Social Institutions and Low Birth Rates*

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Abstract

We document three cross-sectional stylized facts on labor supply and family formation. First, female labor force participation (FLFP) and total fertility rates (TFRs) are much lower in Eastern societies compared to Western economies. Second, labor hours and the gender pay gap are much higher in the East than in the West. Third, parents invest more on schooling in Eastern societies compared to Western economies. To account for these features, we develop and estimate a rich heterogeneous-agent model with endogenous marriage, fertility, labor supply, and time and money investment in children. Estimates using data from South Korea and the United States highlight the importance of gender norms and long work hours practices in driving down FLFP while child quality mores drive down fertility in South Korea. Our results suggest that a multi-pronged policy approach or reductions in the gender pay gap may help boost both FLFP and fertility in East Asia.

Keywords: female labor supply, fertility, child quality, gender norms, long work hours

JEL Codes: D13, E24, H31, J13, J16, J22

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1 Introduction

Total fertility rates (TFRs) are well-below the replacement rate in almost all OECD countries with an average of 1.5 children per women in 2022 (OECD, 2024). East Asian economies such as South Korea (henceforth Korea) fare even worse, with a TFR of 0.7 in 2023. Female empowerment in the form of increased labor force participation (LFP) has often been blamed for such low TFR, as women have less time for children when they work (Doepke et al., 2023). As a result, relaxing the time constraint through child care subsidies or husbands stepping up can enable women to better balance work and children, and mitigate the negative associations between female LFP (FLFP) and fertility (Del Boca, 2002; Del Boca and Sauer, 2009; de Laat and Sevilla-Sanz, 2011). The family-macro literature further argues that labor market frictions in Spain (Guner et al., 2024) as well as parental preoccupation with their children's education (Kim et al., 2024) and sticky gender norms (Myong et al., 2021) in Korea, may also contribute to the low TFRs in these countries. Nevertheless, that literature has typically focused on one explanation in one specific country. Thus, single-prong policies such as eliminating split-shift schedules may help boost fertility and FLFP in Spain (Guner et al., 2024) while taxes on education may help boost fertility in Korea (Kim et al., 2024).

In this paper, we introduce the notion of "greedy kids" to highlight how parents' high valuation of child quality may result in both ultra-low birth rates and low FLFP. The way to raise children has evolved substantially over the past century, with parenting much more intense nowadays (The U.S. Surgeon General, 2024). In East Asian societies in particular, children now require both a lot of time and money to be raised to the high standards aspired by societal norms, whereby success in education is closely tied to parents' perceived achievement and children's self-esteem (Chua, 2012). Therefore, raising children is not only resource-consuming but also parental-time intensive. To make matters worse, these child quality mores are further conflated by two additional conventions that are particularly salient to East Asia: the prevalence of strong gender norms and of long work hours. Women still do the lion's share of housework in Korea, Japan, Hong Kong, and Taiwan (Ho and Myong, 2021). Additionally, as documented below, while FLFP tend to be low in East Asia, work hours tend be very high among those employed. Altogether, we posit that the three channels (child quality mores, gender norms, and labor market institutions) put downward pressures on both FLFP and fertility. As a result, policies that target only one channel may not be effective on their own or may result in a welfare loss. Instead multi-pronged policies that target multiple contributors to low fertility and low FLFP may help boost fertility and FLFP while improving welfare in East Asia. As intense parenting and declining fertility are becoming increasingly prevalent worldwide (Nomaguchi and Milkie, 2020), the insights from our study may also be applicable to Western societies in the impending future.

We start by documenting three stylized facts on labor supply and family formation across high-income Eastern and Western economies using country level statistics from official government websites or from international organizations, as well as data from nationally representative surveys. First, we show that FLFP and birth rates tend to be much lower in East Asian societies (EASIA), such as Korea and Singapore, than in Western OECD countries (WOECD), such as the USA and Norway. Interestingly, OECD countries known for their relatively strong gender norms (OECDSN), such as Italy and Spain, lie in the middle ground with higher (lower) FLFP and fertility compared to EASIA (other WOECD). Nevertheless, although EASIA and OECDSN economies may have similar gender norms (Anderson and Kohler, 2013; Bertrand et al., 2021), EASIA societies display even lower FLFP and ultra-low birth rates, suggesting that others factors may also play a role in driving down FLFP and fertility in EASIA.

Second, we show that EASIA tend to have much longer work hours conditional on employment, as well as higher gender wage gaps compared to WOECD. Such labor market characteristics are consistent with the notion of greedy work à la Goldin (2021), whereby interactions between the inflexible nature of higher paying jobs and the fact that women still tend to be in charge of house chores, leads to higher gender wage gaps. Such interactions are even more prominent in EASIA given even longer work hours and even higher gender wage gaps compared to WOECD.

Third, we document that parents are more involved in their children's schooling activities and spend more on their children's education in EASIA compared to WOECD. This motivates the notion of greedy kids, and suggest that the interactions between the nature of work and gender norms, may be even more conflated in a setting where parents highly value child quality. In the East Asian context, inputs in child quality such as maternal time and spending on education may not be substitutable with alternative inputs such as paternal time or formal child care time. As a result, women may face even tougher choices between devoting time to children or to the labor market. Even when women choose to devote time to children and not to the labor market, they may only be able to afford fewer children for the sake of generating higher quality children. This may be particular salient in the light of the high education costs in EASIA.

Motivated by the evidence, we next examine the determinants of marriage, fertility, labor supply, and time and money investments in children in a unified setting, paying particular attention on how the three social institutions—child quality mores, gender norms, and labor market institutions—may interact to affect such decisions. Parents derive utility from child quantity and quality, and the relative value of quality over quantity differs by maternal education. Child quality depends on parental time inputs and spending on education. Maternal and paternal time productivity in producing child quality, as well as their fixed costs of work, may differ. The model also accounts for gender pay gaps, fixed work hours, and part-time work.

The model is estimated separately for Korea and for the US using the Simulated Method of Moments (SMM). The estimates highlight the roles of stronger emphasis on child quality over quantity, higher fixed cost of work for women, longer work hours, and higher gender wage gaps in driving down FLFP and birth rates in Korea compared to the US. In particular, high emphasis on child quality puts downward pressure on birth rates while gender norms coupled with labor market rigidities leads to lower FLFP. We show that targeting only one social institution may not be enough to boost both FLFP and fertility without compromising welfare. Instead, policies that target multiple institutions at the same time can be effective and welfare improving. We propose two such policies. First, we show that a cap on private tutoring, coupled with reductions in women's fixed cost of work, could help boost both FLFP and fertility. By limiting investment in child quality, the cap leads to a substitution towards child quantity. Meanwhile, a reduction in women's fixed cost of work boosts their LFP. Such policy may be interpreted as targeting child quality mores and gender norms simultaneously. Second, a reduction in the gender wage gap leads to both an increase in FLFP and the number of children. Intuitively, a reduction in the gender wage gap encourages women to work while at the same time boosts their incomes, and thus the demand for children. The latter policy thus targets both gender norms and labor market institutions. Both policies help increase individual welfare.

To the best of our knowledge, this paper is the first to document cross-sectional stylized facts on labor supply and family formation across both Western and Eastern developed economies. Prior literature has so far focused on the positive association between FLFP and fertility in North America and Europe (Adserà, 2005; Ahn and Mira, 2002; Apps and Rees, 2004; Del Boca, 2002; de Laat and Sevilla-Sanz, 2011). By incorporating insights from East Asian societies, our study enables the examination of an additional contributor to low birth rates, the high emphasis on children's quality, and its interaction with gender norms and long work hours contracts. Although countries like Korea are among the first to experience ultra-low TFR, insights from this study may be relevant to other parts of the world given the increased intensity of parenting worldwide (Nomaguchi and Milkie, 2020; The U.S. Surgeon General, 2024).

We contribute to several strands of literature that has examined how each of the three social institutions of interest—child quality mores, gender norms, and labor market institutions—affect fertility and/or female labor supply. First, it is well-known that parents in East Asia invest a lot in their children's education, both in terms of time and money (Anderson and Kohler, 2013; Chua, 2012). Closely related to the angle on child quality mores, is the recent study by Kim et al. (2024) that examines how status externalities in education contribute to overspending on education in Korea, which in turn leads to lower birth rates due to quantity-quality trade-offs (Becker and Lewis, 1973). Our work differs from Kim et al. (2024) in that we examine how parents choose both money and time investments in children, allowing for more highly educated

mothers to care more about child quality. We further focus on the LFP decision of women, taking into account gender norms and labor market rigidities. Whereas we abstract from explicitly modeling status externalities in our framework, we also show that capping the high levels of education expenditures would result in an increase in fertility in our context, which is similar in spirit to curbing education expenditures through education taxes in Kim et al. (2024). Nevertheless, we further show that a cap on education could also have a negative effect on FLFP in the presence of high fixed costs of work, suggesting that a single-pronged policy that targets child quality mores, while effective at boosting fertility, may have detrimental effects on the already low LFP of women in Korea.

Second, we contribute to the literature that has examined how gender norms may simultaneously drive down female labor supply and fertility. Women have traditionally specialized in the domestic sphere whereas men tend to specialize in the labor market sphere (Lundberg and Pollak, 1993). Although FLFP has increased sharply worldwide, there are substantial differences in the extent to which household work is allocated across countries. Specifically, countries with stronger gender norms tend to have both lower FLFP and lower fertility (de Laat and Sevilla-Sanz, 2011; Feyrer et al., 2008). Thus, a reallocation of household chores from wives to husbands or better availability of formal child care may help relax women's time constraint and thus boost both FLFP and fertility (Apps and Rees, 2004; Doepke and Kindermann, 2019; Feyrer et al., 2008; Hwang et al., 2018; Siegel, 2017). Such reallocation or outsourcing of home production works due to the assumption that maternal time can be substituted with alternative providers of time.

In our context with greedy kids, the quality of children is determined by parental time and money investments. Meanwhile, gender norms translate into higher fixed cost of work for women and higher female productivity in generating child quality. We show that simply decreasing the fixed cost of work (e.g., through better opportunities to outsource house chores) or improving male productivity in household production (e.g., by "training" husbands) leads to higher FLFP but lower fertility. Specifically, traditional tools used to relieve a woman's time constraint may not work in a setting where maternal time is not quite substitutable with other providers when it comes to producing the high quality children that are highly valued by parents. As a result, although outsourcing house chores and husbands stepping up may help increase FLFP, the family will be able to afford fewer greedy kids due to the decrease in maternal time devoted to the production of child quality.

Third, many studies argue that a positive association between FLFP and fertility may exist due to the lack of labor market flexibility (Del Boca, 2002; Del Boca and Sauer, 2009). Recent literature also posits that the presence of labor market frictions, whereby the uncertainty caused by unemployment shocks, temporary work contracts, or earnings risk, may also negatively affect female employment and fertility (Da Rocha and Fuster, 2006; Guner et al., 2024; Santos and

Weiss, 2016; Sommer, 2016). Here, in addition to modelling the lack of part-time opportunities, we focus on the presence of long work hours contracts in Korea. As we document below, long work weeks are common in East Asia, and possibly serve as an additional deterrent to FLFP and among those who work, to fertility. We further show that while labor market reforms that decrease work hours may help boost FLFP, such reforms would also result in lower fertility. Similar to the above argument, the presence of greedy kids combined with gender norms, makes it difficult to substitute maternal time inputs in the production of child quality, thereby generating the negative trade-off between FLFP and fertility. Now, how can we reconcile this negative trade-off with the positive cross-sectional association between FLFP and fertility? As explained below, this arises due to compositional differences within country, non-employed married mothers have low LFP but decent TFR in East Asia. Conversely, employed non-married women have high LFP but ultra-low fertility. Overall, different groups drive the cross-sectional averages. Our rich model helps capture such heterogeneity.

Finally, we show that single-prong policies that target one channel only may not be enough to boost both FLFP and fertility without compromising women's welfare in the presence of greedy kids. Instead, multi-prong policies that target multiple channels may help increase female employment and birth rates, while also improving welfare. Interestingly, we also find that reducing the gender wage gap, a policy that targets gender norms and labor market institutions simultaneously, may help boost both FLFP and fertility. Specifically, the substitution effect induced by a rise in female wages relative to male wages, leads to higher LFP for women. As LFP rises, the income effect from higher earnings (thanks not only to employment but also to higher female wages) leads to an increase in fertility. This key result is consistent with Claudia Goldin's recent take that better accessibility to greedy jobs (e.g., through work from home opportunities) may help women better balance work and children (Goldin, 2021; Tsipursky, 2023). We add to this take by showing that such policy may also work in the presence of greedy kids. Specifically, reducing the gender wage gap can help boost both FLFP and fertility.

The reminder of this paper is organized as follows. Section 2 documents some key facts on labor supply and family formation, and provides some context on the three social institutions of interest. Section 3 sets up the model and Section 4 presents the estimated model parameters. Section 5 conducts counterfactual analyses and policy simulations. Section 6 concludes and discusses further research directions.

2 Cross-Sectional Facts

2.1 Data

High income Western and Eastern economies. We focus on high-income OECD countries in East Asia, Europe, and North America as classified by World Bank (2021), and on additional high income East Asian economies. This gives us 33 economies in total: Austria, Belgium, Canada, Czech Republic, Germany, Denmark, Spain, Estonia, Finland, France, Greece, Hong Kong, Hungary, Ireland, Iceland, Italy, Japan, South Korea, Lithuania, Luxembourg, Macau, Netherlands, Norway, Poland, Portugal, Singapore, Slovak Republic, Slovenia, Switzerland, Sweden, Taiwan, the United Kingdom, and the United States. We cluster these economies into three groups: East Asian economies such as Korea and Singapore (EASIA), OECD countries with social norms such as Italy and Spain that tend to have stronger gender norms compared to other OECD countries (OECDSN), and other OECD countries such as the USA and Norway (OOECD). The latter two set of countries are also referred to as Western OECD countries (WOECD) when combined together. The protocol to cluster these economies based on gender norms is described in the Appendix Section A.1 (see also Tables A1 and A2).

Macro data. The cross-sectional facts on fertility and labor supply are documented using publicly available economy level data from official government websites and international organizations such as the World Bank, OECD, and International Labor Organization (ILO). Due to data availability, we focus predominantly on 2010 or the years closest to 2010, but as robustness check, we also document facts from 2019 or the years closest to 2019. A summary of data sources for the macro data is provided in Appendix Table A3.

Micro data. We also use individual and household survey data to document more granular cross-sectional facts for a subset of economies for which such data is available publicly or by application. Such data is also used to estimate the model below for Korea and the US. To the extent possible, we use harmonized data from the Generations and Gender Survey (GGS) and from the Integrated Public Use Microdata Series (International) (IPUMS). We also use data from economy specific-censuses and manpower surveys. Due to data availability, we focus predominantly on 2010 or the years closest to 2010. A summary of micro data sources is listed in Appendix Table A4. The means from the micro data on fertility and labor supply closely match those from the macro data (see Appendix Figure A1). Additionally, we use data from the European Value Survey (EVS), Integrated Value Survey (IVS), the International Social Science Program (ISSP), and Multinational Time Use Study (MTUS) to document attitudes toward gender roles and child care division across economies.

Target age groups. Following the literature (Doepke et al., 2023), we focus on prime-age women (25–54) so as to exclude potential students or retirees. The average age at first birth was above 25 in all economies during our period of interest (see Appendix Figure A2). We also show that the key stylized facts described below are robust to focusing on women of reproductive age (25–44).

2.2 Labor Supply and Family Formation

We now document three cross-sectional facts on labor supply and family formation using data on prime aged women (25–54) in 2010.

Fact 1 (TFR-LFPR) *EASIA societies have both lower TFR and lower female LFPR compared to WOECD countries.*

Figure 1a plots TFR against the female labor force participation rates (LFPR) across WOECD and EASIA economies using macro data. Historically, there used to be a negative cross-sectional relationship between TFR and FLFP, as women in richer countries were more likely to work and have fewer children (Doepke et al., 2023). Nevertheless, in recent years, the correlation has reversed with recent literature documenting a positive cross-sectional association between TFR and FLFP among North American and European countries (Adserà, 2005; Ahn and Mira, 2002; Apps and Rees, 2004; Da Rocha and Fuster, 2006; Del Boca, 2002). Figure 1a confirms this positive association among WOECD countries, with OECDSN countries displaying both lower TFR and female LFPR compared to OOECD countries.[1] Figure 1a further shows that EASIA economies tend to have even lower TFR and female LFPR compared to WOECD countries. In particular, the TFR in WOECD and EASIA economics are respectively, 1.670 and 1.139 children per women while the respective FLFP are 80.534% and 72.108%. Such patterns are robust when we look at more recent 2019 data (Appendix Figure A3) and when we consider prime age women (25–54) as well as those of reproductive age (25–44) using micro data (Appendix Figure A4). Conversely, the LFPRs of men tend to be concentrated at around 90–96% across all economies, suggesting that men still tend to work full-time worldwide (see Appendix Figure A5).

Fact 2 (Greedy Work) *Conditional on employment, women work longer hours and face higher gender wage gaps in EASIA than in WOECD.*

Figure 1b plots TFR against women's average weekly hours of work (conditional on employment) across WOECD and EASIA economies using macro data. As can be seen from the figure,

[1] In particular, such pattern arises due to compositional differences: non-employed married mothers have low LFP but decent TFR while employed non-married women have high LFP but ultra-low fertility in EASIA (see Appendix Tables A5 and A6).

EASIA economies tend to have longer work hours compared to WOECD countries. Women's average weekly work hours in EASIA and WOECD economics are respectively, 41.6 and 35.3 hours per week. Interestingly, Figure 1b indicates a negative association between TFR and work hours, suggesting that societies with shorter work weeks tend to have higher birth rates compared to societies with longer work weeks. The negative associations are robust when we look at more recent 2019 data (Appendix Figure A3) and when we consider prime age women (25–54) as well as those of reproductive age (25–44) using micro data (Appendix Figure A4). Similarly, men in EASIA also tend to work long hours conditional on employment (Appendix Figure A5). Below, we discuss some of the labor market institutions (e.g., fixed work contracts and availability of part-time work) that may contribute to the longer work weeks in EASIA compared to WOECD.

Figures 2a and 2b plot the gender wage gap against female LFPR and TFR, respectively. As can be seen from the Figures, the gender pay gap—defined as the difference between median wages of men and women relative to the median wages of men for full-time workers—tends to be higher in EASIA than in WOECD economies. The gender wage gap in EASIA and WOECD are respectively, 24.2% and 13.2%. Interestingly, there is a negative correlation between the gender pay gap and FLFP as well as a negative association between the gender wage gap and TFR. This suggests that the interaction between gender norms and labor market institutions may play a role in contributing to Fact 1. These patterns are once again robust to using more recent 2019 data or micro data on different age groups (Appendix Figures A6 and A7).

Fact 3 (Greedy Kids) *Parents in EASIA economies are more involved in and spend more on their children's schooling than parents in WOECD countries.*

Figure 3 plots the proportion of parents involved in school-related activities in EASIA and WOECD economies. From the figure, 35.9% (30.6%) of parents in EASIA (WOECD) are involved in activities such as discussing a child's progress with a teacher or volunteering for school activities. Moreover, Figures 4a and 4b respectively plot the average annual spending on educational institutions per child and the percentage of household expenditure spent on education for all children across WOECD and EASIA economies. As can be seen from Figure 4a, parents in EASIA economies spend around twice more on education institutions compared to parents in WOECD countries ($ 1,098 vs. $555). Similarly, from Figure 4b, the share of household expenditure spent on education is more than four times greater in EASIA than in WOECD (4.26% vs. 1%). Ironically, although EASIA economies have fewer children, their total education expenditure as a share of household expenditure are the highest. This suggests that parents in EASIA tend to invest substantially in their children's schooling. This in turn seem to translate into higher learning-adjusted years of schooling (LAYS) in EASIA compared to WOECD countries, with around six months difference in Figure 5.

2.3 Social Institutions

This section provides some background information on three social institutions that could possibly contribute to the stylized facts documented above. We pay particular attention to Korea and the United States to better inform the subsequent heterogeneous agent model set up.

2.3.1 Child Quality Mores

EASIA parents are highly concerned with their children's education (Anderson and Kohler, 2013; Chua, 2012). Such emphasis is historically grounded in Confucian values, whereby education is perceived as a key path towards social improvement. Success in education is thus closely tied to perceived achievement in parenting and to self-esteem (Chen et al., 2021; Hung, 2018). Perhaps, even more importantly, labor market outcomes are closely linked to educational achievement in EASIA (Bray, 2023; Chu and Yu, 2010; Liu, 2012). Given such perceptions, there is a high degree of competition among students, and a "rat-race" to get into the most prestigious universities (Gu and Zhang, 2024; Kang, 2024). Such competition has also been associated with the proliferation of private tutoring, where students take after school classes until late at night. Indeed, around 70% of students participate in private tutoring in EASIA economies (Bray, 2023; Kim et al., 2024; Liu, 2012). The practice is so extreme that the Korean government imposed a ban on private tutoring after 10 PM or 11 PM (Kim et al., 2024).

Consistent with Fact 3, parents in Korea invest much more on their children's education compared to parents in the US (see Figures 3 to 5). From Figure 3, the proportions of Korean and American parents who participate in school related activities look similar at around 33%. However, breaking down the items in Appendix Figure A8, we can see that while American parents are more likely to talk to teachers and volunteer in physical or extra-curricular activities, Korean parents are more likely to participate in school governance, which arguably is more closely related to educational activities provided by the school, rather than individual student issues or extra-curricular activities. Moreover, from Figure 4, parents spend around 5.3% of household income on education which contrasts to the 1.8% spent in the US. Similarly, from Figure 5, Korea has nearly two additional LAYS compared to the US (12.2 vs. 10.4 LAYS).

Although parental involvement in school activities may be more focused on educational activities in EASIA, this does not necessarily translate into higher parental time looking after children compared to WOECD (see Appendix Figures A9 and A10). Nevertheless, parenting time devoted to child care and to educational activities are still higher in Korea compared to the US. Appendix Figure A9 plots the daily minutes of parental time devoted to childcare and educational activities for children aged below six across selected WOECD and EASIA economies for which such data is available. As can be seen from the figure, women (parents) with a child aged

below 6 spend on average 147 (206) minutes on child care and educational activities per child in Korea compared to an average of 75 (134) minutes in the US. So not only do parents invest more time in children in Korea compared to the US, but women also take on a much higher share of the burden at 71% of total time in Korea and 56% in the US. Similar evidence is presented in Appendix Figure A10 for those with children aged below 18.

Given the evidence, we allow child quality and quantity to contribute differently to parents' valuation of children in our model. Moreover, we also allow money and (maternal as well as paternal) time inputs in education to contribute differently to the production of child quality. Interestingly, we also find evidence of a strong positive correlation between parental time investment in children and parental education (Appendix Figure A11). This suggests that more highly educated parents possibly care more about child quality, and thus invest more time into their children. The positive correlation coefficient is particularly higher in EASIA compared to WOECD economies, which further motivates our model assumption that more highly educated women put higher weight on child quality.[2]

2.3.2 Gender Norms

The perception that men belong in the labor market sphere while women belong to the domestic sphere is strong in EASIA. For instance, Table 1 indicates that 32.5% of EASIA respondents agree that "*man's job is to earn money; woman's job is to look after home and family*", in contrast to the 22.5% of WOECD respondents who agree with that question. In addition, 33.7% (30.6%) of EASIA (WOECD) respondents deem that a pre-school child is likely to suffer when a working mother is present. Finally, 33.5% respondents in EASIA reckon that men should have more rights in the labor market than women, while only 13.7% respondents in WOECD agree with such statement. The degree to which respondents agree with the latter two statements is much higher in Korea, where 64.7% and 52.9% of respondents agree with the second and third statements, respectively.

