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Determinants of inter-industry wage differentials: A case of the Korean labor market

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DETERMINANTS OF INTER-INDUSTRY WAGE DIFFERENTIALS: A CASE OF THE KOREAN LABOR MARKET

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ABSTRACT

In spite of the drastic changes in the economy and in the labor market, wage differentials across manufacturing industries have been persistent over the last 30 years in Korea. A two-step approach is adopted to analyze the sources of inter-industry wage differentials with special reference to unique features of the Korean labor market. In the first step, individual workers' earnings are regressed on the personal attributes, human capital factors and industry dummy variables. In the second step, the estimated coefficients of the industry dummy variables are regressed on the industry characteristics.

Special attention is given to the effects of the industrial policies supporting targeted industries and the government intervention in the labor market on earnings in the manufacturing industries. Also, the effects of market power of a few large business groups (chaebôls) and the large influx of women and highly educated workers into the labor market are analyzed.

The empirical finding shows that the amount of subsidized bank loans that is a proxy for the industrial policy and the average years of schooling of the industry have a positive effect on earnings. On the other hand, the large influx of female workers shows a negative effect on the earnings of female workers as well as other workers. In addition, the

results of our analysis show that the effect of the proportion of workers employed in large firms in a given industry on earnings is insignificant. The evidence does not support the hypothesis of the positive effect of the market concentration on wages; nor does it support the hypothesis of the negative effect of the monopsonic restraints in the employment practice.

In general, the results of our study support the proposition that the wage differentials that exist in Korea are products of both human capital characteristics and industry characteristics. In particular, industrial policy has been primarily responsible for keeping wage differentials persistent between the supported industries and the non-supported industries.

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CHAPTER 1

INTRODUCTION

The Korean economy has experienced rapid growth during the last three decades.[1] During this period, the industry structure and the labor market have also undergone a tremendous transformation.[2]

However, the wage structure of the manufacturing industries has been quite stable over time in spite of the rapid changes in the demand and supply of the labor force across industries. There have been large wage differentials among workers who have similar personal characteristics, but are employed in the different industries.

Although the order in which industries are ranked with regard to the average level of the wage paid to workers has

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[1] The GNP of Korea has increased at the average annual rate of 9.0 percent in real terms between 1962 and 1991. The magnitude increased more than twelve-fold since 1962. Its per capita GNP in current dollars has increased from U.S. $87 in 1962 to U.S. $6,518 in 1991. The export has grown from U.S. $55 million in 1962 to $69.8 billion in 1991.

[2] The manufacturing sector has expanded at the growth rate of 15 percent annually in real terms over the last thirty years. The share of this sector in GDP increased from 16.3 percent in 1962 to 28.6 percent in 1991, and that of the employment increased from 8.7 percent in 1962 to 27 percent in 1991 in the manufacturing sector. There have been significant changes in the structure of employment from the light to the heavy industry and in the composition of employment between large and small-sized firms.

changed sightly, there exist high correlations among wage structures across different points of time both in terms of magnitude and ranking.[3] For instance, the textile industry where the low wage was paid in 1972 continues to be a low-wage industry in 1991, while the basic metal industry remains to be a high wage industry since 1972.

With respect to inter-industry wage differentials, the competitive labor market model suggests that inter-industry wage differentials are caused by either systematic differences in worker's ability or by compensating differentials for nonpecuniary aspects of work. This model explains that inter-industry wage differentials reflect discriminatory shifts of labor demand and/or supply due to imperfect short-run labor mobility across industries, and that these differentials disappear in the long run.

On the other hand, the efficiency wage theory and the union threat model suggest that workers' earnings depend not only on their personal attributes but also on industry characteristics in which they are employed. They argue that the optimal wages vary with the conditions necessary for paying efficiency wages across industries.

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[3] The estimated correlation coefficient of wage differentials between 1972 and 1991 is 0.844 in terms of magnitude from the Occupational Wage Survey of Korea. The coefficient between 1982 and 1991 is 0.896.

Many empirical studies found that wage differentials across industries have been stable in the U.S. and in many developing countries. However, few studies have been done for developing and underdeveloped countries.

The purpose of this study is to analyze the sources of inter-industry wage differentials in the Korean context. In this study, we examine what causes the inter-industry wage differentials in the manufacturing sector and how they have changed over the last three decades in Korea. The focus of the research is on the manufacturing sector, because this sector has been growing most rapidly and has played a pivotal role in changing the structure of industry and employment.

A series of econometric analyses are conducted with special reference to the unique features of the Korean labor market. Special attention is given to the effects of industrial policy supporting targeted industries and the government intervention in the labor market on earnings of workers in the manufacturing industries. Also, the effects of market power of a few large business groups, chaebôls, and a large influx of women and highly educated workers, as well as the effect of exposure to the international competition on the wage differentials across industries are analyzed. No prior study has addressed these topics explicitly.

Furthermore, we test how well the current wage differentials theory and empirical studies explain the

inter-industry wage differentials in the Korean context, and examine what kinds of modifications are required.

A two-step approach is adopted to analyze the sources of the inter-industry wage differentials while solving the problems resulting from aggregating the information on individual attributes with the industry characteristics. This is the first time this approach has been used to analyze the inter-industry wage differentials in Korea.

In the first step, we regress earnings on several individual characteristics using micro data and only industry dummy variables. In the second step, the coefficients of industry dummy variables estimated in the first step are regressed on industry characteristic variables to identify the sources of the inter-industry wage differentials.

The earnings equations for three different years of 1972, 1982, and 1991 are estimated under the assumption that each year reflects changes in the labor market during the previous decades. The Occupational Wage Survey (OWS) that is conducted annually by the Ministry of Labor is used to generate a sample of individuals for estimating the effects of personal attributes and human capital factors on wage differentials across the detailed industry categories. Several issues of the Financial Statement Analysis (FSA) and Output-Input Table, both generated annually by the Bank of Korea, are used for the major sources of information on the macro industry-related characteristics.

This study seeks to improve our understanding of the distinguishing features of the Korean labor market, where the wage differentials across the manufacturing industries have been stable over time. The analysis of the sources of the persistent wage differentials across industries will make a valuable contribution to more accurately assessing the role of government intervention in the labor market, the issue of unemployment, and the effect of industrial policies on income distribution.

The outline of the dissertation is as follows: Theoretical and empirical analyses concerning inter-industry wage differentials are reviewed in Chapter 2. Chapter 3 describes the interesting features of the Korean labor market to provide a background for the analysis of wage differentials in Korea. The pattern of changes in the wage structure and the inter-industry wage differentials are examined in Chapter 4. In Chapter 5, the theoretical framework and the method of estimating the sources of the inter-industry wage differentials of Korea are explained. The explanatory variables, data used and empirical results are also discussed. The conclusion of the study is discussed in the final chapter.

CHAPTER 2

REVIEW OF THE LITERATURE

This chapter presents the overview of theories and hypotheses on inter-industry wage differentials. The previous empirical studies that attempted to test them are also reviewed.

2.1. Theories of Wage Differentials

The concept of the wage is the price of labor to economists, but the determination mechanism is not obvious. According to the neoclassical approach, the level of wages and employment are decided by the market forces that operate through labor demand and supply.

The perfect competitive labor market assumption implies "the law of one wage" by which the wage is equal to the value of the marginal product of labor. This approach predicts that job attributes that are not affecting the utility of workers do not influence wages. The wage differentials result either from some barriers to mobility of workers due to the lack of information or from the differences in the quality of working conditions. It suggests that the wage differentials that are not explained by labor quality differences and caused by changes in labor demand or supply are likely to be narrow and disappear in the long run.

On the other hand, the efficiency wage approach suggests that job attributes should have systematic effects on wages because they influence the optimal level of wages that firms choose. In its simplest form, the efficiency wage model can be described by the following firm's production function[1]: $Y = sF[E(W), L]$, where L denotes the number of workers and W is the wage rate. S reflects changes in technology and E denotes the level of effort. The effort function E(W) depends on the wage paid by the firm and the function is assumed to satisfy $E'(W)>0$ and $E''(w)<0$.

The first-order condition for the firm that maximizes profit over W and L are as follows[2]:

$$E'(W^*)W^* / E(W^*) = 1$$

$$E(W^*)\ s\ F'[E(W^*)\ L] = W^*,$$

where W^* is the equilibrium wage. The second-order conditions which require that elasticity of effort be decreasing in effort at the solution are also satisfied.

The equilibrium wage W^* has three properties: first, the elasticity of effort with respect to the wage is equal to one; second, W^* minimizes labor cost per unit of effective labor;

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[1] This part depends on Lectures on Macroeconomics Textbook by Blanchard and Fischer (1989).

[2] The profit function is given by the expression, $P=sF[E(W)L]-WL$.

third, W^* is independent of s, so the firm will not change the wage rate at W*.

Workers are hired until the marginal product of additional work is equal to the wage rate and thus there is no reason of equalizing the level of employment to the number of workers who want to work. The unemployment can be explained by the real wage rigidity due to the firm's rational resistance to wage flexibility.

A firm's behavior of paying the higher wages than the ongoing level can be rationalized if we assume that firms do not always maximize profit, or that paying the higher wages is not very costly for firms for efficiency wage reasons. Several different versions of the efficiency wage model have been proposed as possible rationales for paying noncompetitive wages.

A first model postulates that the higher wages are paid to minimize turnover costs. Salop (1979) and Stiglitz (1974, 1985) suggest that if turnover costs are high and they are the decreasing function of wages paid by the firm, raising wages may be an incentive to minimize turnover costs.

A second possibility is that increasing wages raises the effort level of worker. Workers who are paid only their opportunity costs have little incentive to perform well since losing their jobs would not be costly. The models developed by Calvo (1979, 1985), Salop (1979), Shapiro and Stiglitz (1984), Sparks (1986) as well as Bulow and Summers (1986)

predict that firms paying high wages have high monitoring costs or high costs incurred from shirking.

Alternatively, the third model postulates that a worker's feeling of loyalty to the firm increases with the extent to which the firm shares its profit with workers. Akerlof and Yellen (1988) argue that the worker's productivity is not only dependent on fairness but on his relative earnings compared to earnings of other workers and firm. This model relies on the notion of relative gift that is not well captured by the traditional utility function.

The fourth group of models are based on selection of workers rather than incentive affairs. The models developed by Garen (1985) as well as Weiss and Landau (1984) suggest that firms paying high wages attract a high quality pool of applicants and that high wages are desirable if quality of workers is not directly observable.

These models can explain why characteristics of firms or industries can affect the wage rate. The optimal wage to pay will vary with differences in ability of firms to bear the costs of turnover or to supervise and monitor their workers. That might be caused by differences in management capacity and/or in the technology of production.

2.2 Empirical Studies on Inter-industry Wage Differentials

2.2.1 Existence of Inter-industry Wage Differentials

Slichter (1950) is the first economist to study the industry wage structure. He examines the average hourly wage rate of male workers in manufacturing industries between 1923 and 1946. His findings shows that industry wages are positively correlated with profit margins but negatively correlated to the ratio of payroll to income, and that the average wage rate of unskilled workers in an industry varies positively with that of skilled workers. He concludes that the managerial policy is important in wage setting.

Wachtel and Betsey (1972) estimate the impact of one digit industry and three occupation groups on the residual of wages after controlling for education, experience and demographic factors. They find that a substantial portion of the variance of wage earnings can be explained by industry structure.

Dickens and Katz (1987) estimate wage equations in two steps. In the first step, they regress wages on several individual characteristics and industry dummy variables. In the second step, the coefficients of the three digit industry dummy variables are regressed on industry characteristics.

They argue that the pattern of which industries pay high wages has been very stable over time and across countries.

The estimates show that industry affiliation accounts for 7-30 percent of all interpersonal wage variances for non-union workers and that industry wage differentials are strongly correlated with occupations. They conclude that an individual's earnings depend not only on his own attributes but on the characteristics of his establishment and industry.

Krueger and Summers (1988) estimate human capital earnings functions using cross-sectional and longitudinal data of the Current Population Survey (CPS) and the University of Michigan's Quality of Employment Survey (QES). They control nine occupation dummy variables, education, age, sex, race, union status, a central city dummy, marital status, and veteran status, as well as several interaction terms. They find that the industry dummy variables are statistically significant and have a sizable impact on relative wages. The correlations between estimated industry wage differentials, both between 1979 and 1984 and between 1974 and 1984, are high enough to conclude that the industry wage structure remains stable over time. The hypothesis that wage differentials are due to the short run immobility of labor when the labor demand shocks occur is rejected.

They also test whether the existence of the unmeasured aspects in motivation and innate ability is a reason for the

wage differentials across industries by estimating the changes in standard deviation of the wage differentials.

They use the 1979 CPS Pension Supplement, while adding human capital variables. However, they find no evidence that different quality of labor is the major factor of inter-industry wage differentials. Compensating differentials for a range of job attributes is also examined on the University of Michigan's Quality of Employment Survey. They find that such variables as weekly hours, existence of health hazards and its seriousness, second and third shift dummies, community time and extent and choice of overtime, as well as pleasantness of physical working conditions do not alter the patterns of industry wages.

They also estimate the tenure and quit equations, but the result does not support the proposition that wage premiums reflect compensating differentials. Their findings show that the effect of industry wage premiums on job tenure is positive and statistically significant, but the effect on quit is negative and statistically insignificant. In addition, citing estimates by Brown and Medoff (1978) and Dickens and Katz (1987), they calculate that a 10 percent increase in wage brings about a 0.3 percent increase in output through reduced quits alone. They conclude that although turnover does adversely affect output, reduction in turnover alone is not sufficient to justify wage premiums.

Only the firm size variable explains a substantial portion of wage differentials. However, they argue that the size wage differentials explanation fits into the efficiency wage hypothesis since the high wage increases the motivation of workers and makes up for the monitoring difficulties in a larger firm. It is supported by the analysis of Calvo and Wellisz (1978), Oi (1983) and Bulow and Summers (1986).

Their studies also present many evidences showing that the wage structure has been stable for different types of workers in many countries and industry wage differentials account for a substantial share of individual wage differences. They indicate that certain industries pay all types of workers high wages and others pay all types of workers relatively low wages.

2.2.2 Sources of Inter-industry Wage Differentials

Many empirical studies have been done to clarify the attributes of high-paying and low-paying industries. Previous studies fall into two broad categories: the first group consists of studies attempting to relate industry attributes and average worker characteristics to a measure of industry average wages; the second group of studies adds industry level variables to individual level data sets, allowing detailed controls for worker characteristics. The results vary with different model specifications and data sets.

Various factors are analyzed to explain inter-industry wage differentials, but such variables as the extent of unionization, the product market concentration, plant and/or firm size and the capital intensity are considered the most common significant factors in explaining inter-industry wage differentials.

(1) Extent of Unionization

Fleisher and Kniesner (1984) argue that an increase in the extent of unionization lowers the elasticity of demand for organized workers because the ability of buyers to substitute non-union products for union products tends to be reduced. However, the effect of an increase in the extent of unionization on wages for non-union workers is not ambiguous: wages may increase due to the threat effect of unionization of non-union workers; or wages may decrease due to the increased supply of workers who lose jobs in union firms and move to non-union firms.

Freeman and Medoff (1981) estimate separate union and non-union earnings equations after controlling the industry extent of unionization measure and other individual and industry characteristics. They use the pooled Current Population Survey (CPS) data for production workers in the manufacturing sector and find that the union density has a large positive effect on union wages, but minor impact on non-union wages.

By contrast, Podgursky (1986) finds a large positive effect of industry unionization on the wages of non-union workers in both manufacturing and non-manufacturing industries. Moore, Newman, and Cunningham (1985) also find a positive effect of the union density on non-union wages by using the CPS data which are aggregated into broad industry-occupation-region cells. Hodson and England (1986) estimate industry median earnings equations for male and female using industrial characteristics from the 1970 Census. They also find that the unionization rate has the positive effect on both male and female earnings.

Kim (1991) tests whether unions have a significant impact on non-union wage determination and whether union status is endogenous in wage determination. While using Wage Developments in Manufacturing (WDM) survey data and the Employment Cost Index (ECI) of the United States for the period from 1958 to 1989, he finds that the geographic area (SMSA) union density has a positive and significant effect on both union and non-union wages, but industry union density has a positive effect only on union wages.

His empirical results suggest that union wages have spill-over effect on non-union wages and vice versa over the past three decades, but that the spill-over effect from union to non-union wages is stronger than that from non-union to union wages. He argues that the worker's predicted wage differential has a strong positive effect on the likelihood of

union membership, but that unionism is not independent of the market mechanism although the role of unions in wage determination is not negligible.

On the other hand, Dickens and Katz (1987) argue that the relationship between unionization and the earnings of both union and non-union workers is ambiguous. Their empirical findings from the analysis of the 1983 CPS data show that the coefficient on industry union density is always positive and significant for union workers, but the coefficient is often insignificantly negative when the sample is restricted to manufacturing industries.

(2) Concentration and Other Product Market Power Measures

A competitive labor market approach predicts a positive relationship between product market power and wages based on the notion that the capital-intensive industries are likely to be more concentrated and thus generate monopoly rents. The union threat model and another models in which insider workers have strong bargaining power imply that workers should share the product market rents in the form of high wages.

The same relationship varies from efficiency wage models in which worker's perception of fairness is related to the firm's ability to pay. The expense-preference behavior by managers can be a reason of paying high wages to reduce managerial effort required for monitoring workers and for dealing with turnover.

