# Longitudinal Evidence of Firm Size Effect on Wage Premium and Wage Differential in Korean Labor Market

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**ABSTRACT**

This study analyzes the firm size effect on wage determinant mechanism and wage differential between large firms and small firms. The empirical methodology, based on Fixed Effect estimation, Probit estimation and Oaxaca-Blinder decomposition estimation, be utilized to measure wage determinant factors exclude unobservable characteristics heterogeneity and permits to obtain endowment or discrimination proportion of wage gap. Firm size wage premium mostly be attributed to efficiency wage, compensation wage differential, skill complementarity, monitoring cost, prevent union organization, rent sharing and internal market. However, there are no completely explanatory for firm size wage premium. Estimated results suggest that more educated employees are easily to find in large firms, it is consistent with the hypothesis that higher wages paid by large firms can be explained by efficiency theory. Endowment differential is main reason for wage gap between large firms and small firms. Employees have lower turnover rate in large firms than small firms. This phenomenon can be explained by internal labor market theory which means employees have higher probability of promotion and higher costs of turnover in large firms.

**Keywords**: Firm-size wage differential, Korean Labor and Income Panel Study, wage decomposition

**JEL Classification**: J31, J40, C38

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**Introduction**

Larger firms pay higher wages than smaller ones has been comprehensively documented. This wage premium is called the firm size wage effect. The research for firm size wage differentials started from Moore (1911) who analyzed Italian textile industry female employees' wages. The results of this analysis revealed a positive relationship between firm size and wages by empirical methods. Firms which have more than 500 employees paid 38.5% higher than firms which have less than 20 employees about female employees in textile industry. There is a tendency that employees' benefits and wages became better and better along with the increasing size of the firms.

There are numerous empirical studies about the relationship between firm size and wages. The positive relationship between firm sizes and wages has been revealed in many countries. Namely, wage increased partly depending on the increasing of firm size. Brown (1990) found that the companies which employ more than 500 employees get 35% higher wage per hour than the companies which employ less than 25 employees by making use the data of Current Population Survey (CPS). The wage gap caused by different firm sizes is bigger than the union wage gap (29%) and racial wage gap (14%), but lower than the gender wage gap (36%). In addition, many results showed that there is a significantly positive effect between firm sizes and wages in Germany, France, Japan and Peru etc.

Wages are not only the vital living source for human beings, it also has significant impact on the effective demand of the national economy and the index of price. In Korean labor market, firm size wage gap shrunk in the middle of 90's but return to enlarge after that period. In particular, based on Labor Population Survey from Ministry of Employment and Labor (2012), large size firms award nearly twice as much wages than small firms in the last five years. Notwithstanding the differential seems intolerably, the enlarging trend is still continuing to go on. In 2008[1], the proportion of average wage in small firms against large firms is 54.8%, but the proportion declined to 51.9% in 2012. Since large firms suffered more impact on the economic crisis, wage gap presented a brief shrinking in 2011. In spite of the labor market of large firms got a shrink compared to 2008, which of small size firms also downsized in this period, thus the wage gap is still in a large level. For this kind of wage gap, neo-classical school and institutional school have different explanatory. Neo-classical school focuses the explanatory on qualitative differentials and working conditions differentials. It includes compensation wage theory, human capital theory, efficiency wage theory and unobservable factors etc. Institutional school focuses the explanatory on differentials of market dominant power in production market. It emphasizes the ability differentials on pay-ability hypothesis and differentials in production market dominance institutions such as rent sharing hypothesis, union effect hypothesis etc.

[1] *「small firm topology index」, National Federation of small business, 2012*

Enormous studies revealed that large firms paid more than small firms. This kind of wage premium called the firm size wage premium. There are numerous reasons to induce this premium on wages. The main reasons of firm size wage premium are summarized as:

(1) Employees in large firm possess more effective productivity than employees in small firms (Brown and Medoff, 1989; Evans and Leighton, 1989).

(2) It is hard to monitor employees in large firms, so the employer in large firms prefer to pay more for enhancing productivity (Akerlof, 1984; Yellen, 1984; Kruse, 1992)

(3) For avoiding employees building union, large firms prefer to pay more (Kahn and curme, 1987; Donohue and Heywood. 2004); additionally, employers prefer to share the profits with employees (Brown and Medoff, 1989; Oi and Idson, 1999).

Based on Small firm Federation of Korea '2013 small firm topology index ', during the past five years (2006-2011), small firms have increased the employment more than 1,949,000 (18.3%). It is five times more than the employee number of large firms, which just increased 351,000 (22.6%) employees. It obviously showed that small firms which took 99% of the full number of firms, and 88% of the job positions are magnificent important. It is even more than all the population of DaeJeon city. The number of all kinds firms has increased by 294,000 from 2,940,000 in 2006 to 3,235,000 in 2011. The number of small size firm increased 296,000 (10.1%), on the contrary, big size firm decreased 2,000 (27.8%).

Wages in small firms are significantly lower than large firms. The wages of the manufacturing department in Small Firms (2,620,000) revealed just 53.2% compared with large firms (4,925,000). Not only large firms can provide safer, more productive production environment than small firms, also small firms have relatively lower debt coverage ratio and Interest Coverage ratio than large firms. Small firms take a significant position in Korea and become more and more influential in the world economy.