Such strong gender norms are also reflected in the unequal distribution of home production between men and women. To see this, we use data from the 2012 International Social Survey Programme (ISSP) and follow de Laat and Sevilla-Sanz (2011), to construct a "household chore division index" using first principal component on the responses from all the participants who answered the first five questions regarding household chore divisions. Table 2 presents the index, whereby a lower value indicates that women take on a higher burden. From the table, the average scale for the WOECD cluster is always higher than that for the EASIA cluster, suggestive of more unequal division in EASIA compared to WOECD. This is also consistent with Appendix

[2]Appendix Figure A11 relies on MTUS and ISSP data for families with children aged under 18. Due to the fact that ISSP data may include care time to household members other than children, we focus mostly on MTUS data in Figures A9 and A10 as it contains more precise information on child care and educational activities.

Table A12, which indicates that women still undertake the lion's share of housework in EASIA. We thus assume differential home productivity in child quality production for men and women in the model below.

The links between gender norms and female labor, wages, and/or fertility in OECD countries have been well-documented in prior literature. Due to such norms, women may face greater barriers to work—such as greater guilt at working instead of taking care of the household—which may in turn translate into higher fixed costs of work (Bertrand et al., 2015; Cortés and Pan, 2023; Fernández and Wong, 2014; Field et al., 2021). Prior literature indeed document negative associations between gender norms and FLFP or TFR across OECD countries (de Laat and Sevilla-Sanz, 2011; Fortin, 2005; Rodríguez-Planas and Tanaka, 2022). Women may also be directed towards more "family-friendly" jobs, which in turn result in larger gender pay gaps (Cortés and Pan, 2019; Erosa et al., 2022; Goldin, 2014). Fact 1 indicates that TFR and FLFP are even lower in EASIA relative to WOECD or even OECDSN societies that are known for having strong gender norms. Moreover, the second part of Fact 2 documents greater gender wage gaps in EASIA compared to WOECD economies. These facts are consistent with the presence of stronger interactions between gender norms, child quality mores, and the relatively rigid labor market institutions in EASIA. Our quantitative model seeks to shed light on such interactions.

2.3.3 Labor Market Institutions

Labor markets in most EASIA economies tend to be characterized by long work hours. Such feature of the labor market may possibly be grounded in Confucianism, which emphasizes self-sacrifice and industriousness for the sake of the collective (Liu, 2018). This in turn, is often interpreted as having to display loyalty and commitment to employers, for example, by staying at work until late despite completing the tasks (Brinton and Oh, 2019; Hwang, 2023), although this does not necessarily translate into better employee engagement compared to the more individualistic Western cultures (Hu et al., 2014).

Consistent with the first part of Fact 2 and Figure 1b, we find that hours worked among the employed (HWE) are higher in EASIA compared to WOECD economies, irrespective of gender or marital status (Appendix Table A7). In particular, average work hours in EASIA are 40.3, 42.7, 45.6, and 44.5 for married women, single women, married men, and single men, respectively. Conversely, the corresponding HWE in WOECD countries are lower at 35.2, 37.9, 44.0 and 42.5, respectively. Let 35 hours and 48 hours per week be the criterion for defining part-time and long work hours, respectively (ILO, 2022). Figure 6 shows that while 8.7% (24.7%) of workers work less than 35 hours per week in East Asia (North America), 47.7% (13.8%) of workers work more than 48 hours per week in East Asia (North America).

Appendix Table A8 further shows that more than 80% of workers have a contract that stip-

ulates fixed work hours in Korea while around 55% of works have such a contract in the US (Column 4). The HWE among those with fixed-hour contracts are higher compared to those without such contracts (Columns 1 to 3). Table A8 also shows that more than 80% of male and female employees who work more than 35 or 48 hours per week in Korea, have a fixed-hour work contract. This contrasts with the 56% and 65% (26% and 31%) of men and women who have a fixed-hour work contract, among those work more than 35 (48) hours per week in the US. Examining part-time work prevalence further, the proportions of women working part-time are lower in EASIA compared to WOECD (Appendix Table A9). Korea tends to have even lower rates of part-time female workers with only 5.5% and 12.2% of single and married women working part-time. Conversely, 26.5% and 33% of single and married women work part-time in the US.

Finally, we examine the potential wage penalties associated with shorter work hours and potential bonuses associated with longer work hours across EASIA and WOECD economies. The estimation method builds on Bick et al. (2022) and is presented in Appendix Section A.2. From Figure 7, we find that log earnings increase more steeply with hours (i.e., is more convex) in EASIA than in WOECD economies. This suggests that there may be stronger wage penalties for part-time work in the East compared to the West. Conversely, the earnings-hours profiles tend to be flatter post 40 hours in EASIA compared to WOECD. This indicates that there are no substantial rewards for working long hours in EASIA. In fact, past 55 hours, earnings growth becomes negative in Korea, suggesting that the long work hours are not necessarily due to bonuses in Korea, but possibly due to the norms discussed above.

3 The Model

We next build a heterogeneous-agent model with endogenous marriage, fertility, labor supply, and time and money investments in children. The model is estimated separately for Korea and the US. We focus on Korea because it has both the lowest TRF and the lowest FLFP among East Asian societies (Figure 1a). Meanwhile, the US provides a good comparison economy to Korea as the two countries have similar Human Development Indices that account for life expectancy, access to knowledge, and standard of living, with Korea ranked 19 and the US ranked 20 in 2022 (UNDP, 2022). Both countries are also considered to be mostly free based on the Index of Economic Freedom that factors in the rule of law, government size, regulatory efficiency, and open markets (The Heritage Foundation, 2024). Conversely, as documented above, Korea tends to have stronger gender norms and child quality mores, as well as longer labor market hours compared to the US. Our model aims to shed light on how the parameters governing these social institutions interact to contribute to the ultra low birth rates and to the low FLFP in Korea com-

pared to the US, and how policies targeting these interactions may help boost fertility and FLFP.

3.1 Model Setup

Heterogeneous adults are characterized by a quartet $\boldsymbol{\omega}_{\mathbf{g}}$: gender $g \in (m\,[\text{male}], f\,[\text{female}])$, education e_g, non-labor income b_g, and a taste shifter over children α^M_{nq}, capturing the preference weight on the combined value of children's quantity (n) and quality (q) relative to consumption. First, people decide whether to marry the person they were randomly matched with. Second, given marital status $J \in (S\,[\text{single}], M\,[\text{married}])$, households decide on the number of children n as well as consumption c, labor supply h, time spent on children t, and education expenditures d. We adopt a collective framework à la Chiappori to model married couples' decisions (Blundell et al., 2005; Chiappori, 1988, 1992).

Family formation. Following Baudin et al. (2015, 2020) and Moschini (2023), men and women meet through a random matching process, after which they decide whether to marry or not. Married couples and single women can have children but single men cannot. Furthermore, let $\alpha^S_{nq} = \kappa\alpha^M_{nq}$ with $\kappa \in [0,1]$ for single mothers to capture the social stigma of having children out-of-wedlock in Korea as opposed to the US (Ho and Pavoni, 2020; Myong et al., 2021). Following prior literature, we posit that the choice of children is continuous (de la Croix and Doepke, 2003; de Silva and Tenreyro, 2020). Nevertheless, we also assume that there is a minimum consumption level, $\bar{c}_{\min}$, above which women can have children and below which they are childless.

Time endowment. Each individual can allocate their time to work, child related activities, or leisure. We assume that the time endowment for married individuals is 1 while that of single individuals is $1 - \delta_{g,e}$. Specifically, the time endowment for singles varies with gender and education. $\delta_{g,e}$ can be positive to capture the absence of economies of scale in home production in the absence of a spouse, or negative as single individuals may receive external help with house chores from extended family members or domestic helpers (Baudin et al., 2015; Myong et al., 2021). We further allow $\delta_{g,e}$ to vary with education as those who are more highly educated may be in a better position to outsource domestic chores.

Labor market. Women can be out-of-labor force (OLF), employed part-time (PT), and employed full-time (FT). In particular, there are two types of jobs in the labor market, $O \in \{PT, FT\}$. Working part-time or full-time implies inputting fixed labor hours $\bar{h}_O \in \{\bar{h}_{FT}, \bar{h}_{PT}\}$. Let $h^J_f \in \{0, \bar{h}_{PT}, \bar{h}_{FT}\}$ denote the labor hours options of a woman with marital status $J = S, M$. To capture part-time versus full-time job opportunities, we assume that a fraction $\wp$ of women have a choice between being out-of-labor force, working part-time, or working full-time, while the

remaining fraction $(1-\wp)$ only have a choice between being out-of-labor force or working full-time. If an individual works, the individual earns a wage of $w_{g,O}$, which we model as a function of education below. Wages vary with gender and the type of job to capture the earnings penalty associated with these attributes.

Following standard practice (Fernández and Wong, 2014; Voena, 2015; Zhang, 2023), we further introduce a fixed cost of work for women in the form of a disutility from employment, ϵ^J, which differs by marital status. Such disutility reflects the actual and psychological costs of working, which may include the belief of separate spheres whereby men should be breadwinners while women should primarily be homemakers such that working mothers may feel "guilty" about not spending enough time with children (Fernández and Wong, 2014; Lundberg and Pollak, 1993). Consistent with the stylized facts documented above (Appendix Figure A5), we assume that men always work full-time, $h_m^J = \bar{h}_{FT}$, and do not incur any disutility from work, which also align with Greenwood et al. (2016) and Koll et al. (2024).[3]

Child quality. The time not working may be spent on time investment in children t^J or on leisure. Besides time, parents can also make money investment in children's education d^J. For single women, per-child quality is given by the following Cobb-Douglas production function:

$$q^S = q^S(t_f^S, d^S, n^S) \equiv (d^S)^{\nu} \left(\theta \frac{t_f^S}{n^{S^{\psi}}} \right)^{1-\nu}.$$

θ is a skill multiplier on maternal time, ψ is a parameter governing the economies of scale in time investment when one has n children, and ν and $1-\nu$ are the weights on monetary and time investments, respectively.

For married couples, we assume a constant elasticity of substitution (CES) production function over time inputs by females f and males m, which is consistent with published literature (Blundell et al., 2018; Calvo et al., 2024; Knowles, 2013). The per-child quality production function for married couples is thus given by:

$$q^M = q^M(t_f^M, t_m^M, d^M, n^M) \equiv (d^M)^{\nu} \left(\left[\theta \left(\frac{t_f^M}{n^{M^{\psi}}} \right)^{\beta} + (1-\theta) \left(\frac{t_m^M}{n^{M^{\psi}}} \right)^{\beta} \right]^{\frac{1}{\beta}} \right)^{1-\nu},$$

where β governs the elasticity of substitution (EoS) of parental time $\left(\frac{1}{1-\beta}\right)$.

The higher is θ, the higher is the relative productivity of maternal compared to paternal time.

[3] Only 3.40% and 13.18% of men work part-time in Korea and the US, respectively. The corresponding percentages for women are respectively, 10.08% and 29.67%.

θ may possibly reflect gender norms whereby women are "programmed" to take care of children from a young age and may thus internalize such norms to become more productive in such activities compared to men (Cortés and Pan, 2023).

Relative value of quality over quantity. We assume that parents have preferences over the combined value of quantity (n^J) and quality (q^J) of their children, in the spirit of Becker and Lewis (1973). We further generalize the separate preferences adopted in de la Croix and Doepke (2003) and Vogl (2016) to introduce the interaction of quantity and quality in preferences. The value of children for single mothers with marital status $J = S$ and married parents $J = M$ is such that:

$$K^J = n^J (q^J)^{\gamma_e}.$$

The parameter γ_e captures the relative importance of child quality to quantity. As documented in Section 2, there is a positive cross-sectional correlation between investments in children and parental education (see Appendix Figure A11 for details). We thus further allow γ_e to vary by maternal education. Therefore, parents may differ in their preferences for children's quality across education groups and across countries.

Taxes and transfers. We adopt the commonly used HSV tax function à la Heathcote et al. (2017) to capture tax progressivity. Specifically, we specify a log-linear tax function $T(Y)$ such that net income $\widetilde{Y}$ is given by:

$$\widetilde{Y} = Y - T(Y) = (1-\chi) Y^{(1-\tau)}.$$

χ corresponds to the average tax rate when income is equal to 1 unit and thus captures the notion of the level of taxation in the economy. τ captures the degree of progressivity of the income tax system. Following Guner et al. (2020), we assume that only labor income Y is taxable while non-labor income is not taxed. Non-labor income b_g varies by gender our model and helps capture social insurance and welfare benefits as well as other sources of non-work income.

3.2 Household Problems

For a given marital status, each agent derives utility from the consumption of market goods c_g and leisure time $(1-\delta_{g,e}-h_g^S-t_g^S)$ for singles and $(1-h_g^M-t_g^M)$ for those married. Additionally, single women and married individuals derive utility from the value of children $K^J = n^J (q^J)^{\gamma_e}$. Finally, single and married women experience disutility from work when they are employed ϵ^J.

Single women. Single women choose consumption, the number of children, time and money investments in children, and labor supply:

$$V_f^S(\boldsymbol{\omega}_\mathbf{f}^\mathbf{S}) \equiv \max_{c_f^S, n^S, t_f^S, d^S, h_f^S} \ln(c_f^S) + \alpha_f \frac{(1-\delta_{f,e} - h_f^S - t_f^S)^{1-\phi}}{1-\phi} - \epsilon^S \mathbb{1}_{h_f^S \neq 0} + \alpha_{nq}^S \frac{\left(n^S (q^S)^{\gamma_e}\right)^{1-\eta}}{1-\eta},$$

subject to

$$\begin{aligned} c_f^S + d^S n^S &= (1-\chi)\left[(w_{f,FT}\bar{h}_{FT})\mathbb{1}_{h_f^S=\bar{h}_{FT}} + (w_{f,PT}\bar{h}_{PT})\mathbb{1}_{h_f^S=\bar{h}_{PT}}\right]^{1-\tau} + b_f, \\ q^S &= (d^S)^\nu \left(\theta \frac{t_f^S}{n^{S^\psi}}\right)^{1-\nu}, \\ n^S &= 0 \text{ if } c_f^S \leq \bar{c}_{\min}, \end{aligned}$$

where α_f reflects the weight on leisure while α_{nq} captures the weight of child-related utility. ϕ and η are curvature (CRRA) parameters on leisure and children, respectively. $\mathbb{1}_{h_f^S=\bar{h}_O}$ is an indicator for the job type $O \in \{FT, PT\}$ that a woman chooses.

Single men. Single men choose consumption only as they cannot have children and are assumed to work full-time as described above:

$$V_m^S(\boldsymbol{\omega}_\mathbf{m}^\mathbf{S}) \equiv \max_{c_m^S} \ \ln(c_m^S) + \alpha_m \frac{(1-\delta_{m,e} - \bar{h}_{FT})^{1-\phi}}{1-\phi},$$

subject to

$$c_m^S = (1-\chi)(w_m \bar{h}_{FT})^{(1-\tau)} + b_m.$$

Married couples. Married men and women decide on individual consumption, the number of children, time and money investments in children, and female labor supply within a collective framework. Let the utility of a married woman and man respectively be:

$$U_f^M \equiv \ln(c_f^M) + \alpha_f \frac{(1-h_f^M - t_f^M)^{1-\phi}}{1-\phi} - \epsilon^M \mathbb{1}_{h_f^M \neq 0} + \alpha_{nq}^M \frac{\left(n^M (q^M)^{\gamma_e}\right)^{1-\eta}}{1-\eta},$$

$$U_m^M \equiv \ln(c_m^M) + \alpha_m \frac{(1-\bar{h}_{FT} - t_m^M)^{1-\phi}}{1-\phi} + \alpha_{nq}^M \frac{\left(n^M (q^M)^{\gamma_e}\right)^{1-\eta}}{1-\eta}.$$

A married couple maximizes the following objective function:

$$V^M(\boldsymbol{\omega}_{\mathbf{f}}^{\mathbf{M}}, \boldsymbol{\omega}_{\mathbf{m}}^{\mathbf{M}}) \equiv \max_{c_f^M, c_m^M, n^M, t_f^M, t_m^M, d^M, h_f^M} (1-\rho) U_m^M + \rho U_f^M$$

subject to

$$\Lambda(c_m^M + c_f^M) + d^M n^M = (1-\chi)\left[w_m \bar{h}_{FT} + (w_{f,FT}\bar{h}_{FT})\mathbb{1}_{h_f^M = \bar{h}_{FT}} + (w_{f,PT}\bar{h}_{PT})\mathbb{1}_{h_f^M = \bar{h}_{PT}}\right]^{1-\tau} + b_f + b_m,$$

$$q^M = (d^M)^\nu \left(\left[\theta\left(\frac{t_f^M}{n^{M^\psi}}\right)^\beta + (1-\theta)\left(\frac{t_m^M}{n^{M^\psi}}\right)^\beta\right]^{\frac{1}{\beta}}\right)^{1-\nu},$$

$$n^M = 0 \text{ if } c_f^M \leq \bar{c}_{\min}.$$

ρ is the Pareto weight of the wife, and $1-\rho$ denotes that of the husband. To capture economies of scale in consumption for married couples, we introduce a parameter Λ, where $\Lambda \in \left]\frac{1}{2}, 1\right[$ (Chiappori, 2016). In particular, we assume that consumption is partially public within a marriage, and the sum of spouses' consumption exceeds what they would consume when single and spending the same amount. Denote the corresponding collective indirect utilities for the wife and the husband by $V_f^M(\boldsymbol{\omega}_{\mathbf{f}}^{\mathbf{M}})$ and $V_m^M(\boldsymbol{\omega}_{\mathbf{m}}^{\mathbf{M}})$, respectively.

3.3 Marriage Decisions

After each individual meets a potential opposite sex partner through random matching, they decide whether to marry or not. A randomly matched pair would choose to marry ($M = 1$) if and only if

$$V_f^M(\boldsymbol{\omega}_{\mathbf{f}}^{\mathbf{M}}) \geq V_f^S(\boldsymbol{\omega}_{\mathbf{f}}^{\mathbf{S}}) \text{ and } V_m^M(\boldsymbol{\omega}_{\mathbf{m}}^{\mathbf{M}}) \geq V_m^S(\boldsymbol{\omega}_{\mathbf{m}}^{\mathbf{S}}),$$

which means that marriage would take place if and only if *both* the man and the woman have greater indirect utilities from being married than from staying single. Conversely, if either the man or woman have higher indirect utiilty from staying single, then the randomly matched pair would not marry.

4 Model Estimation

We now estimate the model parameters separately for Korea and the US. We use data for prime aged individual aged 25 to 54 from multiple data sources closest to 2010 in each country, as described in Section 2.1. We start with some preliminaries and then proceed in two-steps. First,

we externally calibrate or estimate 10 parameters by relying on past literature and micro-data. Second, we estimate the remaining 21 parameters using simulated method of moments (SMM).

4.1 Parameterization

Preferences on children. First, we assume that the preference parameter governing the combined value of children's quantity and quality for married parents is log-normally distributed.

$$\alpha_{nq}^{M} \sim \log \mathcal{N}(\mu_n, \sigma_n^2),$$

where μ_n is the mean and σ_n^2 the variance of $\ln(\alpha_{i,nq}^{M})$ for individual i. We scale the taste shifter for single mothers: $\alpha_{nq}^{S} = \kappa\alpha_{nq}^{M}$ to capture the social stigma of out-of-wedlock birth in Korea.

Second, we allow the relative weight on child quality to depend on maternal education:

$$\gamma_e = (1 + k_e \cdot \mathbb{1}_{higheduc_f})\bar{\gamma}_q,$$

where $\mathbb{1}_{higheduc_f}$ in an indicator taking unity when the woman's education is 16 or more years, corresponding to a four-year degree and above. Hence, $\gamma_e = \bar{\gamma}_q$ and $\gamma_e = (1+k_e)\bar{\gamma}_q$ are the taste parameters for low and high educated women, respectively.

Time endowment for singles. As mentioned above, we assume the time endowment for single individuals $1 - \delta_{g,e}$ varies with their education to capture the fact that highly-educated individuals may be more capable of outsourcing household chores:

$$1 - \delta_{g,e} = 1 - \left(\delta_g + k_\delta \cdot \mathbb{1}_{higheduc_g}\right),$$

where $\mathbb{1}_{higheduc_g}$ is an indicator taking unity when the individual of gender g holds a minimum of a four-year degree. Therefore, $1 - \delta_{g,e} = 1 - \delta_g$ and $1 - \delta_{g,e} = 1 - (\delta_g + k_\delta)$ are the time endowments for low and high educated single individuals, respectively. We expect $k_\delta < 0$ as more highly educated individuals may be in a better position to outsource home production.

Non-labor income and wages. Non-labor income b is assumed to be log-normally distributed:

$$b \sim \log \mathcal{N}(\mu_b, \sigma_b^2),$$

where, μ_b denote the mean and σ_b^2 the variance of $\ln(b_i)$ for individual i. We draw b_i separately for males and females. The total non-labor income for a married household equals $b_m + b_f$.

Following Baudin et al. (2015), we compute the wages of men and women by applying Mincerian wage equations and take country-specific gender wage gaps into consideration. We also account for the wage differentials in different type of jobs for women (who can work part-time or full-time) such that wages of females and males are computed as follows:

$$
\begin{aligned}
w_{f,PT} &= \iota\zeta_0 \exp\left(\zeta_1 e_f\right), \\
w_{f,FT} &= \zeta_0 \exp\left(\zeta_1 e_f\right), \\
w_m &= \exp\left(\zeta_1 e_m\right),
\end{aligned}
$$

where e_g denotes the schooling years of an individual of gender $g = m, f$. ζ_1 is the Mincerian return to education, and ζ_0 and ι, respectively, capture the gender and part-time wage penalty.

Pareto weights. We parameterize the Pareto weight of the wife ρ as a function of the relative education of the wife and husband, and adopt the functional form used in Baudin et al. (2015):

$$
\rho \equiv \frac{1}{2}\pi + (1-\pi)\frac{e_f}{e_m + e_f},
$$

π is an auxiliary parameter. The above specification bounds the Pareto weight of the wife from below, with $\frac{1}{2}\pi$ being the lower bound, reflecting the legal aspect of marriage whereby spouses have to respect a minimal level of solidarity within a legal union (Baudin et al., 2020). As $\pi \to 1$, $\rho \to 0.5$, such that the husband's utility and wife's utility are weighed equally. Conversely, for $\pi < 1$, ρ increases in the education of the wife, reflecting a higher bargaining power for more highly educated women.

4.2 Externally Calibrated Parameters

Of the 31 parameters, we calibrate ten outside of the model from literature or directly from the data. Table 3 provides a summary of the externally calibrated parameters and the corresponding sources. We set three parameters to be the same across countries, and four parameters to be country-specific. First, the parameter ϕ governing the curvature of the utility function with regards to leisure is set to $\phi = 2$ following prior literature (Bick, 2016; Kim et al., 2024). Second, the economies of scale in parental time investments in the presence of multiple children is set to $\psi = 0.54$ following Sommer (2016). Third, we follow Voena (2015) and Low et al. (2022) to calibrate the economies of scale in consumption for married couples at $\Lambda = 0.82$ according to the McClements scale.[4]

[4] Based on the McClements scale, $0.61E = c_j^M$ where E is the household expenditure. Under the assumption that spouses have identical consumption levels, $E = \Lambda(c_f^M + c_m^M) = 2\Lambda c_j^M$. Thus, $\Lambda = \frac{1}{2\times 0.61} = 0.82$.

