

## DIFFERENCES IN THE PROCESS OF EARNINGS DETERMINATION AND INEQUALITY BETWEEN WOMEN AND MEN IN SOUTH KOREA\*

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*This study examines the process of earnings determination of workers and assesses the explanatory power of human capital and sex segregation theory on earnings inequality between women and men in the South Korean labor market. It analyzes a pooled cross-section and time series data set for all non-agricultural occupations for 14 years. Two separate regressions for men and women are estimated using two stage weighted least squares methods. The research findings show that education and tenure have positive effects on logged earnings as expected. Proportion female negatively affects earnings of men and women while women tend to experience four times greater penalty for working with other women in occupations. However, the sex segregation becomes an insignificant factor in lowering women's earnings level when occupational groups are controlled. Gender earnings inequality gradually decreased during 14 years as the earnings of women increased more than those of men.*

### INTRODUCTION

For the past thirty years, women have increasingly participated in the labor force in South Korea. The women's labor force participation rate increased from 30 percent in 1960 to 47 percent in 1990 (Korea, Economic Planning Board 1960; Korean Statistical Association 1991). Female workers' economic status has relatively improved. The percentage of female wages to male wages increased from 44.1 in 1971 to 53.5 percent in 1990 (Korea, Ministry of Labor 1972, 1990). Nevertheless, this indicates that female workers still earn only slightly more than half of what male workers earn. The earnings differential between female and male workers in Korea is quite large relative to other countries including advanced countries as well as other Asian newly industrializing countries (NICs) such as Hong Kong, Singapore, and Taiwan. The female labor force participation rates of these four NICs are at the same level or even higher in some cases (Taiwan and South Korea) than those of the industrialized countries. The rates of these

\*An earlier version of this paper was presented at the 1993 Annual Meetings of the American Sociological Association, Miami, Florida, U.S.A. I would like to thank Teresa Sullivan and Arthur Sakamoto who provided helpful comments on earlier drafts of this paper.

four NICs range from 36.8 percent in Hong Kong to 54.3 percent in Taiwan in 1990. Korean women's labor force participation rate is 47 percent, next to Taiwan (ILO 1991). Moreover, Korea has the highest proportion of women in the labor force among these four countries. However, Korean women earn only 53.5 percent of men's wages, while women in other Asian NICs earn as much as 69.5 percent (Hong Kong) (ILO 1991). This earnings gap reveals that Korean women are the least economically advantaged among all female workers in four Asian NICs even though national prosperity among these countries during the last three decades is similarly remarkable. This study is motivated by the need to discover why women earn much less than men in Korea compared to women in other countries such as Taiwan, Singapore, and Hong Kong, which are in a similar stage of economic development like Korea. Are the earnings determination processes for women and men different in Korea? If so, how and why are they different?

In the U.S., a considerable amount of research has been done on female labor force participation and inequality between the sexes in the labor market during the last decades (see Coverman 1988; Stevenson 1988; Treiman & Hartmann 1981). However, the interest in women in the labor market can be traced back only to the early 1980s in Korea. Among them, a few studies actually deal with gender inequality in the labor market (e.g., Bauer & Shin 1987; Kim 1984; Kim 1987; Park 1984). Although these studies have contributed to our understanding of women's disadvantaged situation in the Korean labor market, they have some limitations.

First, these studies use data which are more than 10 years old. Also, since these studies use only cross-sectional data, it is impossible for them to take into account any changes or fluctuations in gender inequality during the last 10 years. In addition, some of them suffer from the limited scope of the data they used. We use aggregate pooled cross-section and time series data in order to overcome some of these limitations. Using pooled data allows us to analyze the effects of human capital and sex segregation across all non-agricultural occupations for a 14-year time period (i.e., from 1977 to 1990).

Human capital theory is applied here to explain differences in the process of earnings determination and earnings inequality between women and men in Korea for two major reasons. First, although human capital theory is one of the most widely accepted economic model used in understanding earnings determinations, this use has been almost exclusively carried out in the examination of Western societies. The explanatory power of this theory may be enhanced by its application to other social and cultural milieu. Secondly, previous studies on Korea point out that individual characteristics are more important than labor market structure in the process of earnings

determination (e.g., Kim 1987).

## THEORETICAL BACKGROUND OF THE EMPIRICAL ANALYSIS

### *Human Capital, Sex Segregation, and Occupation*

Human capital theory suggests that earnings levels are determined by workers' augmented human capital characteristics (Becker 1975; Mincer 1970). According to the theory, individuals invest in human capital as long as they expect future returns to compensate them for foregone earnings and other costs of acquiring human capital. It is assumed that individual workers accumulate their personal investments to maximize earnings through the life-cycle (Mincer 1979). Thus, more investment on human capital increases workers' productivity and, in turn, contributes to raising their wages.

