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Motherhood wage penalty in Japan: What causes mothers to earn less in regular jobs?

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Abstract: This study presents evidence of motherhood wage penalties in regular jobs in Japan. Limited previous studies examine the existence of motherhood wage penalties working permanently. This paper, therefore, investigates the causes of mothers' lower wages in comparison to nonmothers in regular jobs. Japanese female workers are offered the choice between "general" and "integrated" career paths, and which path they choose is likely to affect the magnitude of the wage gap between mothers and nonmothers. This research estimates wage equations that consider observed and unobserved individual characteristics using unbalanced panel dataset from the Japan Household Panel Survey (the JHPS/KHPS 2004-2015) under a fixed-effect method. The empirical estimates confirm there is indeed a wage penalty for Japanese working mothers who work in full-time employment. The result shows that the presence of children is related to penalties in wages of 5.4% per child. Besides, the penalty associated with the presence of one child is consistently higher than that of two children. This study divides regular working women into two categories, large versus small enterprises and estimates the motherhood wage gap for each separately to find what factors contribute to the existence of this wage gap. Interestingly, the result shows the wage penalty for motherhood is high in large companies and not evident at all in small companies. This finding reinforces the hypothesis that the motherhood wage penalties in regular jobs in Japan may be due to "unobserved individual heterogeneity" that there are different career tracks chosen by mothers and nonmothers. High wage penalties in large companies are generated from a comparison between mothers on "general career paths" and childless women who are in "company-specific skills". Meanwhile, there is no evidence of wage penalties in small companies because female workers tend to have the same "traditional pattern." Overall, the finding of high motherhood penalties in regular employment bears a close relationship to labor market practice in Japan that relies heavily upon on-the-job-training (OJT) in company-specific-skills, couples with wages that rise with tenure of employment. However, it pertains only to employees who have chosen integrated career tracks.

JEL Classifications: J24, J31, J81

Keywords: Motherhood wage penalty, wage differentials, occupational choice, working conditions

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1. Introduction

Motherhood is associated with lower wages, but the cause of this link is not well understood in Japan as there are very few studies discussing motherhood wage penalties. This study investigates how large is the effect of children on the motherhood penalty in Japan, and what factors explain mothers' earning lower wages than nonmothers after controlling for observed and unobserved heterogeneity. Previous studies have shown that one factor behind the lower wages of mothers is their preference for "mother-friendly" jobs, as indicated by the greater tendency of mothers to work part-time. However, a clear explanation of the existence of the motherhood wage penalty in permanent employment

has not been widely discussed. This is an important topic to investigate because of the Japanese labor market practice of offering regular employees alternative career tracks.*

Japan is famous for its lifetime employment system. Companies in Japan annually recruit new graduates to become regular employees, provide new hires with on-the-job-training (OJT) in company-specific skills, employ workers until they reach retirement age, and reward employees according to seniority-based pay scales. In return for these job guarantees, employees are expected to work without leaving the company and with high commitment, including adapting to "flexible" work situations in accordance with the convenience of the company. This employment system is most characteristic of the male regular employees of large enterprises and government (Futagami, 2010; JILPT, 2017).

The Japanese employment system has a different aspect for female workers, who are more likely to interrupt their careers when they have young children. Some large companies offer their regular employees a choice between "general" and "integrated" career tracks, with women typically choosing the general track and men choosing the integrated track more characteristic of the lifetime employment, seniority-based wage system. The general track follows the traditional pattern of women's work in which women have fewer different job assignments and fewer obligations to the company along with limited opportunities for promotion or transfer. The integrated career track, on the other hand, offers opportunities and responsibilities (receiving promotions and transfers as well as overtime work) equivalent to those offered to men (Fox, 2004). These two career choices are believed to have different consequences on women's wages, especially on the magnitude of the wage penalty for motherhood. For women who start work in noncareer positions, or who are placed on general career tracks and remain in this position until they decide to have children, the presence of children will not have a significant impact on their wages. Wage gaps based on family status are hypothesized to be small or nonexistent for these women. Conversely, women who initially choose to be placed on integrated career tracks and later decide to have children may be presumed to experience a larger motherhood penalty because they may have to switch to a general career track simply because of their motherhood status. Meanwhile, small to regular-sized companies typically only offer general career paths to their employees, male or female, so a wage gap between mothers and nonmothers is absent. Motherhood wage penalties in the regular employment system of large companies are in accordance with the work-effort model, in which mothers in jobs requiring more effort will experience larger penalties than mothers in jobs requiring little effort (Anderson, Binder, & Krause, 2003)

This study mainly focuses on two research questions. The first is how great the impact of children on the wages of women who work in full-time employment is. The second is what factors explain the size of the motherhood wage penalty for regular employees. This study explicitly includes a variety of observed characteristics based on economic principles. These are marital status, proxies for human capital, and job characteristics. These variables are included in an equation explaining wages to determine whether penalties in payment related to motherhood can be explained by differences in personal characteristics of Japanese women. In addition, the estimates also control for unobserved

* There are different definitions of "regular employees" and "non-regular employees" from surveys to surveys. In Japan, regular (permanent) employments enjoy the benefits of lifetime employment contracts and seniority-oriented pay systems, whereas non-regular employments are not (JILPT, 2017). Based on JHPS/KHPS survey questionnaire, this paper uses "regular employees" to refer to workers described by their workplace as "full-time" and "non-regular" employees to refer to other employees, i.e., contract employee, part-time worker, subcontracted worker, and specialized contract employee.

individual heterogeneity through the inclusion of time-invariant individual fixed effects. Any motherhood wage penalty that still exists after the fixed effects are taken into account can be interpreted either as the result of discrimination against mothers or can be attributed to some other time-varying unobserved heterogeneity (such as motivation, the wish to be a mother, or the desire to have a professional career without company-specific-skills) (Molina & Montuenga, 2009).