We now turn to the calibration of country-specific parameters. First, wages for men and women are computed using the Mincerian functions above. The Mincerian coefficient ζ_1 and the gender wage gap parameter ζ_0 are calibrated from Myong et al. (2021) and Baudin et al. (2015) for Korea and the US, respectively. Unsurprisingly, the scale parameter governing the gender wage gap reflects a larger wage penalty for women in Korea than in the US. Second, to set the fixed work hours, we compute the average weekly hours worked for full- and part-time jobs among prime-aged individuals for Korea and the US using KLIPS 2010 and the Outgoing Rotation Group (ORG) of Current Population Survey (CPS) 2010, respectively. The full-time work week comprises of 45.965 hours for Korea and 40.367 hours for the US. We use a scale of one unit time of endowment and set the total weekly time endowment as 112 non-sleeping hours following the literature (Gayle and Shephard, 2019; Greenwood et al., 2016; Verriest, 2024). The aforementioned hours worked thus correspond to $\bar{h}_{FT}^{\text{KOR}} = 0.410$ and $\bar{h}_{FT}^{\text{USA}} = 0.360$ for South Korea and the US, respectively. Similarly, we normalize the part-time work hours of 23.466 and 22.871 in Korea and the US, respectively.

Third, following Chun (2023) and Wu (2021), the progressive income tax functions for Korea and the US are specified as $\widetilde{Y}^{\text{KOR}} = (1 - 0.087)Y^{(1-0.02)}$ and $\widetilde{Y}^{\text{USA}} = (1 - 0.078)Y^{(1-0.137)}$, respectively. Finally, we calibrate the parameter associated with the social stigma attached on out-of-wedlock birth κ directly from Myong et al. (2021), such that $\kappa^{\text{KOR}} = 0.892$ and $\kappa^{\text{USA}} = 1$.

4.3 Internally Estimated Parameters

We harness SMM à la McFadden (1989) and Pakes and Pollard (1989) to estimate the remaining 21 deep parameters. A minimum distance estimator is applied, where we minimize the distance between the data moments $\hat{\mathbf{m}}_{\mathbf{data}}$ and simulated moments generated from the model $\mathbf{m}_{\mathbf{sim}}(\boldsymbol{\Theta})$ with weights summarized by a diagonal weighting matrix $\mathbf{G} = \text{diag}\left(\frac{1}{\hat{m}^2_{\text{data}_1}}, \frac{1}{\hat{m}^2_{\text{data}_2}}, \cdots\cdots, \frac{1}{\hat{m}^2_{\text{data}_{22}}}\right)$:

$$\hat{\boldsymbol{\Theta}}^{\mathbf{SMM}} = \arg\min_{\boldsymbol{\Theta}} (\hat{\mathbf{m}}_{\mathbf{data}} - \mathbf{m}_{\mathbf{sim}}(\boldsymbol{\Theta}))^{\top} \mathbf{G} (\hat{\mathbf{m}}_{\mathbf{data}} - \mathbf{m}_{\mathbf{sim}}(\boldsymbol{\Theta})),$$

where $\boldsymbol{\Theta}$ is the vector with 21 entries containing the parameters:

$$\left\{ \underbrace{\eta, \mu_n, \sigma_n, \bar{c}_{\min}, k_\delta, \delta_m, \delta_f, \pi}_{\text{Family Formation}}, \underbrace{\epsilon^S, \epsilon^M, \alpha_m, \alpha_f, \wp, \iota, \mu_b, \sigma_b}_{\text{Labor Supply}}, \underbrace{\beta, \theta, \nu, \bar{\gamma}_q, k_e}_{\text{Child Quality}} \right\}$$

We organize the targeted moments into three groups: family formation, labor supply, and child quality. The parameters and corresponding interpretations are summarized in Table 4. We use 22 moments, summarized in Table 5, to estimate the 21 deep parameters. Below, we provide a set of heuristic arguments for how each parameter can be pinned down by those mo-

ments. Whereas we acknowledge that there is no one-to-one mapping—all data moments are used to estimate the parameters, and all simulated moments are functions of all parameters—some moments are particularly salient and informative to identify certain parameters.

The first block of eight targets helps us identify family formation parameters. The CRRA preference parameter on children (η) captures how the marginal sub-utility of children changes when fertility alters. The sample mean and standard deviation of the number of children may thus help determine η. Moreover, we use the sample mean and standard deviation of the number of children for married women to help identify the parameters associated with the taste shifter on the value of children (μ_n and σ_n). Additionally, as women with higher education may be in a better position to have children and outsource home production, we use the means of the number of children among women with high and low education, to discipline the minimum consumption level required to procreate ($\bar{c}_{\min}$) as well as the extra time that the highly educated have compared to the less educated (k_δ) when single. Specifically, an increase in the absolute value of k_δ makes singlehood more attractive such that both marriage and fertility may go down. Furthermore, variation in the time cost of being single for females and males (δ_f and δ_m) will also affect the marriage rates of high and low educated individuals. Thus, we posit that variation in the marriage rates of high and of low educated women help identify these parameters. Finally, because alterations in a women's bargaining power may affect marriage, we use marriage rates among all women to pin down the parameter governing the Pareto weight (π). In particular, the rise in π increases the lower bound of intra-household allocation among married individuals, making men less willing to accept less educated women. Thus, because π captures how attractive the allocation is within marriage is, it is largely determined by variations in the overall marriage rates.

The second block of eight targeted moments discipline the parameters related to labor supply. The sample means of LFP among single and married prime-aged women help to pin down the parameters related to the disutility of work for single and married women (ϵ^S and ϵ^M). Moreover, variations in married men's and women's time investment in children in terms of child care and education related activities, help identify the preference weights on leisure for men and women (α_m and α_f). Additionally, women may choose whether to be OLF, work PT, or work FT. The probability of having a part-time job option ($\wp$) is estimated so as to match the the proportion of women working part-time. Similarly, because non-labor income (μ_b) and the wage penalties for part-time work (ι) influence the relative attractiveness of the different labor market status options for high- and low-educated women, these parameters may be pinned down by using the LFP rates of women with high and low education. Finally, we use the standard deviation of the LFP of all women to pin down the standard deviation of the non-labor income distribution (σ_b).

The last block of five targets govern the parameters related to child quality. Because there is a one-to-one link between the parameter β and the EoS between parental time and money inputs, we use the correlation coefficient between the time investment of the wife and the husband among married couples to help identify β. Moreover, to identify the relative productivity of women compared to men in home production (θ), we leverage the fact that θ is the same across married and single women, and target maternal time investment in children among all women. Additionally, because the Cobb-Douglas weight on monetary investment in children (ν) determines how much a household would spend on children's education, it is mostly determined by variations in the share of household income spent on education among all households. Finally, we choose the parameters governing the relative weight on child quality as opposed to quantity for low- and high-educated women ($\bar{\gamma}_q$ and k_e) so as to match the the number of children among married low- and high-educated women.

4.4 Estimated Parameters and Model Fit

Estimated parameters. The estimated parameters are listed in Table 4 and have reasonably small standard errors. We make the following observations on the parameters governing family formation. First, the time cost of being single is lower for women than for men ($\delta_f < \delta_m$) in both Korea and the US, which is consistent with men losing out the most from the lack of economies of scale in home production in the absence of a spouse. Moreover, highly educated individuals in both countries have a lower time cost compared to those less educated ($k_\delta < 0$), which aligns with the fact that those more highly educated may have better access to external help with house chores. Second, the parameter governing the bargaining power of women within marriage is relatively low in Korea ($\pi = 0.360$), suggesting that while the Pareto weight of the wife in a couple (ρ) has a relatively low lower bound, it also increases more steeply with the relative education of the wife. The converse holds in the US, where the Pareto weight of the wife has a relatively high lower bound but increases less steeply with her relative education ($\pi = 0.816$).

The parameters governing labor supply also display some interesting patterns. First, married women have greater disutility from work relative to consumption, compared to single women in both countries ($\epsilon^S < \epsilon^M$). Moreover, women in Korea seem to have higher relative fixed cost of work in Korea compared to the US, which is consistent with stronger barriers to work in Korea. Second, the probability that a woman has a part-time job opportunity ($\wp$) is lower in Korea than in the US while the scale parameter governing the part-time wage penalty (ι) is higher in Korea than in the US, reflecting the less flexible nature of the labor market in Korea.

Turning to the child production parameters, while the EoS between a husband's and a wife's time in home production ($\frac{1}{1-\beta}$) tends to be lower in Korea than in the US, females tend to be

relatively more productive in home production compared to men in Korea than in the US (i.e., θ is higher in Korea). This is consistent with the presence of stronger gender norms in Korea, where women are groomed to be good at housework and childcare from a young age. Moreover, monetary investments in children have a higher relative weight in the production function in Korea compared to the US (i.e., ν is higher in Korea), suggesting that education is important in generating child quality in Korea. Finally, the relative weight on child quality compared to quantity ($\bar{\gamma}_q$) is higher in Korea than in the US, especially for highly educated mothers (k_e).

Model fit. As can be seen in Table 5, the simulated moments from the model tend to closely match the target empirical moments from the data. Specifically, the model reproduces the average number of children born to all women in Korea and the US, at respectively, 1.45 and 1.60, which are close to their respective data counterparts at 1.44 and 1.72. The number of children are also well matched for married women and for different education groups. Similarly, the model predicts marriage for 77 and 71 percent of women in Korea and the US, respectively, which closely align with the respective data moments of 79 and 71 percent.

The model performs more or less adequately in terms of the key targeted labor supply moments. In both countries, LFP rates are higher among single women than among married women, which holds true both in the model and in the data. For Korea and the US, respectively, the model predicts that 58 and 66 (87 and 71) percent of married (single) women work, while the corresponding percentages from the data are 55 and 74 (78 and 79), respectively. The probability of working part time is also predicted to be 0.4 and 19 percent in Korea and in the US, respectively, compared to their empirical counterparts of 10 and 30 percent. Whereas average LFP of women with low (high) education is well matched in Korea (the US), average LFP of women with high (low) education is overestimated (underestimated) in Korea (the US). We plan to incorporate assortative mating and a richer set of income tax parameters in future versions of this study, which may help improve the degree of match on labor supply moments.

Finally, the simulated moments from our model closely replicates parental time and money investments in children. Specifically, we find that women spend 12 $(= 0.11 \times 112)$ and 10 $(= 0.09 \times 112)$ hours per week on child related activities in Korea and the US, respectively, which closely match the respective corresponding 11 $(= 0.10 \times 112)$ and 10 $(= 0.09 \times 112)$ hours per week observed empirically. Additionally, the mean education spending per child relative to income is much higher in Korea than in the US, which holds true for both data and model with nearly identical magnitudes. In particular, the model predicts relative expenditure of 9 percent in Korea compared to 2 percent in the US, which closely match the 10 percent and 2 percent empirically observed in the respective countries.

Next, we examine the model's performance in terms of non-targeted moment. We follow

Kim et al. (2024) to plot education spending per child relative to income, across different female education levels. From Figure 8, the model successfully generates the patterns of relative education spending over female schooling years in both countries. The almost-decreasing (increasing) patterns are also broadly consistent with the decreasing (increasing) pattern of education expenditures across income quintiles in Korea (the US) (Kim et al., 2024; Kaushal et al., 2011).

5 Simulations and Counterfactual Analyses

In this section, we examine the factors that may contribute to both low FLPF and low fertility, paying particular attention to the key parameters governing the three social institutions discussed above. To do so, we first perform counterfactual analyses by replacing selected estimated parameters for Korea with their US counterparts, keeping other parameters constant. We then explore two welfare improving policies that may help boost FLFP and fertility, notably, a multi-pronged policy that imposes caps on education and decreases the fixed cost of work for women, and a policy that reduces gender wage gaps.

5.1 Social Institutions

To explore the role of each social institution, we perform simulations by varying a single parameter at a time in Table 6. The parameters of interest are child quality taste ($\bar{\gamma}$), the fixed cost of work for married women (ϵ^M), full-time work hours ($\bar{h}_{FT}$), and the gender wage gap (ζ_0).

Child quality mores. To understand the role of child quality mores in Korea, we decrease the preference parameter governing parental taste for child quality over quantity, $\bar{\gamma}_q$, to the corresponding estimate for the US. From Column (2) in the Table 6, we observe that a lower taste for child quality increases the number of children but decreases FLFP. Additionally, we find an increase in marriage rates, and in both time and money investment in child quality. Intuitively, a reduction in parental taste for child quality relative to quantity would encourage individuals to desire more children. As out-of-wedlock births is stigmatized, more individuals marry to have children. As more women marry, they now benefit from greater income thanks to their husbands but also face higher fixed cost of work due to gender norms on married women's role at home, which puts downward pressure on their LFP. This in turn, frees up their time. The higher income from husbands and greater time from not working in turn puts upward pressure on money and time investment in child quality. Ironically, a decrease in the value of child quality relative to quantity, can thus increase average parental investment in child quality as it encourages more individuals to marry and have children, albeit at the cost of reduced FLFP.

Gender norms. To understand the role of gender norms, we next reduce the fixed cost of work for married women, ϵ^M, to that of the US level. As shown in Column (3) of Table 6, fertility decreases slightly but FLFP increases considerably. Moreover, marriage rates increase while time and money investment in children decrease. A lower fixed cost of work for married women makes work within marriage more attractive, which increases marriage rates as well as FLFP. However, an increase in FLFP also means that more women now not only incur a fixed cost of work but also have less time to invest in children. These in turn put downward pressure on the quantity and quality of children, thus reducing the number of children as well as money and time investment in child quality, in favor of increasing consumption instead.[5]

Labor market institutions. To get a sense of how long work hours may also matter, we reduce $\bar{h}_{FT}$ to the US level. From Column (4) of Table 6, we can see that the number of children decreases slightly while FLFP increases slightly. Furthermore, marriage rates, and time and money investments in children decrease slightly. Intuitively, a reduction in long work hours (a) makes work more attractive to those who were previously not working and (b) reduces the earnings of those who were already working but now have to work fewer hours. Among women in (a), the increase in FLFP implies that women now incur a fixed cost of work and have less time for children although they have higher earnings. As a result, marriage and children become less attractive. Among those in (b), the fall in earnings implies lower demand for both child quantity and quality, thereby the fall in money investments in children.

Gender wage gap. Finally, we explore how decreasing the gender wage gap to the level of the US may matter. From Column (5) of Table 6, we can see that a fall in the gender pay gap leads to both higher birth rates and higher FLFP. Additionally, marriage rates increase while both money and time investments in child quality decrease. A fall in the gender pay gap increases the opportunity cost of not working, and thus boosts FLFP. Both the increase in FLFP and in women's pay in turn increase income. As a result, there is higher demand for children and thus marriage. Specifically, the income effect generated from higher female wages, possibly dominates the substitution effect on fertility. Conversely, as more women work, they have less time to invest in child quality. As they also have more children, they also invest less money in child quality, reflective of quantity-quality trade-offs.

[5]We also simulate a decrease the relative productivity (θ) of mothers' time in the production of child quality to that of the US level. This leads to decreases in fertility, marriage rates as well as money and time investments in children but to an increase in FLFP. Similar to the implications from decreasing the fixed cost of work, higher relative productivity of paternal time helps free up maternal time which enables mothers to work but at the cost of lower fertility and lower investment in child quality. Results from additional simulations are available upon request.

5.2 Policy Simulations and Welfare Implications

Based on the above exercise, we can see that parental preferences over child quality contributes to lower fertility and higher FLFP of women, the fixed cost of work and long work hours contribute to lower FLFP and higher fertility, and the gender pay gap contributes to lower fertility and FLFP. Given these insights, we propose three policies that can help boost both fertility and FLFP: a complete ban on private tutoring, a multi-pronged policy in the form of caps on education expenditure and reductions in the fixed cost of work, and a policy that reduces the gender wage gap. We show that the extreme policy of banning private tutoring, while effective at boosting both FLFP and fertility, results in welfare losses. Conversely, the other two policies not only manage to boost FLFP and fertility but also result in welfare gains.

Welfare in our context is measured using the money metric welfare index (MMWI) proposed by Chiappori et al. (2024). For a single individual, this corresponds to their expenditure. For a married individual, given market prices, MMWI is defined as the minimum amount of money that the individual would need to attain the same utility s/he would have when living in a hypothetical situation where s/he were to pay the full price of all commodities including public goods. Following Cherchye et al. (2018) and Chiappori et al. (2024), we consider being single as the hypothetical situation. The details of the MMWI computation procedures are outlined in the Appendix B. This exercise enables us to aggregate welfare across different types of females—irrespective of marital status—in the economy and compute the average across all women.

Ban on private tutoring. The first policy we consider is to impose a cap on parental monetary investments in children. In particular, we let $d \leq \varrho_d \bar{d}$, where $\bar{d}$ is average monetary investments in the Korean baseline model (BM) and $\varrho_d \in \,]0, 1[$ is a scale parameter. Here, we consider the extreme case where private tutoring is completely banned as China attempted to do in 2021 (The Straits Times, 2023). In our context, Korean parents spend around 72% of education expenditures on private tutoring, so we set $\varrho_d = 0.28$. Column (2) of Table 7 illustrates such a situation. Banning private tutoring leads to an increase in both FLFP and fertility. We also observe a slight decrease in marriage rates as well as substantial decreases in parental time and monetary investment in children. Intuitively, the ban on private tutoring makes it prohibitively expensive for parents to invest in child quality and time investments cannot fully substitute for the fall in money investments. Thus, parents switch from demanding higher quality children to higher quantity of children. In the meantime, the lower investment in child quality frees up maternal time which in turn boosts their LFP slightly. Although banning private tutoring may help increase both FLFP and fertility, it is also associated with a decline in women's welfare. As such ban may not be desirable or effective (The Straits Times, 2023), we now turn our attention to alternative policies.

Multi-pronged policy. We next consider a cap at 75% of education costs in the spirit of curbing private tutoring, which corresponds to setting $\varrho_d = 0.75$. This is similar in spirit to the Pigouvian tax on private tutoring in Kim et al. (2024). From Column (3) of Table 7, the effects are similar to those of the complete ban except that FLFP decreases slightly while maternal time investment in children increases. This could because mothers have greater scope to substitute time for money in producing child quality when the cap is not so stringent. Thus, a milder cap on private tutoring does not help boost FLFP and also results in a loss of welfare.

We thus combine the cap of on private tutoring $\varrho_d = 0.75$ with a reduction in the fixed cost of work for married women $\epsilon^M = 0.252$. Specifically, we reduce the fixed cost of work by 31.96% to simulate a comparable increase in FLFP stemming from a curriculum reform that eliminated gender-seggregated industrial arts and home economics classes in junior high schools in Japan, based on Hara and Rodriguez-Planas (2024).[6] From Column (4) of Table 7, we see that both fertility and FLFP increase. Furthermore, the proportion of married women increases while parental time and money investment in child quality decrease. Similar to before, lowering ϵ^M makes work within marriage more attractive, which boosts both FLFP and marriage. As more women work, they have less time to invest in child quality. Meanwhile, the addition of a cap on private tutoring ϱ_d further ensures that parents decrease monetary investments in child quality. As a result, parents substitute away from child quality towards child quantity, thereby boosting fertility. The multi-pronged policy has the additional advantage of boosting individual welfare.

A remaining challenge is the age-old question of how to change the fixed cost of work for women, especially when such costs stem from sticky gender norms. The budding literature on the topic offers a handful of policies that have contributed to the erosion of these norms. Such policies may include gender-neutral school curriculum (Hara and Rodriguez-Planas, 2024), radio propaganda on gender equality (Qian, 2024), classroom discussions on gender equality (Dhar et al., 2022), and making men work side-by-side with women in the military (Dahl et al., 2021). Such policies may help alter gender attitudes and thus possibly boost FLFP. We do note however, that in our context, such interventions need to be complemented by policies that can successfully curb parental spending (or overspending) on education in this part of the world.

Closing the gender wage gap. The final policy involves improving access to "greedy jobs" by reorganizing work structures to enhance flexibility in work hours and reduce the penalties typically associated with such arrangements (Cortés and Pan, 2023), for example, through work-

[6] In particular, Hara and Rodriguez-Planas (2024) argue that the curriculum reform boosted FLFP by 17% by eroding gender norms. We aim to find the corresponding decrease in the fixed cost of work that would generate a 17% increase in FLFP in our context. To do so, we rely on the simulated counterfactual in Column (3) of Table 6, which shows that FLFP increases by 46.12% when the fixed cost of work decreases by 86.76%. Pro-rating, we compute that a 31.96% decrease in the fixed cost of work would result in a 17% increase in FLFP in our context.

from-home opportunities. As no empirical studies has quantified the impact of such policies on reducing the gender pay gap, we take an extreme approach by eliminating the gender-gap entirely, setting the multiplier $\zeta_0 = 1$. As seen in Column (5) of Table 7, both fertility and FLFP increase, mirroring the results in Column (5) of Table 6, where the gap was reduced to that of the US level. Notably, this policy boosts women's welfare by 26%.

6 Conclusion

We document three stylized facts on female labor supply and family formation across developed Western and Eastern societies. First, EASIA economies have the lowest TFR and FLFP in the world. Second, work hours among the employed and gender pay gaps tend to the highest in EASIA. Third, parents in EASIA tend to invest a lot in their children's schooling compared to parents in WOECD. Given these facts, we posit that the low FLFP and birth rates in EASIA are possibly driven by three social institutions: child quality mores, gender norms, and labor market rigidities. Thus, EASIA faces both the issue of greedy work à la Goldin and the issue of greedy kids, which contribute towards driving down both FLFP and TFR.

To explore such mechanisms, we develop a two-stage quantitative model. In the first stage, individuals are randomly matched. In the second stage, households decide on fertility, labor supply, and money and time investment in children. Married couples' decisions are modeled using a collective framework à la Chiappori. The model is estimated separately for Korea and the US using SMM. We show that child quality mores as captured by the high valuation of child quality relative to quantity drives up FLFP and drives down TFR in Korea. Specifically, as child quality is money-intensive and parents value child quality, women choose to work to generate more income to invest in children's education while having fewer children. Conversely, gender norms and labor market rigidities contribute put downward pressure on FLFP and upward pressure on TFR. In particular, high fixed costs of work for women and long work hours in the labor market discourage them from working, which frees up time for children.

As the lower TFR and lower FLFP are driven by multiple drivers, targeting a single institution may not be enough to boost both without compromising welfare. Instead, we show that a multi-pronged policy approach such as a cap on education spending and a reduction in the fixed cost of work helps boost both TFR and FLFP. Alternatively, a reduction in the gender wage gap may also help boost both as the substitution effect helps increase FLFP while the income effect from higher wages helps increase fertility. We find that both policies increases women's welfare. In future work, we plan to explore additional welfare-improving policies that could help boost booth FLFP and TFR. Such considerations are particularly salient given the increased intensity of parenting and declining fertility rates worldwide.

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Tables

Table 1: Average Response to Questions Related to Gender Attitude

Economies	% Agree: man's job is to earn money; woman's job is to look after home and family	% Agree: a pre-school child is likely to suffer if his/her mother works	% Agree: jobs scarce: men should have more right to a job than women
	ISSP	IVS	IVS
	(1)	(2)	(3)
Panel A: East Asian Economies (EASIA)			
Hong Kong	.	0.269	0.282
Japan	0.244	0.164	0.259
Macau	.	0.482	0.253
Singapore	.	0.353	0.281
Korea	0.333	0.647	0.529
Taiwan	0.399	0.109	0.405
Average EASIA	0.325	0.337	0.335
Panel B: Western OECD Economies (WOECD)			
Panel B1: OECD Economies With Social Norms (OECDSN)			
Austria	0.296	0.500	0.142
Czech Republic	0.472	0.319	0.257
Greece	.	0.403	0.366
Hungary	0.444	0.459	0.209
Italy	0.341	0.520	0.233
Poland	0.389	0.516	0.230
Portugal	0.273	0.503	0.197
Slovakia	0.514	0.248	0.421
Slovenia	0.199	0.294	0.113
Spain	0.129	0.263	0.113
Average OECDSN	0.330	0.402	0.228
Panel B2: Other OECD Economies (OOECD)			
Canada	0.123	0.207	0.058
Denmark	0.057	0.101	0.024
Estonia	0.372	0.246	0.103
Finland	0.120	0.141	0.036
France	0.165	0.301	0.106
Germany	0.135	0.291	0.092
United Kingdom	0.169	0.217	0.048
Iceland	0.070	0.212	0.016
Lithuania	0.461	0.537	0.213
Netherlands	0.072	0.143	0.029
Norway	0.092	0.240	0.038
Sweden	0.051	0.144	0.023
Switzerland	0.183	0.347	0.087
United States	0.219	0.197	.
Average OOECD	0.164	0.237	0.067
Average WOECD	0.225	0.306	0.137

Notes: Weighted means are presented. The data source of Columns (2) and (3) is the wave 7 (2017–2022) of the Integrated Value Survey (IVS), which is a harmonized dataset covering both the EVS and the World Value Survey (WVS). For Column (1), because the same question presents in both International Social Survey Programme 2012 (ISSP) and EVS, we impute the missing values in EVS by its counterparts in ISSP, particularly for East Asian economies.

