survey (1993) does not contain information on the annual days of work and salary, so we used data only from 1994 to 2006. The dependent variables of our estimates are annual work hours and log wage. Annual work hours are calculated as the product of one week day hours of work multiplied by the annual days of work. [2]

[2]JPSC has two types of question about men's hours of work. One is the man's real work hours for both one week day and one holiday. The other is the categorical variable of men's weekly hours of work. The

Annual days of work is a categorical variable: (1) less than 50 days, (2) 50-99 days, (3) 100-149 days, (4) 150-174 days, (5) 175-199 days,(6) 200-224 days, (7) 225-249 days, (8) 250-274 days, (9) 275-299 days, (10) more than 300 days. We replace less than 50 days with 30 days, more than 300 days with 320 days, and other categories with those central values. Real hourly wage is constructed as the hourly wage deflated by the consumer price index. JPSC asks a question about salary type. If the respondent was asked hourly wage, we just apply the value into hourly wage. If the respondent was asked daily wage, we divide daily wage by 8 and put this value into hourly wage. Finally if the respondent was asked monthly wage, we divide monthly wage by weekly working hours multiplied by 4.3 and put this value into hourly wage. We use men's age, education, year dummy, industry, occupation and firm size as control variables. Table 1 presents summary statistics for male workers who were born before 1960 and those who were born after 1960 respectively.

3.2 Endogeneity Problems and Estimation Strategy

If unobservable individual characteristics affect both the labor market outcome and the number of children, standard OLS estimation cannot clarify the causal effect of child birth on labor market performance.

To put it simply, if the number of children is caused by unobservable individual characteristics that also affect income and labor supply, we cannot interpret the correlation between number of children and labor market outcome as a causal effect of child birth on labor market outcomes. The literature has solved this endogeneity problem mainly by the following two methods. The first approach is an instrumental variable method. If we can find the variable that is correlated with the number of children but not correlated with unobservable individual traits, we use that variable as an instrument variable and can deal with the endogeneity problem. Angrist and Evans (1998) used sex composition of the first and second children as an instrument for the number of children and estimate the causal effect of children. The idea is that sex composition is randomly determined but is closely related to the number of children through the decision whether to give birth to the third and following children. However, this instrument variable can only be used to estimate impact of the third and following children, so we do not use this method in this study.

The second approach is the fixed effect method. If unobservable individual traits which are correlated with the number of children are time invariant, by adding a fixed effect term to the right hand side of the estimation model, we can get a consistent estimator. Following Korenman and Neumark (1991, 1992), Waldfogel (1997), Lundberg and Rose (2002),and Choi et al. (2008), we use a fixed effect method to control for unobservable individual effects.

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former question is more detailed than the latter, so we use the former one to calculate annual work hours.

However, note that we cannot solve the endogeneity problem completely even if we can control time invariant traits by using a fixed effect method. For example, if workers have children when they expect future wage growth, causality runs from wage to the number of children. Therefore, when the impact of expected wage growth on fertility decisions is large, our estimator of impact on wages has a positive bias. However, since the hours of work is relatively stable, we think that our estimator of impact on hours of work has little bias.

4 Estimation Model

We use estimation models that allow for the possibility that the effect of children on the men's labor market outcome is nonlinear. Following Lundberg and Rose (2002), we estimate the following models by OLS and fixed effects estimation.

The linear specification is given by

$$Y_{it} = a_i + \beta N_{it} + \beta_4 D4_{it} + \gamma^{'} X_{it} + u_{it} \tag{1}$$

where Y_{it} is a labor market outcome variable that is the log hourly wage or annual hours of work of worker i in year t, N_{it} is the number of children but equals zero if it is above three, a_i is individual fixed effect and X_{it} is the vector of individual observable characteristics that contains age, education, industry, occupation and firm size. The dummy $D4_{it}$ equals one if a man has four or more children and zero otherwise.

The nonlinear specification is given by

$$Y_{it} = a_i + \sum_{j=1}^{4} \beta_j Dj_{it} + \gamma^{'} X_{it} + u_{it} \tag{2}$$

The dummy variable D_j equals one if number of children is $j \leq 3$ and zero otherwise.

We also examine the following four specifications to estimate the effects of child gender on labor market outcomes. The first equation is

$$Y_{it} = a_i + \beta_B NB_{it} + \beta_{NG} NG_{it} + \beta_{GB4} DGB4_{it} + \gamma^{'} X + u_{it} \tag{3}$$

where NB is the number of boys if one has less or equal three sons and zero otherwise, NG is the number of daughters if one has less or equal three daughters and zero otherwise, $DGB4$ is a dummy variable that equals one if a man has four sons or daughters and zero otherwise.

The second equation is

$$Y_{it} = a_i + \beta_{DB} DB_{it} + \beta_{DG} DG_{it} + \gamma^{'} X + u_{it} \tag{4}$$

where DB is dummy variable that equals one if a man has at least one son and zero otherwise, and DG is a dummy variable that equals one if man has at least one daughter and zero otherwise.

