DOI: 10.46541/978-86-7233-416-6_18

Julianna Németh
Assistant professor
Pécs, Hungary
nemethj@ktk.pte.hu

WHAT AFFECTS WAGES?

Abstract: For a long time, economic theories did not deal with wages and differences in wages. My main goal is to present Mincer's wage equation and the criticisms of his theoretical and empirical research. After that, I examine how different authors felt about wages, wage determination, and the reasons for wage differences. In connection with the analysis framework, I set out to distinguish two main factors: external and internal (individual) factors. Within the external factors, I examine the studies that analyze how region, industry, sector (private or public), city sizes, company sizes, and unions affect wages. Within the internal factors, I focus more on articles that deal with the influence of education, ability, age, race, gender, and marital status.

Keywords: wage determination, human capital theory, wage differences

1. INTRODUCTION

For a long time, economic theories did not focus on wage determination, wage theories, or wage differences. My main goal in this paper is to present Mincer's wage equation and its theoretical and empirical criticisms. After that, I introduce how different researchers analyzed the wage-determining factors and the reasons for the differences in wages.

2. WAGE DETERMINATION BY MINCER

In almost every article, researchers associate the theory of human capital with three names: Theodore W. Schultz, Gary S. Becker, and Jacob Mincer. Economists and researchers have been looking for the determining factors of wage differences for a long time. Adam Smith has already noted that the cost of education in a particular occupation affects average income. Friedman and Kuznets (1947) examined the incomes of different professions. They realized that wages are high in those occupations where entry costs must be compensated. Mincer (Rosen, 1992) was the first to connect the theory of human capital with research on wage inequalities.

Mincer (1958) emphasizes that income inequalities can be observed in terms of the shape and parameters of statistical frequency distributions. Because of that, the theories of factors affecting personal income distribution should predict the characteristics of observable statistical constructs. The theory states that all individuals have the same skills and opportunities in the labor market. Occupations differ in the number of prior studies that they require. Participating in education takes time, and each year postpones the individual's entry into the labor market, thus only receiving their first salaries later and reducing the amount of income that can be collected during their life. Differences in wages between occupations are due to different education requirements. Just as formal education can be measured by the time an individual spends at school, the other part of training (experience) can also be included in the model by introducing the time the individual spends at the workplace. In Mincer's 1958 model, he measured the combination of formal training and experience with age and looked for differences between occupations. Mincer (1962) used experience instead of age in the following article.

In 1974 Mincer devoted an entire chapter in his book to examining the effects of education and experience. He used logarithmic wage in his equation, on which he regressed education and not only experience but experience squared, as well. This is because experience is assumed to have a non-linear relationship with wage. Based on all of this, we can talk about the following equation.

$$\ln(\text{wage}) = \beta_0 + \beta_1 \text{education} + \beta_2 \text{experience} + \beta_3 \text{experience}^2 + u$$

Initially, Mincer (1974) wanted to focus on education only since differences in school years can explain 7% of wage inequalities. However, he noticed that human capital development continues beyond schooling. Post-school investment, i.e. experience, must also be considered when determining the value or remuneration of human capital. Experience has a significant impact on salary. He pointed out that the effect of experience on wages, although positive, after reaching a certain level (which in the case of his model was visible after nine years) is decreasing. Because of that, he considered it essential to include the square of experience in the equation. Thus, the equation could explain 30% of wage inequalities.
In the database (CPS: Current Population Survey) processed by Mincer (1974), experience data was unavailable. That is why he used an assumption that if experience (t) is counted from school completion, then work experience is equal to the current age minus the number of years spent in education.

$$t = (A - S - b),$$

where:
A = age (at the moment)
b = age at starting school (6 years)
S = number of years spent in education
During his research, he had the following assumptions:

- (1) In the absence of investment after finishing education, the individual with S years of study has a flat age-income profile.
- (2) In the lack of investment after completing education, the discounted present value of life earnings would be the same for all individuals regardless of how many years they attended school.
- (3) The number of years spent at work is independent of the years spent at school.
- (4) The return on investment after education is constant because it increases income.
- (5) The investment rate decreases linearly during the investment period after completing education.