For analyzing the wage gap between large firms and small firms, we employ the variables such as Education, Working years, regular staff, marriage status, union status, occupations and jobs. Obviously, there are other factors that can influence firm size wage differentials, but it is hard to be controlled.

In this paper, for getting rid of the endogenous problem between unobservable employees' characters and firm selection preference, we make advantage of panel data to implement empirical research. If the employees who have unobservable ability or higher productivity be employed by large firms systematically it will reveal an overstating to the firm size differential. If we settle the unobservable characteristics problem properly, we can get more accurate results considering employees who mobilize jobs in fixed effect estimation.

In this paper, we use KLIPS data 2001-2010 to analyze large firms and small firms wage differential. We decompose the two factors (endowment differential and discrimination

differential) which may induce wage differentials. Specifically, we will use Oaxaca-Blinder decomposition to get the influence level of endowment and discrimination. If the human capital factors, such as age, Education, Working years, knowledge and skill level contribute to the wage differential less than other discriminatory factors, it means national labor market should be adjusted more. In addition, if the Dual-labor Market theory between large firms and small firms emerges in Korean labor market it is better to set up effective solutions by government to deal with this situation.

## 1 Literature Review

That larger firms tend to pay higher wages than small firms has been well documented. Numerous literature has researched to document the firm size wage effect and reveal the reason of wage premium (e.g. Brown and Medoff 1989; Oi and Idson 1999; Troske 1999; Belman and Levine 2004). Much of the literature address the various explanations in human capital differentials among workers be employed by different size firms, which controlled the differentials in observed skill partially reduces the magnitude of the estimated size wage effect. Thus it is likely that if unobserved skill or capacity differentials get adequately controlled, the observed firm size wage effect would further diminish.

Several researchers have sought to control for unobserved worker heterogeneity by using longitudinal data when estimating firm size wage effect. Notably, Brown and Medoff (1989) employed fixed effect estimation and control for unobserved productivity differentials, then they reveal a reduction approximately from 5% to 45% in size wage premium.

Although unobserved individual heterogeneity get properly controlled, the firm size wage effect still existed in the analysis. Highly skilled workers cooperate with other highly skilled workers are more productive was revealed by Troske (1999). And highly skilled workers are easier to be found in larger workplaces. According to Becker's (1962) theory of human capital, observed wage differences compensate for skill of employees, so that no employee should receive above market wages given his skill level and capacity.

Given the wage differential, Miller (1981) points out that the likely result of antitrust measures against large firms or subsidies to small firms is higher paid workers being displaced by lower paid workers.

As might be expected, much research has been done in this area, and numerous authors have generally confirmed the existence of a wage differential favoring large firms. Most of these studies have used a series of dummy variables representing various firm sizes or plants sizes (Mellow 1982; Evans and Leighton 1989; Weiss and Landau 1984). Many sources for the firm-size wage differential have been proposed, but there is no conclusive evidence to support any one view. Calvo and Wellisz (1978) suggest that larger firms have larger

administrative hierarchies with more highly paid employees. Lester (1967) argues that large firms are forced to pay more because of the greater public scrutiny they face simply because of their bigness. Similarly, Parsley (1980) implies that the greater profits of large firms make them the object of higher wage demands by unions (and also lead to increased labor organizations in large firms). Mellow (1982) suggests that higher wages are needed to insure a supply of available workers to meet demand increases, to protect a large firm's increased investment in training and recruiting, or to compensate workers for the undesirable character of the workplace. Strand (1987) reasons that larger, more productive firms tend to have larger equilibrium work forces; therefore, they must attract more workers per time period, which they do by offering higher wages.

Calvo and Wellisz (1979) focus on monitoring and efficiency wages. Monitoring effectiveness is determined by ability (innate or acquired) and is more valuable at higher levels in the hierarchy because in equilibrium better monitoring lowers the wage bill for all subordinates. Supervisors receive higher rates of return on their abilities while production workers only receive their outside options. Another efficiency wage idea is that large firms may also share rents with workers. Because larger employers are more likely to generate rents, wages are expected to be higher. An employer's failure to share rents may elicit shirking, which presumably can be minimized by paying an efficiency wage (Teulings and Hartog, 1998). Monopsony search models also predict a positive size-wage elasticity even if workers' skills are the same in large and small firms (Burdett and Mortensen, 1998).

Evans and Leighton (1989) conclude that since small firms offer a more unstable work environment, that is, they have a higher failure rate and more variable growth, they attract unstable workers. On the assumption that worker instability is negatively correlated with ability, they suggest that unstable, small-firm workers will have lower equilibrium wages. Mayo and Murray (1991) take this conclusion a step further and suggest that firm size is merely a proxy for the risk of firm failure by capturing these unobserved characteristics. Belfield and Wei (2004) find support for the idea that higher turnover or monitoring costs is the source of part of the size-wage effect in a recent UK employer-employee matched data set.

