Parental Leave Policies, Fertility, and Labor Supply*

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Abstract

South Korea has been facing persistently low fertility rates and large gender gaps in labor supply. In response, the government has expanded parental leave benefits to address these challenges. To evaluate the effectiveness of these policies, we develop a quantitative, heterogeneous-household life-cycle model in which couples make joint decisions on careers, labor supply, savings, and child-related choices, including fertility, childcare, and parental leave take-up. The model is calibrated to recent Korean cohorts to replicate key patterns observed in the data, including segmented labor markets where career-oriented jobs require high entry costs and long working hours. We find that generous benefits increase fertility and reduce gender gaps in labor supply and wages by enabling more women to remain in career-oriented jobs during their child's early years, facilitating career advancement later. The positive labor supply effects are particularly strong among highly educated parents, and the policy can be self-financing through higher lifetime labor supply. Finally, we find that incentivizing joint parental leave use is more effective than mandating it and that the positive fertility effects may weaken when parents place greater emphasis on child quality—a trend observed in recent years.

Keywords: Parental Leave, Birth Rates, Labor Supply, Gender Gaps, Social Norm, Private Education.

JEL codes: E24, J22, D13, J13, J16.

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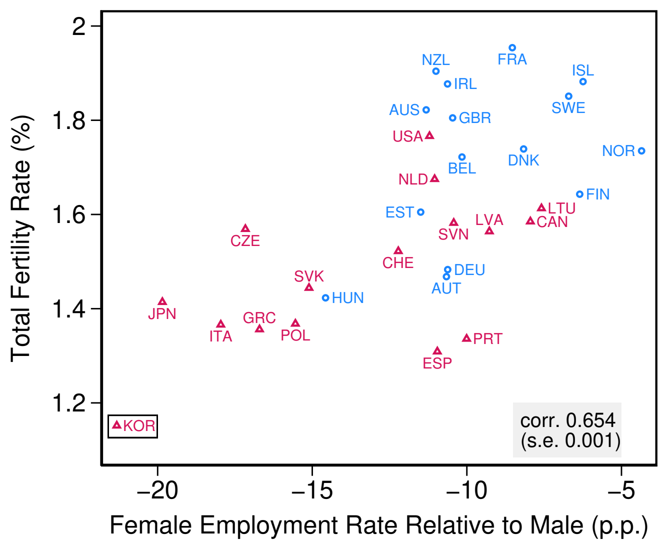
1 Introduction

South Korea (hereafter Korea) faces two stark and interrelated challenges: low fertility and large gender gaps in labor supply. Fertility rates in Korea have remained persistently low. As of 2023, Korea's total fertility rate is the lowest in the world at 0.78 and has remained below one since 2018. At the same time, Korea has the highest gender gap in labor supply among developed countries. These facts position Korea notably in Figure 1, which plots female employment rates relative to male employment against the total fertility rate, both averaged over the past decade (2010–2019). While there is a strong positive cross-country correlation between these two variables (correlation of 0.65), Korea stands out starkly at the bottom left of the figure, underscoring societal and government concerns.[1]

Figure 1: Gender Gaps in Labor Supply and Fertility Across Countries



Notes: The x-axis shows the employment rate gap (%) between working-age females and males within the same subgroup, while the y-axis represents the total fertility rate. Countries are categorized into two groups based on public expenditure on family benefits (as a percentage of GDP): blue circles denote high expenditure (ranks 1–15), and red triangles indicate low expenditure (ranks 16–31). Data represent country averages over the period 2010–2019. Source: OECD.

[1] Although Figure 1 is inspired by Doepke et al. (2023), who highlight that the relationship between female participation rates and fertility has shifted from negative to positive, our figure offers unique value for two reasons. First, South Korea was not included in their changing relationships. Second, while they plot female labor supply, we plot gender gaps. Since countries may have distinct institutional and cultural factors that influence both male and female labor supply, the positive correlation in Figure 1 is more pronounced than when using female labor supply alone, as demonstrated in Appendix Figure A1.

In response to these challenges, the Korean government has recognized the need to expand family policies and, in particular, views parental leave (PL) as a key tool to address them simultaneously.[2] In recent years, the government has implemented significant reforms, transitioning from a low, flat benefit to a generous earnings-dependent system with gradually increasing caps and incentives for couples' joint use.

How effective are these PL policies in increasing fertility and narrowing the large gap in labor supply? What mechanisms drive these policy effects, whether successful or not? While a sizable body of literature empirically estimates the effects of PL reforms, there is a lack of quantitative theoretical analysis on PL, as highlighted by Doepke et al. (2023).[3] This paper provides a structural analysis of PL policies that allows us to investigate these questions. In particular, our quantitative analysis focuses on Korea, a notable example among East Asian countries with high gender gaps, persistently low fertility, and high monetary costs of raising children (Kim et al., 2024).

Our quantitative model explicitly allows couples to make joint decisions on labor supply and PL while considering their future career prospects within an otherwise standard life-cycle framework of endogenous fertility. The fertility component of the model follows the tradition of Becker and Tomes (1976), where parents value both the quantity and quality of children. Additionally, the model incorporates features that link fertility choices to relevant factors, including childcare requirements for newborns and the added burden on working mothers. These factors impose both financial and time constraints on parents, influencing their fertility and labor supply decisions.

A key decision introduced in our model is the PL choice made by both mothers and fathers. We incorporate several key advantages and costs of PL in a parsimonious manner. The primary benefits include additional parental time allocated to children, influenced by social norms that reinforce an unequal gendered division, which is more prevalent in East Asian societies (Hwang et al., 2019, Myong et al., 2021). We first demonstrate that more generous PL benefits may be inherently unable to simultaneously increase fertility and reduce gender gaps in labor supply in a simple *static* model that highlights the conventional trade-off in women's time allocation.

An important benefit of PL in a *dynamic* environment is job security, as it enables parents to remain in career-oriented jobs and keep their match-specific productivity

[2] In line with Olivetti and Petrongolo (2017), the positive relationship in Figure 1 is also explained by family policies, as evidenced by the fact that countries with higher public expenditure on family benefits (as a percentage of GDP) are located in the top right corner (blue circles).

[3] See, e.g., empirical studies on the effects of PL policies on fertility (Dahl et al., 2016, Malkova, 2018, Farré and González, 2019, Raute, 2019) and female labor supply (Lalive and Zweimüller, 2009, Kleven et al., 2020).

shock upon returning from leave—a feature we incorporate into our quantitative dynamic model. On the cost side, we model two key dynamic mechanisms. First, since there are dynamic returns to current labor supply in the spirit of Imai and Keane (2004), parents anticipate that taking PL will negatively affect their career prospects. Moreover, nonpecuniary stigma costs associated with PL use arise to reflect the widely recognized notion that employees, particularly men, often feel uncomfortable taking PL (Kim and Lundqvist, 2023).

The job protection role of PL is particularly relevant in Korea's segmented labor markets.[4] Accordingly, we assume dual labor markets with two types of jobs (permanent versus nonpermanent) (e.g., Guner et al., 2024). Permanent jobs offer multiple advantages, such as higher wages, job stability, and promotion opportunities, compared to nonpermanent jobs. However, these career-oriented jobs are costly to enter and, importantly, require long working hours, unlike nonpermanent jobs.

We calibrate the model using longitudinal data from women born between 1970 and 1975 and their family members in the Korean Labor and Income Panel Study (KLIPS) survey data, who experienced low, flat PL benefits during their childbearing years. Our calibrated model successfully replicates the observed patterns, including labor supply, job types, wages, and fertility choices over the life cycle for both female and male household members.

Using the calibrated model, we evaluate two recent versions of more generous PL policies. We find that these PL policies, whether through a transition to a more generous earnings-dependent system or by increasing benefit caps, can persistently narrow gender gaps in labor supply over the life cycle while raising fertility to a quantitatively meaningful degree (around 10%). Notably, they effectively increase lifetime labor supply for both women and men, with particularly strong effects on women. In our dynamic framework, the job protection role of PL, combined with segmented labor markets, enables women to balance career and family over time, with more generous PL benefits leading more women to seek permanent jobs.[5] The fertility increases are driven by these women whose careers improve, which also contributes to narrowing gender wage gaps in the long term.

Examining heterogeneous policy effects, we find that the largest fertility effect is observed among college-educated women, in line with empirical findings from a similar recent German maternity leave reform (Raute, 2019), particularly among those married to non-college-educated men. Importantly, we find that the positive impacts of

[4] This is a key characteristic of Korea's labor markets, as documented in Section 3.

[5] This mechanism is in line with reduced-form findings such as Baker and Milligan (2008).

more generous PL benefits on lifetime labor supply are particularly pronounced among highly educated couples, and under moderate expansions with a tight cap, PL reforms can even be self-financing without the need for higher taxes.

We also conduct several additional exercises using the model economy. First, to evaluate the joint use incentive program, which was part of the recent reforms, we use our model to compare its effects to a counterfactual policy that mandates joint use. We find that incentivizing joint PL use is more effective than mandating it, as strict mandate requirements discourage PL use among mothers and even fathers, reducing overall policy effectiveness. We also conduct the same policy experiments in an economy adjusted to reflect recent dramatic changes in Korea, particularly increasing demand for private education spending. We find that when parents place greater emphasis on child quality, this not only explains persistently declining fertility in recent years but also weakens the fertility-boosting effects of PL benefits.

As highlighted by Doepke et al. (2023), the literature lacks quantitative theoretical analyses of PL. Notable exceptions include Erosa et al. (2010), who examine its welfare implications, with bargaining dynamics as the key mechanism. Our focus on couples' joint labor supply and career concerns over the life cycle (Borella et al., 2022, Guner et al., 2023), along with the analysis of various PL policies—including changes in benefit schemes, caps, and joint-use incentives—is novel and distinguishes our work in the literature.[6] Since fertility and life-cycle labor supply are central decision variables, our paper also relates to quantitative studies using structural models of endogenous fertility and labor supply but without PL decisions.[7]

In terms of modeling choices, our framework also incorporates borrowing constraints and incomplete asset markets—a workhorse model framework in the literature—as young and relatively low-income households often face borrowing constraints, which may hinder fertility choices, particularly when prospective parents anticipate high monetary costs of having children.[8] Moreover, our model, in which both partners in a couple make their career choices endogenously, aligns with recent studies em-

[6] Adda et al. (2017) estimate a rich structural life-cycle model of female labor supply that incorporates maternity leave (but with exogenous male behavior) to quantify the career costs of children using German data. Their counterfactual analysis focuses on a policy that provides a lump-sum cash transfer at birth. Jakobsen et al. (2024) examine the complex linkages between fertility and labor supply using a rich structural model estimated for Denmark. Their analysis also considers several policy reforms, including the complete removal of maternity leave, using their model that abstracts from fathers' PL. They find that this reform reduces fertility while increasing female labor supply.

[7] See, e.g., Bick (2016), Greenwood et al. (2016), Daruich and Kozlowski (2020), Zhou (2022), Kitao and Nakakuni (2024), and Guner et al. (2024) for recent contributions. For broader discussions, see the literature reviews in Doepke and Tertilt (2016), Greenwood et al. (2017) and Doepke et al. (2023).

[8] Adda et al. (2017) and Choi (2017) also highlight the importance of assets in fertility decisions.

phasizing the importance of modeling joint decision-making within couples (Bick and Fuchs-Schündeln, 2017, Borella et al., 2022, Erosa et al., 2022, Guner et al., 2023), despite the heavier computational burden it imposes, particularly in life-cycle frameworks.[9]

Along the path to gender gap convergence (Goldin, 2014), many developed countries have introduced family-friendly policies, including PL (Olivetti and Petrongolo, 2017). However, empirical evidence on the effects of such policies on gender gaps in labor markets and fertility remains mixed (see, e.g., Lalive and Zweimüller 2009, Dahl et al. 2016, Farré and González 2019, Kleven et al. 2020, Corekcioglu et al. 2024). The literature examines various policy dimensions, including not only benefit generosity but also leave duration, with most studies focusing on European contexts.[10] The variation in findings may stem from differences in societal characteristics, such as segmented labor markets and high expected costs of child-rearing due to education fever in East Asia (Kim et al., 2024). By capturing these underlying economic mechanisms, our theoretical framework provides a useful lens for understanding how PL policies shape fertility and labor supply outcomes.

This paper is organized as follows. Section 2 introduces a simple static model of PL and women's time allocation trade-offs. Section 3 presents key life-cycle patterns in labor supply, careers, and wages by gender. Section 4 develops the quantitative life-cycle model. Section 5 discusses model calibration and assesses its fit. Section 6 conducts the main quantitative exercises. Finally, Section 7 concludes.

2 A Simple Model of PL, Gender Gaps, and Fertility

To illustrate a key obstacle to achieving both higher fertility and reduced gender labor supply gaps through PL policies, we present a simple static model of household decision-making. The model captures the traditional trade-off in women's time allocation between labor supply and child-rearing, as well as the role of more generous PL benefits in shaping these choices within this trade-off.

Setup of the Model We consider a household consisting of a female f and a male m partner who maximize joint utility. Utility is derived from consumption c and the number of children n, while disutility arises from labor supply, denoted by h_f and h_m

[9]As such, our quantitative theoretical approach differs from Yamaguchi (2019) and Wang (2022), who estimate discrete choice models of female labor supply and PL take-up but abstract from wealth heterogeneity through savings and joint decision-making within couples.

[10]For a comprehensive review of the empirical findings, see, for example, Doepke et al. (2023) and Hart et al. (2024).

for the female and male partners, respectively.

Household income depends on wages, w_f and w_m, and each partner's respective labor supply. Having a child incurs costs, denoted by x, which increase with the female labor supply h_f, reflecting the assumption that mothers bear the majority of child-rearing responsibilities. Additionally, these costs rise with the female's wage, capturing the opportunity cost of outsourcing child-rearing activities, such as childcare services, which are assumed to be priced similarly to the mother's wage rate.

We assume that PL benefits are available only to female workers, providing a replacement rate $\theta \in [0,1]$ of their wage per child for time spent away from work $(1-h_f)$.[11] Normalizing total time endowment to 1, the household's budget constraint is:

$$c + xn \leq \sum_{g=f,m} w_g h_g + \theta w_f (1-h_f) n, \tag{1}$$

where $x = \eta h_f w_f$ and η captures the degree of the education burden and childcare.

The household maximizes the following utility function:

$$\max_{c,x,n,h_f,h_m} \log c - \sum_{g=f,m} \chi_g \frac{h_g^{1+\sigma_h}}{1+\sigma_h} + \phi \log n, \tag{2}$$

subject to equation (1). Here, $\chi_g > 0$ represents the disutility weight on labor supply, and $\phi > 0$ captures the utility weight of having children. We consider parameter values that ensure interior solutions, where $c, x, n > 0$ and $h_f, h_m \in (0,1)$.

Optimality Conditions We first present the optimality conditions that characterize household decisions. The optimal labor supply decision implies that the gender labor supply gap (h_m/h_f) is given by:

$$\frac{h_m}{h_f} = \left(\frac{\chi_f}{\chi_m}\right)^{\frac{1}{\sigma_h}} \left(\frac{w_m}{w_f}\right)^{\frac{1}{\sigma_h}} \left[\frac{1}{1-(\eta+\theta)n}\right]^{\frac{1}{\sigma_h}}. \tag{3}$$

This equation shows that the labor supply gap widens with a larger gender wage gap (w_m/w_f). It also shows that a higher childcare burden (η) increases the gap for a given fertility level (n), as mothers bear a disproportionate share of childcare responsibilities.

The gender wage gap and childcare burden also influence fertility choices. The

[11] This assumption is made to focus on the theoretical result we aim to highlight in this section. In the full dynamic model from Section 4 onward, we relax this assumption and allow both partners to use PL for evaluating the policy effects quantitatively.

household's optimal fertility decision is characterized by:

$$n = \left(\frac{1}{1+1/\phi}\right)\left(1+\frac{w_m}{w_f}\frac{h_m}{h_f}\right)\left[\frac{1}{\eta-\theta\left(\frac{1}{h_f}-1\right)}\right]. \tag{4}$$

First, this equation highlights that the gender wage gap (w_m/w_f) affects fertility through changes in the opportunity cost of having a child: a narrower wage gap reduces the incentive to have more children. Second, the childcare burden (η) negatively impacts fertility, as higher costs make having children more expensive.

The Trade-Off in PL Policies: Fertility vs. Gender Labor Supply Gaps We now present the main result of this section, highlighting the trade-off in PL policies that aim to achieve two goals: boosting fertility and reducing the gender labor supply gap. Differentiating equations (3) and (4) with respect to θ, we find that the labor supply gap *worsens* when PL becomes more generous if and only if:

$$\underbrace{n}_{\substack{\text{Direct}\\ \text{channel}}} + \underbrace{(\eta+\theta)\frac{dn}{d\theta}}_{\substack{\text{Indirect channel}\\ \text{via fertility}}} > 0. \tag{5}$$

The first term captures the direct effect on the labor supply gap: as θ increases, women's opportunity cost of working rises in proportion to the number of children, reducing their labor supply. The second term reflects the indirect effect of more generous PL policies on labor supply through changes in fertility choices. When fertility increases, the labor supply gap worsens in proportion to the sum of childcare burden and the existing level of PL generosity.

Note that if PL policies boost fertility ($dn/d\theta > 0$), the overall effect on female labor supply relative to male labor supply is negative.[12] This implies that more generous PL benefits cannot simultaneously increase fertility and reduce the gender labor supply gap. This result highlights the trade-offs in using PL generosity: while generous PL benefits can encourage childbirth, they may also widen the gender labor supply gap by reducing women's labor supply, particularly with strong childcare burdens.