Mincer (1974) emphasized that special attention must be paid to selecting the appropriate wage variable because introducing the number of weeks worked into an equation with a weekly wage would increase the explanatory power of the equation even further. He pointed out that the only drawback of this idea is that it assumes the same post-school investment for all people, which can vary from person to person.

2.1. Criticism of Mincer's wage equation

Blinder (1976) criticized Mincer's equation in his study. In his opinion, there are alternative assumptions that differ from Mincer's and would lead to a further empirical analysis of the human capital model. First of all, it goes back to Mincer's assumptions.
In the case of the first condition (1), he pointed out that income is affected by decisions of labor supply and also by the number of hours spent at work. Because of this, several questions arose regarding its correctness.
Concerning condition (2), he distinguished several problems. Blinder believes that the discounted present value would only be equal if every individual had the same opportunity to enter the capital market and had the same skills in human capital development and income generation. If the workplaces were the same in things other than different levels of education, there would be no various risks or fringe benefits.
He accepts assumption (3), but with (4), he points out that the finite life condition becomes problematic, especially concerning the analysis of older workers.
For condition (5), he did not agree with linearity. He understands the importance of simplification, but many other functions would be more suitable in empirical studies.
Secondly, he pointed out the difference between experience and calculated experience. He showed that the computed experience is correct if we can talk about continuous employment, thus excluding those who were on maternity leave, served in the military, or were unemployed.
Based on these, he proposed an alternative model:

$$logW = f(S, X_1, X_2, other\ variables)$$

Where:
logW = logarithmic wage rate
S = number of years spent in education
X_1 = relevant (given workplace) work experience
X_2 = every other experience
The model allows greater flexibility because it avoids linearity, but because of this, we can also accept several criticisms. For example, if we did not have actual data about work experience, then we can no longer apply the model.

3. WAGE DETERMINATION

In connection with the analysis framework, I distinguish two main factors: external and internal (individual) factors. Within the external factors, I examined the studies that analyzed how region, industry, sector (private or public), city sizes, company sizes, and unions affected wages. Within the internal factors, I dealt in more detail with articles dealing with the influence of education, ability, age, race, gender, and marital status.

3.1. External factors

In his study, Reder (1962) examined the differences in wages. He drew attention to the fact that it is challenging to avoid drastic simplifications during measurement when we analyze the behaviour of wage differences. Researchers often treat workers at all skill levels and industries as one quantity and the average or median wage as one price. During the analysis of wages, in many cases, the analysis of fringe benefits is wholly omitted; therefore, the study assumes that the distribution of fringe benefits is similar to the distribution of wages. In addition: in the case of wage levels, average hourly wages have always been analyzed, which must also include overtime. Reder surveyed skilled and unskilled workers in different occupations. He noticed that we could talk about differences between skills and industries, but the reasons behind them cannot be measured in the short term, only in the change of employment; thus, the wage characteristics of the industry were formed.

Behman (1966) wrote about the wage determination processes of American manufacturing companies. He analyzed the relationship between skilled and unskilled workers and industry wage differentials. He stated that labor is not a homogeneous factor, so an industry can have different labor supply functions in the same period if it wants to employ people with other skills and education levels. The author compared skilled employees to unskilled ones, so in the first step, he defined who was a skilled worker.

- Individuals who acquired their skills during internships, work experiences, or informal on-the-job training.
- Individuals whose skills can be utilized in other industries and therefore may receive job offers in different industries.

According to the theory, workers want to change jobs if the new job's net benefit exceeds the current one's use. Therefore, labor mobility says that the highest wage influences the distribution of workers. In this theory, we assume the entire labor supply and full employment. The job has the same characteristics in every industry, making the worker's decision a simple process. The theory rejects even the idea of voluntary unemployment.

In contrast, Behman noticed that the unsatisfied but skilled workforce was the largest group. They are the ones who migrate from one job to another without unemployment intervening, so their mobility will be low when there are not many jobs, but they will respond to an increase in labor demand, as well. However, this statement is only valid for skilled workers. Because of all this, the skilled worker hypothesis states that an industry with a high proportion of skilled labor is much more willing to change wages following the needs of workers than an industry with a relatively low ratio of skilled labor. This is different for the medium-skilled and unskilled workforce.

