Gender Inequality and Economic Growth in Korea

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Abstract

Calibrating an endogenous-growth model to Korean data, we analyze the impact of gender inequality in Korea on long-term economic growth. We find that gender equality policies that lower discrimination in the labor market or that increase the time spent by a father on child-rearing can contribute positively to female labor market participation and per capita income growth. The simulation results show that when the disparities between men and women at home and in the labor market are completely removed, the female labor force participation rate increases from 54.4% to 67.5%, and the growth rate in per capita income rises from 3.6% to 4.1% on average over a generation.

JEL codes: O53, E24, J13, J71

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1. Introduction

South Korea has made significant economic progress in the past 50 years, as demonstrated by the increase in its per capita income from just $80 in 1960 to over $24,000 in 2013. A critical factor for Korea's economic success has been its fast-growing, well-educated labor force. From 1960 to 2010 the share of adults who had completed secondary schooling or higher soared from 20% to an impressive 87% in 2010 (Barro and Lee, 2013). This abundance of well-educated workers has brought about higher levels of labor productivity and higher returns on investment and has developed capabilities for facilitating technological adoption and innovation. Low-cost and good-quality labor thus became the foundation for Korea's successful export-oriented development strategy.

During its period of rapid industrialization and development, Korea made substantial strides toward gender equality in education and employment opportunities. The gender gap has become negligible in the secondary school enrollment rates and in the advancement rates to higher education.[1] More noticeable than ever before is the presence of women in such elite professions as law, medicine, and high-level civil service. The general improvement in gender equality in Korea is also manifest in the change in sex ratio at birth.[2]

However, there is still a significant gender gap in labor market participation in Korea. According to the OECD data in 2012, only 55% of Korean women from ages 15 to 64 are in the labor force compared to 65% for OECD countries on average. Korea's female labor force participation rate (LFPR) substantially lags behind the male counterpart: the difference in

[1] In 1990, the average years of schooling for Korean women in their 30s were 10.4 while the average years for men were 11.8. By 2010, those averages had risen to 13.9 for women and to 14.1 for men. However, if we consider only women in their 20s, their average schooling years actually reached 14.3 in 2010, even higher than the 13.9 years of their male counterparts (Social Indicators in Korea, Statistics Korea).

[2] In 1990, at the peak of its rise, the sex ratio at birth—measured by the number of boys born per 100 girls—reached 116.5. By 2007, that ratio fell down to the normal level of 106.

LFPR between men and women was 23.4 percentage points in Korea against 17.5 percentage points on average in all the OECD countries in 2011. This wide gender gap in LFPR in Korea has been quite persistent over time.

The labor force participation rate of Korean women shows an M-shaped pattern over the life cycle. Due to career interruption after marriage or child birth, the rate drops significantly in their late 20s and early 30s (see Figure 1).[3] Many Korean women in their 30's are eventually recruited back to the labor market but child rearing remains a major obstacle for highly educated female workers who want to continue their careers.[4] At all levels of incomes, Korean mothers remain primarily responsible for housework and childcare, and inflexible work environments along with a lack of affordable, good-quality childcare facilities make it challenging for them to balance work and home.

Besides market participation, Korean women are also experiencing gender inequality in various other parts of the society. Table 1 shows various measures of gender gap between men and women in Korea. Korean women are reported to have lower employment rates (especially among those highly educated), be less likely to own their businesses, earn less in wage, and be less represented and participating in politics, government, and corporate boards than men.

Korean women generally have a strong perception that there is gender inequality in various parts of society. According to the 2002 Social Survey by Statistics Korea, 72.4% of women have that perception. This finding was also borne out by the global gender gap report

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[3] Between Korea's married men and women, the gender gap in LFPR is much wider. In 2011, the LFPR of married men in Korea was at 82.8% and that of single men at 52.2%. On the other hand, the LFPR of married women was at 49.3% and that of single women at 50.9%.

[4] The Korea Time Use Survey conducted in 2009 reports that time spent by a wife for childcare is, on average, more than 3 times longer than that by a husband—55 minutes per day vs. 14 minutes.

of the World Economic Forum, which ranked Korea 111th in gender equality in 2013 (Table 2). The WEF index takes into account women's general standing in (i) economic participation and opportunity, (ii) educational attainment, (iii) health and (iv) political empowerment.

Through a three-year plan for economic innovation announced in February 2014, the Korean government is currently trying to address the gender inequality issue head-on. The major goal of this plan is to increase the female employment rate from the current 54% to 62% by 2017. This goal will be pursued by encouraging female workers to remain in the workforce through such measures as providing affordable, good-quality childcare facilities and expanding paid parental leave (see detailed description of the Korean government's policies on gender inequality in Appendix A).

How would this gender-based government policy be effective? Which policy would be most effective in enhancing the growth rate of per capita income? In this paper we attempt to address these questions by quantifying the effects of various policies on female labor force participation and on Korea's long-term economic growth. Another objective of this paper is to assess the cost of gender inequality in term of output lost due to the practice of gender inequality, and examine how high the female labor force participation rate can rise if gender bias is eliminated.

The theoretical framework in this paper is largely an extension of our model in Kim, Lee and Shin (2016) which accounts endogenously for women's time allocation between home production, child rearing, and market work. We extend the model by introducing various aspects that are relevant to the Korean economy in particular. We calibrate the extended model to fit its steady-state values to the observed values from Korea and conduct simulations to quantitatively measure the opportunity cost of gender inequality in terms of foregone output as well as the impacts of gender-based policies on women's labor market participation and economic growth.

There is an increasing body of literature on gender equality and growth.[5] Existing theoretical literature emphasizes three channels through which gender equality influences growth— female labor market participation, average human capital stock, and fertility. A considerable number of empirical papers have investigated the impact of gender inequality in education and employment on economic growth and the majority of these studies have found that gender inequality indeed adversely affects economic growth.

As gender inequality has lately become a pressing issue in Korean society, many Korean researchers have studied various aspects of female labor supply and household work, mostly using microeconomic perspectives. Kim and Sung (2007), Woo (2008), Cho (2009) and Choi (2011) have estimated the labor supply function of Korean women empirically or by model calibration in their investigation of the effects of various government policies like subsidies for childcare and earned income tax credits. Kim and Cho (2003) and Kim (2012) have studied the determinants of labor market reentry by married women after childbirth or childcare leave, including several gender-related policies. Huh (2008) has examined the factors for time spent on household production by men and women.

To the best of our knowledge, no academic research using macroeconomic perspectives has yet been undertaken to assess the effects of gender inequality on economic growth in the Korean economy and this paper is an effort to fill this gap. The paper proceeds as follows after this introductory section: In Section 2, we introduce the formal endogenous-growth model considering various aspects of gender disparity. We then calibrate the model and derive the benchmark steady state that is characterized by a balanced growth path. In

[5] See Kim et al. (2016) for a succinct survey of theoretical papers on this topic, including Galor and Weil (1996) and Lagerlof (2003).

Section 3, we experiment on the effects of gender equality policies and estimate the output cost of gender inequality. Section 4 provides concluding observations.

2. The Theoretical Model

Our theoretical model is built on Agenor (2016), Agenor and Canuto (2015) and Kim et al. (2016). The model has a three-period overlapping generations (OLG) structure where various aspects of gender inequality are related to the economy's growth performance. Based on a similar model, Kim et al. (2016) have shown that improving gender equality can contribute significantly to economic growth by changing female time allocation and promoting accumulation of human capital.[6]

In order to fit the model better to the Korean economy, we modify Kim et al (2016) in several directions. First, aside from market and home production, males are assumed to allocate some of their time to child rearing and education. This modification is essential for examining the impact of a government policy that encourages males to spend more time in child rearing.

Second, we assume that the father's education level as well as that of the mother's determines the accumulation of human capital by their children. This change, along with the change in the first modification that males allocate time to education, will allow us to investigate the perfect gender-equality case where males and females behave exactly in the same way.

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6 The model in Kim et al. (2016) simplifies Agénor (2016), but differs in several important dimensions. First, Kim et al. (2016) explicitly considers the difference between the quantity and quality of children in terms of their costs, following Becker et al. (1990), and allows the altruism in utility, as in Ehrlich et al. (1991). Second, the model assumes the existence of a fixed cost per child and a distinct time cost in educating children. Finally, it also assumes that husbands take limited responsibility in household production, which is one aspect of the gender gap.