Human capital consists of education and training, work experience, continuity of work history, effort or commitment, health, etc. (Mincer 1970; Schultz 1961). Especially, education and labor market work experience are regarded as the foremost important human capital in the earnings determination process (Becker 1975; Stevenson 1988). Since schools provide various substitutive skills to future workers, the investment in education increases their productivity in the labor market. Thus, it is assumed that more highly educated workers tend to be more productive and get higher wages. Work experience is another crucial component enhancing workers' productivity because many market skills are acquired, developed, and perfected on the job. Since longer periods of labor force participation expose workers to more opportunities of job training, workers who stay longer in the labor market are expected to be more productive. Both on-the-job training in a specific firm and general training increase workers' productivity (Becker 1975). Thus, the more educated and experienced workers are the more likely they will enjoy higher earnings than their less skilled and educated counterparts. Also, more educated workers tend to experience a steeper growth of earnings with experience. This is mainly because their wage rates are higher (Mincer 1970).

Regarding earnings differentials between women and men, human capital theory underlines gender differences in their labor market characteristics. Human capital theorists argue that different investment in human capital results in different productivity and, in turn, it yields differences in earnings (Becker 1975; Mincer 1970, 1979; Mincer & Polachek 1974). According to human capital theory, the major differences between the human capital of women and men result from the disparity of their life-cycle work experience

in the labor market. While women and men are identical in terms of ability, women's low earnings are due to their lower work experience through their whole life and to lower investments in training, learning, and getting ahead. Women invest less in market human capital and this results in low earnings for women and different occupational arrangements between men and women (Becker 1975, 1985; Mincer 1970). Women's lower investment in human capital leads employers to have lower incentives to invest in women for on-the-job training. Furthermore, women's human capital depreciates through disuse while they are out of the labor force (Mincer & Polachek 1974).

Although it is still a major perspective in explaining the earnings determination process, human capital theory is under criticism by many scholars. The main criticism is that human capital theory does not fully explain earnings inequality between the sexes. Critics point out that the human capital model ignores the structural or institutional aspects of the labor market such as employment structure, the characteristics of jobs, or the matching process of employer and employee (Beck, Horan, and Tolbert 1974; Granovetter 1981). The occupational structure of the labor market is often considered an important factor in earnings differentials between workers (e.g., Bibb & Form 1977; Roos 1981; Stolzenberg 1975; Treiman & Terrell 1975).

Among the factors of earnings inequality, one aspect of the labor market has gained much attention from research for its considerable impact on women's earnings. Many studies point out that occupational sex segregation in the labor market is one of the major factors serving to maintain women's disadvantageous socioeconomic positions and rewards relative to men's (Coverman 1988; Hartmann 1976; Reskin & Roos 1987; Stevenson 1988; Treiman & Hartmann 1981). Occupational sex segregation refers to the concentration of men and women into particular occupations. Women tend to work in certain occupations, firms, and industries along with other women more often than with men.

In fact, studies find that women's concentration in certain jobs or occupations tends to lower their earnings (Baron & Newman 1989; Bergmann 1974; England & Farkas 1986; England *et al.* 1982; Gerhart & Milkovich 1989; Parcel 1989; Roos 1981; Sorensen 1989; Treiman & Hartmann 1981; Treiman & Terrell 1975). By using the percent female in the occupational category as an indicator, they report the negative effect of sex segregation on earnings of female and sometimes for those of male workers. This means that men as well as women suffer from working in female dominated jobs.

As sex segregation becomes one of the main interests in the labor market, studies attempt to answer the questions theoretically and empirically: how sex segregation occurs; and how it is related to women's low earnings. As Crompton (1988) points out, it is not possible to explain the phenomenon satisfactorily with one single perspective since sex segregation at the aggregate level is the outcome of a number of diverse processes. Occupational sex segregation is important because of its implication and impact on the economic and cultural life of women. As mentioned previously, sex segregation is perpetuating economic inequality between women and men by lowering women's earnings (England 1981; Reskin 1984; Reskin and Hartmann 1986; Treiman & Hartmann 1981). Furthermore, it plays a significant role in strengthening the cultural construction of gender roles. In other words, prevalent sex segregation at the workplace tends to reinforce male and female stereotypes (Crompton 1988).

#### *Social Change in South Korea*

There have been many changes in the Korean labor market in the 1980s, especially with respect to the labor movement. Therefore, it is worthwhile to examine the effect of social change on the earnings gap between women and men. By incorporating the critical time periods into the model, we can make an inference on the effect of social change on gender earnings inequality. The criteria for dividing time periods are major social and political events which triggered labor disputes in Korea. Korean society experienced major social and political changes in the 1980s, following the end of former president Park's 19-year regime in 1979. Civil uprising and discontent with the government as the most influential forces in recent social and political change in Korea culminated in 1980 and 1987. Since the labor movement has been strategically repressed by the government (Deyo 1989), civil uprising is often accompanied by intense labor disputes in Korea.

The number of labor disputes, drastically increased in 1980 and 1987 (see Table 1), is an indicator of the turmoil in Korean society. In 1980, the number of labor disputes quadrupled, the number of workers involved tripled, and the number of working days lost quadrupled compared to those in 1979. In 1987 the number of labor disputes increased by 14 times, the number of workers involved in disputes rose by 27 times, and the number of working days lost soared by 96 times relative to those in 1986. According to the primary sources of disputes in Table 1, the demands for wage increases jumped by 35 times in 1987 compared to those in 1986 while they increased slightly in 1980.