The estimation results show the existence of a motherhood wage penalty in regular jobs in Japan. This study finds the wage gap based on family status is higher in large companies than in small companies. The results of the analysis suggest that much of the wage penalty for motherhood is generated from a comparison between women with children on "general career paths" and childless women trained in "company-specific skills." Overall, this study will explain the literature in section two, the methodology and data in section three, the estimation results in section four and conclusions in section five.

2. The wages of mothers and reasons for the motherhood gap in payment

2.1. The theory behind the motherhood wage gap

Many studies have discussed the motherhood wage penalty and its correlates. These include studies of data for specific countries and for cross-sections of countries. Most of the studies focus on how the total wage gap between mothers and nonmothers is related to variation in individual characteristics such as education, work experience, job tenure, marital status, race, ethnicity, geographical location, and industry (Anderson et al., 2003; Budig & England, 2001; Davies & Pierre, 2005; Harkness & Waldfogel, 2003)

There are many approaches to explaining why mothers earn lower wages than nonmothers. In general, these explanations can be classified into three categories: economic, structural, and sociological (Grimshaw & Rubery, 2015). This study analyzes motherhood wage penalties in Japan using an economic approach. The theoretical basis for this approach can be briefly elaborated. There are two reasons why having children is associated with lower wages. One is a supply-side reason, and the other is a demand-side reason. The supply-side explanation attributes the lower wages received by women with children to their having less human capital, worse job performance, and jobs that are less productive. The demand-side explanation is that women with children are discriminated against by employers (Yu & Xie, 2018).

The first supply-side explanation is based on the human capital theory (Becker, 1964; Mincer, 1974) that work experience increases wages because training in the workplace increases worker productivity. Mothers collect less work experience and less on-the-job-training than childless women and thus have lower wages than women without children. A further supply-side explanation for motherhood wage penalties is based on job performance. Many family responsibilities disrupt women's work efforts and productivity and thus lower their wages (Yu & Xie, 2018). Job characteristics are also related to the motherhood wage penalty. Mothers are more likely to choose part-time rather than full-time work. Several studies have found that motherhood wage penalties are reduced after controlling for part-time work (Waldfogel, 1997).

Demand-side explanations for the motherhood wage penalty focus on discrimination by the employers. There are two main types of discrimination against mothers, namely, statistical discrimination and taste discrimination. Because it is expensive to measure

individual productivity before hiring an employee, companies make predictions about the average productivity of mothers and childless women. This is statistical discrimination. Employers exercise taste discrimination when they prefer not to employ women with children as a matter of simple prejudice. Previous empirical studies often interpret the residual wage gap, namely, the wage gap that cannot be attributed to other factors that are comprehensively relevant, as a form of taste discrimination (England, 2005).

Previous studies most often invoke human capital models or their variants in explaining the wage gaps between mothers and nonmothers (Anderson, Binder, & Krause, 2002; Anderson et al., 2003; Budig & England, 2001; Budig & Hodges, 2010). Previous research has rarely attributed variations in maternal wage penalties to the different working conditions that mothers have sought. This factor should be investigated, considering that jobs with different characteristics can potentially reduce or exacerbate the obstacles mothers face. Ignoring that fact could lead one to overestimate the true motherhood wage penalty (Yu & Kuo, 2017). There are several studies (only) that investigate how different working conditions affect the motherhood wage penalty. One of them is Yu & Kuo (2017) that carry out tests related to whether the wage penalty for motherhood changes with occupational exposure to hazardous conditions, scheduled regularity, training in the required work, competitiveness, level of autonomy, and the emphasis on teamwork based on three important explanations for this wage penalty: the conflict between work-family and job performance, differences in compensation, and employer discrimination. Their results show that there is less reduction in wages for each child in jobs with greater autonomy and fewer teamwork requirements. In addition, mothers face smaller penalties when their work imposes less competitive pressure.

2.2. An initial look at the wage gap in Japan

Table 1 (see the Appendix) shows the monthly wages of women (mothers, nonmothers, and a combination of both) expressed as percentages of men's monthly wages. The data are from the twelfth wave of the JHPS/KHPS (2015). The first noticeable result is that a gender wage gap exists. Women receive 51.2% of men's monthly wages. In particular, the gender pay gap exists not only among workers who are working in regular and irregular jobs but also between single and married workers. The pay gap based on gender is smaller for single workers and those who are working in regular jobs. When women are distinguished by family status, the gender pay gap is greater for women with children than for childless women, except in regular jobs in which mothers earn a greater percentage of men's pay than women without children (71.4% vs. 62.9%). This may be because the women with children in the sample have accumulated more work experience than the childless women in the sample.

The figures in Table 2 (Appendix) indicate that wage gaps based on family status are higher than the gender pay gap shown in Table 1. The median monthly wages of mothers are 80.5% of those of childless women. This is consistent with the results shown in Table 1, showing that the wage gap based on family status is smaller among workers who are single. All figures in Table 2 indicate that, in general, women without children have higher monthly wages than mothers on average. However, in regular jobs, there is evidence of a motherhood wage premium in which mothers earn monthly wages 13.64% higher than nonmothers.

In light of the different findings for women who are regular employees (Column 3 of Tables 1 and 2), it is necessary to look more closely at all the characteristics that might influence wages to investigate the extent to which wage differences between mothers and nonmothers can be explained by economic factors. It is necessary to control for marital status, human capital, and job characteristics to accurately measure the motherhood wage penalty. Regarding the wage premium received by mothers in regular work, it might indicate that mothers tend to self-select for better-paid jobs or, alternatively, that women with better-paid jobs are more likely to be mothers (Molina & Montuenga, 2009). In this case, as long as panel data is available and time-invariant unobserved characteristics can also be controlled for, this study might conclude that the observed motherhood penalty can indicate discrimination against mothers or some other time-varying unobserved characteristics.