Third, we remove the parental bias in favor of sons in time allocation and in the preference for educating children because there seems to be no evidence now of that bias in favor of sons.

Finally, we assume in the benchmark model that the government revenue is not spent on any growth-enhancing activities. This will allow us to explore a possible government policy that switches spending from unproductive usage to education.

2.1 Model Structure

Each individual's lifetime has three periods: childhood, adulthood (middle age) and retirement (old age). There is a continuum of identical families consisting of parents born at time (t-1) and children born at time t. The family's utility function at time *t* is as follows:

$$U_t = \eta_c \frac{1}{1-\sigma} {c_t}^{1-\sigma} + \eta_q \frac{1}{1-\sigma} {q_t}^{1-\sigma}$$

$$+\eta_e \left[\frac{1}{1-\sigma} \left(\left(\frac{n_t}{2}\right)^{\delta} e^m_{t+1} \right)^{1-\sigma} + \frac{1}{1-\sigma} \left(\left(\frac{n_t}{2}\right)^{\delta} e^f_{t+1} \right)^{1-\sigma} \right] + \frac{p_A}{1+\rho} \frac{1}{1-\sigma} {c_{t+1}}^{1-\sigma} \quad (1)$$

where c_t (c_{t+1}) is the family's total consumption during the parents' adulthood (parents' retirement), q_t consumption (and production) of home goods, n_t the number of children (of which half are sons and the other half are daughters), e^m_{t+1} (e^f_{t+1}) the education level of sons (daughters) that will determine the efficiency of male (female) adult workers at t+1, $\rho > 0$ the time discount rate, σ^{-1} the intertemporal elasticity of substitution, and p_A the probability of survival from adulthood to retirement. The coefficient η_c pertains to relative preference for today's consumption, η_q to relative preference for the home-produced good, and η_e to relative preference for children's education.[7]

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[7] In our model, an agent in retirement does not spend time on market production, child education, or child rearing, and therefore obtains utility only from consumption.

We assume that the female adult divides her time for four uses: market production, home production, child rearing, and child education. Thus the time constraint for the female is as follows:

$$h_t^w + h_t^q + h_t^R + h_t^e = 1 \qquad (2)$$

where h_t^w is the adult female's time allocated to market production, h_t^q her time allocated to home production, h_t^R her time allocated to child rearing, and h_t^e her time allocated to child education.

We assume that

$$h_t^{mq} = f_1 h_t^q \qquad (3)$$

where h_t^{mq} is the male adult's time allocated to home production and f_1 represents the bargaining power of a wife with respect to home production. Equation 3 implies that the decision on time allocation to home production by the male and by the female is done in two steps: first, the decision on the female's time allocated to home production is made, and then second, the bargaining power of a female determines the male's proportionate time allocation to home production. The bigger the bargaining power of the women, the higher is the proportion. For simplicity, we assume that f_1 is exogenously determined and constant. Generally $f_1 < 1$ and perfect equality is obtained if $f_1 = 1$. This two-step decision allows us to focus solely on the female's decision, thus simplifying the problem. We will make the same assumption for the time allocation to other uses.

We assume that $h_t^R = (2 - f_2)vn_t$ where $2v$ is total rearing time needed per child as a mother and a father each spends v. Again the male's time allocated to child rearing is

$$h_t^{mR} = f_2 v n_t \qquad (4)$$

where f_2 represents the bargaining power of a female with respect to child rearing. f_2 is not necessarily equal to f_1 since the comparative advantage of the male and the female in these activities are not the same. In general, the female has more comparative advantage in child rearing particularly if child rearing also involves breast feeding.

Finally the time allocated to education satisfies $h_t^e = n_t \epsilon_t^e$ where ϵ_t^e is average education time spent for each child. We assume that the female allocates her time equally between sons and daughters. The male's time allocated to child rearing per child is determined by

$$\epsilon_t^{me} = f_3 \epsilon_t^e \quad (5)$$

where f_3 represents the bargaining power of a female with respect to child education. Hence the total time spent on child education by the male is $h_t^{me} = f_3 n_t \epsilon_t^e$.

Then the time constraint faced by the female can be represented as follows:

$$h_t^w + h_t^q + (2 - f_2) v n_t \; + n_t \epsilon_t^e = 1 \quad (6)$$

The home production function is

$$q_t = \bar{q}(h_t^q + h_t^{mq})^{\gamma} [\left(e_t^f\right)^{\chi} (e_t^m)^{1-\chi}] = \bar{q}(1 + f_1)^{\gamma} (h_t^q)^{\gamma} [\left(e_t^f\right)^{\chi} (e_t^m)^{1-\chi}] \quad (7)$$

where e_t^f and e_t^m are the education level of mother and father, and the second equality holds because of (3). We assume that time spent by a male is perfectly substitutable with time spent by a female. However, we assume that the education of a female and a male is introduced as a Cobb-Douglas functional form where χ and $1 - \chi$ are the output elasticity of female and male education.

The education level of children that will become productivity when they become adults is determined by three factors: the average government spending on education per (surviving) child, a mother's human capital e_t^f, and the time mothers allocate to each child, as follows:[8]

$$e_{t+1}^{f} = e_{t+1}^{m} = \bar{e}\left(\frac{\mu G_t}{n_t^a N_t/2}\right)^{\nu_1}\left[\left(e_t^f\right)^{\chi_1}(e_t^m)^{1-\chi_1}\right]^{1-\nu_1}((1+f_3)\epsilon_t^e)^{\nu_2} \tag{8}$$

where G_t is total government spending, μ an indicator of efficiency of government spending, N_t the number of individuals of generation t, and n_t^a the average number of children in the households. Since we assume the representative household, $n_t^a = n_t$ holds in equilibrium.

The household budget constraint at t and t+1 are[9]:

$$c_t + s_t = (1-\tau)w_t^H \tag{9}$$

$$c_{t+1} = \frac{(1+r_{t+1})s_t}{p_A} \tag{10}$$

where $\tau \in (0,1)$ is the tax rate, s_t saving, r_{t+1} interest rate between t and t+1, and w_t^H total gross wage income for the household.

$$w_t^H = e_t^m h_t^{mw} w_t^m + e_t^f h_t^w w_t^f$$

$$= e_t^m(1 - f_1 h_t^q - f_2 \upsilon n_t - f_3 n_t \epsilon_t^e)w_t^m + e_t^f(1 - h_t^q - (2-f_2)\upsilon n_t - n_t \epsilon_t^e)w_t^f \tag{11}$$

where $h_t^{mw} = 1 - h_t^{mq} - h_t^{mR} - h_t^{me}$ is the time allocated by the male to market production. In this expression, $e_t^m h_t^{mw}$ and $e_t^f h_t^w$ measure labor supply by male and female adults in efficiency units, and w_t^m and w_t^f are effective market wages for male and female adults, respectively.

The household maximizes the utility (1) with respect to c_t, c_{t+1}, h_t^q, ϵ_t^e, and n_t

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[8] The formulas for children's human capital accumulation do not include the role of private education spending. However, the mother's time can be interpreted as comprising private educational spending. The model can be extended to include the allocation of family income to education of children, though the solution of the model becomes much complicated.

[9] As in Kim et al (2016), we assume that the savings made by adults who do not survive to old age are confiscated by the government and equally distributed in lump sum to the surviving adults when they become old. Hence the return rate of saving, $\frac{(1+r_t)}{p_A}$ is higher than the actual interest rate, $1 + r_t$.

subject to the constraints (2)-(11). The first order conditions for c_t and c_{t+1} implies that

$$(\frac{c_{t+1}}{c_t})^{\sigma} = \frac{1+r_{t+1}}{\eta_c(1+\rho)} \tag{12}$$

It is useful to derive the saving rate from (12) as follows:

$$\theta_t = 1 - \frac{1}{1+\frac{P_A}{1+r_{t+1}}(\frac{1+r_{t+1}}{\eta_c(1+\rho)})^{1/\sigma}} \tag{13}$$

Market output is produced by identical firms whose number is normalized to unity. Each identical firm *i*'s production function takes the following form:

$$Y_t^i = \bar{Y}(E_t^m H_t^{mw} N_t^{m,i})^{\alpha}(E_t^f H_t^w N_t^{f,i})^{\alpha}(K_t^i)^{1-2\alpha} \tag{14}$$

where $\alpha \in (0,1)$ is the elasticity of output with respect to male and female effective labor that is assumed to be the same. Since the representative firm hires labor from the labor market, it hires male and female workers with average labor productivity (education level) E_t^m and E_t^f, respectively. The average male and female adult's time allocated to market production is denoted by H_t^{mw} and H_t^w and the numbers of male and female workers are $N_t^{m,i}$ and $N_t^{f,i}$. Finally K_t^i is the amount of capital stock employed by firm *i*.