Weiss (1966) finds that concentration has a strong positive relationship with earnings when no labor quality variables are included as controls, while using the 1960 Census of Population and the 1960 Annual Survey of Manufactures. The positive effect of concentration on earnings defined by the private wage and salary income for 1959 is greatly reduced once detailed personal characteristics are included as controls. He concludes that employers in more concentrated industries pay their employees more, but they get the higher quality labor in exchange.

Heywood (1986) analyzes 1,005 household heads in manufacturing industries from Panel Study of Income Dynamics and finds a large positive effect of concentration. Mellow (1982) and Kwoka (1983) also find a large positive and significant effect of industry concentration on wages for non-union workers from the May 1979 CPS and the 1977 Quality of Employment Survey data.

On the other hand, Fujii and Trapani (1978) test the Alchian-Kessel managerial discretion hypothesis that the employer's taste for discrimination should be systematically related to the extent of the market power. They regress the corrected wage differentials on the industry characteristics, market concentration, percent union, and the elasticity of demand for labor, using data on individual black and white workers from the 1967 Survey of Economic Opportunity. The results confirm that industry labor supply curves rise with

employment. They argue that percent union and the elasticity of demand for labor are systematically related to black-white wage differentials across industries, but they find no evidence showing that the relationship between market power and discrimination is significant.

In addition, Phillips (1976) and Pugel (1980) criticize the use of market concentration as a measurement of product market power and monopoly rents by arguing that economic profitability is a better measure of product market power across industries. Hodson and England (1986) find that profit rate has a positive and significant effect on both male and female earnings using the 1970 Census. They conclude that the positive relationship between wages and profitability is apparent even though the direct effect of higher wages is to lower profits. However, Kumar (1972) finds that the after-tax profits as a percentage of sales has a minor positive effect, but the effect on wages of unskilled workers is insignificant in the sample of Canadian industries.

According to Dickens and Katz (1987), the relationship between concentration and wages is quite ambiguous when detailed labor quality controls are involved. In addition, several studies by Heywood (1986), Weiss (1966), Jenny (1978) and Mellow (1982) indicate that the interaction effect among concentration, extent of unionization, and individual union status should be sorted out to estimate effects of concentration on earnings.

(3) Plant and Firm Size

Several studies have documented a positive effect of company and/or establishment size on wages. Masters (1969) reports a positive simple correlation between industry average wages and the industry proportion of workers in large plants. He concludes that large plants need to pay compensating differentials for the regimentation of work. Oi (1983) argues that large employers hire higher quality employees to save the management time since better workers are easier to monitor.

Kwoka (1983), Long and Link (1983) and Pugel (1980) find the positive effect of large plants and establishments even in the presence of detailed control variables, but much of inter-industry wage differentials can not be explained by them. Brown and Medoff (1985) find that both plant and firm size have distinct positive effects on wages of union and non-union employees.

On the other hand, Krueger and Summers (1988) find that plant and firm size controls do not affect the estimates of industry wage differentials while analyzing the May 1979 CPS data. Katz (1986) also finds that estimated industry wage differentials are slightly affected by the firm size variable when non-union workers are analyzed alone.

Dickens and Katz (1987) argue that large employers typically pay more than small employers within a given industry, but the effect is less certain across industries.

Both the analysis of Brown and Medoff, and Dickens and Katz imply that firm size is an important factor in explaining intra-industry wage differentials, but not in explaining differences in the level of wages across industries.

(4) Other Industry Characteristics

Among many other variables reviewed in micro and macro industry wage studies, capital intensity is most likely to be positively related to worker's bargaining power and wages. Haworth and Rasmussen (1971), Hodson and England (1986) and Lawrence (1985), as well as Dickens and Katz (1987) all find that the capital-to-labor ratio has a strong positive relationship with industry average wages.

On the other hand, Moore, Newman and Cunningham (1985) argue that the capital-to-labor ratio has no consistent effect on wages with the different model specifications while utilizing the pooled data set of May CPSs between 1973 to 1979. The literature suggests that skilled labor and capital are complements, but both are substitutes for unskilled labor. However, a basic simultaneity problem makes it difficult to determine whether capital-intensive industries need to pay high wages or high wages generated for other reasons lead to the substitution of capital for labor.

2.2.3 Literature Review in the Korean Context

There are three existing studies that analyze the inter-industry wage differentials in Korea. The first examines the inter-industry wage differentials by using industry average characteristics. The second investigates the effect of the trade policy on wages during the 1970s. The third analyzes the effect of employment size on wage rates while testing efficiency wage hypothesis. In what follows, the major findings of these studies are discussed together with their deficiencies.

(1) Park (1984)

Park estimates the empirical model:

$$Y_i = A_0 + A_1S_i + A_2T_i + A_3F_i + A_4NP_i + A_5LP_i + A_6KL_i,$$

where Y_i = average monthly wage of i industry;

S_i = average years of schooling of i industry;

T_i = average years of job tenure of i industry;

F_i = female worker's ratio of i industry;

NP_i = net amount of profit per worker of i industry;

LP_i = net amount of value-added per worker of i industry;

KL_i = amount of tangible fixed assets per worker of i industry.

A_0 is the intercept and A_1, A_2, A_3, A_4, A_5 and A_6 are parameters.

He employs the OLS method to estimate this equation using the 1980 industry level data for 27 manufacturing industries. His empirical findings indicate that the proportion of female workers in the industry has a negative effect on the average monthly earnings of male workers, but the net profit per worker has a positive effect. The amount of tangible fixed assets per worker which is used as a proxy variable to represent the portion of large firms in the industry is statistically insignificant at the 5% significance level.

The analysis of variance shows that 46 percent of the explained variance comes from the individual's characteristics (S_i, T_i) and 52 percent comes from the industry's characteristics represented by net amount of profit per worker and net value-added per worker. Based on the calculation that the percentage change in the monthly wages due to the changes in S_i and T_i is larger than the change in the monthly wages due to NP_i and LP_i, he concludes that the individual characteristics such as educational attainment and experience are more important factors than industrial characteristics in determining the level of wages.

However, the industry average data he used leads to difficulties in controlling for worker characteristics and causes a conceptual problem concerning the interpretation of estimates. For instance, if an individual's wage depends on his or her own educational attainment and the industry average years of education, the estimate of the effect of average

years of schooling involves a combination of two effects. This leads to an overestimate of the industry average years of schooling.

(2) Ju (1989)

Ju estimates the effect of trade policy on wages using a earnings equation of human capital theory. He incorporates several proxy variables for trade policy into the Mincer's (1974) earnings equation. He estimates the effect of trade policy on wages in 1970, 1975 and 1978, using a semilogarithemic equation:

$$\ln Y_{ij} = A_0 + B_1 S_{ij} + B_2 X_{ij} + C_1 EPR_j + C_2 OLR_j + C_3 K_j + U_{ij},$$

where Y_{ij} = monthly wage of individual i in j industry;

S_{ij} = schooling years of individual i;

X_{ij} = years of experience of individual i;

EPR_j = effective protection tariff rate in j industry;

OLR_j = ratio of official loan in j industry to the total official loan;

K_j = net capital stock per worker in j industry;

U_{ij} = random disturbance error.

A_0 is the intercept and B_1, B_2, C_1, C_2 and C_3 are parameter vectors.

He divides the aggregate labor into two by six different ways: workers in heavy and chemical industries vs. workers in light manufacturing; male workers vs. female workers; skilled

labor vs. unskilled labor; highly educated workers vs. poorly educated workers; workers in large firms vs. workers in small firms; workers in southern part vs. western part of the Korean peninsula.

The Occupational Wage Survey is used for information on the individual wage rate and personal characteristics. His findings indicate that both the protective tariffs and bank loans create wage premiums significantly for the workers in the promoted industries. The trade policy deteriorates wage distribution by creating favorable wage premiums for the skilled, highly educated workers who are employed in the large firms and/or in the heavy and chemical industries.

The deficiencies in his analysis are as follows. First, the analysis has a conceptual problem in the estimation of effect of trade policy on wages because no industry characteristics are considered in the model. It leads to an overestimated effect of trade policy since the industry characteristics are more likely to be influenced by the trade policy and the monopoly profit in the supported industries are related to wages of workers.

Second, as Moulton (1986) argues, the matching of individual data to the industry average characteristics that may differ from the employer's correct attribute leads to biased estimates and incorrect standard errors since some regressors are correlated with the differences between the actual unobserved characteristics and the group mean.

(3) Yoon (1991)

He tests seven hypotheses postulated by the efficiency wage theories regarding causes of paying the higher wages in larger firms in Korean labor market. His empirical results show that among the seven hypotheses only the hypothesis of working conditions is clearly rejected and the other six hypotheses are supported in varying degrees.

The labor quality and adverse selection hypotheses have the strongest support. The turnover explanation is supported by the observed relationships between lower quit rates and longer tenure in larger firms. The union avoidance hypothesis, product market power explanation and monitoring explanation are also supported. He concludes that each of these hypotheses explain only a small part of the differentials and six hypotheses are closely interrelated.

2.2.4 Summary

The studies reviewed above indicate that the effect of industry characteristics on wages is quite sensitive to the different model specifications and sample used. The findings suggest that the effect of industry characteristics on wages is not consistent across industries and the multicollinearity problem makes it difficult to sort out the effects of individual industry attributes.

Furthermore, two problems are likely to happen in combining the individual data with the industry data. The first problem occurs when the respondent's employer is assigned to the industry level attributes instead of the appropriate firm or plant level attributes. It is because only the information on the industry level average attributes is available and matched to the respondent. This problem of an incorrect level of aggregation is likely to lead to the biased estimates and incorrect standard errors. The bias would result from the correlation between included explanatory variables and part of the error terms caused by the differences between the individual's actual industry characteristics and average industry characteristics. Dickens and Ross (1984) suggest that a two step approach is a possible solution to the aggregation problem caused by the correlations between the characteristics of individual workers and the deviations of attributes of firms' characteristics from industry averages.

The second problem with using aggregated or grouped data in estimation is the common group error components or a correlation of the errors within each group. Common group error components arise when the industry aggregated data are used with individual data since two individuals within an industry would be more likely to share an unobserved characteristic than two individuals in separate industries.

This correlation of the errors within groups violates one of the classical assumptions of OLS in which the errors are independent. Moulton (1986, 1990) has demonstrated that the usual OLS coefficient standard errors are generally biased downward for the case of group error components, and therefore the coefficient estimates will have an exaggerated significance. A GLS estimator is suggested to deal with the industry error components.

CHAPTER 3

CHARACTERISTICS OF KOREAN LABOR MARKET

This chapter describes the overall Korean labor market situation. The purpose is to provide a background for the analysis of the inter-industry wage differentials. In section one, we shall look at major factors that have caused the changes in demand for labor force. In section two, we discuss the changes in the supply of labor force.

3.1 Major Factors Affecting Structure of Labor market

3.1.1 Industrial Policy

The Korean government has adopted three major industrial policies targeting different sectors during the last three decades. The first policy was to promote the labor-intensive manufacturing exports in the early 1960s. The government introduced various tax incentives and granted tariff exemptions on raw material imports for export production to support export industries. A preferential financing scheme was also introduced to provide funds with a lower interest rate, which remained in use until 1982.

In the early 1970s, the policy target was shifted toward developing the heavy and chemical industries. Two factors forced the government to change policy target. The first

one was the rapid increase in wages. Real wages rose in most late-industrializing countries during the 1970s, but they increased most spectacularly in Korea, which worsened the comparative advantages of Korea in international competition.

Table 3.1 shows that real wages in Korea rose remarkably faster than in Taiwan, Brazil, Mexico, India, and Turkey.

Table 3.1

Real Wage Increase Rate Per Year in Selected Developing Countries Between 1970 and 1985

(%)

	Korea	Taiwan	Turkey	Brazil	Mexico
1970-1975	4.8	-3.3	3.0	4.9	2.7
1975-1980	11.6	9.1	1.3	0.5	0.3
1980-1985	5.4	5.4	-2.7[a]	-10.4[a]	-8.1[a]

[a] 1980-1984.
Source: Korea: Statistical Yearbook.
Taiwan: Council for Economic Planning and Development (various years).
Turkey: Institute of Statistics(various years).
Brazil, Mexico: Paldam and Rivoros(1987).

The other reason was the growing protectionism by the advanced industrial countries. One example was the bilateral textile restraint agreement negotiated between United States of America and Korea in 1971 when the export of textiles and apparel goods constituted about 40 percent of the total exports of Korea.

The internal and external barriers led Korea to diversify trading partners and upgrade its export products to

high value-added industrial items. Such industries as shipbuilding, automobile, iron and steel, non-ferrous metals and petro-chemical were labelled as "strategic industries," and a wide variety of financial incentives were provided to encourage investment in these industries. These industries were protected by the high tariff rate and concentration of market was allowed in these industries to overcome the small scale problem of the domestic market.

In the early 1980s, right after the second oil crisis in 1979, the government took a series of institutional reforms to attain a high growth of the economy with price stability. The role of the government shifted from supporting specific industries to eliminating bottlenecks in developing technology. The anti-monopoly practices were enforced to support the small and medium-sized firms and many protective measures were removed to increase foreign competition.

The industrial policies have stimulated the changes in the structure of production and employment. The manufacturing sector has expanded at a 15 percent annual growth rate in real terms over the last thirty years. The share of manufacturing sector in the gross domestic products (GDP) increased from 16.3 percent in 1963 to 28.6 percent in 1991, and the share of employment increased from 8.7 percent in 1963 to 27 percent in 1991 as shown in Table 3.2.

The labor movement was from rural to urban areas, and from primary industries to manufacturing and services

Table 3.2

Changes in Share of Production and Employment by Sector Between 1963 and 1991

(%)

	Industrial Structure			Employment Structure		
	I	II	III	I	II	III
1963	43.4	16.3	36.3	63.1	8.7	28.2
1972	26.4	23.1	50.5	50.6	14.2	35.2
1982	14.7	30.4	55.9	32.1	21.9	46.1
1991	8.0	28.6	61.4	16.7	27.0	56.4

I: agriculture, forestry, and fishery
II: mining and manufacturing
III: social and overhead capital and other services
Source: Economic Planning Board, Korea, Major Statistics, several issues.

industries in the 1960s, but the movement changed significantly from inter-industry to intra-industry during the 1970s. It was from large-sized firms to small and medium-sized firms and/or plants during the 1980s.

The industrial policies also induced a massive movement of labor force across industries and within industries, and resulted in the imbalanced investment between heavy and light industries.[1] The share of employment and GDP in the light

[1] The food, beverage textile, wood, painting and non-metallic industries are classified as the light industry. The remaining industries are classified as the heavy and chemical industries. The share of employment in the light industry declined from 66.1 percent in 1960 to 55.7 percent in 1985 and its share of GDP declined from 66.1 percent to 44.1 percent during the same period.

industry has declined rapidly since 1975 due to the industrial policy emphasizing heavy and chemical industries. The trend of employment growth in manufacturing industries between 1972 and 1991 is shown in Table 3.3. Employment in textiles, wearing apparel and leather industries increased until the mid 1970s, but after that time the employment has increased in the fabricated metal products, machinery and equipment industries.

Table 3.3

Changes in Composition of Employment by Industry Between 1972 and 1991

(%)

	1972	1982	1991
Food, beverage	14.1	8.3	7.1
Textile, wearing apparel	32.6	31.6	25.0
wood products	4.6	3.0	1.5
paper, printing and publishing	5.9	4.6	4.8
Chemicals, rubber and plastics	11.5	13.2	9.5
Non-metallic mineral products	4.6	4.5	4.7
Basic metal	2.8	4.2	4.1
Fabricated metal products, machinery and equipment	17.7	26.8	43.2

Source: Report on Mining and Manufacturing Survey, Economic Planning Board, relevant issues.

The industrial policies widened the gap between large and small firms in production in the 1970s. Table 3.4 shows that the share of small and medium-sized industries declined drastically in terms of the number of firms, the number of employees, the value of production and the value-added, compared to those of the early 1960s.[2] In addition, the industrial policies have affected demand for labor forces with the changes in the productivity across manufacturing industries over time. The labor coefficient that represents the number of persons employed that produce the value of one million won of the Korean currency, which is equivalent to

Table 3.4

Share of Small and Medium Industries
in the Manufacturing Sector (1960-1979)

(%)

	1960	1970	1979
No. of Firms	99.1	96.9	96.5
No. of Employees	78.1	46.4	47.5
Value of Production	68.8	30.0	31.8
Value-added	60.3	28.0	35.2

Source: Economic Planning Board, Korea.

[2] The small and medium industries include firms employing less than 300 workers in manufacturing sector, but firms employing less than 500 workers, but producing such labor-intensive products as electronic appliances and automobile parts are also classified as the small and medium industries.

1646 dollars at the constant 1980 prices, has been declining in all the industries since the early 1970s.

Table 3.5 shows that the labor coefficient dropped at the annual rate of 3.1 percent during 1971-75, but the decreasing rate accelerated to 7.3 percent during 1976-1980 and 10.7 percent during 1981-85 respectively. The coefficients dropped faster in the heavy industry than in the light industry in the 1970s, but it was reversed in the early 1980s, which indicates that the growth of labor productivity in the light industry has been faster than in the heavy industry since the early 1980s.

Table 3.5

Changes in Labor Coefficient by Industry
Between 1970 and 1985

	Manufact -uring	Light Industry [a]	Heavy Industry [b]
Labor coefficient			
1970	0.09	0.11	0.08
1975	0.08	0.10	0.06
1980	0.06	0.08	0.04
1985	0.03	0.04	0.03
Annual growth rate(%)			
1971-75	- 3.1	- 1.8	-4.3
1976-80	- 7.3	- 5.5	-7.6
1981-85	-10.7	-11.7	-8.5

[a] Food, beverage, textile, wood, painting, non-metallic.
[b] Petroleum chemical, iron, steel, fabricated metal, machinery manufacturing industries.
Source: Bank of Korea, Input-Output Table.