However, the simple model in this section focuses on the women's time allocation trade-off in a static setting, abstracting from key dynamic factors such as the long-term career impacts of taking PL in an environment with segmented jobs that differ in

[12]It may well be that $dn/d\theta \leq 0$, but we do not consider this case because one of its two policy objectives—higher fertility—is already unattainable.

wage growth and entry barriers to career-oriented ones. In the next section, we present stylized facts on Korea's segmented labor market, followed by a quantitative model that incorporates these dynamic aspects for a more rigorous analysis of PL policies and their macroeconomic effects.

3 Empirical Observations on Gender Gaps in Korea's Segmented Labor Market

This section presents descriptive facts on gender gaps across various dimensions in Korea's labor market, providing the foundation for the quantitative model introduced in the following sections. Throughout the paper, our analysis relies on data from the Korean Labor and Income Panel Study (KLIPS), a comprehensive longitudinal dataset capturing labor market dynamics in Korea. We restrict the baseline sample to households where the female member was born between 1970 and 1975 (*Cohort 2*), observed in the 1998–2021 waves.[13] Notably, this cohort experienced PL policies that were limited in generosity and had very low take-up rates[14]. For robustness, we also examine other cohorts, including those born between 1965–1970 (*Cohort 1*) and 1975–1980 (*Cohort 3*). To adjust for inflation, all nominal variables are converted to 2012 Korean Won (KRW) using the CPI index. Finally, to align with the two-year model periods in the following sections, we aggregate annual data into two-year intervals. More details are available in Appendix Section B.

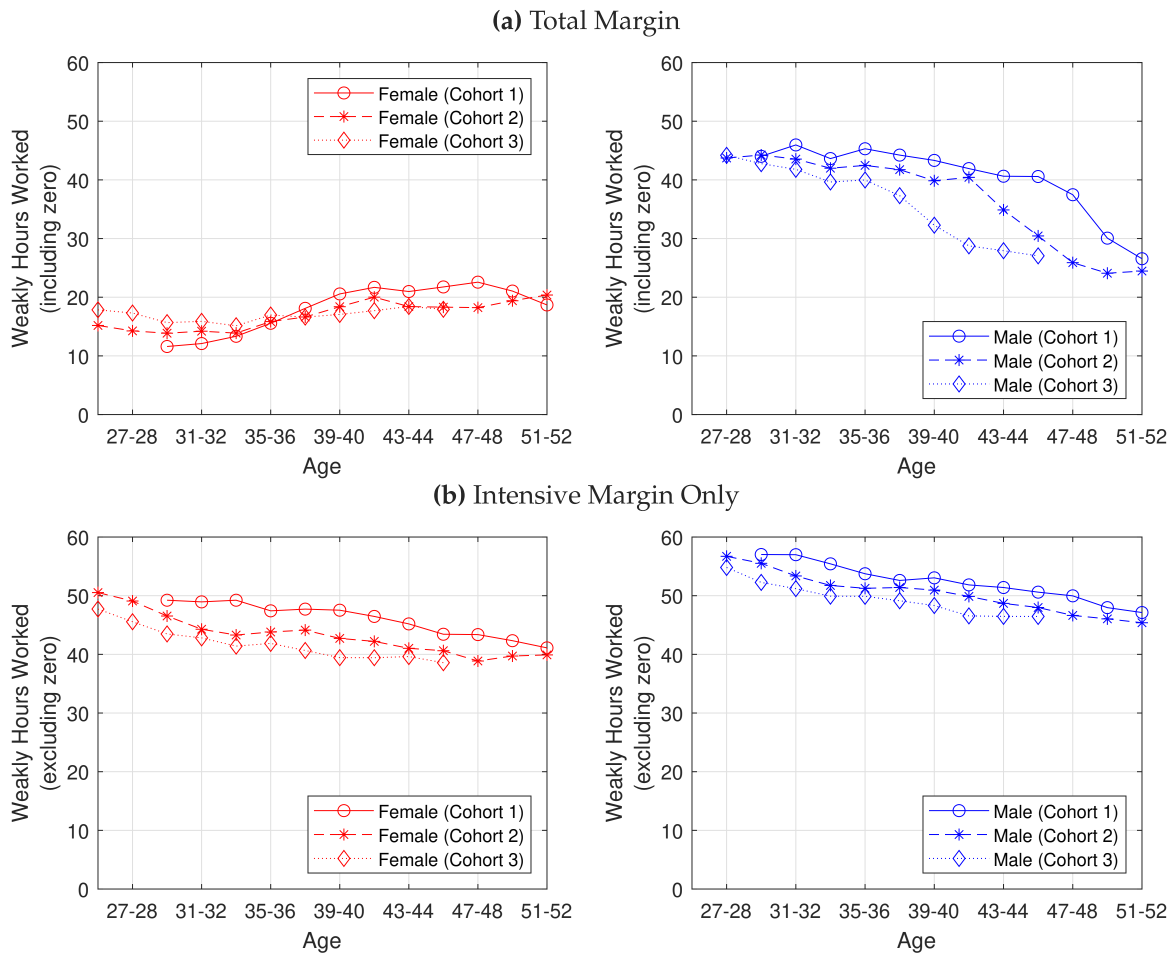
Labor Supply Gaps As highlighted in the introduction, gender gaps in labor supply remain significant in Korea. We now examine these gaps in greater detail. To construct a comprehensive measure of labor supply that captures both the intensive and extensive margins, we compute the average total weekly hours worked over two-year periods including zero observations.

Panel (a) of Figure 2 depicts the average hours worked by females and males by age, starting at ages 25–26. Notably, for males, average total weekly hours are high, around 38, even when nonworking individuals are included as zeros. Male hours worked gradually decline after their 40s, mirroring a common pattern in the life-cycle profile of labor supply observed in other countries. In contrast, females' average total hours

[13] Our sample focuses specifically on married couples, who are largely representative of these cohorts. Cohabitation is uncommon in Korea due to Confucianism-driven social norms, making non-marital childbearing rare as well.

[14] The low PL usage during the childbearing years of our baseline cohort is evident in the very low PL use share in 2010, the first year for which aggregate PL statistics are available (see Figure 6).

Figure 2: Labor Supply Dynamics by Gender Over the Life Cycle



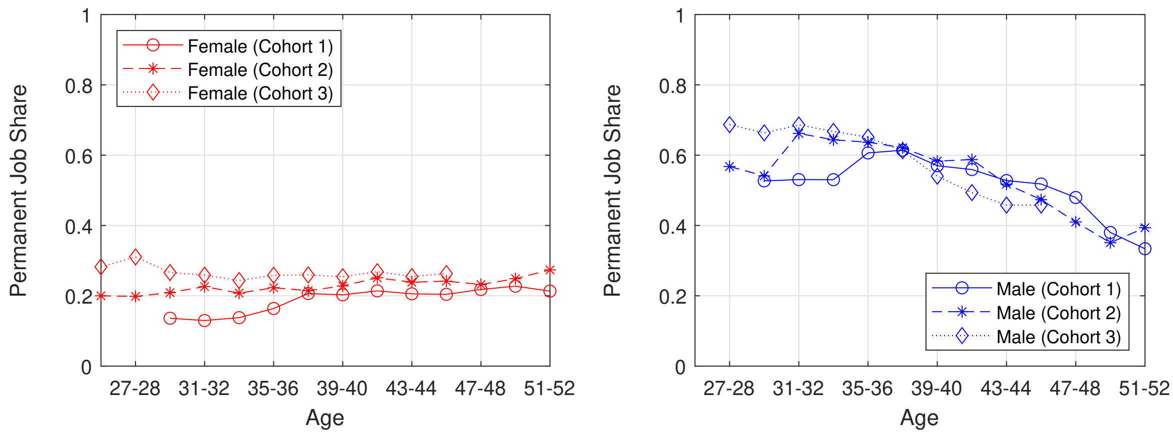
Notes: The total and intensive margins of labor supply are measured by average weekly hours worked over two years, including and excluding zeros, respectively. Cohort 1: 1965-70, Cohort 2: 1970-75, Cohort 3: 1975-80.

worked are considerably lower, around 15 weekly hours at ages 25–26. Somewhat surprisingly, their labor supply then gradually increases with age. By the time their children reach school age, female labor supply begins to rise, possibly due to childcare responsibilities easing.

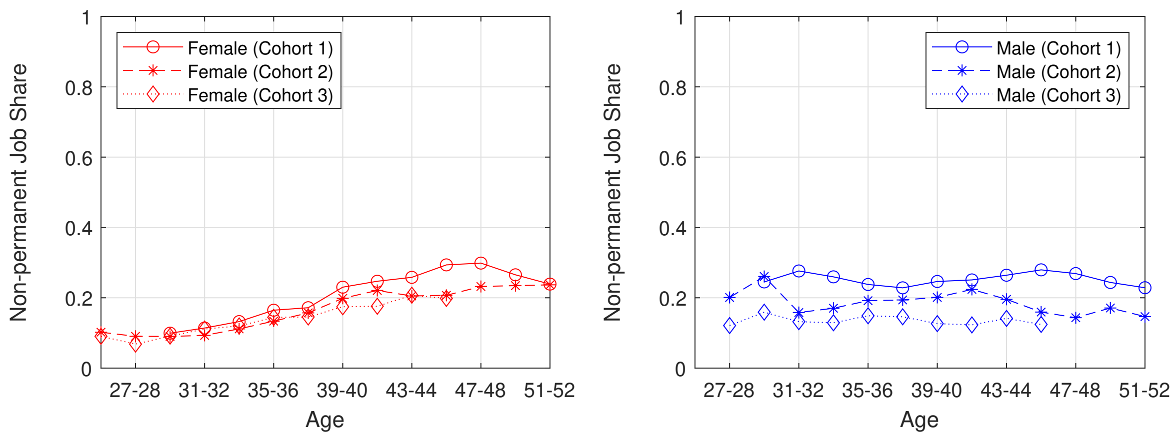
To understand how much of the variation in total hours worked is driven by the intensive vs. extensive margins, Panel (b) of Figure 2 plots hours worked excluding zero observations, capturing the intensive margin of labor supply. Average weekly hours for males is around 54, compared to 41 for females. Importantly, while a gender gap exists, it is much smaller among workers, and its decline with age is nearly parallel for both genders. This suggests that the gender gap in total hours worked is largely driven by the extensive margin, which we now examine in more detail below.

Figure 3: Employment Rates by Job Type and Gender Over the Life Cycle

(a) Permanent Job Employment Rate



(b) Nonpermanent Job Employment Rate



Notes: The permanent and nonpermanent job employment rates are calculated as the ratio of individuals with permanent jobs and nonpermanent jobs, respectively, to the total observations, averaged over a two-year period. Cohort 1: 1965-70, Cohort 2: 1970-75, Cohort 3: 1975-80.

Segmented Labor Markets When it comes to employment (extensive margin), Korea's labor market is distinctly segmented, with permanent (or regular) jobs and nonpermanent jobs, the latter comprising temporary (or irregular) employment and subsistence self-employment.[15] In general, permanent workers benefit from stable employment and higher wages through career progression but face inflexibility, as such jobs typically require long working hours. By contrast, nonpermanent workers experience job insecurity and lower wages, despite having more flexible working hours.

Given the sizable wage and stability premium for permanent jobs, it is important to examine gender gaps in the share of workers holding these positions. Figure 3 shows

[15] A similar dual labor market structure has been studied in a quantitative framework, e.g., for Spain (Guner et al., 2024) and Japan (Yamaguchi, 2019).

the share of male and female workers in permanent jobs (Panel (a)) and nonpermanent jobs (Panel (b)) over the life cycle. Clearly, male workers are significantly more likely to hold permanent jobs at all ages. For females, nonpermanent employment rates increase after their 40s, often exceeding those of males. This shift coincides with the rise in total hours worked among females, as shown in Figure 2. The fact that many of these women enter nonpermanent jobs with lower wages and fewer career opportunities may reflect the challenges of re-entering permanent, career-oriented jobs after career breaks. The difficulty of transitioning to permanent jobs later in life suggests a possible long-term impact of childbirth on women's career trajectories, likely contributing to persistent gender wage gaps, which we now turn to.

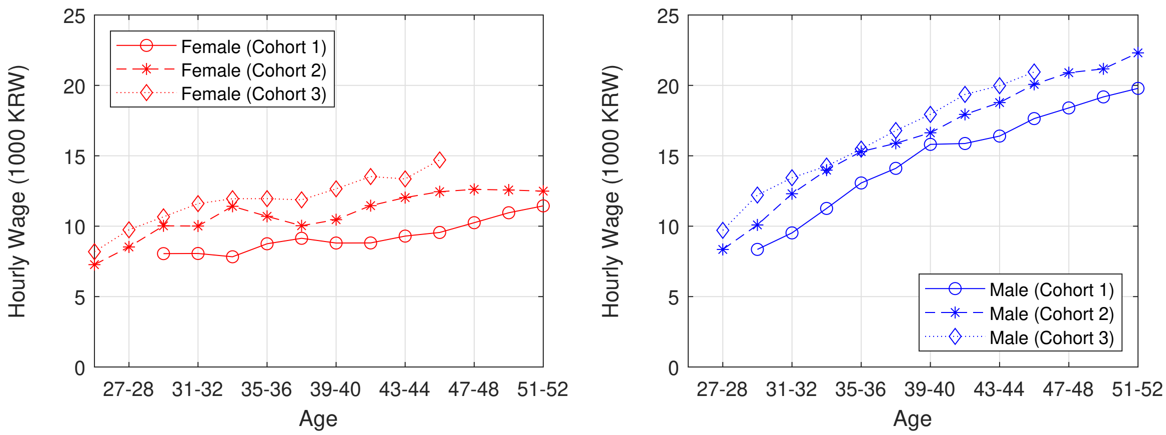
Wage Gaps Korea is often cited as having one of the largest gender wage gaps among developed countries. To illustrate how these gaps evolve over the life cycle, we calculate the average hourly wage by gender and age. Panel (a) of Figure 3 shows that the average male wage increases steadily with age, reflecting career progression effects. In contrast, female wage growth is slower in early career stages, likely due to promotion barriers associated with childbirth. Beyond their mid-30s, women's wages stagnate, suggesting limited career advancement opportunities. By their 50s, male workers earn nearly twice as much as female workers on an hourly basis, highlighting a significant widening of the gender wage gap with age.

The gender wage gap is even more pronounced in career-oriented jobs. Panels (b) and (c) of Figure 4 present average wages for permanent and nonpermanent jobs by gender and age. While gender wage gaps are relatively small among younger workers, they widen significantly with age, particularly in permanent jobs where career development is crucial. In nonpermanent jobs, the gender wage gap remains smaller but persists. These differences in wage trajectories across job types largely explain the overall widening gap seen in Panel (a).

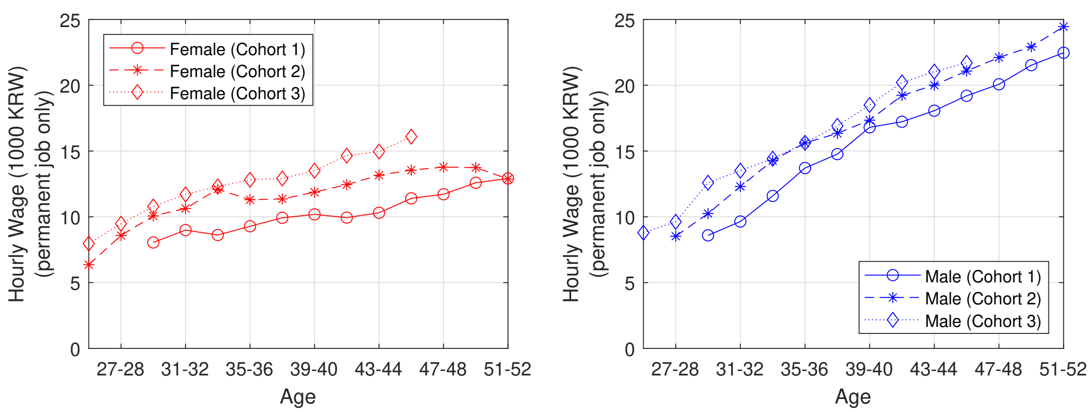
Against the backdrop of the above empirical observations, there appears to be some potential for PL policies to influence gender disparities in labor markets and fertility dynamics beyond the static trade-off in women's time allocation described in Section 2. For example, job protection under PL can ease the burden on female workers seeking to balance work and family by allowing them to remain in permanent jobs. However, as suggested earlier, the mechanisms driving these effects are complex, involving dynamic factors such as market entry frictions, future returns to current labor supply (e.g., promotions), and intertemporal substitutions. Additionally, couples may

Figure 4: Wage Dynamics by Gender and Job Type Over the Life Cycle

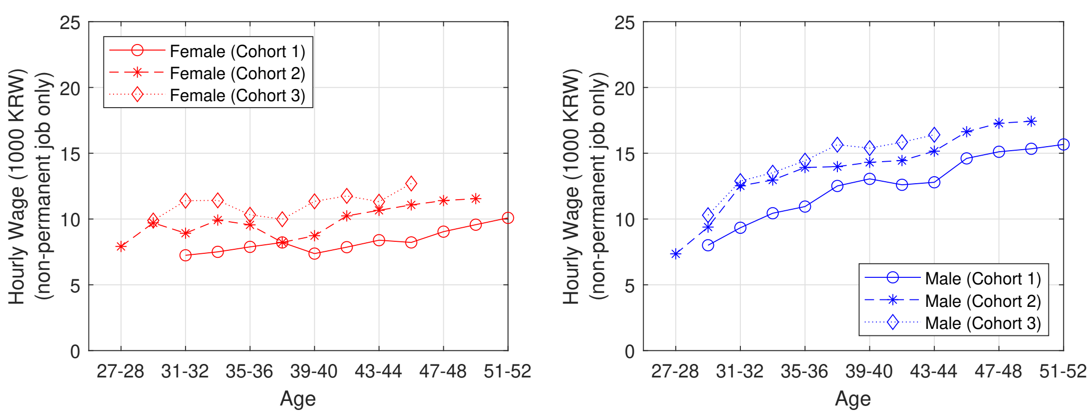
(a) Wage



(b) Wage (Permanent Worker Only)



(c) Wage (Nonpermanent Worker Only)



Notes: Wage is calculated as the average hourly wage in 2012 Korean Won over a two-year period. Cohort 1: 1965-70, Cohort 2: 1970-75, Cohort 3: 1975-80.

strategically adjust their labor supply in response to policy changes, making a purely reduced-form analysis challenging.