Profits of firm i are represented as follows:

$$\Pi_t^i = Y_t^i - \left(w_t^m E_t^m H_t^m N_t^{m,i} + w_t^f E_t^f H_t^w N_t^{f,i}\right) - r_t K_t^i \tag{15}$$

where the price of the marketed good is normalized to unity and r_t is the rental rate of capital that is identical to the rate of return to savings. The firm, taking input prices as given, maximizes profits with respect to the number of male and female workers and capital.

As in Kim et al. (2016), we assume that there is discrimination in the labor market against female workers: while male workers receive their marginal product, female workers receive a faction $\mathrm{d} \in (0,1)$ of their marginal product. For simplicity, we assume that firms do not distribute to households the profits accrued due to female discrimination in the labor market. Then the optimal choices of the firm for labor and capital satisfy the following equations:

$$w_t^m = \frac{\alpha Y_t^i}{E_t^m H_t^{mw} N_t^{m,i}},\ w_t^f = \frac{d\alpha Y_t^i}{E_t^f H_t^w N_t^{f,i}},\ r_t = (1-2\alpha)\frac{Y_t^i}{K_t^i} \quad (16)$$

In equilibrium, $N_t^{m,i} = N_t^m$, $N_t^{f,i} = N_t^f$ and $K_t^i = K_t$ for all *i* and the aggregate output is,

$$Y_t = \int_0^1 Y_t^i = \bar{Y}(E_t^m H_t^{mw} N_t^m)^\alpha (E_t^f H_t^w N_t^f)^\alpha (K_t)^{1-2\alpha} \quad (17)$$

From (14) and the equilibrium conditions, the following relation holds between w_t^m and w_t^f:

$$w_t^m E_t^{mw} H_t^m = d^{-1} w_t^f E_t^f H_t^w \quad (18)$$

In equilibrium the following equations hold: $e_t^m = E_t^m$, $e_t^f = E_t^f$, $h_t^{mw} = H_t^{mw}$ and $h_t^w = H_t^w$.

The government finances its expenditure on education, G_t and on unproductive usage, U_t by taxing the wage income.[10] We assume that the expenditure on the unproductive usage is proportional to that on education: $U_t = \emptyset G_t$. Further we assume that the government budget is balanced every period:

$$G_t + U_t = \tau\left(E_t^m H_t^m N_t^m w_t^m + E_t^f H_t^w N_t^f w_t^f\right) \quad (19)$$

where τ is the tax rate of government expenditure. Then

$$(1+\emptyset)G_t = \tau\left(E_t^m H_t^m N_t^m w_t^m + E_t^f H_t^w N_t^f w_t^f\right) \quad (20)$$

or

$$(1+\emptyset)g_t = \tau\left(E_t^m H_t^m w_t^m + E_t^f H_t^w w_t^f\right) \quad (21)$$

where $g_t \equiv \frac{G_t}{N_t^f} = \frac{G_t}{N_t/2}$.

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[10] The model can be easily extended to allow nondistortionary revenue financing public education expenditures or unproductive government spending reallocated to the education sector. This extension will produce a more positive contribution to economic growth in the form of an increase in government education spending.

In equilibrium, from (16) and (18)

$$(1+\emptyset)g_t = \tau\left(E_t^m H_t^m w_t^m + E_t^f H_t^w w_t^f\right) = \tau\left(e_t^m h_t^m w_t^m + e_t^f h_t^w w_t^f\right) = \tau(1+d^{-1}) e_t^f h_t^w w_t^f$$

$$= 2\tau(1+d)\ \alpha \frac{Y_t}{N_t} \text{ , or} \quad (22)$$

$$(1-\emptyset)G_t = \tau(1+d)\ \alpha Y_t \quad (23)$$

A competitive equilibrium satisfies the following three conditions:

(i) The household maximizes utility (1) with respect to $c_t,\ c_{t+1}, n_t,\ h_t^w, h_t^q, h_t^R$ and h_t^e.

(ii) The firm maximizes profits with respect to $N_t^{m,i}, N_t^{f,i}$ and K_t^i.

(iii) Markets cleared. In particular the asset-market clearing condition requires that total savings by all households $(0.5N_t)$ in period t are equal to total capital stock at the beginning of period (t+1): $0.5N_t s_t = N_t^f s_t = K_{t+1}$.

In the balanced growth path, it can be easily verifiable that $\frac{Y_t}{N_t}$ and $\frac{K_t}{N_t}$ grow at the same rate as e_t^f. Hence the female education (that is the same as the male education) is the key to perpetual growth.

The growth rate of per capita GDP in steady state is[11]:

$$1+\gamma_{Y/N} = 2\bar{Y}(1 - fh^{q*} - f_2 vn^* - f_3 n^* \epsilon^{e*})^{\alpha}\ \ (1 - h^{q*} - (2-f_2)vn^* - n^*\epsilon^{e*})^{\alpha}(k^*)^{-2\alpha} d\alpha\Phi\theta^*(n^*)^{-1} \quad (24)$$

where the variables with * are steady state values and $k^{f*} = (\frac{K}{e^f N^f})^*$.

2.2 Calibration and Balanced Growth Path

Most parameter values are from the macroeconomics literature and Kim et al. (2016). Some of our parameters are derived from the calibration of our model to fit into its steady-state values, which are derived from the average values from Korea for period 2005-2010 as

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11 See Appendix B for the derivation.

reported in the World Development Indicators by the World Bank, Bank of Korea data, and Korea Time Use Survey (2009) data. The values are as follows:

(1) Fertility: 1.17

(2) Annual per capita income growth rate: 3.6%

(3) Net private saving rate (% of disposable income): 16.10%[12]

(4) Female and male labor force participation rate: 54.43% and 75.92%

(5) Wife-husband ratio of child rearing time: 5.1[13] (51 min. a day by wife and 10 min. by husband)

(6) Wife-husband ratio of child education time: 3.25 (26 min. a day by wife and 8 min. by husband).

f_2 is derived from equation $(2 - f_2)/f_2 = 5.1$ while f_3 is derived from equation $1/f_3 = 3.25$. Since the male labor force participation rate in our model is $(1 - f_1 h_t^q - f_2 \upsilon n_t - f_3 n_t \epsilon_t^e)$, parameter f_1 can be estimated from the equation: $f_1 h_t^q = 1 - 0.7592 - f_2 \upsilon n_t - f_3 n_t \epsilon_t^e$, where h_t^q, n_t, and ϵ_t^e are endogenously determined in our model. From the calibration with other average values, we are able to pin down the following parameter values: $f_1 = 0.5897$, $f_2 = 0.3279$, $f_3 = 0.3077$, $v = 2.8099$, $\rho = 0.5982$, $\bar{e} = 4.2797$, and $\bar{q} = 23.6313$.[14] Table 3 reports the parameter values used for the calibration, and Table 4 presents the steady-state values of key variables in the model economy.

3. Estimation of the Economic Effects of Gender Inequality in Korea

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12 Net saving rate is private saving rate (22.10%) minus depreciation (6%).

13 Childrearing time includes time spent on washing, feeding, sending off to school, putting in bed, and transportation of children. Child education time includes time spent on helping homework, teaching, and reading.

14 The estimated ρ should be interpreted as the discount rate which comprises the relative preference parameter for consumption η_c. as well as time discount rate over 30 years.

3.1 Output Costs of Gender Inequality

We can measure the output costs of gender inequality by comparing the performances of the benchmark case with those of a hypothetical Korean economy with no gender inequality. In the hypothetical gender-equality case, males and females have the same opportunities and power at home, in education, and in the labor markets.

