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# LIS

## Working Paper Series

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### **Married Women's Employment and Motherhood Employment Penalty by Couple's Educational Attainments across 10 Countries**

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Married women's employment and motherhood employment penalty by couple's educational  
attainments across 10 countries

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## **Abstract**

This study examines how and to what extent a couple's education is associated with married women's employment and the motherhood penalty in 10 countries. We use data from the Luxembourg Income Study and the Korean Labor & Income Panel Study (2013). Overall, Denmark and Norway show the highest level of married women's employment and no motherhood penalty. Our findings support the opportunity cost perspective, in general, that highly educated women are more likely to participate in work than less educated women, except in Germany, Korea, and Japan. The social capital and gender-egalitarian perspectives hold for the United States and Italy. We also find significant variation in married women's employment in East Asian countries. Married Korean women are less likely to be employed than in China and Taiwan, while Japanese women are the least employed among husband high – wife high education couples.

**Keywords:** married women's employment, motherhood penalty, education

### 3.1 Introduction

Even with the growing female labor force participation rate across Western countries over time, the female employment rate in East Asian countries is still considerably lower (Organisation for Economic Co-operation and Development [OECD], 2021). Asian women are more likely to exit the labor market due to marriage and childbirth than women in Western countries. In East Asian countries, mothers are generally less employed than childless women, implying a motherhood employment gap. We especially find an M-shaped curve of female labor participation in Japan and South Korea (hereafter Korea), with a steep decline in labor participation around the childbearing age (Brinton, 2001).

Numerous studies have found that highly educated women are more likely to be engaged in the labor market (Schober & Scott, 2012; Steiber, Berghammer, & Hass, 2016) and have a relatively stable labor participation rate during childbirth; however, the participation rate among low-educated women falls sharply (Byker, 2016). Nevertheless, relatively less attention has been paid to the husband effect—whether women’s employment is independent of the husband’s resources such as education (Bernardi, 1999; Ng & Chen, 2018), earnings (Henz & Sundström, 2001), occupation (Bernardi, 1999) or job flexibility (Buchler & Lutz, 2021). Here, we are interested in how husbands’ education affects married women’s employment and the motherhood penalty. The limited research on the effect of husbands’ education on wives’ labor market outcomes finds non-negligible cross-national differences. These existing studies state that such variations correspond to the welfare regimes (Blossfeld & Drobic, 2001), while

some find an insignificant husband effect on wives' employment (Solera, 2019).

This study examines how and to what extent a wife's and a husband's resources (education) are associated with the motherhood penalty on employment. We specifically compare married women's employment patterns and the motherhood penalty using combinations of husbands and wives' education in 10 countries. Our research questions are as follows: 1) To what extent does the motherhood employment penalty vary across countries and welfare regimes? 2) Are couples' education combinations associated with married women's employment and the motherhood employment penalty? How and to what extent does this association vary across 10 countries and welfare regimes?

This study makes some important contributions. First, to the best of our knowledge, research on the motherhood penalty has predominantly focused on Western countries. Few have compared the motherhood penalty between East Asian countries. Examining this phenomenon in these countries is important as they differ from Western welfare states as follows. East Asian countries have experienced government-led industrialization, relatively less generous public support to maternal employment, and exhibit strong family value with the gendered division of labor (Raymo et al., 2015; Yu, 2009). However, little is known about how motherhood effects in employment differ across welfare regimes by accounting for East Asian countries.

Second, an examination of the association between couples' education combination and motherhood employment penalty will reveal how the effect of husband's education along with women's own factors differ by country. Employment decisions among mothers are generally made jointly by couples (Brinton & Oh, 2019), and thus, can be complex because of the specialized human capital (Becker, 1985), distribution of resources within a household such as husband's or wife's earnings, educational attainments, time allocation or occupation (Bernardi,

1999; Buchler & Lutz, 2021; Henz & Sundström, 2001; Ng & Chen, 2018) and their gender ideology (Ng & Chen, 2018). We are also interested in providing insights into how East Asian countries are similar to or different from Western countries in terms of how husbands' education levels and childbirth influence wives' employment decisions. Doing so is important as traditional gender divisions remain high in East Asian countries.

The remainder of this study is structured as follows. First, we present a review of the theoretical perspectives on the motherhood employment penalty and couples education. Second, we describe the data and methods used here. Third, we present our findings on the motherhood employment penalty across countries. Furthermore, we investigate how different combinations of couples' educational levels and number of children affect women's employment across countries. Finally, we summarize and discuss the findings.

### **3.2 Married women's employment and the motherhood employment penalty**

Studies have mostly measured the motherhood penalty as a wage gap between childless women and mothers. However, the wage gap may not be a sufficient indicator of how motherhood affects women's labor market outcomes in East Asian countries, where mothers face the layered risks of disadvantages even when they enter the labor market. Employment outcome, whether employed, is of particular interest in its own right, as it can show whether motherhood affects employment across different societies. Thus, we believe that examining the association between motherhood and employment can provide greater clarity on how motherhood may shape career outcomes differently for childless women and mothers (Kahn et al., 2014).

Empirical studies find that having children is associated with changes in women's employment, especially in relation to labor market exit (Kahn et al., 2014). Although each additional child has a negative impact on employment, the first child is associated with the highest risk of a labor market exit (Kahn et al., 2014). Childbirth and childrearing are associated with lower labor force participation; however, as children grow, the mothers' employment supply recovers (Kahn et al., 2014). Notably, there may be counter pressures on mothers to increase their labor supply to meet the financial needs of older children.