Although the years of 1980 and 1987 are the turning points of the labor disputes, we assume that the effects of the socio-political events will not be reflected on the process of wage determination right away. Moreover, while some major events in these two important years broke out around mid year (for example, the Kwangju Uprising in May 1980 and the Peace March in June 1987), the data for this study were collected mostly in April or even earlier. Thus, in this study the three time periods are set up as follows in order to see their effects on earnings of workers and earnings inequality between women and men: 1977~1980; 1981~1987; and 1988~1990. Dummy variables for the time periods will be incorporated into the analysis.

In sum, the hypotheses for this study are:

1. Human capital variables have positive effects on workers' earnings.
  - a) Education and tenure positively affect workers' earnings.
  - b) The interaction between education and tenure positively affect earnings.
2. The proportion female has a negative influence on earnings.
  - a) Proportion female negatively affect men's as well as women's earnings.
  - b) The effects of human capital variables will be significant, but will decrease when proportion female is controlled.
3. Workers' earnings will be affected by the occupations they hold.
  - a) Occupations affect workers' earnings levels differently.
  - b) The effect of proportion female remains significant, but will diminish.
  - c) Human capital will have less influence, but still remain significant when occupational groups and proportion female are controlled.
4. The gender earnings gap will decrease in the 1980s, especially in the late 1980s, relative to the 1970s.

## DATA AND METHODS

The data used to assess earnings inequality come from the Occupational Wage Survey (OWS) conducted by the Ministry of Labor in Korea. This nation-wide survey covers employees working in about 3,000~4,000 establishments and was obtained by stratified sampling from all establishments hiring ten or more regular workers in the private and the public profit-seeking sectors. In order to examine all occupations over the years, the published version of the OWS, i.e., the Report on Occupational Wage Survey (ROWS) is used. The ROWS is constituted with cross-tabulated cell means and, thus, the unit of analysis of this study is a string

TABLE 1. THE OCCURRENCE OF LABOR DISPUTES, 1977-1990<sup>1)</sup>

Year	Total			Delayed Payment of Wages	Wage Increase	Better Labor Conditions
	Number of Disputes <sup>2)</sup>	Workers Involved	Working Days Lost			
1977	96	7,975	8,294	30	36	2
1978	102	10,598	13,230	29	45	-
1979	105	14,258	16,366	36	31	-
1980	407	48,970	61,26 <sup>4)</sup>	287	38	14
1981	186	34,586	30,948	69	38	32
1982	88	8,967	11,504	26	7	21
1983	98	11,100	8,671	35	8	19
1984	113	16,400	19,900	39	29	14
1985	265	28,700	64,300	61	84	41
1986	276	46,941	72,02 <sup>5)</sup>	48	75	48
1987	3,749	1,262,285	6,946,93 <sup>5)</sup>	45	2,629	586
1988	1,873	293,455	5,400,836	59	946	136
1989	1,616	409,134	6,352,443	59	742	21
1990	322	133,916	1,836,000	10	167	2

Notes: 1) Reconstructed from Table 14 in *Korea Statistical Yearbook*, 1991, p. 93.

2) Since only 3 primary sources are reported here, the numbers do not add up to the total number of disputes

Source: KSA, *Korea Statistical Yearbook*, 1991.

of cell means.

Although the incorporation of cross-section and time series data causes some complications in the estimating procedure, it has the advantage of allowing inference between cross-section as well as across time. However, using cross-tabulated cell means of the ROWS limits the data to consist of the last 14 year-time period of the OWS (1977-1990). Because of the inconsistent cross-tabulation, the ROWS of the early years are not comparable to those of later periods and thus they are excluded from the analysis. In each year the data consist of 48 strings (units) of cells, i.e., 24 strings of cells representing aggregate characteristics of men and women workers, respectively. Thus, in this study 672 strings of cell means (336 strings for men and women respectively, i.e., 24 strings for 14 years) are analyzed to assess earnings inequality between the sexes. The combination of six occupation groups and four education classes constitutes these 24 strings of cells.

One limitation of the data lies in the scope of the ROWS. The surveys include only workers in selected firms with ten or more employees. This sample selection excludes large segments of the labor force. Workers in

firms with more than ten employees accounted for about 58 percent of all employed persons in the labor force in 1983, and only 37 percent of all women in non-agricultural employment (Bauer & Shin 1987). Moreover, conditions of female employment is presumably different in the formal sector covered by the ROWS than in the informal sector which is excluded here. However, since women are more disadvantaged in informal sector employment than in formal sector, this study is likely to underestimate female workers' condition. For example, if the findings show some discrimination against women in this selected group of workers, it can be interpreted as evidence of even more serious discrimination against women workers as a whole.