Zweimüller and Barth (1994) examined wage differences in six OECD countries. The authors lacked a broader explanation of wage differences between industries, so they started the research. They refer to Krueger and Summers (1986), in which the authors pointed out that workers who move from one industry to another can experience significant wage changes compared to those who stay. This change can increase if they choose a higher-paying sector and decrease if they continue their career in a lower-paying industry. In addition, referring to Dickens and Katz (1987) stated that we can also see changes within occupational groups. The productivity factor of Becker's (1964) human capital theory cannot explain these factors since, in many cases, the individual's productivity does not change. The second case excludes wage differences resulting from different occupations. Zweimüller and Barth examined: Austria, the United States of America, Canada, Germany, and Norway, including analysis of trade union effects, centralization distribution effects, and cross-country effects. It is important to emphasize that different countries have different characteristics, so while Austria, Norway, and Sweden are corporative countries, i.e. they do not have trade unions, Germany was characterized by highly high trade union membership (2016 ILO data: % of trade union organization Germany 17, Austria 26.9, Sweden 67), on the other hand, the low weight of trade unions is typical in Canada, and the United States are characterized with low union membership. Due to the available country data, it was necessary to run three different regression equations. In all cases, the wage was represented by a logarithmic variable (hourly or weekly). In addition, education, experience, its square, gender and race, and an industry dummy variable were included in all equations.

The explanatory power of the regression increased significantly with the inclusion of the industry variable in the equation. The industry variable was able to provide the newest information because it was shown that there are industries that pay above-average wages in each country, such as Mining and Insurance. Some industries, such as Trade, Hotels, and Restaurants, pay below average. The industry wage structure is very similar in all countries. However, the distribution of wages shows significant differences between countries. This is unsurprising since reducing wage differences is of prime importance for the more unionized and corporatist countries (Scandinavian countries). This is less true in Austria, where trade unions aim to increase employment. Due to decentralized wage determination in Canada and the United States, wage differentials between industries can be as much as fourfold, less likely to be tolerated in corporatist countries.

Dickens and Katz (1987) examined wage differentials within industries. The authors found several kinds of research about wage differences for workers with seemingly identical characteristics in different sectors. According to the authors, previous studies failed to differentiate between union and non-union members. The article aimed to demonstrate whether a focus on union membership can help better explain wage differences between different industries. They concluded that, although individual characteristics and environmental factors were widely controlled, wage differences also remained in union and non-union groups. It has been shown that the wages of different occupations are highly correlated across industries, i.e. if a field is highly paid in one sector, it also has a wage premium in the other industry. They concluded that there are better-paying industries, so if someone is looking for the same job in a higher-paying sector, they can have a higher wage in the same occupation. On the other hand, if you look for a job in a lower-paying industry, even in a well-paying profession, you still have to expect an inevitable wage loss.

Van der Gaag and Vijverberg (1988) examined the wage differences between the private and public sector and their causes. The authors turned back to the theory of human capital. They point out that investing in human capital concerning the return on investment is one of the significant concerns of many researchers. To non-competitive markets and their wages, they first drew attention to union influence, believing that union members experience wage differences compared to non-union members. It should be emphasized here that this difference is only possible between organizations rather than within. In most continental Europe, if a given organization has a union and a collective agreement is concluded, then the wage included applies equally to everyone, whether that person is a member or not. So it is a matter of wage differences between organizations with a union and those without. In the second part of their investigation, they turned to public sector wages. In connection with state employment, we are talking about a wage scale, which also generates differences compared to those working on the market. After that, the influence of the state was investigated, and it was found that it tries to influence the market or market wages in several cases. The introduction of the minimum wage is also such an initiative. These drive a wedge between the marginal productivity of the individual and his compensation, so the market no longer determines wages. By the end of the 1980s, many researchers were dealing with the question: are we talking about wage differences between the private and the public sector?

In most cases, developed countries were examined; therefore, the authors aimed to investigate a developing country. They chose Ivory Coast, seeking to expand Mincer's equation. Their goal was to explore both sectors. Their regression equation analyzed the effect of education, skills, and experience on wages. They concluded that although wages are higher in the private sector, in a developing country with a high proportion of government workers, public employment may be more attractive because non-wage factors make public employment more attractive to employees. Such positive benefits include job security, fixed working hours, fringe benefits, paid sick leave, paid vacation, and social security.