To the best of our knowledge, the motherhood penalty remains underexplored in East Asian countries compared to European and Anglo-Saxon countries. Studies reveal variations in female employment participation within East Asian countries (Ng & Chen, 2018). Korea and Japan exhibit a relatively steep decline in labor participation around the childbirth age (Brinton, 2001). In Korea, children under three have the greatest effect on mothers' employment; however, this negative effect has become smaller over time due to the recent family policy expansion. Interestingly, the negative effect of elementary school children has been greater in 2006 compared to 2016 (Kim, 2018). In Japan, marriage and the birth of the first and second children are associated with labor force exit (Higuchi, 2001; Kenjoh, 2003). This effect can be partly explained by the lack of part-time employment opportunities; however, an increase in children's age is associated with a higher likelihood of having regular or non-regular jobs (Kenjoh, 2003). In Taiwan, compared to unmarried women, the rate of childless married women exiting the labor force was significantly higher, while the labor force exit rate was the highest during the first pregnancy. Having children less than 6 years old, compared to 6–18 years old, also increased women's probability of leaving the labor force (Chang, 2013). Even if they remained in the labor force, many women in Taiwan transitioned into informal employment (helping with family-owned business) or self-employment to meet family needs



(Lu, 2001). Similarly, in China, women with children under three years are less likely to work compared to other life periods (Zhao, 2018). Despite the decrease in women's labor force participation from 79% in 1990 to 69% in 2019 (ILO, 2021) due to the dismantling of the socialist economy and reduction of childcare services, Chinese women are still more likely to be in the labor force than Japanese or Korean women.

### **3.3 Theoretical framework: women's employment and education**

Classic human capital theory argues that highly educated women are more likely to be involved in paid work than lower educated women. This can be explained as the *opportunity cost effect*—highly educated women are likely to expect a greater return for paid work as well as a greater opportunity cost of not having a job compared to less educated women (Anderson, Binder, & Krause, 2002; England et al., 2016). Empirical studies have supported this theory, finding that highly educated women are more likely to be employed than less educated women (Del Boca, Pasquay, & Pronzatoz, 2009). Byker (2016) compared women's labor force participation after they gave birth in the 1980s, 1990s, and 2000s in the United States. She found that women with a master's degree or a bachelor's degree are likely to have a less steep decline in employment probability following childbirth in the 2000s. Steiber et al. (2016) compared the effect of education on women's employment in couples' contexts in five European countries: Austria, France, Germany, Hungary, and Norway. The authors found that in families with dependent children, education effects are statistically significant: highly educated mothers have a higher level of employment. Moreover, the education effects interact with the presence of children and family life cycle (children's age).

However, the mechanism through which education influences women's employment can

be more complex if marriage is involved. Next, we provide the theoretical background on how the education of a wife and a husband is associated with women's employment and motherhood penalty. First, partners specialize in the domains in which they have a comparative advantage to maximize the joint utility of the household, resulting in the division of labor in paid and unpaid work (Becker, 1985). The employment decision is taken by comparing partners' marginal productivity in the labor market from a *comparative advantage perspective*. A husband's higher education, more resources, and greater marginal productivity are likely to be negatively associated with a wife's employment.

Second, married women's employment is a couple's decision that can be influenced by household resources (Henz & Sundström, 2001). Highly educated women are more likely to be partnered with highly educated men with a high income, which may incentivize them to stop working upon motherhood despite their education level; this is called the *income effect* (Steiber, Berghammer, & Haas, 2016). Higher economic resources, especially partners' income, can lower the incentives to work. Conversely, as less educated women are likely to be partnered with less educated men, they may face economic pressure to contribute to household income, leading to greater employment participation (Steiber et al., 2016).

Third, marriage can be considered an incomplete contract potentially subject to termination rather than a stable and permanent community (Iversen & Rosenbluth, 2006). The *gender power relation perspective* assumes that compared to less educated mothers, highly educated mothers tend to have greater power to compete with their husbands regarding sharing housework and working outside the home. Differences in relative bargaining power are also observed in East Asian countries. Ng and Chen (2018) provided insight into how couples' educational levels are related to women's employment in four East Asian countries: China, Taiwan, Korea, and Japan. By examining the interaction between mothers' and fathers'

education, the authors tried to capture how mothers' relative bargaining power changes as a function of fathers' education. The authors concluded that Taiwanese women are likely to have greater bargaining power with their husbands than Korean or Japanese women because highly educated women in Taiwan tend to have higher employment rates than their Korean and Japanese counterparts.

Fourth, the *social capital perspective* considers that a partner's resources help facilitate the employment of both men and women (Kitterod & Lappegard, 2012). Labor market resources, such as skills, networks, and knowledge, are considered a type of capital. This perspective assumes that a higher level of a husband's education positively affects a wife's employment, lowering the motherhood penalty, and vice versa.

Finally, apart from a labor market-related resource, education may represent more egalitarian attitudes than traditional gender role attitudes on the husband and wife. According to the *gender-egalitarian perspective*, highly educated women are more likely to have egalitarian gender attitudes, showing more favorable attitudes toward maternal employment. Likewise, highly educated husbands may stimulate their wives' careers, and highly educated couples are more likely to adopt the dual breadwinner model.