3.1.2 Emergence of Conglomerates (chaebôls)

The government's policy of expanding industrial capacity through promoting fast-growing firms in the 1970s has brought about a few large business groups, so called "chaebôls," the Korean counterpart of the Japanese "zaibatsu." The distinguishing feature of the Korean chaebôls from Japanese zaibatsus or German konzerns of the past which were centered on banks is that they have their bases in the manufacturing sector, but have also expanded their business spheres into the finance industries such as insurance, stock brokerage and banking. They have participated in a number of markets and diversified their business to get more subsidized bank loans and to reduce uncertainties in investment.[3]

The system of rationing bank loans which allocated available funds in proportion to the amount of capital of each demander has induced chaebôls to establish subsidiaries in various industries. Between 1977 and 1982 the number of firms that belonged to the 30 largest chaebôls increased to 608 from 304 in the entire industrial sector. Table 3.6 reveals that the share of the 30 largest chaebôls in the total shipments increased to 40.7 percent in 1982 from 34.1 percent

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[3] According to the World Bank, the concentration ratio measured by the sales share of the largest 100 firms in the manufacturing sector are much higher in Korea than in Japan: it was 44.9 percent in 1977, 46.6 percent in 1982; but it was 28.4 percent in 1975 and 27.3 percent in 1980 in Japan.

in 1977, while the share in the employment declined somewhat between 1977 and 1982.

Table 3.6

Share of Employment and Shipment of Largest 30 Chaebôls in the Manufacturing Industry (1977-1982)

(%)

	Employment	Shipments
1977	20.5	34.1
1982	18.6	40.7

Source: Lee (1990), Chaebôls and Concentration, page 28.

They took part in almost all industries that cover from the labor-intensive textiles industry to the capital- and technology-intensive industries such as chemical and non-ferrous metal industries. Although they are integrated vertically and horizontally in some industries, they compete against each other in various markets.[4]

[4] The largest five Chaebôls called Lucky-Gold-Star, Samsung, Hyundai, Daewoo, Syunkyung comprise altogether 187 subsidiaries in 1987. Among them, 57 subsidiaries are in the fabricated metal, machinery and equipment production industry, 12 subsidiaries are in the petro-chemical industries and 10 subsidiaries are in textile and wearing apparel industry sector. They produce 650 products that accounts for 24.6 percent of the total number of products that are 2,638 under the three digit product classification in manufacturing sector in 1987.

Chaebôls have dominated the market with respect to output and employment as well as bank loans, and they have a monopsonic restraint in employing workers. They have attracted high quality labor force by providing better opportunities for the lifetime earnings. Table 3.7 shows how the small and medium-sized firms in Korea were in a disadvantageous position, compared with Japan and Taiwan, in the early 1980s.

Table 3.7

Status of Small and Medium-Sized Firms in Korea, Japan, and Taiwan in 1981

(%)

	Korea	Japan	Taiwan
No. of firms	96.0	99.2	n.a
No. of employees	51.1	71.5	68.2
Gross product	32.2	52.7	n.a
Value-added product	34.8	57.1	50.4
Bank loans	45.2	61.1	n.a

Source: Economic Planning Board, Korea, Tasks for earlier settlement of the anti-trust system, unpublished paper (1983).

3.1.3 Government Intervention in Labor Market

The collective labor activities have been prohibited by the law and labor movement has been suppressed until 1987. The rationale were to strengthen the competitiveness in trade

and maintain a favorable environment for the capital investment by curbing high inflation rates and keeping good relationship between management and labor.

However, with the political democratization in 1987, control over the labor market by the government was relaxed and direct intervention in labor disputes was stopped. Since 1987 there have been sharp increases in the union organization rate and in the number of labor disputes demanding high increase in wage rate.[5]

Another involvement in the labor market is the restraint on layoffs by the Labor Standard Act.[6] This restriction has been one of the main reasons for the long working hours in Korea.

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[5] The number of members of the Federation of Korean Trade Union (FKTU) that is the affiliation of 20 industrial federations increased from 1,036,000 in 1986 to 1,887,000 in 1990. The organization rate increased from 15.5 percent in 1986 to 21.7 percent in 1990. The average number of labor disputes in a year was 205 during 1980-1986, but 1,890 disputes happened annually during 1987-1990. The increase rate of real wages recorded 12.2 percent annually during 1986-1990, compared to the annual increase rate of 5.6 percent during 1981-1985. As the result, real wages were increased by 77.8 percent during four years.

[6] This law requires that employers must
a) notify employees of any lay-offs 60 days in advance
b) receive the approval of any lay-offs from the Ministry of Labor
c) pay laid-off employees a bonus which amounts to a month's payment in addition to severance payments.

Table 3.8 shows that the average working hours in Korea is declining, but they are 1.26 times as long as that of Germany, 1.22 times as long as that of U.S. and Japan in 1990. The average working hours in Korea are also longer than in Singapore and Taiwan, both are the major competitors of Korea in trade.

Table 3.8

Average Working Hours Per Week
in Manufacturing Industries by Countries

	Korea[a]	Japan[a]	Singapore[a]	Taiwan[a]	U.S.A[b]	Germany[b]
1981	53.7	41.0	48.7	48.5	39.8	41.1
1990	49.8	40.8	48.5	46.6	40.8	39.5

[a] hours actually worked, [b] hours paid for.
Sources: EC, Bureau of Statistics, Labor Costs .
Japan, Ministry of Labor, Labor Statistics.
ILO, Yearbook of Labor Statistics.

3.1.4 Late-industrialization

The rapid industrialization in Korea can be attributable to adopting and borrowing of the advanced technologies from other countries rather than to developing technologies. The process of late-industrialization has widened the inter-industry wage differentials and size-wage differentials by segmenting the traditional technology oriented industries from

the advanced technology industries. This has led the domestic market to be monopolistic or oligopolistic.

In such industry as textile where firm-specific skills had been accumulated from the early developing period, expansion and modernization of production facilities posed no problems to entrepreneurs. By contrast, in all of the new capital-intensive industries that relied on turnkey technology transfers, managers could not manage in a tight, "Taylorist," top-down fashion because no one at the top knew enough about the process. Workers were motivated with relatively high wage rates in industries whose technologies were tacit, implicit and not yet processed.[7] While better manpower and physical resources have been concentrated in capital-intensive firms that tend to be large, large firms have paid skilled-workers high wages since the firm-specific skilled workers were in scarce supply.[8]

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[7] Amsden (1990) argues that wages have risen especially rapidly in Korea, despite "unlimited" labor and political union repression. One of major reasons is that employers had to pay a work force enough to induce its intelligence, rather than any scarce specific manual skills, in order to import foreign technology effectively.

[8] According to the analysis of Lee, J.W. (1983), in the case of male workers, one year of "inside" experience tended to raise wages on average by 10 percent, whereas one year of "outside" experience raised them on average by only about 3.8 percent.

3.2 Changes in the Labor Supply

Until the early 1970s, Korea was an agrarian society containing a large rural population. However, with the rapid economic growth, the Korean labor market passed the era of the "unlimited labor supply" around 1974-75.[9] After a structural adjustment of the economy in 1980s that led the economy to grow at the modest rate, the Korean labor market should have passed the period of "limited supply of labor" around 1989-90 and entered the period of "labor shortage."

The economically-active population, who are 15 years old and over and employed or actively looking for jobs, increased from 10.9 million to 19.0 million between 1972 and 1991. However, the economically-active population of aged 15-24 has declined during the same period. Table 3.9 shows that the total labor force participation rate (LFPR) has been slowly increasing, but that of younger generation aged 15 to 19 has sharply dropped since the mid 1970s. It is mainly due to the

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[9] Bai, M.K (1982) found several evidences showing changes in the labor market as follows: a) labor supply elasticity started to decline from the early 1970s, and reached its trough in 1975; b) Wage rates of the unskilled has rapidly risen during the period 1975-1978; c) Job opening/applicant ratio has been sharply increased since 1975.

increasing enrollment at the higher educational institutions and the lack of part-time job opportunities.

Table 3.9

Labor Force Participation Rates of Young Generation Between 1972 and 1991

	1972	1982	1991
Total Labor Force Participation Rate(%)	57.7	58.6	60.6
Ages 15-19			
Economically active population(thousand)	1,510	940	636
Participation rate (%)	-	24.9	14.8
Ages 20-24			
Economically active population(thousand)	1,157	2,076	2,101
Participation rate(%)	-	62.2	63.4

Source: National Office of Statistics, Annual Report on the Economically Active Population Survey, Relevant Issues.

The other change is that more and more females are entering the labor market as shown in Table 3.10. The rate of labor force participation of females increased to 44.7 percent in 1991 from 28.3 percent in 1972, and the proportion of female workers among the total employed workers in non-farm

sector increased to 39.3 percent in 1991 from 30.8 percent in 1972. They entered either in the low-skilled or labor-intensive industries.

Table 3.10

Female Labor Force Participation Rates and its Trend in Non-farm Sector Between 1972 and 1991

(%)

	1972	1982	1991
Female labor force participation	28.3	38.5	44.7
Ratio of female workers	30.8	36.8	39.3

Source: National Office of Statistics, Annual Report on the Economically Active Population Survey, Relevant issues.

Another change is that the educational attainment of workers has grown very fast. As Table 3.11 shows, the proportion of college graduates among the total workers has increased from 6.2 percent in 1972 to 22.5 percent in 1991.

The increased years of schooling is expected to improve labor productivity in the long run, but the too rapid improvement of educational levels has resulted in a greater supply of white collar workers and a smaller supply of blue collars than demand. It causes a major source of the current job-mismatch problems in the labor market.[10]

Table 3.11

Employment Distribution by Educational Level and its Trend Between 1972 and 1991

(%)

	1972	1982	1991
Under middle school	73.1	60.9	28.3
High school	20.6	31.0	49.2
Over college	6.2	8.1	22.5

Source: Ministry of Labor, Korea, Occupational Wage Survey. Calculated from 1972,1982, 1991 reports.

[10] The proportion of unemployed workers who graduated college to the total unemployed increased from 10.3 percent in 1982 to 23.2 percent in 1991.

CHAPTER 4

INDUSTRY WAGE DIFFERENTIALS

This chapter examines the pattern of changes in the wage structure and wage differentials across industries between 1972 and 1991. In section one, we shall look at the pattern of changes in wages related with the growth of productivity and wage differentials. In section two, we examine the industry wage differentials from the three different perspectives: first, the trend of the inter-industry wage differentials without any worker's quality controls during 1972-1991; second, changes in the wage structure across the manufacturing industries holding the labor quality constant; third, inter-industry wage differentials for the different types of workers.

4.1. Industry Wage Structure

4.1.1. Changes in Wages and Labor Productivity

During the period of 1970-1991, the physical productivity per unit of input work-hours grew at the annual rate of 11.5 percent, while the real wages in manufacturing industries rose at the annual rate of 8.3 percent. However, the pattern of

changes is not consistent throughout the period of time as shown in Table 4.1.

In the mid 1970s when large investment in the heavy-chemical industry was launched and the labor demand for skilled workers and college graduates was increased, the wage drifts of this labor caused a general wage hike. The annual gain of real wages was 11.6 percent during 1975-80.

Between 1980 and 1985, the annual increase of real wages dropped by half to 5.4 percent compared to the latter half of the 1970s. It was the result of a strong stabilization policy adopted in the early 1980s when the economy experienced a serious depression with a negative GNP growth and a high inflation rate as well as a huge deficit in international payments right after "The Second Oil-Shock."

Table 4.1

Annual Growth Rate of Labor Productivity and Real Wages in Manufacturing Industry Between 1970 and 1991

(%)

	1970-75	1975-80	1980-85	1985-91	1970-1991
Labor productivity	8.0	11.3	11.3	14.8	11.5
Real wages	5.6	11.6	5.4	17.0	8.3

Source: Ministry of Labor, Report on Monthly Labor Survey. National Office of Statistics, Korea Statistical Yearbook, relevant issues.

With the political democratization since 1987, collective bargaining has become a major factor in determining wages. Along with the worldwide economic boom, the changed wage setting mechanism resulted in an explosive rise in wages between 1986 and 1991. The annual growth rate of real wages recorded 17.0 percent which exceeded the annual increase rate of labor productivity by 2.2 percentage points in the same period.

The pattern of changes in labor productivity and wages across industries was quite different between 1972 and 1991. Table 4.2 shows that productivity has increased at the highest rate, but real wages have increased at the lowest rate in the fabricated metal, machine and equipment industry. By contrast, productivity has improved at the lowest rate, but real wages have risen at the highest rate in the non-metallic mineral products industry.

The correlation between changes in real wages and labor productivity across industries shows no statistical significance at the 5% significance level. It implies that the increase of real wages is not much related with the growth of the worker's productivity itself.

Table 4.2

Annual Growth Rates of Labor Productivity and Real Wages by Industries Between 1972 and 1991

(%)

	Productivity(A)	Real Wages(B)	(A/B)
Food and Beverage	9.9	7.7	1.29
Textiles, Wearing and Leather	11.7	8.0	1.46
Wood and Furniture	8.2	7.7	1.06
Paper and Printing	9.7	7.7	1.26
Petro-chemical and Plastics	8.8	7.7	1.14
Non-metallic Mineral Products	7.9	8.7	0.91
Basic Metal	13.1	7.5	1.75
Fabricated Metal, Machine and Equipment	16.6	7.5	2.21

Source: National office of Statistics, Korea Statistical Yearbook, Various years.

4.1.2 Wage Differentials

One of the interesting features of the industry wage structure in Korea is that wage differentials are fairly large compared to that of developed countries. According to the analysis of Lee, J.W (1983), size-wage differentials, regional

wage differentials, and inter-industry wage differentials follow an inverted U trend over time and the differentials peaked in the 1970s in Korea. Concerning the sources of wage differentials, Park, S.I and Park, H.K (1984) argue that wage differentials due to individual characteristics such as sex, age and education are larger than those due to such employment characteristics as industry, occupation, firm size and region.

(1) Educational Wage Differentials

Table 4.3 shows that educational wage differentials are very large in Korea. When the average wage of the high school graduates is taken to be 100.0, that of college graduates is 183.5 in 1972, 221.5 in 1982, and 158.9 in 1991.

Although the wage gap among those with different educational attainments has narrowed due to the increased number of college graduates and the income distribution policy, it is larger than in Japan and European countries.[1] It indicates that educational attainment plays a crucial role in determining wages at entry level and the later promotion in the hierarchy of job ladder in the Korean labor market.

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[1] According to Research Institute of Industrial Relations (RIIR) in Japan (1989), the average wage of college graduates to high school graduates is 2.2 times as high as that of high school graduates in Korea, but 1.3 in Japan in 1986. The entry level wages of college graduates is 1.5 times as high as the wages of high school graduates with a 4-year experience in Korea, but 1.1 in Japan.

Table 4.3

Educational Wage Differentials and its Trend
Between 1972 and 1991

	1972	1982	1991
Middle school	63.3	71.8	85.8
High school	100.0	100.0	100.0
College	183.5	221.5	158.9

Source: Ministry of Labor, Korea, Occupational Wage Survey. Calculated from 1971, 1982, 1991 reports.

(2) Gender Wage Differentials

A large part of wage differentials in Korea is also associated with gender. Table 4.4 shows that the average earnings of a female worker were only 49.0 percent of the earnings of a male worker in 1972. Although the wage differentials between men and women become narrower, those were fairly persistent between 1972 and 1991.

Table 4.4

Gender Wage Differentials and its Trend
Between 1972 and 1991

	1972	1982	1991
Male	100.0	100.0	100.0
Female	49.0	48.6	53.6

Source: Ministry of Labor, Korea, Occupational Wage Survey. Calculated from 1972, 1982, 1991 reports.

Concerning the sources of gender wage differentials, the analysis of Park (1984) indicates that 68.5 percent of gender wage differentials is due to differences in productivity and the remaining 31.5 percent is due to the labor market discrimination in 1981. They argue that female workers are segregated into low-paying jobs and employed more likely in temporary jobs and in the family business.

(3) Occupational Wage Differentials

In Korea, administrative and technical workers receive much higher salaries than production workers. Table 4.5 shows that when the average wage of production workers is set at 100.0, administrative and managerial workers receive 293.9, professional and technical workers 162.1, and clerical workers 129.5, while sales and service workers receive 94.7 in 1991.

According to OWS data, occupational wage differentials have drastically declined across occupations since 1972. One interesting feature is that the production workers, on average, started to earn more than sales and service workers in recent years. It is largely due to the relatively higher increase in wages of production workers with the deregulation of union activities since 1987.

Table 4.5

Occupational Wage Differentials and its Trends Between 1972 and 1991

	1972	1982	1991
Professional & Technical workers	267.7	221.8	162.1
Administrative & managerial workers	372.2	411.1	293.9
Clerical workers	201.3	178.7	129.5
Sales & service workers	125.6	129.1	94.7
Production workers	100.0	100.0	100.0

Source: Ministry of Labor, Korea, Occupational Wage Survey. Calculated from the 1972, 1982 1991 reports.

(4) Size-wage Differentials

It is argued that the larger the firm is, the higher the wage is in Korea because large firms provide better opportunities for life-time earnings and better working conditions than small firms. Table 4.6 shows that when the monthly earnings in the largest firms employing 500 or more employees is assigned to be 100.0, that of the smallest firms employing 10-29 workers is 81.5 in 1991.