The third equation is

$$Y_{it} = a_i + \beta_{FB} FB_{it} + \beta_{FG} FG_{it} + \gamma^{'} X + u_{it} \tag{5}$$

where FB equals one if a man has at least one son and first child is son and zero otherwise, and FG equals one if a man has at least one daughter and the first child is a daughter and zero otherwise.

The fourth equation is

$$Y_{it} = a_i + \sum_{j=1}^{3} \beta_{Bj} DBj_{it} + \sum_{j=1}^{3} \beta_{Gj} DGj_{it} + + \beta_{GB4} DGB4_{it} + \gamma^{'} X + u_{it} \tag{6}$$

DB_{jit} is equal one if $j \leq 3$ and number of sons is j and zero otherwise. $DG_{jit}$is equal one if $j \leq 3$ and number of daughters is j and zero otherwise.

5 Results

5.1 The Effect of Children on Wage

Table 2 presents the estimated effect on wages of child birth in the total sample. Columns (1) to (4) report OLS results and column (5) to (8) report fixed effects results. Columns (3), (4), (7), and (8) control industry, occupation and firm size. Columns (1) and (3) imply that OLS estimates predict no significant effects of child birth on wages without controlling for industry, occupation and firm size, but they do predict a significantly positive effect on wages if these three variables are controlled. The estimated impact of child birth is not large and less than or equal to 1%.On the other hand, the estimated impact of child birth on wages becomes large and significant in all specifications if individual fixed effects are controlled. Column (5) and (7) indicate that the number of children increases wage rates at a significant 1%level and the estimated impact is 2.8%. Since the fixed effects estimator predicts a larger impact than the OLS estimator, one can think that the OLS estimator might have a negative bias. These results suggest that the number of children increases wages. However, the number of children and individual fixed effects that have a positive impact on wages are negatively correlated. One interpretation is that those who gain higher income tend to have fewer children in Japan. [3] Columns (6) and (8) that estimate a non linear model indicate that having two or three children increases wages at a 1% significant level.

[3]Lundberg and Rose (2002) used American data and obtained the similar results, but Choi et al. (2008) used German data and obtained opposite results.

The additional impact of the birth of the second child is 2.7%, and that of the third child is 2.8%. This is close to the impact of the birth of the first child, so we do not observe a non linear impact of the number of children on wages. Figure1 shows the relationship between the number of children and wages. The vertical axis corresponds to the log real hourly wage and the horizontal axis corresponds to the number of children. The dash line indicates the OLS estimator of column (2) and the solid line indicates the fixed effects estimator of column (6). Figure 1 clearly shows that the linear relationship between the number of children and the estimated impact on wages by the fixed effect method.

Next, we divide the total sample into two cohorts, born 1960 or before, and born after 1960 to examine whether the effects of children on wages are different. Table 3 presents the estimated impact among those who were born 1960 or before. Columns (1) to (4) shows that the OLS estimates imply that child birth has significantly negative effects on wages in all specifications. On the other hand, columns (5) to (8) show the fixed effect estimations predict a larger impact of child birth on wages than those in the full sample case. The birth of children increases the wage rate of male workers by about 5.4% to 5.6% on average and is significant at the 1% level. Columns (6) and (8) indicate that having one child has no significant effects but having three children has positive effects on wages and is significant at the 1% level. Having two children also increases wages and is significant at the 10% level. The additional impact of the birth of the third child is 7.5% and is significantly positive at the 1% level. The birth of the second child also additionally increases wages significantly at the 10% level. Figure2 indicates that the relationship between the number of children and the estimated impact on wage in the early cohort. Figure shows that fixed effects predict larger impact than OLS and estimated impact is nearly linear. Since there is a large difference between the fixed effect estimator and OLS, the negative bias of OLS estimators are larger in the early cohort, which indicates that the tendency of poor workers to have many children is clear in the early cohort.

Table 4 presents the estimated impact in the later cohort. Contrary to the results in the early cohort, columns (1) to (4) imply that the OLS estimator predicts the birth of children increases wage by 1.5% on average and has a significantly positive impact on wages. However, column (5) to (8) show that the fixed effect estimators predict child birth has no significant effects on average, although having more than four children has a significantly positive impact. Figure 3 shows the relationship between the number of children and wages in the later cohort. The estimated impact on wages is relatively small and the difference between the OLS estimator and the fixed effect estimator is also small. Therefore, in the later cohort, OLS estimators have little bias, which implies that there is no strong tendency between income levels and the number of children.

From these results, we confirm that the birth of children has significantly positive effects on fathers' wage in Japan. The wage premium of fatherhood is 2.8% on average and nearly

linear for the number of children. However, the estimated impacts are strongly different among cohorts. In the early cohort, the wage premium of fatherhood is substantial, but a positive effect of child birth on wages is not supported in the later cohort. These results indicate that the wage premium of fatherhood is decreasing in recent years.[4] We also find that biases of the OLS estimator due to unobservable characteristics are substantial and different among cohorts. In the early cohort, those who have more children are likely to earn lower wages, but in the later cohort such a strong tendency is not observed.