Table 1 presents a theoretical expectation of the underlying mechanism of a couple's education on the motherhood employment gap. There are eight cases based on four different types of education combinations: husband high-wife high (HH-WH), husband high-wife low (HH-WL), husband low-wife high (HL-WH), husband low-wife low (HL-WL), and two cases of motherhood penalty (low or high). The case of a high level of women's employment and low motherhood penalty among highly educated women coupled with a highly educated partner (a) can be explained by the opportunity cost effect. Highly educated women are likely to participate in the labor market due to their high marginal return, along with social capital

and gender-egalitarian perspectives. Despite the wife's low educational attainment, their employment can be high if a husband's high educational attainment facilitates a wife's employment and is associated with a more gender-egalitarian perspective (b). The case of (c) may also be associated with a wife's higher opportunity cost effect and greater bargaining power based on higher education attainment. In case (d), the income effect can positively affect a wife's employment. The low level of women's employment or high motherhood penalty among highly educated women coupled with a highly educated husband (e) suggests greater bargaining power among husbands and the income effect that the husband's high income reduces the likelihood of the wife's employment. However, the combination of highly educated husbands and low-educated wives may result in a low level of wives' employment and a high level of motherhood penalty (f). This is because the husband's marginal productivity is larger than the wife's, and he can earn more for the family; this reduces the wife's likelihood of being employed. A highly educated wife with a low-educated husband may result in a high motherhood penalty if gender relative power rests with the husband rather than the wife (g). Finally, low women's employment and high motherhood penalty may be caused by the opportunity cost perspective—low-educated women are less likely to participate in the labor market—and the social capital perspective—partners with less labor market resources are less likely to be positively associated with women's employment.

[Insert Table 3.1 here]

### **3.4 Methods**

#### *3.4.1 Data*

We used data from the Luxembourg Income Study (LIS) Wave IX (2013) and the Korean Labor and Income Panel Study (KLIPS). The LIS is a cross-nationally harmonized and nationally representative dataset with individual- and household-level variables. We selected 10 countries based on data availability and relevance to the welfare states and family policy typology: China, Denmark, Germany, Italy, Japan, Korea, Norway, Spain, Taiwan, and the United States. We used the literature on the typology of family policy (Del Boca, Pasquay, & Pronzatoz, 2009; Esping-Andersen, 1990; Gauthier, 2002; Holliday, 2000). Norway and Denmark represent “pro-egalitarian” social democratic welfare states. We classify Germany as a “pro-family” conservative welfare state, the United States as a “non-interventionist” liberal welfare state, and Spain and Italy as “pro-traditional” Southern European countries. In Gauthier’s typology (2002), although Japan is classified as a liberal state in terms of family policy support, we classify Japan as an East Asian welfare state along with Taiwan, China, and Korea to highlight the features that distinguish them from Western countries. In Korea, as the LIS dataset does not provide wage and labor income data<sup>1</sup>, we used the KLIPS data. In China, we also restrict our data and analysis to urban Chinese cases because rural Chinese have considerably different patterns of female employment.

First, we restricted our sample to only women who were partnered or married because our main interest lies in the effect of the couple’s educational combination. As the LIS does not specify a husband-and-wife relationship, we considered a man who reported being the spouse of the head of household to be a husband if a female adult reported being the head of household. Likewise, we considered a man who reported being the head of a household to be a husband if

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<sup>1</sup> The Korean dataset in the LIS is based on the Household Income and Expenditure Survey and the Farm Household Income and Expenditure Survey, both conducted by Statistics Korea.

a female adult in the same household reported being a spouse. We excluded cases from the final sample if we could not specify the wife's and husband's education levels. We focused on women aged 25–45 years (Boekman, Misra, & Budig, 2015; Glauber, 2018), which are the prime years of childrearing and working life.

### *3.4.2 Measurement*

Employment is measured as a dichotomous variable based on the main current activity status in the LIS dataset, following the International Labor Organization's (ILO) definition. This variable was self-reported by the respondents. We considered the dependent employed and self-employed to be employed. We also operationalized the key independent variable, motherhood, with a continuous measure of the number of children less than 18 years of age in the household following previous studies (Budig, Misra, & Boeckmann, 2015; Gangl & Ziefle, 2015). Educational level was defined as low if a respondent had less than a high school education or completed high school education but did not attend college and as high if a respondent completed college. The combinations of husbands' and wives' education were categorized as noted before: HH-WH, HH-WL, HL-WH, and HL-WL.

Based on the standard labor supply models and human capital theory, we included family circumstances and individual characteristics, like age, age squared, number of children and household income, as covariates and determinants of female labor supply (Böckmann et al., 2015; Budig & England, 2001; Blau & Kahn, 2003). We also used the natural log-transformed household income to account for the fact that other sources of family income from a spouse, other family members, or the government may decrease the likelihood of female employment.

Income from other household members was calculated based on the total household income subtracted by the respondent's (wife's) income.

### *3.4.3 Analysis*

Employed—as a categorical variable—allowed us to use the logistic regression model; however, for easier interpretation, we used the linear probability regression model. All analyses, including descriptive analyses, were weighted. The regressions were run country-by-country. The first regression model examined the effect of wives' and husbands' education, separately, and the number of children on married women's employment among couples. We further examined how the effect of the number of children on women's employment varied, depending on the value of different combinations of couple education by allowing an interaction effect between the number of children and couples' educational attainment.

## **3.5 Results**

### *3.5.1 Descriptive results*

Table 2 presents the weighted means and distributions of covariates. The percentage of employed women was highest in Denmark (86.68%), followed by Norway (86.0%), China (80.6%), Germany (72.6%), Japan (71.0%), Taiwan (69.6%), the United States (67.7%), Spain (61.7%), Italy (57.2%), and Korea (49.7%). The average number of children ranges from 0.98 in China to 1.58 in Norway and Korea. The average age of the sample ranged from 35.6 years in the United States to 38.0 years in Italy. The distribution of educational attainment varied: Korea had the largest proportion of university graduates (59.0%), followed by the United States

(54.8%) and Norway (54.2%). While China (67.2%) and Italy (75.2%) had a higher proportion of low-low couples, Korea had the highest proportion of high-high couples (50.9%).