The dependent variable is log hourly earnings of men and women workers. Earnings are the sum of monthly regular earnings divided by hours worked per month. Regular earnings consist of basic pay and monthly allowance in kind, including allowance for family, position, and prices of commodities. Since the data include earnings from different time periods, earnings of all years are adjusted by the CPI (Consumer Price Indices) with 1985 as the base year. Independent variables are education, tenure, sex segregation, and occupation. First, education is measured by the level of formal schooling completed by workers. The level of schooling is measured on four levels. Since school dropouts are classified into the next lower level, the numeric values of years completed are assigned to each level of schooling except "junior high school completed." In case of "junior high school completed," the middle value of the schooling is assigned because this category includes dropouts as well as graduates. Each level of schooling is given integer values as follows: 5 to "junior high school completed or lower"; 12 to "high school completed"; 14 to "junior college completed"; and 16 to "college completed or more." Second, firm tenure is used as an indicator of the labor market work experience. It is measured by mean number of years workers have been employed in the current firm. Third, since sex segregation is reported to be a major determinant reducing women's earnings, proportion of female in the occupation is chosen to indicate the degree of sex segregation. Fourth, occupation is estimated as a number of dummy variables omitting production workers as the reference group. Six major occupational groups are used in the analysis.<sup>1</sup> They are "professional, technical, and related workers," "administrative and managerial workers," "clerical and related workers," "sales workers,"

<sup>1</sup>The Report on Occupational Wage Surveys of some years do not include the category of "agricultural, animal husbandry and forestry workers, fishermen and hunters." This category is omitted from the analysis for consistency and comparability of the data set.

“service workers,” and “production and related workers, transport equipment operators and laborers.”

*Estimation Procedures: Analysis of Pooled Cross-section and Time Series Data.*

There are various research designs for the pooled cross-section and time series data (see Hsiao 1986; Kmenta 1986; Sayrs 1989). The most basic method of analyzing the pooled data is the ordinary least squares (OLS) method assuming that the slopes of independent variables and intercepts are constant across cross-sections and over the time period. Although there was a study using pooled data for explaining earnings determination (see England *et al.* 1988), the use of aggregate data of current study limits the possibility of applying other designs. The advantages of using this design are that it is a fairly simple and straightforward technique to derive estimates, and it enables the researcher in establishing reliable estimates by correcting anomalies in the error structure (Sayrs 1989: 24-5).

In general, using the OLS method on pooled cross-section and time series data tends to cause two problems in estimation: heteroscedasticity and autocorrelation. Thus, the classical ordinary least squares regression method does not produce the best linear unbiased estimators (BLUE) when it analyzes pooled data without adjustment on the errors. Kmenta (1986: 618-622) recommends a “cross-sectionally heteroscedastic and timewise autoregressive model” in order to deal with the complications in the estimation of the parameters. As a variation of the OLS estimation procedure, this design assumes that the pooled data have error terms which are cross-sectionally heteroscedastic and autoregressive<sup>2</sup> over time. In this design the transformation of the variables and application of the OLS estimation method on the transformed data are repeated until both autocorrelation and heteroscedasticity are adjusted. Thus, in fact, it is not OLS, but generalized least squares (GLS).

## EMPIRICAL FINDINGS AND DISCUSSION

Since the data used in this study is aggregate, the interpretation of the findings needs to be considered as an approximate inference of individual workers' behavior. The analysis of data is divided into four sections (models) in order to see the change of coefficients by incorporating additional variables: The effects of (1) human capital on earnings; (2) sex

<sup>2</sup>First-order autocorrelation is assumed because AR(1) process is the most commonly observed autocorrelation case.

segregation on earnings; (3) occupational groups on earnings; and (4) time periods on earnings.

Each model went through three stages of analyzing procedure: ordinary least squares; weighted least squares (WLS) adjusting autocorrelation; and WLS correcting for heteroscedasticity. As mentioned in the previous section, this is because pooled data encounter more complex problems in estimating procedures than either cross-sectional or time series data only.

First, OLS was applied while ignoring the possible presence of autocorrelation and heteroscedasticity. Then the data were transformed by multiplying the first-order autocorrelation coefficients which were estimated from the OLS method, since autoregressive functions were detected in the error terms in all four models. Second, the OLS method was applied again to the transformed data in which autocorrelation was adjusted. Third, one more step of transformation was carried out in order to adjust heteroscedasticity in the cross-sectional units.

Table 2 presents means of major variables for men and women of the data for this study. On the average, men earn 1,546 Korean Won an hour and women earn 730 Won an hour (1985 constant price). This indicates that on the average women earn about 47 percent of men's wages across occupations from 1977 to 1990. Women also have lower levels of human capital than men. The average education level of women is 8 years, which is 2 years less than that of men. Women have 2 years of tenure in the current firms and men have 4 years of tenure. Finally, women are slightly more likely than men to work with women coworkers.

TABLE 2. MEANS OF VARIABLES FOR MEN AND WOMEN<sup>1)</sup>

Variables	Men		Women	
	Mean	S.D.	Mean	S.D.
Earnings <sup>2)</sup>	15.46	7.42	7.30	3.56
Log Earnings	2.64	0.42	1.90	0.41
Education	10.08	4.21	7.99	3.69
Tenure	4.16	1.33	2.20	0.55
Proportion Female	0.35	0.11	0.39	0.06

Notes: 1) Means and standard deviations weighted by the size of cells.

2) Earnings (100 Korean Won/hr: 1985 constant price), Education (years), Tenure (years), and Proportion Female.