The size-wage differentials declined during 1972-1982, but increased between 1982 and 1991. Table 4.7 indicates that the size-wage differentials are caused by differences in

annual bonus and overtime payments rather than regular payment.

Table 4.6

Size-Wage Differentials and its Trend
Between 1972 and 1991

	1972	1982	1991
10- 29 workers	69.5[a]	88.2	81.5
30- 99 workers	90.8[b]	94.0	70.7
100-299 workers	100.0[c]	86.7	80.7
300-499 workers	-	90.5	87.9
500 or more workers	-	100.0	100.0

[a] 1-50 workers, [b] 51-200 workers [c] 200 or more workers
Source: Ministry of Labor, Korea, Occupational Wage Survey. Calculated from 1972, 1982, 1991 reports.

Table 4.7

Size-Wage Differentials by Components
of Compensation in 1991

	Group I (10-29)	Group II (30-99)	Group III (100-299)	Group IV (300-499)	Group V (over 500)
Total	100.0	102.3	106.8	114.7	120.0
Payments					
Regular	100.0	97.8	98.6	103.7	108.5
Overtime	100.0	173.7	237.2	290.4	302.3
Annual Bonus	100.0	120.4	160.6	203.4	263.0

Source: Ministry of Labor, Korea, Report on Occupational Wage Survey, 1991.

4.2 Inter-industry Wage Differentials

4.2.1 Inter-industry Wage Differentials Over Time

Many economists argue that the relative wages across industries have been stable in many countries during different periods of time. We examine the wage structure of the manufacturing industries to see whether the inter-industry wage differentials in Korea supports this argument.

We estimate the log of monthly wages for full time workers using the 1972, 1982 and 1991 Occupational Wage Survey (OWS) data. The survey is conducted annually by the Ministry of Labor. The survey provides the most appropriate information for our analysis because it contains the micro-level information on the individual worker and monthly wage, and follows the Korean Standard Industry Classification Code.

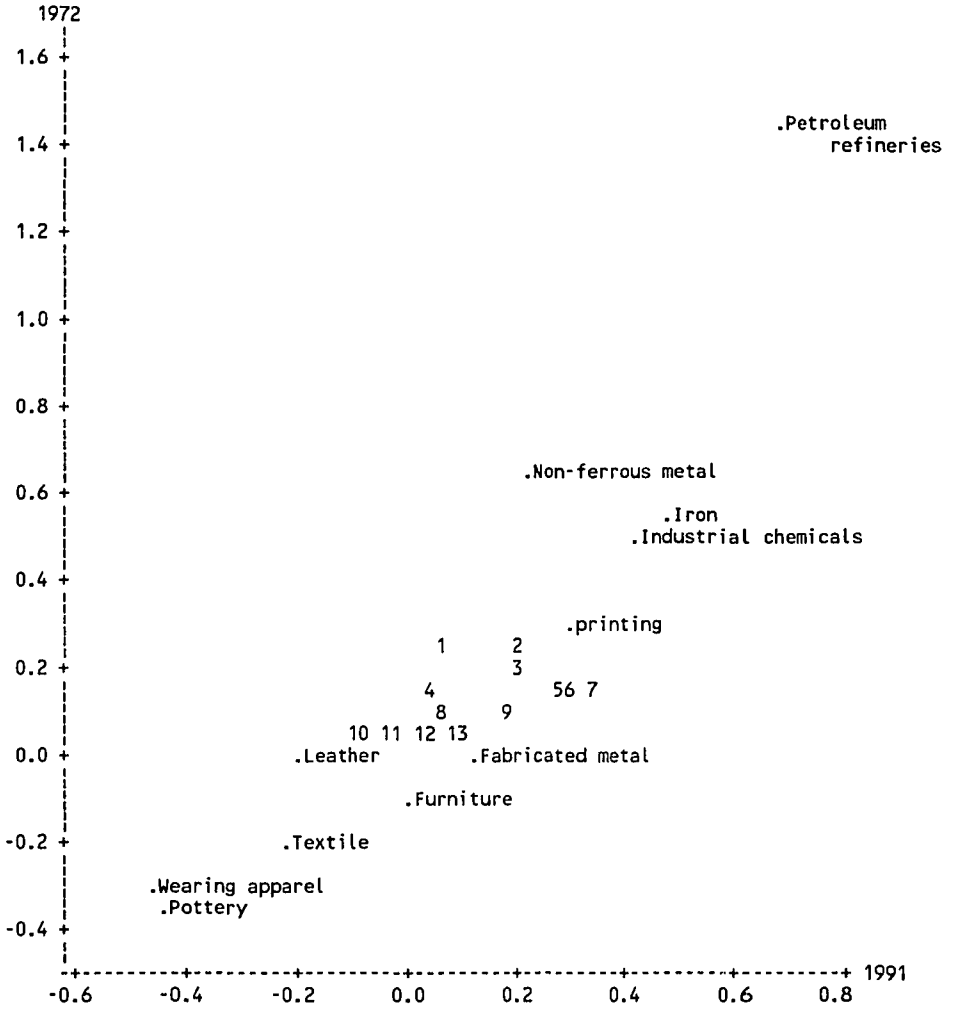
We examine the changes in the magnitude and ranking of wage differentials across 27 manufacturing industries in the three different years. Table 4.8 shows the fractional percentage differences from the weighted mean wage of the whole industry. Figure 4.1 shows the plot of the 1972 wage differentials against the 1991 wage differentials. The result indicates that the high wage industries such as petroleum refineries, iron and steel in 1972 continued to be high-wage industries in 1991, while the low wage industries such as

Table 4.8

Inter-Industry Wage Differentials Over Time: Log Monthly Earnings of Full-Time Workers
(Fractional Differences From the Mean Wage)

Industry	1972	1982	1991
Food	0.03916	0.13563	-0.06648
Beverage	0.14575	0.46201	0.29110
Textile	-0.17887	-0.12826	-0.19457
Wearing Apparel	-0.34712	-0.35651	-0.43373
Leather	0.05864	-0.27924	-0.10018
Footwear	.	-0.20936	-0.40821
Wood	0.16761	0.06220	0.03551
Furniture	-0.11309	0.00339	0.01114
Paper	0.20049	0.20574	0.19281
Printing	0.32035	0.5079	0.29705
Industrial chemicals	0.51976	0.33104	0.41090
Other chemicals	0.10639	0.24561	0.06417
Petroleum refineries	1.44540	0.97877	0.67172
Petroleum products	0.23290	0.41971	0.06346
Rubber	0.00553	-0.09918	-0.20040
Plastic	0.05957	0.15272	0.03401
Pottery, china	-0.37085	-0.23900	-0.41069
Glass	0.16970	0.26191	0.33002
Other nonmetallic	0.25896	0.35798	0.20878
Iron, steel	0.55418	0.39549	0.48107
Non-ferrous metal	0.63843	0.11322	0.14304
Fabricated metal	0.00112	0.00395	0.08328
Machinery	0.10202	0.28465	0.17924
Electronic	0.06723	-0.12381	-0.01751
Transport equipment	0.16870	0.44241	0.28756
Medical measuring goods	0.02770	-0.13366	0.00485
Others	-0.21121	-0.28135	-0.32281
Weighted standard deviation of differentials [a]	0.249	0.259	0.251

[a] Weights are the share of employment in the industry for the respective year.



1. Petroleum products
2. Other nonmetallic
3. Paper
4. Wood
5. Transport equipment
6. Beverage
7. Glass
8. Other chemicals
9. Machinery
10. Food
11. Electronics
12. Medical measuring goods
13. Plastic

Figure 4.1

A Plot of Industry Wage Of 1972 Against 1991
(Fractional Differences from the Mean Wage)

wearing apparel, pottery and china have continued to be low wage industries since 1972.

The dispersion of industry wage differentials does not have any tendency to increase or decrease over time in other countries. However, in Korea it showed a tendency to increase between 1972 and 1982, and decline since the early 1980s.[2]

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[2] H.G. Lewis (1963) showed that the dispersion in relative industry wage differences in the U.S. has no trend over the long run, but that it has a counter-cyclical tendency in the short run: the greatest dispersion occurred in 1932 during the Great Depression; while the lowest standard deviation was during the post-World War II recovery period. Krueger and Summers (1988) found that the structure of industry wages hardly changes between 1900 and 1984, but that the ranking of industry concerning paying wages changed during the same period of time.

The correlation coefficients of the wage differentials of the year 1991 with the year 1972 are 0.844 in terms of magnitude and 0.865 in terms of ranking. That compares to 0.896 and 0.893 between 1991 and 1982 in terms of magnitude and ranking respectively as shown in Table 4.9. The high correlations ranging from 0.84 to 0.90 imply that the manufacturing industry wage structure has remained remarkably stable despite the fluctuation of labor demand and supply over time.

Table 4.9

Correlation Coefficients of 1991 Wage Differentials against 1972 and 1982

Year	Correlation of magnitude with 1991[a]	Correlation of ranking with 1991[b]
1972	0.844	0.865
1982	0.896	0.893

[a] [b] Calculated from 1972, 1982 and 1991 Occupational Wage Survey.

4.2.2 Inter-industry Wage Differentials with Labor Quality Controls

To examine the effect of controlling measurable labor quality on the inter-industry wage differentials, we estimate the log of the monthly earnings of full-time employees with a variety of worker's characteristics for each year of 1972, 1982 and 1991. We compare the results with those estimated without any controls. If the two wage structures are parallel, the differences in the quality of workers are not expected to alter the wage structure.

The years of education, marital status, sex, occupation, firm and job tenure, monthly working hours, location of the establishment are used as control variables. The regression results show that the industry dummy variables are jointly statistically significant. Table 4.10 reports the proportionate differences in wages of the individual industry from the weighted average wage of all the industries.[3]

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[3] We estimate the coefficients of the 27 industry dummy variables in the log of the monthly earnings equation and calculate the weighted industry mean wage by the share of employment of the industry. We normalize the wage differentials by subtracting the industry weighted mean wage from the coefficients of the industry dummy variables.

The figures for the oil refinery industry, for instance, imply that the average wage of workers in that industry is 37 percent higher than that of workers in all the manufacturing industries in 1991, after controlling for differences in human capital and demographic characteristics. The wage premiums in that industry were much higher in previous years - 89 percent in 1972, and 45 percent in 1982. On the other hand, the average wage of workers in the wearing apparel industry is 16 percent lower than the average wage of workers in all the manufacturing industries in 1991. The large wage differentials suggest that other factors besides opportunity costs are important in explaining wage differentials.

The correlations of the industry wage differentials between with and without controls in terms of the magnitude are all high in the three years - 0.878 in 1972, 0.877 in 1982, and 0.902 in 1991. Concerning the ranking, the correlations of wage differentials are 0.623 in 1972, 0.848 in 1982 and 0.879 in 1991.[4]

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[4] Krueger and Summers (1988) analyzed the 1984 Current Population Survey (CPS) in the same way and found that the correlation of the industry wage differentials estimated with and without controls is 0.95.

The evidence indicates that the addition of personal attributes and human capital characteristics caused no change in the magnitude of wage differentials, but that caused a slight change in the ranking of the industry wage between 1972 and 1991.

While controlling for worker characteristics has little impact on the magnitude of the inter-industry wage differentials and rankings in the wage payments, it reduces the estimated inter-industry dispersion of wages. The standard deviation of the estimated industry wage premiums is reduced from 25 percent when no controls are present to 9 percent when controls are included in 1991.

Among control variables, the years of education and gender are the most important contributors to reduce the standard deviation in 1972, but the tenure with the current occupation plays a crucial role of reducing the standard deviation both in 1982 and in 1991. This indicates that higher wage industries attracted qualified workers with high educational attainments during the early 1970s when the supply of labor was in surplus, but tenure with the firm was more compensated as firms began to develop their firm-specific technologies during 1982-1991.

Table 4.10
Inter-Industry Wage Differentials with Labor Quality Controls: Log Monthly Earnings of Full-time Workers
(Fractional Differences from the Mean Wages)

Industry	1972	1982	1991
Food	-0.01565	0.03789	-0.05160
Beverage	0.09272	0.20486	0.06272
Textile	0.00372	0.02308	-0.05098
Wearing apparel	-0.10269	-0.06085	-0.15734
Leather	-0.04682	-0.13270	0.01923
Footwear	.	0.01168	-0.07174
Wood	0.01534	-0.00446	-0.02331
Furniture	-0.07247	0.01638	0.06174
Paper	0.04090	-0.01477	0.07217
Printing	-0.16683	0.12742	0.07960
Industrial chemicals	0.25249	0.12397	0.17273
Other chemicals	-0.06957	0.05302	-0.03376
Petroleum refineries	0.89258	0.44820	0.37074
Petroleum products	0.09656	0.16934	-0.11959
Rubber	0.03230	0.03033	-0.03790
Plastic	0.00826	0.03061	-0.01949
Pottery, china	-0.28746	-0.07509	-0.22543
Glass	0.02763	0.10163	0.14147
Other nonmetallic	0.11778	0.10486	0.03856
Iron, steel	0.24276	0.09125	0.20454
Non-ferrous metal	0.29498	-0.08141	-0.01207
Fabricated metal	-0.14333	-0.11472	0.01084
Machinery	-0.10645	0.01315	0.04651
Electronics	-0.03004	-0.07699	-0.00259
Transport equipment	-0.06967	0.11082	0.09471
Medical measuring goods	-0.09654	-0.14044	0.00689
Others	0.08472	-0.10425	-0.17202
Weighted standard deviation of differentials [a]	0.119	0.08	0.09

[a] Weights are the share of the employment in the individual industry for the respective year.

4.2.3 Wage Differentials for Different Characteristics of Workers

It is known that there have been large wage differentials between young and old workers; between male and female workers; between white and blue collar workers; between college and high school graduates; and among workers working in the large and small firms in Korea. We examine to what extent the inter-industry wage structure changes due to different characteristics of workers.

Table 4.11 compares the wage structure for several sub-samples of workers in 1991. The industry affiliation has about the same effect on wages of high and low educated workers. It suggests that inter-industry wage differentials are not much explained by the differences in the education level of workers. There are high correlations between the wage structures of blue and white collar workers, and between those of male and female workers. It implies that the inter-industry wage differentials are neither simply a reflection of job characteristics nor sex discrimination.

The standard deviation of wage differentials is one third smaller in small firms than in large firms. If high-wage industries are composed of large-sized firms, the industry wage structure may be different partly reflecting the firm size wage differentials.

Table 4.11

The Inter-industry Wage Structure of Different Types of Workers in 1991: Log Monthly Earnings of Full-time Workers

Sample	Standard Deviation of Industry Wage Differentials [a]	Correlation Among Two Groups [b]
Age		
(1) Age 15-30	0.093	0.80 (0.68)
(2) Age 50-65	0.162	
Gender		
(3) Male	0.095	0.73 (0.61)
(4) Female	0.076	
Education		
(5) 14 years or more	0.104	0.87 (0.85)
(6) Less than 14 years	0.099	
Firm size		
(7) 10-300 employees	0.068	0.66 (0.64)
(8) 301 or more employees	0.106	
Occupation		0.87 (0.85)
(9) Blue collar	0.105	
(10) White collar	0.081	

[a] All the standard deviations are weighted by the share of employment of the 3-digit 27 industries.
Control variables are the same as in Table 4.10.
The size of sample for (1) through (10) are 10,653, 1,061, 12,203, 7,424, 15,973, 3,654, 5,434, 14,193, 12,630, 6,305 respectively. All are selected randomly from the 1991 Occupational Wage Survey.

[b] The figures in the parenthesis are the correlation coefficients concerning the ranking.

Yoon (1991) found a positive relationship between firm or establishment size and wages, even after controlling for labor quality. However, there is a high correlation between the inter-industry wage differentials in small and large firms both in terms of magnitude and ranking. The evidence suggests that wages are either high or low to all workers within an industry regardless of its firm size. The results are consistent with the empirical results of Brown and Medoff (1985) who argue that the firm size is an important factor in explaining intra-industry wage differentials, but not important in explaining differences in wage levels across industries.

The dispersion in industry wages among young workers is 42 percent lower than among old workers, but again there is a high correlation of the industry wage differentials between young and old workers. It implies that inter-industry wage differentials do not appear to be affected by hiring of young workers. The high correlations between different types of workers indicate that the industry affiliation has a significant effect on the wage differentials across industries in Korea.

CHAPTER 5

DETERMINANTS OF INTER-INDUSTRY WAGE DIFFERENTIALS

This chapter discusses the inter-industry wage differentials in the Korean labor market. Section one discusses the theoretical framework for the determinants of the inter-industry wage differentials. The empirical model to estimate the inter-industry wage differentials is explained in section two. Section three describes data that are used in the analysis. Section four discusses the explanatory variables for the model and the empirical results the analysis of the wage differentials across manufacturing industries in the Korean labor market.

5.1 Theoretical Framework

According to the competitive labor market model, the inter-industry wage differentials result from the systematic differences in a worker's ability, or the compensating differentials for non-pecuniary aspects of the work. The models explain that the inter-industry wage differentials reflect the discriminatory shift in labor demand or supply caused by imperfect short-run labor mobility across industries, but that those differentials disappear in the long run.

On the other hand, efficiency wage theory and the union threat model suggest that the optimal wages vary across industries with the conditions necessary for paying efficiency wages. They suggest that an individual's earnings are dependent not only on his own attributes but also on industry characteristics. A firm's behavior of paying the higher wages than the ongoing level is rationalized by assuming that firms do not always maximize profit, or that paying higher wage is not very costly for firms because of efficiency wage reasons.