Table 5 reports the steady-state values of various key variables—fertility, female labor force participation, and per capita output growth rate—in the benchmark case (shown in model (i)) as well as in several hypothetical cases.

Model (ii) of this table illustrates the alternative steady-state of the economy with complete gender equality ($d = 1$, and $f_1 = f_2 = f_3 = 1$). According to the simulation results, the female labor market participation rate increases from 54.4 to 67.5 with complete gender equality. Note that in our framework, the labor force participation rates for males and females are equal with no gender bias at home and labor market. Per capita output growth rate in the new steady-state increases to a higher value. The results show that by eliminating the gender inequality, the annual growth rates of per capita income can be enhanced by approximately 0.5% point, by increasing from the current level of 3.6%. to 4.1%. We also find that the fertility rate becomes 0.98, lower than the value in the benchmark case, 1.17.

The table also presents the new steady state values that would be reached by the Korean economy if one of the four inequalities or the inequalities both in home production and labor market are eliminated for a comparison with the case of complete gender equality. The result in model (iii), for example, shows that with the complete elimination of the gender discrimination in labor market alone (i.e., d=1), the female labor market participation rate increases from 54.4% to 59.3%, and per capita income growth increases from 3.6% to 4.3% on average over a generation.

Interestingly, removing only the gender inequality in home production $(f_1 = 1)$ or education $(f_3 = 1)$ lowers the growth rate of per capita income. The decrease in per capita output growth rate is mainly due to a decrease in male labor supply. As husbands increase the time they allocate to home production, child rearing, and education with perfect gender equality in home production or in education, they will spend less time in the labor market. Another reason for the lower income growth rate per person in the case of perfect gender equality in home production $(f_1 = 1)$ is an increase in fertility and thus also in the population growth rate.

3.2 Gender-based Policies

We consider the following three policies to promote gender equality:

(i) Lower discrimination in the labor market (that is, raising d),

(ii) Increase the time spent by a male on child rearing (raising f_2),

(iii) Lower time cost for child rearing (lowering v).

In Figure 2, we illustrate changes in three key variables of the most interest—fertility rate, female labor market participation rate, and per capita income growth—when the three policies are implemented.

Lowering the discrimination in the labor market by changing the value of d from 0.6 to 0.7 increases the growth rate of per capita output by about 0.2% point. When the distortion in the labor market is reduced, the female's time allocated to market production significantly increases, contributing to the increase in per capita output growth. In this case, the fertility is lowered as females allocate more time to market production.

If males increase time for child rearing, i.e., raising f_2 (from 0.328 to 0.667), both female labor market participation and growth rate of per capita output increase. In this case, the fertility rate decreases.

In contrast, when the rearing time needed per child v is lowered from 2.810 to 2.5, the growth rate of per capita output decreases. Since a decrease in v implies that the cost involved with increasing the quantity of children is lowered, the optimal decision is to increase the fertility. In this case, the increase in the fertility rate dominates the increase in aggregate output, eventually lowering the growth rate of the per capita output.

4. Concluding Remarks

This paper provides a theoretical framework that can explain the determination of female labor market participation, human capital accumulation, and economic growth in the Korean economy. We employ this framework to quantitatively analyze the output cost of gender inequality. Our results indicate that the output cost of gender inequality is quite sizable. If the gender inequality is completely eliminated, the female labor force participation rate increases from 54.4% to 67.5%, and the annual per capita income growth rises from 3.6% to 4.1% on average over a generation. The increase in the economic growth rate implies that with the complete elimination of gender inequality, per capita income will become approximately 15% higher over one generation. We believe that this growth enhancing effect of gender equality is comparable to that of other types of policies contemplated in the Korea economy, such as increasing public infrastructure investment and removing unnecessary regulations.

Among various policy measures related with gender equality that we contemplated in our study, we find that the most effective policy in terms of enhancing the growth rate of per capita income is eliminating the discrimination in the labor market. Policies that attempt to mitigate gender inequalities by reducing women's time allocated to home production, child rearing, and education would be helpful for enhancing growth when they are combined with the reduction of fundamental discrimination in the labor market and are designed to minimize negative influences on the male's labor market participation.

One intriguing lesson from our analysis for policy-making is that a particular policy to meet a specific goal can sometimes produce an adverse effect in terms of another goal of our concerns. One example of this point is the policy to eliminate discrimination against women in the labor market. On one hand, this policy will encourage more women to participate in the labor market and increase female labor force participation. However, it will also raise the opportunity cost of time for women, which will likely lower fertility and thus exacerbate the aging population problem. We can also show that childcare subsidies will lower the cost of childrearing and therefore increase fertility while this policy will lower female labor market participation. Similarly, a public policy that promotes males' engagement in child rearing can increase female labor market participation and per capita income growth, but lower fertility.

Since the early 2000s, the relationship between female labor market participation and fertility among OECD countries (based on the cross-sectional data) has been changed from a negative one to a positive one. The OECD data also show a positive relationship between the gender equality index and fertility in recent years. The results from our analysis indicate that these recent changes are not due to one particular policy but rather due to a combination of policies that are well coordinated. It would be wise for the Korean government to implement multiple public policies together in order to achieve a multiple number of goals.

Our analysis has left a number of important issues related to gender inequality unaddressed. For example, our model does not consider the glass ceiling in promotion for women in business and in the public sector, social norms against gender equality, endogenous determination of bargaining power between wives and husbands, and the like.

While it is desirable to model gender inequality that arises endogenously from more fundamental structures of the economy, we treat gender inequality as exogenous in our model because our main goal is to quantify the impact of gender equality policies on female labor force participation and economic growth. We leave this issues and others to future work.

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APPENDIX A

The Korean government has been pursuing various policies to improve the welfare of women in Korea and to reduce gender inequality. A parallel objective of these policies is to encourage childbearing owing to the accelerated aging of Korean society that has been accompanied by extremely low fertility rates during the last few decades.

With these policies, the Korean government in general aims to provide women with a better environment for childbearing and child rearing so as to encourage and enable them to return to the labor market even as they are raising children.

The policies can be categorized into three types:

1. The first type of policies includes those aimed at helping women give birth successfully and at lowering the cost of childbearing for couples. This type of policies include: (a) maternity and paternity leave (for childbirth), (b) childcare leave of absence (for children ages 0-6) for a maximum of 1 year with pay, and (c) reduced work hours during child rearing (for children ages 0-6) for a maximum of 1 year combined with child care leave of absence.

2. The second type of policies aims at providing parents with more reliable childcare facilities for children in grade schools. These are: (a) incentives for firms to provide childcare centers at work: implemented in June 2013, (b) providing public childcare centers, (c) financial support for childcare, and (d) encouraging private and public childcare centers with financial incentives to offer flexible hours for childcare (starting July 2014).

3. The third type of policies aims at giving companies incentives to hire back women after childbirth or child care. At present, private firms can receive tax subsidies if they employ female workers who are trying to return to the labor market after childrearing.

These policies have been successful to some extent in promoting female labor market participation. For instance, in 2014, the female employment rate among women from age 15 and over rose above the 50% mark—50.4% to be exact—for the first time (Economically Active Population Survey, 2014). However, Korea’s female employment rate is still significantly lower than that of many advanced economies like Canada (69.2%), Japan (60.7%), and Sweden (71.8%). This leaves a lot of room for the Korean government to implement better policies for encouraging women’s participation in the labor market**.**

APPENDIX B

In this appendix, we derive equations needed to solve the steady states. Then we calculate the balanced growth rate.

