



LUND UNIVERSITY

School of Economics and Management

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# Is the Glass Ceiling a Motherhood Ceiling After All?

## The Impact of Childbirth on Gender Gaps in the South Korean Labor Market

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South Korea has the highest gender pay gap and the lowest fertility rate in the OECD (OECD Data, n.y.). Gender equity theory suggests that there is a link between high gender inequality and low fertility, as women struggle to have both a career and a family. A growing share of Korean women are voluntarily childless, referred to as the Sampo Generation, giving up dating, marriage, and children, to focus on their careers (Maybin, 2018; UN, 2013). This study quantifies to what extent women are penalized in the labor market for having children, referred to as child penalties. Testing the impact of having children on the labor market outcomes of earnings, wage rate, hours worked, and labor force participation after first births, this study confirms previous studies in the U.S. and in Europe, that also Korean women are penalized in the labor market for having children, while there is generally no child penalties for men. Initially, children reduce female earnings by 34% to never recover to pre-birth levels, and in the long run, childbirth increases the gender pay gap by 55%. Moreover, low- and middle-skilled women and women with several children experience larger child penalties. The size of the female child penalties are decreasing over time, suggesting that the recent expansion of paid parental leave and childcare provision has an impact on gender equality and specifically on labor market outcomes of mothers.

*Key words: gender inequality, gender pay gap, child penalty, fertility, South Korea*

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# 1 Introduction

## 1.1 Background

The fertility decline in South Korea, hereafter Korea, has been one of the most rapid declines in the world, dropping from 6 children per woman in 1960 to 1.7 children in 1990 (Park & Cho, 1995). It was initiated in the 1960s when the Korean government launched family planning programs, spreading knowledge about and increasing the social acceptance of contraception and abortion, to control fertility in families already having children (Kim, 2005). The decline was also due to social factors, such as the structural changes associated with the rapid economic growth in the 1960s and 1970s. Urbanization and increased cost of education altered the perception of children, away from being viewed as a productive asset but rather to become an economic burden (Kwon et al., 1974). Socioeconomic changes also contributed to the declining fertility, such as an unfavorable labor market, delayed marriages and a greater acceptance for celibacy, and the degree of gender equality.

Replacement fertility, 2.1 children per woman, was reached in 1983, and fertility have continued to fall after that, reaching 1.2 children per woman in 2016, the lowest fertility rate in the OECD (Kim, 2005; OECD Data, n.y.). Declining fertility rates lead to an aging population and a rising dependency burden for the working population, which might reduce future incomes (Lee & Mason, 2009). Bloom, Canning & Fink (2010) suggest that OECD countries in general will only have modest declines of GDP growth rates if female labor force participation is increased and the retirement age is raised. The impact of the very low fertility rate in Korea could have especially severe consequences for the economy due to the rapid fertility decline, the high life expectancy, and low female labor force participation (ed. OECD, 2017b). According to UN data, the share of childless women aged 45-49 increased from 1.4% in 1970 to 5.4% in 2005, while the mean age of childbirth has been steadily increasing from 27.2 in 1990 to 31.5 in 2013 (OECD Data, n.y.; UN, 2013). Young, childless Korean women are sometimes referred to as the Sampo Generation, “sam” meaning three in Korean, as these women give up three things: dating, marriage, and children, to instead focus on themselves and their careers (Maybin, 2018).

Researchers suggest that problems of combining labor market employment with family life is an important determinant for the very low fertility experienced by Korea (Fernández-Kranz, Lacuesta & Rodríguez-Planas, 2013). Mishra & Smyth (2010) find an inverse relation between female labor force participation and fertility in OECD-countries, indicating that there is an issue of work-life balance for mothers. The Korean labor market is characterized by high work moral, leading to long hours and little flexibility, which makes it much less compatible

with family life than the labor markets in other OECD-countries (OECD Better Life Index, n.y.). In the last decade, the OECD has been emphasizing the importance of work-life balance on the general well being of citizens (ed. OECD, 2007, ed. 2017a). In the OECD Better Life Index (n.y.) have Koreans lower self-reported levels of life satisfaction than the OECD average, which is likely a result of the work culture. Confucian values still dominate Korea, and gender roles are generally traditional, with the perception that housework and childrearing are tasks for the woman, also in dual-earner households, thus the incompatibility of work and family life largely affect women and not men (Kim, 2005; Ock, 2015; Park & Cho, 1995).

Korea has the highest gender pay gap in the OECD and household gender values are much more traditional in Korea than elsewhere in the OECD (ISSP Research Group, 2016; OECD Data, n.y.). While educational differences and discrimination have long been leading explanations for the gender pay gap, there is a growing literature indicating that the pay gap largely emerges with childbirth, and that childless women are not affected by the same labor market consequences as mothers. This phenomenon is called the motherhood penalty or child penalties and will be the centerpiece of this study.

## 1.2 Aim and Objectives

Given the low fertility rate in Korea, and the rise of voluntarily childless women, the so-called Sampo Generation, the aim of this study is to quantify the child and motherhood penalties on the Korean labor market and to determine if they change with certain characteristics of the parents and if they change over time. This will be done examining the impact of first childbirths on four labor market outcomes: earnings, hours worked, wage rate, and labor force participation. Note that the terms earnings or pay refer to the total income received, while wage refers to the hourly wage rate. The impact of children on the four labor market outcomes will be quantified for both men and women, identifying if there exist child penalties in the labor market. The motherhood penalty assesses to what extent the gender pay gap changes with children, thus indicating if women are penalized to a greater extent in the labor market than men, and if so, by how much. Quantifying child and motherhood penalties contributes to explain the phenomenon of the Sampo Generation and the low fertility rate, as a large motherhood penalty would justify that Korean women are, in fact, faced with the decision of having a career or a family.

Moreover, this study attempts to establish how certain characteristics of the parents change the impact of children on the labor market outcomes and whether the impact of children changes over time. The characteristics that will be tested are the educational level, the place of residence, the type of employment contract, and the number of children the person will have in total. In measuring the gender gap in child penalties over time, this paper aims to hypothesize about future fertility levels in Korea. Gender equity theory indicates there is a connection between gender inequality and fertility. Thus, if child penalties are changing over time, it could be an indication of how fertility will evolve in the future.

## 1.3 Outline of the Thesis

The thesis is outlined as follows. The following chapter will start off by a review of theories associated with the connection between fertility and gender inequality, discussing that the type of very low fertility as that experienced in Korea has a connection to rather high gender inequality. Then theories relating to the gender pay gap will be presented. These theories of the gender pay gap will then be assessed using previous research to validate or contest them. Chapter 3 lays out the Korean context. It includes a discussion of the Korean culture, gender equality within households and in the labor market, and social policies of childrearing. Chapter 4 explains the methodology in greater detail, presents the data used in the study, and discusses limitations. In Chapter 5, the results for each of the tests are presented, and then discussed in relation to previous research and the Korean context. Chapter 6 concludes the study.

## 2 Previous Research

This chapter starts off by providing a theoretical background to the relationship between fertility and gender inequality. A large difference between labor market inequality and household inequality is an explanation to the very low fertility rate that is experienced in Korea, as women have access to the labor market, but still have the main responsibility of childrearing and are, thus, faced with the dilemma of choosing between career and family. It is also argued that very low fertility could generate greater gender equality in the long run, as it becomes evident that women are reluctant to having children in highly unequal contexts. Then the theoretical motivations of the gender pay gap are outlined. It has its foundation in Becker's theory of sexual division of labor, indicating household specialization upon childbirth, which makes women fall behind in the labor market. Other explanations include labor market characteristics unfavorable to mothers and wage discrimination.

Thereupon, empirical evidence will be presented. Most studies on motherhood penalties in the labor market are from the U.S. and Europe. These show that mothers are in fact penalized for having children, both when comparing mothers to fathers, and when comparing mothers to childless women. Mothers are penalized both in terms of income but also in terms of wage rate, suggesting the motherhood penalty is not merely a result of reduction in working hours, but that women actually become worse off in the labor market when they have children. The penalties tend to persist over time, indicating that mothers never catch up with their pre-child levels of income. Moreover, some studies show that men experience a positive impact on labor market outcomes after becoming fathers, such as higher pay and being perceived as more committed, while the effect is opposite for mothers, who are perceived as less committed than other women and men.

### 2.1 Theoretical Discussion

#### 2.1.1 Gender Equity and Fertility

In his paper *Gender Equity in Theories of Fertility Transition* Peter McDonald (2000) argues that the outset of the fertility decline is the choice of individuals, not institutions, and that high fertility rates in pre-transition societies are socially and not naturally determined. He argues that women foresee how lower fertility will change their lives in the future, thus, women actively choose to reduce fertility to increase gender equity. More specifically, the impact of gender equity on fertility depends on the type of gender equity, whether in individual-oriented social institutions, such as the labor market, or in family-oriented social institutions, mainly

the family. A gap between the gender equity in these two types of institutions will lead to very low levels of fertility, as is observed in some high-income countries, such as Korea. This gap is developed when gender equity increases more rapidly in individual-oriented social institutions than in family-oriented social institutions, which is usually the case, as the family is, according to McDonald, the fundament of cultural identity that changes very slowly. In these types of societies women have a dilemma, as their participation in the labor market might not be compatible with their expected gender role associated with family life, and some individuals will choose the individual role over the family role, they either completely neglect having children or they have fewer children than desired.

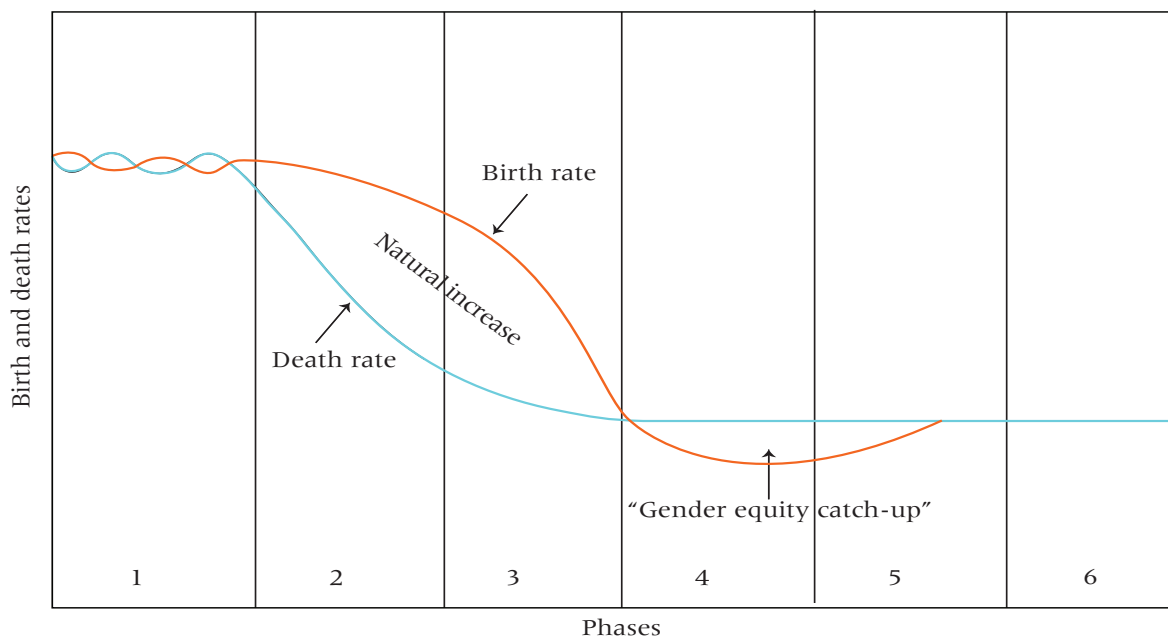


Figure 2.1: Demographic Transition and Gender Equity  
Source: Anderson & Kohler (2015)

Similarly, Anderson & Kohler (2015) claim that the very low fertility rate in so-called second-wave developers, such as East Asia and Southern Europe, is due to a mismatch between institutional and household gender equity, creating work-family conflicts, also associating this mismatch to the slow development of gender norms. However, they go one step further and hypothesize that while the low fertility is caused by the mismatch on gender equity within different institutions, the low fertility is also an instrument through which women can demand high gender equity and, thus, low fertility can be the cause of increased gender equity. They observe that the very low fertility, as that in Korea, is only present in second-wave developers, while the first-wave developers might have sub-replacement fertility, but still at a higher level than the second-wave developers. Figure 2.1, above, illustrates their understanding of the demographic transition, in which they have added a gender equity component to the traditional theory of demographic transition of declining

fertility and mortality. As household gender equity catches up with institutional gender equity, in the phases of “Gender-equity catch-up”, fertility increases again from very low levels. The largely gender equal countries Denmark and Sweden are the first to reach the 6th phase in the transition, while the rest of Western Europe is in the 5th phase and East Asia with its very low fertility is in the 4th phase. That low gender equity affect the fertility rate has been shown by for example Brinton et al. (2018) and Mills et al. (2008); the former finding that the gap between fertility ideals and intentions were greater in the more gender unequal Japan and Spain, than in the U.S. and in Sweden, and the latter finding that traditional gender roles within families have a negative impact on Italian fertility, as women adjust their fertility intentions to their workload.

### 2.1.2 The Gender Pay Gap

The “preference/human capital” hypothesis has been guiding many scholars on gender differences in labor market outcomes, as described by Altonji & Blank (1999). The main idea is that when controlling for the differences in work preferences and educational background, the residual difference that cannot be explained by these factors is the gender inequality in labor market outcomes, explaining female discrimination. Other theories include some measure of unobserved heterogeneity, such as that of Gary Becker (1985). Assuming that traditional gender roles are prevailing, he claims that it is the division of labor within households that create the wage gap between men and women. As caring for children and housework are more intensive leisure activities than others, Becker hypothesize that women have less energy left for work and, thus, spend less effort of each hour worked in the labor market than men do, reducing their productivity and wage. Likewise, this leads women to seek less demanding jobs, generating occupational segregation, which often leads to wage discrimination against women as female-dominated sectors generally have lower wages (Goldin, 2014). Other hypotheses are that employers discriminate against women with children or that the practices of the labor market are disadvantaging to women with children, for example mechanisms such as parental leave and the pay structure of part-time employees (Waldfogel, 1998). The impact of the three latter explanations, the productivity-hypothesis, the discrimination-hypothesis, and the labor market-hypothesis, all seem to increase in magnitude as working women become working mothers, which will be discussed in the following section.

## 2.2 Empirical Evidence

The gender pay gap has been declining in the last century, and especially in the past 40 years and was on average 14% in OECD-countries (see Figure 3.1 in Chapter 3) while women still earn less, are underrepresented in leading positions, and their careers develop at a slower pace (Adda, Dustmann & Stevens, 2017; Kleven, Landais & Sogaard, 2018; Waldfogel, 1998). The

ratio of median annual earnings between men and women (full-time, full-year, age of 25-69) in the U.S. increased from 0.56 in 1980 to 0.74 in 2000, with a much more moderate increase from 2000 to 2010 of 3 percentage points (Goldin, 2014). This was about the same time as the educational level of men and women had nearly converged (Goldin, 2014). Along with the rise of female human capital and anti-discrimination legislation, the human capital-explanation and that of discrimination have lost some of their relevance, as they can only explain part of the remaining gender pay gap. Moreover, there has been a convergence of the gender pay gap in the U.S. and in the more gender equal Denmark, as the gender pay gap in both countries has plateaued around 15-20%, suggesting that the differences of public policies and labor markets no longer explain the pay gap (Kleven & Landais, 2017). This has been giving rise in the literature to a third factor, mainly the effect of children on the gender pay gap (Kleven, Landais & Sogaard, 2018). Gathering micro datasets from 53 countries, Kleven & Landais (2017) find that the gender pay gap declines with economic development, which they attribute to the demographic transition and increased female labor force participation and female wages. Child penalties, only affecting mothers and not fathers, are found to be high at both low and high levels development, but with a lower effect on labor market outcomes in the latter case, as families have fewer children, due to the demographic transition.

### 2.2.1 The Labor Market Motherhood Penalty

The motherhood-hypothesis has been studied considerably in Western, high-income countries, especially in the U.S., and has its foundation in the fact that the gender pay gap often is small among young graduates and individuals in their 20s, while it increases with age, around the time women typically becomes mothers. The gender pay gap is around 90% in younger cohorts in the U.S. for individuals in their 20s, to then increase in the 30s and later decrease in the 40s (Goldin, 2014). Bertrand, Goldin & Katz (2010) study the gender gap for MBA graduates in the U.S. and find that although male and female graduates had almost identical incomes and hours worked upon graduation, there was a large difference 10-16 years later, for both factors. This was mainly attributed to childbirth, as women had more career interruptions and lower weekly hours worked. Venable (2002) find that among childless, U.S. citizens in the ages 27 to 33, women's earnings approach 98% of men's earnings, which is attributed to the fact that childless women "behave as men do" in the labor market, and that differences between men and women in the labor market only become apparent after childbirth. In fact, Crittenden (2001, cited in Correll, Benard & Paik, 2007) report that for individuals under the age of 35, the pay gap between mothers and childless women is larger than the male-female pay gap. Women make decisions about fertility and careers around the same time, in the ages 20-40, and it is thus not surprising that there should be a connection between fertility and female labor market outcomes (Fitzenberger, Sommerfeld & Steffes, 2013). Adda, Dustmann & Stevens (2017) refer to this as a trade-off between occupational choices and desired fertility. Goldin (2014) argue that while current explanations to the gender pay gap such as discrimination and women's lower ability to bargain probably have some merit, they fall short of explaining why the gender pay gap increases with age, or why

childless women earn more than mothers. By adding the motherhood component to the model, a greater share of the gender pay gap can be explained.

Upon having a child, plenty of studies find that there is a negative effect on labor market outcomes of the mother, such as reduced income, wage, hours worked, and labor force participation, but most studies find no such impact for fathers. On the contrary, Lundberg & Rose (2000) find that while the wages of U.S. mothers were reduced by 5% and the hours by 45%, men actually increased their wages by 9% when having children. However, the impact of childbirth on the parents labor market outcomes were conditional on the length and characteristics of the maternity leave, which will be discussed in greater detail below. Similarly, Budig & England (2001) report the unconditional child penalty for women in the U.S. to be 7%, and 5% when controlling for level of experience. Also using an event study around childbirth, Kleven, Landais & Søgaaard (2018) find that for Danish mothers, the earnings drop 30% immediately after childbirth, to then recover to around 20% of pre-birth earnings ten years later. In Germany, the employment loss of mothers was reduced in the first five years after childbirth, and although it was increasing after the initial drop it never recovered (Fitzenberger, Sommerfeld & Steffes, 2013). However, they find the employment loss to be declining with cohorts, comparing births in 1993 with births in 2003. In Spain, Fernández-Kranz, Lacuesta & Rodríguez-Planas (2013) find an unconditional child penalty for women of 9% that, like in Germany, was falling over time. In Sweden, the within-couple gender pay gap increased by 32 percentage points for income and 10 percentage points for wage in the first 15 years after childbirth (Angelov, Johansson & Lindahl, 2016). Studying Denmark, Kleven, Landais & Søgaaard (2018) find the long run wage gap to be 12% and not recovering, but deteriorating over 20 years. They also find a long run child penalty of 23% for mothers in comparison with childless women, while men experienced no significant penalty or reward of becoming fathers, compared with childless men. Moreover, decomposing the gender pay gap, they find that the share of child penalties in the gender earnings gap have increased from 40% in 1980 to 80% in 2013, indicating that having eliminated other sources of the gender pay gap, motherhood has become the dominant explanation of labor market inequality in Denmark. They also find that the child penalty increases by 10 percentage points per child.

### 2.2.2 Explaining the Motherhood Penalty

#### **Household Specialization and Productivity**

Following is a summary of studies attempting to determine the causes behind the divergent impacts childbirth have on labor market outcomes of mothers and fathers, starting with the hypothesis by Becker of household division of labor and labor market productivity losses of mothers. If mothers are responsible for children and the household, and are doing the majority of the household work, she is assumed to have less time and energy left for the labor market. Studying the U.S., Lundberg & Rose (2000) speculate that the impact of childbirth on the gender pay gap depend on the household specialization, as they find their results to be dependent on whether or not the mother was on long maternity leave. Fernández-Kranz,



Lacuesta & Rodríguez-Planas (2013) claim that children interferes with the labor market outcomes of women especially much in Southern Europe due to the lack of childcare, low participation of men in housework, low levels of social protection, and high uncertainty in the labor market, a situation that is largely similar to that of Korea. Angelov, Johansson & Lindahl (2016) argue that even in largely gender equal Sweden are women the main caretaker of children, which is likely to explain the existent gender pay gap. They find that the wage gap is increasing gradually over 15 years after childbirth and not immediately, as it would if the maternity leave was its explanation, suggesting that the difference between mothers and fathers does not depend on the parental leave, but on the different levels of responsibility for the children during the entire childhood. Similar results of the development of wages for parents are found in Denmark by Kleven, Landais & Søgaaard (2018), as there is only a small initial drop in wages, which then increases gradually over 20 years. This indicates that women, when becoming mothers, either switch to more family-friendly sectors, causing gender segregation in the labor market, or that her productivity decreases, due to household specialization, or a combination of the two.

Considering Becker's argument of mothers' reduced labor market productivity, Budig & England (2001) claim that productivity loss and labor market discrimination explain two thirds of the child penalty. Angelov, Johansson & Lindahl (2016) argue that as Swedish women are encouraged to remain in the labor force after childbirth, they choose less demanding jobs to enhance work-life balance. However, Anderson, Binder & Krause (2003) contradict the productivity-hypothesis as they study women in the U.S. by level of education, assuming that highly-educated women are the most productive. They find that middle-skilled women (high school graduates), and not highly-educated women, have the largest child penalties, indicating that child penalties are not due to productivity but to labor market flexibility. However, they do not measure productivity directly, but merely assume that highly-educated women have higher productivity.