Several strands of theory along with related empirical evidence indicate that industry affiliation is important in explaining inter-industry wage differentials. They suggest that the extent of unionization, the degree of product market concentration, plant and/or firm size and the capital intensity ratio are significant factors affecting workers' earnings. However, whether these factors are also significant in explaining the wage differentials across industries is not clear in the Korean labor market where the government intervenes in the labor market and adopts industrial policies to support targeted industries.

Industrial policies have led to a concentrated market with the rapid expansion of a few large business groups, chaebôls, and promoted export industries by providing many incentives. They have also influenced decisions on investment and employment by the private sector and have affected the wage structure.

The intervention of the Korean government in the labor market has lowered a firm's flexibility in responding to the demand shocks and has affected the elasticity of demand for labor. In addition, the large influx of women and college educated workers into the labor market has influenced earnings for these groups as well as other workers. We incorporate these factors that are specific in the Korean labor market in the analysis of the inter-industry wage differentials. Figure 5.1 describes the major factors and their interactions in the determination of wages in the Korean labor market.

We start with the proposition that the inter-industry wage differentials result not only from differences in personal attributes and human capital factors, but also from differentials in industry characteristics. Such personal and human capital characteristics as sex, marital status, education, job and/or firm tenure and occupation have significant impact on earnings at the individual level.

Industrial policies have widened the wage differentials between the supported and non-supported industries since the supported industries demand more labor and the increased demand for labor tends to in turn raise wages. They also tend to induce the migration of workers toward industrial sites and stimulate the unbalanced development of different regions. Furthermore, it leads to increases in the wage differentials between industries that are located in the fast developing

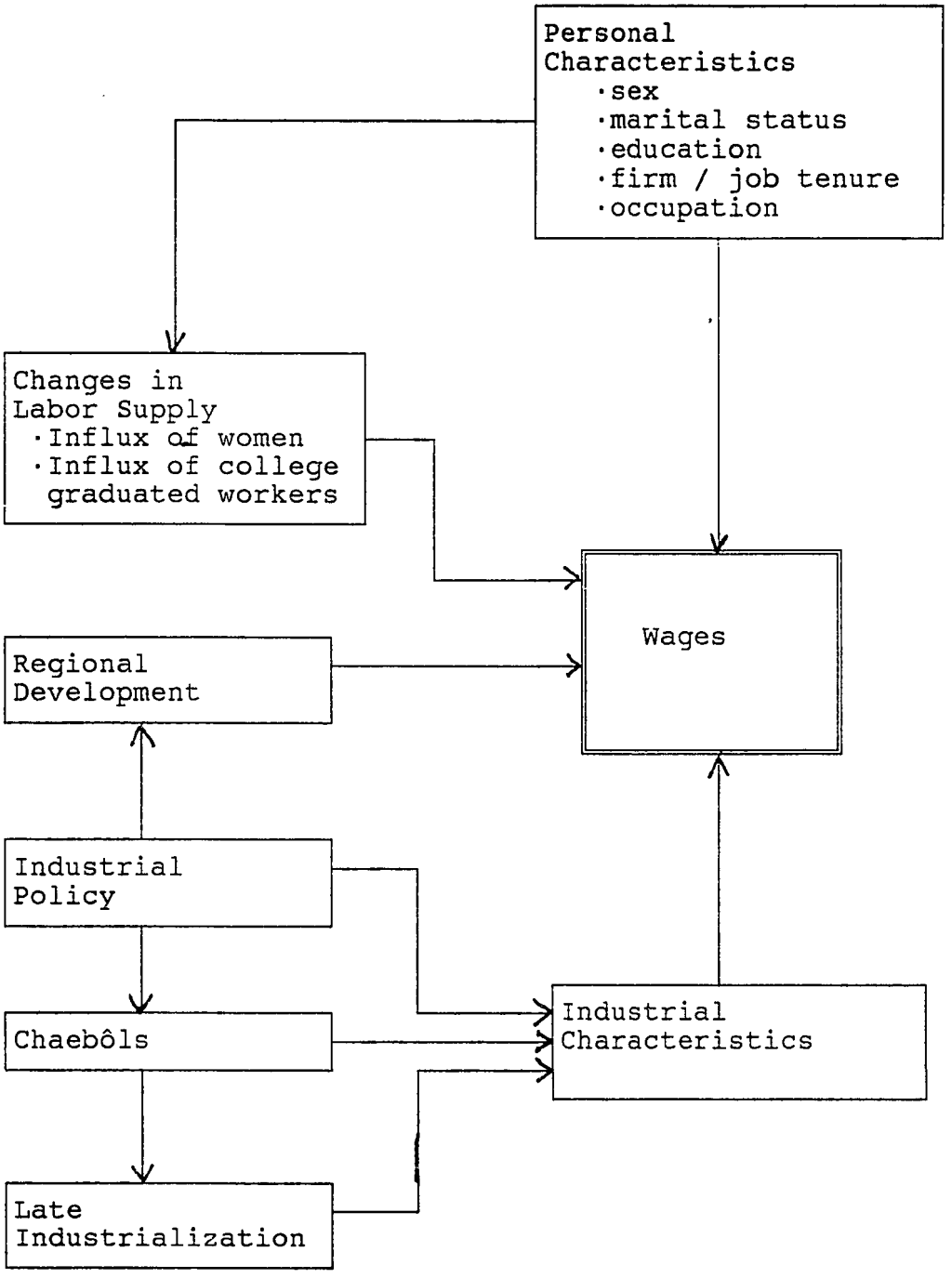

Figure 5.1

Major Factors in the Determination of Wages in Korea

regions and industries that are located in the more slowly developing regions. On the other hand, the industry policy that promotes export-oriented industries narrows the wage differentials since there is downward pressure on the wages of workers in the industries that are exposed to foreign competition.

The emergence of a few large firms, chaebôls, increase the size-wage differentials by segmenting the labor market between large and small firms. Chaebôls expand their activities toward the capital-intensive industries with the help of the industry policy and provide better opportunities for earnings while attracting highly qualified workers. On the other hand, chaebôls also take the superior position in employing workers in the labor market. Whether the effect of market power of chaebôls on wages is positive or negative is revealed by the empirical evidence.

The late-industrialization characterized by the learning and the borrowing of technology from the developed countries makes the wage differentials wider. One reason is that the new industries that rely on turnkey technology transfers pay high wages to motivate workers and to keep workers who have firm-specific skills.

The long overtime working hours caused by the restriction on lay-off are more frequently used in low wage industries in responding to changes in the business cycle and tend to reduce

the inter-industry wage differentials since workers are much more compensated in the low wage industries.

The large influx of women in a certain industry also tends to have a negative effect on wages. In addition, the preference of college-educated workers for employment in large firms and capital-intensive industries will increase the wage differentials across industries.

5.2 The Empirical Model

To examine the sources of the inter-industry wage differentials, we estimate the wage equation in two steps.[1] This approach will solve problems resulting from estimating an earnings equation when industry characteristics are incorporated to the micro data that contains information on human capital factors and personal attributes.[2]

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[1] Dickens and Ross (1984) suggest this approach as a possible solution to the aggregation problem. Dickens and Katz (1987) adopt this approach and analyze the inter-industry wage differentials using the 1983 CPS data set.

[2] The first problem occurs when the respondent's employer is assigned to the industry level attributes instead of the appropriate firm or plant level attributes. This problem of an incorrect level of aggregation will likely lead to the biased estimates and incorrect standard errors. The second problem is the common group error components or a correlation of the errors within each group. Common group error components arise since two individuals within an industry would be more likely to share an unobserved characteristic than two individuals in separate industries. The group error components lead to the usual OLS coefficient standard errors generally biased downward and the coefficient estimates significant with an exaggeration.

In the <u>first step</u>, we regress earnings only on a set of individual characteristics and industry dummy variables which represent the 27 manufacturing industries by the three-digit classification,

$$\ln \mathbf{W}_{ij} = U_o + \mathbf{V}_{ij}\mathbf{F} + \mathbf{W}_j\mathbf{G} + E \text{ ----------(1)}$$

where $\mathbf{W}_{ij}$ = monthly earnings of individual i in industry j;

$\mathbf{V}_{ij}$ = vector of personal attributes, human capital characteristics, occupation dummies and region dummies regarding location of the establishment;

$\mathbf{W}_j$ = industry dummy variables;

E = random disturbance term;

U_o is the intercept, and **F** and **G** are the vector of parameters.

In the first step, the possible correlation between the regressors and deviations of the attributes of the firm's characteristics from industry characteristics can be eliminated. The coefficients of industry dummy variables represent the wage differentials among industries holding personal attributes and human capital factors constant.

In the <u>second step</u>, the estimated coefficients of industry dummy variables from the first step are regressed on variables representing industry characteristics to identify the sources of the inter-industry wage differentials.

The estimate function will be as follows:

$$\mathbf{F} = L_o + \mathbf{M}_j\mathbf{P} + E_j \text{ ----------(2)}$$

where **F** = coefficients of industry dummy variables estimated in equation (1);

$\mathbf{M}_j$ = vector of j industry characteristics;

E = random disturbance error;

L_o is the intercept and **P** is a vector of parameters. The wage equation (1) is estimated for the year of 1972, 1982 and 1991 using Occupational Wage Survey (OWS) data in the first step.

In the second step, the estimated coefficients of industry dummy variables for three years are pooled and regressed on the industry characteristics variables. The relationship between the coefficients of industry dummy variables and the industry average characteristics are simply determined by using OLS unless the normal linear regression model's assumptions are violated. However, it is more realistic to assume that errors are heteroscadastic since values of industry characteristics are different and the variance of omitted minor variables are also different.

If the error variances are not constant and there is a relationship between the error variances and the values of one of the explanatory variables, ordinary squares parameter estimators are unbiased and consistent, but they are not efficient because ordinary squares estimation places more weight on the observations with large error variances than on those with small error variances. This leads to biased estimates of the variances of the estimated parameters. When the biased estimates are used, statistical tests and confidence intervals will be incorrect.

If the variance of error terms are heteroscadastic, we have to estimate equation (2) using transformed variables. If the variance of error terms is given by a simple multiplicative function of independent variables,

$$\sigma_i^2 = \exp\ (w_i'\delta), \qquad i=1,.....,n$$

where $w_i = [1 \quad \ln X_{ji}\ ]'$, $\qquad \delta = [\ln \sigma^2 \quad \alpha]'$,

or equivalently,

$$\ln \sigma_i^2 = \ln \sigma^2 + \alpha \ln X_{ji}, \quad i=1,.....,n,$$

then the variance of error terms is proportional to the jth explanatory variable raised to the power α.[3]

We can estimate α_0 and α using the expression,

$$\ln \sigma_i^2 = \alpha_0 + \alpha \ln X_{ji}$$

and get the estimated variance by taking the exponential of the estimated equation, or

$$\sigma_i^2 = \exp\ (\alpha_0)\cdot(\ X_j^{\alpha}).$$

Then we can transform the variables in the equation (2) by dividing by the square root of σ_i^2.

With a transformed equation

$$\mathbf{F}/v = L_o/v + \mathbf{M}_j/v + E/v \text{ ----------(3)}$$

where $v = \exp\ (\alpha_0/2)\cdot(\Sigma\ X_j^{\alpha/2})$, the ordinary least squares estimates of the parameters will be appropriate parameter estimates and the variance of errors becomes homoscedastic.

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[3] This part relies on <u>the Econometric Analysis of Time Series</u> by Harvey, A.C. (1981).

5.3 Data

The Occupational Wage Survey (OWS), which has been conducted annually by the Ministry of Labor of Korea since 1968, is the basic source of individual worker related information. The survey covers workers who are employed in an establishment with ten or more workers in all the industries except agriculture, forestry, and fishing. The central and local government agencies, the military and police forces, and national and public educational agencies are not included.

The survey contains information on worker's gender, age, marital status, and educational attainment. The years with current job and firm, occupation, monthly regular payments, annual bonuses, monthly working hours, skill level, and rank in the job hierarchy are also included in the survey. The location of the establishment and the size of establishment and firm are surveyed. Although the survey has very detailed information on individual worker, one problem with this survey is that it does not include the substantial portion of the small-scale firms that employ less than ten workers.

A six percent random sample is selected from the data of each year of 1972, 1982 and 1991. We focus only on the manufacturing sector that has played a leading role in the rapid growth of the economy. There are 20,137 observations included in the sub-sample of 1972, and 22,574 in 1982, and

19,627 workers in 1991. The earning equation (1) in section 5.2 is estimated using this micro-level information.

The major source of the macro industry-related data is the Financial Statement Analysis (FSA), which is conducted annually by the Bank of Korea. The FSA contains statistical data on growth, profitability, financial structure and productivity of Korean corporations classified by industry.

The advantage of using this data is that the classification of industry in the FSA is identical to the OWS, and the financial performance of firms is closely related to the ability to pay wages. The disadvantage is that the survey covers only firms whose total annual sales exceed a certain level, that level being 267,000 dollars in 1982, and 657,000 dollars in 1991.

Various years of Input-Output Tables of Korea, generated by the Bank of Korea, are used to calculate the fraction of output exported in the manufacturing industries.

5.4 Empirical Results

5.4.1 The First Step Equation

The Explanatory Variables

We postulate that a worker's earnings are dependent not only on his or her personal attributes and human capital factors, but also on his affiliation with a particular industry. Personal attributes and human capital factors are characterized by such variables as sex, marital status, education, current job and firm tenure, monthly working hours and occupation dummy variables. The region dummy variables, representing where an establishment is located, and the 27 industry dummy variables are included to reflect the inter-industry wage differentials.

(1) Gender

Gender has been a major source of the wage differentials in Korea where most female workers have difficulty in getting jobs after marriage, and thus they have a shorter life-time employment span. A survey shows that promotion of female production workers is virtually impossible due to discrimination in the internal labor market (Korea Employers' Federation, 1986, p.141-143).

The anticipated relationship between being female and the wage level is negative. The dummy variables used are defined

as follows: SEX1 = 1 if male, 0 otherwise; SEX2 = 1 if female, 0 otherwise.

(2) Marital status

Park and Park (1984) suggest that wage differentials among workers in Korea result from differences in the supply cost of workers, that is determined by personal attributes such as sex, marital status, age and family background. They argue that the living cost of individual worker is more important than his or her productivity in determining wages. This argument is supported by the fact that married workers who have responsibility for supporting their families are paid more wages than single workers, due to the incomplete standardization of job classification and the influence of the Confucian tradition in management in Korea.

A positive relationship between being married and earnings is expected, all other things being equal. The dummy variables are defined as follows: MAR1 = 1 if single, 0 otherwise; MAR2 = 1 if married, 0 otherwise.

(3) Educational attainment

The large influx of highly educated workers is one of the most distinguishing changes during in the last 30 years in the Korean labor market. They tend to be drawn into large firms that provide better opportunities for earnings.

Firms demand educated workers to save on the quasi-fixed costs related to training. Years of schooling are expected to have a positive effect on earnings in a given occupation.

The education dummy variables are defined in 1982 and 1991 as follows:

ED1 = 1 if a worker finished primary school,
0 otherwise;

ED2 = 1 if a worker graduated middle school,
0 otherwise;

ED3 = 1 if a worker graduated high school,
0 otherwise;

ED4 = 1 if a worker finished a 2-year college course,
0 otherwise;

ED5 = 1 if a worker graduated university or got higher education, 0 otherwise.

Variables ED4 and ED5 are not classified in 1972. Instead, ED4 defines a worker who graduated a 2-year college or got higher education.

(4) Job experience and firm tenure

A worker's tenure with a firm and job experience is likely to have a positive relationship with earnings. According to Joanne Salop and Steven Salop (1976), employers use upward-sloping earnings profiles to discourage workers who have high propensity to quit. Edward Lazear (1979) argues

that the use of steeply sloped earnings profiles serves to motivate workers and reduce shirking.

Years of working experience with the current firm defines the firm tenure for all the surveyed years. Years of working experience with the current occupation defines the job experience. Total years of experience are used for 1972, but the years of experience dummy variables are used for 1982 and 1991 as below:

Job Dummy	1982	1991
JD1 =	1 if less than 1 year, 0 otherwise;	1 if less than 1 year, 0 otherwise;
JD2 =	1 if over 1 year but less than 3 years 0 otherwise;	1 if over 1 year but less than 2 years 0 otherwise;
JD3 =	1 if over 3 years but less than 5 years 0 otherwise;	1 if over 2 years but less than 3 years 0 otherwise;
JD4 =	1 if over 5 years but less than 9 years 0 otherwise;	1 if over 3 years but less than 4 years 0 otherwise;
JD5 =	1 if over 10 years 0 otherwise;	1 if over 4 years, less than 5 years 0 otherwise;
JD6 =	-	1 if over 5 years, less than 6 years 0 otherwise;
JD7 =	-	1 if over 10 years 0 otherwise

(5) Occupation

Firms have made efforts to improve productivity throughout the last 30 years. One example is that the proportion of engineers increased from 2.9% in 1972 to 7.4% in 1991 in the whole manufacturing industries. The proportion of workers who are employed in the production related jobs declined to 64.4% from 82.4% during the same period as shown in Table 5.1.