[Table 3. 2 here]

### 3.5.2 Education and married women's employment

Table 3 indicates whether the motherhood employment penalty exists and how it varies across countries. The coefficient of the number of children indicates that except Denmark and Norway<sup>2</sup>, a higher number of children are associated with a lower level of employment, suggesting a motherhood employment gap. This negative impact is observed in most countries, with the largest effect in Germany ( $b = -0.107$ ), followed by Italy ( $b = -0.094$ ), China ( $b = -0.088$ ,  $p < 0.001$ ), the United States ( $b = -0.063$ ), and Korea ( $b = -0.046$ ).

Women's educational attainment was positively associated with married women's employment in general but is not statistically significant in Germany or Japan. This positive effect is largest in the Southern European countries, Spain ( $b = 0.263$ ) and Italy ( $b = 0.287$ ), followed by the United States and China ( $b = 0.179$ ), Denmark ( $b = 0.131$ ), Taiwan ( $b = 0.112$ ), Norway ( $b = 0.086$ ), and Korea ( $b = 0.081$ ). Husband's education seems less important in determining the wife's employment in its statistical significance and effect sizes: men's education is only statistically significant in Norway, Spain, and Japan; moreover, the direction

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<sup>2</sup> Although the coefficient for Norway seems negative and significant due to the large sample size, the effect size is close to zero ( $b = -0.005$ ). Likewise, we did not consider Japan as having no motherhood penalty, even if it shows an insignificant effect, because of the small sample size (403); rather, the coefficient ( $b = -0.047$ ) is larger than or similar to that of Taiwan and Korea.



of association differs by country. Japanese husbands' higher education is associated with the wives' lower employment ( $b = -0.194$ ), suggesting greater bargaining power among husbands and the income effect. Meanwhile, Spanish husbands' higher education is associated with wives' higher employment ( $b = 0.057$ ), supporting the social capital and gender-egalitarian perspectives.

[Insert Table 3.3 here]

### 3.5.3 Couples' education combination, motherhood, and wife's employment

Figure 1 presents the predicted probability of married women's employment (vertical axis) by the number of children (horizontal axis) and couples' education after accounting for the impact of other covariates. It shows the overall level of married women's employment and how the employment changes by the number of children and education combination. If employment decreases with an increase in the number of children, this represents the motherhood penalty on employment. We chose a graphical presentation because this figure shows the overall women's employment level, how women's employment changes by the number of children—the degree of motherhood penalty—and whether the motherhood penalty varies by different education combinations. This may not necessarily reflect the statistical significance of the interaction effects. However, relying on the statistical significance of the interaction can be misleading because changing a different reference group in the interaction term can result in a different conclusion and does not show the overall employment level. Considering these aspects, in the appendix, we also present the regression models with the main effect of education combination, the number of children, and their interaction.

We find that the two pro-egalitarian social democratic welfare states that feature generous work and family reconciliation policies, Denmark and Norway, show nearly no motherhood penalty in employment. This is despite the fact that married women's employment in HH-WL and HL-WL couples in Norway shows a slightly downward trend as the number of children increases. Danish and Norwegian mothers maintain a higher level of employment compared to other countries. Regardless of the husband's education level, women's education seems to determine their employment decisions, as women's employment in HH-WH and HL-WH couples is higher than in HH-WL and HL-WL couples. Conversely, women in pro-family welfare states, Germany, experience a steep decline in employment when they become mothers and have more children. For women with no children, the predicted probability of being employed is close to 90 percentage points, similar to that in Denmark and Norway. However, for women with two children, the predicted probability of being employed ranges between 60 and 70 percentage points, 10–20 percentage points lower than Danish and Norwegian counterparts. This trend of a steep decline with increasing numbers of children barely varies across different groups (couple combinations), although women's employment among HH-WL and HL-WH couples is slightly higher than for HH-WH and HL-WL couples in Germany.

Women's education has a strong effect in Italy, Spain, and the United States, as HH-WH and HL-WH couples exhibit a high level of women's employment. However, in the United States, women experience a higher motherhood penalty among HH-WH than HL-WH couples (see the table in the Appendix), while women in HL-WH couples in Italy and Spain maintain a high level of employment. Finally, women from HL-WL couples tend to suffer a motherhood penalty in Spain (compared to HH-WL and HL-WH) and the United States (compared to HL-WH).

Married women's employment levels with no children in East Asian countries, except

Korea, do not differ significantly from those in other countries. Employment among these women in China is slightly higher and similar to their Danish and Norwegian counterparts. However, almost all groups of couple combinations in the four East Asian countries suffer from a decline in employment as they have more children (i.e., the motherhood penalty), except for HH-WL couples in Taiwan who exhibit an increase in women's employment. In Taiwan and China, the effect of women's education is greater than that of men's education on women's employment. In Japan, women's employment among HL-WL couples is the highest, followed by HL-WH, HH-WH, and HH-WL couples. Women's employment among couples in Korea is notably low compared to other countries. The predicted employment probability of married women in Korea ranges from 40 to 60 percentage points; this is much lower than the 50 to 85 percentage points in the US, Japan, and Taiwan. There are few significant differences in women's employment by couple combinations in Korea, suggesting that regardless of women's education level, women's employment is relatively lower than in other countries.

