Affirmative Action in Korea: Its Impact on Women's Employment, Corporate Performance and Economic Growth[*]

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Abstract

This paper analyzes the economic impact affirmative action (AA) has had in Korea, since its implementation in 2006. It estimates both AA's effect on women's employment and corporate performance at the firm level, and AA's potential effect on overall economic growth. The difference-in-differences (DD) estimation results imply that AA in its current format has not significantly raised the overall number of women workers or that of women managers; AA has exerted no significant effect on firm performance, either. The 3SLS estimation results of an augmented Solow growth model suggest that AA can accelerate economic growth, if it effectively reduces the gender wage gap.

Keywords: affirmative action, female employment, corporate performance, economic growth
JEL classification: J16, J71

In Korea, the economic status of women has remained low compared to that of men, and also when compared to the status of women in most other industrialized countries. The employment-to-population ratio of Korean women aged 15-64 was 52.6% in 2010, which was substantially lower than the 73.9% ratio for Korean men of the same age group; this difference of percentage by gender was larger than that of most other OECD countries. Korean women currently earn, on average, only sixty-odd percent of what their male counterparts earn; this shows an exceptionally large gender wage gap in comparison to the 80% and above of male counterparts' salaries that women earn in most other OECD countries (OECD, 2011). Korean studies of this gender wage gap insinuate that a large portion of the observed gap is due to non-productivity-related discrimination against women (e.g., Bai and Cho, 1992; Kim, 2003; Jung, 2007).

In Korea, affirmative action (AA) first came into effect in 2006 as an active measure designed to expand women's employment and to remedy deeply rooted discriminatory practices against them. It was initially implemented for public enterprises and private firms with 1,000 or more employees, and was extended to smaller private firms (with 500-999 employees), after a two-year grace period.

This paper analyzes the economic results of AA in Korea, at both the microeconomic level and the macroeconomic level. In contrast to a large volume of international research directed at the socioeconomic outcomes of AA (e.g., Smith and Welch, 1984; Leonard, 1984, 1990; Coate and Loury, 1993; Holzer and Neumark, 1999, 2000; Orfield, 2001; Paola, 2010), only a few studies have been conducted regarding AA in Korea, reflecting its short history. These studies have mostly dealt with institutional design and implementation issues (e.g., Jang et al., 2006; Kim, Kang and Kwon, 2010). Some studies have examined factors affecting corporate compliance (Cho and Kwon, 2010; Cho, Kwon and Ahn, 2010). This paper differs from the

previous studies in that it explicitly attempts to estimate the economic impact of Korean AA on both women's employment and corporate performance, together with its potential effect on economic growth.

This paper is organized as follows - Section I introduces Korean AA, describing how it is implemented and complied with by targeted firms. Section II estimates the effect of AA on firms' hiring of women and any subsequent effect on corporate performance. Section III explores the potential effect of AA on economic growth via changes in female employment and the gender wage gap. Section IV summarizes the major findings of the paper and draws possible implications from those findings.

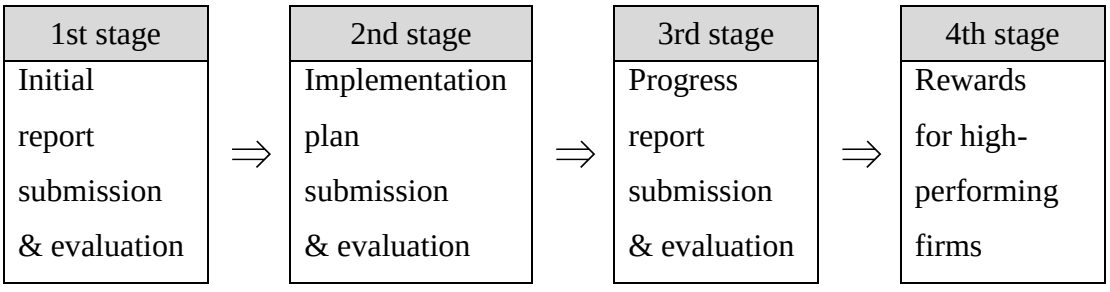
Ⅰ. AA in Korea: Implementation and Compliance

AA came into effect in Korea in March 2006, on the ground of the Equal Employment Act (6^{th} revision in 2005). Unlike in the US and Canada, where AA is applied to gender as well as other minority groups (race, ethnicity and disability), Korean AA tackles only gender issues as is the case in Australia. Korean AA focuses particularly on the female ratio among total workers and that among managerial workers. Firms that employ substantially less women workers or women managers than other firms of similar industrial properties are considered to be discriminatory against women and so required to expand women employment by the AA regulation. Korean AA, however, does not take into account either work quality or earnings inequality, with its sole attention focused on the size of female employment.

AA Implementation

The implementation of AA in Korea proceeds in four stages. First, under the AA provision, targeted firms are required to submit an initial report listing the number of male and female employees by job and rank (1st year). Second, firms with a ratio of women employees (among both total workers and those in managerial positions) which falls below 60% of the industry average must submit an AA implementation plan showing how it plans to expand the hiring of women for the following year (2nd year).[1] Third, firms that have submitted an implementation plan should then submit a progress report the following year, for fulfillment evaluation (3rd year). Lastly, based on the evaluation results, firms that have made remarkable progress are recognized with awards, while firms which failed to meet the requirements are notified of this fact and urged to fulfill the plan which they submitted earlier (3rd year). A financial penalty of 3 million Korean won or less is assigned to the firms which failed to submit an initial report or submitted a false report, the firms that failed to submit an implementation plan, and the firms that submitted no progress report or false report.[2]

Figure 1.1 The AA Implementation Procedure



Source: http://www.aa-net.or.kr.

[1] Firms in which women employees compose more than 50% of all employees are exempt from the submission of the AA implementation plan, even if their female employee ratios are lower than 60% of the industry average.

[2] The amount of 3 million Korean won is equivalent to approximately $2,700 USD as of December 2011.

Table 1.1 provides an overview of the overtime trend of AA-targeted firms with the female ratio of total employees and that of managers. In 2006, a total of 546 firms employing 1,000 workers or more were subject to the AA regulation, and 59.7% of them failed to meet the industrial criteria for female employment; the average female ratio of total employees and managers, for all industries, were 30.7% and 10.2%, respectively. In 2010, AA-targeted firms totaled 1,576 (658 firms with 1,000 or more employees and 918 firms with 500-999 employees). The overall average ratio of women employees and that of women managers were 35.6% and 16.15% for the former group, and 33.07% and 14.33% for the latter group, respectively. Fifty-one percent of the firms with 1,000 employees or more, and 55.9% of the firms employing 500-999 workers, failed to meet the industrial criteria for either the female employee ratio or the female manager ratio or both, and thus were required to submit an implementation plan with the goal of raising the ratio of women employees on the whole, and women managers in specific.