The household problem is to maximize the household utility function:

$$U_t = \eta_c \frac{1}{1-\sigma} {c_t}^{1-\sigma} + \eta_q \frac{1}{1-\sigma} {q_t}^{1-\sigma}$$

$$+\eta_e\left[\frac{1}{1-\sigma}\left(\left(\frac{n_t}{2}\right)^{\delta}e_{t+1}^{m}\right)^{1-\sigma}+\frac{1}{1-\sigma}\left(\left(\frac{n_t}{2}\right)^{\delta}e_{t+1}^{f}\right)^{1-\sigma}\right]+\frac{p_A}{1+\rho}\frac{1}{1-\sigma}{c_{t+1}}^{1-\sigma} \tag{A1}$$

Subject to

$$q_t=\bar{q}(1+f_1)^{\gamma}(h_t^q)^{\gamma}e_t^f \tag{A2}$$

$$(1-\tau)e_t^m\big(1-f_1h_t^q-f_2vn_t-f_3n_t\epsilon_t^e\big)w_t^m$$

$$+(1-\tau)e_t^f\big(1-h_t^q-(2-f_2)vn_t-n_t\epsilon_t^e\big)w_t^f-c_t-\frac{p_Ac_{t+1}}{1+r_{t+1}}=0 \tag{A3}$$

$$e_{t+1}^m=\bar{e}\left(\frac{\mu G_t}{n_t^aN_t/2}\right)^{\nu_1}[e_t^f]^{1-\nu_1}((1+f_3)\epsilon_t^e)^{\nu_2} \tag{A4}$$

$$e_{t+1}^f=\bar{e}\left(\frac{\mu G_t}{n_t^aN_t/2}\right)^{\nu_1}[e_t^f]^{1-\nu_1}((1+f_3)\epsilon_t^e)^{\nu_2} \tag{A5}$$

The first-order optimality conditions derived from the household problem are:

(c_t) $\qquad \eta_c{c_t}^{-\sigma}=\lambda$

(c_{t+1}) $\qquad \frac{p_A}{1+\rho}{c_{t+1}}^{-\sigma}=\lambda\frac{p_A}{1+r_{t+1}}$, or $\left(\frac{c_{t+1}}{c_t}\right)^{\sigma}=\frac{1+r_{t+1}}{\eta_c(1+\rho)}$ (A6)

(h_t^q) $\quad \eta_q\bar{q}^{1-\sigma}\gamma(1+f)^{\gamma(1-\sigma)}(h_t^q)^{(1-\sigma)\gamma-1}\big(e_t^f\big)^{1-\sigma}=\eta_c{c_t}^{-\sigma}(1-\tau)(f_1e_t^mw_t^m+e_t^fw_t^f)$ (A7)

(ϵ_t^e) $\qquad \eta_e\left(\left(\frac{n_t}{2}\right)^{\delta}e_{t+1}^{m}\right)^{-\sigma}\left(\frac{n_t}{2}\right)^{\delta}\bar{e}\left(\frac{\mu G_t}{\frac{n_t^aN_t}{2}}\right)^{\nu_1}(e_t^f)^{1-\nu_1}(1+f_3)^{\nu_2}\nu_2(\epsilon_t^e)^{\nu_2-1}$

$$+\ \eta_e\left(\left(\frac{n_t}{2}\right)^{\delta}e_{t+1}^{f}\right)^{-\sigma}\left(\frac{n_t}{2}\right)^{\delta}\bar{e}\left(\frac{\mu G_t}{\frac{n_t^aN_t}{2}}\right)^{\nu_1}(e_t^f)^{1-\nu_1}(1+f_3)^{\nu_2}\nu_2(\epsilon_t^e)^{\nu_2-1}$$

$$=\eta_c{c_t}^{-\sigma}(1-\tau)[e_t^m(f_3n_t)w_t^m+e_t^f(n_t\epsilon_t^e)w_t^f] \tag{A8}$$

(n_t) $\qquad \eta_e(e_{t+1}^m)^{1-\sigma}\left(\frac{1}{2}\right)^{\delta(1-\sigma)}\delta(n_t)^{\delta(1-\sigma)-1}+\eta_e\big(e_{t+1}^f\big)^{1-\sigma}\left(\frac{1}{2}\right)^{\delta(1-\sigma)}\delta(n_t)^{\delta(1-\sigma)-1}$

$$=\eta_c{c_t}^{-\sigma}(1-\tau)[e_t^fw_t^f(\epsilon_t^e+(2-f_2)v)+e_t^mw_t^m(f_3\epsilon_t^e+f_2v)]\ . \tag{A9}$$

Since $e_t^m=E_t^m$, $e_t^f=E_t^f$, $h_t^m=H_t^m$, $h_t^f=H_t^f$, $Y_t^i=Y_t$ and $N_t^{m,i}=N_t^{f,i}=\frac{1}{2}N_t$ in an equilibrium, we have

$w_t^f=\frac{2d\alpha}{e_t^fh_t^w}\frac{Y_t}{N_t}$, and (A10)

$$w_t^m=\frac{2\alpha Y_t}{e_t^mh_t^{mw}N_t}=\frac{2\alpha}{e_t^f(1-f_1h_t^q-f_2vn_t-f_3n_t\epsilon_t^e)}\frac{Y_t}{N_t}\ . \tag{A11}$$

(i) Dynamics for the population size N_t

The number of adults next period N_{t+1} is the surviving children born at time t. Since the number of households at time t is $\frac{N_t}{2}$ and each household gives birth to n_t that will survive with probability p_c, the dynamics of N_t follows:

$$N_{t+1} = n_t \frac{N_t}{2} \tag{A12}$$

(ii) Savings

For deriving the saving rate, we can use equations (7) and (8).

$$c_t + \frac{p_A c_{t+1}}{(1+r_{t+1})} = (1-\tau) w_t^H \tag{A13}$$

Substituting (A6) into (A13) yields,

$$c_t + \frac{p_A}{1+r_{t+1}} \left(\frac{1+r_{t+1}}{\eta_c(1+\rho)}\right)^{1/\sigma} c_t = (1-\tau) w_t^H, \text{ and therefore} \tag{A14}$$

$$c_t = \frac{1}{1+\frac{p_A}{1+r_{t+1}}\left(\frac{1+r_{t+1}}{\eta_c(1+\rho)}\right)^{1/\sigma}} (1-\tau) w_t^H \tag{A15}$$

Hence the saving rate θ_t is

$$\theta_t = 1 - \frac{1}{1+\frac{p_A}{1+r_{t+1}}\left(\frac{1+r_{t+1}}{\eta_c(1+\rho)}\right)^{1/\sigma}} \tag{A16}$$

Since $e_t^m = E_t^m$, $e_t^f = E_t^f$, $h_t^m = H_t^m$ and $h_t^f = H_t^f$ is held in equilibrium, total gross wage income for the household becomes

$$w_t^m e_t^m h_t^{mw} = d^{-1} w_t^f e_t^f h_t^w \tag{A17}$$

Then the budget constraint for the household becomes

$$w_t^H = e_t^m h_t^{mw} w_t^m + e_t^f h_t^w w_t^f = (1+d^{-1}) e_t^f h_t^w w_t^f \tag{A18}$$

Total savings S_t in equilibrium are therefore

$$S_t = \theta_t (1-\tau)(1+d^{-1}) e_t^f h_t^w w_t^f = \theta_t \ \Phi e_t^f \left(1 - h_t^q - (2-f_2) v n_t - n_t \epsilon_t^e\right) w_t^f \tag{A19}$$

where $\Phi = (1-\tau)(1+d^{-1})$. We can also show that the interest rate is

$$r_{t+1} = (1-2\alpha) \frac{Y_{t+1}}{K_{t+1}} \tag{A20}$$

(iii) Dynamics for the capital stock K_t

From the condition for the equilibrium in section 3.1, we have

$$K_{t+1} \quad = 0.5\left(N_t^m + N_t^f\right) S_t \quad = N_t^f S_t = \Phi N_t^f \theta_t e_t^f \left(1 - h_t^q - (2-f_2) v n_t - n_t \epsilon_t^e\right) w_t^f$$

$= d\alpha\Phi\theta_t Y_t$, and dividing both size by K_t, (A21)

$\frac{K_{t+1}}{K_t} = d\alpha\Phi\theta_t \frac{Y_t}{K_t}$, and therefore (A22)

$$Y_t = \bar{Y}(\frac{E_t^m N_t^m}{K_t})^\alpha (\frac{E_t^f N_t^f}{K_t})^\alpha \ (1 - f_1 h_t^q - f_2 v n_t - f_3 n_t \epsilon_t^e)^\alpha \ (1 - h_t^q - (2 - f_2) v n_t - n_t \epsilon_t^e)^\alpha K_t, \quad \text{(A23)}$$

$$\frac{Y_t}{K_t} = \bar{Y}(\frac{1}{k_t^m})^\alpha (\frac{1}{k_t^f})^\alpha \ (1 - f_1 h_t^q - f_2 v n_t - f_3 n_t \epsilon_t^e)^\alpha \ (1 - h_t^q - (2 - f_2) v n_t - n_t \epsilon_t^e)^\alpha, \quad \text{(A24)}$$

where $k_t^m = \frac{K_t}{E_t^m N_t^m}$ and $k_t^f = \frac{K_t}{E_t^f N_t^f}$.