### **3.6 Discussion**

Considering the tensions between rapid social and economic changes and limited changes in family expectations and obligations in East Asian countries (Raymo et al., 2015), mothers' employment rates are much lower than those in Western countries. We draw attention to the patterns of married women's employment from a comparative perspective, with a focus on the distinction between different welfare regimes, including those in East Asian countries. Specifically, we explored whether women's employment and the motherhood penalty vary according to her or her partner's education using couples' education combinations (both highly educated, both having a low level of education, or mixed high-low). This allowed us to compare

how wives' and husbands' education is differently associated with the motherhood employment penalty across different countries.

First, different characteristics of mothers' employment emerged across the welfare regimes. The social democratic welfare states, Denmark and Norway, show no motherhood penalty, with the highest level of married women's employment, whereas Germany—as a representative of conservative welfare states—shows a significant motherhood penalty. With no (two) children, the predicted employment probability in Germany is not considerably different (much lower) from that in Denmark and Norway. Almost all groups of couple combinations in the four East Asian countries and Spain, Italy, and the United States suffer from a decline in employment as they have more children. This pattern largely mirrors the welfare regime, suggesting the importance of a generous family policy. “Pro-egalitarian” social democratic welfare states are well known for generous parental leave—in terms of replacement rate and duration—and formal childcare (Ferragina, 2017). Studies have documented the critical role of childcare in enabling female workers' return to the labor market and reducing motherhood penalties (Budig, Misra, & Boeckmann, 2012). Likewise, leave policy is generally associated with greater female employment except in the case of extensively long leave that negatively affects female employment (Budig, Misra, & Boeckmann, 2012).

Second, many countries are generally aligned with the opportunity cost perspective. Except for Germany, Korea, and Japan, women's education is generally positively associated with their employment. Highly educated women, regardless of their husbands' education, are more likely to have a higher level of employment than less educated women. However, considering the effect of couples' education combinations rather than the separate impact of husbands' or wives' education helps us situate women's employment using the interaction between a husband and a wife within a household. This also helps us reflect different institutional and

cultural contexts. In Germany, Korea, and Japan, from a comparative perspective, highly educated women are more likely to be disadvantaged because they do not participate in the labor market more than less educated women. In fact, highly educated women (HH-WH and HL-WH couples) do not have a higher predicted employment probability than less educated women. This is especially true in Japan and Korea, where HH-WL has the lowest level of employment; this suggests that a husband's high level of education facilitates greater gender bargaining power, and his high earnings may bar women's employment participation. This result aligns with previous findings that although women's education is closely linked to the greater bargaining power among wives, the degree of bargaining power is relatively weaker in Korea and Japan than in China and Taiwan (Ng & Chen, 2018). Furthermore, the HL-WL couple in Japan shows the highest level of married women's employment with a declining trend (motherhood penalty). This may be because the income effect has a positive impact on women's employment. HL-WL couples may be more likely to engage in paid work due to economic constraints and circumstances. This is in striking contrast to other countries where HL-WL couples tend to show lower employment levels. Nonetheless, the actual size of the income effect may be small considering that we controlled for household income after subtracting the wife's income, which is likely to mainly reflect the husband's income<sup>3</sup>. Some cases support the social capital and the gender-egalitarian perspectives. For example, HH-WL

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<sup>3</sup> Controlling for household income (husband's income) may not completely capture the entire income effect. While household income presents the current income, education level may influence long-term life expected income. Even if the husband's current income is less, if he has a high education level, the wife may expect that he will be able to earn a lot of money later. That is, if she chooses an economic activity based on the level of income that her husband may earn in the long run rather than the current income, there may be an income effect from education level.

couples in Italy and the United States exhibit a higher level of women's employment than the HL-WL couples. In Taiwan and Spain, women's employment among HH-WL couples was lower than HL-WL couples when there was no child; however, with an increasing number of children, their employment probability increases, indicating a lower motherhood penalty.

Third, we also found significant variation in married women's employment in East Asian countries. The predicted employment probability in China is as high as Denmark and Norway (even higher in some cases), while employment levels in Taiwan are similar to those in Spain and the United States. Only Japan and Korea show unique features distinguishing them from Western welfare states and Taiwan and China. Japan, Taiwan, and Korea have enacted more generous childcare and parental leave policies with different approaches in recent years. Japan and Korea have adopted a regulated institutional approach through which childcare services are largely publicly or privately provided and center-based early childhood education and care programs. Taiwan has reinforced family-based childcare by extending parental leave and providing allowances for family and grandparent caregivers, resulting in the lower allocation of financial resources to childcare programs compared to China, Japan, and Korea (Chan, Soma, & Yamashita, 2011). However, female employment in Japan and Korea remains low. Korea has the lowest employment probability among the 10 countries. This may be because although family policy plays a crucial role in female employment, different cultures and other institutional contexts cannot be ignored (Baek, 2017; Brinton & Lee, 2015; Brinton & Oh, 2019). Women's behavior in the labor market is conditioned by the interaction between institutional and cultural factors (Ferragina, 2017). Taiwan and China have more progressive attitudes toward mothers' employment; Japan and Korea tend to have traditional gender role attitudes where wives are seen as caregivers and housekeepers (Lee, 2016) and husbands as breadwinners (Brinton & Oh, 2019). Moreover, the Japanese and Korean labor markets offer

greater employment security and benefits among workers in large firms than in smaller firms (Lee, 2014; Yu, 2009). Furthermore, the organizational culture in both Japanese and Korean firms requires long working hours and demanding work schedules (Brinton & Oh, 2019; Jung, Kim, & Kwon, 2012). Conversely, the Taiwanese labor market provides more employment opportunities for women through small and medium-sized firms with more egalitarian and informal organizational cultures (Kim & Shirahase, 2014; Yu, 2009). Extremely long working hours and organizational cultures are, in fact, interrelated to gender division and gender role attitudes in these countries. Men can escape from childcare responsibility due to the long working hours and their role as the family's main financial support, while women's roles remain to be the primary caregivers for children. This may indicate that despite the rapid expansion of childcare systems and work and life reconciliation policies, female employment in Korea remains extremely low compared to their counterparts from other OECD countries.