### *Model 1: The Effects of Human Capital on Aggregate Earnings*

Table 3 presents the effects of human capital (Model 1) and sex segregation (Model 2) on earnings for men and women, respectively.

Workers of all non-agricultural occupations are analyzed in these models. The estimates reported in this table are produced by using the generalized least squares procedure because the errors are autoregressive and heteroscedastic.

Columns 3 and 4 in Table 3 describe regression coefficients and standard errors for Model 1. Both male and female groups show effects of human capital on earnings as expected. First, individual education and tenure have positive effects on workers earnings as expected. The main effects of both education and tenure are greater for men than women, indicating that men tend to earn more than women in general. However, the overall effects of them (i.e., main effect and interaction) are not consistently greater for men than women. When both women and men are assumed to have 5 years of tenure, women receive approximately 5 percent  $[0.069 - 0.003 \times (5)]$  more earnings for each additional year of education, and men also tend to earn 5 percent more  $[0.088 - 0.007 \times (5)]$ . Women earn 4 percent  $[0.069 - 0.003 \times (10)]$  more earnings for each extra year of education, while men receive 2 percent more  $[0.088 - 0.007 \times (10)]$  given 10 years of tenure. Also, men earn 15 percent  $[0.231 - 0.007 \times (12)]$  more for each additional year of tenure while women earn 17 percent  $[0.207 - 0.003 \times (12)]$  more under the assumption of both having completed high school. Although this shows that the overall rates of return to women's education and tenure are slightly higher than men given certain levels of tenure and education, this does not

TABLE 3. THE EFFECTS OF HUMAN CAPITAL AND SEX SEGREGATION ON LOG EARNINGS, 1977-1990 (ALL NON-AGRICULTURAL OCCUPATIONS)<sup>1,2)</sup>

(1)	Variables (2)	Model 1		Model 2	
		(3)	(4)	(5)	(6)
		b	s.e.	b	s.e.
Male	Intercept	1.124**	0.160	1.231**	0.161
	Education	0.088**	0.012	0.091**	0.012
	Tenure	0.231**	0.025	0.224**	0.024
	Edu × Tenure	-0.007**	0.002	-0.008**	0.002
	Proportion Female	-	-	-0.391**	0.098
Female	Intercept	1.125**	0.153	1.721**	0.168
	Education	0.069**	0.012	0.069**	0.012
	Tenure	0.207**	0.036	0.153**	0.032
	Edu × Tenure	-0.003	0.003	-0.004	0.002
	Proportion Female	-	-	-1.378**	0.148

\*  $p < .05$ , \*\*  $p < .001$ .

Notes: 1) Dependent variable: log hourly total earnings.

2) Generalized least squares regression (N = 336 in all models).

mean that women earn more than men in absolute terms because the average earnings level for women is much lower than men (see Table 2).

*Model 2: Sex Segregation on Earnings*

The effect of occupational sex segregation on earnings is examined with human capital in columns 5 and 6 in Table 3. The occupational sex segregation is operationalized as the proportion of females in 6 occupational categories. Although the effect of proportion female is the main concern in this model, the change in effects of human capital on earnings after controlling for the effect of sex segregation (i.e., proportion female) is also investigated in this model.

First, the effect of proportion female is significant and negative as expected. It is found that employment in occupations with greater numbers of women tends to lower workers' earnings regardless of their sex. Women tend to lose 14 percent of their earnings when the level of sex segregation increases by 10 percentage points. For example, when number of female workers in an occupation increases from 20 percent to 30 percent, women lose 14 additional percent of their earnings. By contrast, men lose only 4 percent of their earnings in the same condition. This indicates that women are more likely to experience the higher penalty for being employed in female-dominated occupations. Women are penalized about four times more than men for working with other women even though both groups tend to be disadvantaged (-1.378 versus -0.391). This corresponds to the findings of studies which show the negative effect of percent female on the earnings level in the United States (e.g., Gerhart and Milkovich 1989; Parcel 1989; Sorensen 1989). This result also supports in part the findings of a previous study in Korea (Park 1984: 212). Park found that women tended to receive lower wages and their starting salary tended to decrease as the number of women in their industries increased. Moreover, he found that their starting salary was affected more negatively as the number of women increases.

Two major reasons for this finding can be identified. First, it seems that systematically low wages for women, widely observed in the case of the Korean labor market, contribute to the significantly higher penalty against women than men who work in female dominated jobs. According to "The Data for Wage-Setting Practices" published by the Korean Association of Employers (1989), most firms explicitly set lower base wages and allowances for women than men at all levels of education and experience. Thus, the already low wages of women may easily decline further due to

the overcrowding effect (Bergmann 1974) if more women join the occupation.

However, it is not simply a problem of crowding itself. The crowding is intertwined with the fact that women are systematically relegated to the lower occupational positions which are also accompanied by low wages. Korean women are not only concentrated in low paying occupational categories, but within these categories they are confined to lower level jobs in which the chances for moving up the "career ladder" are limited (Park 1984: 214-215). According to "The Survey on the Management of the Women Workers' Employment" by the Korean Association of Employers in 1984, for example, 33 percent of firms hiring 100 or more workers does not provide promotion chances to women in the manufacturing industry at all. Thus, women tend to be overrepresented in lower status occupations with less prestige and lower levels skill while men are overrepresented in occupations characterized by higher levels of skill, responsibility, or status.