Table 2: Division of Household Chores

Economies	Doing the laundry (1)	Care for sick family members (2)	Shop for groceries (3)	Household cleaning (4)	Preparing meals (5)	Household chore division index (6)	Best parental childcare option (7)
Panel A: East Asian Economies (EASIA)							
Japan	1.460	1.748	1.723	1.653	1.371	-2.800	1.540
South Korea	1.574	1.896	2.010	1.874	1.560	-1.863	1.800
Taiwan	1.739	2.331	2.263	1.993	1.665	-1.412	1.670
Average EASIA	1.591	1.992	1.999	1.840	1.532	-2.025	1.670
Panel B: Western OECD Economies (WOECD)							
Panel B1: OECD Economies With Social Norms (OECDSN)							
Austria	2.807	2.329	2.402	2.085	2.116	-2.181	1.860
Czech Republic	1.348	2.121	2.330	1.908	1.866	-2.130	1.650
Hungary	1.416	2.010	2.200	1.745	1.607	-1.925	1.570
Poland	1.389	2.141	2.408	1.779	1.730	-1.886	1.870
Portugal	1.389	2.220	2.385	1.766	1.978	-2.851	2.320
Slovakia	1.412	2.082	2.311	1.832	1.785	-2.319	1.660
Slovenia	1.443	2.311	2.354	1.877	1.896	-1.034	2.280
Spain	1.605	2.296	2.440	1.954	2.064	-2.054	2.450
Average OECDSN	1.601	2.189	2.354	1.868	1.880	-2.048	1.960
Panel B2: Other OECD Economies (OOECD)							
Belgium	1.566	2.199	2.463	2.035	2.189	-1.767	2.330
Canada	1.963	2.335	2.457	2.220	2.244	0.299	2.000
Denmark	1.881	2.478	2.453	2.225	2.524	-1.541	2.700
Finland	1.880	2.446	2.637	2.239	2.380	-0.814	2.430
France	1.528	2.130	2.223	1.871	2.078	-0.952	2.340
Germany	1.524	2.037	2.350	1.881	1.876	-1.811	2.190
Iceland	2.011	2.456	2.616	2.256	2.482	-1.402	2.780
Ireland	1.771	2.144	2.171	1.985	2.137	-1.994	2.090
Lithuania	1.727	2.347	2.564	2.050	2.005	-2.196	1.560
Netherlands	1.714	2.236	2.364	1.936	2.266	-1.788	2.840
Norway	1.874	2.409	2.471	2.094	2.441	-1.046	2.680
Sweden	2.114	2.548	2.688	2.363	2.579	-0.234	3.040
Switzerland	1.595	1.958	2.214	1.845	2.054	-2.049	2.500
United States	2.042	2.244	2.185	1.951	2.138	-2.117	1.950
Average OOECD	1.799	2.283	2.418	2.068	2.242	-1.387	2.390
Average WOECD	1.722	2.246	2.393	1.990	2.101	-1.645	2.220

Notes: Weighted means are presented. The data source is the Family and Changing Gender Roles module in 2012 wave of International Social Survey Programme (ISSP). For the first six columns, we restrict our sample to those respondents living in a household where these chores are fully done by her or her partner and whose response is non-missing. Respondents indicate their answer on a five-category scale: always me, usually me, about equal or both together, usually my spouse/partner, or always my spouse/partner. We further construct an index as the first principal component for all the respondents that answer the first five questions regrading household chore divisions. We then restrict the sample to prime-age women (25–54). Thus, a lower value on the scale indicates a greater degree of unequal division of household chores towards women, meaning that women bear more of the household responsibilities. Similar, for the last column, prime-age respondents indicate their answer on a six-category scale: mother at home & father full-time, mother part-time & father full-time, both mother and father full-time, both mother and father part-time, father part-time & mother full-time, or father at home & mother full-time. Thus, a lower value on the scale indicates a greater degree of unequal division of childcare tilting women, meaning that women bear more of the childcare responsibilities.

Table 3: Externally Calibrated & Estimated Parameters

Parameter	Symbol	South Korea		United States	
		Value	Source	Value	Source
Curvature of leisure	ϕ	2	Bick (2016); Kim et al. (2024)	2	Bick (2016); Kim et al. (2024)
Economies of scale in childcare	ψ	0.54	Sommer (2016)	0.54	Sommer (2016)
Economies of scale in consumption	Λ	0.820	McClements scale	0.820	McClements scale
Gender wage gap	ζ_0	0.704	Myong et al. (2021)	0.869	Baudin et al. (2015)
Mincer coef.	ζ_1	0.069	Myong et al. (2021)	0.092	Baudin et al. (2015)
Full-time working hours per week	$\bar{h}_{FT}$	0.410	KLIPS 2010	0.360	CPS-ORG 2010
Part-time working hours per week	$\bar{h}_{PT}$	0.210	KLIPS 2010	0.204	CPS-ORG 2010
Progressivity of income tax	τ	0.020	Chun (2023)	0.137	Wu (2021)
Level of income tax	χ	0.087	Chun (2023)	0.078	Wu (2021)
Utility cost of out-of-wedlock births	κ	0.892	Myong et al. (2021)	1	Myong et al. (2021)

Notes: This table summarizes all the parameters calibrated or estimated outside the model.

Table 4: SMM Estimates

Parameters	Symbol	KOR		USA	
		Estimates (1)	S.E. (2)	Estimates (3)	S.E. (4)
Curvature on children	η	0.601	0.005	0.433	0.004
Mean of the weight on children	μ_n	0.394	0.012	0.189	0.011
Std of the weight on children	σ_n	0.360	0.012	0.166	0.007
Minimum consumption for fertility	$\bar{c}_{\min}$	0.118	0.000	0.446	0.000
Differential time cost for singles w higher educ	k_δ	-0.275	0.127	-0.021	0.007
Baseline level of time cost being single men w lower educ	δ_m	0.245	0.000	0.383	0.000
Baseline level of time cost being single women w lower educ	δ_f	0.156	0.079	0.169	0.017
Bargaining parameter for the wife	π	0.360	0.032	0.816	0.025
Disutility of work for single women	ϵ^S	0.281	0.241	0.0001	0.000
Disutility of work for married women	ϵ^M	0.370	0.076	0.049	0.000
Relative weight on leisure for men	α_m	0.360	0.008	0.184	0.015
Relative weight on leisure for women	α_f	0.277	0.020	0.165	0.001
Prob. women receive a part-time offer	$\wp$	0.198	0.000	0.997	0.000
Part-time wage penalty	ι	0.866	0.008	0.975	0.086
Mean of non-labor income	μ_b	-2.380	0.084	-0.203	0.001
Std of non-labor income	σ_b	0.831	0.004	0.881	0.003
Elasticity parameter in time production	β	0.447	0.007	0.546	0.004
Female relative productivity in time production	θ	0.755	0.008	0.548	0.002
Cobb-Douglas weight on monetary investments	ν	0.608	0.006	0.120	0.009
Baseline level of relative importance of child quality over quantity	$\bar{\gamma}_q$	2.755	0.048	2.612	0.021
Scale parameter for the relative importance for indiv. w higher educ	k_e	0.042	0.004	0.014	0.001

Notes: This table summarizes all the parameters estimated internally by using SMM separately for South Korea and United States. Standard errors are computed by using standard asymptotic formula à la Gourieroux et al. (1993).

Table 5: Model Fit: Targeted Moments

Moment Descriptions		KOR		USA	
		$\hat{\mathbf{m}}_{\mathbf{data}}$ (1)	$\mathbf{m}_{\mathbf{sim}}(\boldsymbol{\Theta})$ (2)	$\hat{\mathbf{m}}_{\mathbf{data}}$ (3)	$\mathbf{m}_{\mathbf{sim}}(\boldsymbol{\Theta})$ (4)
M1	Mean #child of women	1.44	1.45	1.72	1.60
M2	Std #child of women	1.02	1.29	1.43	1.53
M3	Mean #child of married women	1.82	1.80	2.16	2.18
M4	Std #child of married women	0.79	1.25	1.32	1.45
M5	Mean #child of women w lower educ	1.60	1.57	1.94	1.78
M6	Mean #child of women w higher educ	1.08	1.13	1.34	1.25
M7	Prop. married women w lower educ	0.85	0.80	0.70	0.72
M8	Prop. married women w higher educ	0.66	0.69	0.73	0.69
M9	Prop. married women	0.79	0.77	0.71	0.71
M10	Mean single women LFP	0.78	0.87	0.79	0.71
M11	Mean married women LFP	0.55	0.58	0.74	0.66
M12	Mean time investment of married women	0.13	0.13	0.10	0.11
M13	Mean time investment of married men	0.03	0.01	0.06	0.06
M14	Prop. part-time emp. of women	0.10	0.004	0.30	0.19
M15	Mean LFP of women w lower educ	0.59	0.59	0.71	0.60
M16	Mean LFP of women w higher educ	0.64	0.81	0.82	0.82
M17	Std LFP of women	0.49	0.48	0.43	0.47
M18	Corr. parental time investments	0.44	0.72	0.50	0.80
M19	Mean time investment of women	0.10	0.11	0.09	0.09
M20	Mean education spending per child relative to income	0.10	0.09	0.02	0.02
M21	Mean #child of married women w lower educ	1.89	1.90	2.31	2.38
M22	Mean #child of married women w higher educ	1.63	1.48	1.94	1.75

Notes: This table compares the data moments $\hat{\mathbf{m}}_{\mathbf{data}}$ and their simulated counterparts resulting from the model $\mathbf{m}_{\mathbf{sim}}(\boldsymbol{\Theta})$. All the simulated moments are generated separately for South Korea and United States.

Table 6: Plugging in US Parameters

	Korea BM	↓ quality taste	↓ work disutility	↓ work hours	↓ gender pay gap
	(1)	(2)	(3)	(4)	(5)
Panel A: Targeted Outcomes					
Mean #child of women	1.454	1.795	1.442	1.397	1.540
Mean FLFP	0.644	0.591	0.941	0.674	0.776
Prop. married women	0.773	0.796	0.866	0.759	0.810
Mean time investment of women	0.106	0.156	0.058	0.099	0.087
Mean per child edu. inv./income (%)	8.7%	8.5%	6.8%	7.9%	5.5%
Changes edu. inv. per child rel. to BM (%)	0.0%	12.9%	-12.9%	-16.1%	-19.4%
Panel B: Parameters					
$\bar{\gamma}_q$ (taste on quality)	2.755	2.612	2.755	2.755	2.755
ϵ^M (disutility of work)	0.370	0.370	0.049	0.370	0.370
$\bar{h}_{FT}$ (full-time hours)	0.410	0.410	0.410	0.360	0.410
ζ_0 (gender pay gap multiplier)	0.704	0.704	0.704	0.704	0.864

Notes: This table reports the targeted outcomes for the South Korean benchmark economy (BM), and corresponding counterfactual economies with different policies implemented. The South Korean counterfactual economies are constructed by varying parameters or imposing constraints, while keeping all other parameters fixed at their levels in the South Korean benchmark economy.

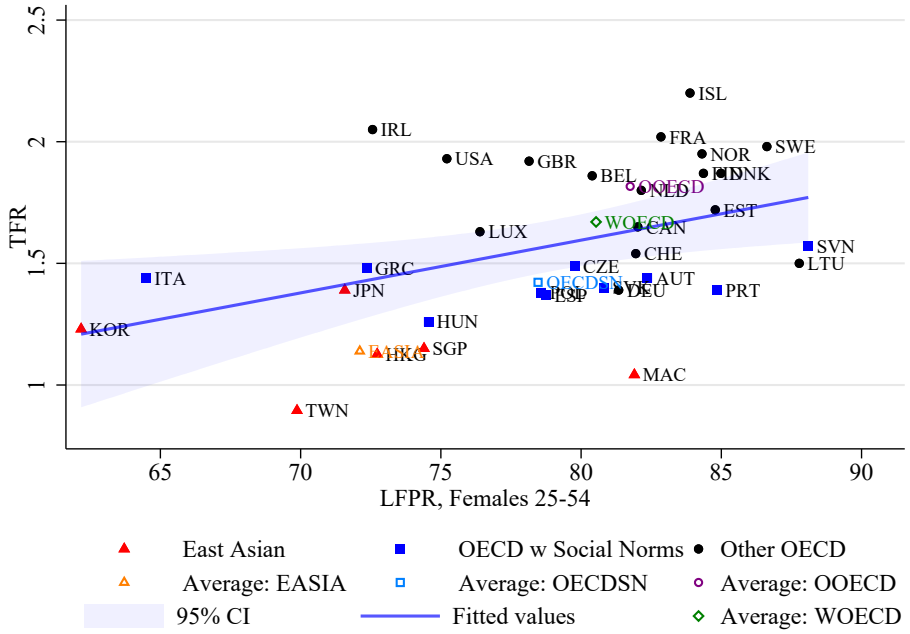
Table 7: Policy Simulation

	Korea BM (1)	Edu. inv. cap $\varrho_d = 0.28$ (2)	Edu. inv. cap $\varrho_d = 0.75$ (3)	Edu. inv. cap $\varrho_d = 0.75$ + Curr. reform on norm (4)	No gender pay gap (5)
Panel A: Targeted Outcomes					
Mean #child of women	1.454	1.568	1.480	1.507	1.563
Mean FLFP	0.644	0.685	0.643	0.774	0.843
Prop. married women	0.773	0.763	0.769	0.827	0.786
Mean time investment of women	0.106	0.052	0.112	0.091	0.075
Mean per child edu. inv./income	8.7%	2.0%	5.1%	4.7%	4.4%
Changes edu. inv. per child rel. to BM (%)	0.0%	-74.2%	-29.0%	-29.0%	-25.8%
Panel B: Welfare Implications					
Changes in female MMWI rel. to BM (%)	0.0%	-0.63%	-0.34%	1.63%	25.71%
Panel C: Parameters					
$\bar{\gamma}_q$ (taste on quality)	2.755	2.755	2.755	2.755	2.755
ϵ^M (disutility of work)	0.370	0.370	0.370	0.252	0.370
$\bar{h}_{FT}$ (full-time hours)	0.410	0.410	0.410	0.410	0.410
ζ_0 (gender-pay gap multiplier)	0.704	0.704	0.704	0.704	1.000

Notes: This table reports the targeted outcomes for the South Korean benchmark economy (BM), and corresponding counterfactual economies with different policies implemented. The post-policy economies are constructed by varying parameters or imposing constraints, while keeping all other parameters fixed at their levels in the South Korean BM. The average percentage welfare change for women following the implementation of the corresponding policy experiments is reported. This is computed by $\frac{MMWI_i^{\text{Policy}} - MMWI_i^{\text{BM}}}{MMWI_i^{\text{BM}}} \times 100\%$. Pre-policy welfare is measured by the welfare level a woman attains in the South Korea BM. Both pre- and post-policy welfare levels are measured by money metric welfare index (MMWI) proposed by Chiappori et al. (2024).

Figures

(a) TFR and Female Labor Force Participation: 2010



(b) TFR and Female Hours Worked per Employed: Closest to 2010

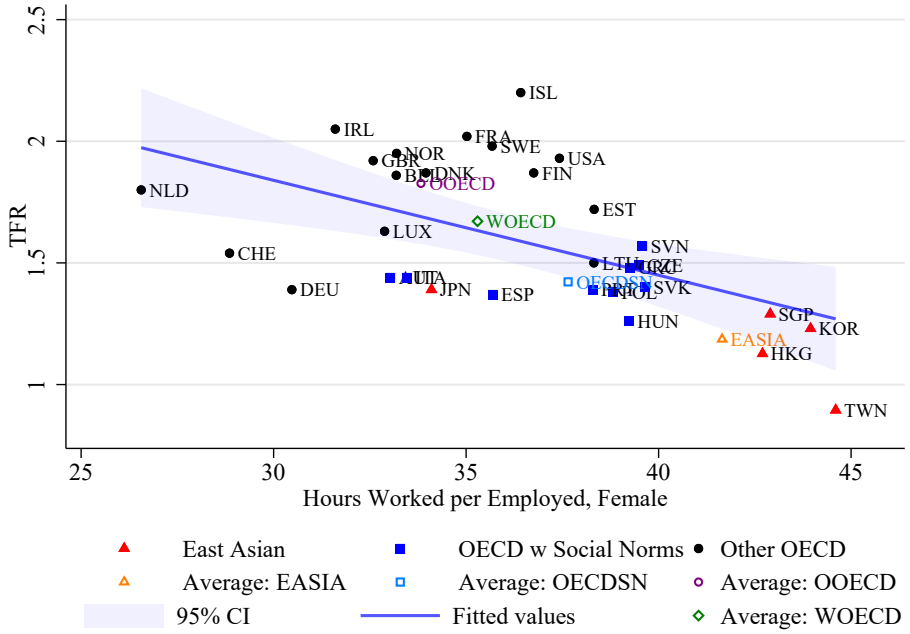
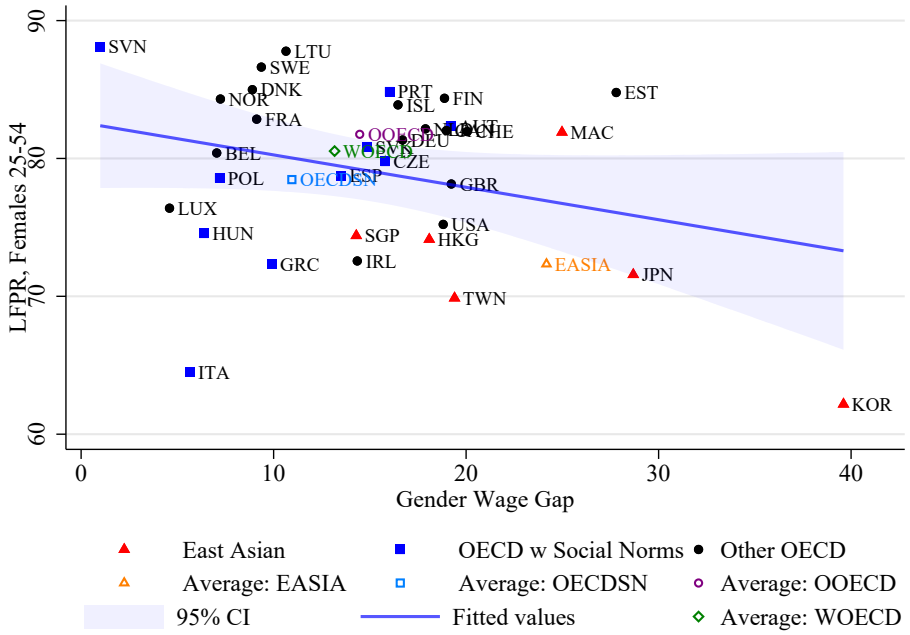


FIGURE 1: FERTILITY AND FEMALE LABOR SUPPLY (25-54) ACROSS ECONOMIES: MACRO DATA

Notes: Data sources are provided in Appendix Table A3. Female LFPR from 33 economies in 2010. Female work hours for 30 economies in 2010; for Singapore in 2012. For most economies, labor supply is for prime aged women; for Hong Kong, Japan, Singapore, and Taiwan, data was only available for all women.

(a) Female Labor Force Participation and Gender Wage Gap: 2010



(b) TFR and Gender Wage Gap: 2010

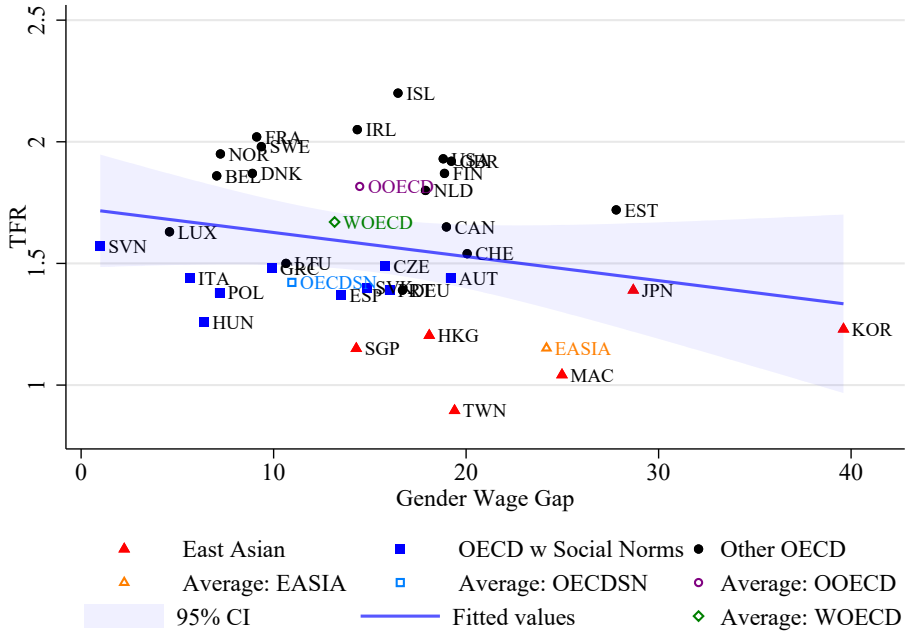


FIGURE 2: FERTILITY, FEMALE LABOR SUPPLY, AND GENDER WAGE GAP ACROSS ECONOMIES: MACRO DATA

Notes: Data sources are provided in Appendix Table A3. Female LFPR from 33 economies in 2010. Unadjusted median gender pay gaps among all full-time workers, defined as the difference between median wages of men and women relative to the median wages of men, in 2010 are shown. The data points for Hong Kong in figures are based on 2011 statistics.