### **Labor Market Characteristics**

Another of the hypotheses explaining labor market child penalties concern the characteristics of the labor market, such as the policies and practices of maternity leave, and the flexibility of the labor market. Waldfogel (1998) suggests that increased security and coverage of maternity leave will reduce the gender pay gap, as mothers would not come so far from the labor market as they do without such securities. Lundberg & Rose (2000) on the other hand find that women "experiencing a substantial interruption in labor market activity" following the childbirth get a child penalty in the wage rate of 23%, while women continuously in the labor force experience no such child penalty, suggesting that maternity leave leads to loss of experience. However, this effect could also be due to that working women live in more equal households, as families in which the woman is continuously in the labor force, the man decreases his hours worked, while the father's hours worked increased in households in which the mother did experience a substantial interruption of labor market activity. This also suggests that as a consequence of the mother's child penalty, the father increases his labor market activities, which then increases the gender pay gap. Fernández-Kranz, Lacuesta & Rodríguez-Planas (2013) claim that half of the female child penalties in Spain are due to

women switching to part-time jobs and the experience loss during maternity leave, while Budig & England (2001) assert this effect to be explaining only a third of the motherhood penalty in the U.S.

The conclusion by Anderson, Binder & Krause (2003), testing the productivity-hypothesis is that low degree of labor market flexibility is the cause of the motherhood penalty, as middle-skilled women are punished the most, because they can be assumed to have employers requiring more specific work hours than highly-educated women. In fact, Goldin (2014) propose greater labor market flexibility as the “last chapter” of the gender convergence, so that individuals working specific hours or long hours are not disproportionately rewarded at the expense of mothers, and making earnings becomes more linearly related to hours worked. Increasing labor market flexibility would be accomplished by reducing the cost of substitution between employees, to reduce the dependence of an employee at specific times of the day. The pharmacist profession is an example of a sector that has increased its flexibility, resulting in a low gender pay gap and only modest part-time penalties, making it more family friendly (Goldin, 2014; Goldin & Katz, 2016).

## **Discrimination**

The last theory is that of discrimination. As already mentioned, Budig & England (2001) suggest that two thirds of the motherhood penalty can be explained by discrimination and productivity. Performing an experiment with both college students and managers of firms in the hiring-procedure, Correll, Benard & Paik (2007) show that there are different views of mothers and fathers on the U.S. labor market. Mothers are viewed as less competent, less committed, less dependable, and less authoritative than both childless women and all men, and that the role of mothers is not in line with the view of the “ideal worker”. Moreover, mothers got called back only half of the time compared to childless women. Fathers, on the other hand, were perceived as more committed and received higher starting salaries. Although their study confirms that there exists discrimination against mothers in the labor market, it cannot rule out differences in productivity.

## **Characteristics of the Woman and the Family**

Using different hypotheses to explain the gender pay gap, some researchers find the results to be conditioned upon some individual characteristics of the woman or her family. As already discussed, Anderson, Binder & Krause (2003) find the female child penalties to be the highest for middle-skilled women in the U.S., which is also confirmed for Germany by Fitzenberger, Sommerfeld & Steffes (2013), while Wilde, Batchelder & Ellwood (2010) find that child penalties in the U.S. are the largest for highly-educated women, which could then explain the especially low fertility for this group of women. The latter study also reports that the total earnings penalty is largest for young mothers, which could also be a reason for delayed childbirth. Concerning the spouse, Bertrand, Kamenica & Pan (2015) find there is no gender pay gap for U.S. women with lower-earning husbands, and Angelov, Johansson & Lindahl (2016) report that in Sweden the gender pay gap increases the less educated a woman is in relation to her spouse. Lastly, Lundberg & Rose (2000) suggest that there is a selection into parenthood as parents-to-be, both men and women, earned on average 9% less than non-

parents prior to the birth of their first child, accounting for some unobserved heterogeneity between parents and non-parents.

## 2.3 Chapter Summary

The gender pay gap has been declining in the past 40 years. This is largely due to that the previously dominant explanations of human capital differentials and discrimination have been declining significantly in magnitude due to the rise in female education and anti-discrimination legislation. As childless and young women experiences a much lower gender pay gap than mothers, there is a growing literature arguing that the gender pay gap is to a great extent a motherhood penalty on labor market outcomes. Studies from the U.S. and from Europe indicate that the female child penalty on wages is around 5%, controlling for level of experience, and that mothers are perceived as less committed and competent than childless women and all men. Men are positively affected by becoming fathers as some studies find them receiving higher wages and being perceived as more committed than childless men. There is also a tendency of men to work longer hours when the mother is experiencing a large child penalty in the labor market, confirming Becker's theory of household specialization. Likewise, some studies show that the gender pay gap depend on the wage and education of the woman in relation to her spouse, suggesting that household equality has an impact on female labor market outcomes, influencing her decision about labor force participation and, in more egalitarian contexts, it might influence her to switch to more family-friendly sectors, generating occupational segregation. As suggested by Goldin (2014), greater labor market flexibility would be a means to reduce the degree to which mothers are punished in the labor force and, thus, increase the work-life balance of women, without necessarily changing the division of labor within households.

## 3 The Korean Context

South Korea has developed from a war-torn, newly established country in the late 1940s into the high-income country it is today, in a process termed ‘the Miracle on the Han River’ (Kim, 2012; Rodrik, 1994). Along with the economic progress, Korea underwent rapid urbanization, modernization and westernization, altogether reshaping the Korean society, abandoning its military regime for democracy in 1993 (Kim, 2003). Today, Korea is the world’s 12th largest economy, has the longest years of tertiary education among younger adults, and the 10th highest life expectancy at birth in the world (ed. IMF, 2019; OECD Data, n.y.).

### 3.1 Culture and Gender Inequality

Korean culture has long been dominated by Confucian values. Although the religion is only practiced by a small share of the population, its values are deeply nested into Korean norms, especially manifesting itself in the hierarchical social relations, between manager and employee, husband and wife, and in considering the family as the fundamental unit of society (Park & Cho, 1995). Confucian values induce male dominance and a preference for sons, fundamentally reducing the power of mothers, wives and daughters within the realm of the family, thus influencing female employment (Cooke, 2010). While women still have the main responsibility for the household and child care, with the rise of nuclear families her burden of caring for the elderly has been reduced and her influence in childbearing decisions has increased (Kim, 2005).

Gender roles in Korea are still highly traditional, with married women doing almost five times more unpaid housework than married men in dual-earner households in 2014; 194 minutes a day in comparison with 40 minutes, with dual-earner households accounting for 44% of the married households, according to the OECD Better Life Index (Ock, 2015). This one of the most unequal divisions of unpaid housework in the OECD (ed. OECD, 2017a). The disparity appears to be a family issue, rather than strictly a gender issue as unmarried women only spent 63 minutes a day on housework (Ock, 2015). Moreover, 22 % of women report that they quit their jobs to get married and have children. The data also showed that although the share of parents taking parental leave is increasing, only 60% returned to the same workplace afterwards, indicating that parental leave is a career disruption and that more flexible workplaces are required for parents with young children.

The unequal distribution of housework has been found to have negative implications for fertility realizations, which likely is a consequence of the work-family conflict imposed on

women with children (Yoon, 2016). Moreover, the problem of work-life balance for married mothers is also found to reduce marital satisfaction for Korean women, as the burden on the household fall on them and as Korean men are “sensitive to having a higher share of housework” (Oshio, Nozaki & Kobayashi, 2013). Lastly, Kim & Cheung (2015) found that women’s values becomes more traditional upon forming a family, which might either be a consequence of the expectations of her as a wife, or a reason for her withdrawal from the labor market.

## 3.2 The Labor Market and Gender Inequality

The Korean labor market stands out among other OECD-countries with its high job security and low long-term unemployment rate, almost 0% in 2016 (ed. OECD, 2017b). However, the job strain among employees and hours worked are both among the highest in the OECD, which is likely due to the work ethic of Korea. Kim & Park (2003) argue that the economic miracle in the 1960s and 1970s would not have been possible without nationalism and pro-growth Confucian ethics. These ideologies made workers perceive the worth of hard work, as well as make them more disciplined, loyal, and dedicated. Confucian values also make married women to be viewed as less committed to their careers, due to their family responsibilities discussed in the previous section (Cooke, 2010). However, as seen in Section 2, this is not unique for East Asia, but is also prevalent in the U.S. Although the unemployment rate has been relatively low, around 3-4% since 2000, the youth unemployment rate of people between 15-24 years old has lingered around 9-10% in the same time period, possibly having an impact on fertility decisions (OECD Data, n.y.).

During the time period of rapid economic growth in the last four decades of the 20th century, Korea had near full employment (Development of National Employment Policies through Two Economic Crises, 2012), and the share of women in the labor force increased from 34% to 41% from 1963 to 2002 (Cooke, 2010). The female labor force participation rate is currently the lowest in the OECD at 59%, while that of men is 78%, and 18% of the women are employed part-time, in comparison with 8% of the men (ed. IMF, 2019; OECD Data, n.y.). The Korean labor market is characterized by a duality between a primary labor market, with the large conglomerates, and a secondary labor market with small and medium sized enterprises, with the former characterized by job security, high wages, and welfare benefits, and the latter by low wages, high risk of unemployment, and poor working conditions (Cho & Lee, 2015). Women are to a much greater extent employed in the secondary labor market and are also more likely to hold temporary contracts, indicating a gender segmentation in the labor market (Cho & Lee, 2015; ed. OECD, 2007). Kim, Lee & Shin (2016) find that the potential GDP growth of Korea would be increased from 3.6% to 4.1% if gender inequality would be completely eliminated, both in households and at the labor market, largely due to a rise in female labor force participation from 54% to 68%. Policy suggestions to achieve this are focusing on reducing discrimination in the labor market and incentivizing fathers to spend more time on childrearing. While there are already laws prohibiting discrimination against

women, unions claim they are rarely enforced and there are countless stories about female discrimination, as women struggle both to enter the labor force after graduation and to advance to leadership positions (Brunhuber, 2018; Draudt, 2016; Jeong, 2019; Maybin, 2018). According to IMF data are only 12% of legislators, senior officials and managers, 17% of parliamentarians, and 9% of ministers women (ed. IMF, 2019). Many of the reports on discrimination concern employers forcing women to resign when having children, an example being a manager asking his pregnant employee “once you have a child your child is going to be your priority and the company will come second, so can you still work?” (Maybin, 2018).

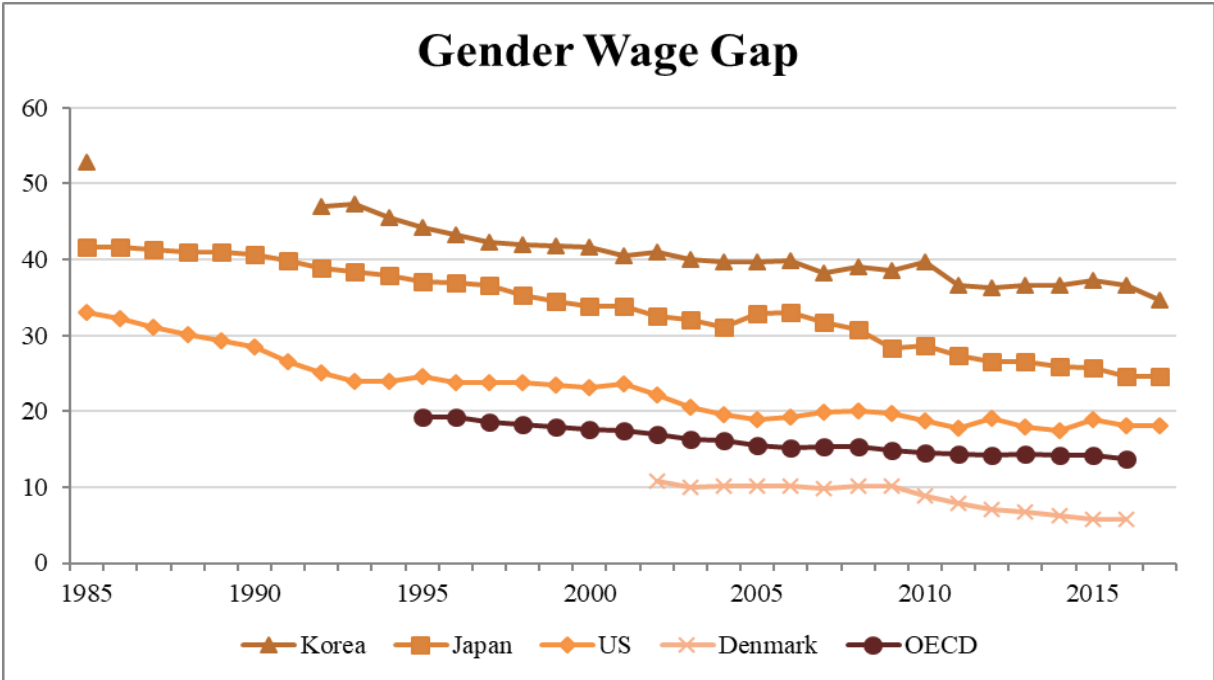


Figure 3.1: Gender Wage Gap, 1985-2016

Source: OECD data

Note 1: The gender wage is defined by the OECD as the difference between median earnings of men and women relative to median earnings of men and this data refers to full-time employees.

Note 2: The other countries shown in the graph were chosen to see a variety of other OECD-countries; Japan for being culturally similar and neighboring Korea, the U.S. for being the largest OECD-country, and Denmark for being largely gender equal.

Korea has the highest gender pay gap in the OECD, although declining over time, see Figure 3.1, above (OECD Data, n.y.). In Korea, women’s median wages for full-time employees were 37% lower than median wages of men in 2016, compared to the OECD average of 14%. Decomposing the gender wage gap of Korea, Japan, and Taiwan, Chang & England (2011) find that differences in education and experience still explain a large share of the pay gap in Korea. Even though Korean women are highly educated, Korean men are even more educated, but returns to education are high for both genders. The influence of experience on the wage indicates that parental leave has a negative impact on the wage. The effect of

education on the wage gap might be declining with younger cohorts, as among individuals aged 25-34 in 2017 did 75% of the women have tertiary education and 65% of the men (ed. OECD, 2018). Chang & England (2011) also find that occupational segregation explains the wage gap, but to a lesser degree than education and experience, due to a large share of men being employed in manual jobs reducing the wage gap, but there is also a male dominance in top non-manual jobs, greatly increasing the wage gap. Cho & Cho (2011) find a systematic sorting of workers in the primary and secondary labor market, and that this occupational segregation is largely driven by large wage differentials among female workers employed in the primary and the secondary labor market. The OECD argues that although Korea has similar public policies regarding parental leave, the workplace practices of long hours, strict hierarchies, and seniority-based remuneration systems, leads to employees taking time off from work for childrearing are punished harder than elsewhere in the OECD, as workplaces are less family-friendly (ed. OECD, 2007).

### 3.3 Children and Gender Inequality

Korea has one of the lowest rates of public social spending as a percentage of GDP within the OECD, although the government has supported a number of initiatives since the early 2000s, to increase the work-life balance of parents (OECD Better Life Index, n.y.). In 2002, the paid maternity leave increased from 8.5 weeks to 58.4 week, which increased further to 64.9 weeks in 2008, at which time paid paternity leave was introduced with 52 paid weeks (OECD Family Database, n.y.). Immediately after birth, mothers have up to 90 days of 100% reimbursed maternity leave, while fathers can take 3-5 days (Kim, 2017). Additionally, both parents have one year of non-transferable parental leave, during which they receive 40% of their ordinary earnings. However, to encourage fathers to take parental leave, Korea introduced the “Daddy months” in 2015, which gives the second parent three months of parental leave, fully reimbursed (Kim, 2017). Moreover, there is flexibility in the parental leave, as it might be taken out as part-time parental leave until the child is eight years old (Kim, 2017). While a rapidly increasing number of fathers take parental leave from negligible levels in 2010, in 2018 only 17% of the persons on parental leave were men, many fathers expressing fear over their careers and the opinions of colleagues as reasons for not taking their parental leave (ed. OECD, 2017a; Steger, 2019). The government has also increased public spending on childcare from 0.1% of GDP in 2000 to 0.9% in 2014, increasing the enrolment rates of children aged 0-2 years from 4% in 2002 to 35% in 2014 and for children aged 3-5 years from 31% in 2005 to 92% in 2014 (OECD Better Life Index, n.y.).

Even though fathers appear to play an increasing role in childrearing, women still have the main responsibility, and often childrearing leads to career disruptions for women. Mothers struggle to return to their previous workplaces after parental leave, largely due to the work culture of Korea in which many workplaces are not family-friendly, and often end up in the secondary labor market (ed. OECD, 2007). This is especially true for highly-educated women who cannot return to their pre-birth well-paid jobs in the primary labor market, but must

switch to low-paid jobs in the secondary labor market, which is argued to be a reason for many women staying at home if they can afford to (ed. OECD, 2017a). Women who only take maternity leave, and not parental leave, are less likely to have a second child, indicating these women are more committed to their careers, while women outside the labor market are more likely to have a second child (Kim, 2015; Ma, 2016). Fertility decisions in Korea appear to be driven partly by the financial situation of the family, as Kim (2015) finds that women with high wages were more likely to have a first child and Ma (2016) finds that women with highly educated husbands were more likely to have a second child, and that second births fluctuates with business cycles. Likewise, the economic volatility of the Asian Financial Crisis in 1997 increased the likelihood of women returning to the labor market after the first birth (Ma, 2016).

In ISSP’s survey ‘Family and Changing Gender Roles’ from 2012 did 44% of the Korean respondents believe that women with children under school age should stay at home; 43% that women should work part-time and only 9% believed that women should work full-time, see Figure 3.2, below. Note that children start primary school at the age of six in Korea (NCEE, n.y.). While 31% of the respondents believed that women with children in school age should work full-time, the majority of the respondents thought the preferred option was women working part-time. The Korean attitudes towards mothers in the labor force are slightly more liberal and moderate than those in neighboring Japan, while more traditional than those in the U.S., and especially in relation to those in gender equal Denmark.

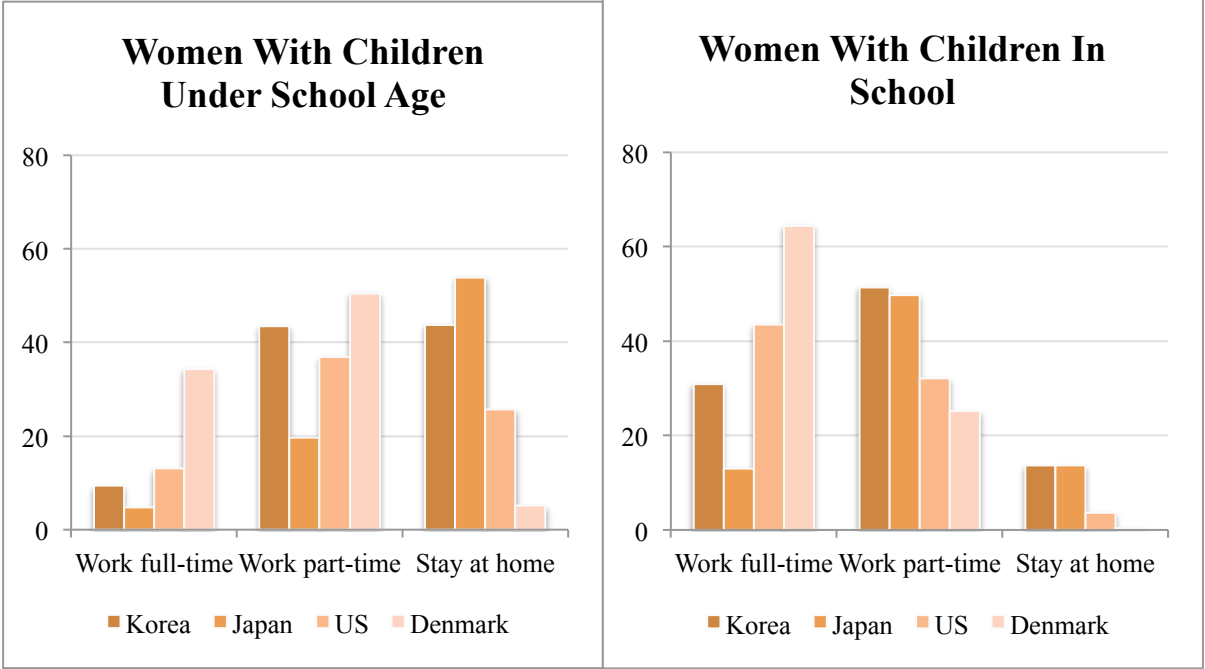


Figure 3.2: Perceptions of mothers in the labor market. Answers to the question ‘Do you think that women should work outside the home full-time, part-time or not at all under the following circumstances?’ Source: ISSP Research Group (2016) Note: Countries in the figure are in order of appearance.



Apart from gender inequality, many Korean women also refer to the high costs of having children as reason to the low fertility rate (Brunhuber, 2018; Maybin, 2018). Korea is predominantly urbanized with 46.1% of the population living in the Seoul metropolitan area, where apartments are expensive, especially in districts with better schools (Lee et al., 2015). The Korean labor market is highly competitive with 70% of the population in the ages 25-34 in 2017 with tertiary education, putting a high pressure on children to perform well in school and forcing parents to pay for expensive tutors (Maybin, 2018; ed. OECD, 2018). Anderson & Kohler (2013) argue that the low fertility rate in East Asia is partly explained by the desire of parents to have “competitive and successful children”, with the result of parents spending a lot time and money on each child. This phenomenon is referred to as ‘education fever’ and its implication for fertility is that parents focus on ‘quality over quantity’. Therefore, it is not surprising that a majority of Koreans believe that children are both an interference to parents’ freedom and a financial burden, see Figure 3.3, below (ISSP Research Group, 2016). The Korean values in these issues differ greatly from those in Japan, the U.S. and Denmark. Moreover, most families with children in Korea constitute two parents, and there exists only a small share of single-parent households (Lee et al., 2015).