In many cases, wage differences also result from differences in education. Interestingly, the private sector offers higher wages compared to the public sector at lower education levels and relatively lower wages at higher education levels. This may be because, while a significant part of government jobs in a developing country requires higher education, lower education is sufficient to work in a factory.

Stelcner (et al., 1989) also wrote a joint article with the authors, in which a study in Peru examined the differences between the public and private sectors. The results supported the conclusions of the previous article. This article discussed the effect of experience, time spent in education, education, and parental education on wages. Experience is given almost the same importance in both sectors, yet it can be noticed that the time spent in education and the diploma are more critical in the public sector. If the worker studied at a public school, he could expect a higher wage in the public sector but a lower one in the private sector. A father's higher education level can also significantly increase wages. However, their most significant conclusion was that wage offers in the public sector are characterized by higher variability than private sector ones.

To see what characterizes developed countries, I examined the study of Mueller (1998), who conducted his research in Canada. The author used quantile OLS regression to study the wages of the two sectors. He noticed that public sector workers have a wage premium compared to private sector workers. This premium is the highest for state government employees. This premium would be negative only in the case of rural male workers. The wage premium in the public sector is higher for women also. When comparing those with lower salaries, the regression showed that this premium is much higher in the public sector. These results prove that even in the case of Canada, a developed country, workers in the public sector receive higher wages than members of the private sector with the same characteristics.

Homund and Zetterberg (1990) also examined the wage-determining variables in different industries by comparing five other countries. During the empirical research, they had the opportunity to examine the panel database of Sweden, Norway, Finland, Germany, and the United States of America between the early 1960s and the mid-1980s. Their most important result was that in the United States of America, industry wages respond much faster to sectoral prices and productivity changes, even when the workers' human capital and demographic characteristics are controlled for in the regression equation. An interesting finding is that the U.S. has the most decentralized wage system among the five listed, yet inflation, unemployment, productivity, and sectoral prices significantly impact workers' wages. This clearly shows that American wages are much more flexible and react more quickly to the shocks of the market. These changes last much longer than in European countries, where the reaction is slower or almost minimal, and there is no visible long-term effect. It can be shown that in the case of industries with a higher proportion of unions, the response to external wages is much more often, which the authors identify as an insider effect.

Fuchs (1967) examined wage differences in different regions and city sizes. The researcher wrote and published in the United States of America, which is essential because much lower wages characterized southern states. Fuchs also highlighted that regional wage differences were significantly more significant for unskilled labor than for skilled labor. The author drew attention to the fact that in the case of previous studies, gross state wages were discussed, or only a few specific industries or occupations were examined. During these researches, wages were calculated from actual income or annual income. Still, in many cases, only certain types of workers were discussed; therefore, they needed a complete picture of hourly wages. It can be seen that self-employed or hourly workers were not examined at all. Age, education, race, and gender were also missing from previous research. If we look at the data with these characteristics, correct conclusions may be drawn regarding regional differences. After these findings, the author began to examine all employed people over the age of 14 who, according to their admission, did not work in agriculture. These people can be classified into different groups according to the following aspects:

- Race: white and non-white
- Gender: male and female
- Number of years spent in school: 0-4, 5-8, 9-11, 12, 13-15, 16, and more
- Age: 14-19, 20-24, 25-34, 35-44, 45-54, 55-64, 65 and above
- Region: North-east, Middle-North, South, and West
- City size: 7 different groups from rural to the standard statistical metropolitan territory, which is 1 000 000 people and above

When calculating the annual working hours, the weekly working hours of each employee were multiplied by the number of weeks they worked. It is important to emphasize that the multiplication was carried out on an individual level for each employee. An estimated income was determined, then divided by the aggregated hours worked, and based on this, an expected income was obtained for each region and city size. Based on all this, the following calculations were made where::

A = actual yearly income
K = number of worked weeks
L = number of worked hours in April
H = K*L = number of estimated worked hours
W = A/H = estimated average hourly wage
c = gender, race, age, education
R = region
u = U. S.
s = city size

$$E_r = \frac{\sum_c H_{cr} W_{cu}}{H_r} = \text{expected average number of hours worked in } r \text{ region}$$

$$R_r = \frac{W_r}{E_r} = \text{actually expected income in } r \text{ region}$$

It should be emphasized that the differences are relative, obtained by dividing the actual by the expected. For this reason, an absolute difference test, which could be calculated from the expected real wages, could be substantial.