According to the occupational distribution of workers over 14 years, most Korean female workers are concentrated in production (67.5%) and clerical (22.7%) occupations. The rest of them (9.8%) are scattered throughout other occupational categories. Only 4.4 percent of women are employed in professional and managerial occupations. By contrast, 15.6 percent of men are working in the professional and managerial occupations, and 79 percent are clerical or production workers. Although the majority of male workers are production and clerical workers, there is a considerable portion of male workers in professional and managerial occupations. Moreover, the occupational distribution of men is not as skewed as that of women. Professional and managerial occupations are the most highly paid occupations while clerical and production are the lowest paid occupations. Thus, it seems that the concentration of women in the two lowest-paying occupations and their underrepresentation in the high paying occupations, especially managerial occupations, contributes to their greater loss of wages in female dominated jobs in general. Furthermore, since women are often relegated to low paying positions within these occupational categories, the channeling of women into low paying positions further decreases the wage level of women as a whole.

Human capital variables are still significant in Model 2 as in Model 1. It was hypothesized that the effects of human capital on earnings would decrease if the proportion of females in occupations, used as an indicator of sex segregation, was incorporated into the equation. It was expected that proportion female would indirectly explain some effects of human capital on earnings. Contrary to the hypothesis, the effects of human capital on

earnings do not show any substantial changes when proportion female is included in the model. This result suggests that proportion female affects women's earnings independently of the influence of education and experience.

### *Model 3: Occupational Groups on Earnings*

#### 1. Male Workers

The effects of occupational groups, controlling for other variables, on workers' earnings are presented in Table 4. The effects of human capital remain significant for men as in Models 1 and 2 in spite of the incorporation of occupational groups into Model 3. Although the effects of human capital on earnings in Model 3 decreased relative to Model 1 and Model 2, the changes in the effects are small. It was expected that occupational groups would weaken the effects of human capital on earnings since occupations require different levels of education and skill and these qualifications function as filters in assigning workers to the different sectors of the labor market. Contrary to the prediction, however, the rates of return to human capital for men did not change much which indicates the persistent effects of human capital on earnings.

A surprising finding in Model 3 is the impact of the proportion of females in occupations on earnings. Contrary to the hypothesis, the effect of proportion female on the earnings of male workers became positive, although it was not significant. This suggests that men are not penalized by working with more women in each occupation. Its effect on men's earnings was not only negative but also significant when proportion female was added to the basic model (see the results for Model 2 in Table 3). The change in the effect of proportion female on earnings from negative to positive implies that men may earn more within each occupational category they engage in as more women are hired, while, in general, they are seen disadvantaged relative to those in the occupations hiring smaller numbers of women.

One recent study in the U.S. suggests that there are various types of hidden advantages for men in female-dominated jobs. Williams points out that men experience "glass escalator" effects rather than glass ceiling effects, when they are employed in predominantly female professions (Williams 1992). Rather than finding a promotional point past which they cannot move upward, men are escorted to the very heights of the corporate ladder. Williams' study does not directly address the wage levels of men, and it discusses only men in predominantly female jobs. Since the enhancement in

their careers is usually accompanied by financial gain, however, the study provides indirect evidence that men in occupations with more women co-workers might be more likely to earn higher wages than men in other occupations.

According to Table 4, male workers in all other occupations, except clerical and service workers, earn significantly more than production workers, everything else being equal (see column 2). Compared with production workers, the greatest returns to occupational employment accrue to those in administrative and managerial occupations, followed by professional and sales occupations. Administrative and managerial workers tend to receive 49 percent  $[(e^{0.396} - 1) \times 100]$  more wages, professional workers receive 26 percent more, and sales workers earn 16 percent more than production workers.<sup>3</sup> There is no statistically significant difference in earnings between clerical and service and production workers, although service workers earn less and clerical workers earn more compared to production workers. Thus, this result shows that administrative and managerial occupations are the most advantageous and sales is the least advantageous occupation relative to production for men.

TABLE 4. THE EFFECTS OF OCCUPATIONAL GROUPS ON LOG EARNINGS, 1977-1990<sup>1,2)</sup>

Variables (1)	Model 3			
	Male		Female	
	(2)	(3)	(4)	(5)
	b	s.e.	b	s.e.
Intercept	0.962**	0.061	0.993*	0.100
Education	0.087**	0.012	0.072**	0.011
Tenure	0.206**	0.023	0.129**	0.036
Edu × Tenure	-0.008**	0.002	-0.005*	0.002
Proportion Female	0.226	0.143	-0.093	0.188
Professional	0.234**	0.073	0.403**	0.122
Managerial	0.396	0.090	0.885**	0.118
Clerical	0.100	0.073	0.377**	0.101
Sales	0.150*	0.076	0.216**	0.094
Service	-0.122	0.092	0.258	0.086

\*  $p < .05$ , \*\*  $p < .01$ .