This study has some limitations. First, although the LIS dataset may be the most suitable data source for cross-national comparative work on employment-related issues, some findings should be interpreted with caution. The non-significance of the motherhood penalty in Japan may result from the small sample size as it may not provide us with sufficient power to detect the effect. Furthermore, the distinctive patterns in Korean mothers' employment may be because we used a different dataset due to inadequate information on marital status and the absence of individual income data in the LIS. Second, we draw inferences regarding the importance of gender role attitudes, allocation of power and resources within a household, and institutional contexts from employment outcomes. However, in essence, employment and gender attitudes can be reciprocal and reinforce each other (Schober & Scott, 2012) through economic independence within the household. Future research should further explore how gender role attitudes and education shape different patterns of mothers' employment across

different countries. Despite these limitations, this study is the first one, to the best of our knowledge, to provide a comprehensive comparison of how couples' education is associated with married women's employment and the motherhood penalty across Western and East Asian countries.



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Table 3.1 Theoretical explanation of motherhood penalty by couple's education combination

	HH-WH	HH-WL	HL-WH	HL-WL
	(a)	(b)	(c)	(d)
High level of wife's employment (low motherhood penalty)	<ul style="list-style-type: none"> <li>✓ Opportunity cost effect</li> <li>✓ Social capital perspective</li> <li>✓ Gender egalitarian perspective (both husband and wife)</li> </ul>	<ul style="list-style-type: none"> <li>✓ Social capital perspective</li> <li>✓ Gender egalitarian perspective (husband)</li> </ul>	<ul style="list-style-type: none"> <li>✓ Income effect</li> <li>✓ Comparative advantage perspective</li> <li>✓ Gender power relation (greater bargaining power among wife)</li> <li>✓ Opportunity cost effect</li> </ul>	<ul style="list-style-type: none"> <li>✓ Income effect</li> <li>✓ Gender power relation (greater bargaining power among wife)</li> </ul>
	(e)	(f)	(g)	(h)
Low level of wife's employment (high motherhood penalty)	<ul style="list-style-type: none"> <li>✓ Gender power relation (greater bargaining power among husband)</li> <li>✓ Income effect</li> </ul>	<ul style="list-style-type: none"> <li>✓ Income effect</li> <li>✓ Comparative advantage perspective</li> <li>✓ Gender power relation (greater bargaining power among husband)</li> </ul>	<ul style="list-style-type: none"> <li>✓ Gender power relation (greater bargaining power among husband)</li> </ul>	<ul style="list-style-type: none"> <li>✓ Opportunity Cost effect</li> <li>✓ Social capital perspective</li> </ul>

		✓ Opportunity cost effect		
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Table 3.2 Weighted descriptive summary

		‘Pro-egalitarian’ social democratic states	‘Pro-family’ conservative welfare State	‘Pro-traditional’ Southern European countries	‘Non-interventionist’ liberal welfare State						
		East Asian countries									
		Denmark	Norway	Germany	Italy	Spain	US	China	Japan	Taiwan	Korea
Numbers of children		1.56	1.58	1.22	1.42	1.18	1.50	0.98	1.54	1.48	1.58
(S.D.)		(1.06)	(1.07)	(1.10)	(0.92)	(0.96)	(1.24)	(0.72)	(0.94)	(0.88)	(0.83)
Women’s education	Low (%)	51.24	45.80	68.28	80.40	52.04	45.22	75.86	52.62	54.95	41.00
	High(%)	48.76	54.20	31.72	19.60	47.96	54.78	24.14	47.38	45.05	59.00

Men's education	Low (%)	62.63	60.97	63.69	85.97	62.90	53.14	70.96	48.31	51.61	34.92
	High(%)	37.37	39.03	36.31	14.03	37.10	46.86	29.04	51.69	48.39	65.08
Couple's education combinati on	Low – Low (%)	41.54	37.35	52.12	75.20	42.69	36.06	67.16	35.42	43.26	26.80
	Low – High (%)	21.09	23.62	11.57	10.77	20.21	17.09	3.79	12.88	8.34	8.11
	High – Low (%)	9.71	8.45	16.16	5.20	9.35	9.16	8.69	17.19	11.68	14.19
	High – High (%)	27.67	30.58	20.15	8.83	27.75	37.70	20.35	34.50	36.71	50.89
Average age		36.21	35.95	36.13	37.93	36.79	35.57	37.17	38.44	37.62	37.78
(S.D)		(5.77)	(5.85)	(5.84)	(5.05)	(5.29)	(5.90)	(5.35)	(4.68)	(4.98)	(4.84)
Household income		10.91	11.08	10.82	9.84	10.01	10.77	8.83	10.35	10.83	10.60



(log transformed)										
(S.D)	(0.77)	(0.63)	(0.76)	(2.15)	(1.39)	(1.20)	(2.13)	(1.87)	(0.63)	(1.25)
Employed (%)	86.68	86.01	72.55	57.20	61.69	67.72	80.57	70.98	69.60	49.65
N	15,206	44,912	3,762	1,034	2,643	13,557	2,819	403	3,707	1,651