5.2 The Effects of Children on Labor Supply

We next examine how child birth affects the labor supply of male workers. Table 5 presents the estimated impact on the labor supply in the total sample. It is obvious that both the OLS and fixed effect estimators predict that child birth increases the annual hours of significantly. Columns (1) to (4) that report OLS coefficients show that the number of children increases annual hours of work by 47 hours on average, and the additional impact of the birth of the second child increase the annual hours of work by 36-41 hours. However, the birth of the third child does not affect the hours of work significantly. Therefore, the impact on the hours of work seems to be non-linear. Columns (5) to (8) indicates that the estimated impact of the birth of children on annual working hours is 65 hours on average if we control individual fixed effects, and that the fixed effects coefficient is larger than that of OLS. As in the case of OLS, the birth of the second child has additional impact on annual hours of works but the birth of third child has no significant effect on annual working hours. Figure 4 shows this non linear relationship between number of children and estimated impact on hours of work in full sample.

Table 6 presents the estimated impact of child birth on the labor supply in the early cohort. It is clear that the estimated impacts are very different between the OLS and fixed effect estimators. Columns (1) to (4) show that OLS estimation predicts the birth of children increases annual working hours of fathers by 58-61 hours on average. However, the estimated impact is far from linear and the birth of the second and the following children have no significant impact on working hours. On the other hand, fixed effect estimation that is shown in columns (5) to (8) implies that the birth of children have almost no or negative effects on the annual hours of work. Column (6) indicates the births of third children reduce working hours, but this impact becomes insignificant if industry, occupation and firm size are controlled (column 8).

Figure 5 shows the relationship between the number of children and the estimated impact on the annual hours of work in the early cohort. This indicates that the impact of OLS coefficients is much larger than that of fixed effects and is obviously non linear.

[4]Lundberg and Rose (2002) used American data and couldn't be observed these currents.

By considering together with the result of Table 3, we predict that male workers who earn lower wage and work hard tend to have more children in the early cohort

Table 6 presents the estimated impact of child birth on labor supply in the early cohort. It is clear that the estimated impacts are very different between OLS and fixed effect stimator. Column (1)- (4) shows that OLS estimation predicts that birth of children increases annual working hours of fathers by 58-61 hours on average. However, estimated impact is far from linear and the birth of the second and the following children have no significant impact on working hours. On the other hand, fixed effect estimation which is shown at column (5)- (8) implies that birth of children have almost no or minus effects on annual hours of work. Column (6) indicates the birth of third children reduce working hours but this impact become insinificant if we control industry, occupation and firm size (column 8). Figure 5 shows the relationship between number of children and estimated impact on annual hours of work in the early cohort and indicates that OLS coefficients is much larger than that of fixed effects and is obviously non linear. By considering together with the result of Table 3, we predict that male workers who earn lower wage and work hard tend to have more children in the early cohort.

Table 7 presents the estimated effects on labor supply in the later cohort. Contrary to the results in table 6, the birth of children increases men's annual hours of work both in OLS and fixed effects results. Columns (1) and (3) show that the OLS estimates expect that birth of children increases annual hours of works by 36-48 hours on average. Column s (2) and (4) clarify that the impact of child birth is a non-linear and the impact of the birth of the first child is much larger than the birth of the following children. The additional impact of the second and the following children is not significant. Columns (5) to (8) show that the impact of the child birth becomes larger if fixed effects are controlled. Column (5) and (7) expect that the birth of children increase annual hours work by 85 hours on average. The fixed effect estimators also indicate that the impact of the child birth is almost linear in number of children (columns (6) and (8)). The birth of the second child additionally increases the annual hours of work by 100-110 hours, which is larger than that of the first child, the birth of third child has a positive effect as same as that of the first child. Figure 6 indicates that the relationship between the number of children and the estimated impact on the annual hours of work in the later cohort. Figure 6 shows that the fixed effects coefficient is larger than that of OLS, with the exception of the first child and that fixed effect estimation expects a linear impact for the birth of children.

These results indicates that the birth of children increases male annual hours of work significantly in Japan but the impact of child birth is different among cohorts. When individual fixed effects are controlled, the birth of children has no significant effects on the annual hours of work in the early cohort, but has a significantly positive impact on the later cohort. Therefore, contrary to the impacts on wages, we can think that the effects of

the birth of children on annual hours of work are increasing. The result is that the effect of child birth increasing the labor supply is also observed in the U.S. (Lundberg and Rose 2002). The direction of bias of the OLS estimator is different between the early and later cohorts. In the early cohort, those who work more time are likely to have more children but the opposite is true in the later cohort. We summarize the impact of child birth on labor market outcomes. First, the birth of children significantly increases the wage rates of male workers only in the early cohort, but it significantly increases the annual hours of work in the later cohort. Second, in the early cohort, there is a strong tendency for those who earn lower wages and work longer hours, to have more children. On the other hand, in the later cohort there is only a weak tendency for those who work fewer hours to have more children. These results imply that both the effects of children on wages and labor supply, and the tendencies of child birth behavior are very different among cohorts. One interpretation of these results is that male workers in the later cohort who are faced with tight labor market conditions find that it is difficult to earn higher wages when they have a child, so instead they increase working hours in order to bear the child care cost.