Therefore, in the next section, we develop a quantitative life-cycle model in which labor supply, careers, and wages of each partner, as well as their joint fertility choices, are endogenously determined. This model allows us to assess how PL policies shape household decision-making in both the short term and over the life cycle while systematically examining the mechanisms driving these effects.

4 Quantitative Life-Cycle Model

4.1 General Model Environments

A household, or married couple, consists of two adults: a female and a male, indexed by $g \in \{f, m\}$. Each period corresponds to two years, and Table 1 provides an overview of the age structure. Households enter the model at $j = 1$, when the female member is 25–26 years old. At this stage, they are ex-ante heterogeneous in education levels, denoted by $\mathbf{e} \equiv (e_f, e_m)$, and in the number of children n born previously. Households make joint decisions regarding work, choosing job types $\mathbf{s} \equiv (s_f, s_m)$, which can be either permanent (P) or nonpermanent (T). Job type determines the available choice set for working hours, as detailed below. Given labor supply choices $\mathbf{h} \equiv (h_f, h_m)$, households then make standard consumption-savings decisions.

At the beginning of each fertile period ($j = 1, 2, \ldots, 10$), households decide whether to have an additional child, subject to fecundity uncertainty. During nonfertile periods ($j = 11, \ldots, 14$), existing children leave the household stochastically. During the old periods ($j \geq 15$), households have no children and no longer make endogenous labor supply choices but receive exogenous old-age income.[16] Households live until $j = 28$ (age 79–80). In all periods, they can save in assets but face standard borrowing constraints within an incomplete asset market framework.

4.2 Children and Gender Norm

Fertility choices primarily depend on the benefits and costs of having children. We assume that children bring utility (Becker and Tomes, 1976) yet also incur costs that

[16]This assumption is made for practical reasons. First, the number of individuals in our baseline cohort sample declines sharply after their early 50s. Moreover, according to Statistics Korea, the average retirement age from the main job has been around 50, though many older individuals continue working in non-career-oriented jobs.

Table 1: Choices and Household Structures Over Model Periods

	Fertile Periods				Infertile Periods			Old Periods		
Female Age:	25–26	27–28	...	43–44	45–46	...	51–52	53–54	...	79–80
$j =$	1	2	...	10	11	...	14	15	...	28
Consumption-Savings	Yes				Yes			Yes		
Labor-Career Choices	Yes				Yes			No		
New Child (Birth)	Possible				No			No		
Children in Household	Possible				Possible			No		

vary by age. A key component of our model is about the cost of having children. Due to the computational burden of tracking each child's age, we classify children into two stages: the infant period (the first two years) and the noninfant periods.

During the infant period, parents must satisfy a childcare requirement constraint:

$$\eta \leq G(t_f, t_g, x_b) \equiv \Big[\nu_t\big(t_f^{\varphi} + t_m^{\varphi}\big)^{\frac{\rho}{\varphi}} + \nu_x\big(x_b\big)^{\rho}\Big]^{\frac{1}{\rho}} \tag{6}$$

where η represents the childcare burden. Childcare needs are met through the nested constant-elasticity-of-substitution (CES) technology G, which aggregates time and monetary inputs. First, parental time contributions (t_f and t_m) are combined with a constant elasticity of substitution determined by $\varphi < 1$ (Knowles, 2013). The aggregate time input is then combined with market goods (x_b, i.e., monetary spending on childcare) under a CES structure with the elasticity determined by $\rho < 1$. The share parameters are given by ν_t and ν_x, respectively.

Children remain costly beyond the infant stage. In Korea, students attend various after-school private education programs, known as *Hagwon*s, which are highly expensive and have an exceptionally high participation rate (Kim et al., 2024). At this stage, Korean parents primarily focus on enrolling their children in more and better *Hagwon*s. Given this, we assume that the perceived quality of a noninfant child is an increasing function of education expenditure per noninfant child x_q: $q = x_q^{\alpha}$. Here, α governs parents' demand for child quality.

A notable feature of Korean society that we incorporate into our model is the gender norm regarding childcare responsibilities (Hwang et al., 2019). First, we assume that parental time input is dictated by social norms as a function of nonworking hours:

$$t_g = (\bar{h} - h_g)\lambda_g, \tag{7}$$

where λ_g captures the degree of the gender norm in childcare, $\bar{h}$ represents total time endowment, and h_g denotes hours worked by parent g. If $\lambda_f > \lambda_m$, this reflects a gender norm that places a greater childcare burden on mothers, aligning with societal expectations of unequal gender roles discussed in the literature.[17]

Second, a noninfant child imposes an additional labor market participation cost on women ι_n, capturing the idea that older children also require significant maternal time when the mother works. This includes activities such as gathering information on better *Hagwon* opportunities, coordinating educational plans, and managing general housework responsibilities related to children. This additional burden ι_n may serve as a microfoundation for the child penalty estimated in Korea, which occurs almost exclusively at the extensive margin (Stansbury et al., 2024).

4.3 Careers: Jobs, Promotion, and Labor Supply

Fertility choices depend on their labor market implications. As illustrated in Section 3, the Korean labor market features a segmented dual structure, where career-oriented jobs are difficult to re-enter at older ages after a career break.[18] Our model endeavors to capture these dynamics in career choice, promotion, and labor supply.

Specifically, in each period, couples decide whether to participate in the labor market and, if so, which job type to pursue (s_g)—permanent (P) or nonpermanent (T). At the end of each period, permanent job workers face exogenous separation with a constant probability ϱ_j. We denote a worker's job status at the end of the period as $\tilde{s}'_g$.

In our model, permanent jobs are attractive for several reasons. First, any worker entering the labor market draws a match-specific shock, $z_g \sim \log N(0, \sigma^2 z)$. To capture the job stability aspect of permanent jobs, we assume that workers who remain in permanent positions ($\tilde{s}'_g = s_g = P$) retain their matched productivity from the previous period. In contrast, nonpermanent workers face uncertainty, as they receive a new match-specific shock each period. Second, beyond the job stability channel, we assume that only permanent workers have opportunities for career development. Assuming a discrete career status ($\chi_g \in 1, 2, 3$), all new permanent workers, like nonpermanent workers, start at the entry level, i.e., $\chi_g = 1$ if $s_g = P$ and $\tilde{s}_g = T$. They then face a promotion probability that increases with their current labor supply. Individuals who

[17]These gender norms, influenced in part by Confucianism (Hwang et al., 2019, Myong et al., 2021), are also prevalent in some European countries.

[18]As discussed above, having children imposes significant costs on women, particularly when they are young, often requiring extended career breaks.

get promoted ($\chi'_g = \chi_g + 1$) earn higher wages in the subsequent period.[19] To account for residual factors not captured by these channels in rationalizing the higher wages of permanent workers observed in the data, we assume that permanent jobs offer an exogenous wage premium relative to nonpermanent jobs, denoted as ω_p. Lastly, the option of PL is available only to permanent job workers, as we elaborate on later.[20]

Despite these advantages, permanent jobs require a minimum number of working hours, as in Jang and Yum (2022), denoted as $\underline{h}_P$, leading to a restricted choice set for hours worked: $\mathbb{H}_P = \{\underline{h}_P, \ldots, \bar{h}\}$. Meanwhile, nonpermanent jobs ($s_g = T$) impose no minimum working hour requirements, allowing flexibility with the choice set $h_g \in \mathbb{H}_T = \{0, \ldots, \bar{h}\}$. Moreover, we assume that individuals who were not in a permanent job in the previous period must incur entry costs to access permanent jobs. Specifically, in each period, those without a permanent job history in the previous period draw entry costs ξ from an age-dependent distribution $F_j(\xi)$. Korea's corporate culture often favors hiring fresh graduates for new permanent positions, partly due to the social importance of age, which can create tension when older employees report to younger supervisors. Given this, we expect that average entry costs increase with age, a pattern we later confirm in the data.

4.4 Parental Leave

In our model, PL take-up is one of the key decision variables. We now discuss how the advantages and costs of using PL are modeled. In our dynamic life-cycle framework, a key advantage of taking PL is job protection. Having an infant imposes time costs, pressuring parents to work less. This is particularly costly when permanent jobs require a minimum number of working hours. We assume that taking PL helps workers retain their permanent jobs, as it is legally counted as a working period. That is, given the PL length (l_g) of permanent workers, the labor supply set is given by:

$$\mathbb{H}_P = \{h_g \geq 0 \mid \underline{h}_P \leq l_g + h_g \leq \bar{h}\}, \tag{8}$$

where PL effectively lowers the minimum required hours. This allows parents to reduce childcare burdens by working fewer hours, enabling them to keep their perma-

[19]Conversely, continuing permanent workers who are not at the entry level ($\tilde{s}_g = \tilde{s}'_g = P$ and $\chi_g \geq 2$) face a probability of demotion ($\chi'_g = \chi_g - 1$), which decreases with their current labor supply.

[20]In practice, temporary job workers are legally eligible for PL if their prior work period meets the minimum requirement (one year or six months in recent years). However, PL take-up is very rare among temporary workers. Moreover, PL take-up for self-employed individuals without employees is conceptually ill-defined. Therefore, we focus on PL take-up among permanent job workers.

nent jobs and avoid entry costs when re-entering a permanent job in the future.

In addition, an income effect arises from the generosity of PL monetary benefits. This effect is captured by $\mathcal{B}(l_f, l_m, w_f, w_m)$, which depends on PL lengths and parental wages. This function is flexible enough to capture flat benefits, wage-dependent benefits, and joint-use incentives, as explained in Section 5.2.

PL comes with costs. First, although the monetary benefit is often considered an advantage, many families choose not to take PL due to financial hardship, as the benefit can be far below typical earnings. Moreover, taking PL can have long-term career implications, as promotion and demotion probabilities depend on actual hours worked, excluding PL periods. Lastly, economic costs alone—whether static or dynamic—may not fully explain the low take-up rates observed in the data. As discussed next, we introduce stigma-related utility costs associated with taking PL.

4.5 Preferences

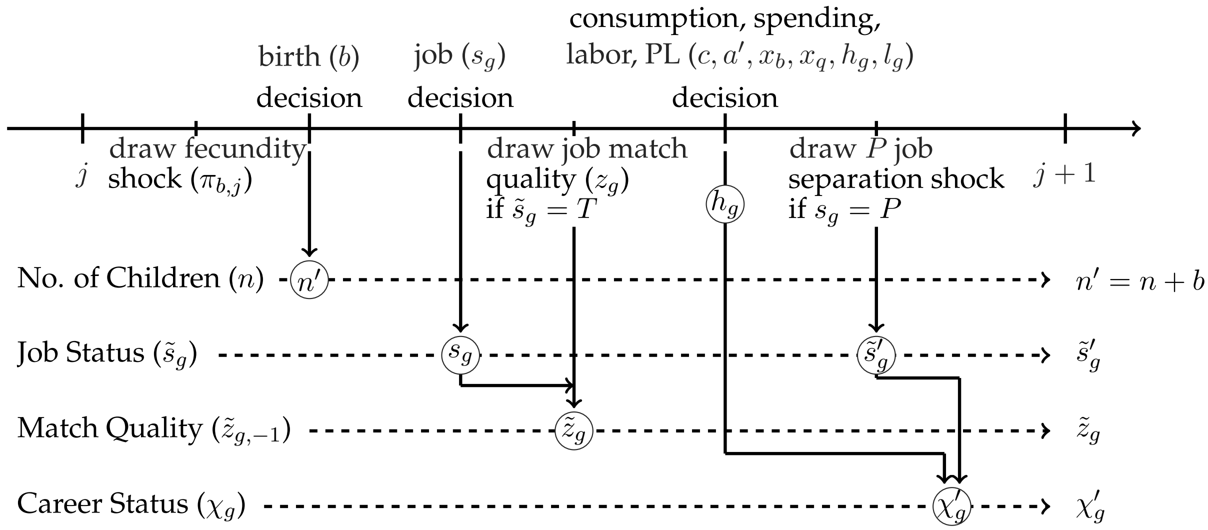
Households derive utility $u(\cdot)$ from total household consumption c divided by an equivalence scale $\Lambda(n)$ that is a function of the number of noninfant children n. Additionally, utility depends on the number n and quality q of noninfant children, captured by $\phi(n, q)$. Labor supply h_g incurs disutility, which also depends on the number of noninfant children to capture child-related participation costs, as discussed above. The disutility of labor supply is captured by the age-dependent function v. In addition to these standard utility components, we introduce stigma disutility associated with PL take-up l_g, captured by the function $d(l_f, l_m)$. This reflects the well-documented reluctance of employees, particularly men, to use PL (Kim and Lundqvist, 2023).

4.6 Household Optimization Problems

We first describe the household optimization problem during fertile periods ($j \leq 10$). Figure 5 outlines the timeline of decisions in a fertile period.

At the beginning of each period j, households learn their fecundity realization $\pi_{b,j}$. If they are able to have a child, they decide whether to have a newborn. At this point, the state variables include household assets (a), the current number of noninfant children (n), previous job and career status ($\tilde{s}_g, \chi_g$), last-period job match quality ($z_{g,-1}$), and education level ($e_g \in \{1, 2\}$, where 2 denotes college and 1 non-college). The value

Figure 5: Timeline within a Fertile Period



function at this stage is then given by:

$$W(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j) = \pi_{b,j} \max\Big\{ \underbrace{\bar{N}(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j)}_{\text{value of having a new-born}}, \underbrace{\bar{V}(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j)}_{\text{value of no additional child}} \Big\}$$
$$+ (1 - \pi_{b,j})\bar{V}(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j), \tag{9}$$

where the value of having a newborn and having no additional child are denoted by $\bar{N}(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j)$ and $\bar{V}(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j)$, respectively. Here, a bold variable represents the vector of a couple's variable: $\mathbf{x} = (x_f, x_m)$.

Depending on their birth choice, they then choose between permanent jobs (P) and nonpermanent jobs (T). If an individual did not have a permanent job history in the previous period ($\tilde{s}_{g,-1} = T$) but wants to enter a permanent job ($s_g = P$), they must pay an entry cost ξ_g drawn from an age-dependent distribution $F_j(\xi)$. The value of having another child ($b = 1$) is thus given by

$$\bar{N}(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j) = \mathbb{E}_{\boldsymbol{\xi}} \max \left\{ \begin{array}{l} \bar{N}_{PP}(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j) - \sum_g \mathcal{I}_{\tilde{s}_g = T}\xi_g, \\ \bar{N}_{PT}(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j) - \mathcal{I}_{\tilde{s}_f = T}\xi_f, \\ \bar{N}_{TP}(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j) - \mathcal{I}_{\tilde{s}_m = T}\xi_m, \\ \bar{N}_{TT}(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j). \end{array} \right\} \tag{10}$$

Note that new permanent workers and temporary workers must draw a new match quality shock. The value of current job choices ($\mathbf{s} = (s_f, s_m)$) *before* observing the match quality shock z_g is given by:

$$\bar{N}_{\mathbf{s}}(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j) = \mathbb{E}_{\mathbf{z}} N_{\mathbf{s}}(a, n, \boldsymbol{\chi}, \tilde{\mathbf{z}}, \mathbf{e}, j) \tag{11}$$

where

$$\tilde{z}_g = \tilde{z}_{g,-1} \times \mathcal{I}_{\tilde{s}_g = s_g = P} + z_g \times (1 - \mathcal{I}_{\tilde{s}_g = s_g = P}), \tag{12}$$

showing that a worker keeps their match quality $\tilde{z}_{g,-1}$ only when they work a permanent job consecutively.