These were the theoretical basis for today's research. In the last part, I will introduce one of the newest wage determination research in connection with external factors, and we will also see some internal factors.

Fogg (et al., 2018) examined the American labor market. The authors pointed out that over the past four decades, the average income benefit of completing a bachelor's degree has increased significantly. The study examines three main factors in the evaluation of human capital. These factors are essential skills, finished school, and work experience. The researchers used a regression equation to examine the effect of the factors listed below on wages. In addition to the Current Population Survey (CPS) database, the PIAAC database was used. First, descriptive statistical data were presented, contributing to the statement that there is a positive relationship between education and skills and a strong positive relationship between skills and income. Based on all of this, workers with a higher level of education receive higher wages than workers with a lower level of education. Measurable differences could be found in the average wages between workers with the same education when examining their reading and addition skills. The authors admitted that they see their model as an extension of Mincer's equation. Education was defined with a dummy variable corresponding to terms described in the PIAAC database, such as high school diploma, post-high school vocational qualification, college degree, bachelor's degree, and master's degree. The third measure they used is the worker's skills, which were taken from the PIAAC database and examined the scores and levels of individuals' numeracy and reading skills. Six wage regressions were analyzed, and abilities were inspected with four sub-regressions. They distinguished four different meanings of skills:

- Skill, standardized points achieved on reading and writing tests
- Skill standardized points achieved on the numeracy test
- Skill, level achieved in the reading and writing test
- Skill, level achieved in the numeracy test

Below you can find the six different regression equations which were run by the authors. The equation was gradually expanded with more and more explanatory variables. In the case of the first equation, the effect of skill on wages was investigated only.

$$\ln(\text{wage}) = \beta_0 + \beta_1 \text{skill} + u$$

In the second equation, they analyzed the effect of skills and education, as well. They investigated the effect of different levels of education on wages.

$$\ln(\text{wage}) = \beta_0 + \beta_1 \text{skill} + \beta_2 \text{education} + u$$

In the third equation, they analyzed the effect of experience and the skills of writing in English. This is important because, in the PIAAC database, there were non-American citizens as well.

$$\ln(\text{wage}) = \beta_0 + \beta_1 \text{skill} + \beta_2 \text{education} + \beta_3 \text{experience}^2 + \beta_4 \text{writing in English} + u$$

In the fourth equation, the authors have included variables that are independent of the person but have an impact on the wages. Such is the sector, which alone can determine the starting salary from which a given person's salary starts. This is also true for occupation, since in many cases the salary of a lawyer is difficult to compare with the salary of a shop assistant, and this is not only due to education.

$$\ln(\text{wage}) = \beta_0 + \beta_1 \text{skill} + \beta_2 \text{education} + \beta_3 \text{experience} + \beta_4 \text{writing in English} + \beta_5 \text{sector} + \beta_6 \text{occupation} + u$$

The authors included the number of hours worked per week, educational status, which refers to enrollment, and residence first in the fifth equation. The place of residence is particularly important because it shows the city size in which the person lives, which can also affect the salary scale.

$$\ln(\text{wage}) = \beta_0 + \beta_1 \text{skill} + \beta_2 \text{education} + \beta_3 \text{experience} + \beta_4 \text{writing in English} + \beta_5 \text{sector} + \beta_6 \text{occupation} + \beta_7 \text{number of hours worked per week} + \beta_8 \text{educational status} + \beta_9 \text{residence} + u$$

The last equation completes the regression. This one takes into account gender and race differences, as well as if someone was not born in the United States of America. With the inclusion of disability, they calculated with variables indicative of discrimination, the filtering out its effects have a significant impact on the effectiveness of the model.

$$\ln(\text{wage}) = \beta_0 + \beta_1 \text{skill} + \beta_2 \text{education} + \beta_3 \text{experience} + \beta_4 \text{writing in English} + \beta_5 \text{sector} + \beta_6 \text{occupation} + \beta_7 \text{weekly worked hours} + \beta_8 \text{educational status} + \beta_9 \text{location of home} + \beta_{10} \text{gender} + \beta_{11} \text{race} + \beta_{12} \text{foreign} + \beta_{13} \text{disability} + u$$

The study significantly contributed to the decision of which external factors are significant in the case of a wage determination model. As a result, sector and place of residence will be included in my wage-determining equation. In addition to all this, I feel it is important to point out that this study already included to a significant extent individual internal factors such as education, experience, occupation, gender, and disability, which I also consider important from the point of view of my equation.
In the next subsection, I focused on the studies dealing with internal factors to finally compile my own, individually defined wage determination model.