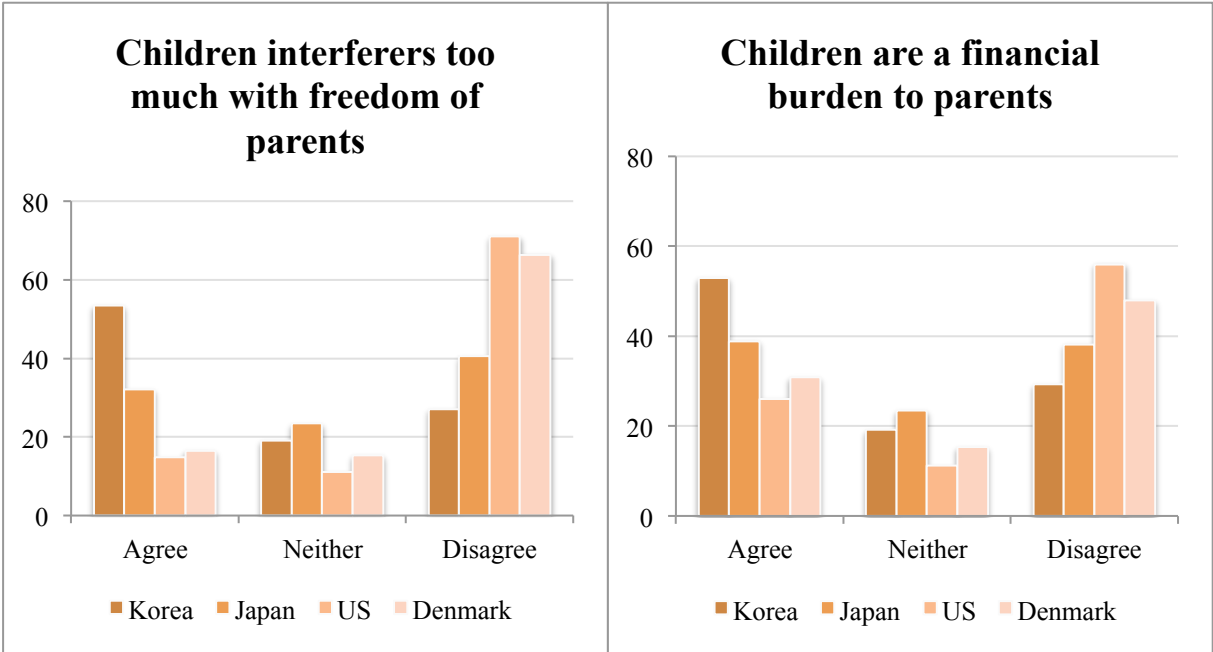


Figure 3.3: Perceptions of children  
 Source: ISSP Research Group (2016)  
 Note: Agree refers to both 'agree' and 'strongly agree', while disagree refers to both 'disagree' and 'strongly disagree'.

## 3.4 Chapter Summary

Korea is characterized by Confucian values that both influence the work attitudes to reward hard work, dedication, and long hours, as well as to induce very traditional gender roles in the households, giving women the responsibility for housework and childrearing. Thus, it could be argued that the Korean labor market is to a lesser extent compatible with motherhood than labor markets in other high-income countries, leading to the low levels of work-life balance in Korea identified by the OECD. The government is attempting to improve the work-life balance of parents by improving public childcare services and incentivizes fathers to take parental leave, but as argued by McDonald (2000) the social values of the family changes rather slowly. However, the context he describes is much in line with the Korean context, of higher gender equality in the labor market than within the households, which then according to McDonald (2000) would be the reason for the very low fertility level in Korea and the dilemma between family or career is what is experienced by the Sampo Generation. If the theory of Anderson & Kohler (2015) holds, the very low fertility could generate greater gender equality in Korea. The efforts of the Korean government to incentivize fathers to take greater responsibility for their children, is ultimately to increase the fertility rate by enhancing household gender equality.

Moreover, as discussed in the previous chapter, a motherhood penalty exists even in largely gender equal Sweden and Denmark, indicating that greater household gender equality can only partly remedy the effect of motherhood on labor market outcomes. So far, the Korean government has made little attempt to improve labor market flexibility, as suggested by Goldin (2014), to reduce the labor market penalties of mothers choosing part-time employment.

## 3.5 Hypotheses

### 3.5.1 Main Hypotheses

Given the child and motherhood penalties found in the U.S. and in Europe and the higher degree of gender inequality in Korea, it is expected that children have a negative impact on labor market outcomes of Korean women, i.e. that there are child penalties for women, and that these are larger than in the U.S. and in Europe (hypothesis a). Children are expected to increase the gender pay gap in Korea, indicating there is a motherhood penalty (hypothesis b). Moreover, these penalties are not expected to recover over time, given previous findings and the gender equality orientation in Korea (hypothesis c). Therefore, the general hypotheses for this study are as follows:

a) There are child penalties for Korean women in labor market outcomes and these are larger than those found for the U.S. and for Europe

- b) There are motherhood penalties for Korean women in labor market outcomes, indicating that they are penalized to a greater extent than men for having children
- c) The female child penalties never fully recover to pre-birth levels, even when extending the time period to cover the time when the child starts school

### 3.5.2 Hypotheses Concerning Characteristics of the Parents

The size and degree of recovery over time for the female child penalties are expected to depend upon certain characteristics of the parents and the time period of study. Given the importance of flexibility to reduce motherhood penalties, it is expected that non-wage earners (employers, self-employed, or unpaid family workers) will have lower female child penalties (hypothesis a). Due to the duality of the labor market, and the problem of combining motherhood and work in the primary labor market, high-skilled women are expected to have higher child penalties than other women (hypothesis b). With almost half of the population living in Seoul Metropolitan Region, this study examines whether there is a difference in child penalties of women living in Seoul and of women living elsewhere in Korea, expecting female child penalties to be larger in Seoul, as the labor market in Seoul is expected to be less family-friendly (hypothesis c). As suggested by previous research, female child penalties decline over cohorts, which is expected also for Korea, given the expansion of social policies (hypothesis d). Female child penalties are expected to increase with the number of children in a family, as found by previous research, hence, mothers with only one child are expected to have lower child penalties than mothers with several children (hypothesis e).

- a) Non-wage earners (employers, self-employed, or unpaid family workers) have lower female child penalties, as they are assumed to have greater flexibility of hours worked
- b) The educational level of the parents determine the size of the female child penalties, with high-skilled women having higher penalties
- c) Female child penalties will be higher if the parents live in Seoul Metropolitan Region than elsewhere in Korea
- d) The female child penalties are declining in size over time
- e) Mothers with only one child will have smaller child penalties than mothers with several children

## 4 Methodology

### 4.1 Korean Labor and Income Panel Study

The analysis of this study is based on survey data from the Korean Labor & Income Panel Study (n.y.), hereafter KLIPS. It is a longitudinal survey of labor outcomes and incomes, conducted annually of a representative sample of Korean households within urban areas, collected by the Center for Labor Statistics Research, Korea Labor Institute, with financial support by the Ministry of Employment and Labor. Originally, it covered 5,000 households, measuring household characteristics as well as individual information about labor market activities, such as income and education, of household members above 15 years of age. The first year of the survey was 1998, following the Asian Financial Crisis and was initiated to provide the government with information to improve employment policies. The sampling method used was a two-stage stratified clustering method, first randomly choosing 10% of Korea's enumeration districts, and secondly, randomly choosing 5-6 households within each district, covering 7 metropolitan cities and urban areas in 8 provinces. Individuals living on Jeju Island, in military service, or staying at institutions were not included. Interviews are carried out face-to-face if possible, and if household members are absent, over the phone or through remaining household members. The first wave in 1998, includes 5,000 households and 13,321 individuals. Individuals that married or were born into the original sample of households are added in the survey as they appear, so that the total number of households and individuals expands as household members create their own families or their families increase in size. However, being a panel dataset, a share of households stop responding to the survey each year; the retention rate of the original 5,000 households was 67.9% in the last survey conducted in 2016. Moreover, to maintain the national representativeness, an additional sampling procedure were conducted in 2009 adding 1,415 households to the panel, including households who had moved from rural to urban areas since 1998 and households from Jeju Island, not included in the original sampling. These households were sampled using the same method as the original sample. This study uses individuals from both the original and the additional sample, as long as they are followed for the 8 years around the birth of their first child, as needed for the analysis.

The analysis is based on an event study, following the labor market outcomes of parents two years before, to five years after the birth of their first child, to estimate the child penalties. The labor market outcomes of interest in this study are earnings, hours worked, wage rate, and labor force participation, which will be presented in greater detail in next paragraph. All available waves of KLIPS are included in the study, thus covering a time period from 1998 to 2016. To be able to follow each parent two years before and five years after the birth, the study includes births from 2000 to 2011. Individuals that did not participate in the survey for all the 8 years needed were removed, ending up with 700 individual having their first birth within 2000 to 2011: totally 5,600 observations, of which 51% were women and 49% men.

The variable earnings represent the amount of average monthly pay (in 10,000 KRW). In the dataset there is a distinction made between wage-earners and non-wage earners, with the former referring to individuals who are employed by a firm and the latter to individuals who are employers, self-employed, or unpaid family workers. Hours worked is the regular weekly hours for wage-earners and average weekly work hours for non-wage earners. Thus, the measurement of hours for wage-earners does not take into account overtime. In the survey, there was such a variable, but as it had only about half of the responses, it is not used in the analysis. The wage rate is calculated dividing the earnings by the hours worked, adjusting the hours to be the monthly hours worked. The participation rate is calculated based on the earnings variable, all individuals with earnings are considered to be within the labor force, thus the participation rate refers to both full-time and part-time employees. See Appendix A for mean values of each labor market outcome in the full sample, by year and gender, including also the male-female gender gap of each outcome.

## 4.2 Research Design

### 4.2.1 Event Study

To investigate the impact of children on gender inequality, this study uses an event methodology, with the event being the birth of the first child. As was discussed in the section of empirical evidence, fertility is not exogenous, but depend to a certain degree on the characteristics of the parents. However, the aim of this study is to quantify how the labor market outcomes changes with children, thus the selection into parenthood is of less concern. The advantage of an event study design is that it clearly shows the individual-level changes in the different labor market outcomes around the time of the birth.

Each parent is followed two years before the birth of their first child, and five years after, having  $t = 0$  indicating the year of the birth, and the other years are indexed relative to that year. As mentioned above, the final sample is a balanced sample, only including individuals with data for each year running from  $t = -2$  to  $t = 5$ . However, it is not necessarily that data exists for both parents of a household, but rather from most households there are data for both parents but in some households there are only data from one parent. These parents are included as well, as the analysis does not link couples, but is focused on detecting the differences in the impact of children on mothers and fathers in the labor market. Moreover, no distinction is made between nuclear and single-parent households.

To estimate the impact of first births on labor market outcomes, the following regression will be run separately on men and women:

$$Y_{ist}^g = \sum_{j \neq -1} \alpha_j^g \cdot \mathbf{I}[j = t] + \sum_k \beta_k^g \cdot \mathbf{I}[k = age_{is}] + \sum_y \gamma_y^g \cdot \mathbf{I}[y = s] + v_{ist}^g \quad (1)$$

in which  $Y_{ist}^g$  represents the labor market outcome of interest,  $i$  the individual,  $g$  the gender,  $s$  the year, and  $t$  the event time. The first term on the right-hand side represents event time dummies, omitting  $t = -1$ , so that the reference year is the year before childbirth. The second term is age dummies and the third year dummies, which are included to control for life-cycle trends, such as the varying age at which individuals have children in the former case, and time trends such as inflation and business cycles in the latter case. The equation above is specified in levels rather than in logs, to keep zeros in the data, representing non-participation. Therefore, the results of the regressions are converted into percentages using the following equation:

$$P_t^g \equiv \frac{\hat{\alpha}_t^g}{E[Y_{ist}^g | t]} \quad (2)$$

in which  $\hat{\alpha}_t^g$  is the estimated event coefficient for gender  $g$ , i.e. the mean value of the outcome at event time  $t$ , in relation to the year before childbirth without the effect of year and age dummies, and  $\tilde{Y}_{ist}^g$  is the predicted outcome without the event time dummies, thus only capturing the effect of life-cycle trends and business cycles. Therefore,  $P_t^g$  represents the effect of children at year  $t$ , as a percentage of the counterfactual outcome absent children, which is the child penalty if negative, and a child benefit if positive, as some studies found the effect to be for fathers. To calculate the motherhood penalty, that is the impact of children for mothers in relation to fathers, the following equation will be used:

$$P_t \equiv \frac{\hat{\alpha}_t^m - \hat{\alpha}_t^w}{E[\tilde{Y}_{ist}^w | t]} \quad (3)$$

capturing to which extent women fall behind men in the labor market outcome of interest at event time  $t$ , due to children had at  $t = 0$ . While child penalties will be calculated for all four labor market outcomes, to determine the effect of each one of them, the motherhood penalty will only be calculated for earnings, being the main variable of interest. To establish to what extent the results are statistically significant, a 95% confidence interval will be estimated around each event coefficient. Thus, all coefficients with an interval surrounding zero will be assessed as statically not different from zero, and hence no impact will be concluded.

#### 4.2.2 Sub-samples

To capture the impact of different circumstances, this study will, in addition to estimating the child penalties of the full sample, divide the data into sub-samples and estimate the child penalties depending on some characteristics on the parents or differences in time period. The first sample that will be tested is, however, the full sample, first using only wage-earners and then using both wage-earners and non-wage earners (employers, self-employed, or unpaid family workers). Given the differences in employment flexibility that is likely to exist among the two groups, the initial analysis is carried out solely on the individuals labeled wage-

earners. The sub-sample female non-wage earners is too small to run the analysis on, but to check this group, it is included in the sub-sample wage-earners and the analysis is ran on this two sub-samples together, to see if the results change by adding this group.

The time period of the event study was largely chosen depending on the availability of data, as many households fall out of the survey over time. Thus, with eight years of the study, a sample large enough could be produced, so that the sub-samples described above would all have enough observations. Moreover, as children start school at the age of six, until event time 5 captures the impact of children on labor market outcomes while the child has not yet started school. To capture the effect after the child starts school, the event time has been extended in the last sample, to run from event time -2 to +10, extending it from five years after childbirth to ten years after childbirth. However, in doing so, the sample becomes significantly smaller, due to households dropping out of the survey, with only 305 individuals remaining, 160 women and 145 men, but with the extended time this result in 3965 observations. See Table 4.1 below for a summary of the sample sizes.

The second sub-sample that will be created is regarding education. As suggested in previous research, the educational level of the parents might influence the size of the child penalty. To test for educational level the parents will be divided into three categories depending on the highest level of education completed. The first educational category includes individuals whom have completed lower and upper secondary school; the second category individuals having completed 2-years college, vocational, technical, or associate's degree; and the third category individuals with a 4-years university degree, master's degree, or doctoral degree. The first category will be referred to as individuals with secondary schooling, the second as college graduates, and the third as university graduates, to make the names shorter in the text, but note that these categories represent the educational levels laid out above. One individual in the original sample had only finished elementary school and is not included in these sub-samples. The first sub-sample includes 1640 observations, of which 111 individuals are women and 94 are men; the second sub-sample has 1488 observations, 98 women and 88 men; and the thirds is comprised of 2464 observations, 146 women and 162 men, see Table 4.1 below.

Third, the data will be divided depending on the place of residence of the parents. Given that almost half of the population lives in Seoul Metropolitan Region, the data will be differentiated between individuals living there and those living elsewhere in Korea. Seoul Metropolitan Region, includes the cities of Seoul and Incheon, as well as the region surrounding them, the Gyeonggi Province. People move over time, and to control that all individuals remain in the same sub-sample throughout the event time, the place of residence during the reference year, the year before childbirth, will decide which sample each observation will be in. The information about place of residence is not available for all observations, so that the Seoul sample includes 74 women and 70 men, 1152 observations in total, and the non-Seoul sample includes 123 women and 107 men, 1840 observations in total.

The fourth sub-sample concerns the time period the child is born, to detect whether or not child penalties in the labor market has changed over time. Given that the time period is not

very long to begin with, the sample is only divided in two time periods. The first covers parents with their first child born between 2000 and 2005, and the second time period with first births from 2006 to 2011. The first sub-sample has 2448 observations, of which 167 are women and 139 are men, while the second sub-sample is comprised of 3152 observations, 188 women and 206 men.

The long run child penalties may depend on the parents having more children during the event time, which is then likely to have an additional impact on the results in the long run. Hence, the data will be differentiated depending on whether or not the parents have more children during the event time period. Note that parents in the one-child sample may well have a second child after the event time period is over. As discussed previously, there may be a pre-child effect on labor market outcomes as well as the post-child effect this study is measuring. But as already discussed the pre-child effect should not be very large, and therefore this selection is made to balance the samples out and arrive at fairly equally large sub-samples. The one-child sample includes 149 women and 126 men, arriving at a total of 2200 observations, while the sample with more than one child has 206 women and 219 men, totaling 3400 observations.

*Table 4.1: Number of observations for each sample*

<b>Sample name</b>	<b>Individuals</b>			<b>Observations</b>		
	<b>Women</b>	<b>Men</b>	<b>Total</b>	<b>Women</b>	<b>Men</b>	<b>Total</b>
<b>Full sample</b>	355	345	700	2840	2760	5600
<b>Educational Level</b>						
<i>Secondary Schooling</i>	111	94	205	888	752	1640
<i>2-year Collage</i>	98	88	186	784	704	1488
<i>University Degree</i>	146	162	308	1168	1296	2464
<b>Place of Residence</b>						
<i>Seoul Metropolitan Region</i>	74	70	144	592	560	1152
<i>Korea Excluding Seoul M.R.</i>	123	107	230	984	856	1840
<b>Time of Childbirth</b>						
<i>Childbirth 2000-2005</i>	167	139	306	1336	1112	2448
<i>Childbirth 2006-2011</i>	188	206	394	1504	1648	3152
<b>Number of Children</b>						
<i>One child</i>	149	126	275	1192	1008	2200
<i>More than one child</i>	206	219	425	1648	1752	3400
<b>Time Extension</b>	160	145	305	2080	1885	3965



### 4.3 Validity and Reliability

While the event study analysis is designed to measure the impact of children on labor market outcomes after the child is born, it cannot capture the pre-birth impact of anticipated fertility. Women may choose to invest less into their education and careers with the anticipation of becoming mothers. In fact, Adda, Dustmann & Stevens (2017) find that the cost of having children is a combination of occupational choice into more family-friendly sectors, earnings loss due to reduced working hours and intermittency during childrearing, and loss of skills during maternity leave, of which the occupational choice may have a pre-birth effect. If the pre-birth effect is large, the estimated child penalties would be underestimated. Given the increasing share of women with university degree in Korea, the pre-birth impact is likely to be small or at least decreasing. Moreover, the purpose of this study is to estimate how women are affected in the labor market by childbirth, regardless of her occupational choices prior to the birth.

A fundamental assumption to an event study analysis is that the outcome variable is exogenous to the event, which in this case is the birth (Kleven, Landais & Sogaard, 2018). Given the results presented in the next section there is no indication that there is an effect prior to the birth, given that the major impact on labor market outcomes appears in event time 0, the year of the birth. However, in some cases, the strongest impact of children is in event time 1. This might be due to that children are born at different times of the year; a child born in December in event time 0 will likely affect its parents labor market outcomes the most in event time 1, while a child born in January may have an impact on the parents' labor market outcomes in event time -1, if the mother withdraws from the labor market prior to the birth.

The results are estimated using levels rather than logs to keep the zeros in the data. This might cause the results to be driven disproportionately by the impact at the top of the distribution. Given the sometimes rather small samples, this risk is increased. However, if the analysis would be made in logs, the zeros of non-participation would not be included and they are of the highest importance as the aim of the study is the capture potential labor market withdrawal of women when they have children. Moreover, the estimation of the very long term child penalties might call for a control group to be validated. It would have been interesting to study how the labor market outcomes developed for mothers in comparison with childless women, but the childlessness of individuals was not clear in the data and therefore such an analysis was not performed.

Moreover, the fact that the analysis is tested on survey data also reduces its reliability partially. First, although the Korean Labor Institute assert that the panel dataset is representative for the entire Korean urban population, they also specify that the enlargement of households in 2009 is for the reason of improving the samples representativeness, as households have moved in and out of urban areas, that Jeju Island was not included initially, and that there was a slight bias in favor of the Western part of Korea (Korean Labor & Income Panel Study, n.y.). Second, there is a tendency of incomes being underestimated in survey data, due to self-reporting (Paulus, 2015). Third, survey data often suffer from self-

selection bias, as households choose themselves to participation in the survey or not (ed. Lavrakas, 2008: 807). As already discussed, there may also be a self-selection into parenthood, with parents-to-be having certain characteristics. For instance Lundberg & Rose (2000) find that parents-to-be had lower income than non-parents. Again, this study is focused on the implications in the labor market of childbirth, and less so on the motivations of fertility. Fourth, the results might be biased due to the relatively small share of households within the survey that had their first child within the survey time period, and also by the relatively low number of women with labor market income in the sample. Lastly, the variable hours may be misleading, as it does not capture the overtime hours, but merely the regular weekly hours for employees, which might then not give an accurate picture, given the prevalence of overtime in Korea.