Since $e_{t+1}^f = e_{t+1}^m$ $k_t^m = k_t^f$, (A25)

$$\frac{Y_t}{K_t} = \bar{Y} \ (1 - f_1 h_t^q - f_2 v n_t - f_3 n_t \epsilon_t^e)^\alpha \ (1 - h_t^q - (2 - f_2) v n_t - n_t \epsilon_t^e)^\alpha (\frac{1}{k_t^f})^{2\alpha} \quad . \quad \text{(A26)}$$

(iv) Dynamics for Education

From (6), (17) and (18),

$$e_{t+1}^f = e_{t+1}^m = \bar{e}\left(\frac{\mu G_t}{n_t^a N_t/2}\right)^{\nu_1} (e_t^f)^{1-\nu_1} [\epsilon_t^e]^{\nu_2} = \bar{e}\left(\frac{\mu\tau(1+d)\alpha}{n_t^a/2}\right)^{\nu_1} \left(\frac{(1-\emptyset)^{-1} Y_t}{N_t}\right)^{\nu_1} (e_t^f)^{1-\nu_1} [\epsilon_t^e]^{\nu_2} \quad \text{(A27)}$$

By definition,

$$\frac{Y_t}{0.5 e_t^f N_t} = \frac{Y_t}{K_t} \frac{K_t}{e_t^f N_t^f} = \frac{Y_t}{K_t} k_t^f$$

$$= \bar{Y} \ (1 - f_1 h_t^q - f_2 v n_t - f_3 n_t \epsilon_t^e)^\alpha \ (1 - h_t^q - (2 - f_2) v n_t - n_t \epsilon_t^e)^\alpha (k_t^f)^{1-2\alpha} \quad \text{(A28)}$$

(v) Dynamics for k_t^f

$$k_{t+1}^f = \frac{K_{t+1}}{E_{t+1}^f N_{t+1}^f} = \frac{K_{t+1}}{E_{t+1}^f 0.5 n_t N_t/2} = \frac{d\alpha\Phi\theta_t Y_t}{0.25 E_{t+1}^f n_t N_t}$$

$$= \frac{d\alpha\Phi\theta_t Y_t/N_t}{0.25 n_t \bar{e}\left(\frac{\mu\tau(1+d)\alpha}{n_t/2}\right)^{\nu_1}\left(\frac{Y_t}{N_t}\right)^{\nu_1} (e_t^f)^{1-\nu_1} [\epsilon_t^e]^{\nu_2}}$$

$$= \frac{d\alpha\Phi\theta_t}{[2(1-b)]^{\nu_2} \bar{e} (n_t)^{1-\nu_1}} (\mu\tau(1+d)\alpha)^{-\nu_1} \left(\frac{Y_t}{0.5 e_t^f N_t}\right)^{1-\nu_1} 2(\epsilon_t^e)^{-\nu_2}$$

$$= \Gamma\theta_t \ \left(\frac{Y_t}{0.5 e_t^f N_t}\right)^{1-\nu_1} (\epsilon_t^e)^{-\nu_2}$$

$$= \ \Gamma\theta_t \ (\bar{Y}\Gamma_1)^{1-\nu_1} \ (1 - f h_t^q)^{\alpha(1-\nu_1)} \ (1 - h_t^q - v n_t - n_t \epsilon_t^e)^{\alpha(1-\nu_1)} (\epsilon_t^e)^{-\nu_2} (k_t^f)^{(1-2\alpha)(1-\nu_1)}$$

(A29)

where $\Gamma = \frac{2d\alpha\Phi}{\bar{e}(n_t)^{1-\nu_1}}(\mu\tau(1+d)\alpha)^{-\nu_1}$.

(vi) Steady-State Growth Rate

From (A11), (A21), and (A24)

$$\frac{Y_{t+1}}{N_{t+1}} = \frac{Y_{t+1}}{K_{t+1}}\frac{K_{t+1}}{N_{t+1}} = \frac{Y_{t+1}}{K_{t+1}}K_{t+1}\frac{1}{N_{t+1}}$$
$$= \bar{Y}\ \ (1 - f_1 h_t^q - f_2 v n_t - f_3 n_t \epsilon_t^e)^\alpha\ \ (1 - h_t^q - (2-f_2)v n_t - n_t\epsilon_t^e)^\alpha (\frac{1}{k_{t+1}^f})^{2\alpha}\ \ d\alpha\Phi\theta_t Y_t \frac{1}{n_t \frac{N_t}{2}}$$

$$=2\bar{Y}\ \ (1 - f_1 h_t^q - f_2 v n_t - f_3 n_t \epsilon_t^e)^\alpha\ \ (1 - h_t^q - (2-f_2)v n_t - n_t\epsilon_t^e)^\alpha (\frac{1}{k_{t+1}^f})^{2\alpha}\ \ d\alpha\Phi\theta_t \frac{1}{n_t}\frac{Y_t}{N_t}$$

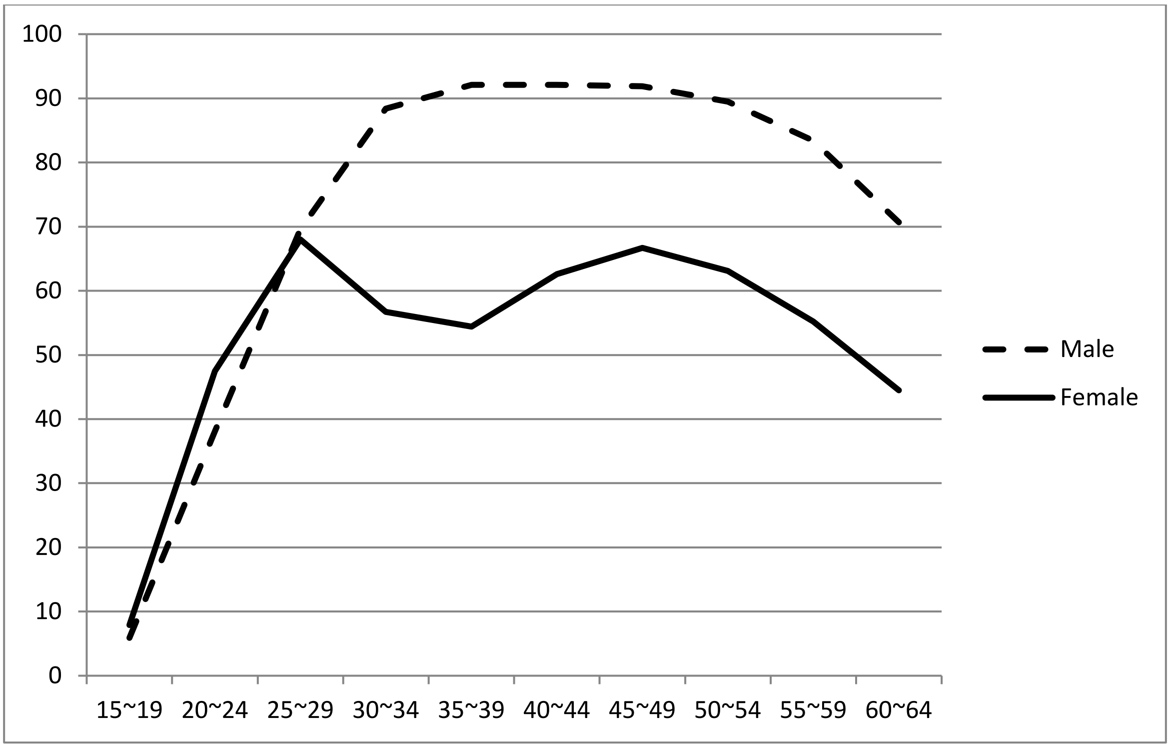
In the steady state, we have

$$1 + \gamma_{Y/N} = 2\bar{Y}(1 - f h^{q*} - f_2 v n^* - f_3 n^* \epsilon^{e*})^\alpha (1 - h^{q*} - (2-f_2)v n^* - n^*\epsilon^{e*})^\alpha (k^*)^{-2\alpha} d\alpha\Phi\theta^*(n^*)^{-1} \tag{A30}$$

where the variables with * are steady state values and $k^{f*} = (\frac{K}{e^f N^f})^*$.