3. Empirical strategy

3.1. The model specification

This study estimates the presence of penalties in pay associated with motherhood with a model as follows.

$$\log(Wage)_{it} = \beta_0 + \beta_1(Child)_{it} + \beta_2(Marstat)_{it} + \beta_3(Human\ capital\ control)_{it} + \beta_4(Job\ control)_{it} + \alpha_i + u_{it} \quad (1)$$

Where β_0 is the intercept; β_1 measures the effect of the presence of children on women's wages; β_2 ; β_3 ; and β_4 capture the effects of marital status, human capital and job characteristics on women's wages, respectively; α is a vector of person-fixed component (that represent unobserved time-invariant characteristics); u is the error term (which is assumed to be independent with the explanatory variables and has a null average and a constant variance); i indexes individuals; and t indexes time period. It has known that in estimating the motherhood wage penalty effect, there are unmeasured individual characteristics that may affect both motherhood and wages. This study uses fixed effects estimators to control the potential bias caused by time-invariant unobserved heterogeneity as commonly reported in the literature.

3.2. Data and estimation procedure

The study uses an unbalanced panel dataset from the Japan Household Panel Survey (JHPS/KHPS), spanning from 2004 to 2015. JHPS/KHPS is a longitudinal dataset compiled by the Panel Data Research Center at Keio University, and it is designed as an annual survey (starting in 2004) of each adult member of the household (aged between 18 and 69 years old). The initial survey involved approximately 4,000 respondents, both males and females nationally. From year to year, some respondents were missing from

observations, so that in 2007 and 2012 new cohorts were added, each of which was about 1,400 and 1,000 respondents.

This study refers to previous studies that utilize a sample of young women with a maximum age of approximately 40 years to analyze motherhood wage penalties (Budig & England, 2001; Davies & Pierre, 2005; Harkness & Waldfogel, 2003; Waldfogel, 1997). Specifically, this research uses all women between 18 and 40 years old as the sample in each year of the survey, which consists of single and married women as main respondents. Samples of women over 40 years are not included in the estimation to reduce sample selection issues because some of them are observed to have children over 20 years old. Children in Japan are considered adults once they reach 20 years old. Thus, women are defined as mothers if they are in between 18 and 40 years and have dependent children whose ages are less than or equal to 20 years, while childless women are defined as women in the same age category without children.

This study includes female workers categorized as wage workers. Thus, those who work in self-employment, professional fields, are employed at the family business, work at home without an employment relationship with a company, perform consigned work or work as a subcontractor (without an employee relationship) are excluded. This study focuses on motherhood wage penalties in regular jobs who report their wages for a monthly period. Thus, samples of workers in irregular jobs are excluded.

The dependent variable is the natural log of monthly wages from the respondent's current job as a regular worker. Independent variables consist of the number of children as the principal variable capturing the motherhood wage penalty effect, marital status, proxy variables for human capital and job characteristics. The number of children is the number that the respondent reported at the interview date each year (2004 through 2015). This research uses both continuous and categorical variables to measure the number of children because the effect of each child on women's wages might be nonlinear (Yu & Xie, 2018). Dummy variables consist of the presence one child, two children, and three or more children with no children as the baseline category (Budig & England, 2001).

This study includes marital status, measures of human capital, and job characteristics in the estimate to confirm whether lower wages received by mothers compared to nonmothers can be explained by the personal characteristics of Japanese women. Women who are married, particularly those with children, are more likely to take jobs in which they can maintain flexible or part-time schedules in order to balance work and family responsibilities. As compensation, women may receive lower wages in return for greater flexibility. In other words, the presence of children themselves may not lower women's wages; women might decide to forego higher wages to have more time for child-rearing activities (Chiodo & Owyang, 2003). Conversely, there is no opportunity for married women with children to trade higher wages for flexible work schedules when deciding to work in a regular job. If this argument is true, marriage should not affect the wage gap between mothers and nonmothers in regular jobs. Marital status is a dummy variable that takes a value of one if the respondent is married or divorced and zero if the respondent is single or has never married.

One of the main explanations for the existence of motherhood wage penalties is a reduction in work experience because mothers tend to take time out of work to look after children. Thus, this study includes some variables adopted from previous studies to measure the impact of human capital depreciation on reducing mothers' wages compared to nonmothers. The variables are educational level, actual work experience, and job

tenure. Education expresses the highest educational attainment completed, and it is measured with dummy variables for a university degree and lower education level than this as a reference. Cumulative work experience measures actual work experience accumulated annually from the beginning of one's career until the most recent job. Job tenure measures seniority in one's current job as a full-time worker.

Controls for a number of job characteristics are added to assess how many motherhood penalties are generated from mothers choosing "mother-friendly" jobs (Budig & England, 2001). Job characteristics include working hours, the nature of the occupation, type of industry, and company size. The nature of the occupation and type of industry are qualitative variables, which include eight types of occupation and fifteen types of industries. Dummy variables for industries use a reference category of a worker who works in medicine, whereas dummy variables for jobs use clerical workers as a reference. Company size expresses the size of the established company, which is the number of employees. There are six categories of company size, ranging from small (1 to 4 persons) to large (500 persons or more) as well as government institutions. This study uses employees who work in small enterprises (1 to 4 persons) as a reference category.