Finally, we compare our results with those of Lundberg and Rose (2002) that estimates the impact of children on wages and annual work hours in Japan with those in the U.S. respectively.[5] Figure 7 shows that the impact of child birth on wages is larger in the U.S. than in Japan. On average, the birth of children increases wage by 4.3% in the U.S., whereas it increases wage by 2.8% in Japan. Figure 8 shows that impact of child birth on wage is larger in Japan than in the U.S. except for the birth of the first child. The birth of children increases annual hours of work by 63-66 hours on average in Japan, while it increases annual hours of work by 38 hours in the U.S. Can we interpret these differences in the impact of child birth between Japan and the U.S. as being caused by difference of labor market institution and customs?

Since the labor market in the U.S. is more flexible than that in Japan, workers in the U.S. may be able to change jobs when they have children. On the other hand, the relationship between wages and performance is relatively weak in Japan, which may be a cause for the difference in the impact of child birth on wage between the U.S. and Japan. However, since the impact of child birth on wage in the early cohort is almost same as that in the U.S., the gap in the wage premium of fatherhood between the U.S. and Japan may be caused by recent stagnation in Japan and can't be explained by institutional factors.

5.3 The Effects of Child Gender on Wage and Labor Supply

Finally, we examine whether the gender of children affects on the impact of child birth on labor market outcomes. Table 8 presents the effects of child gender on wages. It shows

[5]In order to make our results comparable with those in Lundberg and Rose(2002),we use results of column(6) in Table2 and column (6) in table 5.

all results that correspond to models (3) to (6) and the first column are the results in the total sample. The second column is the results in the early cohort sample, and the third column is the results in the later cohort sample.

In the total sample, both having sons and daughters has a positive impact on wages, but it is not a significantly larger impact on wages than having daughters irrespective of model specifications.

In the early cohort, men who have sons increase their wages and is significant at the 5% level on average; yet under some specifications, men who have sons has no significant effects on wages. However, men whose first child is a son significantly increases their wages by 17.1%; that is a large amount. The results of child gender differences are as follows (1) The difference between men whose first child is a son and men whose first child is a daughter are significant at the 5% level. (2) Men whose first child is a son significantly increase their wages more than men whose first child is a daughter. (3) Those who have three sons also increase their wages more than men who have three daughters.

Except for these specifications, there is no significant difference related child gender in the early cohort. In the later cohort, child gender differences have no significant effects on men's wages. Child gender generally has no significantly positive effects on men's wages (Table4). These results indicate while there are no differences in the later cohort, men in the early cohort who have sons are likely to earn higher wages than men who have daughters in some specifications. These trends are also observed in America. Lundberg and Rose (2002) show that in the total and later cohort samples, child gender difference had no significant effects on men's wages. Yet in the early cohort sample, child gender difference had significantly positive effects on men's wages.

Table 9, shows the results that the effects of child gender had on the men' labor supply. In the total sample, except for men who have two daughters, the child's gender significantly affected the increase in the men's annual hours of work. However, men who have two sons work more annual hours than men who have two daughters, which is the only significant difference from child gender. In the early cohort, child gender and child gender difference have no significant effects on men's annual hours of work. Therefore, children are generally no significantly positive effects on men's annual hours of work (Table6) in the early cohort sample regardless of child gender. On the other hand, in the later cohort sample, men who have sons or daughters increase the men's annual hours of work, except for men whose first child was daughter. We also show that the number of sons effect is significantly at the 10% level, with larger effects than that from the number of daughters. Also, men who have two sons have significant larger effects than that of men who have two daughters.

Following these results, child gender and child gender difference are not significant effects on the men's labor market outcomes in the total sample. However, when we divide the total sample into two cohorts, we find that the effects of sons on men's wages is larger

than that of daughters in the early cohort and the effects of sons on men's hours of work is larger than that of daughters in the later cohort. Therefore, the effects of son on men's labor market outcomes are larger than that of daughters and when these effects appear, men's wages or annual hours of work are different between cohorts. The difference in effects between cohorts is not observed for all specifications; this requires close attention to interpret these results.

6 Conclusion

Using data from the Japanese Panel Survey of Consumers (JPSC) 1994-2006, we examine the effect of child birth on father's wage rates and the labor supply in Japan. We also compare the effects of fatherhood among different cohorts by dividing the JPSC sample into two birth year cohorts (born in or before 1960 and born after 1960).

We find that the birth of a child significantly increased hourly wage rates by 2.8 percent and the annual work hours by 65 hours. Compared with results in the U.S. (Lundberg and Rose 2002), the effect of child birth on the labor supply is large, but the effect on wage rates is relatively small in Japan. We also find that child birth has a different impact on labor market outcomes between the early and the later cohorts. In the early cohort, birth of a child significantly increases wage rates but has no significant effect on the labor supply. On the contrary, birth of a child does not increase wage rates but significantly increases the labor supply in the later cohort. Finally, we also examine how gender difference of children matters. Although the impact of gender difference is not so large, the effect of the birth of sons is larger than the effect of the birth of daughters. The effects of child gender are also different between cohorts.