## 2 Data and Demographics

This paper uses recently available data from the Korean Labor and Income Panel Study (KLIPS). The Korea Labor Institute began to collect detailed data for households and individuals starting in 1998. This data collection is modeled after and is similar to the Panel Study of Income Dynamics (PSID) from the University of Michigan. This paper uses data from the 2001 cohort, the fourth year of its collection to 2010, the thirteenth year of its collection. Among those individual observations, we selected those who are currently

employed and have a positive average monthly income. Therefore, we exclude those who are currently self-employed or unemployed. This reduces our sample size to 23,107 individual observations. We also excluded missing values for any of the explanatory variables used in our analysis. The following table summarizes statistics for our data.

The wage variable is an average monthly wage expressed as Korean won (KRW) in 10,000 won units. Average monthly wage income for our data is KRW 1.74 million. Monthly wage income ranges from KRW 40,000 to KRW 3,300,000, which represents the broad range of cross sectional wage groups. Education is measured as the total number of years of schooling. The education variable is available only as a categorical variable in KLIPS, based on levels of attainment, such as graduation from elementary school, middle school, high school and college, etc. We calculated years of education by subtracting the year of birth plus seven from the total number of years of educational attainment. This variable is top-coded at 29 years of education. Age is measured in years.

**Table 1**: Explaination and Description of Variables and Source

| | |
|---|---|
| Data | 2001-2010 full time jobs |
| Age | 18-60 |
| Region | All the regions except Jeju |
| Industry | Exclude education service |
| Occupation | Exclude unemployed and soldier |
| Viable Code | |
| lnWage | Log hourly wage<br>Hourly wage= (monthly wage/(weekly working time*4. 3)) |
| SEX | Gender (male=1) |
| AGE | Age |
| EDU | Education<br>Graduate-birth-7 |
| WY | Working years<br>Survey year-employed year |
| WYSQ | Working years squared |
| PLACE | Region (Seoul=1) |
| MAR | Marriage status (married=1) |
| RJOB | Regular status (regular=1) |
| UNION | Union status (union=1) |

| | |
|---|---|
| LGDP | Economic index (log GDP) |
| Firm size | S1=1-9 employees,<br>S2=10-29 employees,<br>S3=30-99 employees,<br>S4=100-299 employees,<br>S5=300-999 employees,<br>S6=1000 employees or more |

We calculated hourly wage by monthly wage and average weekly working time*4.3. Average weekly working time is the total time of regular working time plus the beyond part of regular working time. We use Korea Standard Industry table for categorizing industry in 8 categories, and use Korea Standard Occupation Table for categorizing occupations to 6 categories. We categorized firm size as the number of employees. There are 6 categories, 1-10,10-30, 30-100, 100-300, 300-1000, and above 1000. The region is separated to Seoul and others.

Table 2 is the essential characteristic of variables. The female observations took up 37.22% and male observations took up the other 62.78%. Male is more than female for 25%.

**Table 2：** Summary Statistics of Variables

| | Mean | Std.Dev. | Minimum | Maximum |
|---|---|---|---|---|
| Education | 14.29 | 4.16 | 1 | 29 |
| Age | 36.33 | 8.91 | 18 | 60 |
| Working years | 5.17 | 5.92 | 0 | 38 |
| Square of WY | 61.78 | 133.44 | 0 | 1,444 |
| Monthly wage | 174.08 | 107.42 | 40 | 3,300 |
| Hourly wage | 0.94 | 0.67 | 0.14 | 20.63 |
| Log hourly wage | 9.01 | 0.61 | 7.24 | 12.24 |
| | Variables | Observations | Proportion | |
| Gender | Female | 8,600 | 37.22 | |
| | Male | 14,507 | 62.78 | |
| Region | Seoul | 17,844 | 77.22 | |
| | Others | 5,263 | 22.78 | |
| Marriage | Married | 8,198 | 35.48 | |
| | Others | 14,909 | 64.52 | |
| Regular | Regular | 19,500 | 84.39 | |

| | | | |
|---|---|---|---|
| | Others | 3,607 | 15.61 |
| Union | Union | 5,547 | 24.01 |
| | Non-Union | 17,560 | 75.99 |
| Firm size | 1-9 (employees) | 5,507 | 23.83 |
| | 10-29 (employees) | 3,978 | 17.22 |
| | 30-99 (employees) | 3,894 | 16.85 |
| | 100-299 (employees) | 2,659 | 11.51 |
| | 300-999 (employees) | 2,115 | 9.15 |
| | 1000 (employees) | 4,954 | 21.44 |
| Industry | Manufacturing | 7,568 | 32.75 |
| | Mining and construction | 411 | 1.78 |
| | Electricity and water supply | 2,251 | 9.74 |
| | Wholesale retail and hotel | 3,864 | 16.72 |
| | Transportation and telecom | 1,623 | 7.02 |
| | Finance and real estate | 1,285 | 5.56 |
| | Public services | 2,177 | 9.42 |
| | Housekeeping services | 3,837 | 16.61 |
| Occupation | Professional managers | 2,474 | 10.71 |
| | Office workers | 9,112 | 39.43 |
| | Service industry | 1,753 | 7.59 |
| | Agroforestry | 1,391 | 6.02 |
| | Production | 6,984 | 30.22 |
| | Simple labor job | 1,314 | 5.69 |

The average age of observations is 36.33, the working years is 5.17. And the average education is 14.29. Observations which get married and have spouse occupied 64.52%, other status just occupied the rest 35.48%. It indicates employees in marriage status are 29% more than other status.