Notes: 1) Dependent variable: log hourly total earnings.

2) Generalized least squares regression (N = 336 in all models).

<sup>3</sup>See Gujarati (1988: 461) for interpreting dummy variables in semilogarithmic equations. He suggested that the interpretations of continuous explanatory variables and dichotomous dummy variables should be different in semilogarithmic equations.

## 2. Female Workers

Unlike the male group in which the effects of both education and tenure on earnings slightly decreased in Model 3 relative to Model 2, women tended to experience the greater effect of education, but the smaller effect of tenure in Model 3. In general, however, the effects of human capital on the earnings of women do not show much change, indicating that the effects of human capital on earnings are not sensitive to the kind of occupations they engage in.

The effect of proportion female on women's earnings is negative as expected, but it is not significant in Model 3. The magnitude of the effect drastically decreased from  $-1.378$  in Model 2 to  $-0.093$  in Model 3 as occupational groups are incorporated. The change in the coefficient of proportion female for women shows that the kinds of occupations women engage in explains most of the effect of proportion female on their earnings. This means that women are not financially penalized by working with other women within an occupation since the effect of proportion female is absorbed into the differences between occupations. Unlike men, however, the effect of proportion female on women's earnings remain negative which is consistent to the hypothesis.

Column 4 in Table 4 shows that female workers in all other occupations earn significantly more than female production workers (omitted category). The difference in returns to occupation is much greater among women than men. However, this does not mean that women earn more than men as clearly shown in Table 4. Rather, it indicates that earnings differentials among female workers in different occupational groups are much greater than those among male workers. Like men, management is the most advantageous occupation for women over production, followed by professional, clerical, service, and sales. Women in managerial occupations earn as much as 142 percent  $[(e^{0.885} - 1) \times 100]$  more than production workers. Professional female workers earn 50 percent more, clerical workers earn 46 percent more, and service workers earn 29 percent more than production workers. Sales workers, as the least benefited occupation compared to the others, earn 24 percent more than production workers. Both the male and the female equations in Model 3 show that workers in managerial, professional, and sales occupations earn more wages than production workers. However, unlike their female counterparts, male clerical and service workers do not earn more than the male production workers. Although it is not significant, service workers tend to earn less than production workers. As discussed in the earlier section, this may result

from the lower prestige of most jobs for men in service occupations than in the production occupations.

*Model 4: Effect of Time on Earnings*

In this model, three dummy variables (one of them is omitted for reference) are estimated in order to reflect the effect of different time periods on the earnings. The criteria for creating dummy variables for time are major social and political events which triggered the labor disputes. As discussed in the earlier section in this paper, the three time periods are set up as follows: 1977~1980; 1981~1987; and 1988~1990. Two dummy variables for the time periods are incorporated into Model 3 while the first time period (1977~1980) serves as reference category.

Column 2 in Table 5 present the final results on the effects of two time periods on the earnings of men while controlling for human capital characteristics and sex segregation. The time dummy for the second period (i.e. 1981~1987) exerts a negative but statistically insignificant effect on the earnings of men. This suggests there were not any wage increases for men in the period of 1981~1987 relative to the period of 1977~1980 holding other factors constant. It seems that the labor disputes did not help to boost wages

**TABLE 5. THE EFFECTS OF ALL VARIABLES AND TIME ON LOG EARNINGS, 1977-1990<sup>1,2)</sup>**

Variables (1)	Model 4			
	Male		Female	
	(2)	(3)	(4)	(5)
	b	s.e.	b	s.e.
Intercept	1.024**	0.126	0.869**	0.136
Education	0.081**	0.008	0.073**	0.008
Tenure	0.202**	0.017	0.136**	0.026
Edu × Tenure	-0.006**	0.001	-0.005**	0.002
Proportion Female	0.077	0.139	-0.136	0.195
Professional	0.203**	0.055	0.429**	0.073
Managerial	0.332**	0.076	0.909**	0.105
Clerical	0.078	0.045	0.343**	0.062
Sales	0.168**	0.052	0.249**	0.064
Service	-0.123	0.064	0.261**	0.065
1981~1987 <sup>3)</sup>	-0.012	0.015	0.075**	0.022
1988~1990	0.174**	0.020	0.267**	0.028

\*\* p < .05, \*\*p < .01.

Notes: 1) Dependent variable: log hourly total earnings.

2) Generalized least squares regression (N = 336 in all models).

3) Time periods: 1981 to 1987; 1988 to 1990; and 1977 to 1980 (omitted period).

of men, and moreover, the second oil shock and the following slowdown in the world economy in 1979~1982 might keep the wage level at the same level as in the previous period.

By contrast, the period of 1988~1990 had a positive and significant effect on men's earnings. During the period of 1988~1990 men earned 19 percent  $[(e^{0.174} - 1) \times 100]$  more than the period of 1977~1980. Since 1986, Korea has been experiencing a remarkable economic boom with a GNP growth rate greater than 12 percent in 1986~1988 (KSA 1991: 467). This stronger performance of the national economy might be reflected in the earnings level of workers in the later period. However, the most strong demands for wage increases from workers in the entire period of industrialization seem to be the real background on this big increases in earnings. While GNP growth rates decreased sharply to 6.8 percent in 1989 and to 9 percent 1990, the frequency and the intensity of labor disputes<sup>4</sup> since 1987 are beyond comparison to those during 1981~1986 as seen in Table 1.