Table 3.3 Estimated Motherhood penalty across ten countries

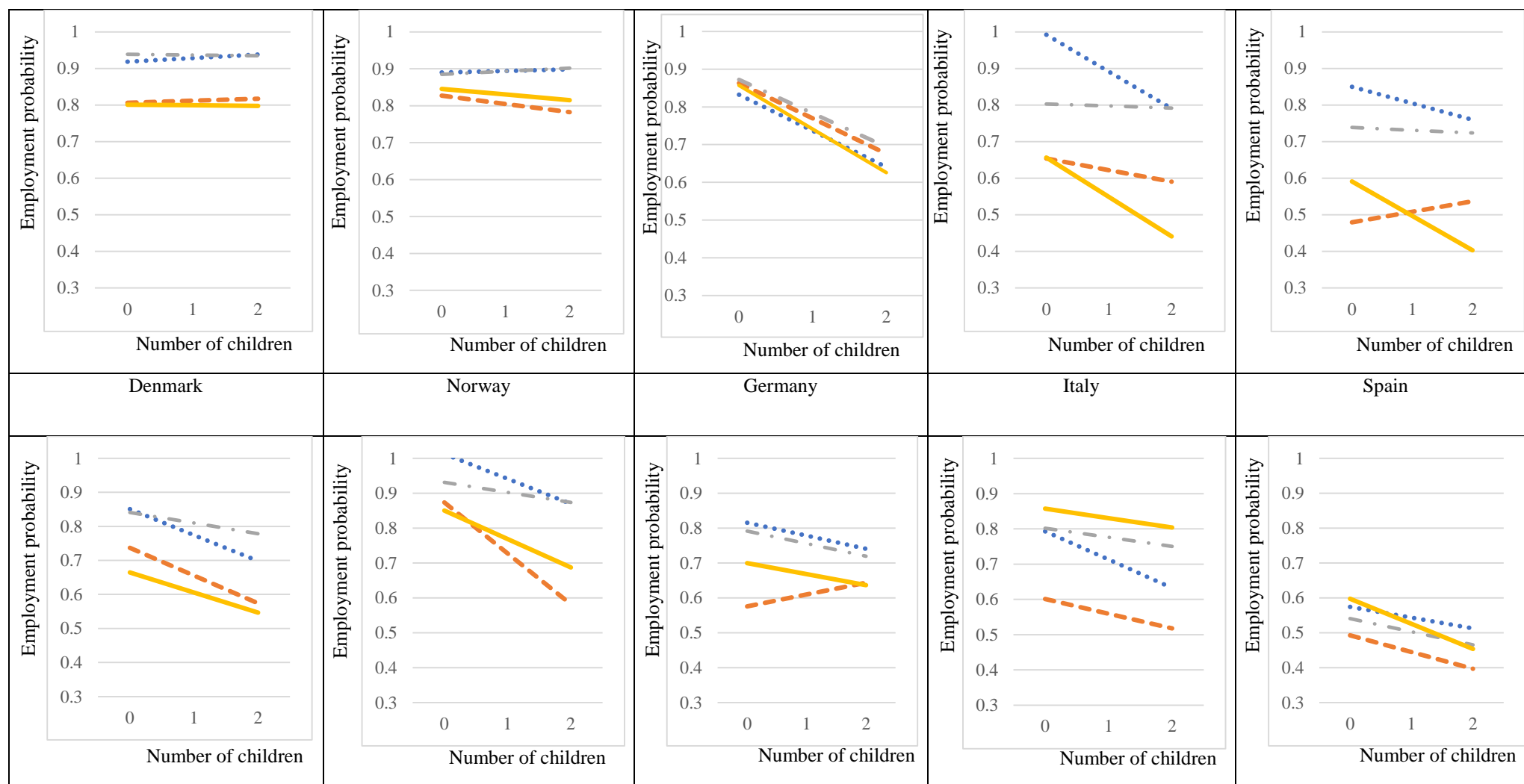
		‘Pro-egalitarian’ democratic welfare states		social conservative welfare State	‘Pro-family’ conservative welfare State	‘Pro-traditional’ European countries	Southern	‘Non- interventionist’ liberal welfare State	East Asian countries		
		Denmark	Norway	Germany	Italy	Spain	US	China	Japan	Taiwan	Korea
Numbers of	children	0.002 (0.003)	-0.005** (0.002)	-0.107*** (0.009)	-0.094*** (0.020)	-0.052*** (0.013)	-0.063*** (0.004)	-0.088*** (0.024)	-0.047 (0.026)	-0.027** (0.009)	-0.046* (0.018)
Women	education High (ref. low)	0.131*** (0.006)	0.086*** (0.004)	0.006 (0.029)	0.287*** (0.048)	0.263*** (0.026)	0.179*** (0.011)	0.179*** (0.030)	0.049 (0.054)	0.112*** (0.020)	0.081* (0.033)
Men	education high (ref. low)	0.005 (0.006)	-0.011** (0.004)	0.004 (0.026)	0.074 (0.056)	0.057* (0.027)	-0.018 (0.010)	-0.017 (0.033)	-0.194*** (0.053)	-0.006 (0.020)	-0.020 (0.034)
Age		0.042*** (0.007)	0.063*** (0.004)	0.044 (0.028)	0.043 (0.048)	0.002 (0.031)	0.022* (0.011)	0.068* (0.031)	-0.008 (0.074)	0.023 (0.023)	0.062 (0.045)