The ratio of female employees and that of female managers greatly vary across different industries. According to the Korean Ministry of Employment and Labor, in 2010, the industry average of the share of women employees ranged from 4.54% in the sewage/refuse disposal and recycling industry to 68.34% in the health and social services industry (for firms with 1,000 employees). The average share of female managers for the same group of firms is also the lowest in sewage/refuse disposal and recycling, while hitting a peak of 44.57% in health and social services. Firms with 500-999 employees show a similar pattern.

Corporate Compliance

Under the current Korean AA system, its success in terms of extending women's employment depends on how well AA-targeted firms comply with the AA regulation; it especially depends on how the firms that failed to meet the industrial criteria carry out the implementation plan that they submitted. Because of the lack of a severe penalty for non-compliance, combined with a weak incentive system, corporate performance pertaining to AA enforcement hinges to a large extent on firms' voluntary participation in the program.

According to a corporate survey of 300 personnel managers conducted in 2007, the majority of firms perceived that the introduction of AA was premature (Cho and Kwon, 2010). In this survey, firms that considered AA as a severe regulation were more likely to be noncompliant, while those acknowledging the potential positive effect of AA on efficient personnel management were more likely to be compliant. It thus behooves the government, for the success of AA, to actively persuade firms of its potential positive effect on corporate personnel management and long-term corporate performance.

Kim, Kang and Kwon (2010) traced 457 firms that were subjected to the AA regulation from years 2006-2009. As shown in Table 1.2, in 2006, a total of 128 firms submitted the implementation plan, while the remaining 329 firms were exempt from doing so. Out of the 128 firms that submitted the implementation plan in 2006, eighty-seven firms (68.0%) wrote the implementation plan every year, for they failed to meet the industrial criteria for the whole period; forty-one firms (32.0%) fulfilled the requirement at least once during this four-year period. Among the 329 firms that fulfilled their requirement in 2006, eighty-six percent successfully kept their female worker ratio and female manager ratio above the industrial criteria

during the whole period of observation; fourteen percent had to submit the implementation at least once during these four years.

According to Cho, Kwon and Ahn (2010), out of the 310 firms that submitted the AA implementation plan in 2006 and the second-year progress report in 2007, seventy-eight percent of the firms were evaluated as satisfactory and the remaining 22.3% failed to meet the minimum standards of the AA progress report.[3] They found that firms with financial stability and active job training opportunities tended to receive high scores in the evaluation of the implementation plan and the progress report. Among the progress reports submitted in 2011, according to the Ministry of Employment and Labor, fifteen percent of the firms were evaluated as unsatisfactory, which is lower than the figure for 2007.

Ⅱ. AA's Effect on Women's Employment and Corporate Performance

The aim of Korean AA, in its current form, is to increase both the total number of female employees and the number of women in managerial positions. For firms with 1,000 or more employees, between 2006 (when AA was first enforced) and 2010, the ratio of female employees rose from 30.7% to 35.6%, and that of female managers increased from 10.2% to 14.7%. It is our objective to determine to what extent these increases in the overall women's share can be ascribed to the effect of AA.

[3] Before the revision of the AA enforcement regulations in June 2009, firms were required to submit an initial report on the gender composition of their employees by May 31st of each year. Firms required to submit their AA implementation plans had to do so by October 15th of the same year, with the progress report to be submitted by October15th of the following year.

Econometric Model

In order to evaluate the effect of AA on female employment and firm performance, we use the difference-in-differences (DD) estimation method, along with a simple DD model. First, we compare the overtime changes in the percentage of female workers and financial measures of firm performance between the group of AA-firms and that of non-AA firms, using the following simple DD formula:

$$(2.1)\ \left(AA^{t'} - AA^{t}\right) - \left(NAA^{t'} - NAA^{t}\right)$$

where AA^t and $AA^{t'}$ refer to the values of the variables for female employment and firm performance for AA-firms, before AA and after AA, respectively; NAA^t and $NAA^{t'}$ refer to the values of the same variables for non-AA firms.

The simple DD analysis can control the impacts of economic changes and other systematic changes that apply to all groups identically, but cannot control firm-intrinsic characteristics that affect female employment or firm performance. In this regard, following Paola, Scoppa and Lombardo (2010), we utilize the following equation for the DD estimation:

$$(2.2)\ \ F_{it} = \beta_0 + \beta_1(AAC) + \beta_2(AAT) + \beta_3(AAC \times AAT) + \beta_4 X_{it} + \epsilon_{it}$$

where F_{it} is a variable that measures women's share in the total workforce and that in the total of managerial workers, and the financial performance of firm *i* in year *t*, respectively; *AAC* is a dummy variable which takes a value of one, if firms are the target group of AA (500 or more

employees for 2009); *AAT* is a year dummy which equals one for 2009 (after AA) and zero for 2005 (before AA); ($AAC \times AAT$) is the interaction term, whose coefficient, β_3, measures the treatment effect of our interest (i.e., the difference in the percentage change of the female employment share and corporate performance measures, between the firms affected by AA and those unaffected by AA); X_{it} is a vector of firm characteristics such as firm size and age, industrial affiliation, and the existence of female board members; ϵ_{it} is an error term.

We further estimate the corporate performance equation in order to shed light on the linkage between female employment and firm performance. Previous studies yield mixed results in this regard. Some studies suggest that gender diversity in workplace can improve firm performance by enhancing the firm's ability to penetrate markets, the creativity of its members, and promoting innovation activities (e.g. Cox and Blake, 1991; Robinson and Dechant, 1997; Cater, Simkins and Simpson, 2003). Such a positive nexus between gender diversity and firm performance is not supported by some other studies (e.g. Rose, 2007; Adams and Ferreira, 2009). The reverse causality is also possible in that high-performing firms have more available resources and so may hire diverse workers to deal with the diversity of consumers and markets. To control for the possible endogeneity problem, we thus use a 2SLS estimation method with a female board member-dummy as an instrumental variable.[4] Based on Cater, Simkins and Simpson (2003), the model specification is as follows:

$$(2.3) \quad FP = \alpha_0 + \alpha_1 GD + \sum \alpha X + \epsilon$$

[4] The correlation between the female board member dummy and the percentage of female workers is 0.16, whereas that between the female board member dummy and firm performance measures ranges from 0.01 to 0.04 in our data set.

where *FP* refers to firm performance as measured by return on assets (ROA), return on sales (ROS), and return on equity (ROE). *GD* is the percentage of female workers among all regular full-time workers. *X* is a vector of other explanatory variables, including firm size (log of total assets), firm age (log of firm age), time dummy and industry dummy.[5]

Data

The data for the empirical analysis were drawn from the Workplace Panel Survey (WPS) for 2005, 2007, and 2009. For the DD analysis, the data for2005 and 2009 were used, where the former year is for the pre-AA period and the latter year is for the post-AA period. For the 2SLS estimation for the nexus between the female employment ratio and firm performance, the data for all three years were used. Corporate performance was measured by return on assets (ROA), return on sales (ROS), and return on equity (ROE).