## 5 Analysis and Discussion

This chapter will present the results for the event study of the impact of children on labor market outcomes for men and women. The analysis will be tested on each sample presented in the previous sections to attempt to establish to what extent women are affected in the labor market by having children, and to what extent the characteristics of the mother or the time period under study influence the findings. Two concepts are important to bear in mind when reading this chapter; the child penalty refers to the negative impact of childbirth on labor market outcomes, while the motherhood penalty refers to how much worse off women are in relation to men, if such an effect exists. Both child and motherhood penalties are estimated in relation to the year before childbirth, and controlling for age and time trends. Each figure displaying results includes a 95% confidence interval around the event coefficients, although it is not always clearly visible. Note that the graphs display the difference in labor market outcomes due to having children, as time and age trends are removed, and not the level of the labor market outcomes. Therefore, at the reference year, which is event time -1, the difference is zero, as it is to this “year” all the other results are compared. It does not indicate that the outcomes were at the same level for men and women. All results are also presented in table-form in Appendix B.

### 5.1 Full Sample

Figure 5.1 plots the impact of first childbirths on labor market outcomes, across event time, for the full sample, using only individuals labeled as wage-earners. The first finding that is striking is that there are child penalties for women for all four labor market outcomes, while none for men; instead the earnings and the wage rate both increase in the long run for men, having increased by 10% and 9% respectively five years after childbirth.

The female child penalties have an immediate effect in the year the child is born, to then increase further in the year after childbirth. This could either be due to the effect when returning to the labor market, or be a part of the initial effect as the data does not stipulate at what time of the year the child is born, and the impact in event time 1 will naturally be different for births in January and December. The year after childbirth, female earnings had dropped nearly 43%, in comparison with the year before childbirth. The earnings recover slightly but never converge back to initial levels, so that five years after childbirth are earnings 34% lower than before childbirth. The drop in earnings for mothers is driven by all of the other three labor market outcomes; wages, hours worked, and labor force participation. However, the impact of children appears to be the largest on the hours worked and on the participation rate, thus those outcomes have the largest impact on the changes in earnings. In

the fourth and fifth year, there is a slight recovery in all labor market outcomes, and five years after childbirth is the hours worked by mothers 51% lower than before childbirth, the participation rate 44% lower, and wages 31% lower. Given that the earnings have increase slightly for fathers at five years after childbirth, the long run motherhood penalty for earnings is 55%, thus children contributes to a sizable earnings gap between Korean men and women. Moreover, note that all four labor market outcomes for women are higher two years before childbirth, than the year just before childbirth.

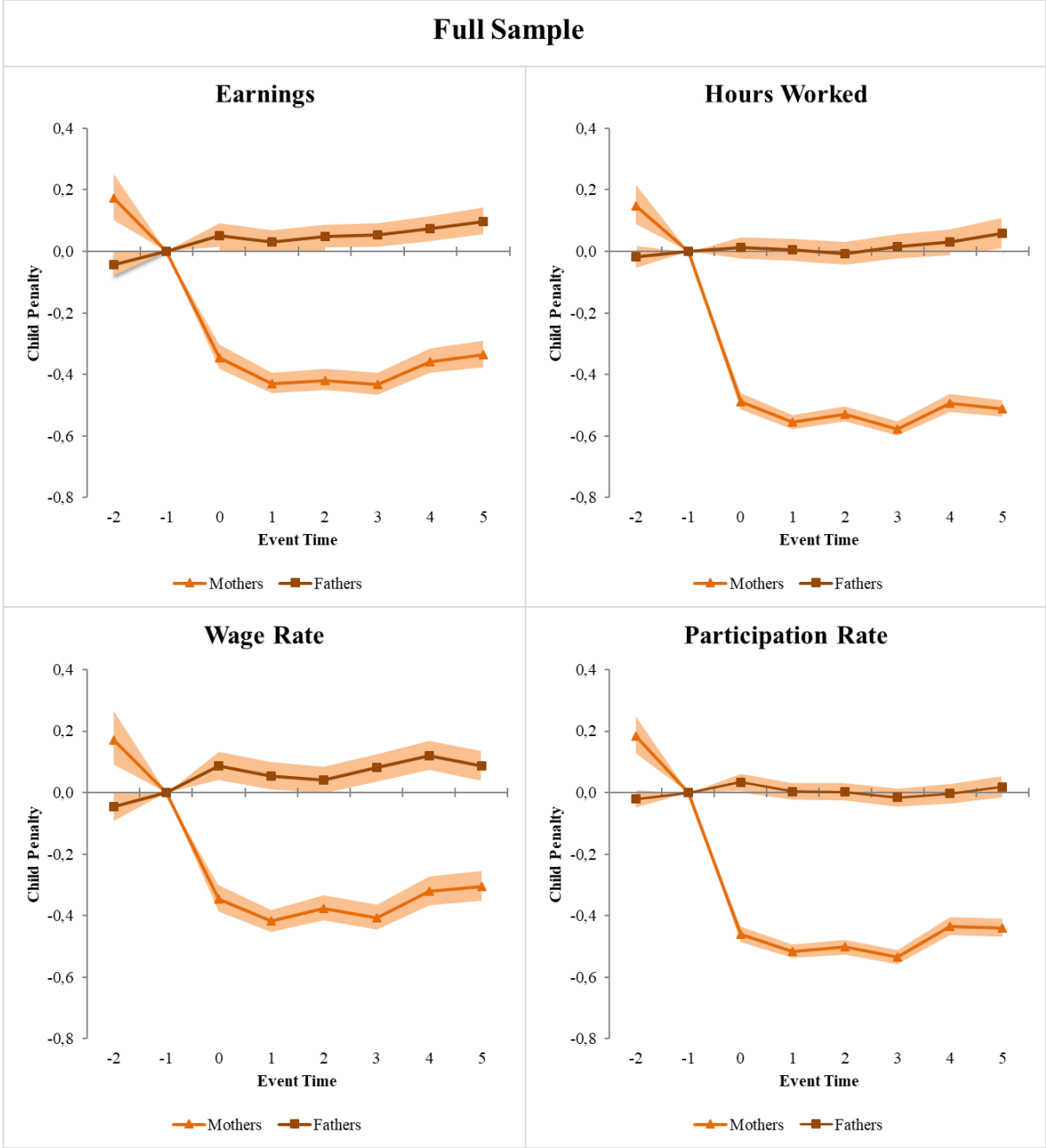


Figure 5.1: Results of the full sample

## 5.2 Including Non-Wage Earners

The second sample to which the analysis is tested, is the combination of wage-earners (employees) and non-wage earners (employers, self-employed, and unpaid family workers). The results can be seen in Figure 5.2. The findings largely follow the same pattern as those for only wage-earners. The main difference is the magnitude of the change, which is slightly smaller for this sample. Female earnings drop 40% to the year after childbirth, and recover to 26% five years after childbirth. The motherhood penalty is also lower, at 45% five years after childbirth, in comparison with 55% for only wage-earners. That the motherhood penalty is smaller is not only due to smaller child penalties for women, but also that the benefit for men is slightly smaller, of 7% for earnings and 8% for wages in the long run.

However, the group non-wage earners is rather arbitrary with three different types of employments, i.e. employers, self-employed, and unpaid family workers, which makes it difficult to distinguish the potential effect each type of employment might have on the child penalties. Would the data have been more detailed, testing each subgroup would have been interesting, if there would have been enough observations to do so. Nevertheless, these results indicate that there are structural differences in the labor market, depending on the type of contract a person holds, as would be expected. To make the results as reliable and generalizable as possible, non-wage earners will not be included in the following sub-samples, as this group clearly operates in a labor market with different characteristics from that of the wage-earners.

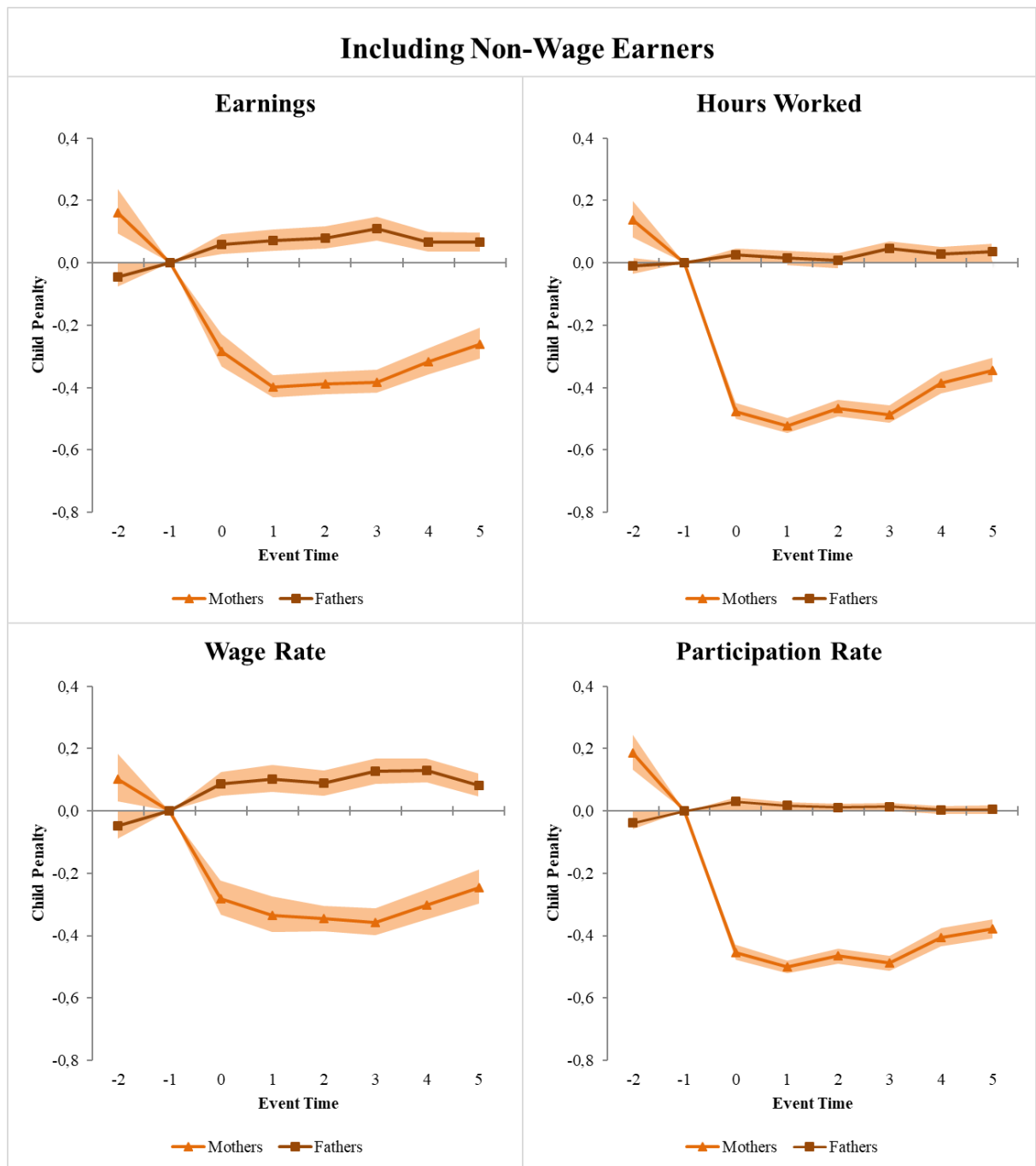


Figure 5.2: Results of the full sample when including non-wage earners

### 5.3 Extended Time Period

To capture potential changes in labor market outcomes when the child begins school, the event time have been extended. The expected recovery in women's earnings over the very long run is absent, instead ten years after childbirth, the women still have a child penalty in earnings of 38%. In the last few years there is a slight recovery of earnings that is driven by a recovery in the participation rate and in the wage rate, ending up around 40% lower than before childbirth. The wage rate recovers slightly from its initial drop of 45% to 35% ten years after childbirth, while the participation rate recovers from 51% to 43%. For hours worked there is a gradual recovery over time, from its initial drop of 58%, but it is still 55% lower ten years after childbirth than before it.

Interestingly, the earnings of men is increasing around event time 7, driven only by an increase in wages, while both the hours worked and the participation rate is decreasing gradually over time. So despite fewer hours worked, men having children increase their wages in the very long run. Therefore, the very long run motherhood penalty is 70%.

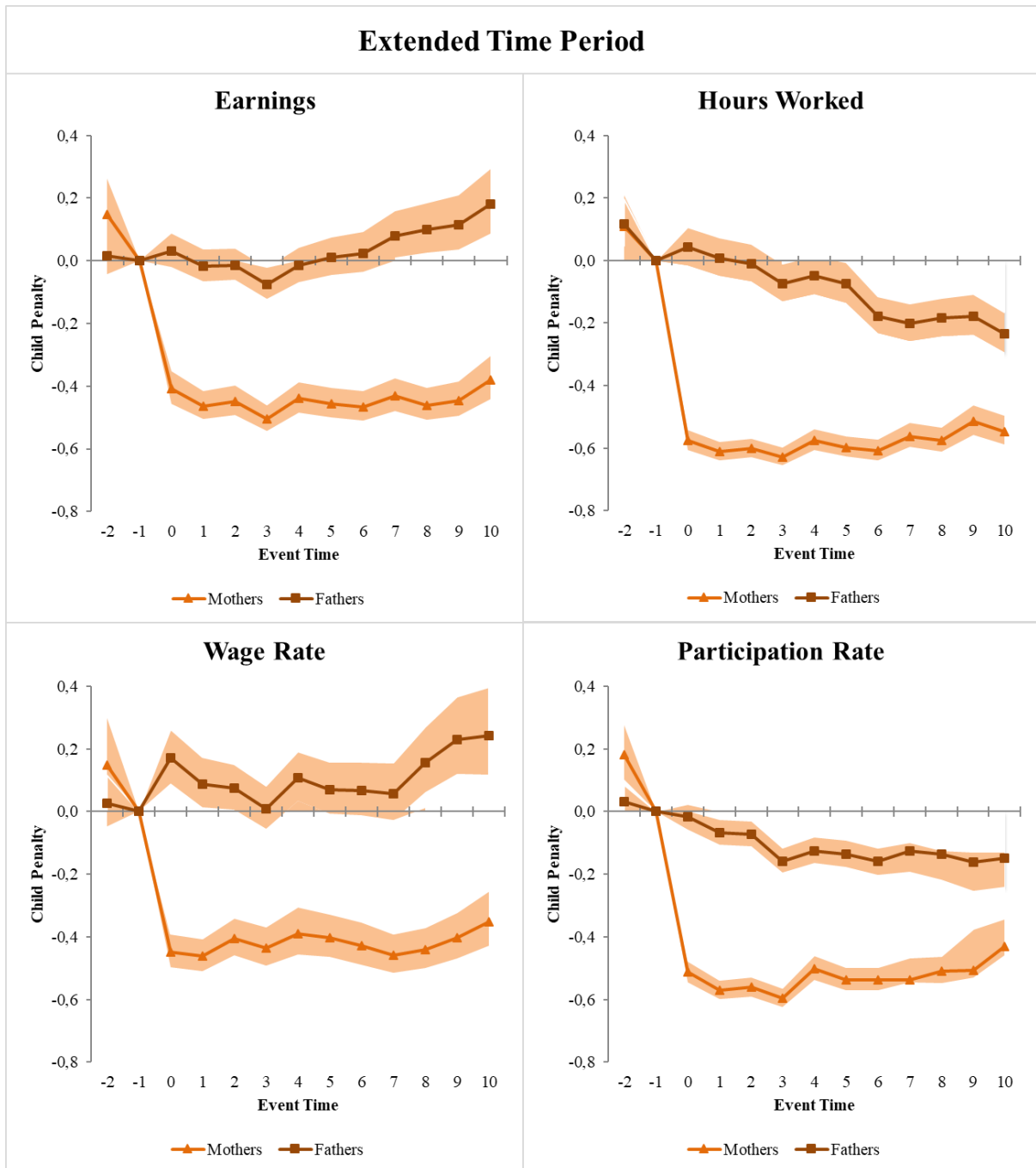


Figure 5.3: Results from the sample of parents in the dataset for an extended period of time



## 5.4 Educational Level

There are large differences in child penalties depending on the level of completed education of the parents. The analysis of child penalties using the three educational samples can be found in Figures 5.3, 5.4, and 5.5 below. Low- and middle-skilled women are punished in the labor market by having children to a greater extent than high-skilled women. The child penalties for earnings are highest for women with secondary and college education, at 49% and 53% respectively the year after childbirth, while at 29% for women with university education. Moreover, these child penalties linger around 40-45% for the low- and middle-skilled women, while the earnings of high-skilled women recover fully to pre-birth levels five years after childbirth. This is due to a combination of a recovery in wages and in participation rate, as the high-skilled women, while still working shorter hours than before childbirth, participate in the labor force to a much greater extent after childbirth than the low- and middle-skilled women.

The results do not only differ for mothers across the educational level, but also for fathers, as low- and middle-skilled fathers appear to benefit the greatest from having children, while high-skilled fathers experience very little benefit. In the long run, the earnings of fathers with secondary education increase 32% and those of fathers with college education increase by 35%, while there is only a 7% increase in earnings for fathers with university education. These increased earnings is driven mostly by an increasing wage, while the hours worked and the participation rate also increases. For low-skilled fathers, the change appears already in the year of childbirth, indicating that it is a response to the reduced labor force participation of the mother.

The motherhood penalties also differ across the educational level, given that both the pattern of the mother and the father differ across the sub-samples. The motherhood penalty is largest for middle-skilled mothers, in comparison with middle-skilled fathers, as the former experience the largest child penalties and the latter the largest benefit from children. The long run motherhood penalty for middle-skilled women is 118%, 107% for low-skilled women and 24% for high-skilled women. Note that the motherhood penalties for this sub-sample relate to the educational background of mothers in relation to fathers with the same education. I do not control for the educational level within households, so the results relate to individuals with a certain educational background within society and is not comparable within households, i.e. the motherhood penalty is not how much a woman is punished in relation to her spouse.

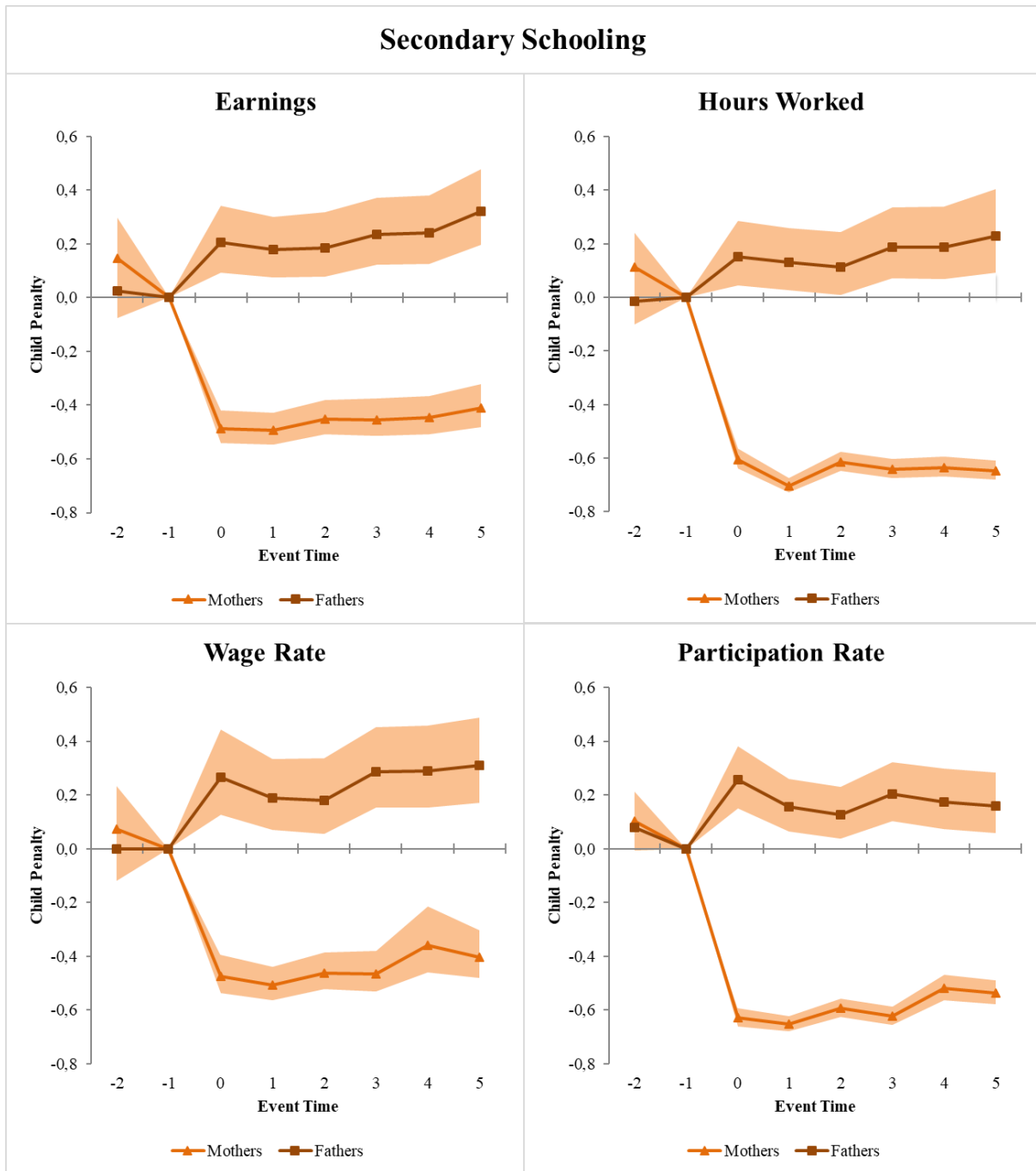


Figure 5.4: Results of educational sample, using individuals with lower or upper secondary schooling