For a given job choice (s) *after* the realization of the match quality shock, the value is given by:

$$N_{\mathbf{s}}(a, n, \boldsymbol{\chi}, \tilde{\mathbf{z}}, \mathbf{e}, j) = \max_{\substack{c, a', x_b, x_q \geq 0 \\ h_g \in \mathbb{H}_{s_g}, l_g \in \mathbb{L}_g}} \left\{ \begin{array}{l} u(c/\Lambda(n)) + \phi(n, x_q^{\alpha}) - v(\mathbf{h}, n, j) - d(\mathbf{l}) \\ \\ +\beta \mathbb{E}_{\boldsymbol{\chi}' | (\boldsymbol{\chi}, \mathbf{s}, \mathbf{l}), \tilde{\mathbf{s}}} W(a', n', \tilde{\mathbf{s}}', \boldsymbol{\chi}', \tilde{\mathbf{z}}, \mathbf{e}, j+1) \end{array} \right\} \tag{13}$$

subject to

$$c + x_q n + x_b + a' = \sum_g w_g h_g + (1+r)a + \mathcal{B}(\mathbf{l}, \mathbf{w}) - \mathcal{T}(\mathbf{h}, \mathbf{l}, a, \mathbf{w}) \tag{14}$$

$$w_g = \omega_{s,e,j} \gamma_{\chi,g} \tilde{z}_g (1 - \mathcal{I}_{g=f} \varsigma), \; g = f, m \tag{15}$$

$$n' = n + 1 \tag{16}$$

$$\eta \leq G(\mathbf{t}, x_b), \tag{17}$$

where r denotes the return on assets, and $\mathcal{T}(\mathbf{h}, \mathbf{l}, a, \mathbf{w})$ represents asset and labor income taxes net of transfers. Individual wages (w_g) depend on several factors. First, $\omega_{s,e,j}$ accounts for permanent job and education premiums in wages. Second, career status influences wages through $\gamma_{\chi,g}$, where promotions increase wages. Match quality $\tilde{z}_g$ also affects individual wages. Finally, we introduce a wage discount for women ($\varsigma \geq 0$) to account for residual factors not explicitly modeled that lower female wages relative to men, allowing the model to match the observed gender wage gap. At the end of each period, permanent workers face an exogenous separation shock. If they experience this shock while holding a permanent job ($s_g = P$), their status in the next period changes to $\tilde{s}_g = T$ and $\chi'_g = 1$.

Since this represents the value conditional on having an additional child, the number of children in the next period increases, and the childcare requirement constraint must be met, as discussed in Section 4.2. Additionally, the budget constraint accounts for monetary spending on noninfant children ($x_q n$) and the infant child (x_b) as expenses, while PL monetary benefits $\mathcal{B}(\mathbf{l}, \mathbf{w})$ appear as income, as discussed in Section 4.4.

The value of not having an additional child ($\bar{V}$) is similar to the value of having a newborn ($\bar{N}$), as described above, but with $b = 0$, and x_b, l_f, and l_m no longer being choice variables. Moreover, the budget constraint excludes PL benefits, and the infant childcare constraint is not present.

The value of a household in infertile periods ($j = 11, \ldots, 14$) is similar to the value of not having a newborn in fertile periods, except that existing children leave households stochastically, as in Sommer (2016).[21] In the old periods ($j = 15, \ldots, 28$), there are no children ($n = 0$) in the household. Instead of modeling endogenous labor supply and career choices, we assume that agents receive exogenous old-age income such as pensions and earnings. The household's value function in this stage, R, follows a conventional life-cycle model with consumption-savings decisions. See Appendix C for details on the recursive problems in the infertile and old periods.

5 Parameterization and Calibration

5.1 Calibration Strategy

For the quantitative analysis, we calibrate the model to our baseline cohort of Korean households, where females were born between 1970 and 1975. The calibration follows a two-step process, which is mostly standard, with a necessary extension in the second step, as we explain below.

First, a set of parameter values is either set or estimated externally without simulating the model. The second step involves calibrating the remaining 31 parameters. Given that male PL use is nearly zero in the calibration target period, it is not feasible to calibrate the parameter governing male PL stigma costs. Therefore, we first calibrate 30 parameters (excluding μ_d) to match 63 relevant target moments obtained from the data, under the assumption that male and female stigma costs of using PL are the same ($\mu_d = 1$). This already results in zero male PL use in the baseline model. To calibrate μ_d, we then use all the calibrated parameters to simulate a recent version of PL policies and determine the value of μ_d that matches the recent male PL use share, as described in detail below.

[21] That is, although we still capture the degree of burden caused by the number of noninfant children in the household, we do not distinguish their quality or age. This assumption facilitates computational tractability, allowing us to incorporate details related to PL and career dynamics instead.

5.2 Model Parameters

The moment-matching technique we adopt relies on the informativeness of target moments for certain parameters, although the relationship is not one-to-one. We now explain these links between parameters and target moments in the second step, along with the description of externally calibrated parameters in the first step.

Children We set the maximum number of children to three ($n \in \{0, 1, 2, 3\}$). This choice is based on the observation that households with more than three children are very rare in our baseline sample. Given this, we assume that the utility from the quantity and quality of children is defined as

$$\phi(n, q) = \tilde{\phi}_n q = \tilde{\phi}_n x_q^{\alpha} \tag{18}$$

where the three parameters $\{\tilde{\phi}_n\}_{n=1}^{3}$ are internally calibrated to match the distribution of completed fertility in the data, while α is calibrated to match the observed average private education spending per child relative to income, as reported in Table 2.

We now turn to the parameters related to the costs of children. First, we set $\rho = 0.25$ in equation (6), according to Hwang et al. (2018), who estimate that parental time and market childcare are substitutable in Korea, though less so than in the United States. (e.g., Bar et al., 2018). The elasticity of substitution between mother's and father's time is governed by φ. We set $\varphi = 0.4$, implying an elasticity of substitution of 2.5, consistent with Knowles (2013) and Myong et al. (2021), who find that mother's and father's time are highly, but not perfectly, substitutable. We normalize the share parameter $\nu_t = 1$ and calibrate ν_x internally to match the average childcare spending relative to income. The degree of infant childcare burden is set using $\bar{\eta} = G(0, \bar{h}/2, \bar{h}/2)$, ensuring that childcare costs are zero ($x_b = 0$) when each parent equally contributes their time allocations to newborn care. Finally, λ_f and λ_m are internally calibrated to match the average parental time with young children (Kim et al., 2024), as shown in Table 2. Note that the large gap in parental time is not solely driven by these parameters but also shaped by endogenous labor supply in our model.

The fecundity probability for $j = 1, 2, \ldots, 10$ decreases as female age increases. To capture this age-dependent fecundity, we introduce the following functional form:

$$\pi_{b,j} = \tilde{\pi}_0 \big[1 - \exp(-\tilde{\pi}_1 (11 - j))\big]. \tag{19}$$

We set $\tilde{\pi}_0 = 0.890$ and $\tilde{\pi}_1 = 0.246$ externally to best fit the medical literature estimates of fecundity by age (Leridon, 2004). This functional form with the parameter values generates declining fertility probabilities, as shown in Appendix Figure A5.

During the infertile periods ($j = 11, \ldots, 14$), children leave the household stochastically. This transition in the number of children over time follows a Binomial distribution: $n' \sim B(n, p_n)$. We set $p_n = 0.953$ externally to match the ratio of the average number of children in the household at $j = 14$ to its counterpart at $j = 11$ in the data (0.865).

Parental Leave In practice, PL policy design involves many dimensions and details, as noted by Doepke et al. (2023). This is especially true when PL benefits depend not only on an individual's choice but also on the spouse's choice and the duration of leave. Given this inherent complexity, we focus on the major aspects of PL policies, which are captured by three key variables in the PL monetary benefit function $\mathcal{B}(\mathbf{l}, \mathbf{w})$: the wage replacement rate, the maximum PL duration, and the benefit bounds (cap and minimum). Note that in our model, PL encompasses both maternity leave and non-maternity parental leave, as implemented in practice.

Some detailed explanations for each dimension of the benefit function are in order. First, the wage replacement rate, $\theta(\mathbf{l})$, is generally modeled to depend on the PL length of each partner (i.e., $\mathbf{l} \equiv (l_f, l_m)$). This allows us to capture the fact that mothers receive a generous 100% replacement rate for their three-month maternity leave (i.e., $\theta(1, \cdot) = 1$), whereas non-maternity PL follows different replacement rules (i.e., $\theta(l_f, \cdot) < 1$ for $l_f \geq 2$).[22] Additionally, incorporating PL length for both partners enables us to account for different replacement rates introduced in recent reforms aimed at incentivizing joint PL use by allowing one partner's benefit to depend on the other's PL use.[23]

Next, the maximum PL length has remained one year for several decades, as discussed in Section 6.1, with recent reforms focusing on other aspects. Given this, we fix it at one year for men ($\bar{l}_m = 4$) and five quarters for women, which includes an additional quarter of maternity leave ($\bar{l}_f = 5$), as discussed above. Given these policy parameters, we allow eligible individuals to choose their PL length: if $s_g = P$ and $b = 1$, then $l_g \in \mathbb{L}_g = \{0, 1, \ldots, \bar{l}_g\}$; otherwise, $\mathbb{L}_g = \{0\}$.

Finally, we introduce a minimum benefit ($\underline{\Theta}$) and a cap ($\bar{\Theta}(\mathbf{l})$). It is important to note that the cap has been the primary focus of recent reforms. As such, we allow the cap to primarily depend on an individual's PL length while also incorporating

[22] Paternity leave, on the other hand, has been highly limited, with a maximum duration of only a few days, as discussed in Appendix Section D. Thus, we abstract from it in the model.

[23] However, this feature is not included in the baseline model, which is calibrated to the period before these reforms. Details on how we model the incentive program are provided in Section 6.1.

the partner's PL length (i.e., $\mathbf{l} \equiv (l_f, l_m)$). For the baseline calibration prior to recent reforms, this structure enables a more generous cap on maternity leave, similar to the wage replacement rate, as explained above.[24] Specifically, since the first two months of maternity leave are not subject to a cap, while the third month is subject to a cap, we assume that the maternity leave benefit for a quarter enters the PL benefits in the following way:

$$\mathcal{B}(\mathbf{l}, \mathbf{w}) = \sum_g b_g(\mathbf{l}, \mathbf{w}), \tag{20}$$

$$\text{where} \quad b_f(\mathbf{l}, \mathbf{w}) = \underbrace{w_f \times \min\{l_f, 2/3\} + \min\{w_f \times \max(0, l_f - 2/3), \bar{\Theta}_f\}}_{\text{maternity}}$$
$$+ \underbrace{\max\left\{\underline{\Theta}, \min\{\tilde{\theta} w_f, \overline{\Theta}\}\right\} \times \max\{l_f - 1, 0\}}_{\text{non-maternity}}, \tag{21}$$

$$b_m(\mathbf{l}, \mathbf{w}) = \max\left\{\underline{\Theta}, \min\{\tilde{\theta} w_m, \overline{\Theta}\}\right\} \times l_m. \tag{22}$$

Here, $\bar{\Theta}_f$ represents the monthly benefit cap for the final month of maternity leave, set to 0.31 (1,350K KRW).[25] Since the baseline calibration period features a flat benefit for non-maternity PL durations, we impose that the quarterly minimum and cap are equal in the baseline calibration: $\underline{\Theta} = \overline{\Theta} = 0.27$, which corresponds to approximately 300 USD per month.[26]

As discussed in Section 4.5, our model introduces nonpecuniary stigma costs associated with using PL. This reflects the widely recognized notion that employees, particularly men, often feel uncomfortable taking PL (Kim and Lundqvist, 2023). In fact, as shown in Figure 6, the data suggest that the share of parents using any PL was very low, especially among men. Nevertheless, in our sample, mothers who take PL tend to have durations that are not particularly short.

Therefore, we specify this stigma cost as a combination of extensive margin costs ($\tilde{d}_{0,g}$) and intensive margin costs ($\tilde{d}_{1,g}$):

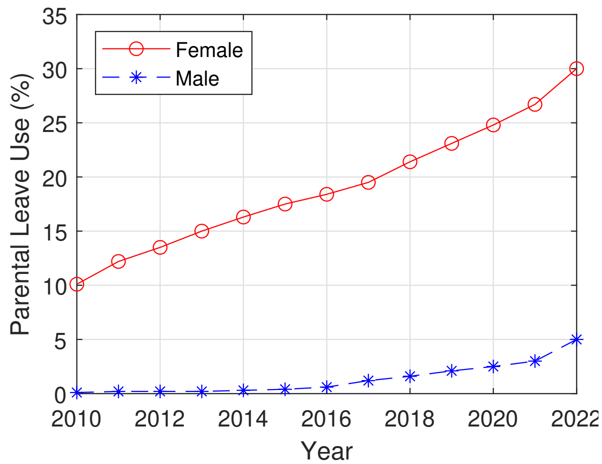
$$d(\mathbf{l}) = \sum_g [\tilde{d}_{0,g} \mathcal{I}_{l_g > 0} + \tilde{d}_{1,g} l_g], \quad \text{where} \quad \tilde{d}_{0,m} = \mu_d \tilde{d}_{0,f}, \quad \tilde{d}_{1,m} = \mu_d \tilde{d}_{1,f}, \tag{23}$$

[24] Additionally, this flexibility—including the interdependence of caps—allows us to incorporate a recent reform that temporarily raises the cap substantially when both spouses use PL leave. However, this program was introduced only recently and is not featured in the baseline calibration. Section 6.1 provides further details.

[25] Monetary values are scaled such that 1 in the model corresponds to 4,300K KRW, or approximately 3,000 USD.

[26] With this restriction of a constant benefit, $\tilde{\theta}$ becomes irrelevant in the baseline economy.

Figure 6: Parental Leave Use by Gender over Time



where the higher intensity of this cost for men is captured by the multiplier $\mu_d > 1$. We first calibrate the two female parameters ($\tilde{d}_{0,f}$ and $\tilde{d}_{1,f}$) internally to match the share of mothers using PL (10.1%) and their average duration (2.4 quarters), conditional on PL use, as shown in Table 2.

Ideally, we would like to include male target moments and calibrate male parameters alongside all other parameters. However, given that the share of fathers using PL is nearly zero in the baseline calibration period, this is not feasible. Instead, we adopt an alternative strategy, as outlined in Section 5.1. Assuming $\mu_d = 1$, we first calibrate all remaining parameters in Table 2 and confirm that male PL use remains zero even with $\mu_d = 1$. To calibrate a realistic value of μ_d, we then apply the more generous 2022 PL policy version, as explained in Section 6.1, using the calibrated parameters, except μ_d, which is then calibrated separately to match the 2022 share of fathers using PL (5.0%). The resulting multiplier is $\mu_d = 1.60$, implying that male stigma costs are 60% higher than those of women.[27]

Wages and Labor Markets As shown in equation (15), individual wages depend on various components, which we parameterize as follows:

$$\omega_{s,e,j} = \tilde{\omega}_0 exp(\tilde{\omega}_1(j-1))(1+\tilde{\omega}_p\mathcal{I}_{s_g=P})(1+\tilde{\omega}_e\mathcal{I}_{e_g=2}) \quad (24)$$

$$\gamma_{\chi,g} = (1+\tilde{\gamma}_g)^{(\chi_g-1)}. \quad (25)$$

The first component of the wage function is the age gradient. Specifically, $\tilde{\omega}_0$ controls the scale, while $\tilde{\omega}_1$ governs the age gradient of general age-wage profiles, which

[27]Note that the baseline calibration remains unchanged, even with $\mu_d = 1.60$ instead of the initial assumption of $\mu_d = 1$, because male PL use is already zero in the baseline period, as noted above.

Table 2: Internally Calibrated Parameters

		Target Statistics		
	Value	Model	Data	Description
$\tilde{\phi}_1$	0.095	{0.086, 0.258,	{0.091, 0.244,	Distribution of completed fertility
$\tilde{\phi}_2$	0.182	0.556, 0.099}	0.559, 0.106}	$Pr(n), n \in \{0, 1, 2, 3+\}$
$\tilde{\phi}_3$	0.250			
ν_x	0.549	0.022	0.024	Avg. childcare spending to income
α	0.346	0.061	0.069	Avg. private educ. (per child) to income
λ_f	0.461	3.26	3.27	Avg. parental time with new born, female
λ_m	0.422	1.05	1.18	Avg. parental time with new born, male
$\tilde{d}_{0,f}$	0.0270	0.109	0.101	PL take-up fraction, female
$\tilde{d}_{1,f}$	0.0057	2.41	2.40	Avg. PL length, female
ϑ	0.600	0.393	0.400	Avg. old inc. / Avg. hh earnings
$\tilde{\omega}_0$	0.713	0.89	1.00	Avg. male wage ($j = 1$), normalization
σ_z	0.340	0.46	0.53	Std. dev. log wage
$\tilde{v}_0$	0.0058	{1.63, 2.15, 2.63}	{1.37, 2.32, 2.69}	Total hours worked, Avg. noncol., female
$\tilde{v}_1$	0.0209	{5.52, 4.64, 3.03}	{5.37, 5.23, 2.99}	Total hours worked, Avg. noncol., male
ι_n	0.0064	{1.76, 2.36, 2.78}	{2.16, 2.29, 2.31}	Total hours worked, Avg. col., female
μ_v	1.022	{5.37, 4.78, 3.03}	{5.43, 4.96, 3.18}	Total hours worked, Avg. col., male
				(j =1–5, 6–10, 11–14)
$\tilde{\varrho}_0$	0.0314	{0.163, 0.218, 0.187}	{0.188, 0.219, 0.253}	Perm. emp. rate, female
$\tilde{\varrho}_1$	0.116	{0.618, 0.612, 0.324}	{0.567, 0.570, 0.370}	Perm. emp. rate, male
$\iota_{f,0}$	0.120	{0.115, 0.148, 0.259}	{0.089, 0.177, 0.229}	Nonperm. emp. rates, female
$\iota_{f,1}$	0.0031			
$\iota_{m,0}$	0.110	{0.198, 0.087, 0.115}	{0.227, 0.222, 0.162}	Nonperm. emp. rates, male
$\iota_{m,1}$	0.0735			(j =1-5, 6-10, 11-14)
$\tilde{\xi}_0$	0.459	0.216	0.247	Avg. perm. entry prob., male (j =2-5)
$\tilde{\xi}_1$	0.139	0.062	0.060	Avg. perm. entry prob., male (j =6-10)
$\tilde{\gamma}_f$	0.153	{0.99, 1.53, 2.03}	{1.19, 1.50, 1.69}	Avg. perm. wage, female
$\tilde{\gamma}_m$	0.181	{1.30, 1.99, 2.48}	{1.43, 2.23, 2.86}	Avg. perm. wage, male
$\tilde{\omega}_P$	0.111	{0.94, 1.28, 1.44}	{1.04, 1.16, 1.40}	Avg. nonperm. wage, female
$\tilde{\omega}_1$	0.0514	{1.07, 1.61, 2.00}	{1.34, 1.79, 1.93}	Avg. nonperm. wage, male
				(j =1–5, 6–10, 11–14)
$\tilde{\omega}_e$	0.107	{1.02, 1.49, 1.76}	{1.38, 1.65, 1.86}	Avg. col. wage, female
		{1.30, 2.03, 2.37}	{1.57, 2.39, 2.94}	Avg. col. wage, male
ς	0.221	{0.93, 1.36, 1.59}	{0.80, 1.00, 1.30}	Avg. noncol. wage, female
		{1.19, 1.84, 2.19}	{1.16, 1.73, 2.19}	Avg. noncol. wage, male
				(j =1–5, 6–10, 11–14)

may reflect tenure effects or time effects. As relevant target statistics for these parameters, we include the average male wage at j =1, which is normalized to 1 in the model, and average nonpermanent worker wages by gender for the three age groups (j =1–5, 6–10, 11–14).