3.1. Internal factors

Sorkin (1969) looked for answers to how skills and education affect and explain wage differences between occupations. In the article, three simple models are tested on an American database. In the first model, wages are presented by the level of education and skills; in the second model, the wages of occupations are explained by the worker's skills, education, and age. In the third model, the author analyzed the relationship between unemployment in a given occupation and skills, education, and average age. Based on the results, skills are more critical than education among the factors affecting wages. The author explains this by saying that the number of years spent in school only shows how many years someone has completed, while skills utilize what has been learned.
Ashenfelter and Krueger (1994) also examined the effect of education on wages. They had the opportunity to study twins who had different educational levels. They realized that the impact of an additional year on the salary is much higher than the previous ones, which can increase by up to 9-12%. Four years later, Ashenfelter and Rouse (1998) determined, based on the analysis of wage data of 700 pairs of identical twins, that the previous estimate of 9% was correct. However, there may be minor deviations due to differences in ability. They stated that better-skilled individuals complete more years of schooling not because it has higher marginal benefits but lower marginal costs.
Smith and Welch (1979) investigated wage inequalities using the CPS database. Their study included education, region, state employment, experience, and the number of weeks worked. Wage differences were examined between white and black men and within the groups of white and black men. They found that although black men suffer a wage disadvantage compared to white men, the distribution of wages within the black male group is more unequal than within the white group. In the case of older black workers, we saw substantial wage inequalities compared to the older white male groups. Education and the number of hours worked per week were found to have the highest explanatory power. They stated that the number of completed school classes also shows significant differences within the group of blacks.

Although trends in employment (number of hours worked) improved between 1960 and 1970, both between groups and within groups, significant differences remained within the black group.
In their study on discrimination, Oaxaca and Ransom (1994) examined wage differences using the CPS database. The sample was narrowed down to individuals over the age of 25. They also used a logarithmic wage regression model, where the dependent variables included experience, measured in years (both linearly and as a quadratic term), the number of years spent in school (quadratic and linear terms), public employment, industry, city size, regional location, and occupation. Hourly wages were used as the basis, and the sample was analyzed for gender and racial differences. Based on these, their equation looked like this:

$$\ln(wage) = \beta_0 + \beta_1 \text{ gender} + \beta_2 \text{ race} + \beta_3 \text{ experience} + \beta_4 \text{ experience}^2 + \beta_5 \text{ education} + \beta_6 \text{ education}^2 + \beta_7 \text{ state} + \beta_8 \text{occupation} + \beta_9 \text{ industry} + \beta_{10} \text{ region} + \beta_{11} \text{ city} + u$$

Lee and Lee's (2006) research was about wage determination in the Korean labor market. The quantile regression had dependent variables such as education, age, work experience, high-paid intellectual employment, low-paid intellectual employment, high-paid physical employment, low-paid physical employment, place of residence at age 14, current region, gender, marital status, and trade union membership. In the Korean labor market, age is the most significant wage-influencing variable; experience plays a lesser role in the higher wage categories. Education plays a prominent role in wage determination for all wage groups, and its effect is relatively consistent across groups. The return on education is relatively low compared to the American model. According to the authors, the reason behind this is that Korean education prepares you for the challenges of the labor market to a relatively small extent. Female workers are significantly underpaid compared to men, and union membership is more rewarding in higher wage brackets because it does not affect wages in lower wage brackets. In the previous articles, I did not find any research that would have involved marital status in the equation. The question has often arisen regarding wage differences and whether a married woman with children is at a wage disadvantage compared to a man with similar abilities.
To prove that my wage determination model is sufficiently innovative, I examined the research of the last ten years in more detail. Castex and Dechter (2014) wrote about the changing role of education and skills in determining wages. The authors used the following regression equation in their study:

$$\ln(wage) = \beta_0 + \beta_1 \text{ education} + \beta_2 \text{ ability} + \beta_3 \text{ experience} + \beta_4 \text{ experience}^2 + \beta_5 X + u$$