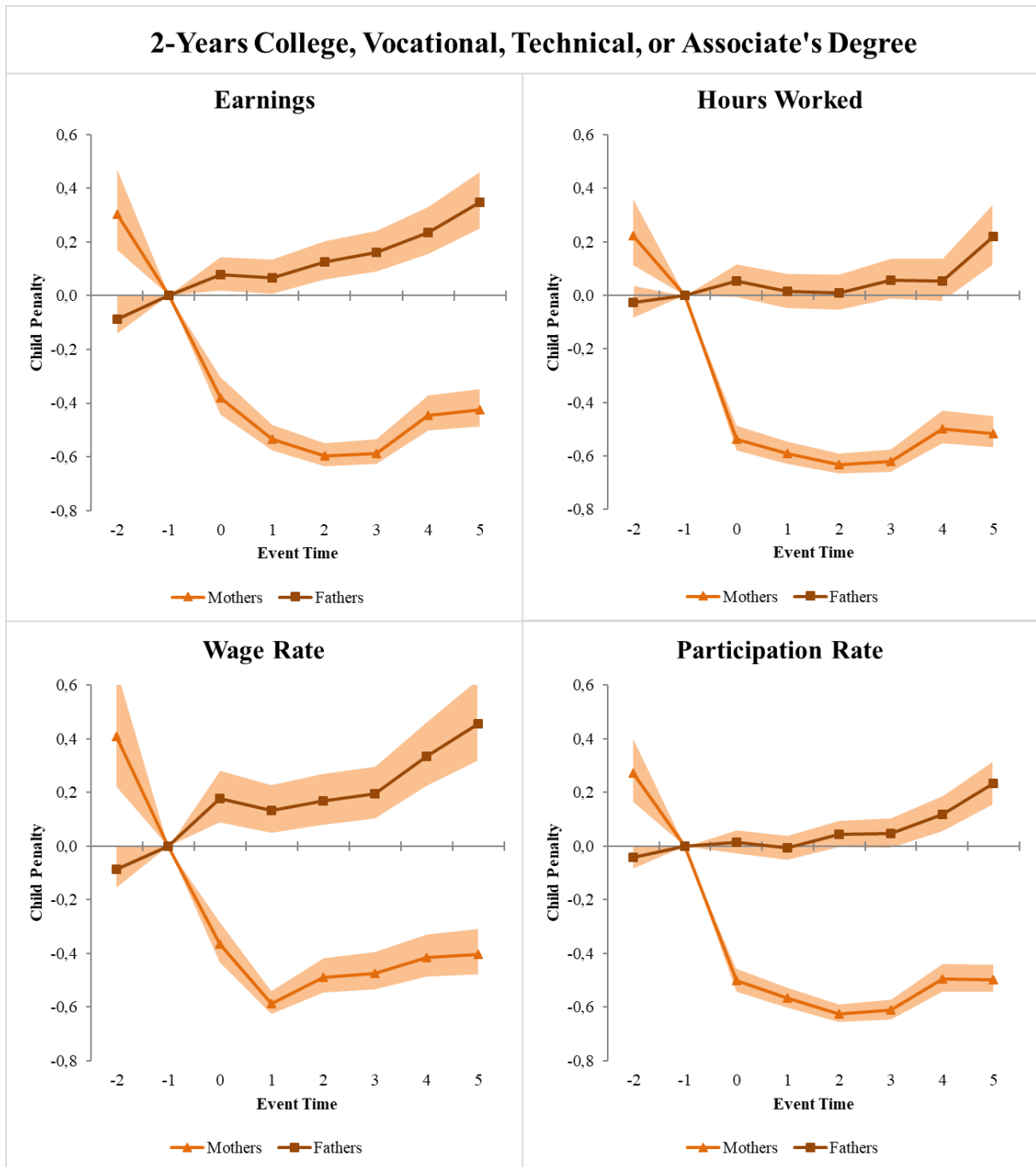


Figure 5.5: Results of educational sample, using individuals with 2-years college, vocational, technical, or associate degree

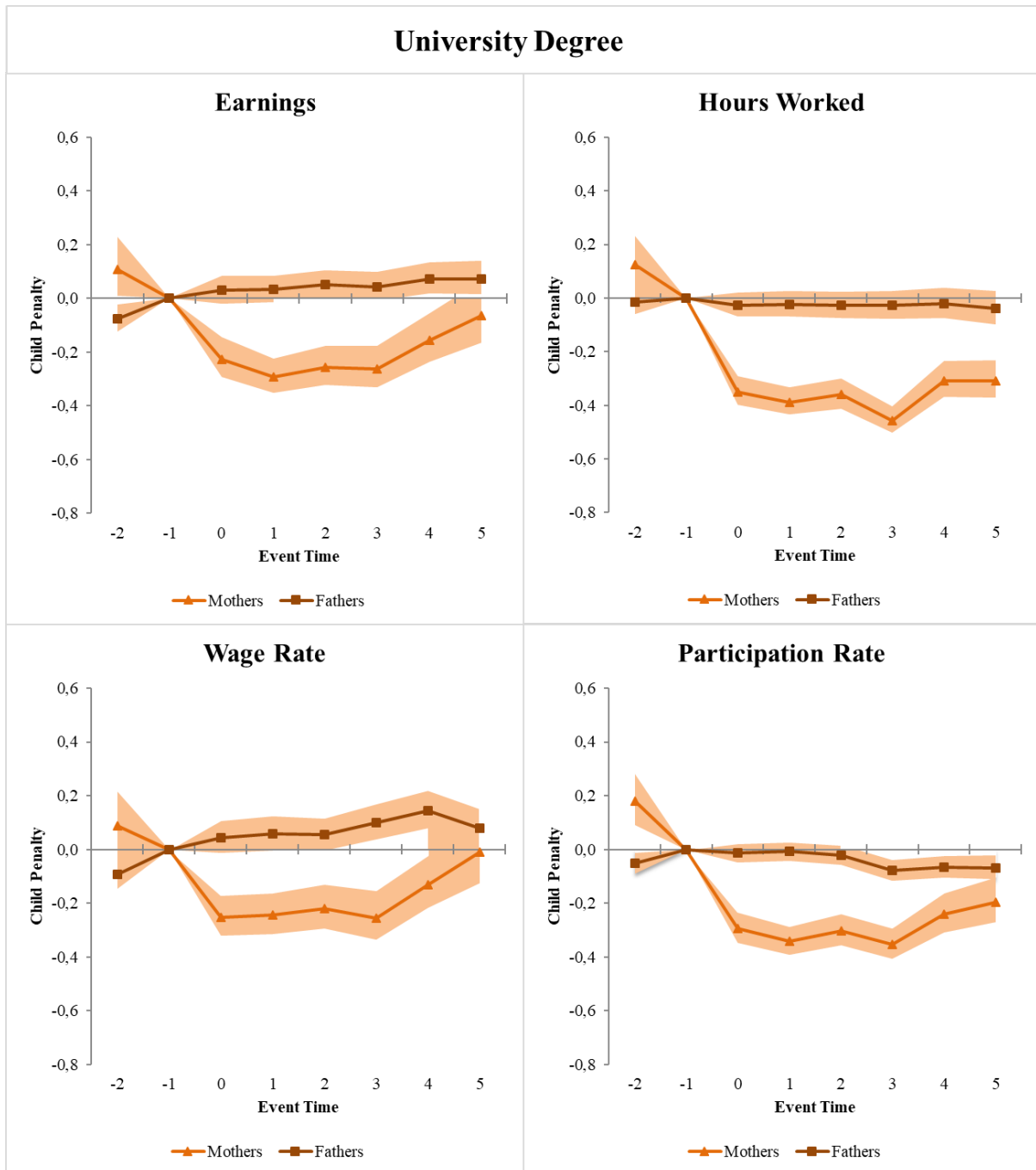


Figure 5.6: Results of educational sample, using individuals with university degree (4 years or more), graduate school (master's degree), or graduate school (doctoral degree)

## 5.5 Place of Residence

As already mentioned, Korea is a highly urbanized country with 46.1% of the population living in the Seoul Metropolitan Region. Being the capital and the largest city, it is possible that the labor market and the way of life differs from the rest of the country, and thus also the impact of children on labor market outcomes. The results from the regional sub-samples are found in Figures 5.6 and 5.7 below.

While there are only slight differences in the child penalties for women living in Seoul Metropolitan Region, hereafter Seoul, and those living elsewhere, there are greater differences among the men. The female child penalties for earnings were 50% in Seoul and 47% elsewhere in Korea the year after childbirth. In Seoul this child penalty recovers moderately to 42% in the long run, while it deteriorates to 51% in Korea outside Seoul. The child penalty in earnings is driven almost equally by changes in the wage rate, hours worked, and participation rate. The greatest difference among the two groups is that the wage rate recovers partially for women residing in Seoul, ending up at a wage penalty of 34% five years after childbirth, while not at all for women residing elsewhere in Korea, as it deteriorates to 51% at event time 5.

However, the greatest difference between the capital and the rest of the country is the impact of children on the fathers. While fathers in Seoul benefit from having children in the long run, with earnings having increased 16% five years after child birth, the earnings of fathers elsewhere in Korea is lower or unchanged five years after childbirth. There is in fact a child penalty for men in Korea excluding Seoul in event time 2-4, which is statistically significant, although moderate in comparison with child penalties of women, around 10% of earnings. The hours worked and participation rate is largely unchanged for men in Seoul, while it decreases over time for men outside Seoul. Moreover, the wage rate of fathers in Seoul increases immediately with childbirth, and additionally over time. While there is also an initial increase in the wage rate for men outside Seoul, it is then reduced to linger around the same level as the year before childbirth.

Despite the fact that the child penalty for earnings recovers slightly over time for women in Seoul, while it deteriorates elsewhere, the motherhood penalty is much larger for women in Seoul than elsewhere in Korea, largely due to that men in Seoul benefits from having children. The motherhood penalty is 75% in Seoul and 42% outside Seoul.

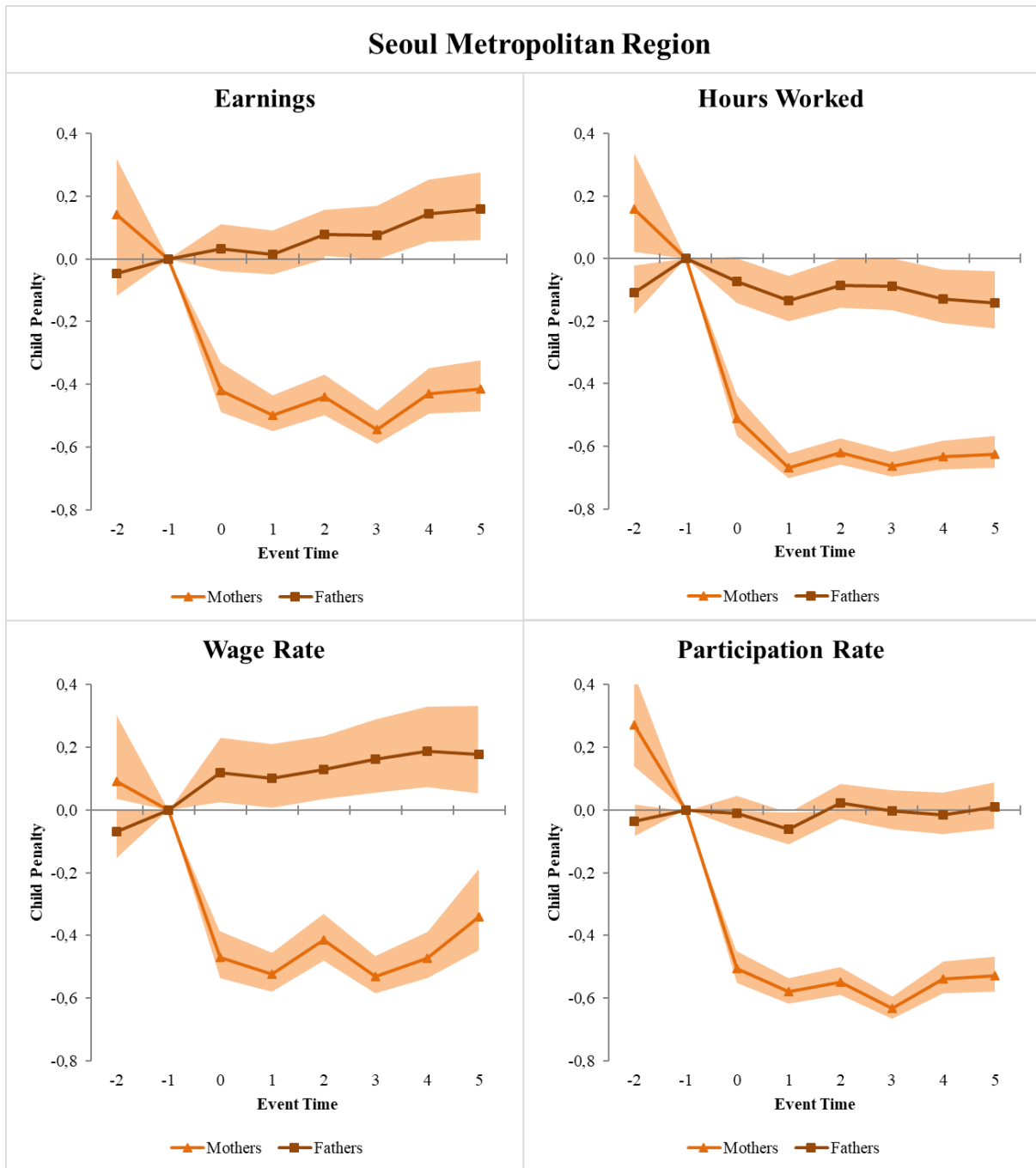


Figure 5.7: Results of the regional sample, using individuals residing in Seoul Metropolitan Region the year before childbirth

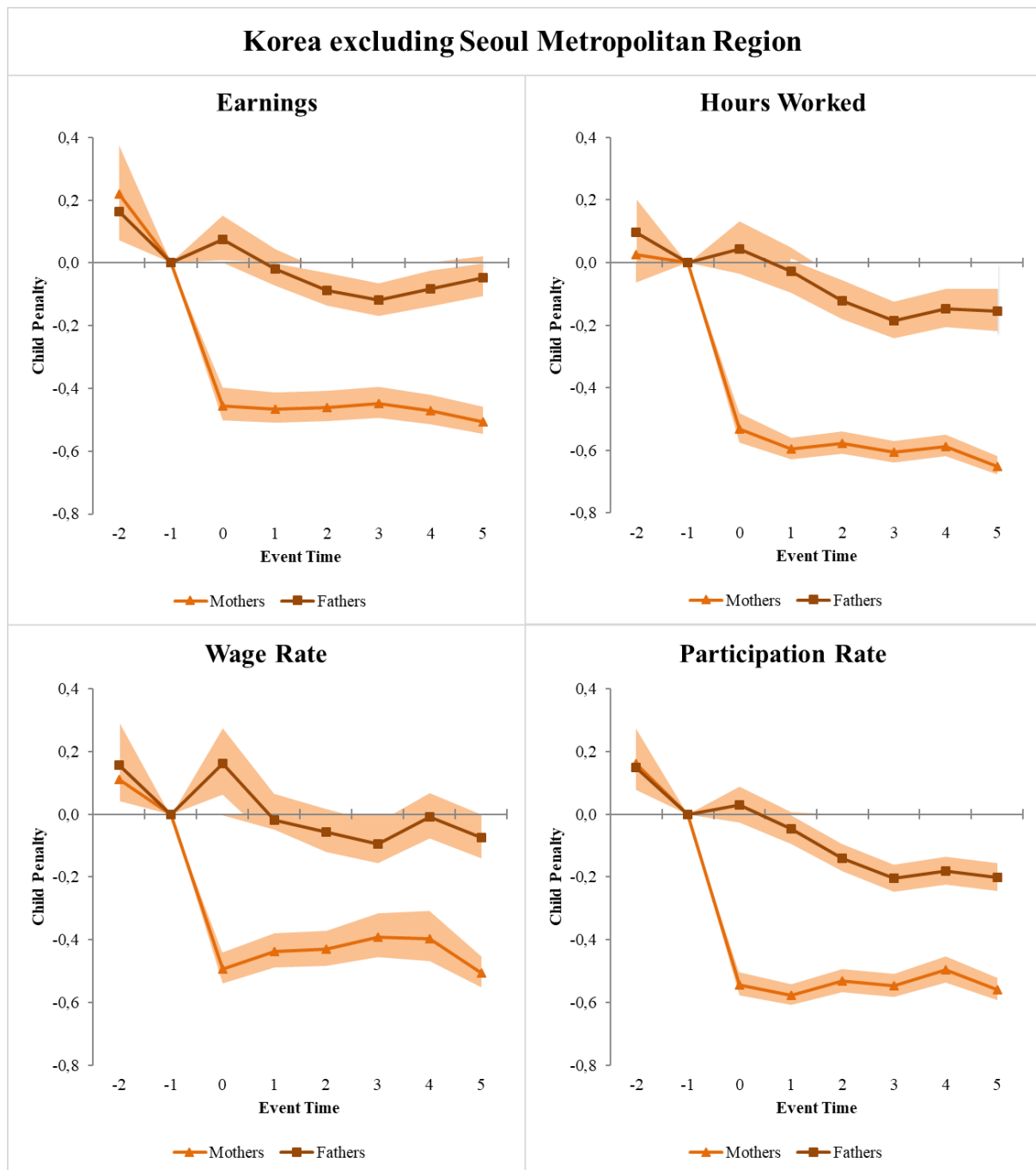


Figure 5.8: Results of the regional sample, using individuals residing outside Seoul Metropolitan Region the year before childbirth

## 5.6 Time Period of Childbirth

When dividing the sample into two different time periods, the results are quite divergent and can be seen in Figures 5.8 and 5.9, below. For the first time period, including births between 2000 and 2005, there is not only a child penalty for women, but also one for men. Men appear to be punished especially in the long run, as there is not initial effect, but at five years after childbirth, their earnings are 11% lower than the year before childbirth. The male child penalty is driven by reductions in hours worked and participation rate, while the reduction in wage rate over time is not statistically significant. Similar to previous samples, the wage rate for men actually increases at the time of childbirth, to then fall back. The child penalty in earnings for women is initially 49% and deteriorates over time, to be 52% five years after childbirth. The child penalty is driven mostly by reduced working hours, but also by reduced participation and wage rates.

Studying instead the sample of births between 2006 and 2011, the results are quite different, as the child penalties for women are much smaller and there is no child penalties for men, but instead a slight benefit over time. The child penalty for women is at 25% for earning the year of the birth, recovering to 19% in event time 5, mainly driven by a recovery in the wage rate. In fact, in this sample the wage child penalty for women is not statistically different from zero five years after childbirth, indicating a near full recovery of wages. For hours worked and participation rate there is little recovery over time. Initially, children have little impact on the men in this time sample, but around event time 3, there is a positive impact on earnings, mainly driven by increasing wages and hours worked. Five years after childbirth, the earnings for men are 14% higher than the year before childbirth.

In the first time sample children creates a gender earnings gap of 29% in the long run, and a gender earnings gap of 53% in the second sample. The lower motherhood penalty in the first sample is largely driven by the fact that there is also a male child penalty, even though the female child penalty is also quite large.