Table 2.1 provides the descriptive statistics for our sample firms. The final sample excludes all observations which do not have information on the major variables for the analysis. On average, the female worker ratio (the female ratio of all regular full-time workers) slightly increased from 28.59% (2005) to 28.92% (2007), but then dropped a bit to 28.49% (2009). However, the female manager ratio and the ratio of female board members exhibited a continuing upward trend. Between 2005 and 2009, the female manager ratio rose from 7.09% to 8.95%, while female representation on boards increased from 4.31% to 5.29%.

[5] The percentage of women workers greatly differs across industries. We control these differences among industries by using seven categories of industry dummies with manufacturing as a reference industry.

Empirical Results

The empirical results do not provide supporting evidence for a positive AA effect on women's employment. As in Table 2.2, the simple DD analysis results indicate a positive yet modest effect of AA on the female share of managers but a small negative effect of AA on the female share of total workers. As for corporate performance, the simple DD results imply a positive effect of AA for ROS but a negative effect for the other two financial measures.

Tables 2.3 and 2.4 present the DD estimation results controlling for some intrinsic differences in firm characteristics between AA firms and non-AA firms. AA does not show a significant effect on either women's employment or firm performance. The group-dummy for AA firms shows a positive yet insignificant effect for both the female worker ratio and the female manager ratio. The time-period dummy (which indicates the time before or after the AA implementation) has a negative and significant effect for the female share of total workers, while it has a positive and significant effect for the female share of managers. The interaction term for the treatment effect renders no significant effect on both measures of female employment. Interestingly, the existence of a female board member significantly raises the share of women workers overall, and that of women managers as well.

AA's effect on corporate performance also turns out to be insignificant. Between 2005 and 2009, AA firms achieved a higher increase rate of ROS with the simple DD analysis. The DD estimation results, however, yield no significant effect of AA on our corporate performance measures. The group dummy and the time-period dummy, as the DD variables, are not statistically significant for all three measures of firm performance. The interaction term is positive for ROS but negative for ROA and ROE; and all are statistically insignificant. In a

nutshell, the AA policy seems to have exerted no significant effect on firm performance during the observed period. Put differently, the AA regulation neither improved firm performance, nor harmed firms' financial performance.

The 2SLS estimation for the causal nexus between gender diversity and firm performance exhibits mixed results, possibly implying the diverse effects of the unobserved firm characteristics such as corporate culture (see Table 2.5). In the case of OLS estimates, the percentage of women workers is negatively related with ROA and ROS but positively related with ROE; but it is not statistically significant. As for the 2SLS estimates, the percentage of women workers is negatively related with ROA and statistically significant at the 10% level. In contrast, the percentage of women workers is positively related with ROS and ROE but not statistically significant. All in all, the explanatory power of each equation (R-squared) is very low, especially for ROA and ROE, implying the potential large effect of the omitted variables on firm performance.

Ⅲ. AA and Economic Growth

While most studies in the related literature were concerned with the microeconomic effects of AA, the macroeconomic effect of AA is also of interest. In this regard, we attempt to estimate the potential effect of AA on economic growth through its effect on female employment and the gender wage gap. The causal relationship between the gender wage gap and economic growth has been previously explored in other studies (e.g., Seguino, 2000; Cavalcanti and Tavares, 2007; Cassells et al., 2009), without any explicit consideration of AA.

Econometric model

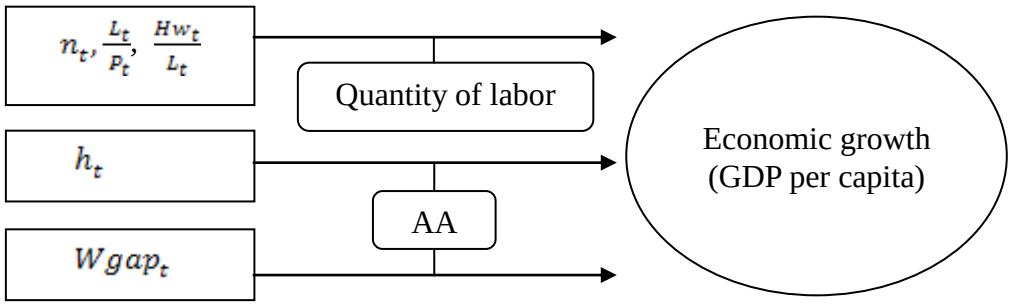
We develop an augmented Solow growth model similar to Mankiew, Romer and Weil (1992) and Cassells et al. (2009). In our growth model, the female share of total workers proxies the human capital level of the economy, based on Murphy (1998); the gender wage gap enters into the total factor productivity (TFP) function, following Seguino (2000). The economic growth model to be utilized is as follows:

$$(3.1)\ ln\left(\frac{Y_t}{P_t}\right) = C^1 + \varphi^1 t + \sigma_0 Wgap_t + \beta_1 ln\left(\frac{I_t}{Y_t}\right) + \beta_2 ln(h_t) + \beta_3 ln(n_t) + \beta_4 ln\left(\frac{L_t}{P_t}\right) + \beta_5 ln\left(\frac{Hw_t}{L_t}\right) + \varepsilon_t$$

where $\frac{Y_t}{P_t}$ is GDP per capita at time *t*, C^1 is a constant, and φ^1 refers to the time effect. $Wgap_t$ is the gender wage gap at time *t*, calculated as the gender wage difference relative to male wage. *I* stands for investment. h_t is the human capital level at time *t*, proxied by the female worker ratio. n_t is the population growth rate at time *t*, $\frac{L_t}{P_t}$ is the labor force participation rate at time *t*, and $\frac{Hw_t}{L_t}$ is the average number of work hours per worker at time *t*. ε_t is an error term.

Figure 3.1 depicts the paths through which AA potentially affects economic growth. Despite its current focus on the female share of employment, the ultimate goal of AA is to remove all forms of gender discrimination in workplaces, including the non-productivity-related gender wage gap. Therefore, we conjecture that AA can potentially affect economic growth through its effect on both female employment and the gender wage gap.