Table 5.1

Proportion of Production Workers and Engineers and its Trends Between 1972 and 1991

(%)

	1972	1982	1991
Food	76.0 (1.4)	68.1 (2.3)	59.6 (4.4)
Textile	89.5 (1.7)	84.8 (1.5)	71.9 (2.2)
Wood	79.9 (8.4)	83.4 (0.7)	76.7 (2.1)
Printing	83.0 (0.5)	75.7 (1.3)	67.5 (3.2)
Industrial chemical	49.0 (7.5)	33.8 (28.4)	39.3 (14.7)
Pottery & china	85.0 (4.4)	87.9 (1.3)	77.2 (1.1)
Iron & steel	72.5 (7.4)	74.6 (9.4)	65.6 (10.1)
Machinery	85.3 (3.3)	73.1 (5.5)	56.0 (13.3)
Electronics	80.8 (4.7)	76.7 (4.6)	59.0 (12.4)
Whole industry	82.4 (2.9)	77.8 (3.3)	64.4 (7.4)

The proportion of engineers is presented in the parenthesis.
Source: Ministry of Labor, Korea, Occupational Wage Survey. Calculated from 1972, 1982, 1991 reports.

The share of engineers more than doubled in the machinery and electronics industries between 1982 and 1991. This indicates that industries that rely on the borrowed

technologies tend to employ skilled workers and invest more to develop their own technology. The average wage of the industry is affected by the proportion of engineers and managers.

The occupations are grouped into five categories and the occupation dummy variables are defined as follows:

OD1 = 1 if a worker is in the professional or technical related jobs,
0 otherwise;

OD2 = 1 if a worker is in the administrative or managerial related jobs,
0 otherwise;

OD3 = 1 if a worker is in the clerical related jobs,
0 otherwise;

OD4 = 1 if a worker is in the sales or service related jobs,
0 otherwise;

OD5 = 1 if a worker is in the production related jobs,
0 otherwise.

(6) Region

Industrial policies have brought about an unbalanced regional development during the past three decades in Korea. Table 5.2 indicates that 86.3 percent of manufacturing firms and 80.0 percent of production measured by the value-added are concentrated in two regions in 1989: Seoul and its suburb, Gyeonggi-Do, and the south-eastern part of Korean Peninsula,

Busan and Gyeonggi-Do (See Figure 5.2). Workers migrated from the rural areas to these intensively developed regions. But the south-western and the middle regions of the peninsula remain underdeveloped. Higher earnings are expected in more rapidly developing regions. However, the effect of industrialization on wages might be different depending on the availability of labor. As the labor market has become tighter since the latter half of 1970s, the effect is expected to be larger.

The region dummy variables are defined as follows:

RD1 = 1 if the firm is in Seoul,
0 otherwise;

RD2 = 1 if the firm is in Busan,
0 otherwise;

RD3 = 1 if the firm is in Gyeonggi-Do,
0 otherwise;

RD4 = 1 if the firm is in Gangweon, Chungcheong and Jeonla-Do,
0 otherwise;

RD5 =1 if the firm is in Gyeongsang-Do,
0 otherwise.

Figure 5.2

Map of South Korea

Table 5.2

Composition of Establishment and Value-added across Province in Manufacturing Industries in 1989

(%)

	No. of Establishment	Value-added
Seoul	27.7	12.6
Busan	10.4	7.2
Gyeonggi-Do	31.1	30.5
Gyeongsang-Do	17.1	29.7
Others[a]	13.7	20.0

[a] Gangweon-Do, Chungcheong-Do, Jeonla-Do are included.
Source: National Statistical Office, Korea, Korea Statistical Yearbook, 1991.

(7) Industry Dummy Variables

We use industry dummy variables to capture characteristics of each industry, which are not explained by the variables discussed so far. A three-digit industrial classification categorizes the whole manufacturing sector into 27 industries. Industry dummy variables are defined as follows:

ID 1 = 1 if manufacture of food, 0 otherwise;

ID 2 = 1 if manufacture of beverage, 0 otherwise;

ID 3 = 1 if manufacture of textiles, 0 otherwise;

ID 4 = 1 if manufacture of wearing apparel, 0 otherwise;

ID 5 = 1 if manufacture of leather and fur, 0 otherwise;

ID 6 = 1 if manufacture of footwear, 0 otherwise;

ID 7 = 1 if manufacture of wood and cork, 0 otherwise;

ID 8 = 1 if manufacture of furniture, 0 otherwise;

ID 9 = 1 if manufacture of paper products, 0 otherwise;

ID10 = 1 if manufacture of printing, 0 otherwise;

ID11 = 1 if manufacture of industrial chemicals, 0 otherwise;

ID12 = 1 if manufacture of other chemicals, 0 otherwise;

ID13 = 1 if manufacture of petroleum refineries, 0 otherwise;

ID14 = 1 if manufacture of products of petroleum,
0 otherwise;

ID15 = 1 if manufacture of rubber products, 0 otherwise;

ID16 = 1 if manufacture of plastic products, 0 otherwise;

ID17 = 1 if manufacture of pottery and china, 0 otherwise;

ID18 = 1 if manufacture of glass products, 0 otherwise;

ID19 = 1 if manufacture of non-metallic minerals,
0 otherwise;

ID20 = 1 if manufacture of iron and steel, 0 otherwise;

ID21 = 1 if manufacture of non-ferrous metal, 0 otherwise;

ID22 = 1 if manufacture of fabricated metal, 0 otherwise;

ID23 = 1 if manufacture of machinery, 0 otherwise;

ID24 = 1 if manufacture of electrical equipment, 0 otherwise;

ID25 = 1 if manufacture of transport equipment, 0 otherwise;

ID26 = 1 if manufacture of medical measuring, 0 otherwise;

ID27 = 1 if manufacture of others, 0 otherwise.

Empirical Results

We estimate wage function (1) in section 5.2 for the years of 1972, 1982 and 1991 using the Occupational Wage Survey with OLS. The natural logarithm of monthly earnings ($\ln W_{ij}$) is regressed on the following set of variables:

$$\ln (W_{ij}) = \alpha_0 + \alpha_1 SEX_{1i} + \alpha_2 MAR_{1i} + \alpha_3 WOR_i + \alpha_4 FTEN_i + \Sigma \beta_k ED_{ik} + \Sigma \gamma_l JD_{il} + \Sigma \delta_m OD_{im} + \Sigma h_p RD_{ip} + \Sigma v_j ID_j \quad (4)$$

$$i = 1, \ldots\ldots\ldots\ldots\ldots\ldots, n,$$

where SEX1 = male workers;

MAR1 = single workers;

WOR = monthly working hours;

FTEN = years of experience with current firm;

ED = educational attainment dummy;

JD = job tenure dummy;

OD = occupation dummy;

RD = region dummy;

ID = industry dummy;

The dependent variable, monthly earnings, includes regular payments and overtime payments, as well as bonuses estimated by dividing the annual total by 12 months.

The equation passes the F-test at the 1% significance level and the empirical results of the first step equation support the theory developed in section 5.1. Virtually all the estimated coefficients have the same sign predicted by the theory. Also the coefficients of the variables are statistically significant. We summarize the major findings in the below.

(1) Wage earnings of male workers are higher than those of female workers.

The coefficients are all statistically significant at the 1% level in each of the three years. The empirical result shows that the earnings of the male worker are higher than those of the female worker, but the effect becomes smaller year by year.

(2) Married workers are paid higher wages than single workers.

The empirical finding supports the proposition that living cost of a worker is more important than his or her productivity in determining wages in Korea. The effect of marital status on wages is smaller in 1991 than in 1982, but it is still one of the important factors in explaining the wage differentials in Korea.

(3) Educational attainment has positive effect on earnings.

The differences in educational attainment explain wage differentials among individual workers well. The coefficients of education are all statistically significant at the 1% level. The education-wage differentials are decreasing over time, but among human capital factors educational attainment is the most influential factor in the determination of wage level.

(4) Working hours have a positive relationship with earnings.

The coefficients are all statistically significant at the 1% level in three years. The longer monthly working hours result in the higher earnings. This result supports the proposition of compensating wage differentials in Korea.

(5) Firm and/or job tenure have a positive effect on wages.

The coefficients of both firm and job tenure are all statistically significant at the 1% level. Years of current job experience and firm tenure have a positive effect on earnings. The result supports the proposition that workers who have longer experience with the current firm and firm-specific skills are paid more in Korea.

(6) There are large wage differentials among occupations.

As shown in table 5.3, there exist large wage differentials among occupations. The result suggests that earnings differentials between administrative and managerial workers and production workers are increasing, but earning differentials between technical workers and production workers are declining. The occupation dummy variables along with educational attainment explain the large portion of wage differentials in Korea.

(7) The effect of regional development on earnings is positive.

The empirical result supports the proposition made in the previous section, which said that earnings are higher in the rapidly developing regions than in the slowly developing regions. The result shows that the workers in Seoul are paid highest and workers in the less developed regions such as Gangweon, Chungcheong and Jeonla-Do are less paid than workers in Gyeongsang-Do holding demographic and human capital factors constant.

(8) Large inter-industry wage differentials exist.

Large inter-industry wage differentials exist across industries throughout the three years as shown in Table 5.4.

Table 5.3

Estimates of First Step Equation

	1972	1982	1991
Gender (omitted=female)			
SEX1	0.380 (50.2)***	0.362 (67.1)***	0.302 (64.7)***
Marital status (omitted=married)			
MAR1	-	-0.142 (-26.0)***	-0.073 (-15.9)***
Education (omitted=college graduate)			
ED1	-0.724 (-44.2)***	-0.642 (-53.1)***	-0.430 (-41.7)***
ED2	-0.597 (-37.5)***	-0.559 (-49.2)***	-0.362 (-43.3)***
ED3	-0.364 (-24.5)***	-0.431 (-42.1)***	-0.258 (-37.4)***
ED4	-	-0.319 (-19.5)***	-0.196 (-21.4)***
WOR	0.002 (20.9)***	0.002 (37.2)***	0.002 (37.1)***
FTEN	0.053 (29.37)***	0.031 (33.6)***	0.028 (44.5)***
Job-tenure	0.044 (32.4)***	-	-
Job-tenure (omitted=JD 7)			
JD 1	-	-0.420 (-36.2)***	-0.349 (-34.2)***
JD 2	-	-0.263 (-24.9)***	-0.193 (-19.5)***
JD 3	-	-0.163 (-24.9)***	-0.123 (-13.2)***
JD 4	-	-0.061 (-16.8)***	-0.082 (- 9.2)***
JD 5	-	-	-0.071 (- 8.3)***
JD 6	-	-	-0.029 (- 4.2)***
Occupation (omitted=production related jobs)			
OD 1	0.246 (12.9)***	0.208 (16.5)***	0.165 (19.9)***
OD 2	0.399 (12.0)***	0.484 (30.6)***	0.501 (39.4)***
OD 3	0.144 (12.3)***	0.165 (22.8)***	0.091 (16.8)***
OD 4	0.009 (0.6)	-0.036 (- 3.0)***	0.011 (1.1)
Region (omitted=Gyeonsang-Do)			
RD 1	0.118 (12.5)***	0.007 (1.1)	0.028 (4.8)***
RD 2	-0.001 (- 0.1)	-0.075 (-10.8)***	-0.089 (-12.8)***
RD 3	0.072 (6.4)***	-0.035 (- 5.8)***	0.005 (1.0)
RD 4	-0.058 (- 4.3)***	-0.063 (- 8.3)***	-0.021 (- 3.1)***
Industry(omitted=manufacturer of others)			
ID 1	-0.109 (- 6.5)***	0.144 (10.7)***	0.104 (8.3)***
ID 2	0.006 (0.2)	0.305 (15.1)***	0.213 (8.3)***
ID 3	-0.088 (- 6.6)***	0.104 (9.1)***	0.097 (8.6)***
ID 4	-0.213 (-12.8)***	0.015 (1.3)	0.014 (1.2)
ID 5	-0.153 (- 4.5)***	-0.043 (- 2.1)**	0.182 (9.3)***
ID 6	-	0.106 (5.6)***	0.100 (7.3)***

Table 5.3 (continued)

ID 7	-0.083 (- 4.2)***	0.042 (2.3)**	0.136 (6.0)***
ID 8	-0.172 (- 3.6)***	0.104 (4.1)***	0.215 (10.2)***
ID 9	-0.056 (- 2.6)***	0.070 (3.8)***	0.210 (13.3)***
ID 10	-0.248 (-11.8)***	0.193 (10.8)***	0.261 (17.4)***
ID 11	0.159 (6.0)***	0.240 (14.1)***	0.355 (22.5)***
ID 12	-0.141 (- 7.1)***	0.186 (12.9)***	0.175 (13.2)***
ID 13	0.807 (21.7)***	0.608 (16.8)***	0.546 (28.7)***
ID 14	0.018 (0.6)	0.234 (9.0)***	0.071 (1.9)*
ID 15	-0.039 (- 1.9)*	0.109 (7.2)***	0.110 (7.3)***
ID 16	-0.147 (- 5.2)***	0.129 (6.3)***	0.138 (8.6)***
ID 17	-0.382 (-11.3)***	0.004 (0.2)	-0.080 (- 2.9)***
ID 18	-0.058 (- 1.9)*	0.201 (8.4)***	0.298 (15.9)***
ID 19	0.024 (1.1)	0.163 (10.1)***	0.184 (12.1)***
ID 20	0.129 (5.7)***	0.166 (10.5)***	0.364 (25.9)***
ID 21	0.248 (4.9)***	0.016 (0.5)	0.151 (5.8)***
ID 22	-0.221 (-12.3)***	-0.010 (- 0.7)	0.178 (14.0)***
ID 23	-0.176 (- 7.7)***	0.121 (8.3)***	0.221 (17.5)***
ID 24	-0.108 (- 6.5)***	0.057 (4.9)**	0.174 (16.1)***
ID 25	-0.151 (- 6.3)***	0.223 (15.8)***	0.286 (23.8)***
ID 26	-0.181 (- 5.1)***	-0.013 (- 0.7)	0.200 (11.1)***
R-square	0.611	0.754	0.774
F-value	789.7	1498.8	1394.8
Mean of log Wages	9.7	12.1	13.4
Number of observations	20,098	22,498	19,627

The t-values are in the parentheses.

* ; significant at 10 % level
** ; significant at 5 % level
*** ; significant at 1 % level

The estimated coefficients represent the percentage effect of the industry dummy variables.[4] Although there are slight changes in the ranking with regard to the relative wage level over time, the empirical finding supports the hypothesis which argues that a worker's earnings are dependent not only on his personal attributes and human capital factors but also on industry characteristics.

To examine the influence of the industry affiliation in wage dispersion and its trend, we use the analysis of covariance. The proportion of the variation in wage explained by the covariates (the variables in **V**) and industry affiliation is given by the R^2 of the equation. The importance of the industry affiliation can be estimated by examining the changes in the R^2 with adding or deleting the industry dummy variables in the regression. The lower bound on the importance of the industry is given by the increase in explanatory power arising from adding industry dummy variables to the equation already including the covariates. The upper bound results from the R^2 of the log wage regression that includes only the industry dummy variables.

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[4] The method that Kennedy (1981) suggested to measure the relative effect of dummy variables on earnings in the semilogarithmic equation is as follows: $[\exp(c - 0.5 \cdot V(c)) - 1] \times 100\%$, where c is the estimated coefficient of the dummy variables and V(c) is the variance of c.

The basic decompositions of the sources of wage variation for the three years are presented in Table 5.4. We estimate the lower bound on the importance of the industry by holding covariates constant. Industry dummy variables account for 2.6-4.3 percent of the total variance of wage earnings in the three years. The upper bound ranges from 13.8 to 23.8 percent of the wage variation. The broad ranges arise from the large degree of multicollinearity between the industry effects and the covariates.

The conservative estimate of the standard deviation in log wages attributable to industry differentials is 0.134 in 1972. That compares to 0.106 both in 1982 and in 1991. The upper bound of the standard deviation in log wages attributable to industry differentials is 0.249, 0.258 and 0.248 in the respective years.[5]

The F-statistic for the hypothesis that the industry effects are all zero once the covariates are present in the wage equation is large enough to reject the hypothesis at any significance level for each year. These findings support the proposition that the industry affiliation is important in explaining the inter-industry wage differentials in Korea.

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[5] We multiply the proportion of the sum of the squares attributable to industry dummies by the variance of log wage and then take the square root of the quantity.

Table 5.4

Analysis of Sources of Wage Differentials
(Share of Total Sum of Squares)

Sources of variation	1972[a]	1982	1991
1. Covariates and Industry(T)	0.611	0.754	0.774
Error	0.389	0.246	0.226
2. Covariates first(C)	0.580	0.728	0.731
Industry(T-C)	0.031	0.026	0.043
3. Industry first(I)	0.138	0.192	0.238
Covariates(T-I)	0.473	0.562	0.536
Total number of observations	20,098	22,498	19,627
Standard Deviation of log(wage)	0.67	0.59	0.51
Mean of log(wage)	9.70	12.05	13.38

[a] Marital status is not included in 1972 due to the lack of the information.

T is the R^2 from the log wage regression including both the covariates and industry dummies; C is the R^2 from the regression on the covariates alone; I is the R^2 from the regression on industry dummies alone.

5.4.2. The Second Step Equation

The Explanatory Variables

In the second step, we regress the estimated inter-industry wage differentials on the average industry characteristics. The industry characteristics variables included are as follows.

(1) Human capital variable

We have already controlled for such standard human capital variables as education attainment, working experience and firm tenure at the individual level. However, it is possible that average levels of human capital in a given industry level may still be correlated with wages. Workers in industries where other workers are highly educated, more experienced and/or have longer firm tenure may be treated exceptionally.

Among the human capital variables, we use only the average years of schooling in the industry to proxy the difference in the quality of workers since other variables such as working experience, and the current firm and job tenure are likely to be correlated with the educational attainment. Table 5.5 shows that the average years of schooling are increasing in all the manufacturing industries throughout the period of 1972-1991.