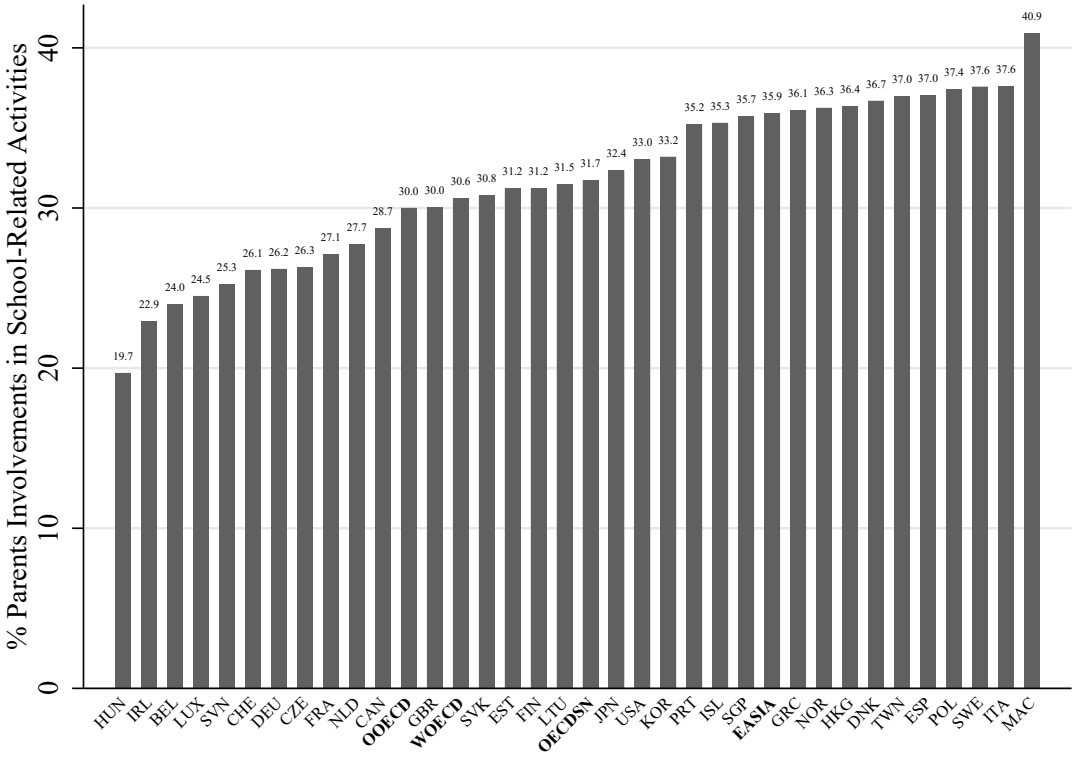
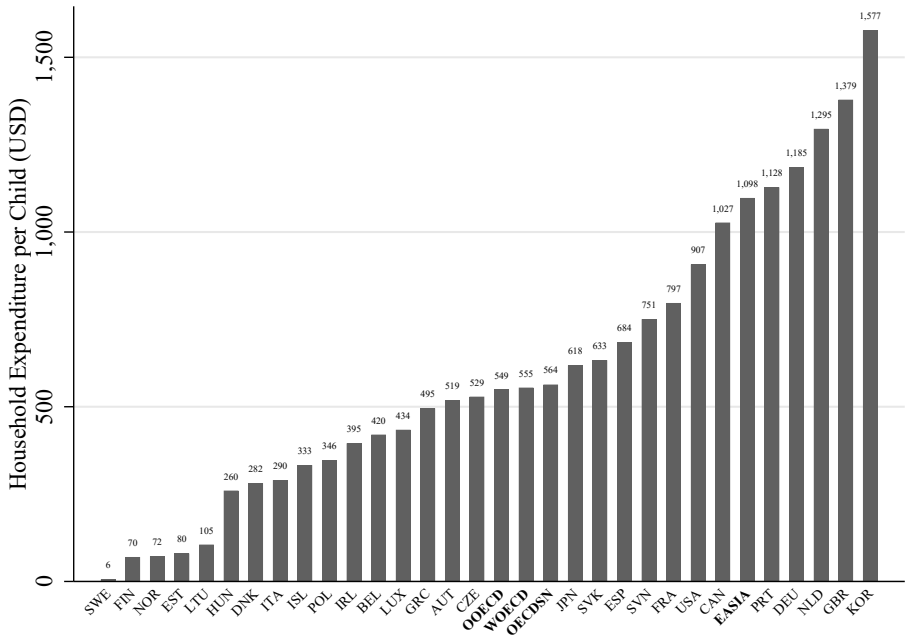


FIGURE 3: PROPORTION OF PARENTS INVOLVEMENTS IN SCHOOL-RELATED ACTIVITIES ACROSS ECONOMIES: MACRO DATA

Notes: Data sources are provided in Appendix Table A3. We compute the mean of the average responses of parents for the following four questions for each economy to measure parental involvement in school relevant activities: "discussed their child's progress with a teacher on their own initiative," "discussed their child's progress on the initiative of one of their child's teachers,""participated in local school government," and "volunteered in physical or extracurricular activities."

(a) Household Education Expenditure per Child Across Economies



(b) The Percentage of Household Expenditure Spent on Education

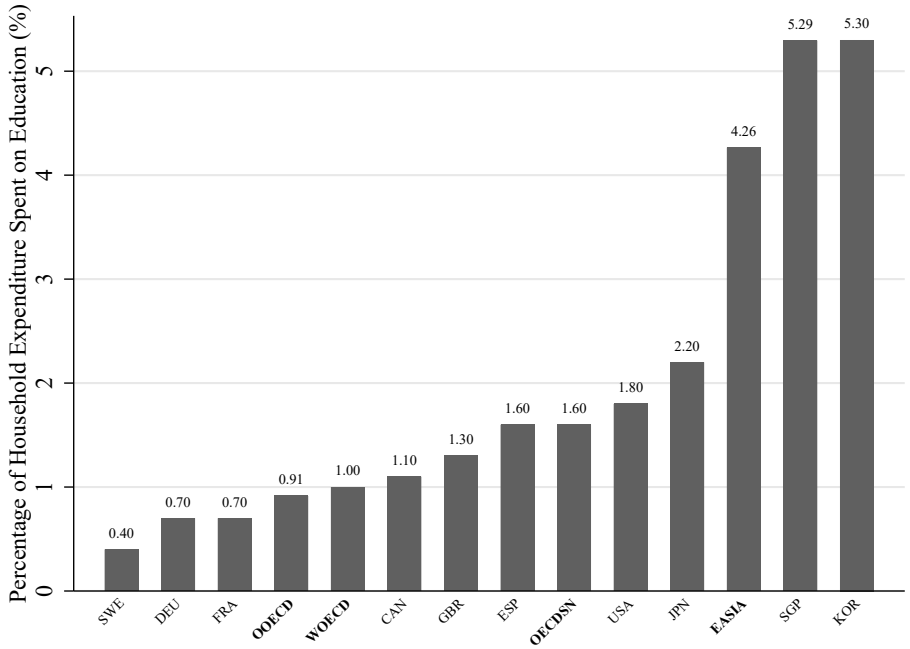


FIGURE 4: EDUCATION INVESTMENTS ACROSS ECONOMIES: MACRO DATA

Notes: Data sources are provided in Appendix Table A3. For subfigure 4a, we use the statistics of the year which is closest to 2010 if multiple years of data are available, within a range of no more than 5 years.

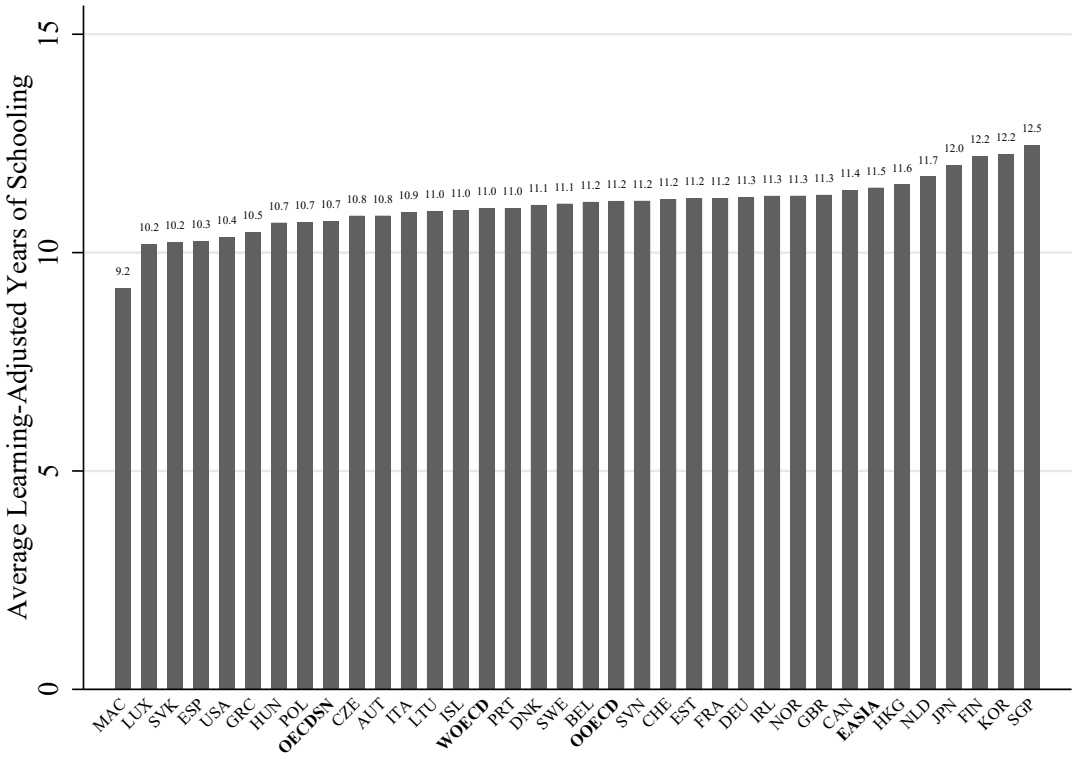
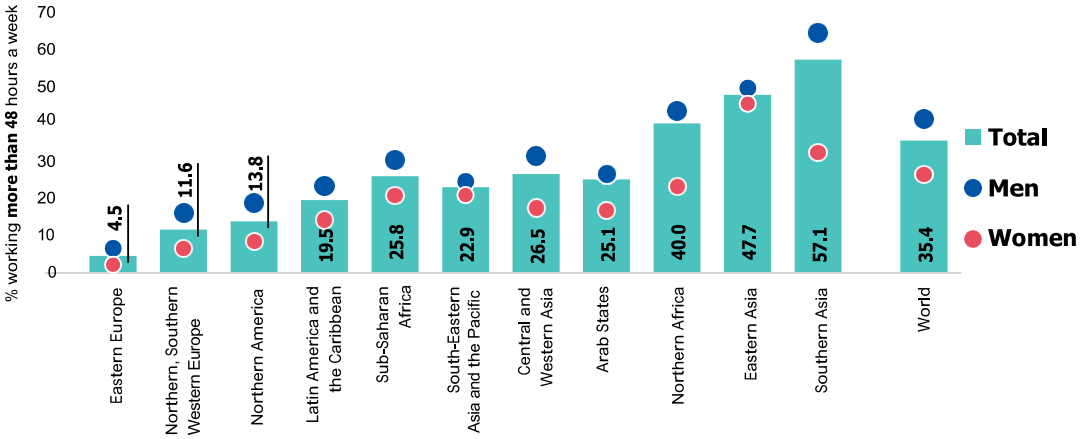


FIGURE 5: AVERAGE LEARNING-ADJUSTED YEARS OF SCHOOLING: MACRO DATA

Notes: Data sources are provided in Appendix Table A3. Learning-adjusted years (LAYS) is computed by adjusting the expected years of school based on the quality of learning, as measured by the harmonized test scores from various international student achievement testing programs. The adjustment involves multiplying the expected years of school by the ratio of the most recent harmonized test score to 625. Here, 625 signifies advanced attainment on the TIMSS (Trends in International Mathematics and Science Study) test, with 300 representing minimal attainment. Unadjusted expected years of schooling is a quantity-based metric; however, students across different economies often achieve significantly different learning outcomes despite completing the same number of school years. To address this, we use Learning-Adjusted Years of Schooling (LAYS), which refines the standard years of schooling measure by accounting for how much students learn each year they are in school. See Filmer et al. (2020) for details.

(a) Figure 4b in ILO (2022): Workers Working More Than 48 Hours per Week, by Sex and Detailed Geographic Region (Total Employment 2019, in %)



(b) Figure 10b in ILO (2022): Workers Working Less Than 35 Hours per Week, by Sex and Detailed Geographic Region (Total Employment, in %)

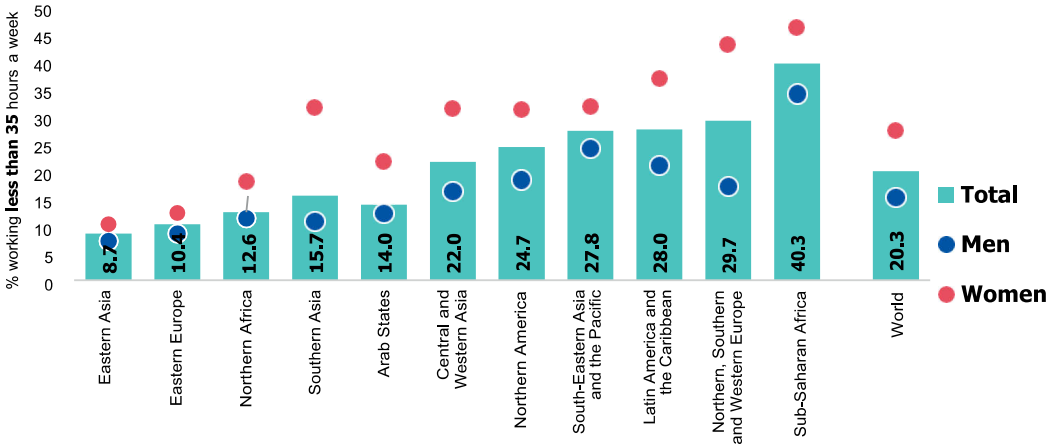
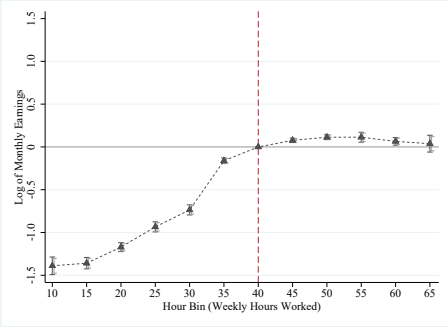
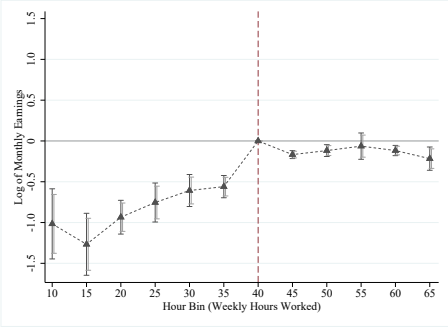


FIGURE 6: FIGURES IN ILO (2022)

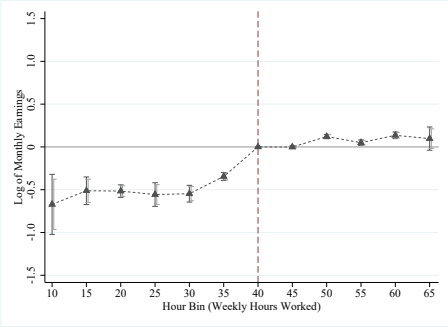
(a) Earnings-Hours Profiles: Japan



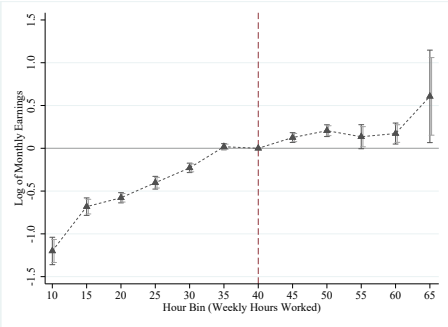
(b) Earnings-Hours Profiles: South Korea



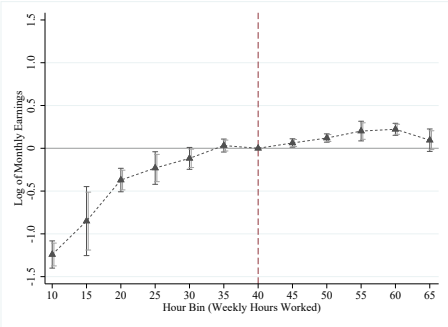
(c) Earnings-Hours Profiles: Taiwan



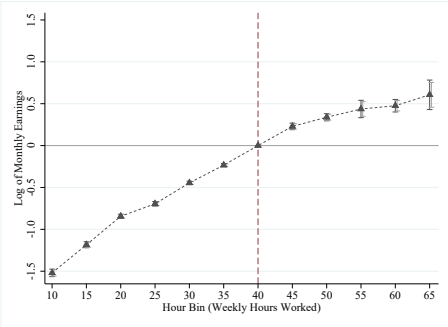
(d) Earnings-Hours Profiles: Austria



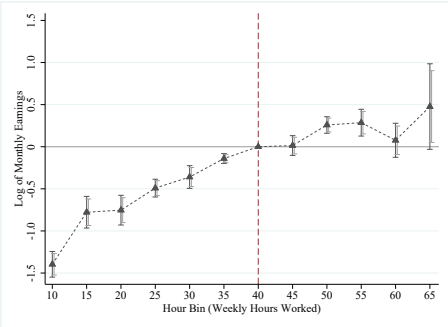
(e) Earnings-Hours Profiles: Czech Republic



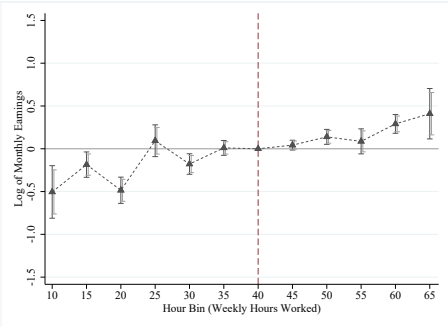
(f) Earnings-Hours Profiles: United States



(g) Earnings-Hours Profiles: France



(h) Earnings-Hours Profiles: Lithuania



(i) Earnings-Hours Profiles: Netherlands

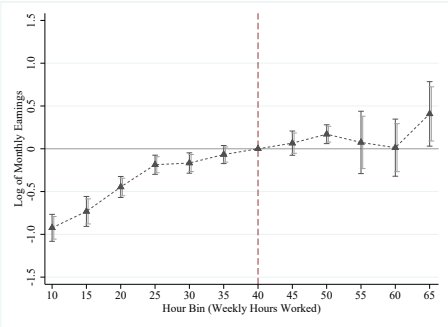


FIGURE 7: EARNINGS-HOURS PROFILES

Notes: Weighted regression results are presented. Each triangle is the point estimate of the hour-earning gradient; vertical bands are the corresponding 90% (grey bands) and 95% (black bands) confidence intervals. The reference category is 40 hours. Robust standard errors are applied.

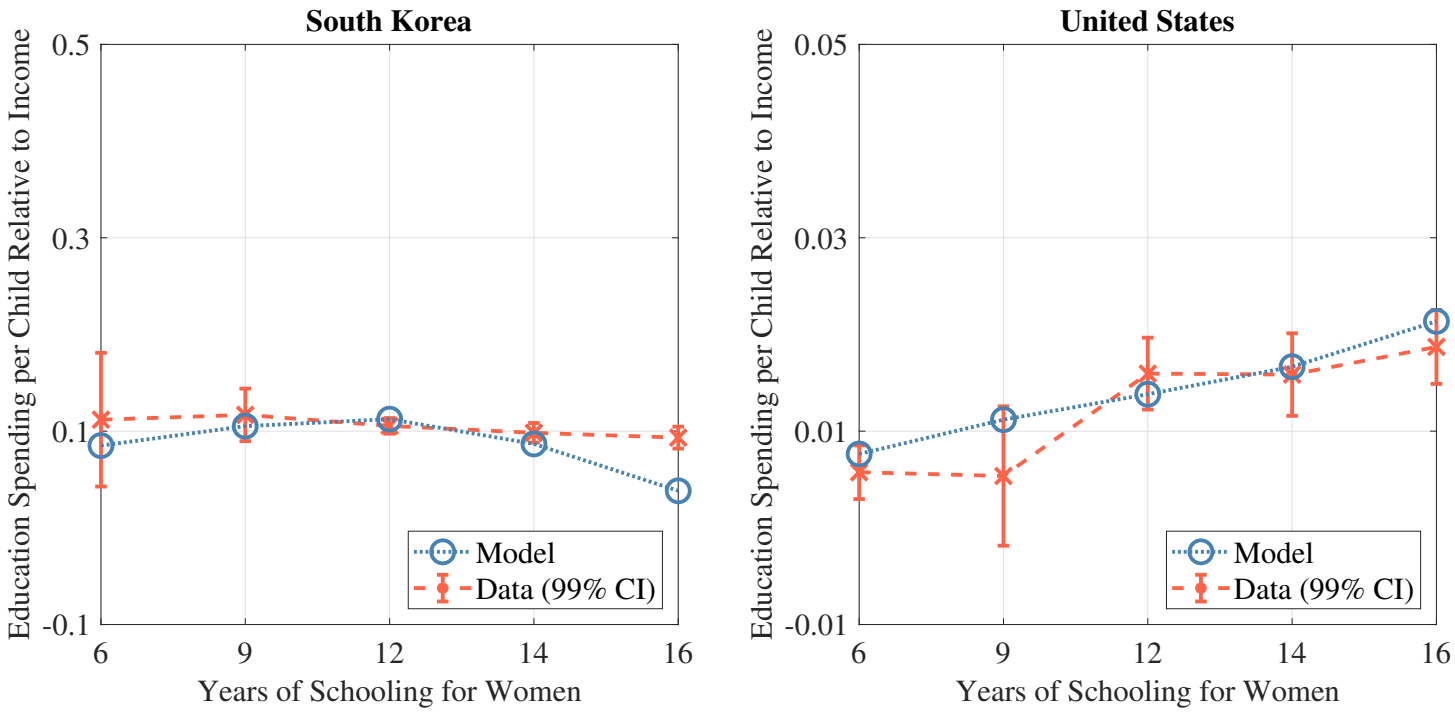


Figure 8: Non-Targeted Moments: Education Spending per Child Relative to Income over Female Schooling Years

Appendix

Appendix A More on Cross-Sectional Facts

A.1 EASIA, OEDCSN, and OOECD Clusters

Economies can be grouped into three main clusters, namely, East Asian countries (EASIA), OECD countries with social norm (OECDSN), and other OECD countries (OOECD). We label the combination of the last two clusters as Western OECD countries. Specifically, EASIA consists of Korea, Hong Kong, Japan, Macau, Singapore, and Taiwan. Next, we follow Anderson and Kohler (2013) and we use the degree *familism* to differentiate between OECDSN and OOECD. As can be seen from Appendix Table A1, the degree of familism tends to be closely tied to gender attitudes with those with strong familism also displaying stronger preferences for "mothers as primary caregivers" or for "women to take on household responsibilities". We thus classify Southern and Eastern European countries (and Austria) into the OECDSN group, and Northern and Western European (except for Austria) and North American countries into the OOECD cluster. As a result, OECDSN consists of Austria, Czech Republic, Greece, Hungary, Italy, Poland, Portugal, Slovakia, Slovenia, and Spain, while the remaining economies in WOECD are grouped into the OOECD cluster.

Using the degree of conservatism towards gender roles from Bertrand et al. (2021), we confirm that OECDSN captures WOECD economies with stronger gender norms compared to those in the OOECD cluster. Specifically, Bertrand et al. (2021) grade the level of conservatism by using the average responses to gender attitude question: "*Do you agree that a man's job is to earn money and a women's job is to look after the home and family*?" from the 2002 and 2012 waves of the International Social Science Program (ISSP). Countries are then rated on a scale of 1 to 3, with 3 being the highest degree of conservatism (see Appendix Table A2). Specifically, all OOECD countries are rated 1 or 2 while all EASIA countries are rated 3. Meanwhile, all OECDSN countries are rated 3 except for Spain which is rated 2. Nevertheless, Spain is well-known for having strong gender norms (de Laat and Sevilla-Sanz, 2011), we hence still classify it as part of the OECDSN cluster.