Figure 3.1 Path Diagram of the AA-Growth Linkage



As for the empirical estimation, we construct a system of simultaneous equations using the first difference of each variable in equation 3.1, where each of seven equations includes its own lagged variables as instrument variables. By doing so, we take into account the endogeneity of each variable and also the non-stationarity of the time-series data.[6] A 3SLS method is applied to the following seven equations. We treat $\Delta ln(h_t)$ as an endogenous variable, as specified in Equation (3.8), which is different from Cassels et al (2009).

$$(3.2)\ \Delta ln\left(\frac{Y_t}{P_t}\right) = \varphi + \sigma_0 \Delta Wgap_t + \beta_1 \Delta ln\left(\frac{I_t}{Y_t}\right) + \beta_2\ \Delta ln(h_t) + \beta_3 \Delta ln(n_t) + \beta_4 \Delta ln\left(\frac{L_t}{P_t}\right) + \beta_5 ln\left(\frac{Hw_t}{L_t}\right) + \Delta\epsilon_{0t}$$

$$(3.3)\ \Delta ln\left(\frac{I_t}{Y_t}\right) = \alpha_1 + \sigma_1 \Delta Wgap_t + \beta_6 \Delta ln\left(\frac{I_{t-1}}{Y_{t-1}}\right) + \beta_7 \Delta ln\left(\frac{I_{t-2}}{Y_{t-2}}\right) + \beta_8 \Delta ln\left(\frac{I_{t-3}}{Y_{t-3}}\right) + \beta_9\ \Delta ln(h_t) + \beta_{10} \Delta ln(n_t) + \beta_{11}\ \Delta ln\left(\frac{L_t}{P_t}\right) + \beta_{12}\ ln\left(\frac{Hw_t}{L_t}\right) + \beta_{13}\ \Delta ln\left(\frac{Y_t}{P_t}\right) + \Delta\epsilon_{1t}$$

[6] We tested all the variables in Eq. (3.1) using the augmented Dickey Fuller test. As a result, all variables except $ln\frac{Y_t}{P_t}$ are non-stationary. After having the first difference, all variables satisfy the stationarity condition.

$$(3.4)\ \Delta ln(n_t) = \alpha_2 + \sigma_2 \Delta Wgap_t + \beta_{14}\,\Delta ln(n_{t-1}) + \beta_{15}\,\Delta ln(n_{t-2}) + \beta_{16}\,\Delta ln(n_{t-3}) + \beta_{17}\Delta ln(n_{t-4}) + \beta_{18}\,\Delta\, ln(h_t) + \beta_{19}\Delta\, ln\left(\frac{I_t}{Y_t}\right) + \beta_{20}\Delta\, ln\left(\frac{L_t}{P_t}\right) + \beta_{21}\, ln\left(\frac{Hw_t}{L_t}\right) + \beta_{22}\Delta\, ln\left(\frac{Y_t}{P_t}\right) + \Delta\epsilon_{2t}$$

$$(3.5)\ \Delta ln\left(\frac{L_t}{P_t}\right) = \alpha_3 + \sigma_3 \Delta Wgap_t + \beta_{23}\,\Delta ln\left(\frac{L_{t-1}}{P_{t-1}}\right) + \beta_{24}\,\Delta ln\left(\frac{L_{t-2}}{P_{t-2}}\right) + \beta_{25}\,\Delta ln\left(\frac{L_{t-3}}{P_{t-3}}\right) + \beta_{26}\,\Delta ln(h_t) + \beta_{27}\Delta\, ln(n_t) + \beta_{28}\,\Delta ln\left(\frac{I_t}{Y_t}\right) + \beta_{29}\, ln\left(\frac{Hw_t}{L_t}\right) + \beta_{30}\,\Delta\, ln\left(\frac{Y_t}{P_t}\right) + \Delta\epsilon_{3t}$$

$$(3.6)\ \Delta ln\left(\frac{Hw_t}{L_t}\right) = \alpha_4 + \sigma_4 \Delta Wgap_t + \beta_{31}\,\Delta ln\left(\frac{Hw_{t-1}}{L_{t-1}}\right) + \beta_{32}\,\Delta ln\left(\frac{Hw_{t-2}}{L_{t-2}}\right) + \beta_{33}\,\Delta ln\left(\frac{Hw_{t-3}}{L_{t-3}}\right) + \beta_{34}\,\Delta ln(h_t) + \beta_{35}\Delta\, ln(n_t) + \beta_{36}\,\Delta\, ln\left(\frac{L_t}{P_t}\right) + \beta_{37}\, ln\left(\frac{I_t}{Y_t}\right) + \beta_{38}\,\Delta\, ln\left(\frac{Y_t}{P_t}\right) + \Delta\epsilon_{4t}$$

$$(3.7)\ \Delta Wgap_t = \alpha_5 + \beta_{39}\,\Delta(Wgap_{t-1}) + \beta_{40}\,\Delta(Wgap_{t-2}) + \beta_{41}\,\Delta(Wgap_{t-3}) + \beta_{42}\,\Delta ln(h_t) + \beta_{43}\Delta\, ln(n_t) + \beta_{44}\,\Delta\, ln\left(\frac{L_t}{P_t}\right) + \beta_{45}\, ln\left(\frac{I_t}{Y_t}\right) + \beta_{46}\,\Delta ln\left(\frac{Y_t}{P_t}\right) + \beta_{47}\,\Delta ln\left(\frac{Hw_t}{L_t}\right) + \Delta\epsilon_{5t}$$