However, the relative level of educational attainment of the industry shows a stable pattern. The average years of schooling in the textile and pottery and china industries were low since 1972, while those have been high in industrial chemicals industry since 1972. That suggests that the textile, pottery and china industries prefer to employ less educated workers, while the industrial chemicals, iron and steel, machinery, and electronics industries prefer to employ more highly educated workers.

The average years of schooling of workers increased most sharply in the machinery manufacturing industry between 1972 and 1982, while this same increase happened in the industrial chemicals and electronics industries between 1982 and 1991.

Table 5.5

Average Years of Schooling in Manufacturing Industries

	1972	1982	1991
Food	9.2	10.0	11.5
Textile	8.2	9.3	10.8
Wood	9.2	9.6	11.1
Printing	9.3	10.0	11.4
Industrial chemicals	10.2	10.7	12.9
Pottery & china	8.2	8.7	9.2
Iron & steel	10.0	10.8	11.7
Machinery	9.0	10.7	12.2
Electronics	10.0	10.6	12.3
Whole industry	8.9	9.9	11.5

Source: Ministry of Labor, Korea, Occupational Wage Survey. Calculated from 1972, 1982, 1991 reports.

(2) Changes in the participation of women in the labor market

The large influx of women in the labor market results in a remarkable change in the employment structure during the last 30 years in Korea. Table 5.6 shows that the participation of female workers increased between 1972 and 1982, but it declined afterwards. The main reason is that many female workers have changed their occupations from the manufacturing to the service sector since the late 1980s. Women are dominant in the textile, pottery and china, and electronics industries, between 1972 and 1991, while few female workers are employed in the industrial chemicals, iron and steel, and machinery industries during the same time.

Women are crowding into certain industries and that crowding may affect their wages and the wages of other workers. The percentage of an industry's work force which is female tends to be related to the average wage in the industry. The percentage of each industry's workers that are female is used to proxy the effect of a large influx of women on earnings. Year dummies are used to reflect the change in the employment structure. Year dummy variables are defined as follows:

D72 = 1 if year = 1972, 0 otherwise;

D82 = 1 if year = 1982, 0 otherwise;

FD72 = D72*FEM;

FD82 = D82*FEM; where FEM = ratio of women to total workers in the industry.

We can anticipate that industries which employ a large proportion of female workers pay, on average, lower wages than the industries which employ a small proportion of female workers.

Table 5.6

Composition of Female Workers in Manufacturing Industries
(%)

	1972	1982	1991
Food	41.6	41.0	42.2
Textile	69.2	67.1	57.7
Wood	26.7	25.4	26.7
Printing	22.5	21.1	23.1
Industrial chemicals	15.5	30.3	12.6
Pottery & china	42.2	55.8	68.5
Iron & steel	3.7	6.7	6.2
Machinery	4.1	9.1	14.4
Electronics	42.9	54.7	44.0
Whole industry	44.2	45.9	37.8

Source: The Ministry of Labor, Korea, Occupational Wage Survey.
Calculated from 1972, 1982, 1991 reports.

(3) Industrial policy

The Korean government adopted industrial policies and provided various incentives to the private sector to support the targeted industries. Among many incentives, subsidized loans are the most important factor, which affects the employment and wage structure in Korea. The subsidized loans, of which interest rates are about 5 percentage points lower

than commercial loans are rationed based on the magnitude of the capital of the firm. This loans have also longer grace periods on repayment than commercial loans. The group of large firms that are financially consolidated are in a better position to access the loans. Their ability to invest more in the capital-intensive industries with the subsidized loans increases concentration in the market.

The amount of loans per worker in the industry is used to estimate the effect of industry policy on earnings differentials between supported and non-supported industries. The sum of the long-term debt to banking institutions and the long-term foreign debt is divided by the number of the employees in the industry to control for differences in the demand for capital among industries. This calculation is based on the information found in the several Financial Statement Analyses.

(4) Overtime working hours

The number of hours of overtime worked is a source of compensating wage differentials. However, the long overtime working hours in Korea is caused by the legal constraint on layoffs. The law aims to protect workers from being laid-off, but most firms use the overtime working hours of existing workers to respond to the business cycles. With overtime working, the employers are able to avoid high quasi-fixed

employment costs related to the fringe benefits, training and hiring while at the same time workers make more earnings.

Overtime working hours tend to be higher and less volatile in low wage industries than in high wage industries. A negative relationship between overtime working hours and earnings is expected. The average monthly overtime working hours in the industry is used in the regression.

(5) Effect of chaebôls

The industrialization of Korea is propelled by a few large firms, chaebôls, that expand the labor-intensive assembly lines under the subcontracting system. Chaebôls make the prime contracts and small firms supply parts and components. Since most of small firms are either independent suppliers within the chaebôls or controlled by chaebôls financially and technically, the profits of small firms are squeezed and chaebôls concentrate the market.

Industries where Chaebôls participate tend to be highly concentrated and the highly concentrated industries are expected to yield higher profits to share with the labor force. On the other hand, chaebôls that have the market power are in the superior position in employing workers and determining wages (Hodson, 1983). The effect of chaebôls on earnings will depend on technology adopted in the industry and the labor market situation: the positive effect of the market power will be dominant if the industry is capital-intensive

and the labor market is tight; on the other hand, the negative effect is dominant if the technology is labor-intensive and the labor supply is in surplus with workers crowding into the large firms.

We use the ratio of workers employed in firms that employ more than 500 workers in a given industry to proxy the market power of chaebôls.

(6) Fraction of output exported

Since the early 1960s, the Korean government has adopted export promotion policies to overcome the small scale of the domestic market. Several studies found that international competition affected wages. Lawrence and Lawrence (1985) argue that increased international competition makes the demand for labor more inelastic and shifts it inward. Macpherson and Stewart (1990) found that a 10% rise in the import share lowered the union wage differentials by about 2% using data of Current Population Survey from the May 1975 to 1981 .

Although predictions of previous studies are sensitive to model specifications, a general consensus regarding the effect of international competition on wage differentials is that as an industry is increasingly exposed to international competition, wages of workers are under increasing pressure.

Fraction of output exported is used to approximate the effect of the foreign competition on wage earnings. The ratio is calculated based on the information from the Input-Output table.

Empirical Results

We estimate wage equation (2) in section 5.2 to examine the sources of the wage differentials, while regressing the coefficients of industry dummy variables estimated from wage equation (3) on the industry characteristics variables. The model specification is as follows:

$$F = \beta_0 + \beta_1 \text{ SCH} + \beta_2 \text{ FEM} + \beta_3 \text{ FD72} + \beta_4 \text{ FD82} + \beta_5 \text{ LOAN} + \beta_6 \text{ OW} + \beta_7 \text{ MAR} + \beta_8 \text{ EXP} + e \text{ -------(5)},$$

where F = vector of the estimated coefficient of industry dummy variables;

SCH = average years of schooling in the industry;

FEM = proportion of female workers in the industry;

FD72 = dummy variable of FEM for 1972;

FD82 = dummy variable of FEM for 1982;

LOAN = amount of long-term debt to bank and foreign per worker in the industry;

OW = average overworking hours in the industry;

MAR = ratio of workers employed in firms that employ more than 500 workers;

EXP = fraction of output exported in the industry.

The equation passes the F-test at the 1% significance level, but does not pass the test of homoscadasticity.[6] We specify the variance of error terms as a multiplicative function of independent variables. We tried all the variables and found that the average overtime working hours (which is included in the model) and the average years of firm tenure in a given industry (which is not included in the model since it has multicollinearity problem with years of schooling and the proportion of female workers in the industry) are significantly related to the estimated variance of error terms. We extended the simple multiplicative specification discussed in section 5.2 to the two variable model and regressed the variance of error terms on the variables.

The result of regression is as follows:

$$\ln \sigma_i^2 = \underset{(0.457)}{0.751} - \underset{(-3.029)^{***}}{1.382} \ln (OW) - \underset{(-3.044)^{***}}{1.926} \ln (FTEN)$$

$$R^2 = 0.232$$

where σ_i^2 = variance of error terms;

OW = overtime working hours;

FTEN = years of working experience with current firm.

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[6] The test of first and second moment specification shows that $\chi^2(41) = 230361$, which rejects the null hypothesis: errors are constant.

By taking the exponential, we estimated the variance of error terms as follows:

$$V^2 = \sigma_i^2 = \exp(0.751)*(OW^{-1.382})*(FTEN^{-1.926}).$$

We transformed the model (5) by dividing all the variables by the square root of the estimated variances of error terms. The transformed equation is as follows:

$$F/v = \beta_0/v + \beta_1 SCH/v + \beta_2 FEM/v + \beta_3 FD72/v + \beta_4 FD82/v + \beta_5 LOAN/v + \beta_6 OW/v + \beta_7 MAR/v + \beta_8 EXP/v + e/v \quad \text{----------(6)},$$

where $v = \exp(0.751/2)*(OW^{-1.382/2})*(FTEN^{-1.926/2})$.

The regression results cannot reject the null hypothesis that errors are homoscedastic ($\chi^2(42)=44.5$) and the F statistic is statistically significant. The results of our analysis can be summarized as follows:

(1) Positive relationship between the average years of schooling and earnings.[7]

The result of analysis reveals that although the human capital factors are controlled at the individual level, the average levels of schooling in the industry have a positive effect on earnings. As shown in Table 5.7, the coefficient

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[7] Earnings refer to wage differentials across industries hereafter.

is statistically significant at the 1% level. This indicates that a worker's wage is dependent not only on the level of schooling of himself or herself, but on the average level of schooling in the industry. The evidence suggests that some industries prefer highly educated workers, while paying higher wages, but others do not. In addition, educational attainment is an important factor in entering firms and in the later promotion, as well as in the determination of wages in the internal market.

(2) Negative relationship between proportion of female workers and earnings.

The empirical result shows that the coefficients are statistically significant at the 5% level. The relationship between the proportion of female workers and earnings are negative in 1972 and 1991, but positive in 1982. It can be assumed that the positive relationship in 1982 represents the tight labor market situation that changed from the surplus of supply to the shortage beginning in the latter half of the 1970s. The crowding of female workers in unskilled and low wage jobs has, however, had a negative effect on wages of these group and other workers, as the industry structure becomes more capital-intensive. The evidence supports the proposition that female workers are likely to have a shorter life-time employment span and enter the low-skilled labor-intensive industries.

(3) Industrial policy has a positive effect on earnings.

The empirical result shows that the coefficient is statistically significant at the 1% level. It indicates that the amount of long-term bank loans per worker which has been a means of implementing industrial policy is an important factor in explaining inter-industry wage differentials in Korea. The finding of a positive relationship between the amount of bank loans per worker and earnings is mainly due to the fact that firms in the supported industries invest more in the capital-intensive technology with subsidized funds and demand in turn highly qualified workers.

The covariance analysis shows that differences in the amount of bank loans per worker in the industry account for the 72% of the total wage differentials. The evidence supports a proposition that the industrial policy has widened the wage gap between workers in the supported industries and workers in the non-supported industries.

(4) Negative, but insignificant relationship between the proportion of export to output and earnings.

Our finding of the insignificant relationship between the ratio of export to output and earnings does not support the proposition that the international competition lowers wages of workers.

(5) The effect of market power on earnings is not significant

As shown in Table 5.7, the proportion of workers with large firms in the industry is not significant in explaining inter-industry wage differentials in Korea. It does not support the hypothesis of the positive effect of concentration on wages; nor does it support the hypothesis of the negative effect of the monopsonic restraints in the employment practice.

(6) Insignificant relationship between overtime working hours and earnings.

The result of analysis shows that the differences in overtime working hours is not significant in explaining wage differentials across industries in Korea. The positive relationship between overtime working hours and earnings in high wage industries is due to the fact that employers use existing workers and make them work overtime in response to an increased demand rather than employing additional workers and thereby incurring the quasi-fixed costs related to recruiting and training. On the other hand, the negative relationship between overtime working hours and earnings in low wage industries are mainly due to the fact that workers tend to work overtime to make extra income to compensate for their low wage rate.

Table 5.7

Results of Second Step Equation

	Parameter Estimates	T-value
Intercept	-0.496	-3.377***
SCH (years of schooling)	0.056	4.554***
FEM	-0.146(D-2)	-2.546**
FD72	-0.290(D-2)	-2.247**
FD82	0.156(D-2)	2.161**
LOAN (bank loan per worker, thousand won)	0.341(D-5)	4.762***
EXP (fraction of output exported, %)	-0.329(D-3)	-0.565
MAR (ratio of workers employed in large firms, %)	0.770(D-3)	1.499
OW (overtime working hours)	0.160(D-3)	0.180

NOTE: Mean of dependent variable = 0.090
Total number of observations = 77
F-value = 87.4
Correlation between estimated parameters and fitted values = 0.944
$\chi^2(42) = 44.5$ ($\chi_{0.05}{}^2(42) = 58.11$)

* ; significant at 10 % level
** ; significant at 5 % level
*** ; significant at 1 % level

CHAPTER 6

CONCLUSION

The rapid economic growth in Korea during the last three decades has substantially changed the industry structure and the labor market. In particular, the labor market has undergone significant changes since the beginning of the 1970s. Long working hours, a large influx of women and highly educated workers, pirating of relatively highly skilled workers between firms, and the preference of workers for large firms have become common.

Furthermore, the following features are prominent in the Korean labor market and wage structure:

1) Working hours per worker in Korea are much longer than in other countries.

2) Increases in wage rates are much more marked than in other countries.

3) Wage differentials among workers are fairly large compared to other countries.

4) Inter-industry wage differentials in terms of magnitude and ranking are stable over the last three decades.

5) Inter-industry wage differentials are the result of differences both in human capital factors and industry characteristics.

The purpose of this dissertation is to examine the sources of the inter-industry wage differentials in Korea. A series of econometric investigations are conducted with special reference to the unique features of the Korea labor market. Specifically, attention is focused on the following subjects:

(1) The impact of industrial policy and the government intervention in the labor market on the wage structure in manufacturing industries.

(2) The influence of a few large business groups, chaebôls, on employing workers and wage earnings.

(3) The effect of the large influx of female workers and highly educated workers in the labor market on earnings.

(4) The difference in exposure to international competition among industries and its effect on earnings.

(5) The applicability of the current theories and models to inter-industry wage differentials in the Korean context.

A two-step approach is employed to analyze wage differential across industries while solving the problems resulting from aggregating the information on individual attributes with the industry characteristics. In the first step, we regress earnings on several individual characteristics using micro data and industry dummy variables. Sex, marital status, firm and job tenure, monthly working hours, occupation dummy variables and region dummy variables are included in the regression.

In the second step, the coefficients of industry dummy variables estimated in the first step are regressed on industry characteristics. Such variables as the industry average years of schooling, the proportion of female workers, the amount of bank loans per worker, the average overtime working hours in the industry, the fraction of output exported, and the proportion of workers employed in the large firms in a given industry are examined to identify the sources of the inter-industry wage differential in Korea.

The Occupational Wage Survey (OWS) that is conducted by the Ministry of Labor is used to generate a sample of individuals to estimate the effects of personal attributes and human capital factors on wage differentials across industries. The 1972, 1982, and 1991 OWS are used for the first step regression. The Financial Statement Analysis (FSA) and Input-Output Table, both generated by the Bank of Korea, are used to estimate the industry-related characteristics in the second step regression.

The following major conclusions are drawn from the results of our study:

(1) Our empirical finding shows that the industrial policy is an important factor in explaining inter-industry wage differentials in Korea. The finding of a positive relationship between the amount of bank loans per worker and earnings is mainly due to the fact that the firms in the supported industries invest more in the capital-intensive technology

with subsidized funds and demand, in turn, highly qualified workers. The covariance analysis shows that differences in the amount of bank loans per worker in the industry account for the 72% of the total wage differentials.

The evidence supports a proposition that the industrial policy has widened the wage gap between workers in the supported industries and workers in the non-supported industries. In spite of the fact that the industrial policy and the government's intervention in the labor market have influenced the structure of the labor market and wage differentials across industries, no prior study has addressed this topic explicitly.

(2) It is agreed that the wages in large firms are higher than those in small firms. Yoon (1991) empirically finds that large firms pay higher wages than small firms do for efficiency reasons in Korea.

Our empirical finding shows that the relationship between the proportion of workers employed in the large firms in the industry and earnings is insignificant. The evidence does not support the hypothesis of the positive effect of the market concentration on wages; nor does it support the hypothesis of the negative effect of the monopsonic restraints in employing on earnings.

(3) Working hours in Korea are much longer than in other countries and overtime working hours are more volatile in high wage industries than in low wage industries.

Our finding shows that differences in overtime working hours across industries have no significant relationship with earnings. They are statistically insignificant at the 5% level in explaining the inter-industry wage differentials.

(4) The Korean government has pursued export promotion policy since the early 1960s. The relationship between the fraction of output exported and earnings is not significant. It does not support such a general consensus that the international competition lowers wage differentials among workers across industries in Korea.

(5) Our finding shows that the average years of schooling in the industry have a positive effect on earnings, although the human capital factors are controlled at the individual level. It indicates that a worker's wage is dependent not only on the level of schooling of himself or herself but on the average level of schooling in the industry.

These findings support the fact that some industries prefer highly educated workers while paying higher wages, but others do not. In addition, educational attainment is the important factor in entering firms and the later promotion as well as in determining wages in the internal market.

(6) The large influx of female workers into the labor market and the crowding into the certain industries shows a negative effect on the wages of female workers as well as other workers. It supports the proposition that female workers tend to have a shorter life-time employment span and enter the low-skilled labor-intensive industries.