4. Results

4.1. Descriptive statistics

Table 3 (Appendix) indicates the personal characteristics of the sample respondents, all of whom are Japanese women who work in regular jobs. The women in the sample are between 20 and 40 years old, with a mean age of approximately 32 years. The ages of mothers in the sample are on average about five years older than those of childless women in the sample. Almost half of the women are married (45.5%), 12% of them have one child, 19.4% have two children, and 4.3% have three children or more. The maximum age of the children is 18 years. Characteristics related to human capital show that 64.1% of Japanese women in the sample have completed university degrees. The women in the sample have accumulated on average 10.41 years of work experience and approximately 7.121 years of job tenure in their current position. Characteristics related to job conditions indicate that women in regular jobs earn on average 222,149 thousand yen per month and work an average of 42 hours per week. Most women work in medicine, manufacturing, other services, wholesale, and finance industries. Only a few women work in small companies. The majority of the women in this group either do clerical work, specialize in technical jobs (such as practitioners, teachers, artists, and programmers), or are service and sales workers.

When comparing characteristics between mothers and nonmothers, mothers earn a higher average wage than nonmothers (231,542 thousand yen vs. 216,914 thousand yen per month). Mothers also have more work experience and longer tenure in their current jobs (almost three more years). If experience and job tenure are positively related to wages, then mothers must receive higher wages than nonmothers, which might explain why mothers in the sample on average earn higher wages than nonmothers. An additional factor that explains higher monthly wages for mothers is the type of work they do. Mothers in the sample are more likely to work in medicine and the manufacturing and financial industries. In addition, many of them work in large companies and government institutions, so some of them may be presumed to receive payments based on company-specific skills. On the other hand, a higher percentage of childless women in the sample

have completed university degrees (68%). On average, childless women in the sample work almost five more hours per week than mothers. Although a majority of childless women in the sample work in the same "medicine" industry as mothers, a higher percentage of the childless mothers work in wholesale and other service industries compared to mothers. Both mothers and nonmothers are more likely to work as clerical and specialized workers. However, more of the childless women in the sample are employed in small and medium enterprises than mothers.

4.2. Estimates of the motherhood penalty in regular jobs

Table 4 (Appendix) presents the estimated results of the wage gap based on family status in regular jobs. Models 1 and 2 represent net motherhood penalties after controlling for marital status, human capital, and job characteristics. In all the regression models, the individual fixed-effects estimates are preferred. Therefore, the tables show the fixed-effect estimates.

The estimates in Table 4 show that there is a motherhood wage penalty in full-time employment. On average, the motherhood wage penalty is approximately 5.4% for each child, while it is about 21.5% for the presence of one child, 10.5% for the presence of two children, and 20.1% for the presence of three or more children. The impact of children on women's wages is larger for the presence of one child than for two and three or more children. The summed coefficients for motherhood penalties due to the presence of one child, two children, and three or more children are significant at the 1% significance level (the jointly F test).

An examination of the complete results of the regression estimates indicates that only a few control variables have a significant effect on women's wages. Experience, which is the proxy for human capital, has a positive and significant impact on wages (2.5%). Likewise, variables related to job characteristics - whether the jobs are in utilities, finance, or educational industries as well as service, management, and manufacturing occupations - have significant impacts on women's wages.

4.3. Motherhood wage penalties in regular jobs: small vs. large enterprises

This study confirms the presence of a motherhood wage penalty in regular jobs. However, it is unclear what factors contribute to the existence of this wage gap. This study argues that the wage penalty for motherhood may be due to the different career tracks chosen by female workers. Childless women may be more likely to choose an "integrated career track" in which their wages gradually increase as their experience and expertise increase. Mothers who work may prefer to occupy positions in the "general career track" that are more compatible with childcare duties. Their wages are relatively stable or do not experience a significant increase with tenure, compared to the wages of women on the "integrated career track." To test these conjectures, this research divides the sample into two categories based on the size of firm in which the women are employed, large enterprise versus small, and estimates the motherhood pay gap for each separately. As explained in the introduction, small companies in Japan generally offer their employees one "general" career path, while large companies offer a choice between two career paths. Women employed in large enterprises can choose either "integrated" or "general" career

tracks. This study hypothesizes that wage penalties will be small or less evident in small companies because mothers and nonmothers employed by small companies are likely to have the same career path (general career track). Meanwhile, many of the motherhood wage penalties are generated from a comparison between women with children on a "general career path" and women without children who are trained in "company-specific skills." This is evidenced by the existence of high wage penalties in large companies.

The JHPS/KHPS dataset provides information about company size. There is a question that asks, "how many total employees does the company where the respondent works usually have?" There are six options provided which are: 1-4 persons, 5-29 persons, 30-99 persons, 100-499 persons, 500 persons or more, and government institution. This study utilizes this information to categorize women based on their employment at small and large enterprises. However, to categorize the sample of women who work in regular employment into small and large enterprises based on the number of employees hired is troublesome considering the varied definitions of small and large enterprises shown in the literature.

It is generally agreed that in the Japanese labor market system, permanent employment applies to regular employees in large-scale enterprises, some medium-scale firms in the private sector, and regular employees in the public bureaucracy. The practice of permanent employment is least applicable in the small-scale private sector (Cole, 2018; Futagami, 2010). Enterprises can be classified into different categories according to their size; different criteria may be used for this purpose, but the most common criterion is the number of employees. According to the Small and Medium-sized Enterprise Basic Act (METI, 2016), the definition of SMEs depends on the type of industry, with the maximum number of employees for "small and medium firms" ranging between 50 and 300 employees. Meanwhile, the OECD reports in more detail the number of employees a business in the manufacturing sector must have to be categorized as small and medium enterprises (SMEs); they must fewer than 250 people. The OECD further subdivides SMEs into microbusinesses (fewer than 10 employees), small businesses (10 to 49 employees), medium-sized enterprises (50 to 249 employees). In this case, the definition of a large company is any business with more than 250 employees (OECD, 2018). Based on this definition, this research classifies female workers as employed by small companies if the number of employees at their place of work is between 1-99 (category of 1-4 persons, 5-29 persons, and 30-99 persons), while they are categorized into large companies if they work in companies with 500 or more employees or in government institutions. In this case, those women who work in companies with 100-499 employees are excluded from the estimation to avoid ambiguity because they can be classified either a medium-sized enterprise (SME) or as a large company. Overall, of 1,453 respondents, as many as 486 people reportedly worked in large companies, and 650 people worked in small companies. The rest of the respondents (317 people) were excluded from the estimated data because they could not be classified, namely, workers included in the company size category with 100-499 people.