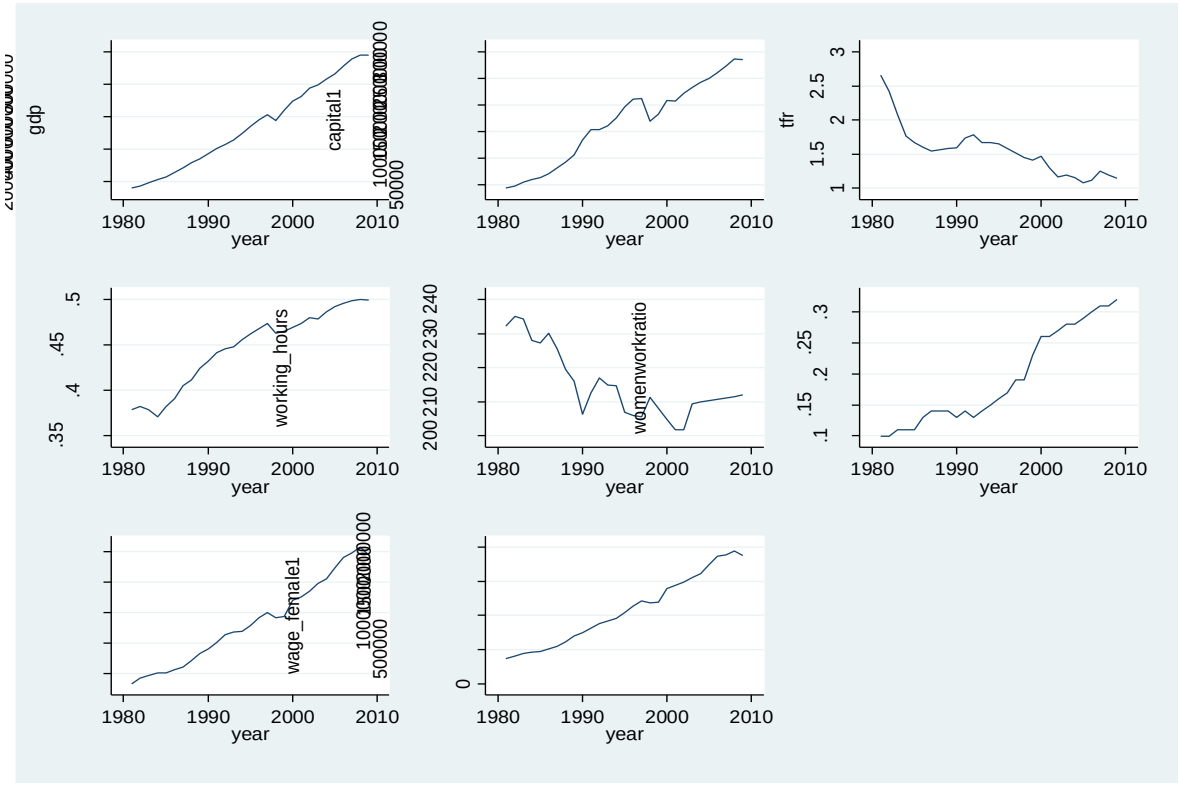
$$(3.8)\ \Delta ln(h_t) = \alpha_6 + \beta_{48}\,\Delta ln(h_{t-1}) + \beta_{49}\,\Delta ln(h_{t-2}) + \beta_{50}\Delta\, ln(n_t) + \beta_{51}\,\Delta\, ln\left(\frac{L_t}{P_t}\right) + \beta_{52}\, ln\left(\frac{I_t}{Y_t}\right) + \beta_{53}\,\Delta\, ln\left(\frac{Y_t}{P_t}\right) + \Delta\epsilon_{4t}$$

Data

As for the empirical analysis, we utilized the time-series data for the macroeconomic variables for 1981-2009. Monetary variables were converted to real terms (in 2005 prices). Table 3.1 presents the descriptive statistics for major macro variables. As illustrated in Figure 3.2, for nearly thirty years from 1981-2009, most macro variables exhibit an overall rising trend except a

few fluctuations; in contrast, the total fertility rate (TFR) and number of work hours have been decreasing.

Figure 3.2 Time Trend of the Macroeconomic Variables



Empirical results

Table 3.2 to Table 3.8 present the main results of the 3SLS regression for Equations (3.2) to (3.8). Several observations are noteworthy. First, both the TFR and human capital are increasing functions of GDP per capita, although the significant level is low for the TFR, according to Table 3.4 and Table 3.8, respectively. Second, there is a trade-off between the TFR and women's labor force participation rate, yet such a relationship is not statistically significant, as is observed in

Table 3.4 and Table 3.8. Third, work hours significantly contribute to human capital accumulation, as shown in Table 3.8. Fourth, the gender wage gap is a decreasing function of human capital, although not statistically significant, according to Table 3.7. Finally, GDP per capita increases as human capital increases, as is expected; however, GDP per capita is positively related to the gender wage gap, although not statistically significant (see Table 3.3).

Let us focus on the nexus between GDP per capita, the female share of workers, and the gender wage gap. In Table 3.3, the coefficient of the human capital variable is 0.355, exhibiting a direct positive effect of human capital on GDP per capita. Human capital also exerts an indirect effect on GDP per capital through its relation to other endogenous variables in Equation (3.1). The direct effect of human capital is captured by coefficient β_2, and the indirect effects include $\beta_1 \times \beta_9$, $\beta_{3\times}\beta_{18}$, $\beta_{4\times}\beta_{26}$, $\beta_5 \times \beta_{34}$, and $\sigma_0 \times \beta_{42}$. According to Table 3.9, the direct effect of the female worker ratio is significantly positive, but the indirect effects are all negative. When we add up all these effects, the total effect is -0.047; if we add up only the significant effects, the coefficient is only -0.015. We can thus conclude that a rise in the female worker ratio has not facilitated economic growth, since its negative indirect effects offset its positive direct effect.

Table 3.10 presents the direct and indirect effects of the gender wage gap on economic growth. The direct effect of the gender wage gap is measured by coefficient σ_0 and the indirect effects are captured by $\beta_1 \times \sigma_1$, $\beta_{3\times}\sigma_2$, $\beta_{4\times}\sigma_3$, $\beta_5 \times \sigma_4$. Although the direct effect of the gender wage gap on economic growth is positive, the indirect effects offset this positive effect. The net effect is -0.561 when we add up all the effects; it nets out to -0.597 when we only add those effects with statistical significance.

To sum up, the gender wage gap exerts a relatively large negative effect on GDP per capita,

but a growth effect of the female share of the work force is not apparent. The direct effect of the female worker ratio on economic growth is positive and statistically significant, but its indirect effects through the interaction with other related variables are all negative; when we add up all of the direct and indirect effects, the net growth effect of the female worker ratio is almost zero. In contrast, the net growth effect of the gender wage gap is negative and relatively large, with the positive direct effect dominated by far larger negative indirect effects; this result implies that, on average, a one-percentage point reduction in the gender wage gap would accelerate the growth of GDP per capita by 0.6%. We can thus infer that AA can be an effective measure to induce economic growth, if it reduces the gender wage gap; the growth effect of the rise in the female worker ratio, however, is not supported by our study.

Ⅳ. Concluding Remarks

The major findings of this paper are as follows: At the firm level, Korean AA, since its implementation in 2006, has not yet significantly raised the female share in total employment or the female share in managerial positions; in addition, it has not demonstrated any significant impact on corporate performance, be it productivity-enhancing or productivity-impeding. As for the potential macroeconomic effect of AA, we confirm a growth-enhancing effect of lowering the gender wage gap, but not for a concomitant rise in the female share of total workers. It thus implies that AA can serve as a driving force for macroeconomic growth if adequately designed and enforced, while at the same time enhancing the economic well-being of female workers.