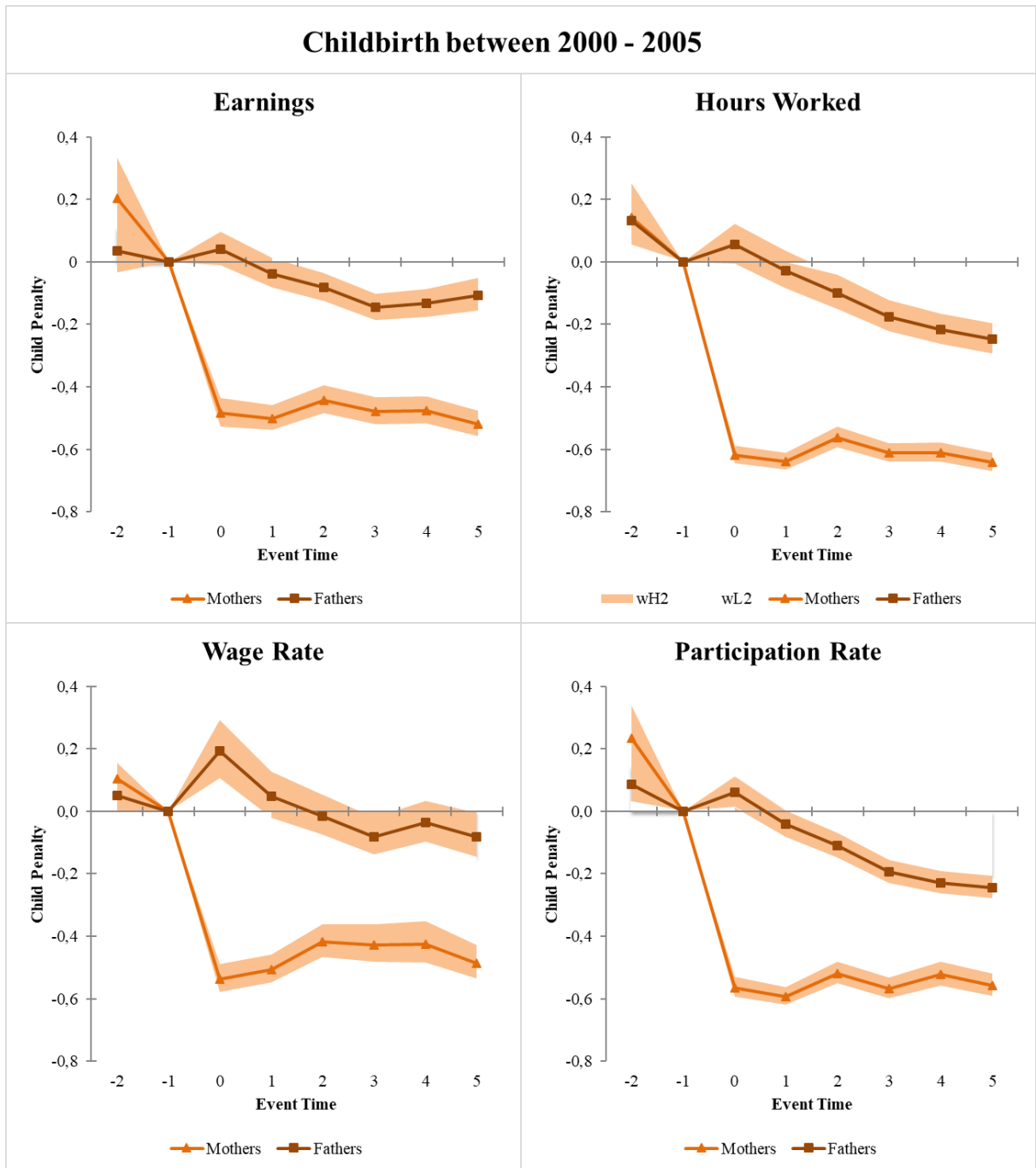


Figure 5.9: Results from the first time sample, of parents with children born in 2000-2005

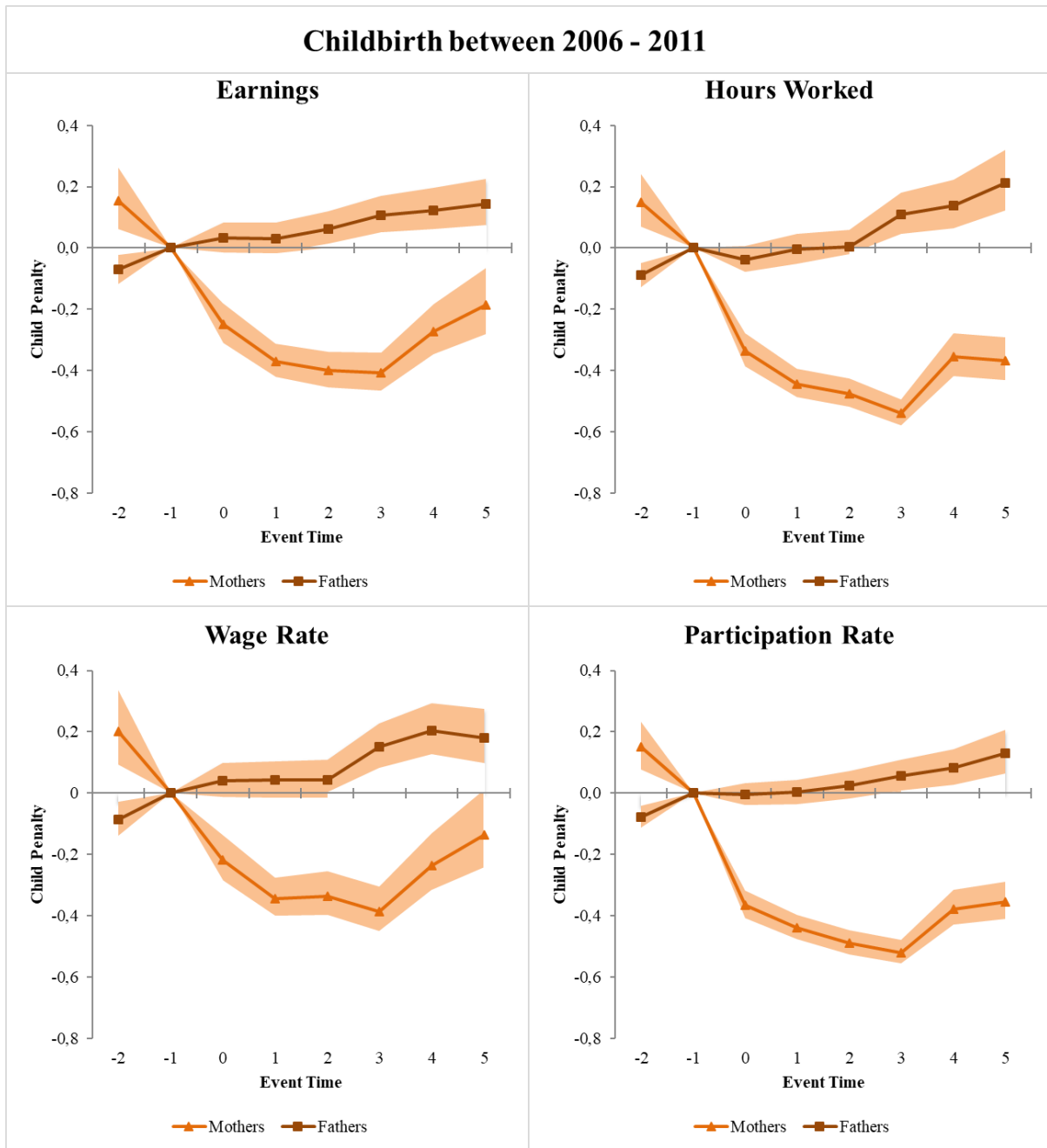


Figure 5.10: Results from the second time sample, of parents with children born in 2006-2011

## 5.7 Number of Children during Event Time

Given the design of the study, the long run child penalties might capture the effect of additional children, which is why single-child households are of specific interest. Figure 5.10 presents the results of the analysis for parents with only one child during the entire event time, and Figure 5.11 presents the results for parents having several children during the period of the study.

While the one-child mothers have slightly smaller child penalties, than mothers of several children, they do not recover over time as expected. The year after childbirth, one-child mothers' earnings have decreased by 38%, recovering slightly to 31% five years after childbirth. Earnings for mothers of several children are reduced by 47% in the year after childbirth, recovering to 35% over time. For both groups of women the impact of children on earnings is mostly driven by reduced hours worked and participation rate, but also by reduced wages.

There are greater differences for men across the samples, as one-child fathers benefit from having children, both initially and over time. Initially, these men increase their earnings by 17% compared to the year before childbirth, increasing to 30 % over time. This is driven by a combination of increasing wage rate, more hours worked, and high participation rate. For fathers with several children, there is no change in earnings and wage rate, and the hours worked and participation rate are both reduced with children. Given the large benefit of fathers in the one-child sample, the long run motherhood penalty for women with only one child is much larger than for women with several children, at 82% for the former compared to 37% for the latter.

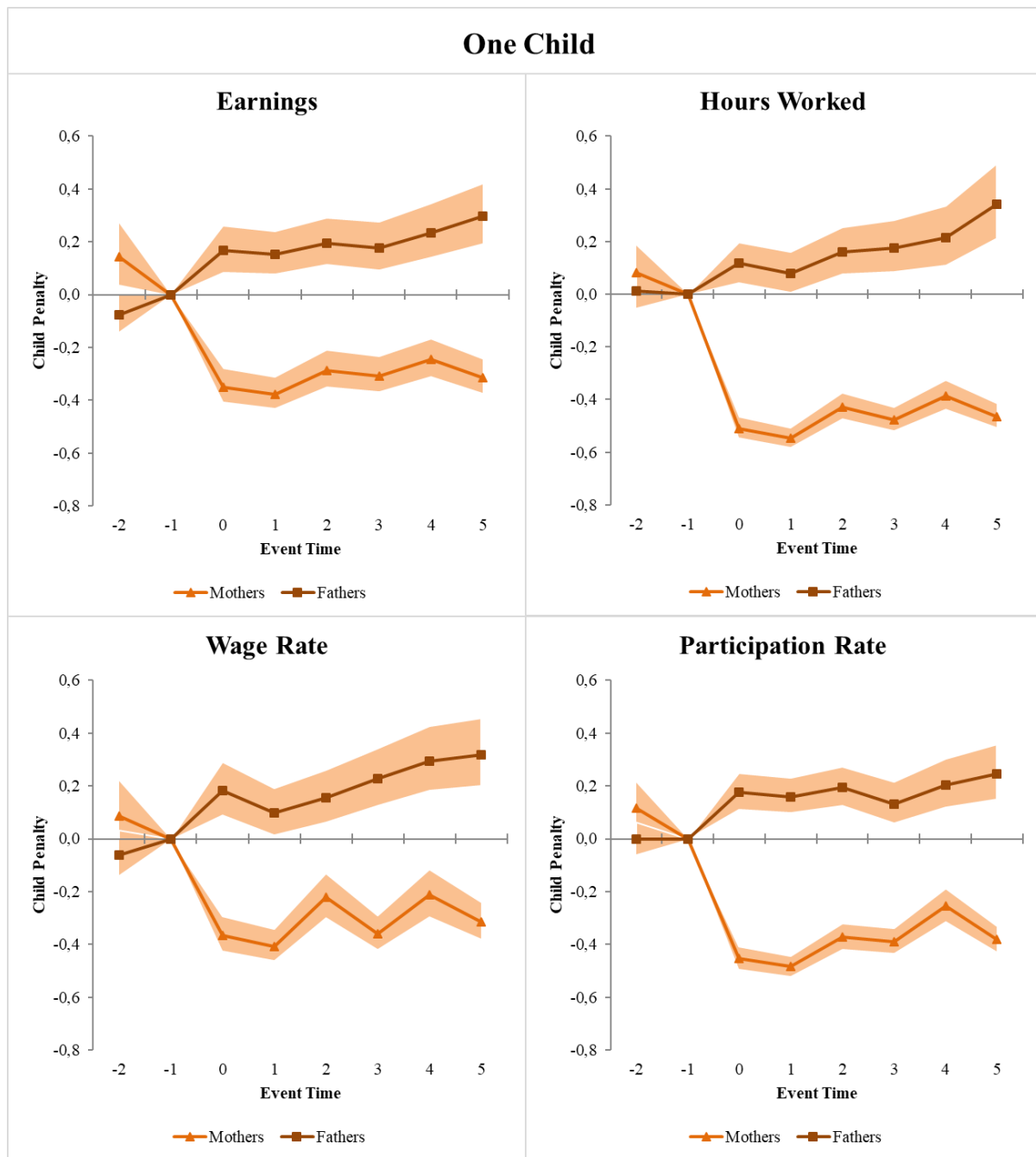


Figure 5.11: Results from the sample of parents with only one child throughout the event time

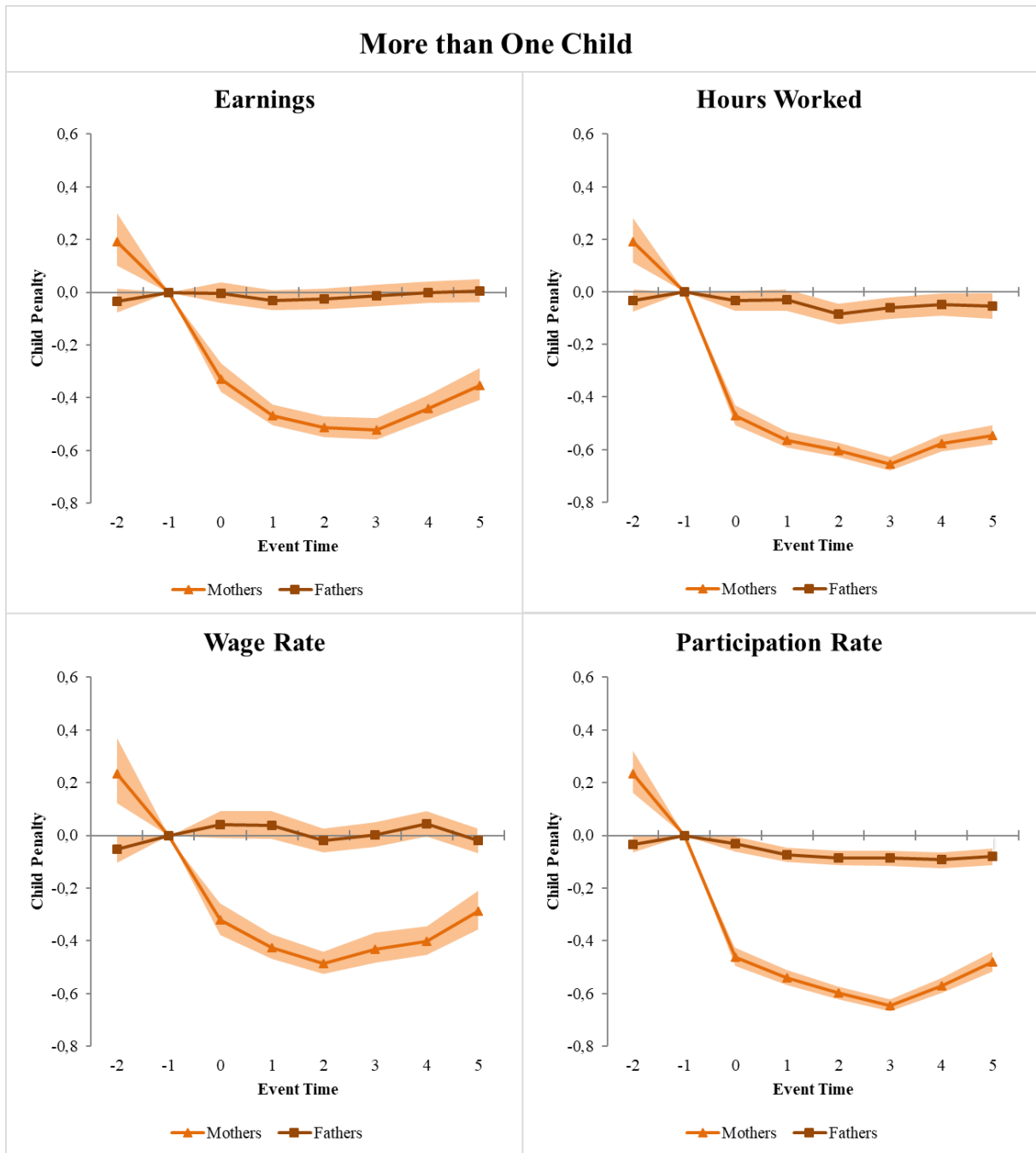


Figure 5.12: Results from the sample of parents with several children born throughout the event time

## 5.8 Discussion

### 5.8.1 General Findings

Estimating child penalties for men and women on the full sample, this study finds that there are both female child penalties and motherhood penalties, as only women are penalized in the labor market for having children, but not men. Thus, children increase the gender pay gap, which is in line with the first and second hypotheses. The year after childbirth were female earnings 43% lower than the before having children, which recovered slightly to 34% five years after childbirth. Having children increases the gender pay gap by 55% five years after the child is born. Although the child penalties for women decline over time, they never converge back to the levels before children, confirming the third hypothesis.

The child penalty for earnings of Korean women is significantly larger than those found for women in the U.S. and in Europe, which were around 5-10% in general (see for instance Budig & England (2001) for the U.S., and Fernández-Kranz, Lacuesta & Rodríguez-Planas (2013) for Spain). They were also higher than those found in Denmark using the same methodology, which were around 30% initially, declining to 20% over time (Kleven, Landais & Søgaaard, 2018). That female child penalties are higher in Korea than in the U.S. and in Europe was largely expected, given the higher degree of gender inequality in Korea, compared to other OECD-countries. However, it is more surprising that the wages of Korean women recover partially over time, by 10 percentage points after 10 years, while wages in largely gender equal Sweden and Denmark deteriorates over time (Angelov, Johansson & Lindahl, 2016; Kleven, Landais & Søgaaard, 2018). Given the finding of Kleven, Landais & Søgaaard (2018) that the child penalties increase with each child, the very low fertility of Korea might perhaps be an explanation, that each woman in general has fewer children, and thus over time her wage rate is not as affected. However, falling child penalties that failed to converge back to previous levels were found in Germany and Spain (Fernández-Kranz, Lacuesta & Rodríguez-Planas, 2013; Fitzenberger, Sommerfeld & Steffes, 2013), which then is in line with the findings of this study. That female earnings never converge back to initial levels is in line with research suggesting that the loss of experience during parental leave can never be restored (Lundberg & Rose, 2000) and with research arguing that mothers seek improved work-life balance by switching to more family-friendly sectors (Angelov, Johansson & Lindahl, 2016). Moreover, in the sample of extended time, men experience a long run positive impact on their wages and earnings, which is not in line with previous studies that either found no impact on the earnings of the fathers, or only an immediate positive impact (Angelov, Johansson & Lindahl, 2016; Kleven, Landais & Søgaaard, 2018; Lundberg & Rose, 2000).

Another point to make is that all four labor market outcomes are higher two years before the birth, than the year before the birth. This might be due to an anticipation of children by the mothers-to-be, whom then adjust their labor market activities accordingly. This is a likely explanation as the largest difference is for the participation rate and the lowest for the wage

rate, which would suggest that the drop is voluntary, rather than driven by external factors in the labor market. Another implication for the decreased labor force participation could be that women might be more inclined to start a family if they become unemployed, given the labor market sacrifice is no longer present, which was shown by Hammarström (1996) on young women in Sweden. Given the high youth unemployment, this could be the case also for Korea.

### 5.8.2 Non-wage Earners

Running the analysis on wage-earners as well as non-wage earners (employers, self-employed, or unpaid family workers), the size of the child and motherhood penalties are reduced, which is in line with the expectations and previous research. These people are assumed to have greater flexibility in their work life, which, according to Goldin (2014), is essential to make labor market employment compatible with motherhood. However, these findings are not very certain, given the small amount of individuals with non-wage earnings.

### 5.8.3 Educational Level

The findings for educational level of the mother are not in line with the expectations. Given the country context of women struggling to return to their jobs in the primary labor market after childbirth, it was expected that high-skilled women would to a greater extent be forced to switch to more family-friendly jobs in the secondary labor market, with reduced wages and job security as a result. On the contrary, women with university education have much smaller child penalties than women with secondary or college education.

This is, however, in line with previous research (Anderson, Binder & Krause, 2003; Fitzenberger, Sommerfeld & Steffes, 2013) and with the flexibility-hypothesis discussed above. High-skilled women are more likely to work in sectors in which they may choose their working hours to a greater extent, and thus it may be easier for them to combine motherhood with labor force participation. However, this could also be due to that high-skilled women value their career to a greater extent, given that they have invested more into their education and therefore ensure their return to the labor market, and does not switch to family-friendly sectors to the same extent as other women.

Moreover, it was found that children have a positive impact on earnings and wages for low- and middle-skilled fathers, while close to no impact for high-skilled fathers, making the motherhood penalty much larger for low- and middle-skilled women than for high-skilled women. This could be due that the fathers are forced to increase their earnings given the child penalty of their spouse, which was found by Lundberg & Rose (2000), assuming that spouses have fairly similar level of education. This is a likely explanation in the Korean context given the high cost of having children, thus, the fathers must increase their incomes as a consequence of the reduced incomes of the mothers.

#### 5.8.4 Place of residence

Testing the differences in child and motherhood penalties among people residing in Seoul Metropolitan Region and elsewhere in Korea, it is found that while the child penalties for female earnings are similar, they recover moderately only in Seoul. Moreover, the largest difference between Seoul and the rest of the country is that the earnings and wages of fathers in Seoul increase with children, while they are largely unchanged elsewhere in Korea. This indicates that the labor markets of Seoul and the rest of the country are significantly different. However, it is rather unexpected that the child penalties are larger outside Seoul, as it was expected that life in the capital would be less compatible with children. This might be due to that people in Seoul have adapted and have fewer children than those outside Seoul.

#### 5.8.5 Time Period of Childbirth

Studying the child penalties for both men and women across different cohorts, both the pattern and the size of the child penalties change. The child penalties are much larger for women with children born in 2000-2005. In this time period, there is a child penalty also for men. For individuals with children born in 2006-2011, the female child penalty is much lower than for the earlier cohorts, initially at 25% compared to 49% for the earlier cohorts. There is no male child penalty in the second time period, instead in the long run; all four labor market outcomes increase due to children for men. Thus, over time the child penalties for women on labor market outcomes are significantly reduced, in accordance with findings from Germany (Fitzenberger, Sommerfeld & Steffes, 2013), and the child penalties for men becomes a child benefit.

The change in child penalties over time might be due to the extensive changes in parental leave and provision of childcare in Korea: the paid maternity leave was extended in 2002, while paternity leave was introduced in 2008, and the childcare enrollment of children under the age of five increased significantly between 2000 and 2014. These policy changes have likely improved the work-life balance of parents, as the former incentivizes fathers to take an increasing responsibility for children and household duties, and the latter makes motherhood more compatible with labor force participation. The policy changes were aimed at increasing the fertility rate, although they would do so through increased gender equality. Therefore, it is in accordance with the argument made by Anderson & Kohler (2015) that a very low fertility rate may be the cause of increased gender equality. If succeeding, the fertility rate would in the future increase as gender equality increases in the Korean society. The finding that child penalties decrease over cohorts suggests that greater gender equality is on the rise in Korea.

Moreover, given that child penalties for men turn into an advantage in the labor market over time suggest that there might be an attitude change towards the role of a father. Perhaps, fathers are viewed in a more positive light on the Korean labor market over time, similar to the perception of fathers as more competent than other men on the American labor market (Correll, Benard & Paik, 2007).