In the model, permanent jobs are attractive because they provide career benefits by enabling workers to move up the career status (χ_g). These promotion effects are captured by $\tilde{\chi}_g$, which we allow to depend on gender to account for potential gender-based disadvantages in promotion benefits. Wages also depend on $\tilde{\omega}_P$, which applies only to permanent job workers. This helps to match permanent job wage premiums observed in the data. We internally calibrate these parameters to match average permanent job wages by gender for the age groups (j =1–5, 6–10, 11–14).

Next, the college premium parameter ($\tilde{\omega}_e$) together with the female-specific discount factor (ς) are internally calibrated to match mean wages by education and gender for the three age groups (j =1–5, 6–10, 11–14) in the data. Finally, equation (15) also depends on a match-specific shock, assumed to be drawn from a log-normal distribution: $z_g \sim \log N(0, \sigma_z^2)$. The dispersion of the shock (σ_z) is internally calibrated to match the observed standard deviation of log wages, as shown in Table 2.

We now turn to exogenous components related to labor market transitions. In the model, permanent job workers are subject to an age-dependent separation shock (ϱ_j), specified as:

$$\varrho_j = \tilde{\varrho}_0 \exp(\tilde{\varrho}_1 (j-1)). \tag{26}$$

The parameters $\tilde{\varrho}_0$ and $\tilde{\varrho}_1$ are internally calibrated to match permanent employment rates by gender for the age groups (j =1–5, 6–10, 11–14). At the same time, entry into permanent jobs is not frictionless in the model and is governed by entry costs (ξ). In the data, the probability of entering a permanent job declines sharply with age, likely reflecting Korean corporate culture and potential age discrimination, as discussed in Section 4.3. To replicate this pattern, we specify the distribution of entry costs to be age-dependent:

$$F_j(\xi) = U[0, \bar{\xi}_j] \quad \text{where} \quad \bar{\xi}_j \equiv \tilde{\xi}_0 \exp(\tilde{\xi}_1 (j-1)), \tag{27}$$

and use the average permanent entry probability for men in the two age groups (j =2–5, 6–10) to internally calibrate the entry cost parameters $\tilde{\xi}_0$ and $\tilde{\xi}_1$.[28] In addition to

[28] We exclude the first period because the model imposes initial conditions where all individuals begin without permanent job experience. We only use male transition statistics since female job transitions are more affected by other factors, such as childbirth.

transition probabilities, these parameters, which control entry difficulties, also help calibrate the target moments of permanent employment rates.

Finally, we estimate the transition matrix $\pi(\chi'|\chi, (P, P), \mathbf{h})$, which governs the mapping from current labor supply to promotion probability, directly from the data. The key property of this transition matrix is that the probability of promotion increases with labor supply, while the probability of demotion decreases with labor supply. We specify this relationship as follows:

$$\pi_{P,g,j}^{motion}(h_g) = \left[1 + \left(\frac{1}{\Pi_{P,g,j}^{motion}} - 1\right) \exp\left(-\zeta_P^{motion}(h_g - 5)\right)\right]^{-1}, \tag{28}$$

where $motion$ represents either promotion (u) or demotion (d), and $\Pi_{P,g,j}^{motion}$ denotes the probability of promotion or demotion, conditional on $h_g = 5$ for each group.[29] We classify groups along two dimensions: gender and broad age groups (27–44 and 45–52). The parameter ζ_P^{motion} is estimated using logistic regressions with fixed effects by household, gender, and broad age group. The estimated coefficient for promotion is 1.23, while for demotion, it is –1.37, both of which are statistically significant at the 1% level, based on clustered standard errors. Details are provided in Appendix Section B.3.

Consumption and Labor Supply The utility function for consumption follows the standard form in macroeconomics and life-cycle literature:

$$u(c/\Lambda(n)) = \frac{(c/\Lambda(n))^{1-\sigma_c}}{1-\sigma_c}, \tag{29}$$

where we set the inverse elasticity of intertemporal substitution to $\sigma_c = 2$, a commonly adopted value in the literature. We define the equivalence scale as $\Lambda(n) = 1.5 + 0.3n$, based on the OECD modified equivalence scale. This scale assigns a value of 1 to the adult head, 0.5 to an additional adult, and 0.3 to each child under age 14. Old-age income is assumed to depend on final career status and education level, scaled by ϑ, as specified in Appendix Section C. This parameter is internally calibrated to match 0.4, the ratio of average old-age household income to average household earnings. Finally, we set the discount factor to $\beta = 0.92$ and the two-year real interest rate to $r = 0.1$ externally.

We categorize total hours worked over a two-year model period into 9 bins, where

[29] The benchmark hours of $h_g = 5$ correspond to the mode of the distribution for both female and male permanent job working hours.

each nonzero bin could be interpreted as 9 weekly hours.[30] A value of 5 indicates that average weekly hours worked is greater than 36 and less than or equal to 45, corresponding to typical full-time work conditional on employment. This is set as the minimum required labor supply for permanent jobs, $\underline{h}_P$.

Next, we specify the disutility of working, $v(\mathbf{h}, \mathbf{e}, j)$, as a combination of the standard constant-Frisch-elasticity function for the intensive margin of labor supply and participation fixed costs for the extensive margin, both with age-dependent shifters:

$$v(\mathbf{h}, \mathbf{e}, j) = \sum_g v_{e_g} \left[\tilde{v}_0 \exp((j-1)\tilde{v}_1) \frac{h_g^{1+\sigma_h}}{1+\sigma_h} + \iota_{0,g} \exp((j-1)\iota_{1,g}) \mathcal{I}_{h_g>0} \right] + \iota_n n \mathcal{I}_{h_f>0}. \tag{30}$$

The parameter σ_h governs the Frisch elasticity and is set to 1, as is standard in the literature. We assume that labor supply shifters for the intensive margin depend only on age, while those for the extensive margin depend on age and gender. These parametric assumptions are motivated by the labor supply patterns documented in Figure 2, which show that the intensive margin declines with age in a parallel fashion, whereas the age gradient in the extensive margin differs starkly by gender. In addition, labor supply exhibits education dependence, captured by v_{e_g}, which takes the value μ_v if $e_g = 2$ (college) and 1 if $e_g = 1$ (noncollege). This reflects the empirical observation that, despite higher wages among college-educated workers, labor supply does not exhibit clear differences by education level. Finally, as discussed in Section 4.2, mothers who choose to work face an additional participation cost per child, denoted by ι_n. These labor disutility parameters for both the intensive and extensive margins are internally calibrated to match total hours worked by gender and education, as well as nonpermanent employment rates by gender for the age groups ($j =$1–5, 6–10, 11–14), as reported in Table 2.

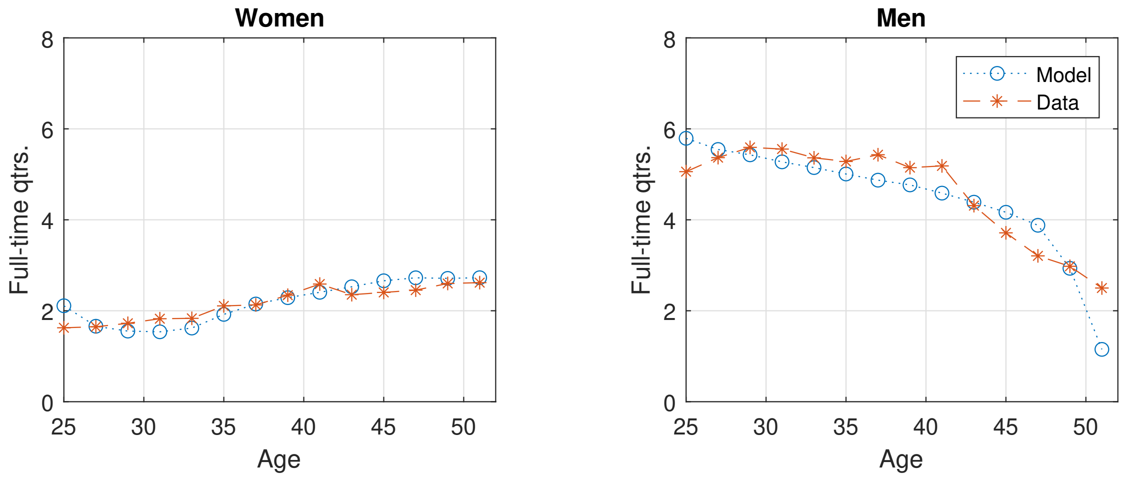
Tax and Transfers The tax function net of transfers is given by:

$$\mathcal{T}(\mathbf{h}, \mathbf{l}, a, \mathbf{w}) = \sum_g \left[E_g - (1-\tilde{\tau}_s) E_g^{1-\tilde{\tau}_p} \bar{E}^{\tilde{\tau}_p} \right] + \tilde{\tau}_k r a - T, \tag{31}$$

where E_g includes earnings and PL benefits, $\bar{E}$ denotes average individual earnings, and T represents lump-sum transfers. The capital income tax rate is set to $\tilde{\tau}_k = 0.14$,

[30]See Appendix B.3 for exact categorization formulas. This process helps mitigate measurement errors and, more importantly, ensures consistency with the discrete labor supply choices in the quantitative model.

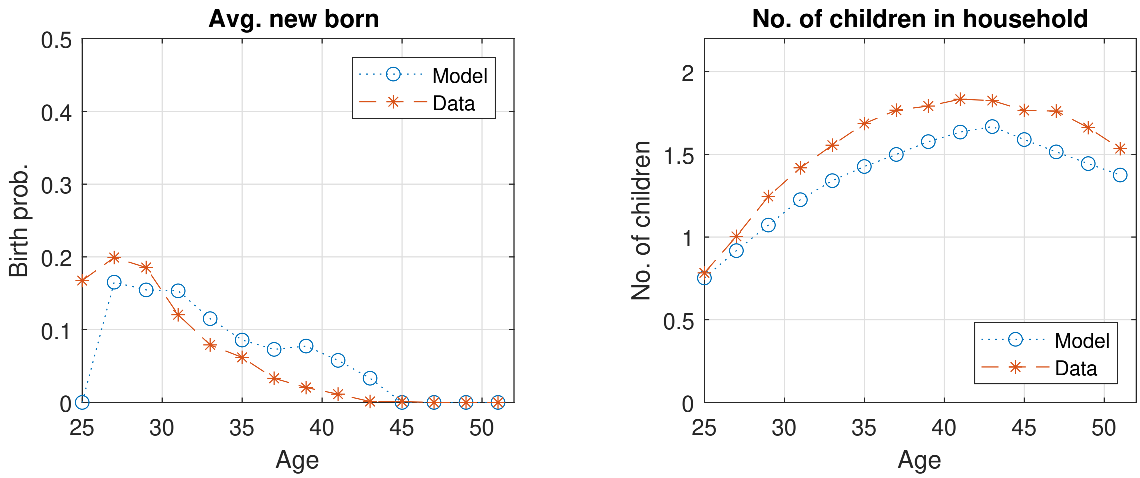
Figure 7: Labor Supply by Age and Gender



and T, which captures various welfare programs, is set at 10% of average household income. The progressive labor income tax follows the functional form of Heathcote et al. (2017). Since the Korean National Tax Service does not allow joint filing, we apply this function separately to each partner. We set $\tilde{\tau}_p = 0.175$ for progressivity and $\tilde{\tau}_s = 0.169$ for scale, based on Lim and Kim (2023).

Initial Distributions We take the initial distribution of couples' education and their corresponding number of children directly from the data, as summarized in Appendix Table A1. Two patterns are worth noting. First, college-educated individuals are more likely to marry partners with similar education levels, reflecting a strong pattern of educational assortative matching, similar to what is observed in the United States (Greenwood et al., 2014). Second, more educated parents tend to have fewer children at younger ages, suggesting a negative relationship between education and early fertility. This pattern may be driven by delayed family formation among highly educated individuals, as many choose to spend more than four years completing higher education (officially a four-year college degree) in Korea.[31]

Figure 8: Children in Households by Age



5.3 Calibration Results and Model Fit

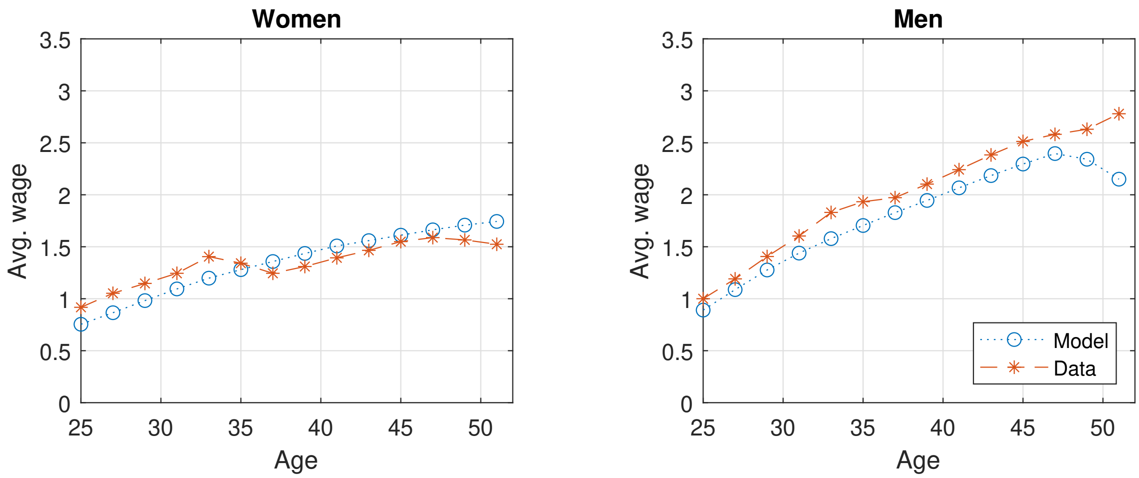
Table 2 summarizes the internally calibrated parameters, their target statistics, and the match between model-implied and empirical data moments. Given the degree of overidentification, the model performs well in matching the target statistics. We now discuss the model fit in greater detail, focusing on the key dimensions outlined in Section 3.

Figure 7 presents the age profile of labor supply by gender. While we only targeted the average over the three broad age groups (as shown in Table 2), the model successfully captures more detailed two-year age patterns. In particular, as highlighted in Section 3, the model replicates the key pattern where female labor supply increases with age as childbearing and childcare responsibilities decline, whereas male labor supply tends to decrease, particularly after their 40s. Table 2 also shows that a 2.2% higher disutility of work for the college-educated ($\mu_v = 1.022$) allows the model to reproduce similar labor supply patterns across education levels, despite large wage gaps between college- and noncollege-educated workers.

The left panel of Figure 8 displays the childbirth probability within two-year periods, capturing the timing of childbirth, while the right panel shows the average number of children per household by age. In the model, these dynamics are shaped by fecundity, externally calibrated through equation (19), as well as by endogenous fertility choices. Notably, the model's statistics align well with the data across all ages. Note that up to age 45, these moments are not directly targeted in calibration because

[31] Additionally, most men in Korea are required to complete mandatory military service, which lasts approximately two years (recently reduced to 1.5 years) and is typically served during their college years, further contributing to delayed marriage and family formation among the college-educated.