Given that AA in Korea aims exclusively at increasing women's share in the workforce and in managerial positions, our findings, which do not support any female employment-raising effect of AA, may be viewed as somewhat puzzling. This result may be attributed to several factors. For one thing, it may take more time for the effect of AA to be fully realized, requiring both active participation by firms and proactive changes in the corporate system. Furthermore, both the lack of strong incentives for compliant firms and penalties for non-compliant firms are often cited as factors contributing to low corporate compliance. Also, we cannot rule out the conventional omitted variable problems in our DD estimation results. In-depth studies utilizing alternative approaches with a rich data set are thus called for as a robustness check.

The current AA system is also often criticized for its limitations in tackling gender inequality issues (Cho, Kwon and Ahn, 2010; Jung et al., 2010; Kim, Kang and Kwon, 2010). Among other things, it currently covers only approximately 10% of the total number of female workers, of which the vast majority are crowded in small- and medium-sized firms. It also focuses only on the overall size of female employment (female share of total workers and managers), ignoring both the quality of employment and earnings inequality. Our finding of the growth-accelerating effect of the declining gender wage gap suggests that AA should ultimately tackle non-productivity related gender wage gap issues.

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Table 1.1 AA-Targeted Firms and the Industrial Criteria for Female Employment (2006-2010)

(unit: number, %)

Year	Targeted firms	Number of firms			Avg. ratio of female workers	Avg. ratio of female managers
		AA-targeted (A)	Firms below the industrial criteria (B)	B/A (%)		
2006	1,000 workers +	546	326	59.7	30.7	10.2
2007	1,000 workers +	613	343	59.7	32.32	11.00
2008	1,000 workers +	622	323	51.9	35.02	13.17
	500-999 workers	803	498	62.0	32.44	11.99
2009	1,000 workers +	666	345	51.8	35.10	14.84
	500-999 workers	941	557	59.2	33.24	13.62
2010	1,000 workers +	658	335	50.9	35.60	16.15
	500-999 workers	918	513	55.9	33.07	14.33

Source: Ministry of Employment and Labor.

Table 1.2 AA-Targeted Firms and Progress in Female Employment

(unit: number, %)

		Number of implementation plan submission (2006-2009)					Total
		0	1	2	3	4	
Implementation plan (2006)	Submitted	0 (0.0)	7 (5.5)	5 (3.9)	29 (22.7)	87 (68.0)	128 (100.0)
	Not-submitted	283 (86.0)	28 (8.5)	13 (4.0)	5 (1.5)	0 (0.0)	329 (100.0)
AA-targeted firms		283 (61.9)	35 (7.7)	18 (3.9)	34 (7.4)	87 (19.0)	457 (100.0)

Source: Kim, Kang and Kwon (2010), p.76.

Table 2.1 Summary Statistics for Micro Data

(unit: %, 100 million won, number)

	2005	2007	2009
Female worker ratio	28.59	28.92	28.49
	(23.37)	(24.04)	(23.54)
Female manager ratio	7.09	7.66	8.95
	(12.68)	(13.18)	(13.69)
Female ratio on board	4.31	4.43	5.29
	(14.01)	(13.09)	(15.39)
Total assets	12,719	13,369	12,826
	(63,268)	(83,290)	(45,288)
Sales	7,207	7,069	9,442
	(24,752)	(24,828)	(33,592)
Net profit	505	452	545
	(2,383)	(2,109)	(2,616)
Equity	4,295	4,641	5,697
	(18,921)	(17,663)	(21,078)
ROA	-0.77	4.99	4.68
	(174.21)	(20.14)	(13.38)
ROS	200.45	387.15	145.58
	(1,423.73)	(7,055.02)	(171.96)
ROE	12.21	15.01	9.76
	(108.61)	(206.55)	(490.40)
Number of firms	1,896	1,735	1,737

Notes: 1) ROA=(Net Profit/Total Assets)×100. ROS=(Net Profit/Total Sales)×100. ROE=(Net Profit/Total Equity)×100.
2) Standard deviations in parentheses.

Table 2.2 Simple DD Analysis Results

(unit: %)

	Program/Treatment group	2005	2009	Difference(%p)
Female worker ratio	AA–firms (A)	30.99	29.89	-0.5
	Non-AA firms (N)	27.64	28.16	0.52
	A – N	2.75	1.73	-1.02
Female manager ratio	AA–firms (A)	7.04	10.01	2.97
	Non-AA firms (N)	7.79	8.69	0.90
	A – N	-0.75	1.32	2.07
ROA	AA–firms (A)	6.09	4.86	-1.23
	Non-AA firms (N)	4.63	4.64	0.01
	A – N	1.46	0.22	-1.24
ROS	AA–firms (A)	139.35	154.36	15.01
	Non-AA firms (N)	171.24	143.33	-27.91
	A – N	-31.89	11.03	49.92
ROE	AA–firms (A)	11.26	7.68	-3.58
	Non-AA firms (N)	10.53	10.29	-0.24
	A – N	0.73	-2.61	-3.34
Number of firms	AA–firms (A)	161		
	Non-AA firms (N)	535		

Table 2.3 DD Estimation Results: AA Effect on Female Employment

		Female Employment Effect	
		Female worker ratio	Female manager ratio
Constant		26.05**	-1.08
		(14.41)	(6.23)
DD variables	Group dummy	1.53	1.01
		(3.79)	(1.65)
	Time period dummy	-2.09**	2.03***
		(0.93)	(0.40)
	Interaction	-2.13	-1.32
		(4.83)	(2.09)
Control variables	Size (log of total assets)	3.11*	0.23
		(1.96)	(0.85)
	Age (log of firm age)	-9.36	2.83
		(7.19)	(3.10)
	$(Size)^2$	-0.12	-0.01
		(0.08)	(0.03)
	$(Age)^2$	0.95	-0.50
		(1.24)	(0.53)
	(Size × Age)	-0.11	-0.08
		(0.35)	(0.15)
	Female board member dummy	9.71***	10.62***
		(1.37)	(0.59)
	Industry dummy	Yes	Yes
Observations		1,682	1,677
Adj. R^2		0.16	0.36
F-Statistic		21.88***	63.30***

Notes: Standard errors using heteroskedasticity-consistent covariance matrix in parentheses.
***, **, and * denote significance at the 1, 5 and 10 percent respectively.