## 3 Econometric model

### 3.1 Mincer wage equation

In this paper, we will follow the human capital theory for wage determination, and adopt the basic Mincerian (1974) wage equation. That is, the natural log of the wage is a function of

individual skills, and individual skills are measured at the level of education, age and working years. Other socioeconomic covariates are also included as in the wage equation.

$$\ln W_i = x_i^{'}\beta + \varepsilon_i \qquad (1)$$

$\ln W_i$ is the natural log of average monthly wage as a dependent variable, and $\mathbf{x}_i$ is a vector of explanatory variables including Education, Age, Working years, Square of Working years, Full time status, Occupation types, Industry types, Gender, Union status and Areas.

### 3.2 Fixed Effect Model

Panel data allow us to control individual characteristics heterogeneity we cannot observe or measure like cultural factors or variables that change over time but not across entities.

Fixed effect model also is called as dummy variable model. Presumably the whole sample has significant difference and the similarity is low, thus, it is not required to implement sampling procedure which means all of the sample will be adopted to analyze individual difference. Fixed intercept present each individual is equipped with different characteristics and will not change over time. This model adapts with the situation that there are insufficient independent variables to explain dependent variable.

When using fixed effect model we assume that some heterogeneity exist within the individual and which impact or bias the predictor or error term. This is the rationale behind the assumption of the correlation between individual's error term and predictor variables. Fixed effect estimation eliminate the effect of those time-invariant characteristics from the predictor variables so we can assess the predictors' net effect. Another important assumption of the FE model is that those time-invariant characteristics are unique to the individual and should not be correlated with other individual characteristics. Each entity is different therefore the entity's error term and the constant (which captures individual characteristics) should not be correlated with the others. If the error terms are correlated then FE is no suitable since inferences may not be correct and you need to model that relationship (probably using random-effects), this is the main rationale for the Hausman test (presented later on in this document).[2]

The equation for the fixed effects model becomes:

$$Y_{it} = \sum_{j=1}^{m} \beta_{ij} X_{ijt} + \alpha_i + \varepsilon_{it} \qquad (2)$$

[2] *Fixed-effects will not work well with data for which within-cluster variation is minimal or for slow changing variables over time.*

Where

– $\alpha_i$ ($i$=1….n) is the unknown intercept for each entity ($n$ individual-specific intercepts).

– $Y_{it}$ is the dependent variable where $i$ = individual and $t$ = time.

– $X_{ijt}$ represent independent variables where $i$ = individual and j = characteristic variable.

– $\beta_{ij}$ is the coefficient of independent variable.

– $\varepsilon_{it}$ is the error term.

### 3.3 Oaxaca-Blinder (OB) decomposition

We do Oaxaca(1973) decomposition by means of wage function. We defined the equilibrium income of large firms and small firms as $\overline{W}_H$ and $\overline{W}_L\beta_H$ and $\beta_L$ is the vector of regression coefficient (structure of wage).

We defined the wage of function as follow.

$$\ln\overline{W}_H = X_H\beta_H + \varepsilon_H \qquad (3)$$

$$\ln\overline{W}_L = X_L\beta_L + \varepsilon_L \qquad (4)$$

The value of large firms and small firms' individual characters vector is $X_H$ and $X_L$. Because the average value of error term in OLS is 0, the average wage differential between large firms and small firms is defined as equation (5).

$$\ln\overline{W}_H - \ln\overline{W}_H = X_H\beta_H - X_L\beta_L \qquad (5)$$

Based on undifferentiated labor market wage, we defined the large firms wage and the equilibrium proportion with small firms wage is $\ln(\overline{W}_H/\overline{W}_L)^0 = (X_H - X_L)\beta_H$. Then we can get the decomposition equation (6).

$$\ln\overline{W}_H - \ln\overline{W}_L = (X_H - X_L)\beta_H + X_L(\beta_H - \beta_L) \qquad (6)$$

The first term of right side of the equation is the wage differential with no discrimination between large firms and small firms. Namely, the wage differential is on behalf of the

employee skill level differential between large firms and small firms. The second term on right side of the equation is the wage differential occurred by wage structure differential between large firms and small firms. It means the discrimination on wage between large firms and small firms under employees' similar productivity.

## 4 Estimation results

### 4.1 Fixed effect model regression approach and results

In this section we will investigate the determinant mechanism of wages and focus on the firm size effect on wages from the basic Mincer wage equation that explains wages as a function of education and a quadratic in working years. The original Mincer wage equation contains essential human capital factors, it does not reveal a complete representation of labor market in light of describes only the supply side of the market. Whereas most studies add variables such as industry, occupation, firm size, unionization dummies to the wage equation for banishing the demand side of the labor market.

Despite empirical literature on firm size wage reveals, in Table 3 presents the result of Fixed Effect estimations and GLS estimations of firm size wage differential using KLIPS data. The results of Hausman Test suggest utilize Fixed Effect estimation which rejects to have no relationship exist between explaining variables and error term. For comparing these results, it suggests that the effect of Working years on wages lower from 0.034 to 0.019. The effect of firm size on wages lowered 5.7%, 13.7%, 13.6%, 22.6%, and 26.1%.