They had information about the individual's abilities, which measured the cognitive abilities, the average verbal ability, and the average mathematical ability. This is essential information for the employer when making salary decisions, as it shows the new employee's skills. X is a vector for determining the individual ability and family background. The authors highlighted that it would be interesting for future research if they continue to follow these characteristics and thereby determine which attributes of the individual possibly led to a dismissal, promotion, or different career opportunities.
Mehdikarimi (et al., 2015) included the relationship between wages and the number of hours worked in their model:

$$\text{Hourly wage} = \beta_0 + \beta_1 \text{ lnwage} + \beta_2 \text{ rfamilymember} + \beta_3 \text{ lngas} + \beta_4 \text{ middle} + \beta_5 \text{ high} + \beta_6 \text{ voucher} + u$$

Where:

hourly wage	= the average hours the individual worked during the week
lncome	= the logarithm of the individual's corrected personal income of the previous year
family member	= number of family members who worked in the last 12 months
lngas	= logarithmic monthly gas (heating, cooking, hot water) bills
middle	= workers whose income was greater than $20,599
high	= individual's income in the last 12 months > $104,096
voucher	= whether the individual received a food voucher

In addition to the previous ones, this article helped to realize that hourly wages are the appropriate dependent variable because, in many cases, workers from lower-wage families only work a few hours a day and do not have full-time jobs. The article also presented the interchangeability and substitutability effect, which shows that workers who earn more are willing to work more.
The presentation of these equations was essential because it helped me create a set of variables I wanted to incorporate into my wage determination model. During the article, I paid particular attention to the regression equations and the properties of the explanatory and control variables within them.

4. RESULTS AND SUMMARY

As a summary, I present in the following table how the work of the author(s) described above influenced the development of my wage-determining equation. Only those researchers who influenced my equation were included in the table. As seen in the table, in my wage-determining equation - a modified version of Mincer's equation - I only used variables that were also given special attention by the author(s) analyzed in the article (Table 1). An exception to this is the family status variable, which is not included in the table and is only mentioned as marital status by Lee and Lee (2006). Still, it is significant from the point of view of determining an individual's income. By family status, I mean whether someone is single or married and whether they have children. I do not assume a significant difference between the wages of a single childless man and a woman. On the other hand, we can find substantial wage differences between a mother with children and a single man.

Table 1: Synthesizing wage-determining equations

	Variable/Author	Mincer (1958)	Reder (1962)	Mincer (1974)	Dickens and Katz (1987)	Oaxaca and Ransom (1994)	Fogg et al. (2018)	Own
Internal	Education	X		X		X	X	X
	Experience			X		X	X	X
	Expericence^2			X		X		X
	Racer					X		X
	Gender					X		X
	Family status							X
External	Occupation				X	X	X	X
	Industry		X		X	X	X	X
	Location				X	X		X
	Union				X			X
	City size					X		X
	Organization size							X
	Other	X	X		X	X	X	

* age, skilled, public employee, skills, other abilities,

Source: Own editing

Based on these, my wage-determining equation became the following:

$$\ln(\text{wage}) = \beta_0 + \beta_1 \text{ gender} + \beta_2 \text{ race} + \beta_3 \text{ experience} + \beta_4 \text{ experience}^2 + \beta_5 \text{ education} + \beta_6 \text{ family status} + \beta_7 \text{ occupation} + \beta_8 \text{industry} + \beta_9 \text{ city size} + \beta_{10} \text{ organization size} + \beta_{11} \text{ region} + \beta_{12} \text{ union} + u$$

Under the other variable, I listed variables that only one author selected. Ultimately, I did not consider them particularly important in my equation either. Among them, we find the skilled variable from Reder's (1962) equation, instead of which Mincer, Oaxaca and Ransom, and myself, used education. The public employee variables used by Oaxaca and Ransom can also be found here. Many variables can significantly impact wages, and many of them could have been included in my equation as control variables. However, my goal was not to examine discrimination or wage differences between different markets but to determine which explanatory variables determine wages the most

REFERENCES

Ashenfelter, O.,, & Krueger, A. B. (1994). Estimates of economic return to schooling from a new sample of twins. *Quarterly Journal of Economics, 84* (5), 1157-1173.