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Table 1: Descriptive Statistics

Variables	Born 1960 or earlier	Born after 1960
Real hourly wage	1790.10	1589.99
	(792.25)	(752.27)
Log (real hourly) wage	7.413	7.294
	(0.396)	(0.376)
Annual hours worked	2608.343	2619.49
	(709.9)	(734.683)
Age	43.087	34.475
	(4.836)	(4.560)
Number of children	2.047	1.613
	(0.889)	(0.985)
Number of sons	1.133	0.877
	(0.831)	(0.823)
Number of daughters	0.932	0.746
	(0.809)	(0.785)
After first child born, son	0.545	0.445
	(0.498)	(0.497)
After first child born, daughter	0.391	0.393
	(0.488)	(0.489)
At least one son	0.762	0.622
	(0.426)	0.485
At least one girl	0.666	0.559
	(0.472)	0.497
Number of observations	4305	7200

Table 2: Effect of children on log wage (all sumple)

	OLS				FE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Number of Children	0.005		0.009**		0.028***		0.028***	
(0 if none or > 4)	(0.004)		(0.004)		(0.006)		(0.006)	
(Exactly) one child		0.014		0.012		0.025*		0.026*
		(0.011)		(0.011)		(0.014)		(0.014)
(Exactly) two children		0.016		0.024**		0.052***		0.053***
		(0.011)		(0.010)		(0.015)		(0.015)
(Exactly) three children		0.018		0.026**		0.086***		0.084***
		(0.012)		(0.12)		(0.020)		(0.020)
More than four children	0.031	0.037	0.025	0.028	0.091**	0.091**	0.081**	0.081**
	(0.023)	(0.024)	(0.022)	(0.023)	(0.041)	(0.041)	(0.041)	(0.041)
Two children - one child		0.0026		0.0116		0.0276***		0.0272***
Three children - two children		0.0013		0.0023		0.032**		0.0306**
Control variables								
Education	yes	yes	yes	yes	no	no	no	no
Age	yes	yes	yes	yes	yes	yes	yes	yes
Industry & Ocuupation	no	no	yes	yes	no	no	yes	yes
Firm Size	no	no	yes	yes	no	no	yes	yes
Year	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.127	0.127	0.211	0.211	0.06	0.06	0.066	0.066
No. of .Obs	11208	11208	11169	11169	11215	11215	11176	11176

Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 3: Effect of children on log wage (born before 1960)

	OLS				FE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Number of Children	-0.029***		-0.021***		0.054***		0.056***	
(0 if none or > 4)	(0.007)		(0.006)		(0.015)		(0.015)	
(Exactly) one child		-0.056**		-0.092***		0.046		0.052
		(0.026)		(0.024)		(0.045)		(0.046)
(Exactly) two children		-0.075***		-0.083***		0.086*		0.094*
		(0.024)		(0.022)		(0.048)		(0.049)
(Exactly) three children		-0.103***		-0.104***		0.161***		0.169***
		(0.025)		(0.23)		(0.054)		(0.054)
More than four children	-0.059*	-0.076**	-0.020	-0.064	0.034	0.030	0.032	0.029
	(0.033)	(0.037)	(0.031)	(0.035)	(0.072)	(0.077)	(0.072)	(0.078)
Two children - one child		-0.0186		0.0084		0.0407*		0.0419*
Three children - two children		-0.0284**		-0.0206		0.0747***		0.0755***
Control variables								
Education	yes	yes	yes	yes	no	no	no	no
Age	yes	yes	yes	yes	yes	yes	yes	yes
Industry & Ocuupation	no	no	yes	yes	no	no	yes	yes
Firm Size	no	no	yes	yes	no	no	yes	yes
Year	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.095	0.095	0.232	0.233	0.038	0.038	0.055	0.055
No. of .Obs	4216	4216	4206	4206	4221	4221	4211	4211

Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 4: Effect of children on log wage (born after 1960)

	OLS				FE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Number of Children	0.015***		0.014***		0.009		0.007	
(0 if none or > 4)	(0.004)		(0.004)		(0.007)		(0.007)	
(Exactly) one child		0.020		0.020		0.010		0.011
		(0.013)		(0.012)		(0.015)		(0.015)
(Exactly) two children		0.024**		0.022*		0.020		0.020
		(0.012)		(0.012)		(0.017)		(0.017)
(Exactly) three children		0.055***		0.049***		0.025		0.017
		(0.015)		(0.14)		(0.024)		(0.024)
More than four children	0.081**	0.080**	0.020	0.020	0.115**	0.115**	0.096*	0.096*
	(0.034)	(0.035)	(0.033)	(0.033)	(0.052)	(0.052)	(0.052)	(0.052)
Two children - one child		0.0041		0.0018		0.0098		0.084
Three children - two children		0.031***		0.0276**		0.0048		-0.022
Control variables								
Education	yes	yes	yes	yes	no	no	no	no
Age	yes	yes	yes	yes	yes	yes	yes	yes
Industry & Ocuupation	no	no	yes	yes	no	no	yes	yes
Firm Size	no	no	yes	yes	no	no	yes	yes
Year	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.138	0.138	0.209	0.209	0.081	0.081	0.089	0.089
No. of .Obs	6992	6992	6963	6963	6994	6994	6965	6965

Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 5: Effect of children on anuual hours worked (all sumple)