### 5.8.6 Number of Children

In accordance with the hypothesis and previous research from Denmark (Kleven, Landais & Sogaard, 2018), the child penalties for women with only one child are smaller, although only moderately smaller. It is surprising that the earnings of these women do not converge back to a greater extent to previous levels. Instead, it is found that fathers of one child benefit of having children, generating a large motherhood penalty for these women. However, with several children there might be an increasing need for fathers to participate in childrearing and housework, affecting their labor market outcomes negatively.

## 6 Conclusion

The fertility decline in Korea has been one of the most rapid in the world, and fertility is currently at the lowest level of the OECD. Gender equity theory links the very low fertility of countries such as Korea to the relatively high gender inequality; the gender pay gap in Korea is the highest in the OECD. The growing literature presenting motherhood as the main explanation to labor market gender inequality further proves the link between fertility and gender equality. In Korea, there is a phenomenon called the Sampo Generation, women neglecting dating, marriage, and children to focus on themselves and their careers. As stipulated by the gender equity theory, if household gender inequality is high in relation to labor market gender inequality, a growing share of women will neglect family life over having a career, just as in Korea.

By using an event methodology to capture the impact of children on labor market outcomes, this study shows that the Sampo Generation is, in fact, making a relevant choice, as the child penalties for mothers in the labor market are large. Having children increase the gender pay gap by 55% for Korean women in the long run, and women are never able to catch up with their pre-birth earnings or wages, although a slight recovery is visible over time. The child penalties are lower for women with more flexible work hours, for women with higher education, and women residing in Seoul Metropolitan Region.

Moreover, the child penalties for mothers are declining in size over time, indicating that the policy changes taking place during the time period of the study has an impact. The results of this study indicate that expanding the parental leave, including incentivizing fathers to take advantage of it, and expanding the provision of childcare reduce the size of the negative impact children has on the labor market for mothers. The aim of these policies was ultimately to increase fertility, so the question remains if, as a second step, women will respond to the reduced child penalties with increased fertility. Nevertheless, the hypothesis by Anderson, Binder & Krause (2003) that very low fertility can generate policies improving gender equality can already be confirmed. To further improve the work-life balance for mothers, it is suggested that the government attempts to improve the flexibility in the labor market, to make jobs in the primary labor market more compatible with motherhood. Initially, this could entail policies aimed at reducing the amount of overtime for full-time employees, and making it more socially acceptable to take part-time parental leave in highly competitive jobs in the primary labor market.

This study set out to answer whether or not the glass ceiling is in fact a motherhood ceiling. Given the size and the persistence of the impact of children on the labor market outcomes of women, it can be concluded that, partially yes, the glass ceiling is a motherhood ceiling. However, given that the analysis comparing mothers to childless women could not be performed, the study cannot say what the earnings of women without children are. It can be assumed that as long as women “behave as men” in the labor market, their incomes are

largely similar, as suggested by Venable (2002). Nevertheless, the concept of the glass ceiling also includes representation, and Korea has very few women in legislative and ministerial positions, although they recently had their first female president. It is likely that if Korea manages to break their motherhood ceiling, there is still another glass ceiling above it.

The impact of children on labor market outcomes in Korea has not been assessed before, so this study supplement the large literature on child penalties in the U.S. and in Europe, by studying a new country, in another continent. Given the cultural similarities, as well as similar levels of fertility and gender inequality, it is likely that the impact of children on the labor market is similar for women in Japan. To a certain degree the implications are probable similar also in Southern Europe, given that they also have very low fertility rates and high gender inequality.

Future research on the topic to complement this study would include comparing the labor market outcomes of mother and childless women, and also of fathers and childless men, to capture the full impact of children. Further, a larger sample would be desirable both to support the findings of this study, and to enable greater sub-sampling.

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# Appendix A: Descriptive Statistics

<b>Data Description</b>		<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
<b>Women</b>	Earnings	97	77	46	101	108	124	136	148	157	179
	Hours Worked	46.5	46.6	89.1	45.5	44.3	44.2	45.4	43.1	43.9	43.4
	Wage Rate	0.45	0.38	0.12	2.39	2.61	3.13	3.18	4.11	3.80	4.41
	Participation	0.68	0.59	0.40	0.35	0.45	0.37	0.35	0.37	0.36	0.63
<b>Men</b>	Earnings	116	118	51	146	164	180	198	215	227	235
	Hours Worked	53.3	51.0	121.2	49.0	50.7	50.5	49.2	47.5	47.3	46.9
	Wage Rate	0.52	0.53	0.10	3.40	3.42	3.73	4.28	4.80	5.19	5.36
	Participation	0.61	0.77	0.68	0.78	0.78	0.79	0.79	0.79	0.83	0.83
<b>Gender Gap</b>	Earnings	0.83	0.65	0.89	0.69	0.66	0.69	0.69	0.69	0.69	0.76
	Hours Worked	0.87	0.91	0.73	0.93	0.87	0.87	0.92	0.91	0.93	0.93
	Wage Rate	0.87	0.72	1.00	0.70	0.76	0.84	0.74	0.86	0.73	0.82
	Participation	1.11	0.77	0.59	0.45	0.57	0.47	0.44	0.47	0.43	0.77

<b>Data Description</b>		<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>
<b>Women</b>	Earnings	188	185	182	200	211	205	203	222	193
	Hours Worked	42.9	43.7	41.7	41.4	40.8	38.4	40.5	37.0	38.8
	Wage Rate	4.71	4.46	4.53	5.06	5.54	5.55	5.44	6.19	5.01
	Participation	0.25	0.41	0.42	0.31	0.30	0.28	0.26	0.28	0.43
<b>Men</b>	Earnings	243	250	260	280	308	324	339	348	399
	Hours Worked	45.5	45.0	44.8	44.4	43.9	43.5	43.6	41.9	41.3
	Wage Rate	5.62	5.88	6.09	6.55	7.32	7.75	8.01	8.48	9.79
	Participation	0.83	0.77	0.80	0.81	0.76	0.78	0.75	0.68	0.62
<b>Gender Gap</b>	Earnings	0.77	0.74	0.70	0.72	0.68	0.63	0.60	0.64	0.48
	Hours Worked	0.94	0.97	0.93	0.93	0.93	0.88	0.93	0.88	0.94
	Wage Rate	0.84	0.76	0.74	0.77	0.76	0.72	0.68	0.73	0.51
	Participation	0.30	0.53	0.52	0.38	0.40	0.36	0.34	0.42	0.70

<b>Age at Childbirth</b>	<b>Women</b>	<b>Men</b>
Average	29.48	32.09
Lowest	19	22
Highest	43	45

# Appendix B: Tables with Results

## 1. Full sample

	Women	Confidence Interval	Men	Confidence Interval	Motherhood Penalty
<i>Earnings</i>					
-2	0,17	(0,1;0,25)	-0,04	(-0,08;0)	-0,26
-1	0	0	0	0	0
0	-0,34	(-0,38;-0,3)	0,05	(0,01;0,09)	0,45
1	-0,43	(-0,46;-0,39)	0,03	(0;0,07)	0,50
2	-0,42	(-0,45;-0,38)	0,05	(0,01;0,09)	0,52
3	-0,43	(-0,46;-0,39)	0,05	(0,02;0,09)	0,55
4	-0,36	(-0,39;-0,32)	0,07	(0,03;0,12)	0,52
5	-0,34	(-0,38;-0,29)	0,10	(0,06;0,14)	0,55
<i>Hours</i>					
-2	0,148537802	(0,09;0,22)	-0,01786744	(-0,05;0,02)	-
-1	0	0	0	0	0,175897111
0	-0,49	(-0,51;-0,46)	0,01	(-0,02;0,05)	0,51
1	-0,56	(-0,58;-0,53)	0,00	(-0,03;0,04)	0,56
2	-0,53	(-0,55;-0,5)	-0,01	(-0,04;0,03)	0,52
3	-0,58	(-0,6;-0,55)	0,02	(-0,02;0,06)	0,60
4	-0,49	(-0,52;-0,46)	0,03	(-0,01;0,08)	0,53
5	-0,51	(-0,54;-0,48)	0,06	(0,01;0,11)	0,59
<i>Wage</i>					
-2	0,17	(0,09;0,26)	-0,05	(-0,09;0)	-0,26
-1	0	0	0	0	0
0	-0,34	(-0,39;-0,3)	0,09	(0,04;0,14)	0,52
1	-0,42	(-0,45;-0,38)	0,05	(0,01;0,1)	0,52
2	-0,38	(-0,41;-0,33)	0,04	(0;0,09)	0,46
3	-0,41	(-0,45;-0,36)	0,08	(0,04;0,13)	0,58
4	-0,32	(-0,37;-0,27)	0,12	(0,07;0,17)	0,58
5	-0,31	(-0,35;-0,25)	0,09	(0,04;0,14)	0,49
<i>Participation</i>					
-2	0,18	(0,13;0,25)	-0,02	(-0,05;0,01)	-0,21
-1	0	0	0	0	0
0	-0,46	(-0,48;-0,43)	0,03	(0,01;0,06)	0,51
1	-0,52	(-0,54;-0,49)	0,00	(-0,02;0,03)	0,52
2	-0,50	(-0,53;-0,48)	0,00	(-0,03;0,03)	0,51
3	-0,53	(-0,56;-0,51)	-0,02	(-0,05;0,02)	0,51
4	-0,43	(-0,46;-0,4)	0,00	(-0,03;0,03)	0,43
5	-0,44	(-0,47;-0,41)	0,02	(-0,02;0,06)	0,46

## 2. Including non-wage earners

	<b>Women</b>	<b>Confidence Interval</b>	<b>Men</b>	<b>Confidence Interval</b>	<b>Motherhood Penalty</b>
<i>Earnings</i>					
-2	0,09	(0,24;-0,26)	-0,08	(-0,01;0)	-0,26
-1	0	0	0	0	0
0	-0,33	(-0,23;0,43)	0,03	(0,09;0)	0,43
1	-0,43	(-0,36;0,57)	0,04	(0,11;0)	0,57
2	-0,42	(-0,35;0,59)	0,05	(0,12;0)	0,59
3	-0,42	(-0,34;0,67)	0,07	(0,15;0)	0,67
4	-0,36	(-0,27;0,5)	0,04	(0,1;0)	0,50
5	-0,31	(-0,21;0,45)	0,04	(0,1;0)	0,45
<i>Hours</i>					
-2	0,08	(0,2;-0,15)	-0,04	(0,02;0)	-0,15
-1	0	0	0	0	0
0	-0,50	(-0,45;0,52)	0,00	(0,05;0)	0,52
1	-0,55	(-0,5;0,55)	-0,01	(0,04;0)	0,55
2	-0,49	(-0,44;0,48)	-0,02	(0,03;0)	0,48
3	-0,51	(-0,46;0,57)	0,02	(0,07;0)	0,57
4	-0,42	(-0,35;0,43)	0,00	(0,05;0)	0,43
5	-0,38	(-0,3;0,41)	0,01	(0,06;0)	0,41
<i>Wage</i>					
-2	0,03	(0,18;-0,2)	-0,09	(0;0)	-0,20
-1	0	0	0	0	0
0	-0,33	(-0,22;0,46)	0,05	(0,13;0)	0,46
1	-0,39	(-0,27;0,56)	0,06	(0,15;0)	0,56
2	-0,39	(-0,3;0,55)	0,05	(0,13;0)	0,55
3	-0,40	(-0,31;0,66)	0,09	(0,17;0)	0,66
4	-0,35	(-0,25;0,62)	0,09	(0,17;0)	0,62
5	-0,30	(-0,19;0,46)	0,04	(0,12;0)	0,46
<i>Participation</i>					
-2	0,13	(0,24;-0,25)	-0,06	(-0,02;0)	-0,25
-1	0	0	0	0	0
0	-0,48	(-0,43;0,5)	0,02	(0,04;0)	0,50
1	-0,52	(-0,48;0,53)	0,00	(0,03;0)	0,53
2	-0,49	(-0,44;0,48)	0,00	(0,02;0)	0,48
3	-0,51	(-0,46;0,51)	0,00	(0,03;0)	0,51
4	-0,43	(-0,37;0,41)	-0,01	(0,02;0)	0,41
5	-0,41	(-0,35;0,39)	-0,01	(0,02;0)	0,39

### 3. Extended time period

	Women	Confidence Interval	Men	Confidence Interval	Motherhood Penalty	
<i>Earnings</i>						
	-2	0,15	(0,05;0,26)	0,02	(-0,04;0,08)	-0,11
	-1	0	0	0	0	0
	0	-0,41	(-0,46;-0,35)	0,03	(-0,02;0,09)	0,47
	1	-0,47	(-0,51;-0,42)	-0,02	(-0,06;0,04)	0,43
	2	-0,45	(-0,49;-0,4)	-0,01	(-0,06;0,04)	0,42
	3	-0,51	(-0,54;-0,46)	-0,08	(-0,12;-0,02)	0,35
	4	-0,44	(-0,48;-0,39)	-0,02	(-0,07;0,04)	0,41
	5	-0,46	(-0,5;-0,4)	0,01	(-0,05;0,07)	0,48
	6	-0,47	(-0,51;-0,42)	0,02	(-0,03;0,09)	0,52
Event Time	7	-0,43	(-0,48;-0,38)	0,08	(0,01;0,16)	0,58
	8	-0,46	(-0,51;-0,41)	0,10	(0,03;0,18)	0,64
	9	-0,45	(-0,5;-0,39)	0,12	(0,04;0,21)	0,65
	10	-0,38	(-0,44;-0,3)	0,18	(0,09;0,29)	0,70
<i>Hours</i>						
	-2	0,11	(0,02;0,21)	0,12	(0,05;0,2)	0,06
	-1	0	0	0	0	0
	0	-0,58	(-0,6;-0,54)	0,04	(-0,02;0,11)	0,64
	1	-0,61	(-0,64;-0,58)	0,01	(-0,05;0,07)	0,62
	2	-0,60	(-0,63;-0,57)	-0,01	(-0,07;0,05)	0,59
	3	-0,63	(-0,66;-0,6)	-0,07	(-0,13;-0,01)	0,53
	4	-0,58	(-0,61;-0,54)	-0,05	(-0,11;0,02)	0,51
	5	-0,60	(-0,63;-0,56)	-0,08	(-0,14;-0,01)	0,50
	6	-0,61	(-0,64;-0,57)	-0,18	(-0,23;-0,12)	0,37
Event Time	7	-0,56	(-0,6;-0,52)	-0,20	(-0,26;-0,14)	0,29
	8	-0,58	(-0,61;-0,53)	-0,18	(-0,24;-0,12)	0,33
	9	-0,52	(-0,56;-0,46)	-0,18	(-0,24;-0,11)	0,27
	10	-0,55	(-0,59;-0,5)	-0,23	(-0,29;-0,17)	0,23
<i>Wage</i>						
	-2	0,15	(0,03;0,3)	0,03	(-0,05;0,12)	-0,10
	-1	0,00	0,00	0,00	0,00	0,00
	0	-0,45	(-0,5;-0,39)	0,17	(0,09;0,26)	0,75
	1	-0,46	(-0,51;-0,4)	0,09	(0,01;0,17)	0,62
	2	-0,40	(-0,46;-0,34)	0,07	(0,01;0,15)	0,54
	3	-0,44	(-0,49;-0,37)	0,01	(-0,06;0,08)	0,45
	4	-0,39	(-0,46;-0,3)	0,11	(0,03;0,19)	0,59
	5	-0,40	(-0,46;-0,33)	0,07	(-0,01;0,16)	0,53
	6	-0,43	(-0,49;-0,35)	0,07	(-0,01;0,16)	0,55
Event Time	7	-0,46	(-0,51;-0,39)	0,06	(-0,03;0,16)	0,56
	8	-0,44	(-0,5;-0,37)	0,16	(0,06;0,27)	0,71
	9	-0,40	(-0,47;-0,32)	0,23	(0,12;0,37)	0,79
	10	-0,35	(-0,43;-0,25)	0,24	(0,12;0,4)	0,74

		<i>Participation</i>				
<b>Event Time</b>	-2	0,18	(0,1;0,27)	0,03	(-0,01;0,08)	-0,14
	-1	0,00	0,00	0,00	0,00	0,00
	0	-0,51	(-0,54;-0,48)	-0,02	(-0,06;0,02)	0,49
	1	-0,57	(-0,6;-0,54)	-0,07	(-0,11;-0,03)	0,47
	2	-0,56	(-0,59;-0,53)	-0,07	(-0,11;-0,03)	0,45
	3	-0,60	(-0,62;-0,56)	-0,16	(-0,19;-0,12)	0,36
	4	-0,50	(-0,54;-0,46)	-0,13	(-0,16;-0,08)	0,32
	5	-0,54	(-0,57;-0,5)	-0,14	(-0,18;-0,09)	0,34
	6	-0,54	(-0,57;-0,5)	-0,16	(-0,2;-0,12)	0,30
	7	-0,51	(-0,55;-0,47)	-0,15	(-0,19;-0,1)	0,30
	8	-0,51	(-0,55;-0,46)	-0,18	(-0,22;-0,13)	0,26
9	-0,43	(-0,48;-0,37)	-0,21	(-0,25;-0,16)	0,13	
10	-0,41	(-0,46;-0,34)	-0,19	(-0,24;-0,14)	0,13	

#### 4. Education: secondary

	Women	Confidence Interval	Men	Confidence Interval	Motherhood Penalty
<i>Earnings</i>					
-2	0,15	(0,03;0,3)	0,03	(-0,07;0,15)	-0,10
-1	0	0	0	0	0
0	-0,49	(-0,54;-0,42)	0,20	(0,09;0,34)	0,85
1	-0,49	(-0,55;-0,43)	0,18	(0,08;0,3)	0,81
2	-0,45	(-0,51;-0,38)	0,19	(0,08;0,32)	0,79
3	-0,45	(-0,52;-0,38)	0,23	(0,12;0,37)	0,91
4	-0,45	(-0,51;-0,37)	0,24	(0,13;0,38)	0,94
5	-0,41	(-0,48;-0,32)	0,32	(0,2;0,48)	1,07
<i>Hours</i>					
-2	0,11	(0,01;0,24)	-0,01	(-0,1;0,09)	-0,13
-1	0	0	0	0	0
0	-0,61	(-0,64;-0,56)	0,15	(0,05;0,28)	0,79
1	-0,70	(-0,73;-0,67)	0,13	(0,03;0,26)	0,86
2	-0,61	(-0,65;-0,58)	0,11	(0,01;0,24)	0,75
3	-0,64	(-0,67;-0,6)	0,19	(0,07;0,33)	0,86
4	-0,63	(-0,67;-0,59)	0,19	(0,07;0,34)	0,85
5	-0,65	(-0,68;-0,61)	0,23	(0,09;0,4)	0,89
<i>Wage</i>					
-2	0,07	(-0,05;0,23)	0,00	(-0,12;0,15)	-0,08
-1	0	0	0	0	0
0	-0,47	(-0,54;-0,39)	0,26	(0,13;0,44)	0,87
1	-0,51	(-0,56;-0,44)	0,19	(0,07;0,33)	0,79
2	-0,46	(-0,52;-0,38)	0,18	(0,05;0,34)	0,74
3	-0,46	(-0,53;-0,38)	0,29	(0,15;0,45)	0,96
4	-0,36	(-0,46;-0,21)	0,29	(0,15;0,46)	0,89
5	-0,40	(-0,48;-0,3)	0,31	(0,17;0,49)	0,98
<i>Participation</i>					
-2	0,10	(0,01;0,21)	0,08	(-0,01;0,18)	-0,01
-1	0	0	0	0	0
0	-0,63	(-0,66;-0,59)	0,26	(0,15;0,38)	0,91
1	-0,65	(-0,68;-0,62)	0,15	(0,06;0,26)	0,83
2	-0,59	(-0,63;-0,56)	0,13	(0,04;0,23)	0,74
3	-0,62	(-0,66;-0,59)	0,20	(0,1;0,32)	0,86
4	-0,52	(-0,56;-0,47)	0,17	(0,07;0,3)	0,72
5	-0,54	(-0,58;-0,49)	0,16	(0,06;0,28)	0,71

#### 4. Education: college

	Women	Confidence Interval	Men	Confidence Interval	Motherhood Penalty
<i>Earnings</i>					
-2	0,30	(0,17;0,47)	-0,09	(-0,14;-0,03)	-0,52
-1	0	0	0	0	0
0	-0,38	(-0,44;-0,3)	0,08	(0,02;0,14)	0,56
1	-0,53	(-0,58;-0,48)	0,07	(0,01;0,13)	0,69
2	-0,60	(-0,63;-0,55)	0,13	(0,06;0,2)	0,90
3	-0,59	(-0,63;-0,54)	0,16	(0,09;0,24)	0,98
4	-0,45	(-0,5;-0,37)	0,24	(0,15;0,33)	0,99
5	-0,43	(-0,49;-0,35)	0,35	(0,25;0,46)	1,18
<i>Hours</i>					
-2	0,22	(0,11;0,36)	-0,03	(-0,08;0,04)	-0,27
-1	0	0	0	0	0
0	-0,54	(-0,58;-0,49)	0,05	(-0,01;0,12)	0,62
1	-0,59	(-0,63;-0,55)	0,01	(-0,05;0,08)	0,61
2	-0,63	(-0,67;-0,59)	0,01	(-0,05;0,08)	0,65
3	-0,62	(-0,66;-0,58)	0,06	(-0,01;0,14)	0,71
4	-0,50	(-0,55;-0,43)	0,05	(-0,02;0,14)	0,58
5	-0,52	(-0,57;-0,45)	0,22	(0,12;0,35)	0,82
<i>Wage</i>					
-2	0,41	(0,22;0,66)	-0,09	(-0,15;-0,01)	-0,62
-1	0	0	0	0	0
0	-0,37	(-0,43;-0,28)	0,18	(0,09;0,28)	0,77
1	-0,59	(-0,63;-0,54)	0,13	(0,05;0,23)	0,89
2	-0,49	(-0,55;-0,42)	0,17	(0,08;0,27)	0,88
3	-0,47	(-0,54;-0,39)	0,19	(0,1;0,3)	0,96
4	-0,42	(-0,49;-0,33)	0,33	(0,22;0,46)	1,18
5	-0,40	(-0,48;-0,31)	0,46	(0,32;0,62)	1,37
<i>Participation</i>					
-2	0,27	(0,17;0,4)	-0,04	(-0,09;0)	-0,34
-1	0	0	0	0	0
0	-0,50	(-0,54;-0,45)	0,02	(-0,03;0,06)	0,52
1	-0,57	(-0,6;-0,52)	-0,01	(-0,05;0,04)	0,55
2	-0,62	(-0,66;-0,59)	0,04	(0;0,1)	0,69
3	-0,61	(-0,65;-0,57)	0,05	(-0,01;0,11)	0,68
4	-0,50	(-0,54;-0,44)	0,12	(0,06;0,19)	0,66
5	-0,50	(-0,54;-0,44)	0,23	(0,16;0,32)	0,78