When f increases, depending on what happens to the steady state solutions, particularly h^q, the steady state growth rate can either increase or not.

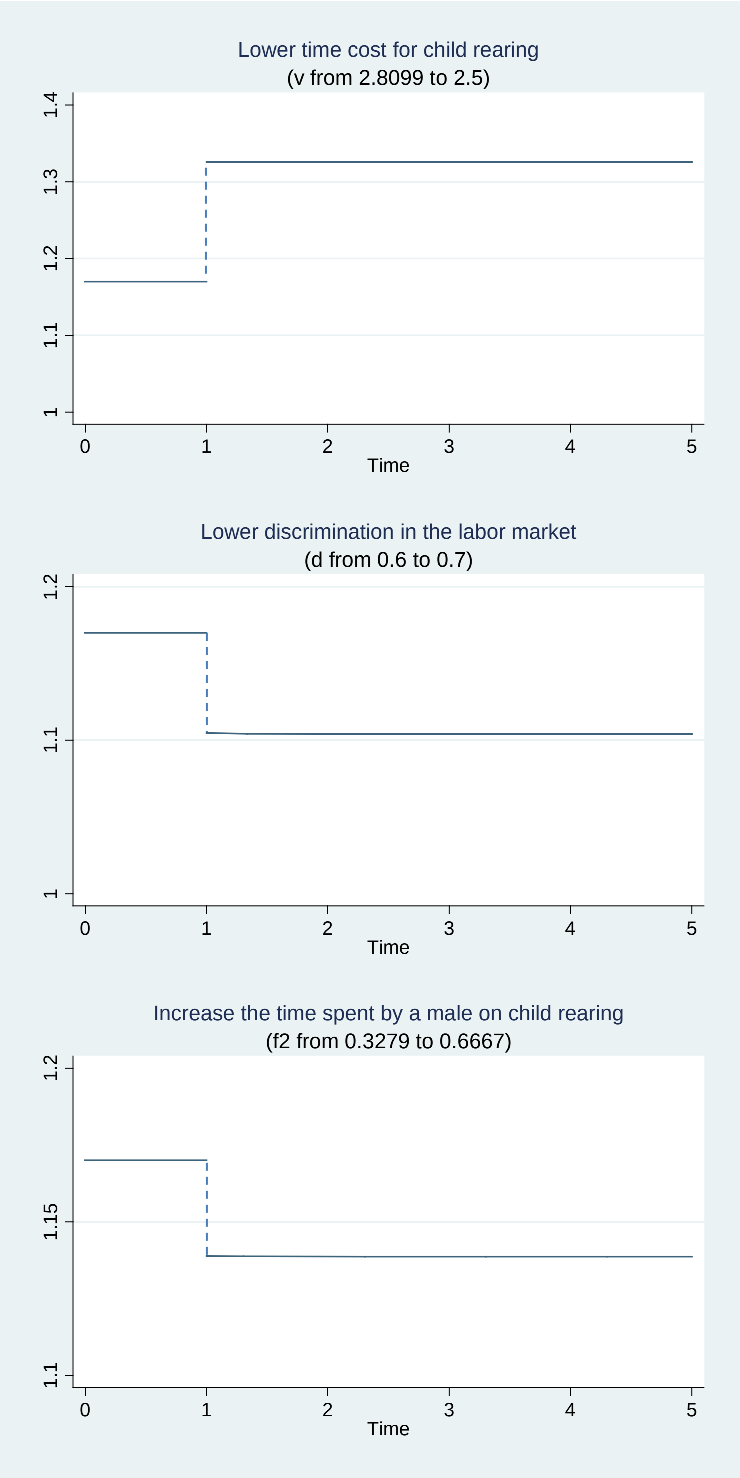
Figure 1. Cohort Employment Rate in 2013: Male vs. Female in Korea



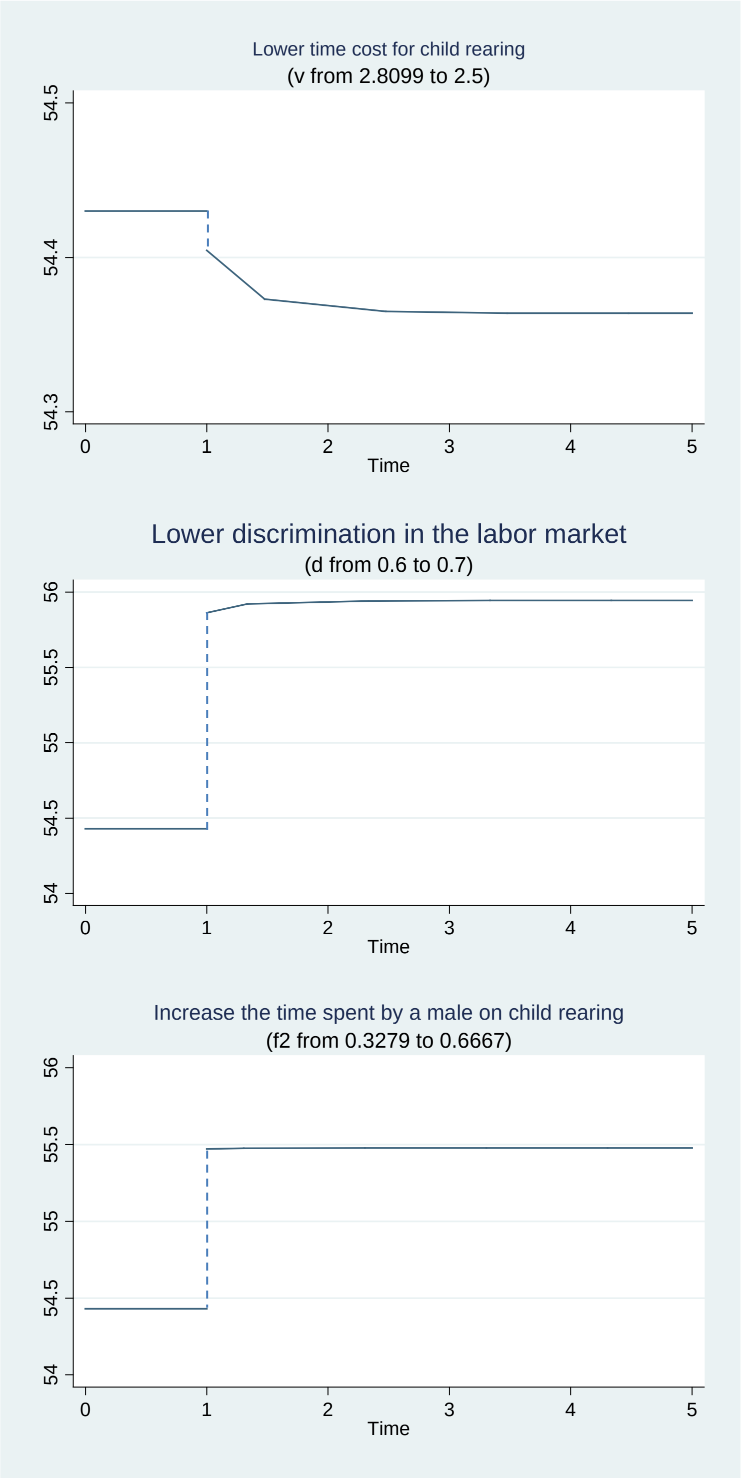
Source: OECD (http://stats.oecd.org)