The difference of results between Fixed Effect model and GLS model suggest exist such unobservable employees' characteristics that could not get controlled in cross-section analysis. Particularly, the bias induced by cross-section analysis may exist a magnifying evaluation about the firm size wage effect.

The advantage of Fixed Effect estimation is we can control the changing of unobservable employees' characteristic heterogeneity. However, if employees attend intra-firm learning process for turnover, there may also cause a bias of Fixed Effect estimation.

**Table 3:** Panel Data results for wage regression

| | GLS | | FE | |
|---|---|---|---|---|
| | Coeff. | Std.Error | Coeff. | Std.Error |
| Education | 0.029*** | (0.001) | | |
| WY | 0.034*** | (0.001) | 0.019*** | (0.002) |
| WY-squared | -0.001*** | (0.000) | 0.000** | (0.000) |

| | | | | |
|---|---|---|---|---|
| Age | 0.003*** | (0.000) | | |
| Male | 0.298*** | (0.006) | | |
| Seoul | 0.068*** | (0.006) | 0.001 | (0.021) |
| Married | 0.129*** | (0.006) | 0.133*** | (0.013) |
| Regular | 0.151*** | (0.007) | 0.060*** | (0.010) |
| Union | 0.061*** | (0.007) | 0.009 | (0.009) |
| 10-29 | 0.144*** | (0.017) | 0.087*** | (0.021) |
| 30-99 | 0.278*** | (0.017) | 0.141*** | (0.025) |
| 100-299 | 0.303*** | (0.022) | 0.167*** | (0.030) |
| 300-999 | 0.374*** | (0.021) | 0.145*** | (0.032) |
| 1000 or more | 0.404*** | (0.021) | 0.143*** | (0.036) |
| Manufacturing | 0.084*** | (0.016) | 0.084*** | (0.028) |
| Mining and construction | 0.144*** | (0.055) | 0.167** | (0.066) |
| Electricity and water supply | 0.130*** | (0.019) | 0.108*** | (0.032) |
| Wholesale retail and hotel, | 0.037*** | (0.014) | 0.017 | (0.027) |
| Transportation and telecom | 0.127*** | (0.028) | 0.086** | (0.040) |
| Finance and real estate | 0.254*** | (0.053) | 0.182*** | (0.053) |
| Public services | 0.144*** | (0.018) | 0.097*** | (0.033) |
| Professional managers | 0.424*** | (0.013) | 0.075*** | (0.026) |
| Office workers | 0.314*** | (0.011) | 0.113*** | (0.023) |
| Service industry | 0.100*** | (0.013) | 0.054** | (0.024) |
| Agroforestry | 0.147*** | (0.014) | 0.072** | (0.028) |
| Production | 0.154*** | (0.011) | 0.058*** | (0.021) |
| LGDP | 0.617*** | (0.010) | 0.759*** | (0.015) |
| Firm size*Industry | Yes | | | |
| Intercept | 7.569*** | (0.022) | 8.701*** | (0.032) |
| Observation | 23,107 | | 23,107 | |
| R-squared | 0.649 | | 0.410 | |

Note: 1) standard errors are in parentheses.

2) FE is fixed effect model. Heteroskedasticity and series correlation has been considered.

3) Based on housekeeping services and simple labor job.

4) Firm size*Industry means interaction effect. Interaction term includes 5 types of firm sizes and 7 types of industries. There are 35 interaction variables.

5) ***, **, *, statistically significant at 1%, 5%, 10%.

Source: KLI (2001-2008), KEIS (2009-2010), 「KLIPS」

### 4.2 Probit model regression approach and results

Table 4 reveals the determinant factors which kind of employees have more probability be employed by large firms and replenishes the research on previous section. First, we find the major factors make employees be employed by large firms by means of Mincer wage equation include employees' personal characteristics, industry and occupations. In this section, we estimate the result by Probit estimation, heteroscedasticity and time serial correlation are eliminated in our estimation yet. Firms are divided as large firms which have more than 300 employees and the other firms which have less than 300 employees as small firms.

The results suggest employees who accept more education years, there are more probability to be employed in large firms. With one year more education, there is about 2.3% more probability to be employed by large firms. Age shows that elder employees are more possible to be employed by small firms, but the statistic significant is slight. As we preconceived, female is disadvantage to be employed by large firms than male. It is 1.3% lower probability for female to be employed by large firms than male.

The results indicate the effect of industry and occupation on large firm employment probability estimation emerged significantly. There is an apparent relationship between employment and industry, occupation, which means employees engage in certain industry have more probability to be employed by large firms. Based on Housekeeping services, there are more than 52.9%, 26.9%, 21.3% and 19.6% probability for employees engaging in Finance and Real estate, Electricity and Water supply, Transportation and Telecom, Manufacturing, Mining and Construction to be employed by large firms. Based on Simple labor job, there are more than 6.3%, 16.3%, and 7.8% probability for employees engaging in Service industry, Agroforestry, Office workers to be employed by large firms. Besides, the variables such as Wholesale retail and Hotel, Public services, Professional managers, Production are not statistic significant in the results.