#### 4. Education: university

	Women	Confidence Interval	Men	Confidence Interval	Motherhood Penalty
<i>Earnings</i>					
-2	0,11	(0,01;0,23)	-0,08	(-0,12;-0,02)	-0,26
-1	0	0	0	0	0
0	-0,23	(-0,29;-0,15)	0,03	(-0,02;0,08)	0,29
1	-0,29	(-0,35;-0,22)	0,03	(-0,01;0,08)	0,36
2	-0,26	(-0,32;-0,18)	0,05	(0;0,11)	0,37
3	-0,26	(-0,33;-0,18)	0,04	(-0,01;0,1)	0,36
4	-0,16	(-0,24;-0,06)	0,07	(0,02;0,13)	0,32
5	-0,06	(-0,17;0,07)	0,07	(0,01;0,14)	0,24
<i>Hours</i>					
-2	0,12	(0,04;0,23)	-0,01	(-0,06;0,04)	-0,15
-1	0	0	0	0	0
0	-0,35	(-0,4;-0,29)	-0,03	(-0,07;0,02)	0,31
1	-0,39	(-0,43;-0,33)	-0,02	(-0,07;0,03)	0,35
2	-0,36	(-0,41;-0,3)	-0,03	(-0,08;0,02)	0,32
3	-0,46	(-0,5;-0,4)	-0,03	(-0,08;0,03)	0,41
4	-0,31	(-0,37;-0,23)	-0,02	(-0,07;0,04)	0,28
5	-0,31	(-0,37;-0,23)	-0,04	(-0,1;0,03)	0,25
<i>Wage</i>					
-2	0,09	(-0,02;0,21)	-0,09	(-0,15;-0,03)	-0,26
-1	0	0	0	0	0
0	-0,25	(-0,32;-0,17)	0,04	(-0,01;0,11)	0,34
1	-0,25	(-0,31;-0,16)	0,06	(0;0,12)	0,36
2	-0,22	(-0,29;-0,13)	0,05	(0;0,12)	0,33
3	-0,25	(-0,33;-0,15)	0,10	(0,04;0,17)	0,47
4	-0,13	(-0,22;-0,02)	0,14	(0,08;0,22)	0,44
5	-0,01	(-0,13;0,15)	0,08	(0,01;0,15)	0,19
<i>Participation</i>					
-2	0,18	(0,09;0,28)	-0,05	(-0,09;-0,01)	-0,26
-1	0	0	0	0	0
0	-0,29	(-0,35;-0,23)	-0,01	(-0,05;0,02)	0,27
1	-0,34	(-0,39;-0,29)	-0,01	(-0,04;0,03)	0,33
2	-0,30	(-0,36;-0,24)	-0,02	(-0,06;0,02)	0,27
3	-0,35	(-0,41;-0,29)	-0,08	(-0,12;-0,04)	0,23
4	-0,24	(-0,31;-0,16)	-0,07	(-0,11;-0,02)	0,13
5	-0,20	(-0,27;-0,1)	-0,07	(-0,11;-0,02)	0,08

### 5.Region: Seoul Metropolitan Area

	Women	Confidence Interval	Men	Confidence Interval	Motherhood Penalty
<i>Earnings</i>					
-2	0,14	(0;0,32)	-0,05	(-0,12;0,04)	-0,24
-1	0	0	0	0	0
0	-0,42	(-0,49;-0,33)	0,03	(-0,04;0,11)	0,49
1	-0,50	(-0,55;-0,44)	0,02	(-0,05;0,09)	0,53
2	-0,44	(-0,5;-0,37)	0,08	(0,01;0,16)	0,60
3	-0,54	(-0,59;-0,48)	0,08	(0;0,17)	0,70
4	-0,43	(-0,49;-0,35)	0,14	(0,05;0,25)	0,72
5	-0,42	(-0,49;-0,32)	0,16	(0,06;0,28)	0,75
<i>Hours</i>					
-2	0,16	(0,02;0,34)	-0,11	(-0,18;-0,02)	-0,36
-1	0	0	0	0	0
0	-0,51	(-0,57;-0,44)	-0,07	(-0,14;0,01)	0,38
1	-0,67	(-0,7;-0,62)	-0,13	(-0,2;-0,05)	0,45
2	-0,62	(-0,66;-0,57)	-0,09	(-0,16;0)	0,50
3	-0,66	(-0,7;-0,62)	-0,09	(-0,17;0,01)	0,54
4	-0,63	(-0,67;-0,58)	-0,13	(-0,21;-0,04)	0,44
5	-0,62	(-0,67;-0,57)	-0,14	(-0,22;-0,04)	0,41
<i>Wage</i>					
-2	0,09	(-0,06;0,3)	-0,07	(-0,15;0,03)	-0,22
-1	0	0	0	0	0
0	-0,47	(-0,54;-0,38)	0,12	(0,02;0,23)	0,68
1	-0,52	(-0,58;-0,45)	0,10	(0,01;0,21)	0,70
2	-0,41	(-0,48;-0,33)	0,13	(0,04;0,24)	0,64
3	-0,53	(-0,58;-0,46)	0,16	(0,06;0,29)	0,81
4	-0,47	(-0,54;-0,39)	0,19	(0,07;0,33)	0,81
5	-0,34	(-0,45;-0,18)	0,18	(0,05;0,34)	0,71
<i>Participation</i>					
-2	0,27	(0,14;0,43)	-0,04	(-0,09;0,02)	-0,33
-1	0	0	0	0	0
0	-0,51	(-0,55;-0,45)	-0,01	(-0,06;0,05)	0,49
1	-0,58	(-0,62;-0,53)	-0,06	(-0,11;-0,01)	0,49
2	-0,55	(-0,59;-0,5)	0,02	(-0,03;0,09)	0,58
3	-0,63	(-0,67;-0,59)	0,00	(-0,06;0,07)	0,63
4	-0,54	(-0,58;-0,48)	-0,01	(-0,08;0,06)	0,52
5	-0,53	(-0,58;-0,46)	0,01	(-0,06;0,09)	0,54

## 5. Region: Korea excluding Seoul

	Women	Confidence Interval	Men	Confidence Interval	Motherhood Penalty
<i>Earnings</i>					
-2	0,22	(0,1;0,37)	0,16	(0,07;0,27)	0,09
-1	0	0	0	0	0
0	-0,45	(-0,5;-0,4)	0,08	(0,01;0,15)	0,61
1	-0,47	(-0,51;-0,41)	-0,02	(-0,07;0,04)	0,43
2	-0,46	(-0,5;-0,41)	-0,09	(-0,14;-0,03)	0,29
3	-0,45	(-0,49;-0,39)	-0,12	(-0,17;-0,06)	0,22
4	-0,47	(-0,51;-0,42)	-0,08	(-0,14;-0,02)	0,32
5	-0,51	(-0,55;-0,46)	-0,05	(-0,11;0,02)	0,42
<i>Hours</i>					
-2	0,03	(-0,06;0,13)	0,10	(0;0,21)	0,10
-1	0	0	0	0	0
0	-0,53	(-0,57;-0,48)	0,04	(-0,04;0,13)	0,59
1	-0,60	(-0,63;-0,56)	-0,03	(-0,1;0,05)	0,56
2	-0,58	(-0,61;-0,54)	-0,12	(-0,18;-0,05)	0,41
3	-0,61	(-0,64;-0,57)	-0,19	(-0,24;-0,12)	0,36
4	-0,59	(-0,62;-0,55)	-0,15	(-0,21;-0,08)	0,40
5	-0,65	(-0,68;-0,62)	-0,16	(-0,22;-0,08)	0,46
<i>Wage</i>					
-2	0,00	0	3,00	0	0,00
-1	0,00	0	4,00	0	0,00
0	0,00	0	5,00	0	Men
1	0,00	0	Hours	0	0,00
2	Earnings	0	-2,00	0	0,00
3	-2,00	0	-1,00	0	0,16
4	-1,00	0	0,00	0	0,00
5	0,00	0	1,00	0	0,08
<i>Participation</i>					
-2	0,16	(0,07;0,27)	0,15	(0,08;0,23)	0,03
-1	0	0	0	0	0
0	-0,54	(-0,58;-0,5)	0,03	(-0,03;0,09)	0,58
1	-0,58	(-0,61;-0,54)	-0,05	(-0,09;0,01)	0,51
2	-0,53	(-0,57;-0,49)	-0,14	(-0,18;-0,09)	0,33
3	-0,55	(-0,58;-0,51)	-0,21	(-0,25;-0,16)	0,25
4	-0,50	(-0,54;-0,45)	-0,18	(-0,22;-0,13)	0,25
5	-0,56	(-0,59;-0,52)	-0,20	(-0,25;-0,15)	0,27

## 6. Births in 2000-2005

	Women	Confidence Interval	Men	Confidence Interval	Motherhood Penalty
<i>Earnings</i>					
-2	0,20	(0,1;0,33)	0,03	(-0,03;0,11)	-0,14
-1	0	0	0	0	0
0	-0,49	(-0,53;-0,44)	0,04	(-0,01;0,1)	0,57
1	-0,50	(-0,54;-0,46)	-0,04	(-0,08;0,01)	0,42
2	-0,44	(-0,48;-0,39)	-0,08	(-0,12;-0,04)	0,26
3	-0,48	(-0,52;-0,43)	-0,15	(-0,19;-0,1)	0,15
4	-0,48	(-0,52;-0,43)	-0,13	(-0,18;-0,09)	0,18
5	-0,52	(-0,56;-0,48)	-0,11	(-0,15;-0,05)	0,29
<i>Hours</i>					
-2	0,14	(0,05;0,25)	0,13	(0,06;0,22)	0,05
-1	0	0	0	0	0
0	-0,62	(-0,64;-0,59)	0,05	(-0,01;0,12)	0,70
1	-0,64	(-0,66;-0,61)	-0,03	(-0,09;0,03)	0,60
2	-0,56	(-0,59;-0,53)	-0,10	(-0,15;-0,04)	0,41
3	-0,61	(-0,64;-0,58)	-0,18	(-0,22;-0,12)	0,34
4	-0,61	(-0,64;-0,58)	-0,22	(-0,26;-0,17)	0,28
5	-0,64	(-0,67;-0,61)	-0,25	(-0,29;-0,2)	0,26
<i>Wage</i>					
-2	0,10	(-0,01;0,24)	0,05	(-0,04;0,15)	-0,02
-1	0	0	0	0	0
0	-0,54	(-0,58;-0,49)	0,19	(0,11;0,29)	0,86
1	-0,51	(-0,55;-0,46)	0,05	(-0,02;0,13)	0,60
2	-0,42	(-0,46;-0,36)	-0,01	(-0,07;0,05)	0,39
3	-0,43	(-0,48;-0,36)	-0,08	(-0,14;-0,02)	0,26
4	-0,42	(-0,48;-0,35)	-0,04	(-0,1;0,03)	0,35
5	-0,49	(-0,54;-0,43)	-0,08	(-0,14;-0,01)	0,33
<i>Participation</i>					
-2	0,23	(0,15;0,34)	0,09	(0,03;0,15)	-0,12
-1	0	0	0	0	0
0	-0,56	(-0,59;-0,53)	0,06	(0,01;0,11)	0,65
1	-0,59	(-0,62;-0,56)	-0,04	(-0,08;0)	0,53
2	-0,52	(-0,55;-0,48)	-0,11	(-0,15;-0,07)	0,35
3	-0,57	(-0,6;-0,53)	-0,19	(-0,23;-0,16)	0,26
4	-0,52	(-0,56;-0,48)	-0,23	(-0,26;-0,19)	0,15
5	-0,56	(-0,59;-0,52)	-0,24	(-0,28;-0,21)	0,17

## 6. Births in 2006-2011

	<b>Women</b>	<b>Confidence Interval</b>	<b>Men</b>	<b>Confidence Interval</b>	<b>Motherhood Penalty</b>	
<i>Earnings</i>						
	-2	0,15	(0,06;0,26)	-0,07	(-0,12;-0,02)	-0,30
	-1	0	0	0	0	0
	0	-0,25	(-0,31;-0,18)	0,03	(-0,01;0,08)	0,32
	1	-0,37	(-0,42;-0,31)	0,03	(-0,02;0,08)	0,43
	2	-0,40	(-0,45;-0,34)	0,06	(0,01;0,12)	0,54
	3	-0,41	(-0,46;-0,34)	0,11	(0,05;0,17)	0,65
	4	-0,27	(-0,35;-0,18)	0,12	(0,06;0,2)	0,57
	5	-0,19	(-0,28;-0,06)	0,14	(0,07;0,22)	0,53
<i>Hours</i>						
	-2	0,15	(0,07;0,24)	-0,09	(-0,13;-0,05)	-0,29
	-1	0	0	0	0	0
	0	-0,34	(-0,39;-0,28)	-0,04	(-0,08;0,01)	0,27
	1	-0,44	(-0,49;-0,39)	-0,01	(-0,05;0,05)	0,44
	2	-0,48	(-0,52;-0,43)	0,00	(-0,05;0,06)	0,48
	3	-0,54	(-0,58;-0,49)	0,11	(0,05;0,18)	0,70
	4	-0,35	(-0,42;-0,28)	0,14	(0,07;0,22)	0,56
	5	-0,37	(-0,43;-0,29)	0,21	(0,12;0,32)	0,65
<i>Wage</i>						
	-2	0,20	(0,09;0,33)	-0,09	(-0,14;-0,03)	-0,38
	-1	0	0	0	0	0
	0	-0,22	(-0,29;-0,14)	0,04	(-0,01;0,1)	0,30
	1	-0,34	(-0,4;-0,28)	0,04	(-0,01;0,1)	0,43
	2	-0,34	(-0,4;-0,26)	0,04	(-0,02;0,11)	0,43
	3	-0,39	(-0,45;-0,31)	0,15	(0,08;0,23)	0,73
	4	-0,24	(-0,32;-0,13)	0,20	(0,13;0,29)	0,70
	5	-0,14	(-0,25;0,01)	0,18	(0,1;0,28)	0,55
<i>Participation</i>						
	-2	0,15	(0,08;0,23)	-0,08	(-0,11;-0,04)	-0,26
	-1	0	0	0	0	0
	0	-0,37	(-0,41;-0,32)	0,00	(-0,04;0,03)	0,36
	1	-0,44	(-0,48;-0,4)	0,00	(-0,04;0,04)	0,44
	2	-0,49	(-0,53;-0,45)	0,03	(-0,02;0,07)	0,53
	3	-0,52	(-0,56;-0,48)	0,06	(0,01;0,11)	0,60
	4	-0,38	(-0,43;-0,32)	0,08	(0,03;0,14)	0,49
	5	-0,36	(-0,41;-0,29)	0,13	(0,06;0,21)	0,52

## 7. One child

	<b>Women</b>	<b>Confidence Interval</b>	<b>Men</b>	<b>Confidence Interval</b>	<b>Motherhood Penalty</b>
<i>Earnings</i>					
-2	0,14	(0,04;0,27)	-0,08	(-0,14;0)	-0,29
-1	0	0	0	0	0
0	-0,35	(-0,41;-0,28)	0,17	(0,09;0,26)	0,68
1	-0,38	(-0,43;-0,32)	0,15	(0,08;0,24)	0,67
2	-0,29	(-0,35;-0,21)	0,20	(0,12;0,29)	0,66
3	-0,31	(-0,37;-0,24)	0,18	(0,1;0,27)	0,65
4	-0,25	(-0,31;-0,17)	0,23	(0,14;0,34)	0,67
5	-0,31	(-0,37;-0,25)	0,30	(0,19;0,42)	0,82
<i>Hours</i>					
-2	0,08	(-0,01;0,18)	0,01	(-0,05;0,08)	-0,06
-1	0	0	0	0	0
0	-0,51	(-0,54;-0,47)	0,12	(0,05;0,2)	0,65
1	-0,55	(-0,58;-0,51)	0,08	(0,01;0,16)	0,64
2	-0,43	(-0,47;-0,38)	0,16	(0,08;0,26)	0,61
3	-0,48	(-0,52;-0,43)	0,18	(0,09;0,28)	0,67
4	-0,39	(-0,44;-0,33)	0,21	(0,11;0,34)	0,60
5	-0,46	(-0,5;-0,42)	0,34	(0,21;0,5)	0,77
<i>Wage</i>					
-2	0,09	(-0,02;0,22)	-0,06	(-0,14;0,03)	-0,20
-1	0	0	0	0	0
0	-0,37	(-0,42;-0,29)	0,18	(0,09;0,29)	0,70
1	-0,41	(-0,46;-0,34)	0,10	(0,02;0,19)	0,59
2	-0,22	(-0,3;-0,13)	0,16	(0,07;0,26)	0,51
3	-0,36	(-0,42;-0,29)	0,23	(0,13;0,34)	0,77
4	-0,21	(-0,29;-0,11)	0,29	(0,19;0,43)	0,71
5	-0,32	(-0,38;-0,24)	0,32	(0,2;0,46)	0,82
<i>Participation</i>					
-2	0,12	(0,03;0,21)	0,00	(-0,06;0,06)	-0,12
-1	0	0	0	0	0
0	-0,45	(-0,49;-0,41)	0,18	(0,11;0,25)	0,68
1	-0,48	(-0,52;-0,44)	0,16	(0,1;0,23)	0,68
2	-0,37	(-0,42;-0,32)	0,19	(0,12;0,27)	0,60
3	-0,39	(-0,43;-0,34)	0,13	(0,06;0,21)	0,53
4	-0,26	(-0,31;-0,19)	0,20	(0,12;0,3)	0,47
5	-0,38	(-0,43;-0,33)	0,25	(0,15;0,36)	0,62

## 7. Several children

	<b>Women</b>	<b>Confidence Interval</b>	<b>Men</b>	<b>Confidence Interval</b>	<b>Motherhood Penalty</b>
<i>Earnings</i>					
-2	0,19	(0,1;0,3)	-0,03	(-0,08;0,01)	-0,26
-1	0	0	0	0	0
0	-0,33	(-0,38;-0,27)	0,00	(-0,04;0,04)	0,32
1	-0,47	(-0,5;-0,43)	-0,03	(-0,07;0,01)	0,40
2	-0,51	(-0,55;-0,47)	-0,03	(-0,06;0,01)	0,45
3	-0,52	(-0,56;-0,48)	-0,01	(-0,05;0,03)	0,49
4	-0,44	(-0,49;-0,39)	0,00	(-0,04;0,04)	0,44
5	-0,35	(-0,41;-0,29)	0,00	(-0,04;0,05)	0,37
<i>Hours</i>					
-2	0,19	(0,11;0,28)	-0,03	(-0,08;0,01)	-0,25
-1	0	0	0	0	0
0	-0,47	(-0,51;-0,43)	-0,03	(-0,07;0,01)	0,42
1	-0,56	(-0,59;-0,53)	-0,03	(-0,07;0,01)	0,51
2	-0,60	(-0,63;-0,57)	-0,08	(-0,12;-0,04)	0,46
3	-0,66	(-0,68;-0,63)	-0,06	(-0,1;-0,02)	0,55
4	-0,58	(-0,61;-0,54)	-0,05	(-0,09;0)	0,50
5	-0,55	(-0,58;-0,51)	-0,06	(-0,1;0)	0,46
<i>Wage</i>					
-2	0,23	(0,12;0,37)	-0,05	(-0,11;0)	-0,34
-1	0	0	0	0	0
0	-0,32	(-0,38;-0,26)	0,04	(-0,01;0,09)	0,41
1	-0,43	(-0,47;-0,37)	0,04	(-0,01;0,09)	0,50
2	-0,49	(-0,53;-0,44)	-0,02	(-0,06;0,03)	0,44
3	-0,43	(-0,49;-0,37)	0,00	(-0,04;0,05)	0,44
4	-0,40	(-0,45;-0,34)	0,04	(-0,01;0,1)	0,51
5	-0,29	(-0,36;-0,2)	-0,02	(-0,07;0,03)	0,23
<i>Participation</i>					
-2	0,24	(0,16;0,32)	-0,03	(-0,07;0)	-0,29
-1	0	0	0	0	0
0	-0,46	(-0,49;-0,42)	-0,03	(-0,06;0)	0,41
1	-0,54	(-0,57;-0,51)	-0,07	(-0,1;-0,04)	0,43
2	-0,60	(-0,62;-0,57)	-0,09	(-0,11;-0,06)	0,46
3	-0,65	(-0,67;-0,62)	-0,09	(-0,12;-0,06)	0,50
4	-0,57	(-0,6;-0,54)	-0,09	(-0,12;-0,06)	0,42
5	-0,48	(-0,52;-0,44)	-0,08	(-0,11;-0,05)	0,35