Figure 2. The Impact of Gender Equality Policies

2.1 Fertility



2.2 Female's Time Allocated to Market Production



2.3 Per Capita Output Growth

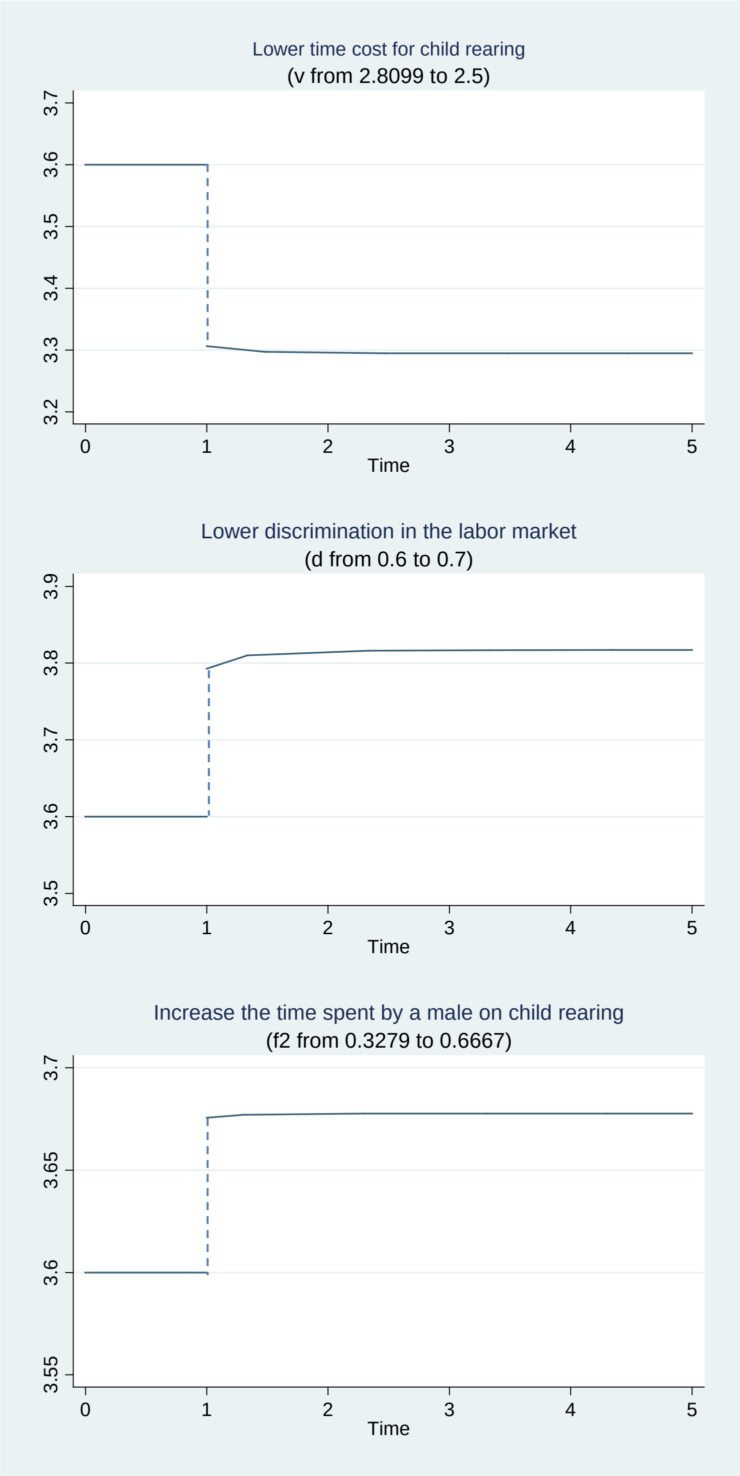


Table 1. Various Measures of Gender Gap in Korea

	Women	Men
Employment rate[a]		
Master's degrees or higher	59.4%	80.6%
Bachelor degrees	50.0%	58.7%
Distribution of workers by employment types[b]		
Employer	3.2%	8.4%
Own account workers	12.4%	20.3%
Unpaid family workers	10.7%	1.2%
Regular	37.1%	49.5%
Temporary	28.7%	15.0%
Daily	7.9%	6.8%
Relative average monthly wage[c]		
Overall	64%	100%
Bachelor degrees or higher	66%	100%
Professional occupations (doctors, lawyers, etc.)	62%	100%
Representation in politics and government		
18^{th} National Assembly members	41	258
Federal government employees[d]	41%	59%
Members of corporate boards[e]	1.9% [12%]	98.1% [88%]

Data sources: a. Ministry of Education, Science and Technology. *Statistical Yearbook of Education*, 2011. b. Statistics Korea. *Annual Report on the Economically Active Population Survey*, 2011. c. Ministry of Employment and Labor. *Survey on Labor Conditions by Type of Employment*, 2010. d. Statistics Korea. *Annual Report on the Economically Active Population Survey*, 2011. e. GMI Ratings. "GMI Ratings' 2013 Women On Board Survey", April 2013.

Note: 1. Average monthly wage is based on the total of the monthly salary and the monthly share of the annual bonus. 2. Members of corporate boards comprise both private and public firms.

Table 2. The Global Gender Gap Index Ranking in 2013

Country	Overall	Economic participation and opportunity	Educational attainment	Health and Survival	Political empowerment
Iceland	1	22	1	97	1
Finland	2	19	1	1	2
Norway	3	1	1	93	3
Sweden	4	14	38	69	4
Philippines	5	16	1	1	10
Germany	14	46	86	49	15
United States	23	6	1	33	60
Sri Lanka	55	109	48	1	30
Singapore	58	12	105	85	90
Thailand	65	50	78	1	89
China	69	62	81	133	59
Vietnam	73	52	95	132	80
Bangladesh	75	121	115	124	7
Indonesia	95	103	101	107	75
India	101	124	120	135	9
Malaysia	102	100	73	75	121
Japan	105	104	91	34	118
Korea, Rep.	111	118	100	75	86
Pakistan	135	135	129	124	64

Source: Bekhouch, Y., Hausmann, R., Tyson, L. D., & Zahidi, S. (2013, September). *The Global Gender Gap Report 2013*.

Table 3. Calibrated Parameters

Parameter	Value	Description
Households		
ρ	0.5982*	Time discount rate (over 30 years)
σ	0.8	Inverse of elasticity of substitution
P_A	0.987	Survival probability
δ	1.05	Preference parameter for number of children
η_e	0.2	Preference parameters for children's education
η_q	12	Family preference parameter for home production output
η_c	3.5	Preference parameter for consumption
υ	2.8099*	
Home output		
γ	0.122	Curvature of production function
f_1	0.5897*	Bargaining power of a female in home production
f_2	0.3279*	Bargaining power of a female in child rearing
f_3	0.3077*	Bargaining power of a female in child education
$\bar{q}$	23.6313*	
χ	0.8	
Market output		
α	0.4	Elasticity with respect to (wrt) labor input
d	0.6	Gender bias in the workplace
$\bar{Y}$	1	
Human capital		
υ_1	0.4	Elasticity wrt public spending in education
υ_2	0.3	Elasticity wrt public-private ratio
$\bar{e}$	4.2797*	
Government		
τ	0.163	Tax rate on marketed output
μ	0.39	Education spending efficiency parameter
$\emptyset$	3	Factor of unproductive, exogenous government expenditure to educational expenditure

Note: Parameter values with * are derived from our own calibration of the model, using the World Development Indicators by the World Bank, data from the Bank of Korea, and Korea Time Use Survey data. The rest are from the macroeconomic literature and Kim et al. (2016). See section 2.2 for details.

Table 4. Steady State Solutions

Variables	Value	Description
$p_c n$	1.17	Fertility rate (n = 1.17)
h^m	0.7592	Labor force participation rate of males
h^w	0.5443	Labor force participation rate of females
θ	0.1610	Net private savings rate
$\gamma_{Y/N}$	1.889	Per capita growth rate (= 1.0360^{30} – 1)

Source: Authors' calculation

Table 5. Steady-state Values for the Hypothetical Cases with Gender Equality

	Fertility	Female labor participation rate (%)	Per capita output growth rate
(i) *Current level*	*1.17*	*54.43*	*0.0360*
Complete gender equality			
(ii) d =1, $f_1 = f_2 = f_3 = 1$	0.98	67.51	0.0406
Partial equality			
(iii) d = 1	0.97	59.30	0.0434
(iv) $f_1 = 1$	1.29	62.24	0.0346
(v) $f_2 = 1$	1.10	56.50	0.0378
(vi) $f_3 = 1$	1.08	55.43	0.0345
(vii) d =1, $f_1 = 1$	1.04	64.84	0.0420

Note: See Table 3 for the definition of the parameters, d, f_1, f_2, and f_3.

Source: Authors' calculation