	OLS				FE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Number of Children	47.70***		46.74***		65.83***		63.12***	
(0 if none or > 4)	(7.845)		(7.759)		(14.119)		(14.135)	
(Exactly) one child		113.72***		114.43***		65.48**		70.60**
		(24.205)		(23.869)		(30.314)		(30.416)
(Exactly) two children		154.79***		150.43***		155.30***		152.88***
		(22.356)		(22.080)		(34.012)		(34.067)
(Exactly) three children		155.57***		154.95***		169.86***		165.33***
		(25.757)		(25.452)		(45.524)		(45.616)
More than four children	234.89***	279.24***	201.52***	245.87***	321.689***	308.210***	314.83***	304.99***
	(49.339)	(50.910)	(49.063)	(50.621)	(90.554)	(91.324)	(50.910)	(91.969)
Two children - one child		41.1**		36.0**		89.82***		82.3***
Three children - two children		0.8		4.5		14.62		12.4
Control variables								
Education	yes	yes	yes	yes	no	no	no	no
Age	yes	yes	yes	yes	yes	yes	yes	yes
Industry & Ocuupation	no	no	yes	yes	no	no	yes	yes
Firm Size	no	no	yes	yes	no	no	yes	yes
Year	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.013	0.015	0.05	0.052	0.007	0.007	0.014	0.015
No. of .Obs	11498	11498	11449	11449	11505	11505	11456	11456

Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 6: Effect of children on anuual hours worked (born before 1960)

	OLS				FE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Number of Children	65.39***		58.41***		-44.26		-52.99	
(0 if none or > 4)	(13.423)		(13.222)		(34.013)		(34.140)	
(Exactly) one child		259.71***		268.88***		1.03		17.96
		(51.853)		(51.254)		(98.421)		(100.171)
(Exactly) two children		288.09***		288.50***		25.92		21.13
		(46.842)		(46.152)		(105.244)		(106.751)
(Exactly) three children		305.10***		293.188***		-132.53		-138.36
		(49.291)		(48.641)		(117.988)		(119.208)
More than four children	294.0***	434.72***	278.36***	431.59***	-30.28	-10.19	-76.50	-36.84
	(66.084)	(74.095)	(65.898)	(73.755)	(156.288)	(167.501)	(158.461)	(170.205)
Two children - one child		28.4		19.6		24.9		3.2
Three children - two children		17.0		4.7		-158.4***		-159.5
Control variables								
Education	yes	yes	yes	yes	no	no	no	no
Age	yes	yes	yes	yes	yes	yes	yes	yes
Industry & Ocuupation	no	no	yes	yes	no	no	yes	yes
Firm Size	no	no	yes	yes	no	no	yes	yes
Year	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.033	0.037	0.084	0.088	0.01	0.011	0.019	0.02
No. of .Obs	4300	4300	4284	4284	4305	4305	4289	4289

Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 7: Effect of children on anuual hours worked (born after 1960)

	OLS				FE			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Number of Children	36.83***		38.54***		86.63***		83.84***	
(0 if none or > 4)	(9.880)		(9.843)		(16.768)		(16.806)	
(Exactly) one child		80.89***		89.80***		62.47*		67.81**
		(27.778)		(27.423)		(32.992)		(33.070)
(Exactly) two children		115.33***		109.36***		170.70***		169.24***
		(26.365)		(26.156)		(38.566)		(38.641)
(Exactly) three children		105.84***		122.88***		241.89***		234.91***
		(32.376)		(32.254)		(54.150)		(54.306)
More than four children	160.1**	188.98**	133.96***	161.90***	418.80***	406.69***	414.406***	404.64***
	(75.268)	(76.391)	(74.586)	(75.703)	(117.900)	(118.454)	(118.349)	(118.890)
Two children - one child		34.4		19.6		108.2***		101.4***
Three children - two children		-9.5		13.5		71.2*		65.7*
Control variables								
Education	yes	yes	yes	yes	no	no	no	no
Age	yes	yes	yes	yes	yes	yes	yes	yes
Industry & Ocuupation	no	no	yes	yes	no	no	yes	yes
Firm Size	no	no	yes	yes	no	no	yes	yes
Year	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.008	0.009	0.049	0.049	0.009	0.010	0.019	0.019
No. of .Obs	7198	7198	7165	7165	7200	7200	7167	7167

Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 8: Effect of sons or daughters on log wage