Table 5 (Appendix) reports the estimation results to prove the hypothesis that the motherhood wage penalty will be high in large companies as the results of differences in career paths between mothers in general career paths and non-mothers in integrated career paths. Table 5 shows the existence of a motherhood wage penalty in large companies. In this case, the wage gap based on family status is approximately 8.3% per child, while it is approximately 30.1% for the presence of one child, 17.5% for the presence of two children, and 40.5% for the presence of three or more children.

Consistent with the estimation results shown in Table 4, the wage penalty due to the presence of one child is greater than that for two children, and the motherhood penalty due to the presence of three or more children is larger than that for one and two children. The different coefficient estimates for motherhood penalties due to the presence of one child, two children, and three or more children are significant at the 1% significance level (the joint F-test). Variables related to human capital and job characteristics explain some of the wage gaps between mothers and nonmothers. Tenure in a woman's current job explains approximately 5.8% to 7.8% of the gap in payment, and almost all dummies of industries clarify the lower wages received by mothers compared to childless women.

Table 6 (Appendix) reports the estimated results to attest the hypothesis that the motherhood wage penalty will be small in small companies because mothers and nonmothers are more likely to have the same career paths (general career tracks). Unlike the results shown in Table 5, motherhood wage penalties are not evident in small firms (Table 6). None of the variables indicating the presence of children are statistically significant in explaining women's wages in small firms. Work experience is the only statistically significant variable in the equation. It has a positive impact on wages of approximately 4%. Overall, the estimates show that motherhood wage penalties are more negative and more statistically significant in large enterprises. This finding reinforces the hypothesis (initial conjecture) that the factor that causes the motherhood wage penalty in Japan is that mothers who are employed by large enterprises or the government are more likely to have chosen general career tracks, while childless women employed by large enterprises or the government are more likely to have chosen integrated career tracks.

5. Conclusions

This study examines the motherhood wage penalty in Japan. The empirical analysis of the wages of women in regular employment provides a comprehensive explanation of what factors might contribute to the lower wages earned by mothers in comparison to nonmothers. In particular, this study emphasizes the effect on wages of an unobserved individual factor, the different career tracks chosen by mothers and nonmothers.

The estimates afford strong evidence of a motherhood wage gap in regular jobs. Fixed-effect estimates indicate the net motherhood wage penalty is approximately 5.4% per child and approximately 21.5%, 10.5%, and 20.1%, for the presence of one, two, and three children or more at home, respectively, after controlling for marital status, human capital, and job characteristics. The finding of high wage penalties for motherhood in regular employment bears a close relationship to labor market practices in Japan. The Japanese employment system relies heavily upon on-the-job-training (OJT) in company-specific skills, coupled with wages that rise with the tenure of employment. However, this is a feature of large enterprises and government in Japan, not small enterprises, and it pertains only to employees who have chosen integrated career tracks. Interestingly, the overall estimated results show that the motherhood wage penalty due to the presence of one child is consistently higher than that for two children. It seems that the timing of first birth is important in Japan and may have great consequences on women's wages.

This study confirms that an unobserved individual factor, the different career tracks chosen by mothers and by nonmothers are related to the motherhood wage penalty in Japan. This research found no evidence of a motherhood wage penalty in small companies. Female workers in small companies tend to have the same "traditional pattern

of general career tracks" whether or not they have children. Women on this career track do not accumulate company-specific skills. They are not burdened with extraordinary obligations to their employers, but they have few opportunities for promotion or transfer. For these reasons, the presence of dependent children at home does not significantly decrease the productivity of working mothers employed by small enterprises, nor does it decrease their wages in comparison to those of childless women.

This study has found that the motherhood wage penalty is more evident in large companies. The presence of children causes mothers to suffer a decrease in wages by 8.3% on average per child and approximately 30.1% for one child, 17.5% for two children, and 40.5% for three children or more. Based on the empirical results, this research suggests several possible explanations for the existence of high wage penalties in these large companies. First, women who start their careers on "integrated" career paths may switch to the "mommy track" or "general" career path when deciding to have children, which are suitable for parenting. Their wages are predicted to decline significantly due to the presence of dependent children, causing them to no longer be able to work optimally and fulfill job demands and responsibilities (such as receiving promotions and transfers and working overtime). Furthermore, the wages they receive are much lower when compared to women who do not have children and might prefer to remain on an "integrated" career path. However, this study cannot determine whether the existence of motherhood wage penalties in large companies is because women move from "integrated" to "general" or "mommy track" career paths only after they have children because information about the initial career path chosen by each woman is not available. Perhaps a more plausible and acceptable explanation in many cases is that women who already have children when joining a large company get on the general career path. In this case, there is a pattern of female Japanese workers who wish to have children in the future. They may initially work in a regular company but leave the company if they have children. They later look for work at different companies after their children grow up a little, and then they continue on a "general" career path that is in accordance with the responsibility of parenting. In other words, many of the motherhood wage penalties found in large companies are generated from a comparison between women with children on "general career paths" and childless women who are trained in "company-specific skills." Overall, the study concludes that the proportion of women with children on the "general" career track receive lower wages than women without children who are more likely to have chosen the "integrated career path" in large companies. However, women with children get the same wages as women without children who work on the same career path or women in small companies who are all on "general career tracks."