A.2 Earnings-Hours Profile

We now examine the potential wage penalties associated with shorter work hours and potential bonuses associated with longer work hours across EASIA and WOECD economies. To do so, we start by partitioning the range of weekly hours between 10 and 69 into five-hour bins. We next

adopt a similar specification in Bick et al. (2022):

$$\ln w_{it} = \beta_0 + \sum_{h \in H, h \neq 40} \beta_1^h \mathbb{1}_{ih} + \mathbf{X_i'} \boldsymbol{\beta_2} + \varepsilon_i, \tag{A1}$$

where $\ln w_{it}$ denote the monthly earning of individual i. Denote the set of five-hour bins of weekly hours worked by $H = \{10, 25, \cdots, 65\}$, and let $h \in H$ denote the minimum threshold of a specific bin. A set of indicators $\mathbb{1}_{ih}$ take value 1 if individual i's weekly hours worked fall in the bin h, zero otherwise. $\mathbf{X_i}$ is a control vector including a second polynomials in age, a dummy for higher education, marital status (married, never married), and gender.

We conduct economy-specific regressions on prime-age individuals to pin down the kink in the earning-hours profiles, below which shorter hours are penalized by lower earnings. Following the literature, we use 40 as our benchmark threshold by omitting the coefficient β_1^{40} from the regressions. In this case, the remaining β_1^h represent the differences of wage-hour gradient relative to that of 40 hours. As shown in the Figure 7, most economies for which data is available exhibit a convex earnings-hours profile when hours worked is below 40. The earnings-hours profiles of EASIA economies are shown in the first row, while those of WOECD countries are displayed in the second and third rows. For all economies, moving from 10 hours bin to the 40 hours bin, log monthly earning increases (i.e., becomes less negative). This is consistent with the notion of greedy jobs from prior literature (Goldin, 2014). Nevertheless, log earnings increase more steeply with hours (i.e., is more convex) in EASIA than in WOECD, suggesting stronger wage penalties for part-time work. Conversely, the earnings-hours profiles tend to be flatter post 40 hours in EASIA, suggesting that there are no substantial rewards for working long hours. In fact, past 55 hours, earnings growth becomes negative in Korea, suggesting that the long work hours are not necessarily due to bonuses in Korea.

Appendix B Money Metric Welfare Index

One can show that MMWI is a sufficient statistics for individual collective indirect utility, while the reference price is fixed at the market price, which renders MMWI robust to shifts in the environment. Therefore, by applying this util-to-dollar conversion, MMWI enables us to evaluate the welfare changes when a counterfactual experiment is implemented, while taking preference shifts, externalities of public goods, and shifts in quality production possibilities into considerations. Specifically, we proceed with the following steps. First, we compute the *collective indirect utility* for each spouse based on their current optimal allocation, which is denoted by

$$V_g^M(\boldsymbol{\omega}_\mathbf{g}^\mathbf{M}) \equiv V_g^M\left(c_g^{M^*}(\mathbf{p}, I), t_g^{M^*}(\mathbf{p}, I), h_f^{M^*}(\mathbf{p}, I), n^{M^*}(\mathbf{p}, I), q^{M^*}(\mathbf{p}, I); \boldsymbol{\omega}_\mathbf{g}^\mathbf{M}\right),$$

where $g = \{f, m\}$, $q^{M^*}(\mathbf{p}, I) = q^M(t_f^{M^*}(\mathbf{p}, I), t_m^{M^*}(\mathbf{p}, I), d^{M^*}(\mathbf{p}, I), n^{M^*}(\mathbf{p}, I))$, and all Marshallian demand functions $x_g^{M^*}$ where $x = c, t, h, n, q$ are functions of *the market price vector* $\mathbf{p}$ and disposable household income I. Note that given preferences, market prices, household income, and $\boldsymbol{\omega}_\mathbf{g}^\mathbf{M}$, the Pareto weight is pinned down and hence the collective indirect utility. To ease the exposition, we use $x_g^{M^*}$ and omit the explicit dependence on $\mathbf{p}$ and I, where $x_g^{M^*}$ is a function of $\mathbf{p}$ and I. Second, we consider a hypothetical situation where the household member live alone and produce the public goods solely and hence face the full per unit cost.

We note that for single individuals, MMWI exactly coincides with the income that they currently have, which stems from the dual theorem. Whereas for married individuals, we define their MMWI as:

$$MMWI_i = \min_{\tilde{c}_g^S, \tilde{d}_g^S, \tilde{t}_g^S, \tilde{h}_g^S, \tilde{n}_g^S} \tilde{c}_g^S + \tilde{d}_g^S \tilde{n}_g^S + (1-\chi)\Big[\big(w_{f,FT}(1-\bar{h}_{FT})\big)\mathbb{1}_{\tilde{h}_f^S=\bar{h}_{FT}} + \big(w_{f,PT}(1-\bar{h}_{PT})\big)\mathbb{1}_{\tilde{h}_f^S=\bar{h}_{PT}} + w_{f,FT}\mathbb{1}_{\tilde{h}_f^S=0}\Big]^{1-\tau}$$

subject to

$$U_g^S(\tilde{c}_g^S, \tilde{d}_g^S, \tilde{t}_g^S, \tilde{h}_f^S, \tilde{n}_g^S, \tilde{q}_g^S; \boldsymbol{\omega}_\mathbf{g}^\mathbf{S}) \geq V_g^M(c_g^{M^*}, t_g^{M^*}, h_f^{M^*}, n^{M^*}, q^{M^*}; \boldsymbol{\omega}_\mathbf{g}^\mathbf{M}),$$

$$\tilde{q}^S = \left(\tilde{d}^S\right)^\nu \left(\left[\theta \times \mathbb{1}_{g=f} + (1-\theta) \times (1-\mathbb{1}_{g=f})\right] \frac{\tilde{t}_g^S}{\tilde{n}^{S\psi}}\right)^{1-\nu},$$

$$q^{M^*} = (d^{M^*})^\nu \left(\left[\theta\left(\frac{t_f^{M^*}}{n^{M^*\psi}}\right)^\beta + (1-\theta)\left(\frac{t_m^{M^*}}{n^{M^*\psi}}\right)^\beta\right]^{\frac{1}{\beta}}\right)^{1-\nu},$$

where $g = \{f, m\}$ and $\tilde{x}_g^S$ denotes the optimal allocations for $x = c, t, h, n, q$ which each spouse would choose in the hypothetical situation to achieve the same collective utility level when they live together in a household.

Appendix C Additional Tables

Table A1: Characteristics of Weak and Strong Familism

Strong familism	Weak familism
• Late parental home move out ("late nest leaving")	• Premarital parental home move out ("early nest leaving")
• Traditional gender roles	• High degree of individual autonomy
• Strong family ties	• Lowered parental authority
• Very low out of wedlock births	• Cohabitation common
• Cohabitation not very common	• High use of childcare, babysitters, and nannies
• Often linked to religion, ideology, or ethical and philosophical system (e.g. Confucianism, Catholicism)	• Housework is shared relatively equally by both men and women
• Mothers as primary caregivers	• Moderately low or near replacement level (TFR of 1.7–2.1) common
• Women take on household responsibilities	• **Northern and Western Europe**
• Low (TFR of 1.3–1.7) or lowest-low (TFR of or below 1.3) fertility levels common	
• **East Asia, Southern Europe, Eastern Europe**	

Notes: This table is taken from the Table 1 in Anderson and Kohler (2013).

Table A2: Classification of Gender Norm Group

Economy Name	Code	Average Response	Rank
Norway	NOR	0.07	1
Sweden	SWE	0.08	1
Denmark	DNK	0.10	1
Finland	FIN	0.11	1
Canada	CAN	0.12	1
Netherlands	NLD	0.13	1
Ireland	IRL	0.16	2
France	FRA	0.17	2
Germany	DEU	0.18	2
UK	GBR	0.18	2
Spain	ESP	0.21	2
USA	USA	0.23	2
Switzerland	CHE	0.24	2
Belgium	BEL	0.25	2
Japan	JPN	0.28	2
Austria	AUT	0.33	3
Korea	KOR	0.33	3
Portugal	PRT	0.34	3
Hungary	HUN	0.39	3
Poland	POL	0.44	3
Taiwan	TWN	0.45	3
Czech Republic	CZE	0.48	3
Slovakia	SVK	0.51	3

Notes: This table is originally from the Appendix Table 4 in Bertrand et al. (2021). We sort all economies based on the value of average response

Table A3: Macro Data Sources

Variable	Economy	Source	Reference Year
Panel A: Total Fertility Rate			
	All OECD countries	OECD (2023a)	1980–2020
	Hong Kong, Macau, Singapore	World Bank	1980–2020
	Taiwan	Ministry of the Interior of Taiwan	1980–2020
Panel B: Labor Force Participation Rate			
	All OECD countries	OECD (2023b)	
	Hong Kong	ILO Modelled Estimates (only real value used)	1990–2020
	Macau	ILO Modelled Estimates (only real value used)	1992–2016
	Taiwan	ILO Modelled Estimates (only real value used)	1990–2020
	Singapore	Ministry of Manpower of Singapore	1991–2020
Panel C: Hours Worked per Employed			
	OECD countries except for Japan	OECD Database (Hours Worked – Indicators)	
	Japan	Statistics Bureau of Japan	2009–2022
	Hong Kong	Report on Annual Earnings and Hours Survey	2010–2022
	Singapore	Ministry of Manpower of Singapore	2012–2022
	Taiwan	Ministry of Labor of Taiwan	1980–2022
Panel D: Women Age at First Birth			
	All OECD countries except for Japan and Korea	OECD Family Database	
	Japan	OECD Family Database in the Asia-Pacific Region	1980–2017
	Korea	OECD Family Database in the Asia-Pacific Region	1983–2020
	Singapore	OECD Family Database in the Asia-Pacific Region	1987–2016
	Taiwan	Ministry of the Interior of Taiwan	1980–2020
Panel E: Unadjusted Median Gender Pay Gap			
	All OECD countries	OECD Database – Gender Wage Gap	2010 & 2019
	Hong Kong	Census and Statistics Department of Hong Kong SAR	2011 & 2019
	Singapore	Singapore Ministry of Manpower (2014, 2022)	2010 & 2019
	Taiwan	Ministry of Labor of Taiwan	2010 & 2019
Panel F: % Parents Involvements in School-Related Activities			
	All economies	OECD (2019)	2018
Panel G: Household Education Expenditure per Child			
	All economies	OECD Database on Expenditure on Educational Institutions per Full-Time Equivalent Student	2010
Panel H: Percentage of Household Expenditure Spent on Education			
	All economies except for Singapore	Hu et al. (2023)	
	Singapore	Singapore Department of Statistics	2008
Panel I: Average Learning-Adjusted Years of Schooling			
	All economies	Our World in Data (2024)	2010

Notes: The macro data is utilized to document both time-series and cross-sectional patterns. However, due to data availability, there may be some gaps in the targeted time series range from 1980 to 2020. Additionally, in certain economies, time series data may not be available for all years within the specified time range outlined above.

Table A4: Micro Data Sources

Economy	Year	Source
Austria	2013	Generations and Gender Survey I, Wave 2
Belgium	2010	Generations and Gender Survey I, Wave 1
Czech Republic	2009	Generations and Gender Survey I, Wave 2
Germany	2009	Generations and Gender Survey I, Wave 2
Estonia	2005	Generations and Gender Survey I, Wave 1
France	2011	Generations and Gender Survey I, Wave 3
Greece	2011	Integrated Public Use Microdata Series, International
Hong Kong	2016	Macro TFR Data (fertility), Hong Kong 2016 Population By-Census 5% Dataset (LFPR, hours worked)
Hungary	2011	Integrated Public Use Microdata Series, International
Italy	2003	Generations and Gender Survey I, Wave 1
Japan	2016	Japanese Panel Study of Employment Dynamics
Korea	2010	Population and Housing Census 2010 (fertility), Korean Labor & Income Panel Study 2010 (KLIPS) (LFPR & hours worked)
Lithuania	2006	Generations and Gender Survey I, Wave 1
Netherlands	2004	Generations and Gender Survey I, Wave 1
Norway	2020	Generations and Gender Survey II
Poland	2011	Generations and Gender Survey I, Wave 1
Slovenia	2002	Integrated Public Use Microdata Series (IPUMS), International
Sweden	2021	Generations and Gender Survey II
Taiwan	2013	Manpower Utilization Survey
United States	2010, 2012	Current Population Survey (CPS) 2012 – June Fertility Supplement (fertility), Current Population Survey (CPS) 2010 – Annual Social and Economic Supplement (LFPR), Current Population Survey 2010 – Outgoing Rotation Groups (hours worked)

Notes: If the sources for different statistics differ, we specify the statistics that rely on the specific dataset in parentheses to provide clarity. Note that Hong Kong Population Census/By-Census did not included the question about the number of children ever born after 1981, we thus use corresponding macro data instead. In CPS, only outgoing rotation group (ORG) households are surveyed the questions related to *current* hours worked, thus we compute the hours worked statistics from CPS-ORG. And the ORG sample is constructed as a subset of the basic monthly samples of 2010, following the instructions of IPUMS.

Table A5: Number of Children for Prime-Aged Individuals by Marital Status Across Economies: Micro Data

Economies	Women (Age 25-54)	
	Married No. of Children	Single No. of Children
	(1)	(2)
Panel A: East Asian Economies (EASIA)		
Hong Kong	.	.
Japan	1.360	0.300
Korea	1.822	0.000
Taiwan	1.909	0.000
Average EASIA	1.697	0.100
Average EASIA (-JPN)	1.865	0.000
Panel B: Western OECD Economies (WOECD)		
Panel B1: OECD Economies With Social Norms (OECDSN)		
Austria	1.850	0.447
Czech Republic	1.880	0.642
Greece	1.819	0.071
Hungary	1.868	0.594
Italy	1.824	0.111
Poland	1.921	0.535
Slovenia	1.807	0.627
Average OECDSN	1.853	0.432
Panel B2: Other OECD Economies (OOECD)		
Belgium	1.925	1.007
Estonia	2.096	0.982
France	2.118	0.968
Germany	1.890	0.679
Lithuania	1.674	0.464
Netherlands	2.010	0.436
Norway	2.228	1.794
Sweden	1.842	1.004
United States	2.163	0.947
Average OOECD	1.994	0.920
Average WOECD	1.932	0.707

Notes: Weighted means are presented. Data sources are provided in Appendix Table A4. We abstract from divorced, separated, and widowed men and women. Married ones are strictly defined as individuals who are married legally or consensually, and thus cohabitation is also considered as Married in the dataset of Taiwan. Whereas, single ones are strictly defined as those never married. The Japanese data does not distinguish between never-married and divorced singles, so caution is needed when interpreting the statistics for singles in Japan. Note that since the fertility data for Korea and Taiwan only includes responses from married women, we follow a common approach in the literature (Hwang, 2023; Yoo and Sobotka, 2018) and assume that all single (never married) women in these two economies are childless. Average (-JPN) refers to the average number of children across all economies in the EASIA cluster except for Japan, which contrary to other EASIA economies, has a relatively high rate of part-time workers (Ogawa and Ermisch, 1996; Rodríguez-Planas and Tanaka, 2022; Yanagimoto, 2023).

Table A6: Proportion of LFP for Prime-Aged Individuals by Marital Status Across Economies: Micro Data

Economies	Women (Age 25-54)		Men (Age 25-54)	
	Married LFPR	Single LFPR	Married LFPR	Single LFPR
	(1)	(2)	(3)	(4)
Panel A: East Asian Economies (EASIA)				
Hong Kong	0.691	0.888	0.937	0.893
Japan	0.641	0.915	0.989	0.920
Korea	0.554	0.785	0.952	0.744
Taiwan	0.658	0.917	0.936	0.885
Average EASIA	0.636	0.876	0.954	0.860
Average EASIA (-JPN)	0.634	0.863	0.942	0.840
Panel B: Western OECD Economies (WOECD)				
Panel B1: OECD Economies With Social Norms (OECDSN)				
Austria	0.871	0.864	0.989	0.919
Czech Republic	0.916	0.913	0.959	0.872
Greece	0.600	0.839	0.947	0.896
Hungary	0.767	0.791	0.929	0.873
Italy	0.612	0.793	0.983	0.861
Poland	0.791	0.862	0.946	0.896
Slovenia	0.885	0.886	0.957	0.920
Average OECDSN	0.777	0.850	0.958	0.891
Panel B2: Other OECD Economies (OOECD)				
Belgium	0.813	0.925	0.960	0.940
Estonia	0.897	0.906	0.957	0.922
France	0.858	0.926	0.979	0.961
Germany	0.762	0.853	0.942	0.880
Lithuania	0.896	0.939	0.973	0.935
Netherlands	0.649	0.858	0.950	0.926
Norway	0.887	0.835	0.953	0.898
Sweden	0.947	0.895	0.979	0.919
United States	0.736	0.788	0.936	0.828
Average OOECD	0.827	0.881	0.959	0.912
Average WOECD	0.805	0.867	0.959	0.903

Notes: Weighted means are presented. Data sources are provided in Appendix Table A4. We abstract from divorced, separated, and widowed men and women. Married ones are strictly defined as individuals who are married legally or consensually, and thus cohabitation is also considered as Married in the dataset of Taiwan. Whereas, single ones are strictly defined as those never married. The Japanese data does not distinguish between never-married and divorced singles, so caution is needed when interpreting the statistics for singles in Japan. Average (-JPN) refers to the average LFP across all economies in the EASIA cluster except for Japan, which contrary to other EASIA economies, has a relatively high rate of part-time workers (Ogawa and Ermisch, 1996; Rodríguez-Planas and Tanaka, 2022; Yanagimoto, 2023).

Table A7: Average Hours Work per Employed for Prime-Aged Individuals by Marital Status Across Economies: Micro Data

Economies	Women (Age 25-54)		Men (Age 25-54)	
	Married HWE (1)	Single HWE (2)	Married HWE (3)	Single HWE (4)
Panel A: East Asian Economies (EASIA)				
Hong Kong	45.903	46.180	45.869	45.292
Japan	29.450	37.927	45.600	42.350
Korea	42.497	43.234	45.856	45.880
Taiwan	43.297	43.640	44.953	44.368
Average EASIA	40.287	42.745	45.570	44.473
Average EASIA (-JPN)	43.899	44.351	45.560	45.180
Panel B: Western OECD Economies (WOECD)				
Panel B1: OECD Economies With Social Norms (OECDSN)				
Austria	30.673	36.481	44.613	43.717
Czech Republic	40.439	42.389	46.254	46.134
Greece	37.203	38.263	43.636	42.236
Italy	32.936	37.884	43.496	42.197
Poland	39.632	40.801	46.577	44.100
Average OECDSN	36.177	39.163	44.915	43.677
Panel B2: Other OECD Economies (OOECD)				
Belgium	33.569	35.019	45.482	43.480
Estonia	39.972	40.702	43.744	42.795
France	34.566	35.766	42.988	40.669
Germany	30.944	37.359	44.205	43.771
Lithuania	41.013	41.703	45.006	44.144
Netherlands	25.941	34.784	43.577	41.677
Norway	37.278	36.235	42.719	40.640
United States	33.899	35.353	39.530	36.938
Average OOECD	34.648	37.115	43.406	41.764
Average WOECD	35.236	37.903	43.987	42.500

Notes: Weighted means are presented. Data sources are provided in Appendix Table A4. We abstract from divorced, separated, and widowed men and women. Married ones are strictly defined as individuals who are married legally or consensually, and thus cohabitation is also considered as Married in the dataset of Taiwan. Whereas, single ones are strictly defined as those never married. The Japanese data does not distinguish between never-married and divorced singles, so caution is needed when interpreting the statistics for singles in Japan. Average (-JPN) refers to the average hours worked per capita across all economies in the EASIA cluster except for Japan, which contrary to other EASIA economies, has a relatively high rate of part-time workers (Ogawa and Ermisch, 1996; Rodríguez-Planas and Tanaka, 2022; Yanagimoto, 2023).

Table A8: Fixed-Hour Contracts and Hours Worked

	Hours Worked			Prop. Fixed #Hours		
	Fixed	Non-Fixed	(1)-(2)	All	HWE≥35	HWE≥48
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: South Korea						
All	44.838	42.980	1.858***	0.838	0.860	0.816
Women	43.042	39.507	3.535***	0.849	0.877	0.834
Men	46.083	45.077	1.006†	0.830	0.849	0.806
Panel B: United States						
All	38.805	38.773	0.032	0.545	0.599	0.275
Women	37.432	34.490	2.942***	0.558	0.650	0.310
Men	40.055	42.307	-2.252***	0.534	0.564	0.260

Notes: Weighted means are presented. The statistics of South Korea is computed based on 2010 Korean Labor & Income Panel Study. And the statistics of United States is computed based on 2015 American Working Conditions Survey. Fixed contract proportion is computed based on the proportion of targeted individuals who reported their number of weekly hours worked is fixed.

$^{***}p < .01$, $^{**}p < .05$, $^{*}p < .10$, $\dagger p < .15$.

Table A9: Proportion of Part-Time Employment for Prime-Aged Individuals by Marital Status Across Economies: Micro Data

Economies	Women (Age 25-54)		Men (Age 25-54)	
	Married %Part-Time	Single %Part-Time	Married %Part-Time	Single %Part-Time
	(1)	(2)	(3)	(4)
Panel A: East Asian Economies (EASIA)				
Hong Kong	0.142	0.101	0.095	0.098
Japan	0.539	0.205	0.047	0.141
Korea	0.122	0.055	0.028	0.048
Taiwan	0.051	0.022	0.039	0.034
Average EASIA	0.214	0.096	0.052	0.080
Average EASIA (-JPN)	0.105	0.059	0.054	0.060
Panel B: Western OECD Economies (WOECD)				
Panel B1: OECD Economies With Social Norms (OECDSN)				
Austria	0.568	0.310	0.025	0.066
Czech Republic	0.096	0.101	0.021	0.070
Greece	0.251	0.221	0.116	0.131
Italy	0.464	0.162	0.050	0.070
Poland	0.187	0.137	0.043	0.095
Average OECDSN	0.313	0.186	0.051	0.086
Panel B2: Other OECD Economies (OOECD)				
Belgium	0.514	0.380	0.067	0.067
Estonia	0.086	0.076	0.024	0.060
France	0.376	0.290	0.070	0.112
Germany	0.647	0.278	0.039	0.070
Lithuania	0.134	0.109	0.059	0.073
Netherlands	0.796	0.440	0.089	0.124
Norway	0.233	0.231	0.062	0.103
United States	0.330	0.265	0.090	0.202
Average OOECD	0.390	0.259	0.063	0.101
Average WOECD	0.360	0.231	0.058	0.096

Notes: Weighted means are presented. Data sources are provided in Appendix Table A4. Part-time employment is defined as people in employment (whether employees or self-employed) who usually work less than 35 hours per week in their main job. We abstract from divorced, separated, and widowed men and women. Married ones are strictly defined as individuals who are married legally or consensually, and thus cohabitation is also considered as Married in the dataset of Taiwan. Whereas, Single ones are strictly defined as those never married. Average (-JPN) refers to the proportion of part-time employment across all economies in the EASIA cluster except for Japan, which contrary to other EASIA economies, has a relatively high rate of part-time workers (Ogawa and Ermisch, 1996; Rodríguez-Planas and Tanaka, 2022; Yanagimoto, 2023).