Table 2.4 DD Estimation Results: AA Effect on Firm Performance

		Firm Performance		
		ROA	ROS	ROE
Constant		-266.26***	3,474.36***	-57.70
		(100.27)	(808.17)	(378.93)
DD variables	Group dummy	-3.25	74.65	7.35
		(26.36)	(212.16)	(99.72)
	Time period dummy	5.81	-58.99	4.18
		(6.49)	(52.37)	(24.55)
	Interaction	-1.76	24.37	-10.16
		(33.56)	(269.86)	(126.77)
Control variables	Size (log of total assets)	73.00***	-768.44***	4.51
		(13.66)	(110.18)	(51.64)
	Age (log of firm age)	-93.41**	755.65**	3.07
		(50.11)	(403.38)	(189.49)
	$(Size)^2$	-4.81***	44.22***	-0.36
		(0.56)	(4.53)	(2.12)
	$(Age)^2$	-12.98	78.46	2.27
		(8.66)	(69.78)	(32.75)
	(Size × Age)	14.05***	-102.24***	0.13
		(2.42)	(19.58)	(9.16)
	Female board member dummy	-26.29***	190.16***	2.11
		(9.55)	(76.97)	(36.04)
	Industry dummy	Yes	Yes	Yes
Observations		1,665	1,671	1,657
Adj. R^2		0.06	0.08	0.01
F-Statistic		7.99***	10.06***	0.78

Notes: Standard errors using heteroskedasticity-consistent covariance matrix in parentheses.
***, **, and * denote significance at the 1, 5 and 10 percent respectively

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Table 2.5 The Effect of Female Employment on Firm Performance

	OLS			2SLS		
	ROA	ROS	ROE	ROA	ROS	ROE
Constant	-66.57	8,281.64***	-25.34	-12.25	7,959.93***	-27.51
	(59.56)	(750.80)	(220.70)	(67.71)	(802.40)	(232.67)
Female worker	-0.07	-0.96	0.04	-2.25***	12.93	0.12
ratio	(0.10)	(1.36)	(0.40)	(0.87)	(10.49)	(2.95)
Size	23.79***	-1,744.14***	0.86	27.83***	-1,765.23***	0.78
(log of total assets)	(8.58)	(108.56)	(31.18)	(9.16)	(109.68)	(31.50)
Age	-45.57	1,106.06***	1.95	-50.92	1,106.87***	1.95
(log of firm age)	(28.58)	(421.43)	(106.05)	(30.88)	(367.61)	(106.37)
$(Size)^2$	-2.15***	81.07***	-0.19	-2.19***	81.34***	-0.19
	(0.35)	(4.44)	(1.30)	(0.38)	(4.53)	(1.31)
$(Age)^2$	-11.11*	-79.99	0.81	-11.35*	-79.28	0.83
	(5.05)	(73.33)	(18.72)	(5.45)	(64.70)	(18.78)
(Size × Age)	9.40***	-50.11*	0.44	8.71***	-44.66*	0.46
	(1.63)	(20.44)	(5.64)	(1.66)	(19.82)	(5.74)
Time dummy	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,536	2,551	2,512	2,536	2,551	2,512
Adj. R^2	0.02	0.13	0.001	0.02	0.13	0.001
F-Statistic	5.46***	29.12***	1.04	5.15***	28.06***	1.04

Notes: Standard errors using heteroskedasticity-consistent covariance matrix in parentheses.
***, **, and * denote significance at the 1, 5 and 10 percent respectively.

Table 3.1 Summary Statistics for Macro Data (1981~2009)

Variables	Definition/Measurement	Mean	S.D.	Source
Y_t	Real GDP (10 bill. won)	543,018	267,745	Bank of Korea (ECOS)
Y_t/P_t	GDP per capita (1,000 won)	1,180	519	Bank of Korea (ECOS)
I_t	Real capital (10 bill. won); total fixed capital formation	166,893	77,594	Bank of Korea (ECOS)
I_t/Y_t	Capital/GDP	0.31	0.034	
n_t	population growth; total fertility rate (TFR)	1.55	0.37	KOSIS
L_t/P_t	Labor force participation rate (%)	60.3	1.83	KOSIS, Ministry of Employment and Labor
w_m	Male wage (Korean won/month)	1,840,829	698,708	KOSIS, Ministry of Employment and Labor
w_f	Female wage (Korean won/month)	1,083,086	514,026	KOSIS, Ministry of Employment and Labor
$Wgap_t$	Wage gap; $(w_m-w_f)/w_m$	0.44	0.07	
Hw_t	Working hours (month)	215	9.84	KOSIS, Ministry of Employment and Labor
h_t	Female worker ratio (%)	19.3	7.57	

Note: 1,000 Korean won is about 0.9 US dollar in December 2011.

Table 3.2 Growth Equation (Eq. 3.2)

Dependent variable: $\Delta ln\,(\frac{Y_t}{P_t})$

	Coefficient	*z*-value
$\Delta Wgap_t$	.266	0.45
$\Delta ln\,(\frac{I_t}{Y_t})$	.180*	1.73
$\Delta ln\,(h_t)$	.355***	5.07
$\Delta ln\,(n_t)$	.007	-0.07
$\Delta ln\,(\frac{L_t}{P_t})$	1.440***	3.01
$\Delta ln\,(\frac{Hw_t}{L_t})$	-.759***	-2.80
Constant	.029***	3.47

Notes: *, **, *** are significant at 10%, 5%, 1% critical level, respectively.

$R^2 = 0.41$

Table 3.3 Investment Equation (Eq. 3.3)

Dependent variable: $\Delta ln\,(\frac{I_t}{Y_t})$

	Coefficient	*z*-value
$\Delta ln\,(\frac{I_{t-1}}{Y_{t-1}})$	.277*	1.66
$\Delta ln\,(\frac{I_{t-2}}{Y_{t-2}})$	-.284	-1.64
$\Delta ln\,(\frac{I_{t-3}}{Y_{t-3}})$	.007	0.04
$\Delta ln\,(h_t)$	-.071	-0.38
$\Delta ln\,(n_t)$	.408**	2.40
$\Delta ln\,(\frac{L_t}{P_t})$	-.198	-0.19
$\Delta ln\,(\frac{Hw_t}{L_t})$	-.534	-0.80
$\Delta ln\,(\frac{Y_t}{P_t})$	1.027**	2.22
$\Delta Wgap_t$	3.303**	2.25
Constant	-.022	-0.92

Notes: *, **, and *** are significant at 10%, 5%, 1% critical level, respectively.