**Table 4:** Estimated results of marginal effect on Probit model

| | Dependent variable (big size firm employees=1) | | | |
|---|---|---|---|---|
| | Coeff. | Std.Error | dy/dx | Std.Error |
| Education | 0.067*** | (0.005) | 0.023*** | (0.002) |
| Age | 0.004* | (0.002) | 0.001* | (0.001) |
| Male | 0.039 | (0.039) | 0.013 | (0.013) |

| | | | | |
|---|---|---|---|---|
| Seoul | -0.095** | (0.040) | -0.032** | (0.013) |
| Manufacturing | 0.551*** | (0.058) | 0.196*** | (0.021) |
| Mining and construction | 0.704*** | (0.114) | 0.269*** | (0.045) |
| Electricity and water supply | 0.192*** | (0.068) | 0.068*** | (0.025) |
| Wholesale retail and hotel | 0.076 | (0.065) | 0.026 | (0.023) |
| Transportation and telecom | 0.566*** | (0.076) | 0.213*** | (0.030) |
| Finance and real estate | 1.449*** | (0.077) | 0.529*** | (0.022) |
| Public services | 0.116* | (0.070) | 0.041 | (0.025) |
| Professional managers | 0.013 | (0.090) | 0.004 | (0.031) |
| Office workers | 0.225*** | (0.074) | 0.078*** | (0.026) |
| Service industry | 0.177** | (0.087) | 0.063** | (0.032) |
| Agroforestry | 0.439*** | (0.090) | 0.163*** | (0.035) |
| Production | 0.004 | (0.075) | 0.001 | (0.026) |
| LGDP | 0.129*** | (0.046) | 0.044*** | (0.016) |
| Intercept | -2.098*** | (0.134) | | |
| R-squared | 0.1022 | | | |
| Log likelihood | -12775.712 | | | |
| Observations | 23,107 | | | |

Note: 1) dy/dx is marginal effect coefficients.

2) Standard errors are in parentheses.

3) Heteroskedasticity and series correlation has been considered.

4) Based on housekeeping services and simple labor job.

5) ***, **, *, statistically significant at 1%, 5%, 10%.

Source: KLI (2001-2008), KEIS (2009-2010), 「KLIPS」

### 4.3 Oaxaca-Blinder decomposition approach and results

In this section we will make advantage of Oaxaca-Blinder decomposition based on Mincer wage equation. By means of Oaxaca-Blinder decomposition estimation, the contribution degree of endowment differential and coefficient differential on firm size wage differential will be revealed.

Table 5 indicates the wage differential between large firms and small firms increases inconsecutively form 2001 to 2010. Wage differential presents a decreasing tendency from 53.5 to 50.7 in 2004-2005, but the differential returned to 53.2 in 2006. The highest wage differential value in our study occurred in 2008. There is a decreasing tendency from 2008-

2010. We summaries the reason of the wage differential decreasing from 2008-2010 attribute to large firms suffered more in world economic crisis than small firms in this period.

**Table 5:** Oaxaca-Blinder decomposition yearly results

| | Total | Endow. differ | Coeff. differ | Endow. differ(%) | Coeff. Differ(%) |
|---|---|---|---|---|---|
| 2001 | 38.8 | 26.9 | 12.0 | 69.2% | 30.8% |
| 2002 | 44.4 | 30.6 | 13.8 | 69.0% | 31.0% |
| 2003 | 49.9 | 30.6 | 19.2 | 61.4% | 38.6% |
| 2004 | 53.5 | 34.3 | 19.1 | 64.2% | 35.2% |
| 2005 | 50.7 | 29.8 | 20.8 | 58.9% | 41.4% |
| 2006 | 53.2 | 31.6 | 21.6 | 59.3% | 40.7% |
| 2007 | 53.1 | 32.4 | 20.8 | 60.9% | 39.1% |
| 2008 | 56.2 | 28.4 | 27.9 | 50.4% | 49.6% |
| 2009 | 51.0 | 30.1 | 20.9 | 59.0% | 41.0% |
| 2010 | 48.8 | 29.1 | 19.7 | 59.6% | 40.4% |
| T.ave. | 53.0 | 31.7 | 21.3 | 59.8% | 40.2% |

The average wage differential between large firms and small firms is 0.53. 59.8% of all differential is attributed to endowment differential. The rest of 40% differential is attributed to coefficient differential. It means 59.8% wage differential between large firms and small firms is caused by human power differential.

This part of differential is rational to happen in market system and it means employees get same level salary when they do the same work with same skill level. The other 40% differential is formed by numerous reasons. We decomposed the factors of wage differential in Table 6. The results reveal education differential is the most principal factor of the wage differential. There is 0.155 (29.2%) of total differential was caused by Education. It means large firms are significantly stronger than small firms for education compensation. Further, for education differential, endowment differential 8.7 is rather higher than coefficient differential 6.8. Small firms are also lower in profit sharing for their employees than large firms. About endowment differential factors, Education (0.087), Working years (0.075),

Gender (-0.026) are more significantly influential than any other factors. It is because employees have much longer working years in large firms and there are more female employees to be employed by large firms. For coefficient differential, the Education, Working years, Age, Regular employed, are 0.037, 0.068, -0.059 and 0.053. Coefficient differential means the differential of compensation, apparently, Education is the most leading factors in coefficient differential.