The results of our study imply that the industrial policy has contributed to inequality of earnings. In addition, such industry characteristics as the average years of schooling and the proportion of female workers in the industry contribute to the persistence of wage differentials across industries in Korea. These results will make a valuable contribution to more accurately assessing the role of the government in the labor market, the issues of income distribution and unemployment.

We have studied the industry characteristics that are responsible for the persistent inter-industry wage differentials in Korea. Unfortunately, our study has the following weaknesses:

(1) This study does not analyze the effect of union on wages, although collective bargaining has become a major factor in determining wages since 1987 in Korea.

(2) This study does not consider the intra-industry wage dispersions. Both weaknesses are due mainly to the lack of data, the impossibility of identifying firm codes in the data

sets used, and the impossibility of matching relevant firms to the industry characteristics. Better data sets will eliminate these deficiencies.

APPENDIX

Table A.1

Amount of Bank Loans Per Worker Across Industries

(Thousand Won)

Industry	1972	1982	1991
311	1107	2936	6470
313	1575	2902	6949
321	991	3858	9426
322	86	1717	2585
323	227	935	5706
324	-	176	6797
331	1052	4344	9495
332	105	1666	5259
341	1620	5729	18823
342	422	1115	5045
351	6826	10703	23327
352	285	2105	14495
353	14926	28823	77101
354	273	2188	7124
355	150	968	16324
356	447	2948	12599
361	73	513	4095
362	1123	6381	15015
369	5527	7475	14025
371	2274	11543	40283
372	3794	16405	12928
381	240	2895	11375
382	432	6773	8962
383	350	1963	9840
384	3023	7220	12848
385	516	965	5261
390	103	731	3860

Table A.2

Proportion of Output Exported

(%)

Industry	1972	1982	1991
311	9.9	3.1	4.8
313	2.6	2.9	1.0
321	47.2	22.6	31.6
322	25.9	60.6	61.3
323	68.2	58.0	60.7
324	-	-	-
331	47.6	12.2	8.0
332	8.1	5.3	5.8
341	13.8	1.3	6.2
342	7.4	9.5	1.5
351	7.3	8.5	13.0
352	25.9	6.8	10.8
353	12.8	65.5	11.6
354	2.1	11.3	1.1
355	31.9	5.5	35.8
356	10.5	30.5	10.6
361	49.2	8.9	12.8
362	38.4	12.7	1.1
369	24.4	39.8	8.5
371	10.7	38.1	13.2
372	63.6	46.3	14.8
381	0.0	43.6	22.6
382	2.4	6.8	19.2
383	16.2	10.8	38.3
384	0.0	30.3	15.0
385	7.9	13.8	32.2
390	7.8	2.3	50.7

Table A.3

Proportion of Female Workers in the Industry

(%)

Industry	1972	1982	1991
311	41.6	41.0	42.2
313	29.3	26.5	18.3
321	69.2	67.1	57.7
322	69.6	80.2	73.5
323	18.9	43.5	36.2
324	-	60.5	67.5
331	26.5	25.4	26.7
332	10.8	21.1	38.6
341	22.5	21.1	23.1
342	13.5	20.7	25.3
351	15.5	30.3	12.4
352	42.2	38.7	36.0
353	6.8	6.8	10.0
354	2.5	8.2	6.7
355	37.4	55.5	45.3
356	36.7	28.0	21.7
361	42.2	55.8	68.5
362	16.9	21.0	10.7
369	12.9	15.9	17.1
371	3.7	6.7	6.1
372	4.2	17.3	10.4
381	11.7	18.8	20.5
382	4.1	9.1	14.4
383	42.9	54.7	44.0
384	7.4	6.9	9.2
385	20.4	35.6	49.8
390	80.2	56.8	55.5

Table A.4

Proportion of Workers With Large Firms in the Industry

(%)

Industry	1972	1982	1991
311	18.4	52.2	41.8
313	13.6	69.0	36.0
321	32.4	49.9	42.7
322	30.2	36.9	37.8
323	25.3	34.6	24.3
324	-	66.9	67.0
331	66.2	72.9	43.9
332	0.0	61.4	39.8
341	5.6	20.3	20.8
342	22.7	55.4	54.4
351	40.3	55.1	43.9
352	16.6	40.8	46.7
353	20.4	75.4	67.9
354	0.0	0.0	28.6
355	81.8	89.7	63.5
356	52.1	37.9	34.0
361	21.2	35.3	13.8
362	16.5	23.8	60.7
369	25.6	46.1	38.4
371	54.2	72.1	73.0
372	0.0	23.1	55.8
381	13.3	30.2	38.5
382	17.2	60.5	45.1
383	45.4	55.2	65.1
384	37.2	74.1	75.3
385	0.0	42.3	58.4
390	10.5	36.9	60.6

Table A.5

Years of Schooling Across Industries

(Years)

Industry	1972	1982	1991
311	9.18	10.01	11.49
313	8.57	11.15	11.87
321	8.20	9.34	10.75
322	8.04	8.70	10.47
323	8.88	9.11	10.24
324	-	9.14	9.91
331	9.20	9.60	11.14
332	7.41	9.31	10.78
341	9.33	9.98	11.41
342	11.07	11.51	12.91
351	10.16	10.69	12.93
352	10.36	11.65	12.86
353	12.67	13.02	13.84
354	8.00	9.42	10.18
355	8.57	9.27	10.31
356	9.36	10.48	11.57
361	8.23	8.69	9.21
362	8.21	9.78	11.40
369	8.91	9.82	11.15
371	10.04	10.79	11.70
372	11.25	10.25	11.75
381	8.79	9.94	11.12
382	8.99	10.68	12.22
383	10.02	10.62	12.26
384	9.55	74.1	12.01
385	9.15	42.3	12.11
390	7.16	36.9	10.38

Table A.6

Monthly Overtime Working Hours Across Industries

(Hours)

Industry	1972	1982	1991
311	20.69	37.02	36.57
313	14.24	35.05	45.00
321	20.99	44.74	39.59
322	37.08	52.03	24.51
323	26.33	46.11	34.13
324	-	51.81	39.26
331	35.47	66.06	40.35
332	21.31	48.90	47.62
341	27.66	45.23	45.63
342	15.18	47.55	11.18
351	21.05	34.18	23.48
352	8.19	17.06	11.25
353	3.10	9.89	32.47
354	21.25	44.52	27.40
355	26.26	54.89	47.68
356	53.18	39.25	41.89
361	22.55	47.26	36.17
362	16.06	36.23	44.76
369	22.39	53.45	48.10
371	41.89	58.63	50.88
372	7.83	37.78	45.32
381	18.18	38.52	39.28
382	10.87	39.44	31.62
383	12.13	26.49	28.49
384	24.65	43.21	32.97
385	10.93	26.40	24.75
390	13.59	40.94	34.76

REFERENCES

Amsden, Alice H. (1990), "South Korea's Record Wage Rates: Labor in Late Industrialization," Industrial Relations, vol 29, No. 1 (Winter), 77-93.

Amsden, Alice H. (1989), Asia's Next Giant: South Korea and Late Industrialization, Oxford University Press, Inc.

Akerlof, George A., and Yellen, Janet L. (1988), "Fairness and Unemployment," American Economic Review, vol.78, No. 2 (May), 44-49.

Bai, Moo-Ki. (1982), "The Turning Point in the Korea Economy," The Developing Economics, XX, 117-140.

Bank of Korea, Financial Statements Analysis, several issues.

Bank of Korea, Input-Output Analysis, several issues.

Blanchard, Oliver Jean and Fisher, Stanley (1989), Lectures on Macroeconomics, Cambridge: MIT press.

Brown, C., and Medoff, J. (1978), "Trade Unions in the Production Process," Journal of Political Economy, vol. 86, 355-378.

Bulow, Jeremy I., and Summers, Lawrence H. (1986), "A Theory of Dual Labor Market with Application to Industrial Policy, Discrimination, and Keynesian Unemployment," Journal of Labor Economics, vol.4, No. 3, 376-414.

Calvo, G. (1979), "Quasi-Walrasian Theories of Unemployment," American Economic Review, vol. 69 (May), 102-107.

Calvo, G. (1985), "The Inefficiency of Unemployment: The Supervision Perspective," Quarterly Journal of Economics, vol.100 (May), 337-387.5

Calvo, G., and Wellisz, S. (1978), "Supervision, Loss of Control, and the Optimum Size of the Firm," Journal of Political Economy, vol. 86, 943-952.

Council for Economic Planning and Development, Republic of China, Taiwan Statistical Data Book, various years, Taipei.

Dickens, W.T and Katz, L. (1987), "Inter-industry Wage Differences and Industry characteristics," in Lang, K., and Leonard, J. (ed.) Unemployment and Structure of Labor Market, London: Basil Blackwell.

Dickens, W.T and Ross, B. A. (1984), "Consistent Estimation Using Data From More Than One Sample," NBER Technical Working Paper, No. 33.

Economic Planning Board of Korea, Korea Statistical Yearbook, several issues.

Economic Planning Board of Korea, Annual Report on the Economically Active Population Survey, several issues.

Fleisher, B. M., and Kniesner, Thomas J. (1984), Labor Economics: Theory, Evidence, and Policy, third edition, Prentice Hall, Englewood Cliffs, N.J.

Freeman, R. B., and Medoff, J. (1981), "The Impact of Percentage Organized on Union and Non-Union Wages," Review of Economics and Statistics, vol. 63, 561-572.

Fujii, Edwin T., and Trapani, John M. (1978), "On Estimating the Relationship between Discrimination and Market Structure," Southern Economic Journal, vol. 44, No. 3, 557-567.

Garen, John E. (1985), "Worker Heterogeneity, Job Screening, and Firm Size," Journal of Political Economy, vol. 93, No. 4, 715-739.

Harvey, A.C.(1981), The Econometric Analysis of Times Series, Oxford, Philip Allan Publishers.

Haworth, C. T., and Rasmussen, D. W. (1971), "Human Capital and Inter-Industry Wages in Manufacturing," Review of Economics and Statistics, vol. 53, No. 4, 376-380.

Hashimoto, M.(1990), Japanese Labor Market in a Comparative Perspective with the United States, W.E.Upjohn Institute for Employment Research, Michigan.

Hashimoto, M. and Raisian, J. (1985), "Employment Tenure and Earnings Profiles in Japan and the United States," American Economic Review, vol. 75, 721-735.

Helwege, J. (1992), "Sectoral Shifts and Interindustry Wage Differentials," Journal of Labor Economics, vol. 10, No. 1, 55-84.

Heywood, J. S. (1986), "Labor Quality and the concentration-Earnings Hypothesis," Review of Economics and Statistics, vol. 68, No. 2, 342-358.

Hodson, R. and England, P. (1986), "Industrial Structure and Sex Differences in Earnings," Industrial Relations, vol. 25, 16-32.

Hodson, R. (1983), Worker's Earnings and Corporate Economic Structure, New york, Academic Press.

Institute of Statistics, Statistical Yearbook of Turkey, various years, Ankara:Institute of Statistics.

Jenny, F. (1978), "Concentration, and Unionization in French Manufacturing Industries," Journal of Industrial Economics, vol, 26, 315-327.

Katz, L. F. (1986), "Efficiency Wage Theories: A Partial Evaluation," in Fischer, S. (ed.), NBER, Macroeconomics Annual 1986, Cambridge, MA: MIT Press.

Kennedy, P.(1981), "Estimation with correctly interpreted dummy variables in semilogarithmic Equations," American Economic Review, 16, 238-59.

Kim, Youngkwa (1991), Unions and Wage Discrimination: Three Essays, Ph. D. Dissertation, University of Hawaii.

Korea Employers' Federation, (1986), Rodong Kyungje Yungam: Annual Report on Labor Economics in Korea.

Krueger, A., and Summers, L. H. (1988), "Efficiency Wages and the Inter-Industry Wage Structure," Econometrica, vol. 56, No. 2 (March), 259-293.

Kwoka, J. (1983), "Monopoly, Plant, and Union Effects on Worker Wages," Industrial and Labor Relations Review, vol. 36, 251-257.

Kumar, P. (1972), "Differentials in Wage Rates of Unskilled Labor in Canadian Manufacturing Industries," Industrial and Labor Relations Review, vol. 26, 631-645.

Lawrence, C., and Lawrence, R. (1985), "Relative Wages in US Manufacturing: An Endgame Interpretation," Brookings Papers on Economic Activity, vol. 1, 47-106.

Lazear, Edward P. (1979), "Why Is There Mandatory Retirement?," Journal of Political Economy, vol. 87, No. 4, 1261-1284.

Lee, Joung-Woo, (1983), Economic Development and Wage Inequality in South Korea, Unpublished Ph.D. dissertation, Harvard University.

Lee, Kyu-uck (1986), "The Concentration of Economic Power in Korea: Causes, Consequences and Policy," in Lee, Kyu-uck (ed.) Industrial Development Polices and Issues, Seoul, Korea Development Institute.

Lee, Kyu-uck and Lee, J.S. (1990), Chaebôls and Concentration, Seoul, Korea Development Institute.

Long, J. E., and Link, A. N. (1983), "The Impact of Market Structure on Wages, Fringe Benefits, and Turnover," Industrial and Labor Relations Review, vol. 36, 239-250.

Masters, S.H. (1969), "Wages and Plant Size: An Interindustry Analysis," Review of Economics and Statistics, vol. 51, 341-345.

Macpherson, M. A. and Stewart, James, B., (1990), "The Effect of International Competition on Union and Nonunion Wages," International and Labor Relations Review, vol. 43, No. 4.

Mellow, W. (1982), "Employer Size and Wages," Review of Economics and Statistics, vol. 64, 495-501.

Mincer, J. (1974), "Schooling, Experience, and Earnings," NBER, N.Y.

Ministry of Labor of Korea, Report on Occupational Wage Survey, several issues.

Ministry of Labor of Korea, Report on Monthly Labor Survey, several issues.

Moore, W.J., Newman, R.J., and Cunningham, J. (1985), "The Effect of the Extent of Unionism on Union and Non-Union Wages," Journal of Labor Research, vol. 6, 21-44.

Moulton, Brent R. (1986), "Random Group Effects in A Regression Analysis," Journal of Business and Economic Statistics, vol. 5, No. 2, 275-282.

Moulton, Brent R. (1990), "An Illustration of A Pitfall in Estimating the Effects of Aggregate Variables on Micro Units," The Review of Economics and Statistics, vol. 72, No. 2, 334-338.

Oi, W. (1983), "The Fixed Employment Costs of Specialized Labor," in Triplett, J. (ed.) The Measurement of Labor Cost, Chicago: University of Chicago Press.

Paldam, M., and Riveros L.A. (1987), "The Causal Role of Minimum wages in Six Latin American Labor Markets," Report No. DRD270, Economics and Research Staff, Development Research Department, World Bank, Washington, D.C.

Park, S.I and Park, H.K. (1984), The Wage Structure of Korea, Research series No. 54, Seoul, Korean Development Institute.

Phillips, A. (1976), "A Critique of Empirical Studies of Relations between Market Power and Profitability," Journal of Industrial Economics, vol. 24, 241-249.

Podgursky,M. (1986), "Unions, Establishment Size, and Intra-Industry Threat Effects," Industrial and Labor Relations Review, vol. 39, 277-284.

Pugel, T. (1980), "Profitability, Concentration and Inter-Industry Variation in Wages," Review of Economics and Statistics, vol. 62, No. 2, 248-253.

Research Institute of Industrial Relations (RIIR) of Japan (1989), Gekido Suru Kankoku no Rodo Jyosei.

Salop, Joanne and Salop, Steven (1976), "Self-Selection and Turnover in the Labor Market," Quarterly Journal of Economics, Vol. 90, No. 4, 619-27.

Salop, Steven C. (1979), "A Model of the Natural Rate of Unemployment," American Economic Review, vol. 69, No. 1 (March), 117-125.

Sengenberger W. (1990), "Flexibility in the Labor Market: Internal versus External Adjustment in International Comparison," in Appelbaum, E. and Schettkat, R. (ed.) Labor Market Adjustments to Structural change and Technological Progress, New York, Praeger Publishers, 144-162.

Shapiro, Carl and Stiglitz, Joseph E. (1984), "Involuntary Unemployment As a Worker Discipline Device," American Economic Review, vol. 74, 433-444.

Slichter, S. (1950), "Notes on the Structure of Wages," Review of Economics and Statistics, vol. 32, No. 1, 80-91.

Sparks, Roger (1986), "A Model of Involuntary Unemployment and Wage Rigidity: Worker Incentives and the Threat of Dismissal," Journal of Labor Economics, vol. 4, No. 4, 560-581.

Stiglitz, Joseph E. (1974), "Alternative Theories of Wage Determination and Unemployment in LDC's: The Labor Turnover Model," Quarterly Journal of Economics, vol. 88 (May), 194-227.

Stiglitz, Joseph E. (1985), "Equilibrium Wage Distributions," Economic Journal, vol. 95 (September), 595-618.

Wachtel, M., and Betsey, C. (1972), "Employment at Low Wages," Review of Economics and Statistics, vol. 54, 121-128.

Weiss, Andrew and Landau, Henry J. (1984), "Wage, Hiring Standards, and Firm Size," Journal of Labor Economics, vol. 2, No. 4, 477-499.

Weiss, L. (1966), "Concentration and Labor Earnings," American Economic Review, vol. 56 96-117.

World Bank, (1987), Korea: Managing the Industrial Transition, vol. II. Selected Topics and Case Studies, Washington, D.C.

Yoon, Dong-Sup (1991), The Effect of Employment Size on Wage Rates in Korea, Ph. D. Dissertation, University of Hawaii.