Equation Number	Variables	Full sample (1)	Born 1960 or ealier (2)	Born after 1960 (3)
(3)	Number of boys	0.025***	0.052***	0.003
	(0 if none or > 3)	(0.008)	(0.018)	(0.010)
	Number of girls	0.022**	0.010	0.010
	(0 if none or > 3)	(0.009)	(0.021)	(0.010)
	Number of boys - Number of girls	0.003	0.043	-0.006
(4)	At least one boy	0.033**	0.038	0.017
		(0.012)	(0.033)	(0.014)
	At least one girl	0.037***	0.070**	0.015
		(0.012)	(0.029)	(0.013)
	At least one boy - At least one girl	-0.004	-0.032	0.002
(5)	After first child, boy	0.052***	0.171***	0.018
		(0.017)	(0.049)	(0.019)
	After first child, girl	0.026	0.030	0.007
		(0.018)	(0.046)	(0.020)
	After first child, boy - After first child, girl	0.026	0.141**	0.011
(6)	(Exactly) one boy	0.028**	0.031	0.015
		(0.012)	(0.033)	(0.014)
	(Exactly) one girl	0.039***	0.068**	0.016
		(0.012)	(0.029)	(0.013)
	One boy - One girl	-0.011	-0.038	-0.001
	(Exactly) two boys	0.041**	0.064	0.005
		(0.017)	(0.040)	(0.020)
	(Exactly) two girls	0.038**	0.013	0.015
		(0.019)	(0.045)	(0.022)
	Two boys - Two girls	0.003	0.052	-0.010
	(Exactly) three boys	0.086**	0.195***	-0.016
		(0.033)	(0.061)	(0.042)
	(Exactly) three girls	0.037	-0.072	0.010
		(0.038)	(0.092)	(0.043)
	Three boys - Three girls	0.049	0.267**	-0.025

Significance levels : $*$: 10% $**$: 5% $***$: 1%

Table 9: Effect of sons or daughters on annual hours worked

Equation Number	Variables	Full sample (1)	Born 1960 or ealier (2)	Born after 1960 (3)
(3)	Number of boys	77.40***	-54.67	112.45***
	(0 if none or > 3)	(18.208)	(39.193)	(21.603)
	Number of girls	42.90**	-29.55	57.57**
	(0 if none or > 3)	(19.378)	(46.658)	(22.424)
	Number of boys - Number of girls	34.50	-25.12	54.83*
(4)	At least one boy	94.37***	40.75	100.53***
		(27.550)	(73.307)	(30.889)
	At least one girl	50.74*	-22.63	58.97*
		(26.773)	(64.611)	(30.421)
	At least one boy - At least one girl	43.63	63.38	41.53
(5)	After first child, boy	115.90***	111.45	108.84**
		(38.193)	(104.071)	(42.513)
	After first child, girl	74.89*	-23.10	72.64
		(39.909)	(101.959)	(44.612)
	After first child, boy - After first child, girl	41.01	134.55	36.16
(6)	(Exactly) one boy	89.38***	26.12	94.55***
		(27.390)	(72.331)	(30.699)
	(Exactly) one girl	54.82**	16.23	64.87**
		(26.741)	(64.197)	(30.483)
	One boy - One girl	34.55	9.89	29.63
	(Exactly) two boys	173.61***	-95.86	259.98***
		(38.694)	(89.061)	(45.813)
	(Exactly) two girls	60.07	-101.36	105.69**
		(42.469)	(98.435)	(49.250)
	Two boys - Two girls	113.53**	5.54	154.3**
	(Exactly) three boys	146.67*	-89.81	205.66**
		(74.920)	(134.725)	(96.742)
	(Exactly) three girls	173.33**	49.21	201.90**
		(86.469)	(206.091)	(98.779)
	Three boys - Three girls	-26.6	-139.02	3.8