**Table 6:** Oaxaca-Blinder decomposition of Mincer wage regression results

| Variable | Total (as%) | Endowment differ (as%) | Coeff. differ (as%) |
|---|---|---|---|
| Education | 15.5 | 8.7 | 6.8 |
| WY | 21.1 | 17.5 | 3.7 |
| WY-squared | -4.6 | -4.9 | 0.2 |
| Age | -6.2 | -0.2 | -5.9 |
| Male | -2.6 | 1.9 | -4.5 |
| Seoul | -0.2 | 0 | -0.2 |
| Married | 1.3 | 1 | 0.3 |
| Regular | 5.9 | 0.6 | 5.3 |
| Union | 2.9 | 2.7 | 0.2 |
| Manufacturing | 1.7 | 0.3 | 1.4 |
| Mining and construction | 0 | 0.2 | -0.2 |
| Electricity and water supply | -0.1 | -0.2 | 0.1 |
| Wholesale retail and hotel | -0.4 | 0.5 | -0.9 |
| Transportation and telecom | 0.9 | 0.1 | 0.8 |
| Finance and real estate | 1.5 | 1.7 | -0.2 |
| Public services | -0.4 | -0.1 | -0.2 |
| Professional managers | -0.9 | -1.1 | 0.2 |
| Office workers | 3.6 | 5.1 | -1.4 |
| Service industry | 0.1 | -0.5 | 0.6 |
| Agroforestry | 0.3 | 0 | 0.3 |
| Production | 0.1 | -1.3 | 1.4 |
| Intercept | 13.6 | 0 | 13.6 |
| Total | 53.0 | 31.7 | 21.3 |

Note: $\hat{\beta}_L(\overline{X}_L - \overline{X}_H)$ denote endowment differential. $\overline{X}_L(\hat{\beta}_L - \hat{\beta}_H)$ denote coefficient differential.

Source: KLI (2001-2008), KEIS (2009-2010), 「KLIPS」

The combination of endowment differential and coefficient differential is total wage differential. Anyhow working years is the most effective factor of all in total wage differential. This differential is caused not so much by large firm employees getting more compensation as by large firm employees having longer working years. The compensations of working years and education are the major reasons of the wage differential. It is consistent with human capital theory and internal labor market theory which indicate education and working years occupy an important position in wage differential.

## 5 Conclusions and Policy Directions

In this study, firstly, we set up Mincer wage equation in terms of efficiency wage theory and human capital theory for analyzing the factors which effect on firm size wage premium. We picked out employees who working in large firms and small firms from KLIPS (2001-2010). We investigate the reasons why employees be employed by large firms and the differential for wage determinant factors between large firms and small firms by Fixed Effect estimation, Probit estimation and Oaxaca-Blinder decomposition in this study. The results suggest firm size impose an apparent influence on wages. Namely, wages show an increasing tendency with the enlarging of firm size and the number of employees. Employees who possesses higher education, longer working years, more ages and not working in capital city have more probability to be employed by large firms. And employees who engage in Manufacturing, Electricity and Water supply, Finance and Real estate, Wholesale retail and Hotel have more probability to be employed by large firms. Employees who occupy in Professional managers, Office workers, Service industry have more probability to be employed by large firms.

We took advantage of Oaxaca-Blinder decomposition for deeply analyzing the reasons for the wage differential between large firms and small firms. The results indicate there is 59.8% of the wage differential to be attributed to differing endowments which means employees working in small firms have lower skill level than other employees who working in large firms. On the contrary, the rest of 40.2% differential is attributed to coefficient differential which means even employees possess identical personal attributes they still do not get the same salary in different size firms. And the factors which have more influence on wage differential are Working years, Education, Regular and Union.

In this study, we find large firms pay more for high skill level employees than small firms. Usually, large firms have remarkable career training system and help to develop intra-firm

labor market. In addition, large firms are provided with reasonable labor relationships, favorable working condition and credible financial condition, it helps large firms to attract more productive employees. Large firms occupy most of social information and resource, for improving and holding their corporate image, they prefer to pay higher wage for employees. On the contrary, small firms have relatively disordering management system, unsatisfactory working environment and unsafe financial situation. It is hard for small firms to seek and hold outstanding employees. Besides, the differential in the career training system level, benefits system level and incentive strategy system level are other reasons that induce the differential in wages.

For shrinking the wage differential and extending employees' working years in small firms, government should have to establish support and assist policy for small firms. Federal government and local government should help to bring up connection system between large firms and small firms, allocate more resource to small firms and create more jobs for small firms. In order to foster and keeping more human power for small firms, it is better to build more technical colleges and form a combination of production and study, the government should focus more on working environment improving, financial support, career training support and small business starting and promoting financial support for small firms.

**References**

Akerlof, George A.(1984), "Gift Exchange and Efficiency-Wage Theory: Four Views," *The American Economic Review*, Vol. 74, No. 2, pp. 79 - 83.

Brown C. and J. Medoff(1989), "The employer size wage effect," *Journal of Political Economy*, Vol. 97, pp. 1027-1059

Brown C. and J. Medoff(2003), "Firm age and wages," *Journal of Labor Economics*, Vol. 21, No. 3, pp. 677-697.