One important difference in the estimates for women and men is the effect of the period from 1981 to 1987 on the earnings of women. As seen in Table 5, the earnings of men did not increase during the years of 1981-1987. However, women experienced some increases of their earnings in the same period compared to the previous years (1977~1980) when everything else is equal. The level of earnings for women increased 8 percent  $[(e^{0.075} - 1) \times 100]$  during this period. Although the magnitude of the wage increases is not big, it seems to be a substantial amount taking into account the economic difficulty Korean society experienced under the stagnation of the world economy. In other words, this indicates that women were not influenced negatively by the economic crisis during this period as men might have been. Nevertheless, the period from 1988 to 1990 has statistically significant and positive effect on both women's and men's earnings. Women earned 31 percent  $[(e^{0.267} - 1) \times 100]$  more during 1988~1990 than during the period of 1977~1980. It seems that the unprecedented intensity of the labor movement and the gradual economic recovery since the mid 1980s positively affected the earnings of women as well as men during this period.

A comparison of the coefficients of dummy variables for the different time periods between women and men can show how much the gender earnings gap decreased during certain time periods. The effects of the period from 1988 to 1990 on earnings are 0.174 and 0.267 for men and women and the effects of the period from 1980 to 1987 are -0.012 (not

<sup>4</sup>There are four major types of labor disputes: stay-in strike; veto of operation; demonstration; and others (KSA 1991, p. 93).

statistically significant) for men and 0.075 for women. Thus, women had about 12 percentage points  $\{(e^{0.267} - 1) \times 100\} - \{(e^{0.174} - 1) \times 100\}$  higher increase in earnings than men during the period of 1988~1990 relative to the period of 1977~1980. In 1981~1987 women also earned 9 percentage points  $\{(e^{0.075} - 1) \times 100\} - \{(e^{-0.012} - 1) \times 100\}$  more than men. This suggests that there has been a continuous improvement in the net gender log earnings gap when everything else is equal. It also shows that the earnings gap has improved greater since 1988 than during the period of 1981~1987. Moreover, this supports the hypothesis that the gender earnings gap tends to decrease as labor movements intensify since the labor movements were much more aggressive in the period of 1988~1990 relative to the period of 1981~1987.

This study attempted to identify the sources of gender earnings inequality using theories of human capital and sex segregation and to discover the change of gender earnings inequality over time. The findings of the empirical analysis suggest that women tend to have lower human capital than men and this causes most of earnings inequality between women and men.<sup>5</sup> However, it is difficult to conclude that Korean women do not invest because they do not want to. Rather, it can be said that investment in human capital, i.e., education and tenure, might not be the choices for women. Human capital theory assumes that individuals invest in human capital if they expect returns from their investments—but it often does not take into account other factors which might affect the decisions to invest in human capital. For example, the study on Japanese society by Brinton (1988) suggests that human capital development in Japan is more likely to be stratified by social institutions such as schools, labor market, and family, and these institutions tend to encourage more inequality between women and men than in the U.S.. In other words, unlike men, women in Japan tend to be discouraged to invest in human capital and/or are not supported to do as much as men are. Since Korean society shares many characteristics of these Japanese institutions, it may similarly discourage the development of women's human capital.

Therefore, it is hard to conclude that Korean women's lower level of human capital is caused simply because women did not invest. Rather, women might be socially conditioned not to invest as much as men did (e. g., Moon 1985). Unfortunately the data for this study did not contain the

<sup>5</sup>Although the result is not reported in this paper, the standardization of gender earnings gap shows that 54 percent of earnings gap is explained by women's lower level of human capital than men. The remaining 46 percent is not explained and may be attributable to discrimination against women and to unmeasured factors.

appropriate measures of these interconnected social institutions in Korea, however, we could not disentangle how much of the gender earnings was purely caused by women's lower human capital which is not affected by these institutions, for example, parents' lack of supports to daughters.

There are some issues which we were not able to address in the current stage of this research, but in the future we may investigate. First, there is a rising concern about the growing ambiguity and declining significance of occupations in the labor market study. In her recent paper, Sullivan (1990) argues that we need to investigate firms and industries more, in order to address questions raised about the mechanisms in the labor market, such as persistent sex segregation in the face of rapid growth in female employment. She points out that "new technology, internationalization, corporate reorganization, and failed government regulation (1991, p.13)" tend to make the division of labor at the individual level easily changeable, and the investment in particular occupations and occupational identities become less important to the employers, as well as to individual workers.

Furthermore, although this study has shown that it is important to take into account the time effect on earnings, future study needs to use more precise indicators of social change, since the present study could only use the three crucial time periods as the approximate indicators reflecting the social changes during the 1980s. The incorporation of refined measures of social changes (for example, direct measures of unionization, and of the types and frequencies of labor dispute within firms or industries over time) will help to identify more accurately their effects on the reduction of gender earnings inequality.

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