Appendix D Additional Figures

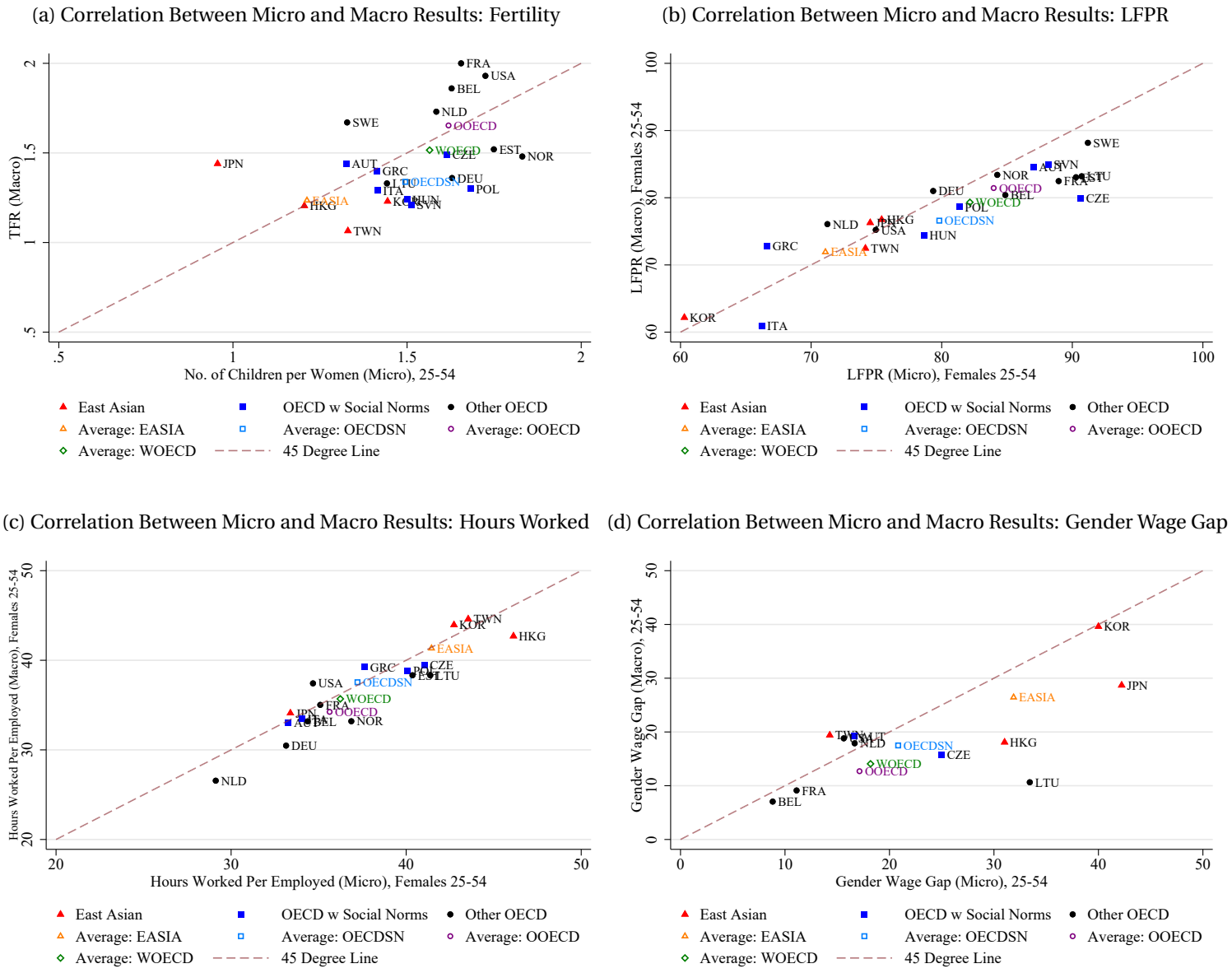
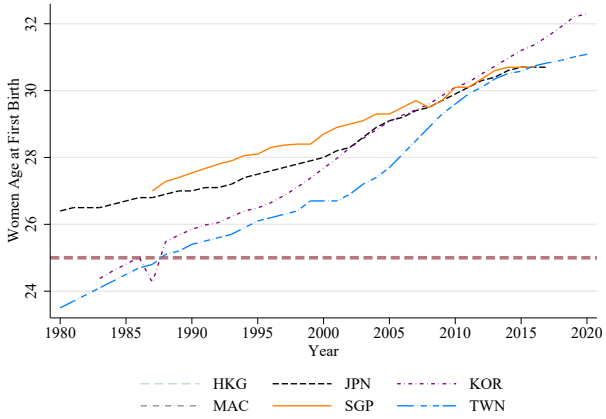
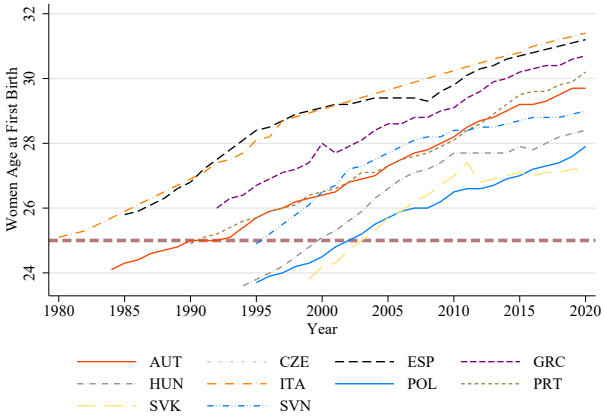


FIGURE A1: CROSS-VALIDATION USING MACRO AND MICRO DATA

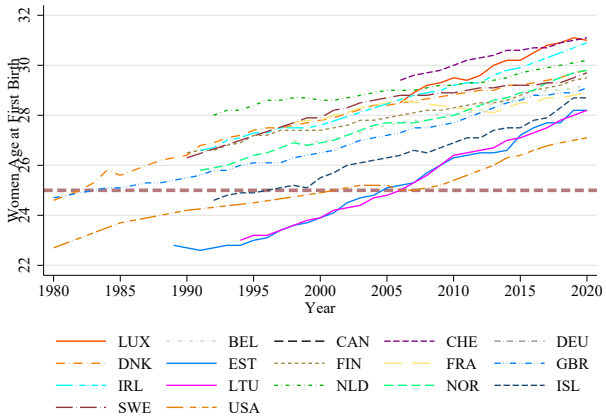
(a) Women Age at First Birth: EASIA



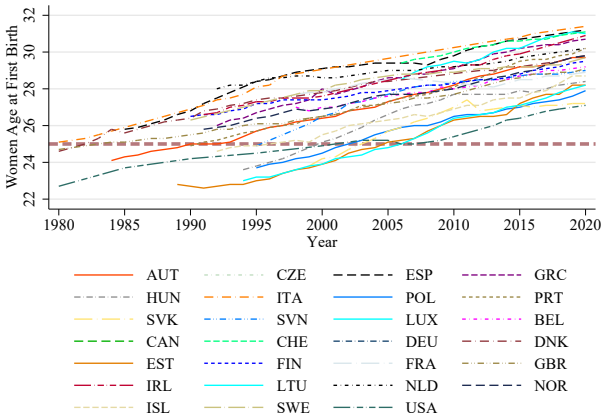
(b) Women Age at First Birth: OECDSN



(c) Women Age at First Birth: OOECD



(d) Women Age at First Birth: WOECD



(e) Women Age at First Birth: Average

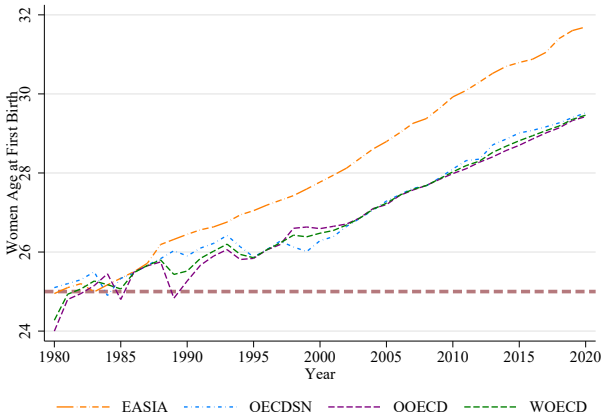


FIGURE A2: WOMEN AGE AT FIRST BIRTH ACROSS ECONOMIES: MACRO DATA

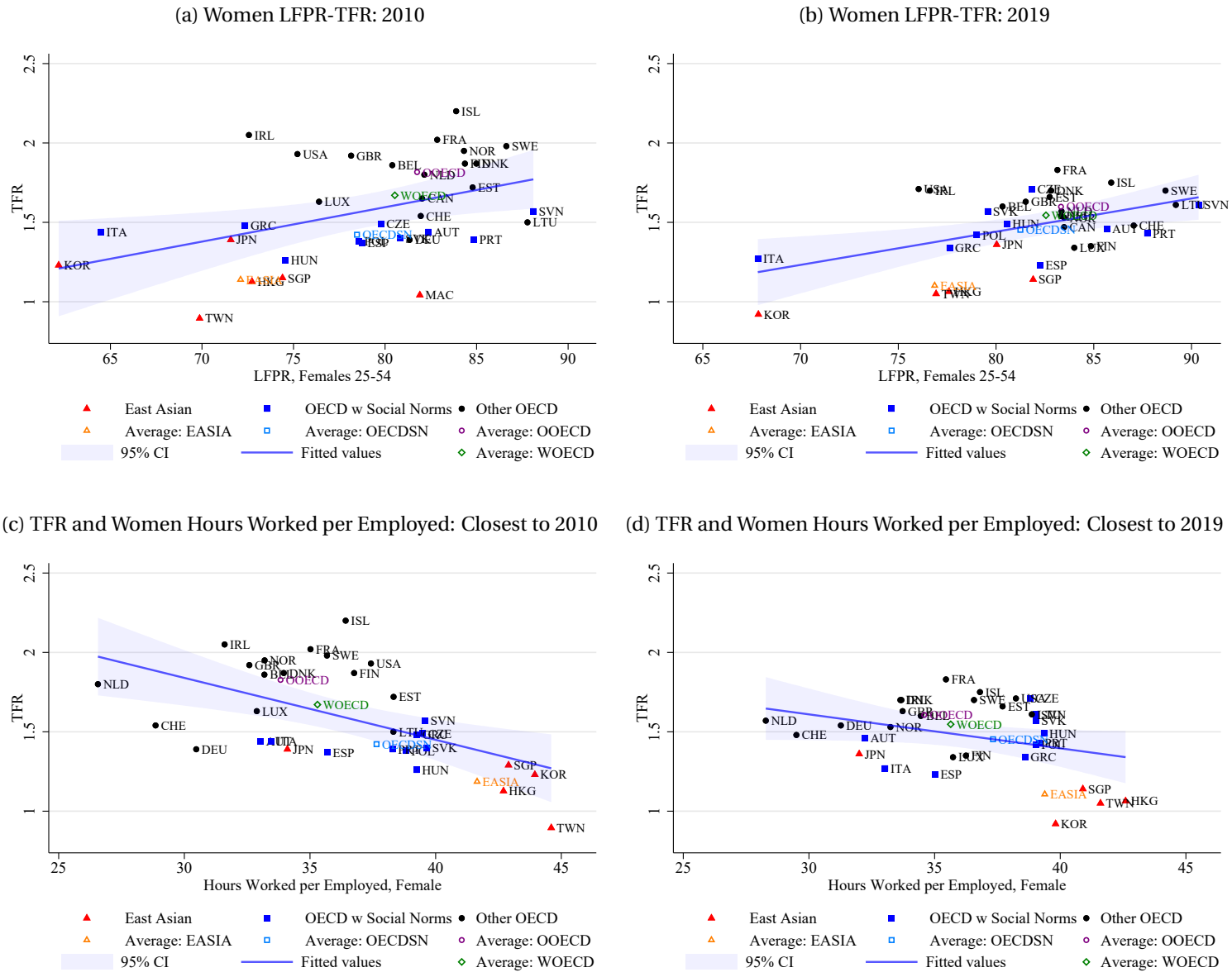
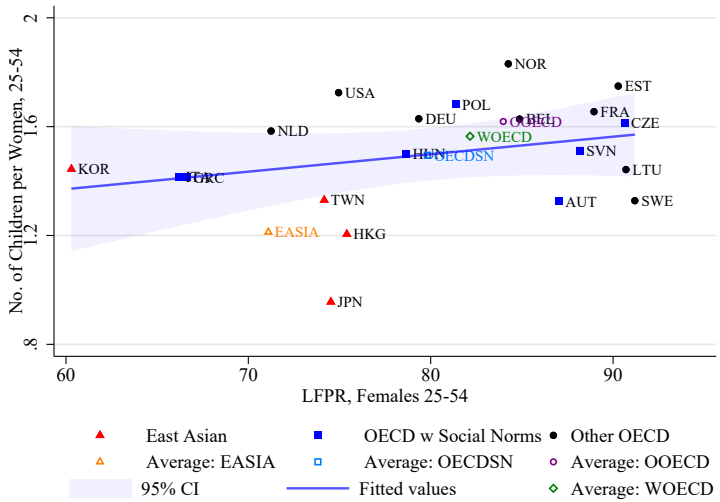
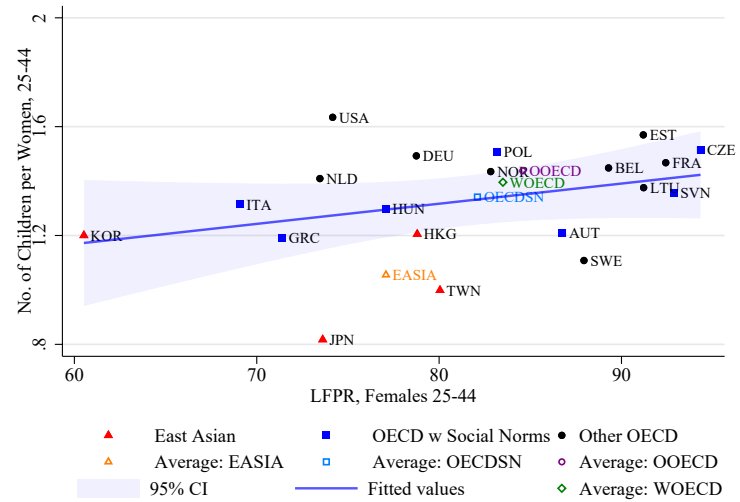


FIGURE A3: FERTILITY AND FEMALE LABOR SUPPLY (25-54) ACROSS ECONOMIES: MACRO DATA

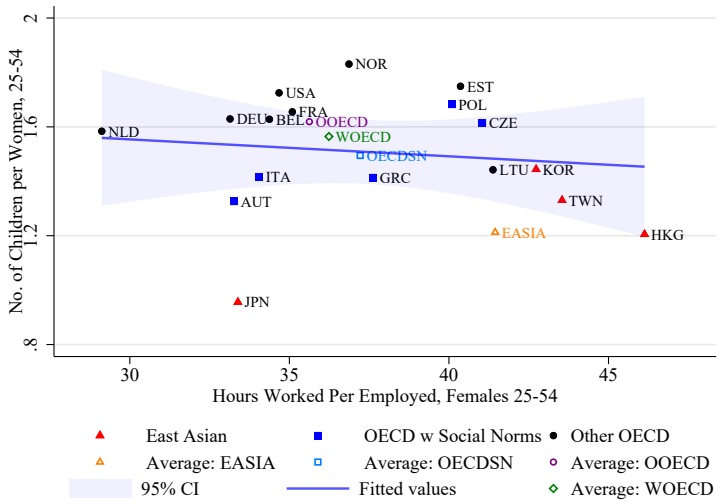
(a) Number of Children per Women and FLFP (Age 25-54), Micro Data



(b) Number of Children per Women and FLFP (Age 25-44), Micro Data



(c) Number of Children per Women and Female Hours Worked per Employed (Age 25-54), Micro Data



(d) Number of Children per Women and Female Hours Worked per Employed (Age 25-44), Micro Data

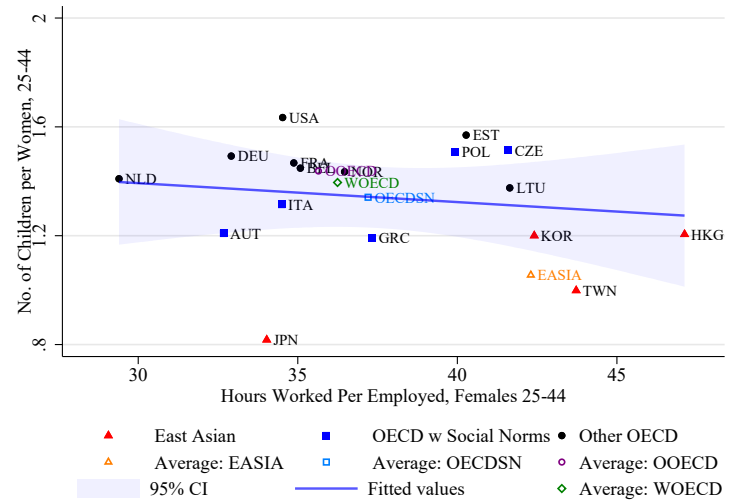


FIGURE A4: NUMBER OF CHILDREN PER WOMEN AND FEMALE LABOR SUPPLY (25–54): MICRO DATA

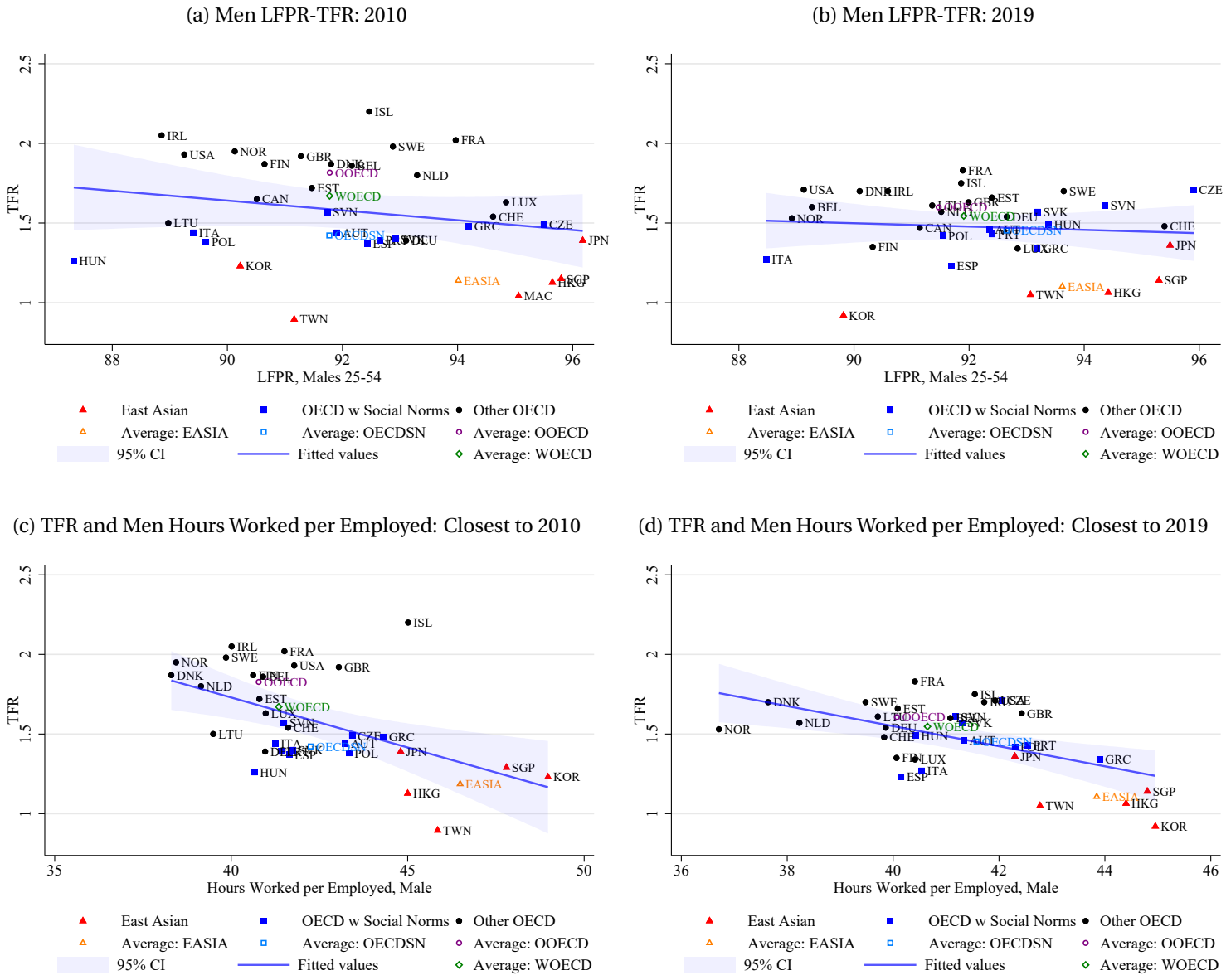


FIGURE A5: FERTILITY AND MALE LABOR SUPPLY (25-54) ACROSS ECONOMIES: MACRO DATA

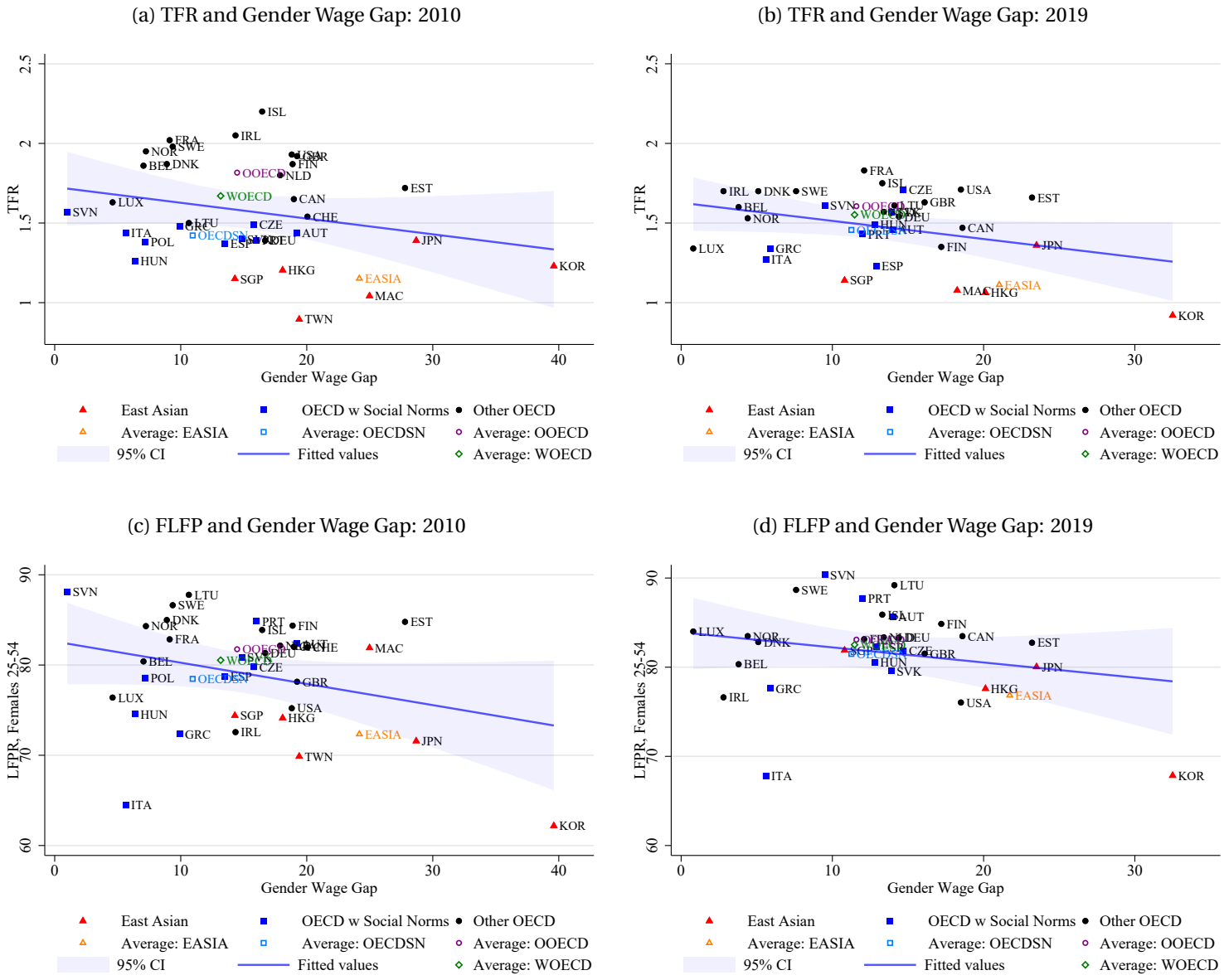


FIGURE A6: FERTILITY / FLFP AND GENDER WAGE GAP ACROSS ECONOMIES: MACRO DATA

Notes: Data sources are provided in Appendix Table A3. The data point for Hong Kong in 2010 is based on 2011 statistics, while the 2019 data corresponds directly to that year. The LFPR data for Macau is not available in 2019, we hence omit Macau in the Subfigure A6d. For the other economies, statistics are available for both 2010 and 2019.