Figure 9: Wage by Age and Gender



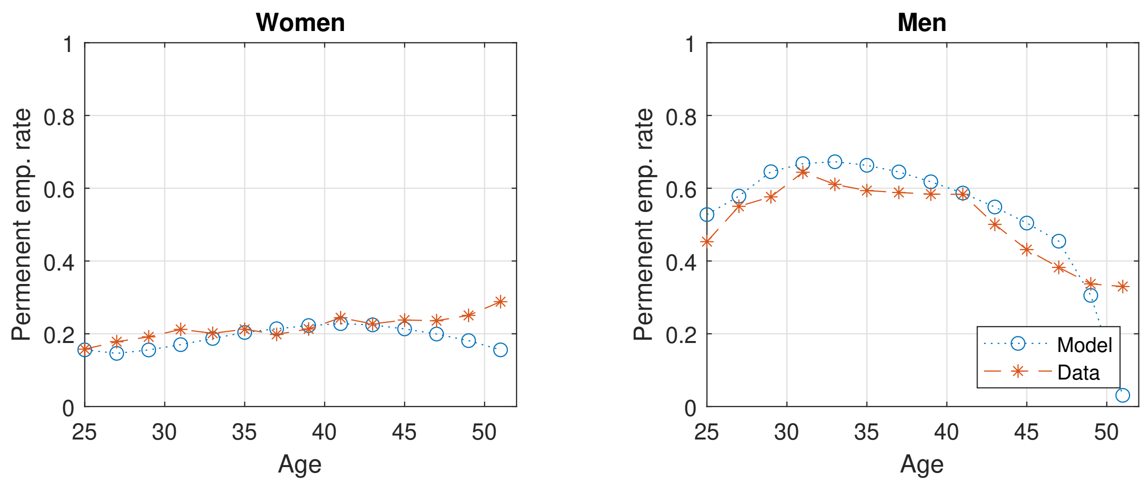
the target moments include only the distribution of completed fertility, not the timing of births. In contrast, the declining trend after age 45 is more directly calibrated, as its slope is calibrated to match the data through the Binomial parameter (p_n), as discussed in Section 5.2.

Figure 9 plots the age profile of wages by gender, which is largely disciplined by internal calibration, subject to the parsimonious parametric assumptions in equations (15) and (24). The model successfully reproduces the widening gender wage gap over the life cycle. The gender wage gap in the model is primarily driven by direct effects, which stem from gender-related differences in career-related parameters that govern wages, such as $\tilde{\gamma}_m = 0.181$ being larger than $\tilde{\gamma}_f = 0.153$, as well as the female-specific wage discount ($\varsigma = 0.221$). These differences contribute to lower wage growth for women compared to men. In addition to these direct effects, indirect effects arise through their impact on endogenous labor supply and career choices, further amplifying the gap with an additional premium on permanent jobs ($\tilde{\omega}_P = 0.107$).

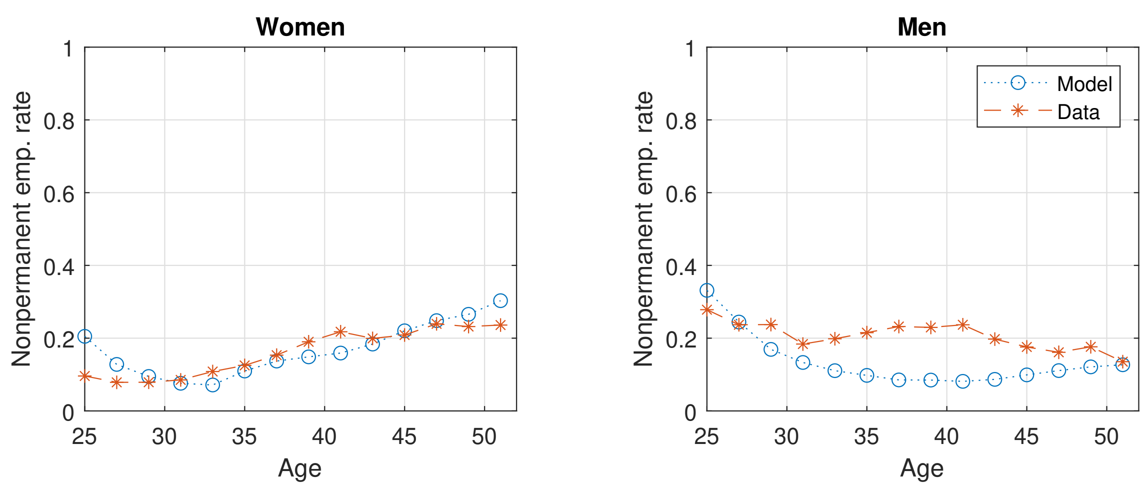
Relatedly, Figure 10 presents permanent job employment rates (Panel (a)) and nonpermanent job employment rates (Panel (b)) by gender over the life cycle, comparing model predictions with the data. The model successfully replicates two key patterns in employment dynamics by gender. First, permanent job employment rates remain consistently low for women throughout the life cycle, whereas men exhibit significantly higher rates, particularly at younger ages. Second, nonpermanent job employment rates increase with age for women, while the opposite holds for men. In the model, these patterns arise due to structural barriers such as entry costs for permanent jobs that increase with age ($\tilde{\xi}_0 = 0.459$, $\tilde{\xi}_1 = 0.139$) and career interruptions from childrearing, which disproportionately limit women's access to career-oriented jobs. These dis-

Figure 10: Employment Rates by Job, Age and Gender

(a) Permanent Job Employment Rates



(b) Nonpermanent Job Employment Rates



proportionate effects stem from gender norms related to childcare, as reflected in the additional participation cost imposed on mothers ($\iota_n = 0.0064$) and the greater childcare responsibility assigned to women ($\lambda_f = 0.461$ vs. $\lambda_m = 0.422$), among others.[32]

Finally, Table 3 presents lifetime labor supply—aggregated for each individual and normalized by the maximum possible labor supply—and completed fertility, categorized by couples' educational matching. Notably, our calibration strategy does not impose any statistics based on educational matching patterns. It is reassuring that the

[32]In fact, our calibration suggests that the gap between λ_f and λ_m is not large, although the model matches the large gender gaps in parental time. This is consistent with the empirical finding by Moon and Shin (2018) that changes in social norms have a limited effect on gender roles in childcare unless the issue of overwork is addressed.

Table 3: Lifetime Labor Supply and Completed Fertility by Educational Matching

	Lifetime labor supply (max: 1)								Completed fertility			
	Female				Male							
$e_f =$	1	1	2	2	1	1	2	2	1	1	2	2
$e_m =$	1	2	1	2	1	2	1	2	1	2	1	2
Model	0.28	0.20	0.36	0.27	0.58	0.62	0.47	0.55	1.56	1.79	1.37	1.76
Data	0.26	0.27	0.28	0.28	0.58	0.61	0.57	0.57	1.71	1.74	1.67	1.63

Notes: Lifetime labor supply is calculated as the sum of total labor supply over the lifetime, divided by the maximum possible labor supply. $e_g = 1$ denotes noncollege-educated, and $e_g = 2$ denotes college-educated.

model reproduces these nontargeted patterns reasonably well, despite some quantitative discrepancies between the model and the data.

6 Quantitative Results

In this section, we use our calibrated model to investigate the impact of PL policy reforms on labor supply, gender gaps, and fertility, presenting the main quantitative exercises.

6.1 PL Policy Reforms and Computational Experiment Design

As discussed in Section 5, Given the timing of childbearing for the baseline cohort (women born in 1970–75), the baseline model sets PL benefits at approximately 400K KRW (300 USD) per month. As detailed in Appendix D, monetary PL benefits were first introduced in 2001 and gradually increased over time. While the benefit amount was adjusted incrementally, the overall structure remained flat, with no major reforms to the replacement rate or maximum duration.

In recent years, the Korean government has expanded PL policy benefits along various dimensions, as described in Appendix D. Accordingly, our quantitative experiments in this section focus on two major policy shifts, referred to as the 2022 Reform and the 2025 Reform.

2022 Reform Our first reform counterfactual considers a version implemented in 2022, characterized by the following key features.

Since 2011, PL benefits have undergone a crucial transition from a flat-rate to an earnings-dependent system, similar to the 2007 maternity leave reform in Germany

(Raute, 2019), with replacement rates improving several times over the following years. The first feature of the 2022 Reform is that, unlike the flat, limited benefits, workers receive PL benefits with a replacement rate of 80% ($\tilde{\theta} = 0.8$), subject to a minimum and a cap. As detailed in Appendix D, the minimum was raised to approximately 1.5 times the baseline flat benefit (inflation-adjusted), while the maximum was increased to about 3.1 times the baseline flat benefit: $\underline{\Theta}' = 1.5 \times \underline{\Theta}$ and $\overline{\Theta}' = 3.1 \times \overline{\Theta}$. Additionally, the maternity leave cap for the third month was increased by 20% in real terms, approximately 1.2 times the baseline: $\overline{\Theta}'_f = 1.2 \times \overline{\Theta}_f$.

Secondly, we also consider the *3+3 program*, introduced in 2022 to encourage joint PL usage in response to low take-up rates among male parents. Under this program, when both parents take PL—three months per parent (hence the name, *3+3 program*)—the replacement rate increases to 100%, and the benefit cap is significantly raised to approximately 6.3 times the baseline flat benefit: $\overline{\Theta}' = 6.3 \times \overline{\Theta}$.

2025 Reform There are ongoing policy debates suggesting that the benefit cap remains insufficient. In the next reform counterfactual, the 2025 Reform, we consider more generous caps set for implementation in 2025. Specifically, the new caps are higher but gradually decrease over time: the first and second quarter caps are 5.2 and 4.2 times the baseline flat benefit ($\overline{\Theta}'_1 = 5.2 \times \overline{\Theta}$ and $\overline{\Theta}'_2 = 4.2 \times \overline{\Theta}$), while the cap for the third quarter and beyond is 3.3 times the baseline ($\overline{\Theta}'_3 = 3.3 \times \overline{\Theta}$).

6.2 Effects of PL Reforms on Labor Markets and Fertility

Effects on Gender Gaps in Labor Supply and Fertility We now evaluate the two versions of PL policy reforms, described in Section 6.1, using the calibrated baseline economy. Table 4 presents the key results on labor supply effects by gender for three age groups (j =1–5, 6–10, 11–14), as well as fertility and PL usage by gender.

A key finding is that the gender gap in labor supply shrinks, mostly driven by increases in female labor supply, while fertility also increases following the PL reforms. The increase in female labor supply is particularly pronounced during early career stages, coinciding with the primary childbearing years, indicating that more mothers are pursuing careers and utilizing PL. Although the fertility effects are not large, they are quite meaningful, with an increase of around 10%. Note that this result contrasts with the predictions of the static model in Section 2, where generous PL benefits are subject to a time allocation trade-off that prevents achieving both goals. In our life-cycle framework, however, career dynamics introduce long-term benefits from PL, leading to increased female labor supply alongside higher fertility.

Table 4: Effects of PL Policy Reforms in the Benchmark Economy

	Labor Supply						Fertility	Parental Leave			
	Female (by j)			Male (by j)				Users (%)		Length(>0)	
	1-5	6-10	11-14	1-5	6-10	11-14	Rate	Female	Male	Female	Male
Baseline	1.70	2.26	2.71	5.44	4.72	3.03	1.67	10.9	0.0	2.4	n/a
Experiments											
	% change relative to baseline										
2022 reform	*2.8*	*2.6*	*1.2*	*-0.2*	*1.0*	*2.4*	*8.8*	24.7	5.0	4.1	4.0
2025 reform	*5.4*	*3.0*	*1.9*	*-0.7*	*0.0*	*1.4*	*11.7*	28.6	4.8	3.9	4.0

Notes: Italicized numbers indicate the effects of PL reforms, expressed as percentage changes relative to the baseline economy. The last four columns report levels for each economy.

It is also worth noting that the effects of the 2022 Reform on labor supply and fertility arise together with the increased use of PL by mothers (25%), which is broadly in line with the 2022 data (30%) (see Figure 6). Reflecting a higher engagement in fathers' PL—though still relatively weak—following both policy reforms, along with a higher spousal labor supply, especially at younger ages, young male labor supply declines slightly. However, some fathers also benefit from the career advantages of PL, raising their labor supply in later years ($j = 11$–14).

Finally, we find that the policy reform can be *self-financing*: despite the increased generosity of PL benefits, government net revenue rises by 0.4% following the 2022 Reform.[33] The self-financing effect arises because PL benefits facilitate a sizable number of women's careers, particularly for those who would have otherwise been out of the labor force, by mitigating career interruptions due to childbearing. The PL policy reform, which shifts from a low, flat benefit to an earnings-dependent system, not only raises fertility disproportionately more among highly educated parents, but also induces more educated and productive parents to increase their *lifetime* labor supply. This latter effect leads to higher tax revenues (from their higher income), more than offsetting the government's increased expenditure on more generous PL benefits. Interestingly, we find that the 2025 Reform, on the other hand, *reduces* government net revenue by 0.8%, indicating that the long-term fiscal benefits can be outweighed by the significantly higher fiscal costs associated with the increased caps.

[33]The government net revenue is defined as the sum of income tax revenues, net of transfers and PL-related expenditures, for all working-age individuals ($j = 1$–14).

Table 5: Effects of PL Reforms on Career Dynamics

Panel A. Job Dynamics by Gender

	Perm. Emp Rate						Nonperm. Emp Rate					
	Female (by j)			Male (by j)			Female (by j)			Male (by j)		
	1-5	6-10	11-14	1-5	6-10	11-14	1-5	6-10	11-14	1-5	6-10	11-14
Baseline	0.16	0.22	0.19	0.62	0.61	0.32	0.12	0.15	0.26	0.20	0.09	0.11
Experiments												
	% change relative to baseline											
2022 reform	*12.3*	*6.9*	*4.1*	*0.7*	*1.0*	*2.6*	*-3.9*	*-3.5*	*-1.8*	*-1.1*	*-1.6*	*0.7*
2025 reform	*15.8*	*9.8*	*6.0*	*0.2*	*0.1*	*1.3*	*-4.5*	*-4.5*	*-2.3*	*-1.2*	*-1.5*	*0.5*

Panel B. Wage Dynamics by Gender

	Avg. Wage						Avg. Perm. Wage					
	Female (by j)			Male (by j)			Female (by j)			Male (by j)		
	1-5	6-10	11-14	1-5	6-10	11-14	1-5	6-10	11-14	1-5	6-10	11-14
Baseline	0.98	1.43	1.68	1.25	1.95	2.30	0.99	1.53	2.03	1.30	1.99	2.48
Experiments												
	% change relative to baseline											
2022 reform	*-0.6*	*0.8*	*0.8*	*0.0*	*0.0*	*0.3*	*-0.5*	*0.4*	*0.5*	*0.0*	*0.0*	*0.3*
2025 reform	*-0.1*	*0.9*	*1.0*	*0.0*	*0.1*	*0.3*	*0.0*	*0.1*	*0.3*	*0.1*	*-0.8*	*-0.1*

Notes: Panel A reports the effects on employment rates, while Panel B reports the effect on wages. Wages are normalized such that the male wage in $j = 1$ is set to one. Italicized numbers indicate the effects of PL reforms, expressed as percentage changes relative to the baseline economy.

Underlying Mechanisms We now illustrate the mechanism through which female labor supply increases significantly, particularly in the long term, while fertility also rises. To this end, Table 5 provides key information on the policy effects on life-cycle career dynamics, including job choices and wages over the life cycle.

Panel A of Table 5 shows a notable and persistent increase in female employment rates in permanent jobs, indicating that more women pursue career-oriented employment. This rise is driven by both transitions from nonpermanent to permanent jobs, as evidenced by reductions in nonpermanent employment rates, and new entries into permanent jobs from individuals previously out of the labor force. Generous PL policies encourage female employment in career-oriented jobs primarily because a larger number of parents benefit from the job protection role of PL, which mitigates the minimum hours requirements imposed on permanent jobs. This inflexibility often acts as an indirect barrier for female parents, who typically bear a greater childcare burden than male parents. Career breaks may hinder female workers from entering permanent jobs when they re-enter the labor market as child-related burdens lessen, due to higher entry costs, particularly for older individuals, thereby pushing them toward nonpermanent employment. Another key factor is that the attractiveness of permanent jobs increases with more generous PL benefits, as eligibility for PL benefits requires employment in permanent positions.

These career-oriented shifts, particularly among women, also contribute to narrowing gender *wage* gaps, as reported in Panel B of Table 5. Interestingly, we find that in the short term, PL reforms lead to a decline in the average wage of young female workers. This negative effect arises from the short-term career costs of using PL and selection effects. As illustrated in Sections 4.3 and 4.4, PL usage negatively affects careers by reducing *actual* labor supply, which in turn hampers promotions or increases the likelihood of demotions, lowering average wages at young ages. However, female workers experience wage growth at older ages ($j = 6$–14) by up to 1%. Having avoided career interruptions in earlier model periods due to PL, they remain in high-paying permanent jobs and sustain career progression, ultimately improving lifetime earnings and closing gender wage gaps.

Heterogeneous Effects of PL Reforms The impact of policy reforms may vary across education groups. We examine how the effects on labor supply and fertility differ in Table 6. The labor supply measure we focus on here is *lifetime labor supply*, calculated as the sum of total labor supply over the lifetime, divided by the maximum possible labor supply. We find that total household labor supply, i.e., the combined labor supply of both spouses, increases substantially more when the male spouse is college-educated. In fact, although female lifetime labor supply tends to increase across all education groups, male lifetime labor supply declines when the male spouse is non-college-educated but rises when he is college-educated.