$R^2 = 0.45$

Table 3.4 Population Growth Equation (Eq. 3.4)

Dependent variable: $\Delta ln\ (n_t)$

	Coefficient	*z*-value
$\Delta ln\ (n_{t-1})$	.215	0.94
$\Delta ln\ (n_{t-2})$	-.050	-0.33
$\Delta ln\ (n_{t-3})$	.165	0.95
$\Delta ln\ (n_{t-4})$	-.041	-0.24
$\Delta ln\ (h_t)$	-.650**	-2.39
$\Delta ln\ (\frac{I_t}{Y_t})$	.420	1.24
$\Delta ln\ (\frac{L_t}{P_t})$	-.924	-0.46
$\Delta ln\ (\frac{Hw_t}{L_t})$	3.453***	4.03
$\Delta ln\ (\frac{Y_t}{P_t})$	1.180	1.24
$\Delta Wgap_t$	-6.464***	-3.42
Constant	-.091**	-2.12

Notes: *, **, and *** are significant at 10%, 5%, 1% critical level, respectively.

$R^2 = 0.78$

Table 3.5 Labor Force Participation Equation (Eq. 3.5)

Dependent variable: $\Delta ln\ (\frac{L_t}{P_t})$

	Coefficient	*z*-value
$\Delta ln\ (\frac{L_{t-1}}{P_{t-1}})$	.017	0.13
$\Delta ln\ (\frac{L_{t-2}}{P_{t-2}})$	.021	0.17
$\Delta ln\ (\frac{L_{t-3}}{P_{t-3}})$	-.162	-1.16
$\Delta ln\ (h_t)$	-.146***	-3.45
$\Delta ln\ (n_t)$	.048	1.37
$\Delta ln\ (\frac{I_t}{Y_t})$	-.066	-1.37
$\Delta ln\ (\frac{Hw_t}{L_t})$	.220	1.47
$\Delta ln\ (\frac{Y_t}{P_t})$	.427***	4.13
$\Delta Wgap_t$	-.191	-0.61
Constant	-.007	-0.99

Notes: *, **, and *** are significant at 10%, 5%, 1% critical level, respectively.

$R^2 = 0.12$

Table 3.6 Work Hours Equation (Eq. (3.6)

Dependent variable: $\Delta ln\left(\frac{Hw_t}{L_t}\right)$

	Coefficient	z-value
$\Delta ln\left(\frac{Hw_{t-1}}{L_{t-1}}\right)$	-.031	-0.25
$\Delta ln\left(\frac{Hw_{t-2}}{L_{t-2}}\right)$	-.041	-0.40
$\Delta ln\left(\frac{Hw_{t-3}}{L_{t-3}}\right)$	-.030	-0.28
$\Delta ln\,(h_t)$	.211***	3.19
$\Delta ln\,(n_t)$	.150**	2.48
$\Delta ln\left(\frac{L_t}{P_t}\right)$	.639	1.62
$\Delta ln\left(\frac{I_t}{Y_t}\right)$	-.045	-0.52
$\Delta ln\left(\frac{Y_t}{P_t}\right)$	-.458***	-2.63
$\Delta Wgap_t$	1.570***	3.52
Constant	.025***	2.93

Notes: *, **, and *** are significant at 10%, 5%, 1% critical level, respectively.
$R^2 = 0.31$

Table 3.7 Gender Wage Gap Equation (Eq. 3.7)

Dependent variable: $\Delta Wgap_t$

	Coefficient	z-value
$\Delta Wgap_{t-1}$	.017	0.09
$\Delta Wgap_{t-2}$	-.031	-0.19
$\Delta Wgap_{t-3}$	.034	0.26
$\Delta ln\,(h_t)$	-.053	-1.46
$\Delta ln\,(n_t)$	-.090***	-2.85
$\Delta ln\left(\frac{L_t}{P_t}\right)$	-.161	-0.79
$\Delta ln\left(\frac{I_t}{Y_t}\right)$	.080**	2.02
$\Delta ln\left(\frac{Y_t}{P_t}\right)$	.028	0.27
$\Delta ln\left(\frac{Hw_t}{L_t}\right)$	.375***	3.49
Constant	-.007	-1.33

Notes: *, **, and *** are significant at 10%, 5%, 1% critical level, respectively.
$R^2 = 0.34$

Table 3.8 Human Capital Equation (Eq. 3.8)

Dependent variable: $\Delta ln\ (h_t)$

	Coefficient	*z*-value
$\Delta ln\ (h_{t-1})$	-.022	-0.15
$\Delta ln\ (h_{t-2})$	.003	0.02
$\Delta ln\ (n_t)$	-.028	-0.11
$\Delta ln\ (\frac{L_t}{P_t})$	-3.462**	-2.59
$\Delta ln\ (\frac{I_t}{Y_t})$	-.225	-0.73
$\Delta ln\ (\frac{Y_t}{P_t})$	2.297***	4.41
$\Delta ln\ (\frac{Hw_t}{L_t})$	1.535*	1.92
Constant	-.055*	-1.72

Notes: *, **, and *** are significant at 10%, 5%, 1% critical level, respectively.

$R^2 = 0.67$

Table 3.9 The Effect of the Female Worker Ratio on Economic Growth

	First coefficient	Second coefficient	Effect
$h_t \rightarrow \frac{Y_t}{P_t}$	0.355***	-	0.336
$h_t \rightarrow \frac{I_t}{Y_t} \rightarrow \frac{Y_t}{P_t}$	-0.071	0.180	-0.013
$h_t \rightarrow TFR \rightarrow \frac{Y_t}{P_t}$	-0.650**	-0.007	-0.005
$h_t \rightarrow \frac{L_t}{P_t} \rightarrow \frac{Y_t}{P_t}$	-0.146***	1.440***	-0.210
$h_t \rightarrow \frac{Hw_t}{L_t} \rightarrow \frac{Y_t}{P_t}$	0.211***	-0.759***	-0.160
$h_t \rightarrow Wgap_t \rightarrow$	-0.053	0.266	-0.014
Total effect (all effects)			-0.07
Total effect (significant effects only)			-0.03

Table 3.10 The Effect of the Gender Wage Gap on Economic Growth

	First coefficient	Second coefficient	Effect
$wgap_t \rightarrow \frac{Y_t}{P_t}$	0.266	-	0.266
$wgap_t \rightarrow \frac{I_t}{Y_t} \rightarrow \frac{Y_t}{P_t}$	3.303**	0.180	0.595
$wgap_t \rightarrow TFR \rightarrow \frac{Y_t}{P_t}$	-6.464***	-0.007	0.045
$wgap_t \rightarrow \frac{L_t}{P_t} \rightarrow \frac{Y_t}{P_t}$	-0.191	1.440***	-0.267
$wgap_t \rightarrow \frac{Hw_t}{L_t} \rightarrow \frac{Y_t}{P_t}$	1.570***	-0.759***	-1.192
$wgap_t \rightarrow h_t \rightarrow \frac{Y_t}{P_t}$	.375***	0.266	0.098
Total effect (all effects)			-0.455
Total effect (significant effects only)			-1.094