		-0.051***	-0.079***	-0.045	-0.039	-0.000	-0.026	-0.093*	0.014	-0.029	-0.060
Age squared/100		(0.010)	(0.006)	(0.039)	(0.065)	(0.043)	(0.015)	(0.044)	(0.099)	(0.030)	(0.060)
Log household income		-0.017***	0.024***	0.007	-0.004	-0.000	-0.012**	-0.023***	0.004	-0.120***	-0.048***
		(0.004)	(0.003)	(0.014)	(0.009)	(0.009)	(0.004)	(0.005)	(0.013)	(0.011)	(0.007)
Constant		0.141	-0.662***	-0.220	-0.396	0.457	0.360	-0.175	0.893	1.535***	-0.433
		(0.130)	(0.082)	(0.499)	(0.867)	(0.568)	(0.193)	(0.538)	(1.372)	(0.432)	(0.810)
R2		0.050	0.036	0.081	0.113	0.106	0.068	0.074	0.055	0.036	0.047
N		15206	44912	3762	1034	2643	13557	2819	403	3707	1651

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Figure 3.1 Married women's employment penalty for motherhood by couple's educational arrangements across 10 countries



US	China	Taiwan	Japan	Korea
<p> <span style="color: blue;">.....</span> High-high              <span style="color: orange;">- - -</span> high-low              <span style="color: gray;">- · -</span> low-high              <span style="color: yellow;">———</span> low-low         </p>				

The model controlled for other covariates such as age, age squared, and household income.

Appendix Table 3.1 Interaction effect of education and numbers of children

Reference group		Germany	Denmark	Norway	Italy	Spain	US	China	Japan	Taiwan	Korea
HL-WL	Numbers of children $\times$ (HL-WH)	0.027	-0.000	0.023***	0.102	0.087*	0.027*	0.053	0.001	-0.004	0.110
		(0.032)	(0.007)	(0.004)	(0.077)	(0.036)	(0.011)	(0.044)	(0.071)	(0.031)	(0.060)
	Numbers of children $\times$ (HH-WL)	0.022	0.007	-0.007	0.076	0.123**	-0.023	-0.065	-0.015	0.066*	0.027
		(0.023)	(0.012)	(0.007)	(0.092)	(0.048)	(0.013)	(0.069)	(0.094)	(0.031)	(0.052)
	Numbers of children $\times$ (HH-WH)	0.020	0.011	0.019***	0.007	0.049	-0.017	0.010	-0.054	-0.006	0.060
		(0.026)	(0.007)	(0.004)	(0.047)	(0.027)	(0.009)	(0.032)	(0.052)	(0.020)	(0.040)
	Numbers of children $\times$ (HL-WL)	-0.027	0.000	-0.023***	-0.102	-0.087*	-0.027*	-0.053	-0.001	0.004	-0.110
		(0.032)	(0.007)	(0.004)	(0.077)	(0.036)	(0.011)	(0.044)	(0.071)	(0.031)	(0.060)
		-0.005	0.007	-0.031***	-0.026	0.036	-0.050***	-0.118	-0.016	0.070	-0.083

HL-WH	Numbers of children $\times$ (HH- WL)	(0.036)	(0.012)	(0.007)	(0.115)	(0.054)	(0.015)	(0.074)	(0.109)	(0.040)	(0.068)
	Numbers of children $\times$ (HH- WH)	-0.007	0.012	-0.004	-0.095	-0.037	-0.045***	-0.043	-0.054	-0.002	-0.050
		(0.038)	(0.006)	(0.004)	(0.083)	(0.037)	(0.011)	(0.043)	(0.077)	(0.032)	(0.059)
HH-WL	Numbers of children $\times$ (HL- WL)	-0.022	-0.007	0.007	-0.076	-0.123**	0.023	0.065	0.015	-0.066*	-0.027
		(0.023)	(0.012)	(0.007)	(0.092)	(0.048)	(0.013)	(0.069)	(0.094)	(0.031)	(0.052)
	Numbers of children $\times$ (HL- WH)	0.005	-0.007	0.031***	0.026	-0.036	0.050***	0.118	0.016	-0.070	0.083
		(0.036)	(0.012)	(0.007)	(0.115)	(0.054)	(0.015)	(0.074)	(0.109)	(0.040)	(0.068)
	Numbers of children $\times$ (HH- WH)	-0.002	0.004	0.026***	-0.069	-0.074	0.005	0.074	-0.039	-0.071*	0.033
		(0.030)	(0.011)	(0.007)	(0.098)	(0.048)	(0.013)	(0.067)	(0.098)	(0.032)	(0.051)
HH-WH	Numbers of children $\times$ (HL- WL)	-0.020	-0.011	-0.019***	-0.007	-0.049	0.017	-0.010	0.054	0.006	-0.060
		(0.026)	(0.007)	(0.004)	(0.047)	(0.027)	(0.009)	(0.032)	(0.052)	(0.020)	(0.040)

	Numbers of children × (HL- WH)	0.007	-0.012	0.004	0.095	0.037	0.045***	0.043	0.054	0.002	0.050
		(0.038)	(0.006)	(0.004)	(0.083)	(0.037)	(0.011)	(0.043)	(0.077)	(0.032)	(0.059)
	Numbers of children × (HH- WL)	0.002	-0.004	-0.026***	0.069	0.074	-0.005	-0.074	0.039	0.071*	-0.033
		(0.030)	(0.011)	(0.007)	(0.098)	(0.048)	(0.013)	(0.067)	(0.098)	(0.032)	(0.051)
N		3762	15206	44912	1034	2643	13557	2819	403	3707	1651

All other covariates (education, number of children, age, age squared, household income,) are controlled.

\* p<.05, \*\* p<.01, \*\*\* p<.001, Robust Standard Errors in parenthesis.