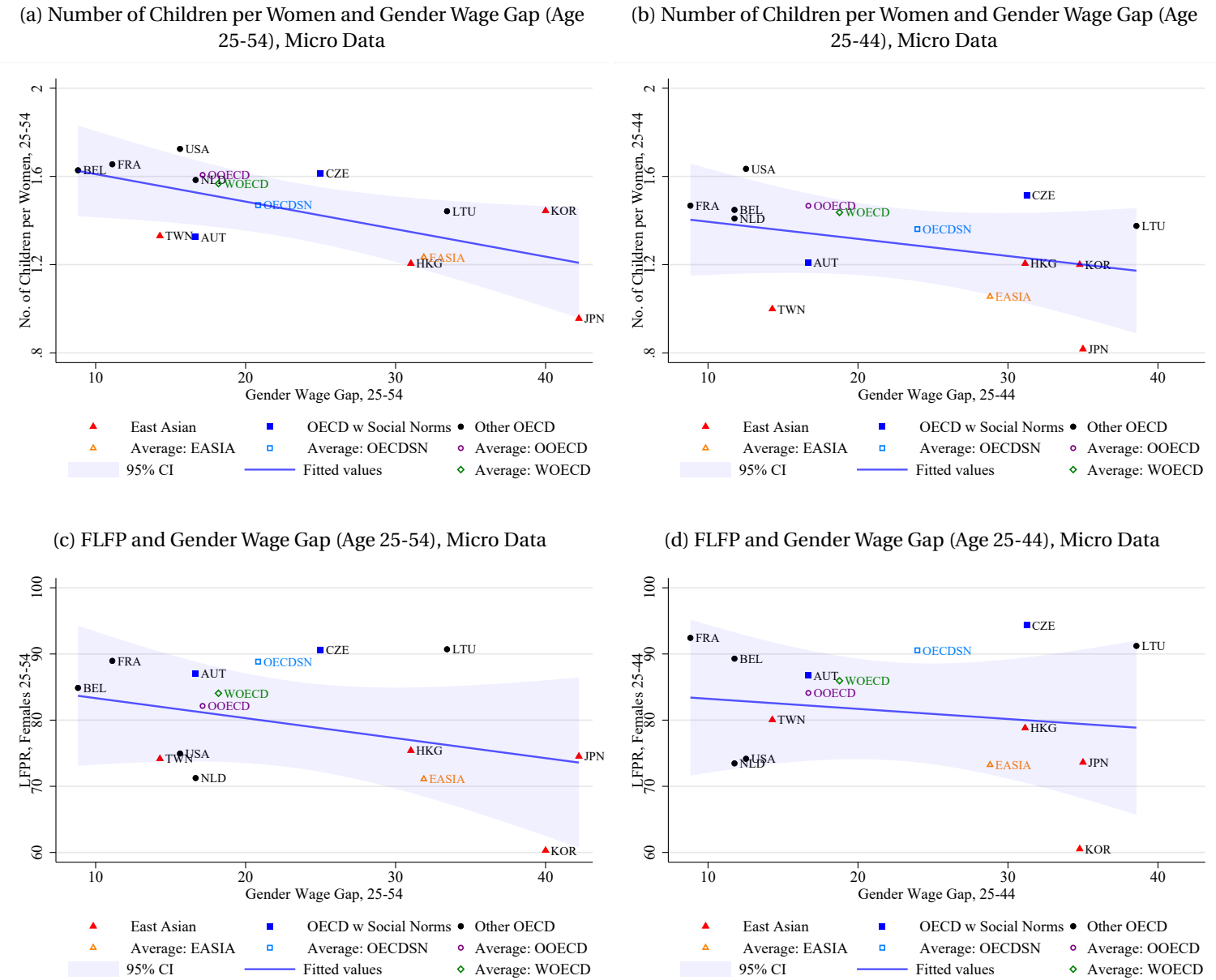
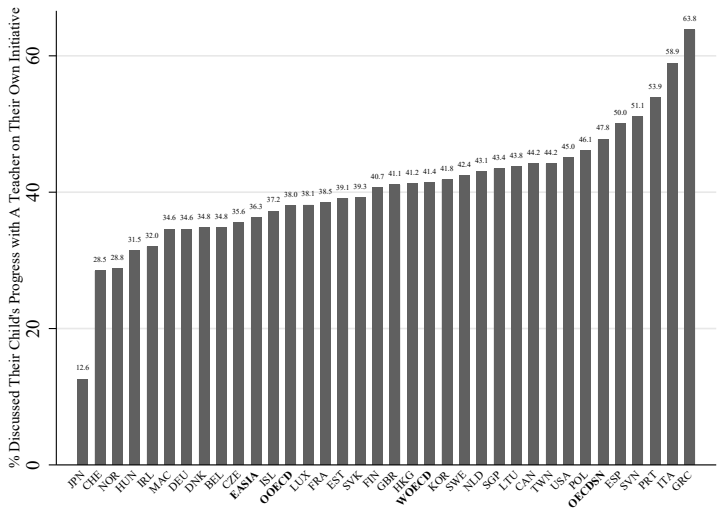
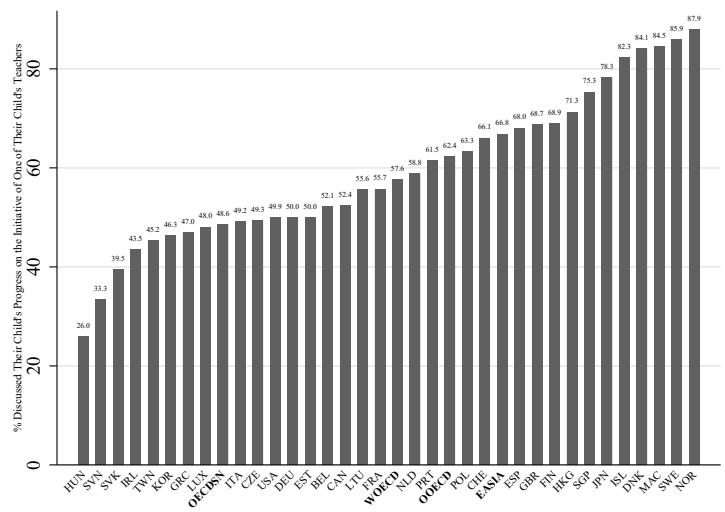


FIGURE A7: FLFP AND GENDER WAGE GAP: MICRO DATA

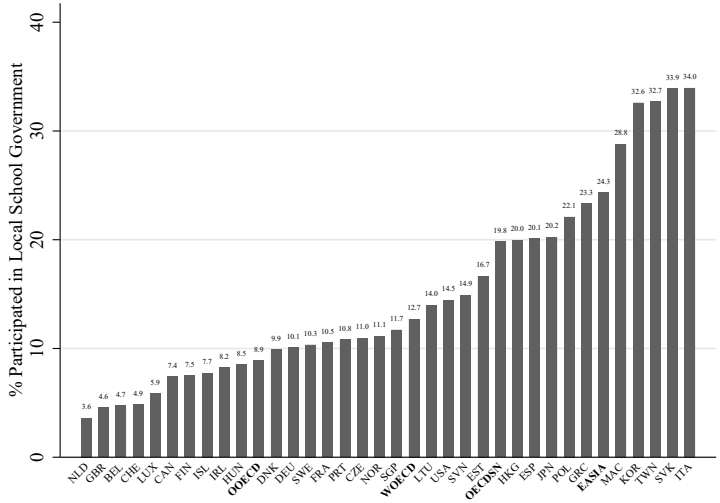
(a) % Discussed Their Child's Progress with A Teacher on Their Own Initiative



(b) % Discussed Their Child's Progress on the Initiative of One of Their Child's Teachers



(c) % Participated in Local School Government



(d) % Volunteered in Physical or Extracurricular Activities

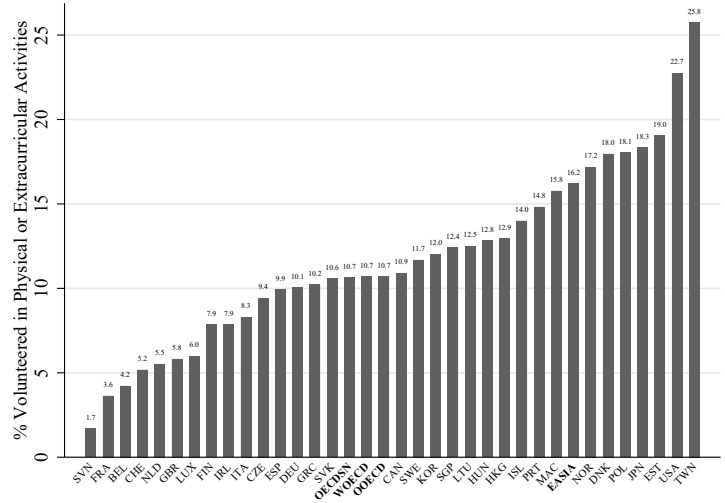


FIGURE A8: PROPORTION OF PARENTS INVOLVEMENTS IN SCHOOL-RELATED ACTIVITIES: FOUR SUB-QUESTIONS

Notes: Data source is OECD (2019).

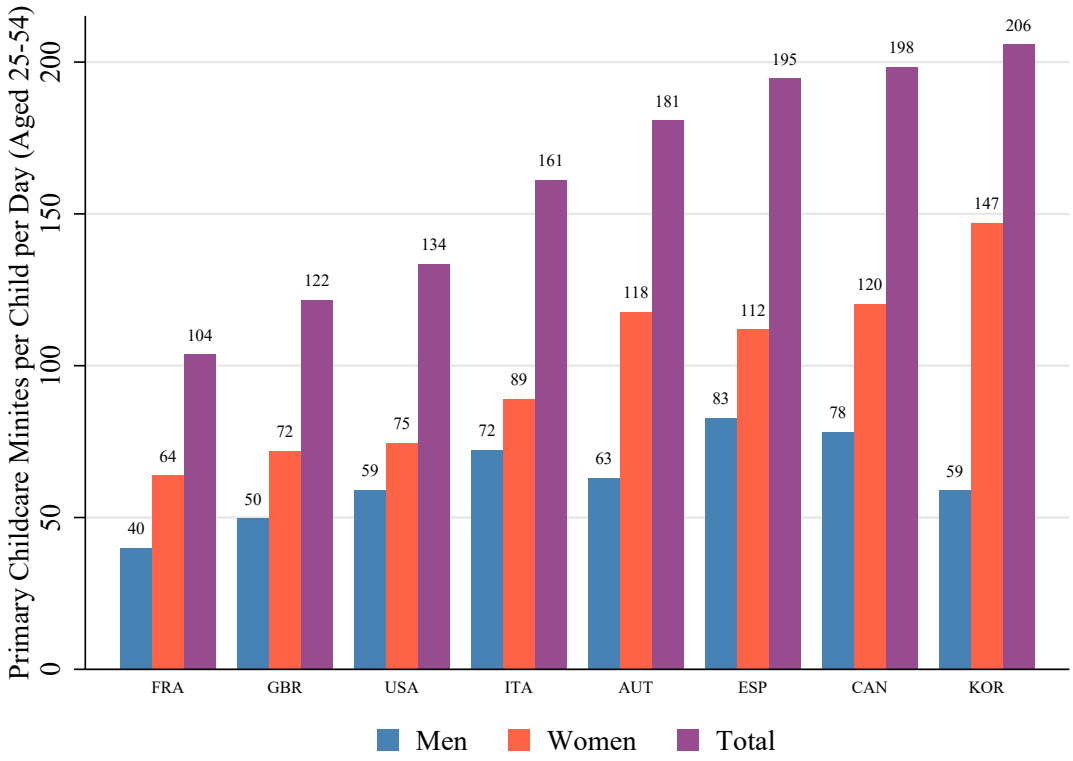


FIGURE A9: TIME SPENT ON CHILD CARE AND EDUCATIONAL ACTIVITIES PER CHILD FOR PRIME-AGED PARENTS WITH CHILDREN AGED BELOW 6

Notes: Weighted means are presented. Data is from Multinational Time Use Survey (MTUS). We plot parental time spent on child care and educational activities in minutes per day per child for prime-aged parents who have at least one child aged below six for listed economies. Due to data availability, we use the year which is closest to 2010 if multiple years of data are available, within a range of no more than 5 years. The resulting economies (wave) are Austria (2009), Canada (2010), Spain (2010), France (2010), the UK (2014), Hungary (2010), Italy (2009), South Korea (2009), Netherlands (2005), and the US (2010). However, the time for Hungary and Netherlands is not available for our targeted child age group (i.e., the children aged below 6), only eight economies are listed above. To increase the cross-economy comparability, we divide the the country average parental time by TFR to net off the confounding effects stemming from differential fertility.

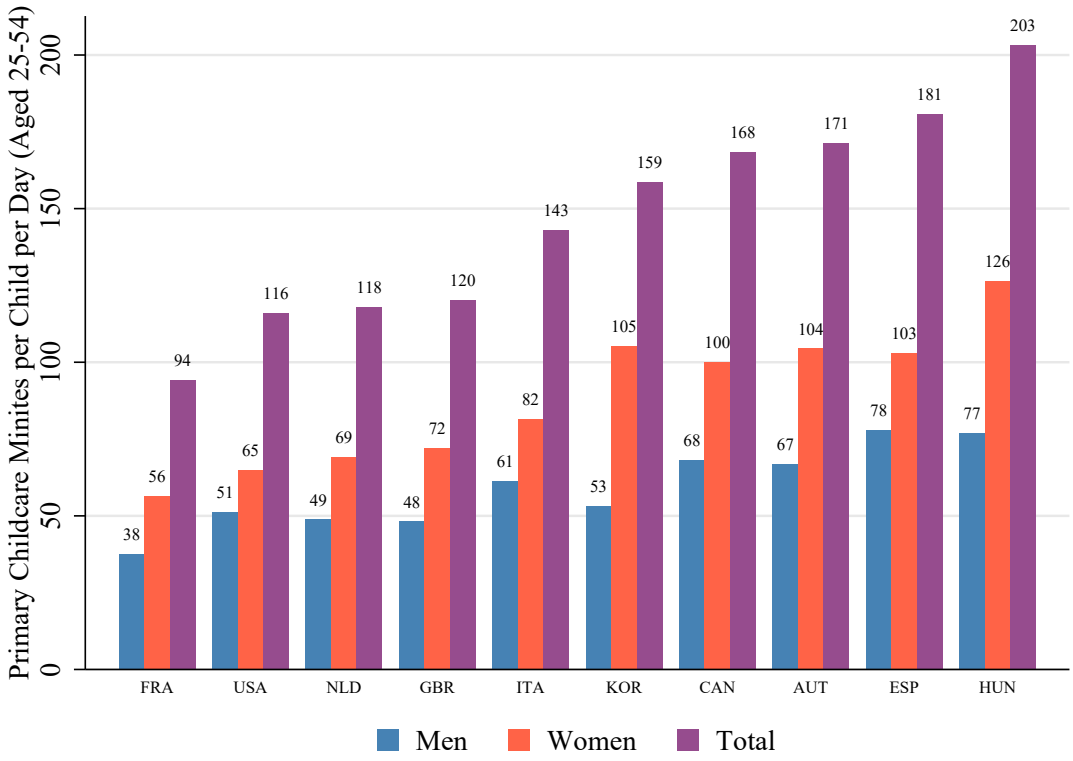


Figure A10: Time Spent on Child Care and Educational Activities per Child for Prime-Aged Parents with Children Aged Below 18

Notes: Weighted means are presented. Data is from Multinational Time Use Survey (MTUS). We plot parental time spent on child care and educational activities in minutes per day per child for prime-aged parents who have at least one child aged below 18 for listed economies. Due to data availability, we use the year which is closest to 2010 if multiple years of data are available, within a range of no more than 5 years. The resulting economies (wave) are Austria (2009), Canada (2010), Spain (2010), France (2010), the UK (2014), Hungary (2010), Italy (2009), South Korea (2009), Netherlands (2005), and the US (2010). To increase the cross-economy comparability, we divide the the country average parental time by TFR to net off the confounding effects stemming from differential fertility.

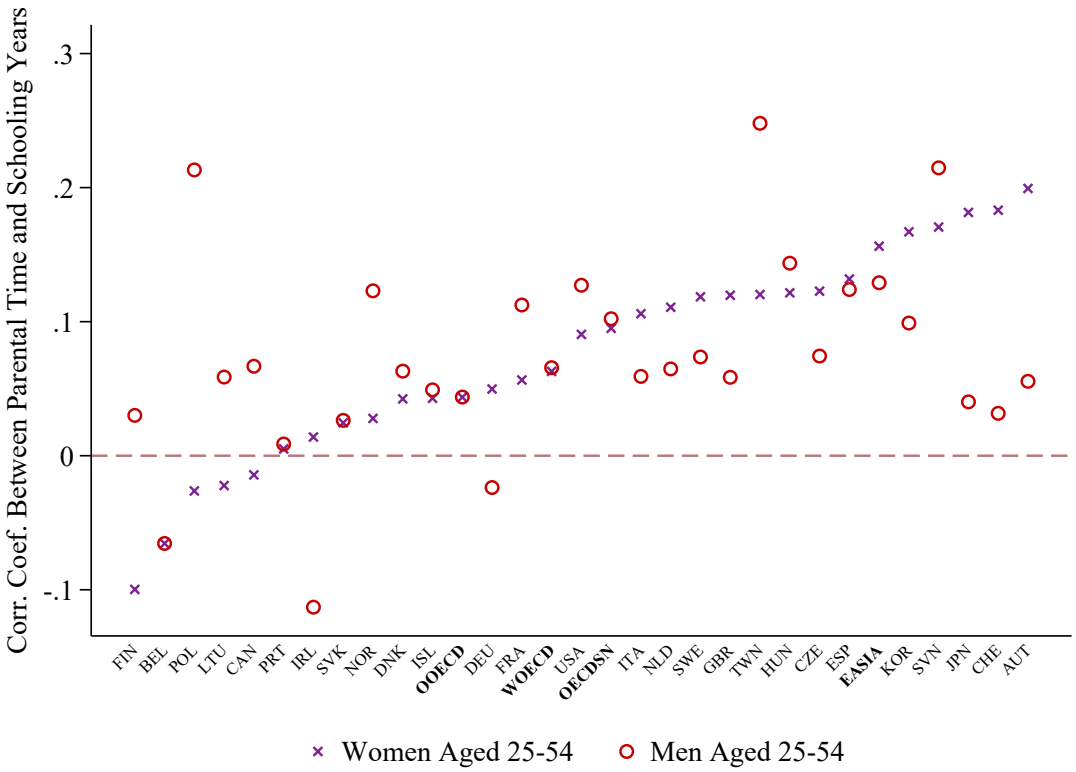


Figure A11: Correlation Coefficient Between Parental Weekly Time Investments and Schooling Years Across Economies for the Prime-Aged

Notes: Weighted means are presented. Data is from Multinational Time Use Survey (MTUS) and International Social Survey Programme (ISSP) 2012. Due to data availability, we choose the countries in MTUS whose wave is closest to 2010, within a range of no more than 5 years, if multiple years of data are available. The resulting MTUS economies (wave) are Austria (2009), Canada (2010), Spain (2010), France (2010), the UK (2014), Hungary (2010), Italy (2009), South Korea (2009), Netherlands (2005), and the US (2010). And we complement MTUS with ISSP 2012 for those targeted economies omitted in MTUS. When the data is available in both two datasets, we prioritize the statistics computed based on MTUS because it provides more precise measure of time investments and has a much larger sample size. ISSP data may include care to household members other than children. The targeted sample is the prime-aged individuals with at least one child aged strictly below 18.

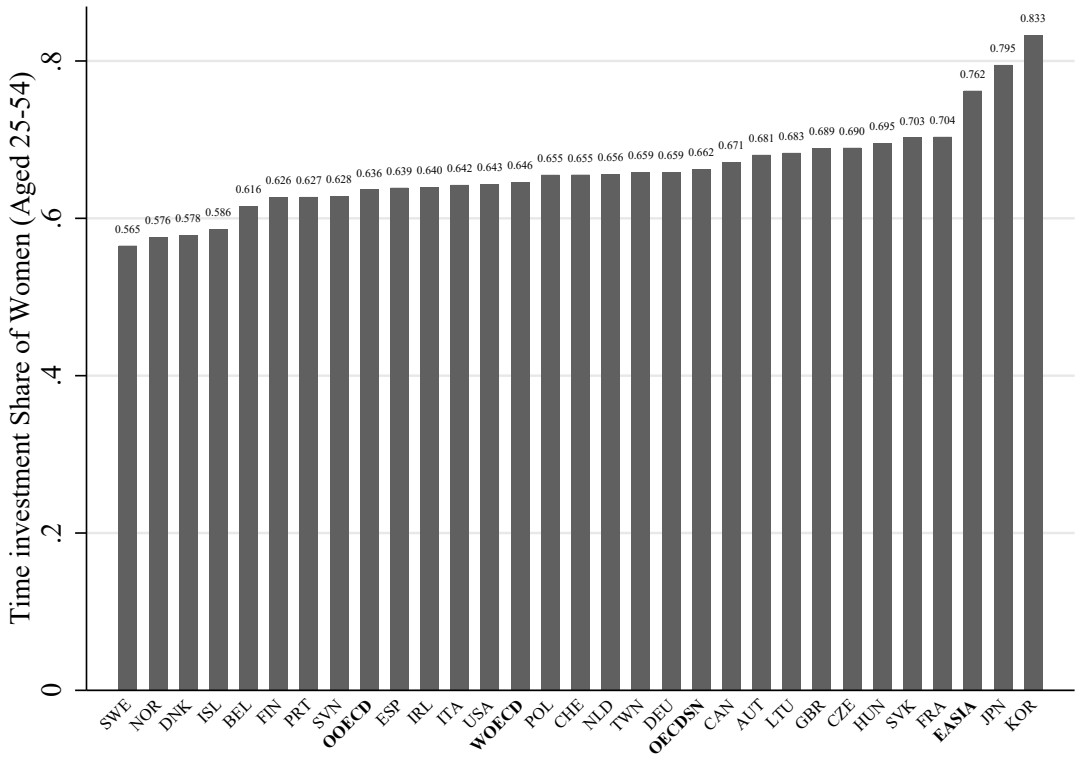


Figure A12: Proportion of Time Investment Borne by Women for Prime-Aged Individuals

Notes: Weighted means are presented. Data is from Multinational Time Use Survey (MTUS) and International Social Survey Programme (ISSP) 2012. The proportion is defined as

$$\frac{\text{Average Women Weekly Care Hours}}{\text{Average Women Weekly Care Hours} + \text{Average Men Weekly Care Hours}}.$$

Due to data availability, we choose the countries in MTUS whose wave is closest to 2010, within a range of no more than 5 years, if multiple years of data are available. And we complement MTUS with ISSP 2012 for those targeted economies omitted in MTUS. When the data is available in both two datasets, we prioritize the statistics computed based on MTUS because it provides more precise measure of primary childcare and has a much larger sample size. ISSP data may include care to household members other than children. The targeted sample is the prime-aged individuals with at least one child aged strictly below 18.

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