Blinder, A.S.(1973), "Wage discrimination: Reduced Form and Structural Estimates," *The Journal of Human Resources*, Vol. 8, No. 4, pp. 436-455.

Brain G. M. Main and Barry Reilly, "The Employer size-Wage: Evidence for Britain," *Economia*, Vol. 60, No. 23, 1993, pp. 125-142.

Burdett, K. and D.T. Mortensen(1998), "Equilibrium Wage Differentials and Employer Size," Discussion Paper no. 860, Northwestern University.

Belfield, C. and Wei, X.(2004), "Employer size-wage effects: evidence from matched employer–employee survey data in the UK," *Applied Economics*, Vol. 36, pp. 185-193.

Bliner A.(1973), " Wage discrimination: Reduced from and structural variables," *Journal of Human Resources*, Vol. 8, No. 4, pp. 436-464.

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

Dale Belman and David I. Levine(2004), "Size, Skill and Sorting," *Review of Labour Economics and Industrial Relations*, Vol. 18, No. 4, pp. 515-561.

Donohue, S. and Heywood, J.(2004), "Job satisfaction, comparison income and gender:evidence from the NLSY," *International Journal of Manpower*, Vol. 25, pp. 211–34.

Evans, David and Linda Leighton(1989), "Some Empirical Aspects of Entrepreneurship," *American Economic Review*, Vol. 79, No. 3, pp. 519-535.

Edward M. Miller(1981), "Large Firms Are Good for Their Workers: Manufacturing Wages as a Function of Firm Size and Concentration," *The Antitrust Bulletin*, Vol. 26, pp. 145-154.

Greene, W. H.(2003), Econometric Analysis, 5th ed. Upper Saddle River, NJ: Prentice-Hall.

Hausman, J. A. and W. E. Taylor(1981), "Panel Data and Unobservable Individual Effects," *Econometrica*, Vol. 49, No. 6, pp. 1377-1398.

Kahn, L. and Curme, M.(1987), "Unions and Nonunion Wage Dispersion," *Review of Economics and Statistics*, Vol. 69, pp. 600-607.

Kruse, Douglas L.(1992), "Profit Sharing and Productivity: Microeconomic Evidence from the United States," *The Economic Journal*, Vol. 102, No. 410, pp. 24-36.

Kieron J. Meagher and Hugh Wilson(2004), "Different Firm Size Effects on Wages for Supervisors and Workers," *EconomicsLetters*, Vol. 84, No. 2, pp. 225-230.

Lester, Richard(1967), “Pay Differentials by Establishment Size,” *Industrial Relations*, Vol. 7, pp. 57-67.

Mayo, JW and MN Murray.(1991), “Firm size, employment risk and wages–Further insights into a persisitent puzzle,” *Applied Economics*, Vol. 23, pp. 1351-1360.

Moore, H. L.(1911), "Laws of wages: An essay in statistical economics," The Macmillan Company.

Mincer, Jacob(1962), “On–the–Job Training, Costs, Returns and Implications,” *Journal of Political Economy*.

Mellow, Wesley(1982), “ Employer Size, Unionism, and Wages,” *Research in Labor Economics*, supplement 2, JAI Press.

Nolan P. and Brown W.(1983), “Competition and workplace wage determination”, *Oxford Bulletin of Economics and Statistics*, Vol. 45, No. 3, pp. 269-287.

Oi, W.Y.(1983), “Heterogeneous firms and the organization of production,” *Economic Inquiry*, Vol. 21, pp. 147-171.

Oaxaca R.(1973),”Male-Female Wage Differentials in Urban Labor Markets,” *International Economics Review*, Vol. 14, No. 3, pp. 693-709.

Parsely, C.J.(1980), “ Labor Union Effects on Wage Gains: A Survey of Recent Literature,” *Journal of Economic Literature*, Vol. 18, No. 1, pp. 1-31.

Strand, J.(1987), “Long - term Union – Firm Contracts,” Memorandum No. 12, Department of Economics, University of Oslo.

Teuling C. and Hartog J.(1998), *Corporatism or competition? Labour contracts, institutions and wage structures in international comparison*, Cambridge University Press, Cambridge.Nickell, S.(1999), “ Product markets and labour markets,” *Labour Economics*, Vol. 6, pp. 1-20.

Troske, K.R..(1999), “Evidence on the employer size-wage premium from manufacturing,” *Review of Economics and Statistics*, Vol. 81, pp. 15-26.

Winter-Ebner, Rudolph and Josef Zweimuller(1999), “Firm-Size Wage Differentials in Switzerland: Evidence from Job-Changers,” *The American Economic Review*, Vol. 89, No. 2, pp. 89-93.

Weiss and Henry Landau(1984), “Wages, Hiring Standard, and Firm Size,” *Journal of Labor Economics*, Vol. 2, pp. 477-499.

Walter Y. Oi & Todd L. Idson(1999), "Workers Are More Productive in Large Firms," *American Economic Review*, American Economic Association, Vol. 89, No. 2, pp. 104-108.

Yellen, Janet L.(1984), "Efficiency Wage Models of Unemployment," *The American Economic Review*, Vol. 74, N0. 2, pp. 200 - 205.