Ashenfelter, O., & Rouse, O. C. (1998). Income, schooling and ability: Evidence from a new sample of identical twins. *Quarterly Journal of Economics, 113* (1), 253-284.

Becker, G. S. (1964). *Human capital* (2nd ed.) Columbia University Press. New York.

Behman, S. (1966). Wage-determination process in U.S. Manufacturing. *Quarterly Journal of Economic*, *82* (1), 117-142.

Blinder, A. S. (1976). On dogmatism in human capital theory. *The Journal of Human Resources, 11* (1), 8-22.

Castex, G., & Decter, E. K. (2014). The changing roles of education and ability in wage determination. *Journal of Labor Economics, 32* (4), 685-710.

Dickens, W. T., & Katz L. F. (1987). Inter-industry wage differences and theories of wage determination. *NBER working paper No. 2271.*

Fuchs, V. R. (1967). *Differentials in Hourly Earnings by region and city size. 1959.* National Bureau of Economic Research.

Fogg, N., Harrington P,. & Khatiwada, I (2018). *Skills and earnings in the full-time labor market.* In The impact of Human Capital in the American Labor Market Series. The ETS Center for Research on human capital and education. ETS, Princeton.

Friedman, M., & Kuznets, S. (1947). *Income from Independent Professional Practice*. National Bureau of Economic Research, New York.

Homund, B., & Zetterberg, J. (1990*).* Insider effects in wage determination – Evidence from five countries. *European Economic Review, 35*, 1009-1034.

Krueger, A., & Summers, L. (1986). Efficiency wages and the wage structure. *National Bureau of Economic Research Working paper series, 1952,* 1-37.

Lee, B., & Lee, M. J. (2006). Quantile regression analysis of wage determinants in the Korean Labor Market. *The Journal of the Korean Economy, 7* (1), 1-31.

Mehdikarimi, S., Norris, S., & Stalzer, C. (2015). *Regression Analysis of the Relationship between Income and Work Hours*. Georgia Institute of Technology. Econometric Analysis.

Mincer, J. (1958). Investment in human capital and personal income distribution. *Journal of Political Economy, 66* (4), 281-302.

Mincer, J. (1962). On-the-Job Training: Costs, Returns, and Some Implications. *Journal of Political Economy, 70* (5), Part 2: Investment in Human Beings. 50-79.

Mincer, J. (1974). Schooling, Experience and Earnings. *National Bureau of Economic Research,* 64-82.

Mueller, R. E. (1998). Public-private sector wage differentials in Canada: evidence from quantile regression. *Economics Letter, 60*, 229-235.

Oaxaca, R. L., & Ransom, M. R. (1994). On discrimination and the decomposition of wage differentials. *Journal of Econometrics, 61*, 5-21.

Reder, M. W. (1962). *Wage differentials: Theory and measurement.* In Aspects of Labor Economics. Universities-National Bureau Committee for Economic Research. 257-317, Princeton University Press.

Rosen, S. (1992). Distinguished Fellow: Mincering Labor Economics. *Journal of Economic Perspectives 6* (2), 157-170.

Smith, J., & Welch, F. (1979). Inequality: Race differences in the distribution of earnings. *International Economic Review. 20* (2), 515-526.

Stelcner, M., & Van der Gaag, & J. Vijverberg, W. (1989). A switching regression model of public-private sector wage differentials in Peru: 1985-86. *The Journal of Human Resources, 24* (3), 545-559.

Sorkin, A. L. (1969). Some factors associated with earnings and unemployment differences between occupations. *Nebraska Journal of Economics & Business, 8* (1), 44-52.

Van der Gaag, J., & Vijverberg, W. (1988). A switching regression model for wage determinants in the public and private sectors of a developing country. *The Review of Economics and Statistics*, *70* (2), 244-252.

Zweimüller, J., & Barth, E. (1994). *Bargaining Structure, wage determination, and wage dispersion in 6 OECD countries*. Kylos. 47, 81-9.