Significance levels : $*$: 10% $**$: 5% $***$: 1%

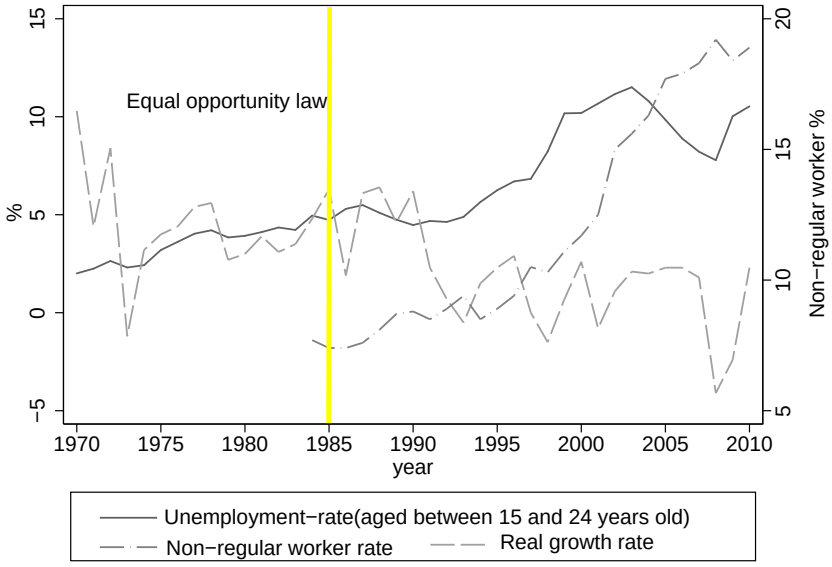

Figure 1: Trends in Japanese labor market

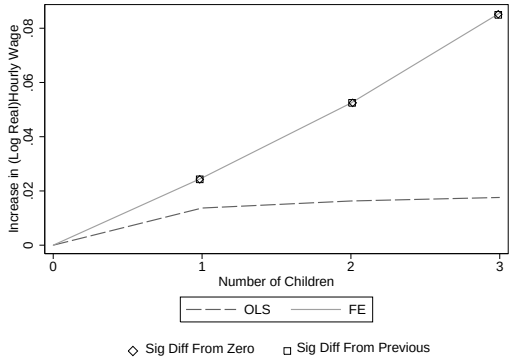

Figure 2: Effect of children on wages, full sample

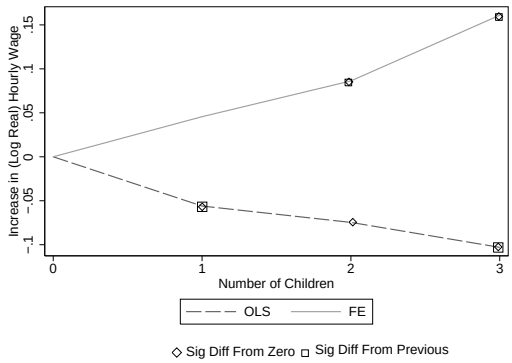

Figure 3: Effect of children on wages, early cohort

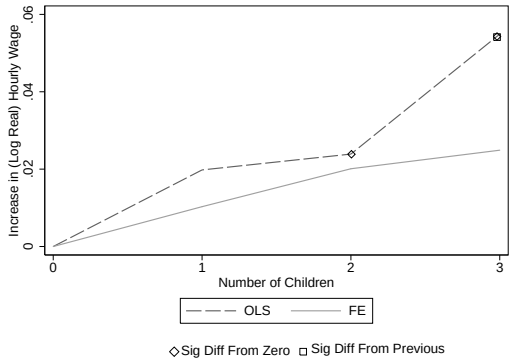

Figure 4: Effect of children on wages, later cohort

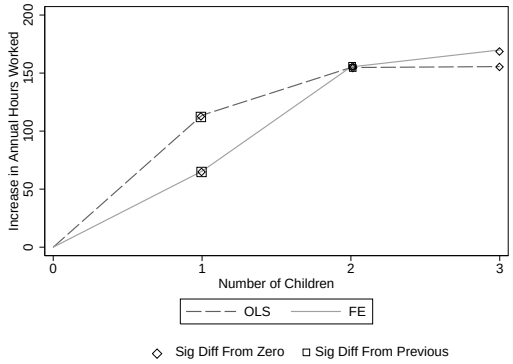

Figure 5: Effect of children on hours worked, full sample

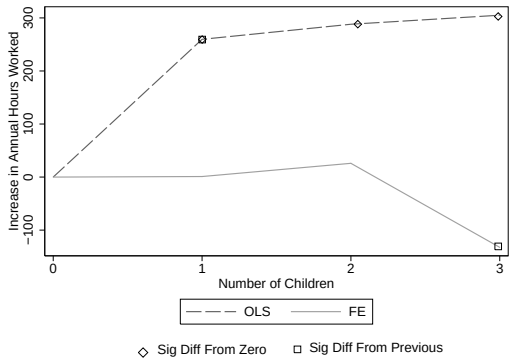

Figure 6: Effect of children on hours worked, early cohort

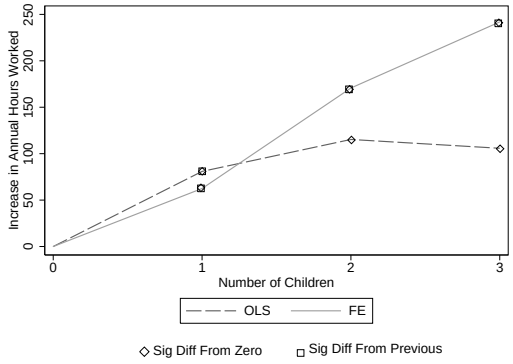

Figure 7: Effect of children on hours worked, later cohort

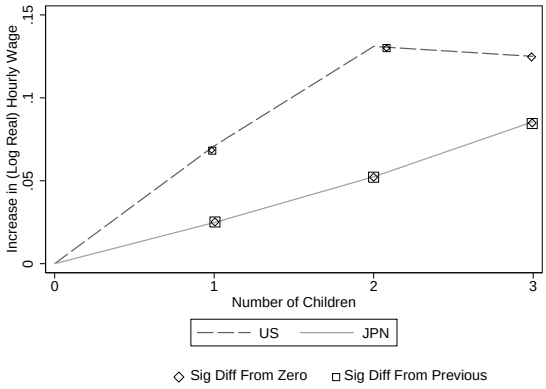

Figure 8: Effect of children on wages: JPN vs. US

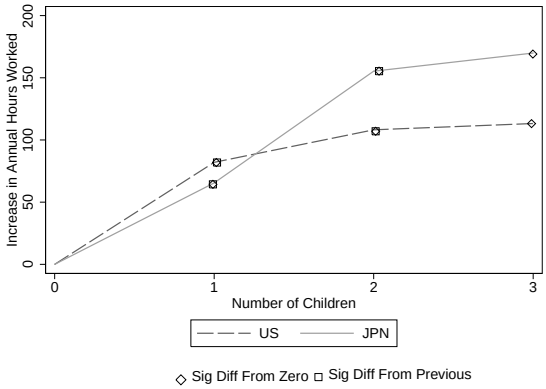

Figure 9: Effect of children on hours: JPN vs. US