The results represented in Tables 1 and 2 (Appendix) indicate that mothers earn more than nonmothers in regular jobs. The estimation results show the existence of a motherhood wage penalty in large companies after controlling for observed personal characteristics and for individual unobserved heterogeneities through a fixed-effect estimator.

The various results prompt the following interpretations. (1) Some characteristics of Japanese mothers (i.e., the level of accumulation of human capital and the quality of work) allow them to receive higher wages, thereby reducing the wage penalty for motherhood. (2) The higher wages received by mothers who are employed by large companies could be because some of them have accumulated company-specific-skills, while all mothers employed by small enterprises have only general skills. (3) Motherhood wage penalties in large enterprises represent individual unobserved characteristics, the choice of career track

- women with children are more likely to choose the "mommy track" which is a "general career track," and their wages are lower than childless women employed by large enterprises who are more likely to be on "integrated" career paths. An alternative explanation for the higher wages of mothers employed by large enterprises than for childless women employed by small enterprises is inverse causality. Perhaps women who earn more in large or regular companies decide to have children precisely because of their high incomes. In this case, there will be a causal relationship between wages and having children. Some of the observed results support this view. When individual fixed effects are included, the wage penalties are clearer, particularly in large companies. Additionally, compared to nonmothers, mothers accumulate more human capital and tend to choose better jobs (by working in large companies which entail training in company-specific-skills) that allow them to receive higher wages. In this case, an estimate with instrumental variables is needed for those associated with having children. However, this study has limitations that make it difficult to find valid instruments for the presence of children. By ignoring this possibility, the estimates may have an endogeneity bias.

In conclusion, although this study has limitations because it only considers women who are working and there is the possibility of an endogenous issue as having children is usually planned, the fixed-effects estimator confirms the existence of a wage penalty based on family status for Japanese women who work in regular jobs. This study affirms that a large motherhood wage gap is due to "individual unobserved heterogeneity," which is different career tracks chosen by mother and nonmothers; this is evidenced by the coefficient of motherhood wage penalties, which are more significant and evident in large companies than in small companies. Overall, the estimation results consistently show that the wage penalty in Japan is high after controlling for the observed and unobserved characteristics of Japanese women. This study casts doubt on whether the remaining explanation for an unrevealed motherhood wage penalty may reflect wage discrimination against mothers or the fact that mothers exert less effort at work than nonmothers. The impossibility of obtaining information about these two conditions is a limitation of this study.

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Appendix

TABLE 1. MEDIAN MONTHLY WAGES OF WOMEN EXPRESSED AS A PERCENTAGE OF MEDIAN MONTHLY WAGES OF MEN FOR DIFFERENT CATEGORIES (JHPS/KHPS-2015) IN THE 18-64 YEARS AGE RANGE*

WAGES	TOTAL	REGULAR AND IRREGULAR	REGULAR	IRREGULAR	MARRIED	SINGLE
	(1)	(2)	(3)	(4)	(5)	(6)
All Women	51.2	53.7	68.6	40.0	47.2	78.0
Women without children	58.8	57.1	62.9	48.0	55.6	80.0
Women with children	47.4	51.4	71.4	40.0	44.4	69.0

Notes: Median monthly wages are used because the average value is affected by data outlier. Meanwhile, OECD defines the gender wage gap as the difference between the median earnings of men and women relative to median earnings of men (OECD, 2019). JHPS/KHPS is the data set utilized in the estimation. It is explained in detail in section 3.2 Data and estimation procedure.

TABLE 2. MEDIAN MONTHLY WAGES OF MOTHERS EXPRESSED AS A PERCENTAGE OF MEDIAN MONTHLY WAGES OF CHILDLESS WOMEN FOR DIFFERENT CATEGORIES (JHPS/KHPS-2015) IN THE 18-64 YEARS AGE RANGE

WAGES	TOTAL	REGULAR AND IRREGULAR	REGULAR	IRREGULAR	MARRIED	SINGLE
	(1)	(2)	(3)	(4)	(5)	(6)
Women with children / without children	80.50	90.00	113.64	83.33	80.00	86.25

Notes: Median monthly wages are used because the average value is affected by data outlier. Meanwhile, OECD defines the gender wage gap as the difference between the median earnings of men and women relative to median earnings of men (OECD, 2019). JHPS/KHPS is the data set utilized in the estimation. It is explained in detail in section 3.2 Data and estimation procedure.