Table 6 also shows that fertility responses are considerably stronger among college-educated women, particularly those married to non-college-educated men. This pattern aligns with Raute (2019), who estimate the fertility effects of Germany's maternity leave reforms that shifted from a flat benefit to an earnings-dependent system, showing that it raised fertility more among highly educated women. Given that those who benefit most from such reforms are individuals with higher (potential) earnings, and that having a child is an immediate requirement for taking PL (whereas lifetime la-

Table 6: Heterogeneous Policy Effects

	Lifetime Labor Supply (max: 1)								Completed Fertility			
	Female				Male							
$e_f =$	1	1	2	2	1	1	2	2	1	1	2	2
$e_m =$	1	2	1	2	1	2	1	2	1	2	1	2
Baseline	0.28	0.20	0.36	0.27	0.58	0.62	0.47	0.55	1.56	1.79	1.37	1.76
Experiments												
					% change relative to baseline							
2022 Reform	*2.0*	*3.5*	*2.0*	*2.0*	*-0.8*	*1.1*	*-0.7*	*2.1*	*4.9*	*8.1*	*12.9*	*11.3*
2025 Reform	*2.8*	*4.4*	*3.0*	*3.5*	*-1.2*	*0.5*	*-1.8*	*1.1*	*7.7*	*9.5*	*21.5*	*14.2*

Notes: Lifetime labor supply is calculated as the sum of total labor supply over the lifetime, divided by the maximum possible labor supply. $e_g = 1$ denotes noncollege-educated, and $e_g = 2$ denotes college-educated. Italicized numbers indicate the effects of PL reforms, expressed as percentage changes relative to the baseline economy.

bor supply is influenced by longer-term dynamics), our experiments reveal stronger educational gradients in fertility effects.

6.3 Promoting Egalitarian PL Use: Incentive vs. Mandate

In this subsection, we examine an interesting component of the 2022 Reform designed to promote joint PL usage: the *3+3 program*. To assess whether this program effectively fosters more egalitarian PL use, we compare this incentive-based approach with a counterfactual policy that mandates joint PL use. Our model, which endogenizes the choices of both household partners, allows us to conduct this experiment.

Specifically, we evaluate the marginal contribution of the *3+3 program* within the 2022 Reform by comparing the policy effects of the full 2022 Reform to a modified version that excludes only the *3+3 program*. In the joint-use mandate scenario, we replace the *3+3 program* with a restriction requiring that PL can only be used if both spouses take at least one quarter of PL.[34] This counterfactual policy aims to promote gender-equal PL participation and increase fertility, though in a somewhat rigid and prescriptive manner.

Table 7 shows that the marginal effect of the *3+3 program* is evident, as it leads to a higher share of male PL users (5.0%) compared to 4.2% without it. This change is also accompanied by a slightly higher fertility gain under the *3+3 program*. The last

[34] We assume that a quarter of maternity leave is not subject to this mandate.

Table 7: Promoting Egalitarian Parental Leave Use

		Fertility Rate	Parental Leave: Users (%) Female	Parental Leave: Users (%) Male	Parental Leave: Length (> 0) Female	Parental Leave: Length (> 0) Male	Net Gov. Revenue
Baseline		1.67	10.9	0.0	2.4	n/a	
Experiments: 2022 Reform							
3+3	Joint Mandate	*% change*					*% change*
N	N	*8.5*	24.3	4.2	4.0	4.0	*0.6*
Y	N	*8.8*	24.5	5.0	4.1	4.0	*0.4*
N	Y	*0.4*	13.3	3.3	2.0	3.1	*-0.1*

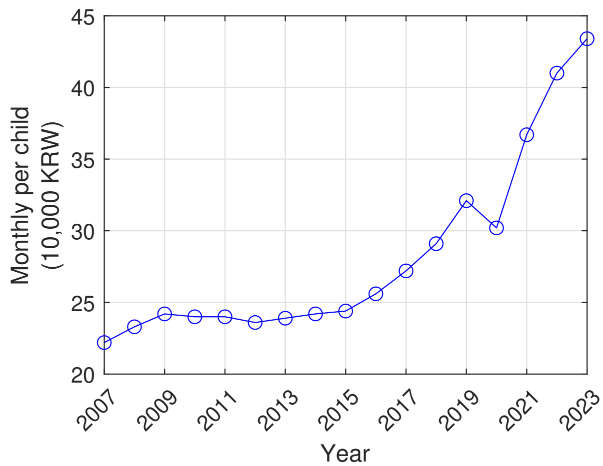
Notes: "3+3" refers to the *3+3 program*, which incentivizes joint PL use by temporarily increasing the cap and replacement rate. "Joint mandate" requires both spouses to take PL for at least one quarter if either spouse wishes to use it.

row of Table 7 presents the results of the mandated joint PL policy. Surprisingly, this mandate leads to only a negligible increase in fertility (0.4%), despite offering more generous benefits than the baseline PL policy. While both female and male PL usage increase relative to the baseline economy with a flat PL benefit, these increases are much smaller than those observed under the *3+3 program* and even the 2022 Reform without it.[35]

These results highlight the ineffectiveness of a mandated joint PL policy. Rather than increasing PL uptake, the mandate discourages PL use by restricting parents to take PL only if their spouse also does. This constraint triggers unintended behavioral responses, with some families avoiding PL altogether, leading to reduced overall participation. Additionally, by making permanent jobs less attractive for women due to rigid PL requirements, the mandate lowers female permanent employment and PL eligibility. These findings suggest that mandated joint PL may ultimately undermine gender-equal PL participation, reducing female PL use, labor supply, and fertility. Moreover, the mandated joint PL policy is not self-financing. Because it neither effectively boosts female labor supply nor supports long-term career development, the policy increases government spending on PL benefits without generating sufficient additional tax revenues.

[35]Since a quarter of maternity leave is not subject to this mandate, the difference in PL usage under this scheme arises because 10% of mothers use only a quarter of maternity leave.

Figure 11: Recent Change in Private Education Expenditure



Source: Private Education Expenditures Survey, Statistics Korea

6.4 The Role of Higher Demands for Private Education

Korea is a prominent example with a strong emphasis on education, often referred to as "education fever" (Kim et al., 2024). Unlike most European countries, Korea exhibits exceptionally high private education spending, which has continuously increased in recent years. Figure 11 illustrates this trend: while average private education spending per child has been substantial for several decades, it has risen by nearly 50% in real terms over the past ten years, now exceeding 300 USD per month.

Note that our baseline model is calibrated to the most recent cohorts who have completed their working years, and the policy effects we have found thus far are based on these cohorts. However, if one is interested in evaluating the impact of PL reforms on currently young households, it would be valuable to consider an alternative economy that captures the significant changes occurring in recent years. Therefore, we conduct policy experiments in an economy with elevated private education expenditures. Specifically, we assume that α is set 30% higher than its calibrated value in the baseline economy. This adjustment results in a 36% increase in the ratio of private education spending (x_q) to household income.

Table 8 presents how the baseline economy would change under heightened private education demand, as well as the effects of the 2022 Reform, alongside their counterparts in the benchmark economy. Interestingly, the baseline economy with higher private education demand leads to significantly lower fertility: 1.39 vs. 1.69 in the

Table 8: Alternative Economy with Higher Demand for Private Education

	Labor Supply						Fertility	Parental Leave			
	Female (by j)			Male (by j)			Fertility	Users (%)		Length(>0)	
	1-5	6-10	11-14	1-5	6-10	11-14	Rate	Female	Male	Female	Male
Baseline	1.70	2.26	2.71	5.44	4.72	3.03	1.69	10.9	0.0	2.4	n/a
Baseline with High α	1.77	2.31	2.77	5.50	4.72	3.13	1.39	15.1	0.0	2.1	n/a
Experiments with Benchmark α											
	% change relative to baseline										
2022 Reform	*2.8*	*2.6*	*1.2*	*-0.2*	*1.0*	*2.4*	*8.8*	24.7	5.0	4.1	4.0
Experiments with High α											
	% change relative to baseline with high α										
2022 Reform	*3.0*	*2.1*	*1.2*	*-0.6*	*-0.4*	*0.1*	*6.5*	29.8	2.3	3.6	4.0

Notes: Italicized numbers indicate the effects of PL reforms, expressed as percentage changes relative to the baseline economy.

baseline scenario, consistent with the persistently declining total fertility rate in Korea. Since more income is required to finance private education (despite having fewer children), the overall labor supply of both females and males increases.

More importantly, although the PL effects on narrowing gender gaps in labor supply remain largely unchanged, the positive impact of more generous PL benefits on fertility is noticeably dampened. These findings highlight a key mechanism of PL policy in fertility decisions: PL benefits primarily support families during the early stages of child-rearing, whereas the financial burden of private education extends over a much longer period. Consequently, when private education spending is high, the effectiveness of PL reforms in promoting fertility is diminished.

7 Conclusion

We document significant gender gaps across various dimensions over the life cycle in Korea's labor markets. We then develop a rich structural life-cycle model of couples with endogenous fertility and career dynamics, calibrated to replicate these labor market patterns and other relevant aspects observed in the data, using cohorts who experienced low, flat PL benefits during their childbearing years. Through a series of policy experiments, we highlight the impact of generous PL benefits on fertility and labor market outcomes. Most importantly, we find that expanding PL benefits—whether through a transition to a more generous earnings-dependent system or by increasing benefit caps—can raise fertility, narrow gender gaps in labor supply, and ultimately reduce gender wage disparities.

We show that this result contrasts with the implications of a static model that relies solely on the conventional time-allocation trade-off. In our dynamic framework, the job protection role of PL, combined with segmented labor markets, allows more women to balance career and family over time. We also find that incentivizing joint PL use is more effective than mandating it, as strict requirements discourage PL use and reduce overall policy effectiveness. Finally, when parents place greater emphasis on child quality, the fertility-boosting effects of PL benefits are weakened.

In general, large-scale reforms requiring significant government budgets may face political challenges. Interestingly, we find that the positive effects of more generous PL benefits on lifetime labor supply are particularly pronounced among highly educated couples, and under moderate expansions with a tight cap, PL reforms can even be self-financing. More generous caps, such as those implemented in 2025, may impose greater fiscal pressure, raising important questions about fiscal policy design. Financing these PL expansions through higher tax progressivity could be a reasonable approach, given that PL policy tends to disproportionately benefit high-income families. Alternatively, optimizing replacement rates by leave duration may offer a better way to cover these costs. We leave this interesting exploration for future work.

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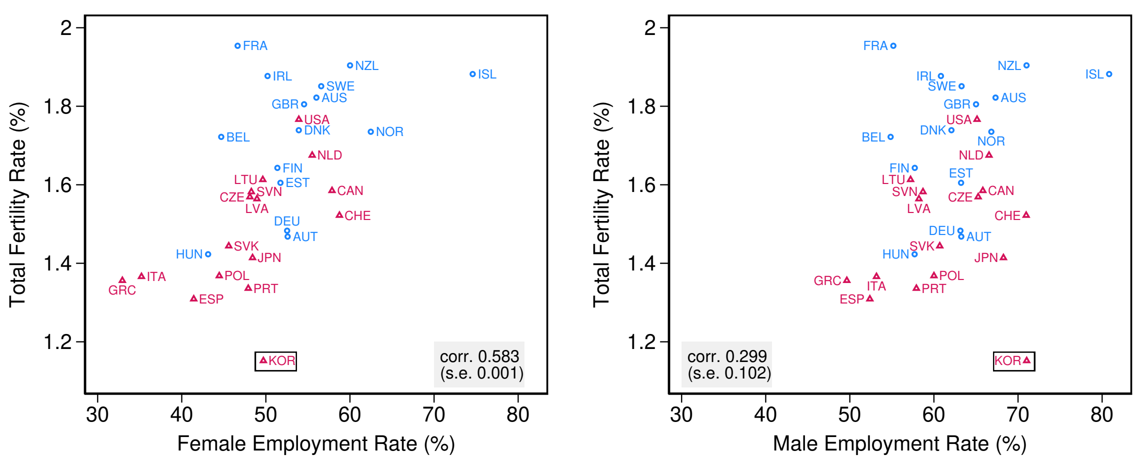
Online Appendix

A Details on Evidence based on Aggregate Data

Work culture affects labor supply patterns for both men and women. Korea exhibits relatively high work pressure and long working hours, as documented in Section 3. Figure A1 plots the relationship between fertility and female vs. male employment rates separately. The left panel closely resembles the positive relationship between fertility and female labor force participation documented in Doepke et al. (2023), with the key difference being that Korea is included. As shown, female employment rates are positively associated with fertility, with a correlation coefficient of 0.58, reaffirming the findings of Doepke et al. (2023). While the correlation for male employment rates is lower (0.30) than for females, it remains positive and statistically significant.

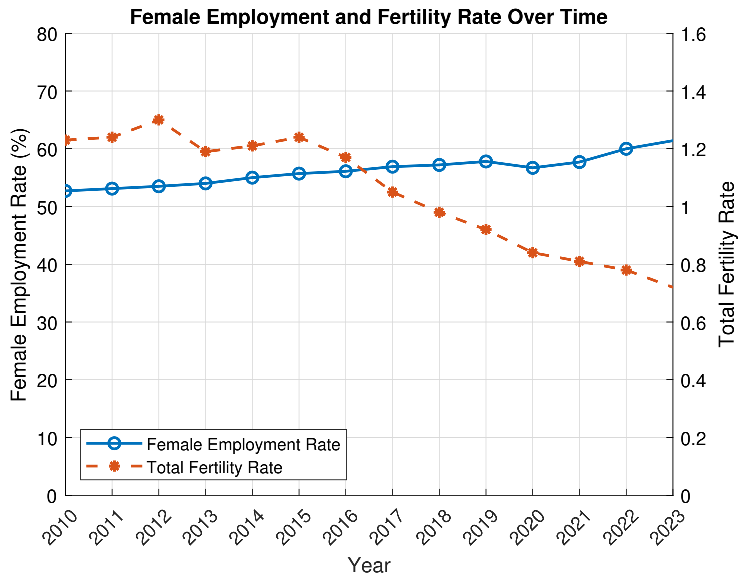
As noted in the introduction, Figure 1 plots fertility against the female employment rate relative to the male employment rate to isolate gender gap aspects while controlling for country fixed effects related to labor supply. Fertility exhibits a stronger positive correlation with the gap between female and male employment rates, yielding a correlation coefficient of 0.65—higher than that observed for female employment alone (0.58).

Figure A1: The Cross-Country Relationship Between Fertility and Female vs. Male Employment Rates



Notes: The x-axis displays the employment rate (%) of working-age females and males employed within the same subgroup. The y-axis represents the total fertility rate. Countries are categorized by public expenditure on family benefits (as a percentage of GDP): blue circles for high expenditure (ranks 1–15) and red triangles for low expenditure (ranks 16–31). Data are country averages over the period 2010–2019. Source: OECD.

Figure A2: Female Employment Rate and Fertility Over Time in Korea



One might wonder whether Korea is a puzzling case that challenges the traditional trade-off between women's work and fertility, which underlies the simple static model presented in Section 2. In Figure A2, we plot the evolution of these two variables at the aggregate level within Korea. We find that they generally move in opposite directions: since 2010, women's hours worked have been on an upward trend, while the total fertility rate has steadily declined. Note that, as we do not observe the counterfactual absence of PL benefit expansions, these time trends alone do not reflect the effects of PL policies.

B Details on Micro Data

B.1 Data and Variable Construction

We use data from the Korean Labor and Income Panel Study (KLIPS) to provide empirical evidence in this paper. KLIPS is a longitudinal survey of representative Korean households and individuals, conducted annually since 1998. The survey tracks 5,000 households and their members, offering detailed information on household demographics, education, labor supply, income, expenditure, and fertility. All monetary variables are originally in 2015 KRW, are adjusted for inflation using the Consumer Price Index (2015=100). We first match the individual and household survey data. Household observations are excluded if (1) no matched female member survey exists or (2) one member is an unpaid worker or a business owner with employees. The second condition ensures a focus on subsistence self-employment.

We extract the following variables from KLIPS. From the household-level survey data, we obtain household ID, year, number of (surviving) children, child age, household labor income (annual), financial income (annual), real estate income (annual), and education spending (monthly). From the individual-level survey data, we collect individual ID, year, age (computed from birth year), education status (dropout, enrolled, graduate) across educational levels (elementary, middle, high school, 2-year college, 4-year college, master's, doctorate), weekly hours worked (regular and extra hours), labor income (monthly wage and non-wage compensation), work status (wage worker, business owner, or unpaid family business worker), regular job status, and employer status.

Using the extracted variables, we define household income as the sum of household labor income, financial income, and real estate income. Childcare spending is constructed based on education spending for children aged one or younger, while non-infant education-related spending is based on education spending for children older than one. At the individual level, total hours worked are defined as the sum of regular and extra working hours, and hourly wages are calculated as labor income divided by 4.3 times working hours. Job status is categorized as permanent if an individual has a regular job and positive working hours, and nonpermanent if they do not have a regular job but have positive working hours.

B.2 Empirical Evidence in Section 3

After applying the sample restrictions to the 1998–2021 waves, our final sample includes 1,485 households (female and male parents) in Cohort 1, 1,537 households in Cohort 2, and 1,369 households in Cohort 3. This corresponds to 14,239 total observations for Cohort 1, 14,116 observations for Cohort 2, and 10,773 observations for Cohort 3. To maintain consistency with the two-year model periods, we first average individual variables over two-year intervals before computing cross-sectional averages for the figures in Section 3.

In addition to the figures presented in Section 3, Figure A3 plots labor supply separately for permanent and nonpermanent workers by gender, while Figure A4 shows wages for nonpermanent workers by gender.

B.3 Details on Calibration

The calibration sample consists of households in which the female member was born between 1970 and 1975 (Cohort 2), as defined above. To facilitate consistency with model statistics, we define household (married couple) age solely based on the female's age, unlike in Section 3. For example, when referring to a man's wage at age 30, we mean the wage of a man whose spouse is 30, not necessarily his own age. In line with the two-year model periods, we average individual variables over two-year intervals.[36] The final calibration sample consists of: 1,614 households and 8,616 observations, with biannual observations ranging from 203 to 896 households.