TABLE 3. SUMMARY STATISTICS OF VARIABLES USED IN THE ANALYSIS BASED ON MOTHERHOOD STATUS

VARIABLES	ALL WOMEN		CHILDLESS WOMEN		MOTHERS	
	mean	s.d	mean	s.d	mean	s.d
Wage (thousand yen / month)	222.149	89.456	216.914	63.641	231.542	122.382
<i>FAMILY CHARACTERISTICS:</i>						
Number of children	0.643	0.955	0.000	0.000	1.798	0.688
Child 1	0.120	0.325	0.000	0.000	0.335	0.472
Child 2	0.194	0.396	0.000	0.000	0.542	0.499
Child 3 or more	0.043	0.204	0.000	0.000	0.121	0.327
Married	0.455	0.498	0.199	0.400	0.913	0.281
Age	32.337	4.814	30.611	4.510	35.433	3.655
<i>HUMAN CAPITAL VARIABLES:</i>						
Experience	10.413	5.122	9.117	4.756	12.738	4.934
Job tenure	7.121	4.900	6.069	4.190	9.010	5.483
Education	0.641	0.480	0.680	0.467	0.571	0.495
<i>JOB CHARACTERISTICS VARIABLES:</i>						
Worked hours	42.438	14.55	44.069	15.06	39.512	13.10
<i>TYPES OF INDUSTRIES:</i>						
Fishery	0.001	0.026	0.001	0.033	0.000	0.000
Construction	0.041	0.199	0.055	0.227	0.017	0.131
Manufacturing	0.151	0.358	0.144	0.351	0.163	0.370
Wholesale	0.121	0.326	0.156	0.364	0.058	0.233
Restaurant	0.008	0.087	0.010	0.098	0.004	0.062
Finance	0.095	0.293	0.070	0.255	0.140	0.348
Real Estate	0.011	0.104	0.013	0.113	0.008	0.087
Transport	0.011	0.104	0.013	0.113	0.008	0.087
Information and telecommunication	0.028	0.166	0.034	0.182	0.017	0.131
Utilities	0.001	0.026	0.001	0.033	0.000	0.000
Medicine	0.268	0.443	0.228	0.420	0.338	0.474
Education	0.075	0.264	0.068	0.251	0.088	0.284
Other service	0.123	0.329	0.151	0.358	0.073	0.261
Public safety	0.053	0.224	0.044	0.205	0.069	0.254
Other	0.014	0.117	0.013	0.113	0.015	0.123
<i>COMPANY SIZE:</i>						
1-4 persons	0.049	0.216	0.049	0.217	0.048	0.214
5-29 persons	0.218	0.413	0.257	0.437	0.148	0.356
30-99 persons	0.180	0.385	0.198	0.399	0.148	0.356
100-499 persons	0.218	0.413	0.209	0.407	0.235	0.424
500 or more	0.233	0.423	0.197	0.398	0.298	0.458
Government	0.101	0.302	0.089	0.285	0.123	0.329
<i>NATURE OF OCCUPATION:</i>						
Sales	0.089	0.285	0.079	0.270	0.106	0.308
Service	0.090	0.287	0.104	0.305	0.065	0.247
Manager	0.003	0.059	0.000	0.000	0.010	0.098
Clerical	0.427	0.495	0.443	0.497	0.398	0.490
Transportation or telecommunication	0.004	0.064	0.002	0.046	0.008	0.087
Manufacturing	0.047	0.211	0.046	0.210	0.048	0.214
IT and technical (specialized)	0.330	0.470	0.315	0.465	0.356	0.479
Other	0.010	0.101	0.011	0.103	0.010	0.098
<i>n (person)</i>	1,453		933		520	
<i>Number of ID</i>	464		464		464	

Notes: This table classifies women into three subsamples: (1) all women, (2) mothers, and (3) childless women. Mothers refer to all women with dependent children (with ages less or equal to 20 years), whereas all childless women refer to those without children.

TABLE 4. FIXED EFFECT ESTIMATES OF THE MOTHERHOOD PAY GAP IN REGULAR JOBS

VARIABLES	MODEL 1 FE	MODEL 2 FE	VARIABLES	MODEL 1 FE	MODEL 2 FE
Number of children	-0.054** [0.023]		Information and telecommunication	-0.075 [0.104]	-0.084 [0.105]
Child 1		-0.215*** [0.048]	Education	0.092 [0.059]	0.127*** [0.044]
Child 2		-0.105** [0.042]	Other services	-0.048 [0.070]	-0.065 [0.073]
Child 3 or more		-0.201* [0.106]	Public safety	0.013 [0.070]	-0.015 [0.069]
Married	-0.018 [0.030]	-0.000 [0.032]	Other	-0.107* [0.064]	-0.094 [0.066]
<i>HUMAN CAPITAL</i>			<i>COMPANY SIZE (REFERENCE IS 1-4 PERSONS)</i>		
Experience	0.023 [0.015]	0.025* [0.015]	5-29 persons	-0.021 [0.065]	-0.001 [0.066]
Experience squared	0.000 [0.001]	0.000 [0.001]	30-99 persons	-0.039 [0.061]	-0.016 [0.062]
Job tenure	0.001 [0.015]	0.001 [0.015]	100-499 persons	-0.013 [0.064]	0.006 [0.065]
Job tenure squared	-0.000 [0.001]	-0.001 [0.001]	500 more	0.057 [0.066]	0.075 [0.067]
Education ^a			Government institution	-0.036 [0.069]	-0.029 [0.070]
<i>JOB CHARACTERISTICS</i>			<i>NATURE OF OCCUPATION (REFERENCE IS CLERICAL)</i>		
Worked hours	0.002 [0.001]	0.002 [0.001]	Sales	0.006 [0.049]	-0.003 [0.050]
Worked hours squared	-0.000 [0.000]	-0.000 [0.000]	Service	-0.118 [0.072]	-0.121* [0.073]
<i>TYPE OF INDUSTRY (REFERENCE IS MEDICINE)</i>			Manager	-0.071* [0.040]	-0.084** [0.041]
Fishery ^a			Transportation or telecommunication	0.005 [0.094]	0.089 [0.104]
Construction	-0.145 [0.137]	-0.169 [0.136]	Manufacturing	-0.102*** [0.031]	-0.105*** [0.031]
Manufacturing	0.039 [0.073]	0.026 [0.078]	IT and technical (specialized)	0.004 [0.028]	0.007 [0.027]
Wholesale	0.050 [0.079]	0.031 [0.081]	Other occupation	-0.017 [0.042]	0.001 [0.036]
Restaurant ^a					
Utilities	0.187*** [0.069]	0.169** [0.072]	Constant	5.078*** [0.091]	5.078*** [0.089]
Finance	-0.130 [0.086]	-0.142* [0.080]			
Real Estate	-0.057 [0.108]	-0.072 [0.106]	Observations	1,453	1,453
Transportation	-0.120 [0.119]	-0.189 [0.126]	R-squared	0.114	0.139
			Number of id	464	464

Notes: Cluster-robust standard errors are in brackets. * - Refers to 90% confidence level, ** - Refers to 95% confidence level, and *** - Refers to 99% confidence level. ^a - Dummies for educational attainment, fishery and restaurant industries are omitted because of collinearity.

TABLE 5. FIXED EFFECT ESTIMATES OF THE MOTHERHOOD PAY GAP IN LARGE ENTERPRISES

VARIABLES	MODEL 1	MODEL 2	VARIABLES	MODEL 1	MODEL 2
	FE	FE		FE	FE
Number of children	-0.083**		Finance	0.439**	0.630***
	[0.037]			[0.180]	[0.218]
Child 1		-0.301***	Real estate ^a		
		[0.087]			
Child 2		-0.175**	Transportation	-0.003	-0.023
		[0.081]		[0.066]	[0.060]
Child 3 or more		-0.405**	Information and telecommunication	0.444***	0.572***
		[0.162]		[0.134]	[0.143]
Married	-0.033	-0.010	Education	0.491***	0.623***
	[0.060]	[0.064]		[0.117]	[0.131]
<i>HUMAN CAPITAL</i>			Other services	0.466***	0.596***
Experience	-0.008	-0.027		[0.121]	[0.141]
	[0.027]	[0.029]	Public safety	0.266***	0.249***
Experience squared	0.002	0.002**		[0.062]	[0.053]
	[0.001]	[0.001]	Other	0.371***	0.548***
Job tenure	0.058**	0.078***		[0.112]	[0.124]
	[0.024]	[0.026]	<i>NATURE OF OCCUPATION (REFERENCE IS CLERICAL)</i>		
Job tenure squared	-0.002**	-0.003***	Sales	0.005	-0.008
	[0.001]	[0.001]		[0.118]	[0.110]
Education attainment ^a			Service	-0.378	-0.401
				[0.364]	[0.368]
<i>JOB CHARACTERISTICS</i>			Manager	0.086	0.010
Worked hours	0.002	0.001		[0.122]	[0.134]
	[0.002]	[0.002]	Transportation or telecommunication ^a		
Worked hours squared	0.000	-0.000			
	[0.000]	[0.000]	Manufacturing	-0.100**	-0.096*
<i>TYPE OF INDUSTRY (REFERENCE IS MEDICINE):</i>				[0.048]	[0.051]
Fishery ^a			IT and technical (specialized)	-0.063	-0.061
				[0.061]	[0.042]
Construction ^a			Other occupation	-0.031	0.007
				[0.053]	[0.049]
Manufacturing	0.536***	0.670***	Constant	4.755***	4.766***
	[0.132]	[0.160]		[0.148]	[0.139]
Wholesale	0.645***	0.805***			
	[0.229]	[0.261]	Observations	486	486
Restaurant ^a			R-squared	0.298	0.355
			Number of id	174	174
Utilities ^a					

Notes: Cluster-robust standard errors are in brackets. * - Refers to 90% confidence level, ** - Refers to 95% confidence level, and *** - Refers to 99% confidence level. ^a - Dummies are omitted because of collinearity.

TABLE 6. THE FIXED EFFECT ESTIMATED RESULTS OF THE MOTHERHOOD PAY GAP IN SMALL ENTERPRISES

VARIABLES	MODEL 1	MODEL 2	VARIABLES	MODEL 1	MODEL 2
	FE	FE		FE	FE
Number of children	-0.055 [0.048]		Finance	0.009 [0.211]	0.004 [0.214]
Child 1		-0.108 [0.066]	Real estate	-0.195 [0.179]	-0.218 [0.181]
Child 2		-0.096 [0.098]	Transportation ^a		
Child 3 or more		-0.061 [0.098]	Information and telecommunication	-0.059 [0.118]	-0.077 [0.121]
Married	-0.046 [0.088]	-0.030 [0.098]	Education	-0.041 [0.084]	-0.012 [0.077]
<i>HUMAN CAPITAL</i>			Other services	-0.063 [0.100]	-0.081 [0.104]
Experience	0.041* [0.023]	0.042* [0.023]	Public safety	-0.049 [0.103]	-0.031 [0.103]
Experience squared	-0.001 [0.001]	-0.001 [0.001]	Other	-0.022 [0.076]	-0.035 [0.077]
Job tenure	-0.031 [0.029]	-0.031 [0.029]	<i>NATURE OF OCCUPATION (REFERENCE IS CLERICAL)</i>		
Job tenure squared	0.001 [0.001]	0.001 [0.001]	Sales	-0.050 [0.059]	-0.062 [0.063]
Education attainment ^a			Service	-0.117 [0.095]	-0.123 [0.097]
<i>JOB CHARACTERISTICS</i>			Manager	0.032 [0.180]	0.007 [0.162]
Worked hours	0.002 [0.002]	0.002 [0.002]	Transportation or telecommunication	-0.097 [0.102]	-0.112 [0.105]
Worked hours squared	-0.000 [0.000]	-0.000 [0.000]	Manufacturing	-0.120** [0.048]	-0.120** [0.048]
<i>TYPE OF INDUSTRY (REFERENCE IS MEDICINE)</i>			IT and technical (specialized)	0.024 [0.042]	0.025 [0.042]
Fishery ^a			Other occupation	-0.041 [0.053]	-0.040 [0.053]
Construction	-0.215 [0.181]	-0.240 [0.182]	Constant	5.087*** [0.126]	5.086*** [0.126]
Manufacturing	-0.055 [0.171]	-0.062 [0.167]	Observations	650	650
Wholesale	0.138 [0.154]	0.126 [0.154]	R-squared	0.063	0.064
Restaurant ^a			Number of id	237	237
Utilities	0.172 [0.109]	0.157 [0.111]			

Notes: Cluster-robust standard errors are in brackets. * - Refers to 90% confidence level, ** - Refers to 95% confidence level, and *** - Refers to 99% confidence level. ^a - Dummies for educational attainment, fishery, restaurant, and transportation industries are omitted because of collinearity.