For the consistency with the quantitative model, labor supply moments are computed after constructing average weekly hours worked over two-year periods, categorized into eight non-zero bins to capture variations in work intensity, capturing both intensive and extensive margins. Specifically, $h_g \in \{0, 1, \cdots, 8 = \bar{h}\}$ corresponds to

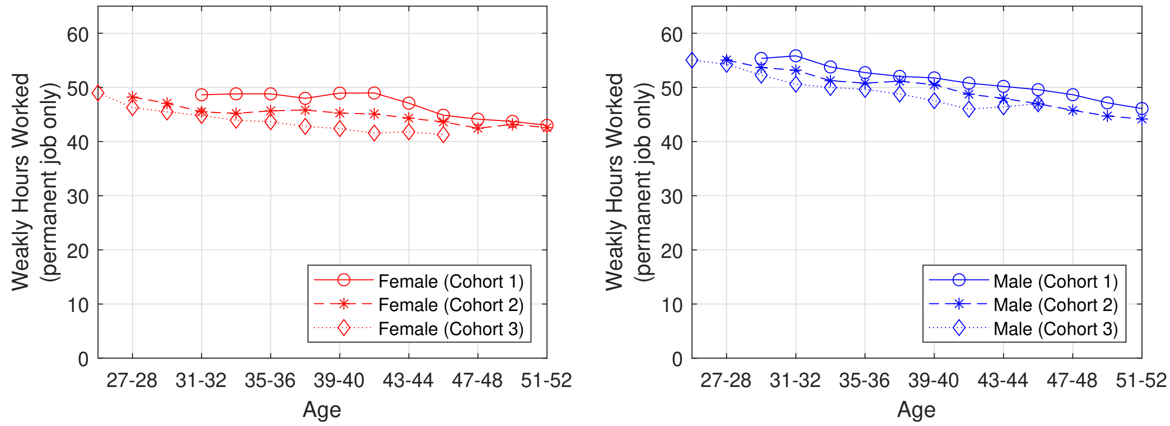
$$
\begin{aligned}
\text{avg. weekly hours worked} &= 0 && \text{if } h_g = 0 \\
9 \times (h_g - 1) < \text{avg. weekly hours worked} &\leq 9 \times h_g && \text{if } 1 \leq h_g \leq 7 \\
63 < \text{avg. weekly hours worked} &\leq h_g && \text{if } h_g = 8
\end{aligned}
$$

Promotion and Demotion Transitions In our model, permanent job workers can experience either promotion (an increase in χ) or demotion (a decrease in χ). Empirically, promotion and demotion are determined based on the two-year wage growth, where either a wage increase or decrease exceeding 20% triggers the corresponding

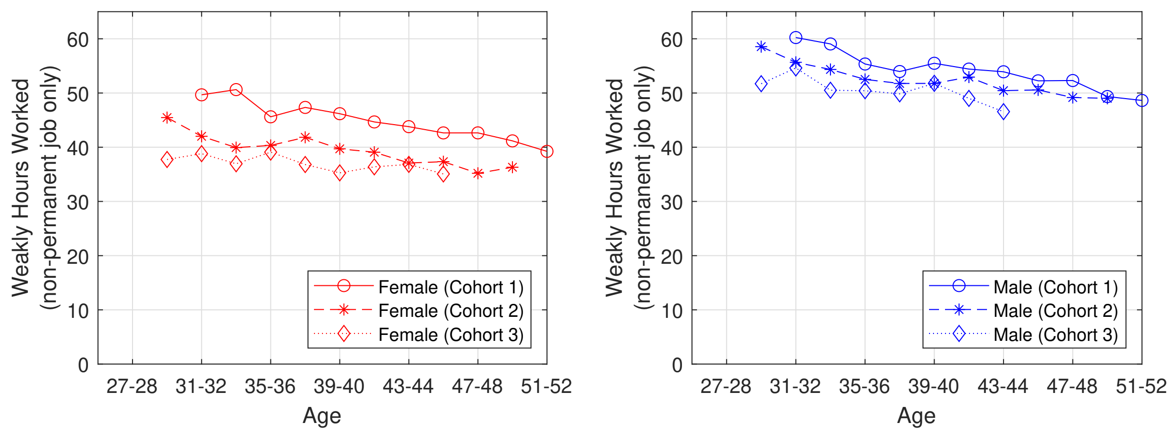
[36] Also, we winsorize the number of children at a maximum of three.

Figure A3: Permanent vs Nonpermanent Labor Supply (Intensive Margin) Dynamics over the Life Cycle by Gender

(a) Permanent



(b) Nonpermanent

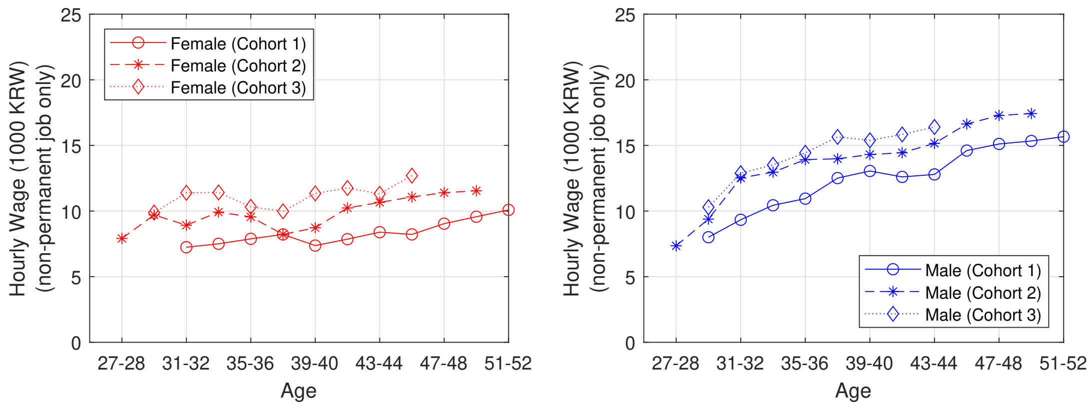


Notes: Labor supply of permanent workers or nonpermanent workers is measured by the average weekly hours worked over two years. Cohort 1: 1965-70, Cohort 2: 1970-75, Cohort 3: 1975-80.

event. The probabilities of promotion and demotion vary by gender and age. For female permanent workers, the promotion probabilities at $h_g = 5$ are $\Pi^u_{P,f,j\in[1,10]}$ =12.4% and $\Pi^u_{P,f,j\in[11,14]}$ =5.6% for younger and older age groups, respectively, while the corresponding demotion probabilities are $\Pi^d_{P,f,j\in[1,10]}$ =5.4% and $\Pi^u_{P,d,j\in[11,14]}$ =4.1%. These probabilities are higher for male permanent workers, with promotion rates of 20.3% and 12.8%, and demotion rates of 6.3% and 5.0% for the two age groups, respectively.

The transition matrix $\pi(\chi'|\chi,(P,P),\mathbf{h})$ is specified according to (28), as discussed in Section 5. We estimate the parameter ζ_P^{motion} through logistic regression on discretized working hours with fixed effects (household by gender by broad age group) as follows.

Figure A4: Nonpermanent Worker Wage over the Life Cycle by Gender



Notes: Wage is calculated as the average hourly wage in 2012 Korean Won over a two-year period. Cohort 1: 1965-70, Cohort 2: 1970-75, Cohort 3: 1975-80.

For promotion (u), the regression equation becomes:

$$\text{Prob}(\ln w_{i,g,j+1} - \ln w_{i,g,j} > 0.2 | h_{i,g,j}) = \frac{\exp\left(\text{fe}_{i,g,\tilde{j}} + \zeta_P^u h_{i,g,j}\right)}{1 + \exp\left(\text{fe}_{i,g,\tilde{j}} + \zeta_P^u h_{i,g,j-1}\right)}, \tag{A1}$$

where i and $\tilde{j}$ index households and broad age groups ($[1, 10]$ and $[11, 14]$), and $\text{fe}_{i,g,\tilde{j}}$ denotes the fixed effects defined above. Similarly, for demotion (d), we have:

$$\text{Prob}(\ln w_{i,g,j+1} - \ln w_{i,g,j} < -0.2 | h_{i,g,j}) = \frac{\exp\left(\text{fe}_{i,g,\tilde{j}} + \zeta_P^d h_{i,g,j-1}\right)}{1 + \exp\left(\text{fe}_{i,g,\tilde{j}} + \zeta_P^d h_{i,g,j-1}\right)}. \tag{A2}$$

The estimated coefficients for ζ_P^u and ζ_P^d from regression equations (A1) and (A2) are 1.230 (0.158) and –1.366 (0.175), respectively, with standard errors in parentheses, clustered at the level of gender by broad age group. The estimated ζ_P^u and ζ_P^d are statistically significant at the 1% level.

Fecundity Probabilities To account for this age-dependent fecundity, we adopt the functional form given by equation (19) and choose the parameters by minimizing the distance between the data points reported in Leridon (2004) and the values implied by the function. The resulting parameter values, $\tilde{\pi}_0 = 0.890$ and $\tilde{\pi}_1 = 0.246$, are plotted in Figure A5.

Initial Distribution Table A1 reports the distribution of education sorting and fertility patterns, measured among families whose women's age is 25–26. Panel A reports

Figure A5: Fecundity by Age Across the Fertile Periods

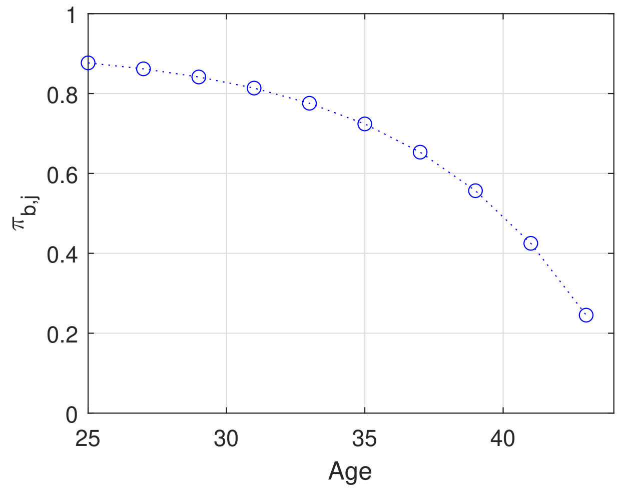


Table A1: Initial Distribution

Panel A. Share

	$e_f =$	1	1	2	2
	$e_m =$	1	2	1	2
Share		36.4%	13.3%	6.7%	43.5%

Panel B. Number of Children

	$e_f =$	1	1	2	2
	$e_m =$	1	2	1	2
No. of children	0	27.8%	37.5%	42.9%	61.7%
	1	36.1%	53.1%	42.9%	28.3%
	2	35.1%	9.4%	14.3%	10.0%
	3+	1.0%	0.0%	0.0%	0.0%
Average		1.093	0.719	0.714	0.483

Notes: This table presents the initial distribution of education sorting and fertility patterns. $e_g = 1$ denotes noncollege, and $e_g = 2$ denotes college. Panel A reports the share of families by education pairing, while Panel B shows the distribution of the number of children across different education groups.

the share of families by education pairing. Panel B shows the distribution of the number of children for each combination of the education groups.

C Recursive Problems in Nonfertile and Old Periods

Infertile periods In non-fertile periods ($j = 11, \cdots, 14$), fertility is not a choice variable, and children leave the household stochastically. The value of a non-fertile household is:

$$\bar{V}(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j) = \mathbb{E}_{\xi} \max_{\mathbf{s}} \left\{ \bar{V}_{\mathbf{s}}(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j) - \sum_{g} \xi_g \mathbb{1}_{\tilde{s}_g = T, s_g = P} \right\}. \tag{A3}$$

The expected value of both working the permanent job before drawing the match-specific shock $\tilde{z}_g$ is

$$\bar{V}_{\mathbf{s}}(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j) = \mathbb{E}_{\tilde{\mathbf{z}}} V_{\mathbf{s}}(a, n, \boldsymbol{\chi}, \tilde{\mathbf{z}}, \mathbf{e}, j). \tag{A4}$$

The value of working s_g job after realization of $\tilde{z}_g$ is

$$V_{\mathbf{s}}(a, n, \tilde{\mathbf{s}}, \boldsymbol{\chi}, \tilde{\mathbf{z}}_{-1}, \mathbf{e}, j) = \max_{\substack{c, a', x_q \geq 0 \\ h_g \in \mathbb{H}_{s_g}}} \left\{ \begin{array}{l} u(c/\Lambda(n)) + \phi(n, x_q^{\alpha}) - v(\mathbf{h}, n, j) - d(\mathbf{l}) \\ +\beta \mathbb{E}_{\boldsymbol{\chi}' | (\boldsymbol{\chi}, \mathbf{s}), \tilde{\mathbf{s}}} \bar{V}(a', n', \tilde{\mathbf{s}}', \boldsymbol{\chi}', \tilde{\mathbf{z}}, \mathbf{e}, j+1) \end{array} \right\} \tag{A5}$$

subject to

$$c + x_q n + a' = \sum_{g} w_g h_g + (1+r)a - \mathcal{T}(\mathbf{h}, a, \mathbf{w}) \tag{A6}$$

$$w_g = \omega_{s,e,j} \gamma_{\chi,g} \tilde{z}_g, \quad g = f, m \tag{A7}$$

$$n' \sim B(n, p_n), \tag{A8}$$

where $B(n, p_n)$ denotes a binomial distribution with parameters n and p_n. In other words, each child leaves the household with probability $1 - p_n$, so the total number of children in the household in the next period follows a binomial process: $n' \sim B(n, p_n)$.

Old Periods The household optimization problem simplifies during the old periods, specifically for $j = 15, ..., 28$, as there is no endogenous labor supply and no children in the household. The value functions in these periods can be expressed as:

$$R(a, \boldsymbol{\chi}, \mathbf{e}, j) = \max_{c, a' \geq 0} \{ u(c/\Lambda(0)) + \beta R(a', \boldsymbol{\chi}, \mathbf{e}, j+1) \}$$

subject to

$$c + a' = \sum_g \mathcal{P}(\chi_g, e_g) + [1 + (1 - \tilde{\tau}_k) r] a$$

where $\mathcal{P}(\chi_g, e_g) = \vartheta \times \tilde{\omega}_0 exp(\tilde{\omega}_1(15-1))(1+\tilde{\gamma}_g)^{(\chi_g - 1)}(1 + \tilde{\omega}_e \mathcal{I}_{e_g=2})$ represents old-age income, which is assumed to be proportional to final working-age income, depending on education and career stage, with a scaling parameter ϑ.

D Parental Leave Policy Reforms in Korea

The PL policy in Korea dates back to 1988, when the Equal Employment Act granted female workers eligibility for unpaid leave for up to one year. In 1995, the Labor Standards Act allowed male workers to take leave only as a substitute for mothers. It was not until 2001 that both mothers and fathers were allowed to take leave, with a small flat monetary benefit introduced at a modest level (approximately 200K KRW per month). Benefit amounts gradually increased over time, reaching 300K KRW in 2002, 400K KRW in 2004, and 500K KRW in 2007.

Maternity leave has existed for decades, first introduced in 1953 under the Labor Standards Act, with a maximum duration of 60 days. In 2001, the same act extended the duration to 90 days, with a 100% replacement rate, subject to a cap of 1,350K KRW for the final month. Paternity leave was introduced in 2008 under the Equal Employment Act, initially allowing a maximum of three days, which was later extended to 10 days in 2019.

In 2011, PL benefits transitioned from a flat-rate system to a wage-dependent structure, covering 40% of the worker's salary. The benefit was capped at approximately 2.5 times the prior flat rate, with a minimum of 500K KRW and a maximum of 1,000K KRW per month. In 2017, PL benefits became more generous. The replacement rate was sharply increased to 80% for the first three months and 50% for the remainder of the leave period. Moreover, the benefit cap rose by 50% to 1,500K KRW, while the minimum increased by 40% to 700K KRW. In 2020, both mothers and fathers in Korea became eligible to take PL simultaneously; prior to this change, parents were required to take leave sequentially without overlap.

In 2022, PL benefits were further expanded, with new benefit amounts set at a minimum of 700K KRW and a maximum of 1,500K KRW per month, while maintaining the replacement rates. Adjusting for a 2% average annual inflation rate, these amounts are equivalent to 583K KRW and 1,250K KRW in baseline terms. Compared to the baseline value of 400K KRW, the 2022 Reform increased the minimum benefit by 50% and the maximum benefit by 210%. Additionally, the maternity leave cap for the third month was raised to 2,000K KRW, representing a 20% increase from the baseline. Notably, the 3+3 program was introduced to encourage joint PL usage in response to low take-up rates among fathers. Under this program, the replacement rate increases to 100% when both parents take PL for three months, either simultaneously or sequentially within a year of birth, and the benefit cap was significantly raised to 3,000K KRW per parent, approximately 6.3 times the baseline amount after inflation adjustment. These form the basis for the policy parameter choices in the *2022 Reform* discussed and analyzed in Section 6.

Despite these expansions, ongoing policy debates suggest that the benefit cap remains insufficient. A recent reform, scheduled for implementation in 2025, will introduce a more generous but gradually diminishing cap structure, with a cap of 2,500K KRW and 2,000K KRW in the first and second quarters, respectively, and 1,600K KRW from the third quarter onward. The policy parameter choices in the *2025 Reform* in Section 6 are based on these changes. In practice, the government also considered other programs that are not incorporated in our analysis to maintain a focused scope. These include the expansion of the 3+3 program, aimed at increasing fathers' PL uptake further, and an extension of the maximum leave duration to 1.5 years.